

Product catalogue

www.spminstrument.com

SPM
condition monitoring solutions

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Product catalogue



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5 Vibration transducers and transmitters, DuoTech

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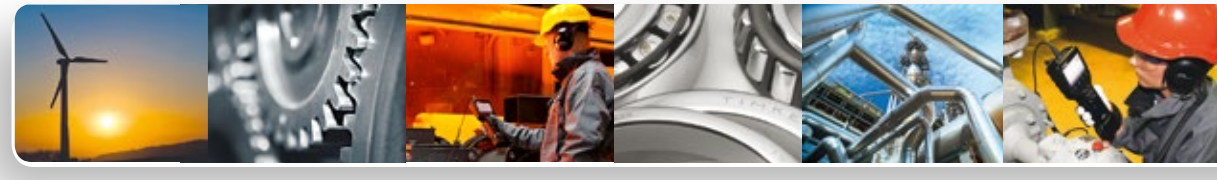
9 Instruments approved for potential explosive atmosphere

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SPM
condition monitoring solutions

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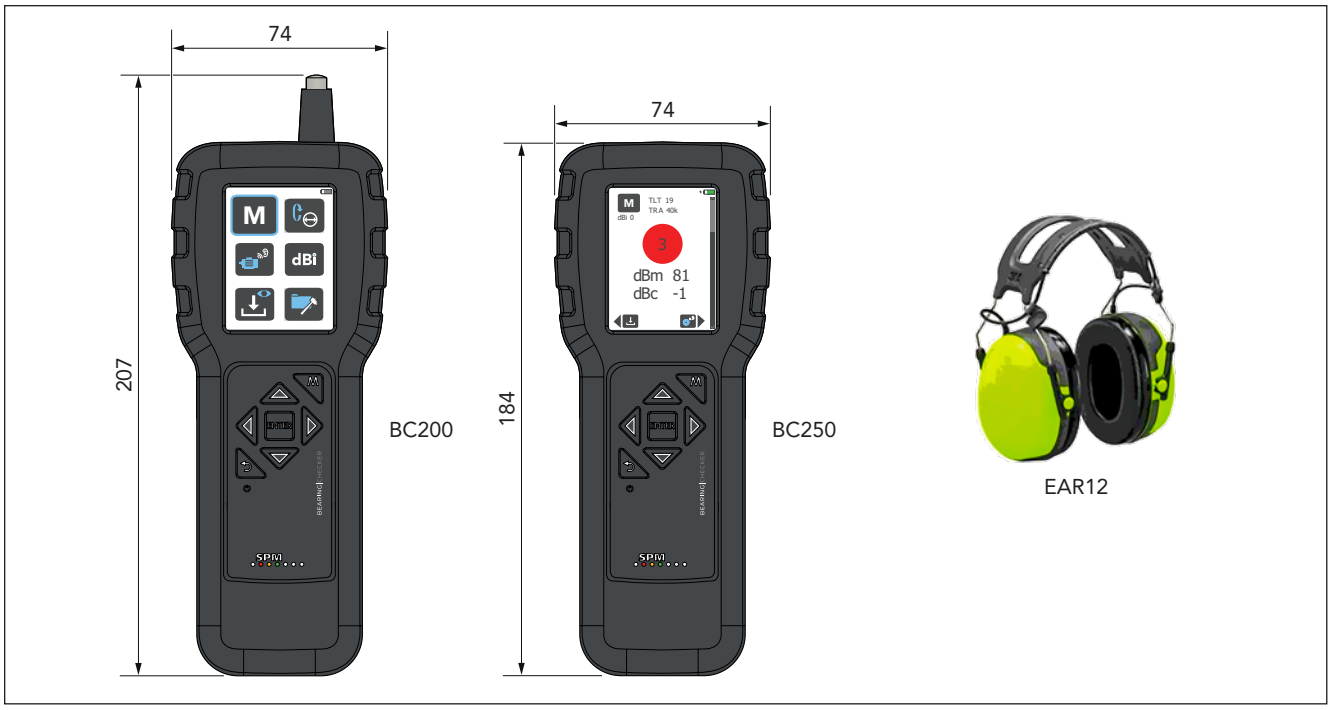


Portable Instruments

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Bearing Checker



BearingChecker is a portable instrument for fast and easy measurement of bearing condition in preventive maintenance. The instrument is push button controlled and basic measurement data are entered manually.

BearingChecker measures shock pulses, either with a built-in probe (BC200) or with an external transducer. The instrument can also be used as an electronic stethoscope for detecting machine sound irregularities.

Measuring results are indicated by green-yellow-red symbols along with detailed evaluation of measurement values. Measurement results can also be transferred to a file for further processing, e.g. in Microsoft Excel.

For prepared kits containing instruments, carrying case, charger, charger cable, etc., see TD-573.

Technical specifications

Material, casing:	copolyester/TPE
Size:	BC200: 207x74x41 mm (8.1x2.9x1.6 in) BC250: 184x74x41 mm (7.2x2.9x1.6 in)
Weight:	BC200: 335 g (11.8 ounces) BC250: 300 g (10.6 ounces)
Protection class:	IP65
Keypad:	sealed, snap action
Display:	2.4" Color TFT LCD Display
Power supply:	3.63 V Lithium Ion, USB rechargeable
Battery life:	> 25 hours of normal use
Operating temperature:	–10° to +50 °C (14° to 122 °F)
General functions:	battery status display, transducer line test, metric or Imperial units of measurement, menus with symbols, storage of up to 10 measurement values
Input connector:	mini coax, for external shock pulse transducers
Output connector:	mini-B USB (adapter allows 3.5 mm stereo jack for headphones)

Shock pulse measurement

Measurement technique:	dBm/dBc, measuring range –9 to 90 dBsv, ±3 dBsv
Transducer type:	built-in probe, external 40000 or 42000 transducer, TRA73, TRA74, or TRA75
Condition indication:	green, yellow, and red symbols

Stethoscope

Earphone mode:	7 level amplification
Transducer type:	built-in probe or external 40000 transducer

Part numbers

BC200	BearingChecker with probe, excl. options
BC250	BearingChecker without probe, excl. options

Options

CAB52	Measuring cable, 1.5 m, mini coax - BNC slip-on
CAB94	Charger cable, USB type A to mini-B USB, 1.5 m
CAS24	Carrying case, plastic with foam inlay set for 1 BC/VC instrument, 326x222x116 mm
CAS29	Carrying case, plastic with foam inlay set for 2 BC/VC instruments, 437x379x130 mm
EAR12	Headphones with eardefenders (TD-404)
TRA73	External transducer with probe (TD-250)
TRA74	Transducer with quick connector (TD-251)
TRA75	Transducer with quick connector, angled (TD-252)
18103	Cable adapter, mini-B USB to 3.5 mm stereo jack
18226	Kit for screen protection (2 pcs screen protector)
90647	Charger, 100-240 V, 50-60 Hz, 6 W
93363	Cable adapter, mini coax - BNC
93062	Cable adapter, BNC - TNC, plug-jack

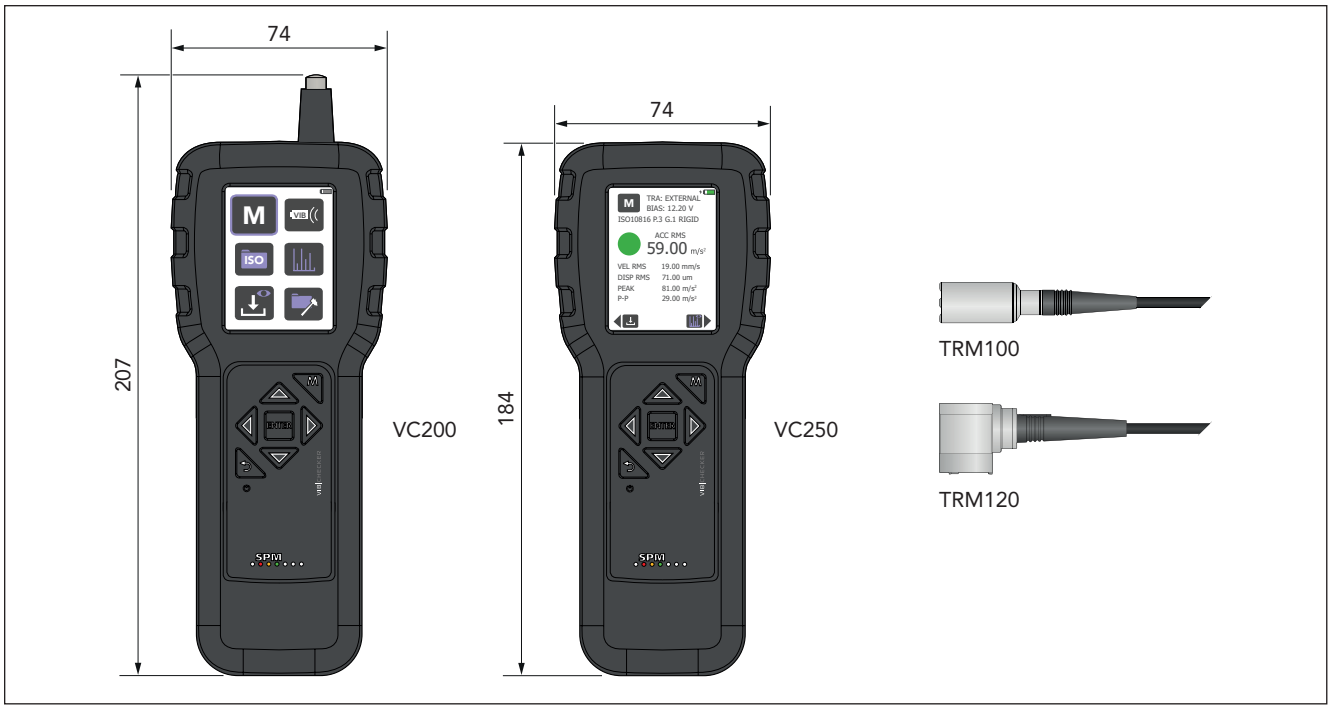
Spare parts

18128	Rubber sleeve, built-in probe

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VibChecker



VibChecker is an instrument for fast and easy measurement of machine condition in preventive maintenance. It is based on the recommendations of ISO 2372 and ISO 10816 standards for broad band measurements of vibration. These standards make the assumption that limited information, obtained easily and at a low cost, is often as useful as a detailed analysis using expensive equipment and elaborate techniques.

The instrument measures either with a built-in probe (VC200) or with an external transducer. It is push button controlled and basic measurement data are entered manually. Evaluated measuring results are indicated by green-yellow-red symbols, and a time signal and its FFT spectrum are produced for easy pattern recognition. Measurement results can also be transferred to a file for further processing, e.g. in Microsoft Excel.

For prepared kits containing instruments, carrying case, charger, charger cable, etc., see TD-573.

Technical specifications

Frequency range:	10 to 1000 Hz
Readings:	RMS/peak/peak-to-peak
Measuring range (sinus signal and 100 mV/g accelerometer):	
Velocity RMS	100 mm/s (4 ips) at 80 Hz (inaccuracy 0.15 mm/s ±3%)
Acceleration RMS	100 m/s² (10 g) at 10-1000 Hz
Displacement RMS	100 um (4 mil) at 80 Hz
Condition evaluation:	according to ISO 2372 and ISO 10816 Part 2, 3, 4 >600 rpm
Spectrum:	linear, 200/400/800 lines, Hanning window, Hz/cpm, zoom, RPM markers
Time signal:	512/1024/2048 samples, zoom, marker
General functions:	battery status, transducer check, metric or imperial units, language independent menus, storage of up to 10 measuring samples
Condition indication:	green, yellow and red symbols
Display:	2.4" Color TFT LCD Display
Keypad:	sealed, snap action
Material, casing:	copolyester/TPE
Protection class:	IP65
Power supply:	3.63 V Lithium Ion, USB rechargeable
Battery life:	> 25 hours of normal use
Internal transducer:	accelerometer type MEMS
Input connector:	mini coax, for external transducer
External transducers:	vibration transducer TRM100/ TRM120 or IEPE (ICP®) type transducers with voltage output
Output connector:	mini-B USB
Operating temperature:	–10 °C to +50 °C (14 °F to 122 °F)
Size:	VC200: 207x74x41 mm (8.1x2.9x1.6 in) VC250: 184x74x41 mm (7.2x2.9x1.6 in)
Weight:	VC200: 335 g (11.8 ounces) VC250: 300 g (10.6 ounces)

Part numbers

VC200	VibChecker with probe, excl. options
VC250	VibChecker without probe, excl. options

Options

CAB52	Measuring cable, 1.5 m, mini coax - BNC slip-on
CAB78	Measuring cable, 1.5 m, mini coax - 2 pin
CAB94	Charger cable, USB type A to mini-B USB, 1.5 m
CAS24	Carrying case, plastic with foam inlay set for 1 BC/VC instrument, 326x222x116 mm
CAS29	Carrying case, plastic with foam inlay set for 2 BC/VC instruments, 437x379x130 mm
TRM100	Transducer with integral magnet, straight, 1.5 m
TRM120	Transducer with integral magnet, angled, 1.5 m
18226	Kit for screen protection (2 pcs screen protector)
90647	Charger, 100-240 V, 50-60 Hz, 6 W
93363	Cable adapter, mini coax - BNC
93062	Cable adapter, BNC - TNC, plug-jack

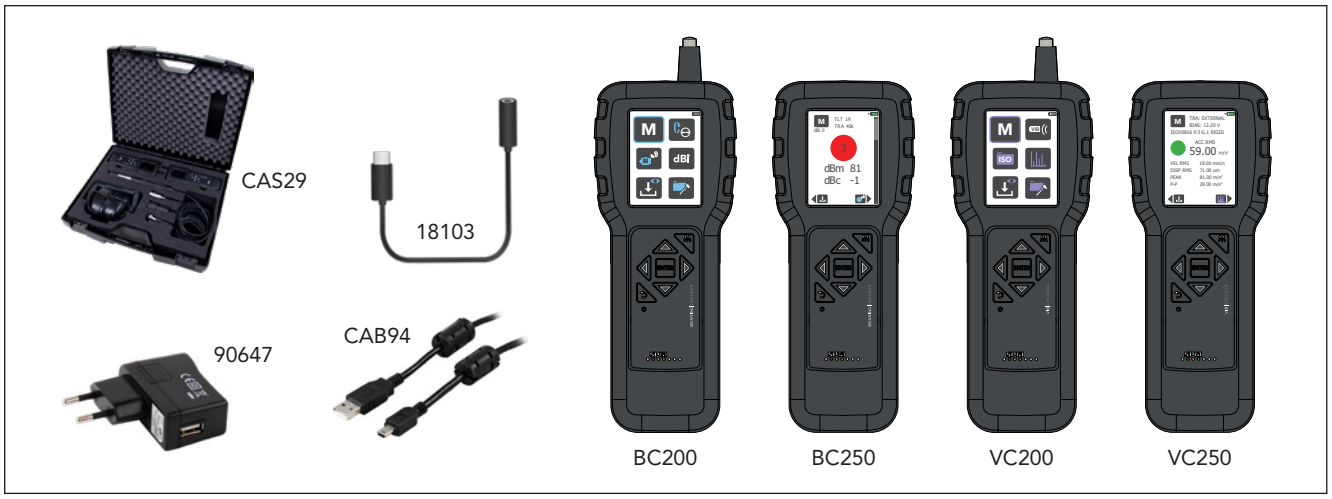
Spare parts

18128	Rubber sleeve, built-in probe

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Bearing Checker/VibChecker kits



BC200-KIT-1
BC200 BearingChecker with probe (TD-554)
TRA74 Sensor with quick connector for adapters (TD-251)
EAR12 Headphones with eardefenders (TD-404)
CAB94 Charger cable, USB type A to mini-B USB, 1.5 m
90647 Charger, 100-240 V, 50-60 Hz, 6 W
18103 Cable adapter, mini-B USB to 3.5 mm stereo jack
CAS29 Carrying case for 2 instruments, 437x379x130 mm

BC200-KIT-2
BC200 BearingChecker with probe (TD-554)
TRA73 External sensor with probe (TD-250)
EAR12 Headphones with eardefenders (TD-404)
CAB94 Charger cable, USB type A to mini-B USB, 1.5 m
90647 Charger, 100-240 V, 50-60 Hz, 6 W
18103 Cable adapter, mini-B USB to 3.5 mm stereo jack
CAS29 Carrying case for 2 instruments, 437x379x130 mm

BC200-KIT-3
BC200 BearingChecker with probe (TD-554)
CAB94 Charger cable, USB type A to mini-B USB, 1.5 m
90647 Charger, 100-240 V, 50-60 Hz, 6 W
18103 Cable adapter, mini-B USB to 3.5 mm stereo jack
CAS29 Carrying case for 2 instruments, 437x379x130 mm

BC250-KIT-1
BC250 BearingChecker without probe (TD-554)
TRA74 Sensor with quick connector for adapters (TD-251)
EAR12 Headphones with eardefenders (TD-404)
CAB94 Charger cable, USB type A to mini-B USB, 1.5 m
90647 Charger, 100-240 V, 50-60 Hz, 6 W
18103 Cable adapter, mini-B USB to 3.5 mm stereo jack
CAS29 Carrying case for 2 instruments, 437x379x130 mm

BC250-KIT-2
BC250 BearingChecker without probe (TD-554)
TRA73 External sensor with probe (TD-250)
EAR12 Headphones with eardefenders (TD-404)
CAB94 Charger cable, USB type A to mini-B USB, 1.5 m
90647 Charger, 100-240 V, 50-60 Hz, 6 W
18103 Cable adapter, mini-B USB to 3.5 mm stereo jack
CAS29 Carrying case for 2 instruments, 437x379x130 mm

BC250-KIT-3
BC250 BearingChecker without probe (TD-554)
TRA73 External sensor with probe (TD-250)
CAB94 Charger cable, USB type A to mini-B USB, 1.5 m
90647 Charger, 100-240 V, 50-60 Hz, 6 W
18103 Cable adapter, mini-B USB to 3.5 mm stereo jack
CAS29 Carrying case for 2 instruments, 437x379x130 mm

VC200-KIT-1
VC200 VibChecker with probe (TD-555)
TRM120 Angled transducer with integral magnet, 1.5m (TD-303)
CAB94 Charger cable, USB type A to mini-B USB, 1.5 m
90647 Charger, 100-240 V, 50-60 Hz, 6 W
CAS29 Carrying case for 2 instruments, 437x379x130 mm

VC200-KIT-2
VC200 VibChecker with probe (TD-555)
CAB94 Charger cable, USB type A to mini-B USB, 1.5 m
90647 Charger, 100-240 V, 50-60 Hz, 6 W
CAS29 Carrying case for 2 instruments, 437x379x130 mm

VC250-KIT-1
VC250 VibChecker without probe (TD-555)
TRM120 Angled transducer with integral magnet, 1.5m (TD-303)
CAB94 Charger cable, USB type A to mini-B USB, 1.5 m
90647 Charger, 100-240 V, 50-60 Hz, 6 W
CAS29 Carrying case for 2 instruments, 437x379x130 mm

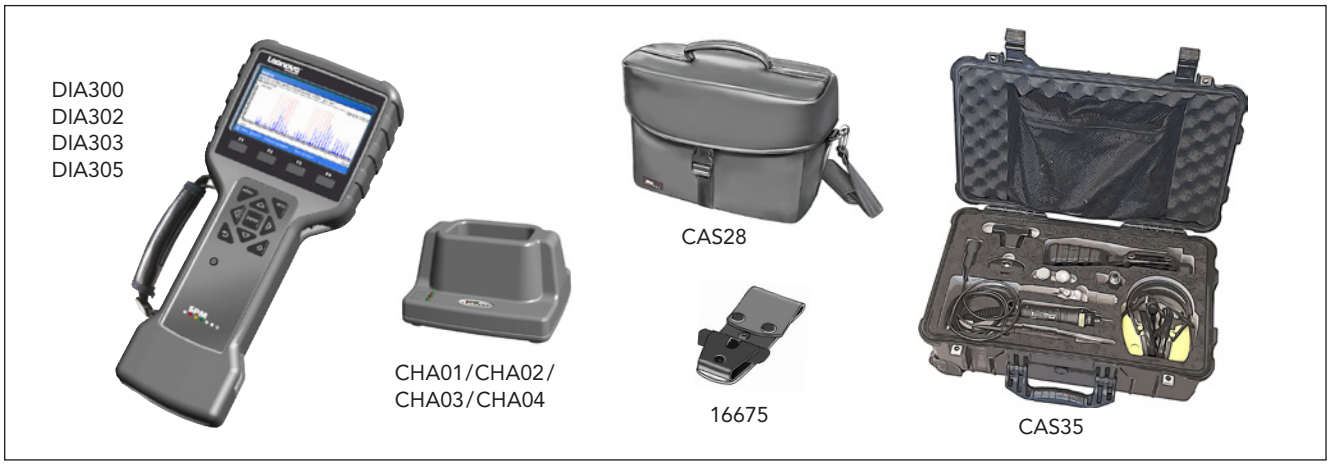
BC/VC-200-KIT-1
BC200 BearingChecker with probe (TD-554)
VC200 VibChecker with probe (TD-555)
TRA74 Sensor with quick connector for adapters (TD-251)
TRM120 Angled transducer with integral magnet, 1.5m (TD-303)
EAR12 Headphones with eardefenders (TD-404)
CAB94 Charger cable, USB type A to mini-B USB, 1.5 m
90647 Charger, 100-240 V, 50-60 Hz, 6 W
18103 Cable adapter, mini-B USB to 3.5 mm stereo jack
CAS29 Carrying case for 2 instruments, 437x379x130 mm

BC/VC-250-KIT-1
BC250 BearingChecker without probe (TD-554)
VC250 VibChecker without probe (TD-555)
TRA73 External sensor with probe (TD-250)
TRA74 Sensor with quick connector for adapters (TD-251)
TRM120 Angled transducer with integral magnet, 1.5m (TD-303)
EAR12 Headphones with eardefenders (TD-404)
CAB94 Charger cable, USB type A to mini-B USB, 1.5 m
90647 Charger, 100-240 V, 50-60 Hz, 6 W
18103 Cable adapter, mini-B USB to 3.5 mm stereo jack
CAS29 Carrying case for 2 instruments, 437x379x130 mm

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Leonova Diamond® – Platform



Leonova Diamond is a three-channel handheld machine condition analyser designed for use in harsh environments. The following functions are always included for unlimited use:

- Data logging with Condmaster® Ruby.
- ISO 2372 vibration monitoring.
- Speed and temperature measurements.
- Analog signals, current, and voltage.
- Automatic recording, up to 50 hours.
- Stethoscope function.
- Reading from and writing to CondID® memory tags.
- Recording of vocal comments.

The main Leonova functions are user-selected, see TD-359. With synchronous measurement, enveloping, true zoom, and up to a 25 600 line spectrum over DC up to 40 kHz, Leonova Diamond has full vibration analysis capacity. The evaluation tables of the ISO 10816 standards for broadband measurement of vibration velocity, acceleration, and displacement are also incorporated. For single and dual plane rotor balancing, a graphical guide calculates balancing weights and their position. For shaft alignment, Leonova Diamond uses advanced laser technique with easy targeting, modulated line laser beam, and automatic precision calculation of shaft positions.

Part numbers

DIA300	Leonova Diamond, SPM HDm/HDc
DIA302	Leonova Diamond, Balancing, single and dual plane
DIA303	Leonova Diamond, SPM LR/HR
DIA305	Leonova Diamond, SPM HDm/HDc and LR/HR
DIA162	Extra memory, 4 GB
DIA163	Extra memory, 8 GB
BATT02-Std	Optional battery pack
16644	Battery adapter unit
CHA01	Battery charger incl. AC adapter, Euro plug
CHA02	Battery charger incl. AC adapter, UK plug
CHA03	Battery charger incl. AC adapter, US plug
CHA04	Battery charger incl. AC adapter, AU plug
93484	Car charger cable 12V
CAB94	Communication cable, USB - mini USB
16675	Belt clip, complete
16646	Shoulder strap with safety buckle
CAS28	Carrying case, soft with modular insert, 370x200x270 mm
CAS35	Carrying case/trolley case with two wheels, plastic with foam insert, 560x350x230 mm
81468	Code lock, TSA approved, for CAS35

Parts of the Leonova system are specified on the technical data sheets (TD) listed below:

Instrument specifications	TD-357
User-selected functions	TD-359
Shock pulse method SPM HD frequency and time domain analysis	TD-361
SPM Shock pulse method dBm/dBc	TD-406
SPM Shock pulse method LR/HR	TD-362
SPM Spectrum®	TD-407
Vibration monitoring ISO 2372	TD-408
Vibration monitoring ISO 10816 with spectrum	TD-363
Vibration monitoring ISO 20283-5	TD-484
3-channel simultaneous vibration monitoring	TD-364
Vibration Advanced	TD-459
FFT spectrum with symptoms	TD-460
HD ENV	TD-511
Vibration Expert	TD-365
EVAM evaluated vibration analysis	TD-401
HD ENV	TD-511
Run up/Coast down and Bump test	TD-402
HD Order tracking	TD-403
Frequency Response Function, FRF	TD-402
HD Analysis	TD-514
Vibration Expert	TD-365
SPM HD Expert	TD-361
Orbit analysis/Shaft centerline plot	TD-368
Balancing, single and dual plane	TD-369
Shaft alignment	TD-370
Recording function	TD-409
Alignment Sensors	TD-524
Transducers and measuring cables	TD-377
Leonova Service Program	TD-379
Tachometer/Temperature probe	TD-380

Spare parts

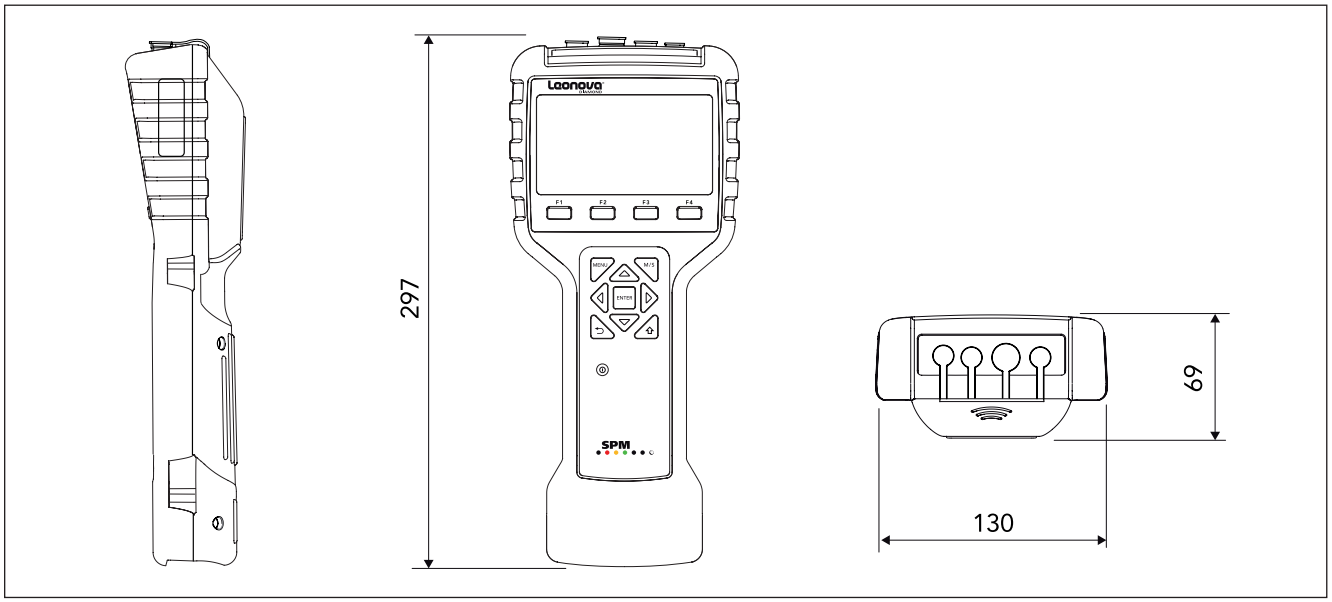
16645	Protection foil for display
14661	Wrist strap
81469	Silica gel (moisture absorbent) spare for CAS35
90362	AC adapter, Euro plug, 100-240 V AC
90380	AC adapter, UK plug, 100-240 V AC
90379	AC adapter, US plug, 100-240 V AC
90528	AC adapter, AU plug, 100-240 V AC
16574	Battery charger
PRO52	Leonova Service Program
71950	Leonova Diamond User guide

Patents: www.spminstrument.com/patents

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Leonova Diamond® – Instrument specifications



Technical specifications

Housing:	ABS/PC/TPE, IP65
Dimensions:	297 x 130 x 69 mm
Weight:	890 g
Keypad:	Sealed, snap action
Display:	TFT colour, 480 x 272 pixels, 4.3 inch widescreen, adjustable backlight
Main processor:	400 MHz ARM
Memory:	256 MB RAM, 512 MB Flash, SD card 1GB expandable up to 8GB
Operating system:	Microsoft Windows® CE
DSP processor:	375 MHz floating point
Communication:	USB 2.0
Power supply:	Rechargeable Lithium-Ion battery pack, 5200 mAh or power adapter
Battery power:	For min. 16 hours normal use (20°C)
Operating temperature:	–20 to 55 °C , non condensing
Charging temperature:	0 to 45 °C
General features:	Language selection, battery status indication, transducer line test, metric or imperial units
Meas. point identification:	NFC transponder for communication with CondID™ tags, read/write distance max. 50 mm (2 inch)

Vibration monitoring

Vibration channels:	3 simultaneous
Dynamic range:	up to 120 dB, 24 bit A/D converter
Frequency range:	0 (DC) to 40 kHz
Resolution:	Max. 25 600 lines
Vibration transducer input:	< 24 Vpp. Transducer supply of 2,5 mA for IEPE (ICP) type can be set On/Off
Transducer types:	Any transducers (disp., vel. or acc.) with voltage output
Measuring techniqes:	ISO 2372, ISO 10816, HD ENV, EVAM Evaluated Vibration Analysis, FFT Spectrum with Symptoms, Orbit analysis, 3 channels simultaneously, balancing

Bearing monitoring

Measuring range:	SPM HD: –30 to 110 dBsv (44000 transducer) dBm/dBc: –9 to 99 dBsv LR/HR: –19 to 99 dBsv
Resolution:	0,2 dB/HD, 1 dB dBm/dBc and LR/HR
Transducer types:	SPM 40000, 42000, 44000, probe and quick connector transducers, DuoTech

Tacho input

Measuring range:	1 to 150 000 PPM
Resolution:	1 pulse
Accuracy:	± (1 pulse + 0.01% of reading)
Transducer types:	TTP10, TTL pulses, keyphasor and proximity switch NPN/PNP.
Output:	TTL output for stroboscope and 12 VDC

Analog signals

Measurement range:	0 to 10 V DC, 0 to 20 mA
Resolution:	18 bit A/D converter
Accuracy:	± 1% of reading + 0,1 V/mA

Output/input

Headphones/microphone:	3.5 mm stereo plug
Communication:	Mini USB

Temperature measurement

Inputs:	TTP10 or via analog input

Stethoscope

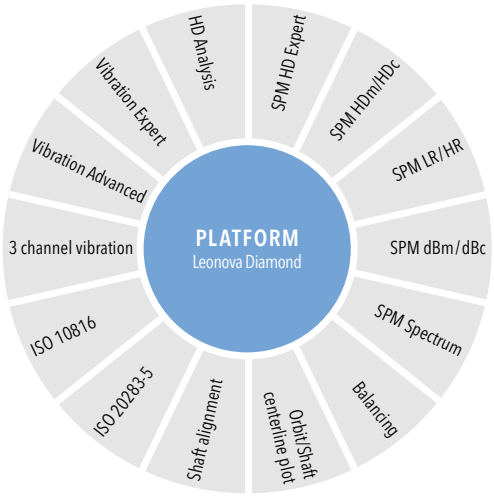
Transducer types:	Shock pulse and vibration transducer
Settings:	Filter, volume and gain

Patents: DE#60304328.3 - US#7,054,761 - US#7,167,814 - US#7,200,519 - US#7,301,616 - US#7,313,484 US#7,324,919 - US#7,711,519 - US#7,774,166 - DE#60336383.0 - US#7,949,496 - DE#60337804.8 GB#1474662 - GB#1474663 - DE#60338365.3 - ZA#2011/04946 - SE#0951017-3 - DE#60341502.4 GB#1474659 - SE#1000631-0 - US#8,762,104 - US#8,812,265 - US#8,810,396 - CN#ZL200980155994.1 CN#ZL201080019737.8 - KZ#020791 - RU#020791 - AU#2009330744 - RU#021908 - KZ#021908 US#9,200,980 - US#9,213,671 - CN#ZL201180006321.7 - KZ#022630 - RU#022630 - US#9,279,715 US#9,304,033 - KZ#024339 - RU#024339 - CN#ZL201380007381.X - AU#2015203801 - AU#2013215672 RU#201491377 - CN#ZL2012800347548 - US#6,873,931 - DE#602013021988.5 - DK/FI/FR/IT/NL/NO/ES/ GB#2810027 - SE#13744257.0 - AU# 2015203361 - RU# 027452 - GB# 2505984 - US# 9,772,219

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Leonova Diamond® – User-selected functions



PLATFORM — **Module in Ruby**

always included for unlimited use

- Platform function (see TD 355)
- RMS vibration, ISO 2372
- Speed measurement
- Temperature measurement
- Stethoscope function
- Analog signals, current and voltage
- Time signal recording
- Measuring point identification with CondID® memory tags
- Automatic recording, up to 50 hours
- Check points, free text
- Recording of vocal comments
- Supports 2 channel simultaneous vibration measurements — MOD136
- Supports up to 12.800 lines, 20 kHz — MOD139

To obtain the optimal performance range and instrument price, Leonova users can select any or all of the condition diagnosis and maintenance functions below, under two alternative conditions of sale. The choice is between unlimited and limited use (Function & Use).

When use is limited, the price for the function itself is much lower. Instead, the user prepays a tankful of 'credits'.

Leonova automatically deducts credits from the tank when its 'Measure' key is pressed. Thus, the user's operating costs depend on the number of measurements taken. Credit tanks are refilled, and/or new functions added, by loading a coded file ordered via the local distributor.

Unlimited and limited functions can be combined at will. Platform functions are always included and their use is unlimited.

Functions for Unlimited Use

		Module in Ruby
DIA195	SPM HD Expert, time and frequency domain analysis	MOD195
DIA197	Shock pulse method HDm/HDc	(Platform)
DIA130	Shock pulse method dBm/dBc	MOD130
DIA131	Shock pulse method LR/HR	MOD131
DIA132	SPM Spectrum, 12.800 lines/20 kHz	MOD132 MOD139
DIA133	Vibration ISO 10816 with spectrum	MOD133
DIA198	Vibration ISO 20283-5	MOD198
DIA138	Orbit analysis/Shaft centerline plot	MOD138
DIA192	3 channel simultaneous vibration	MOD192
DIA193	Vibration Expert HD ENV EVAM evaluated vibration analysis 25.600 lines/40 KHz HD Order Tracking Time signal, Post trigger Run up/coast down, Bump test and FRF	MOD193
DIA194	Vibration Advanced HD ENV FFT spectrum with symptoms 12.800 lines/20 kHz, Time signal, HD Order Tracking, Post trigger	MOD135+MOD139
DIA140	HD Analysis Vibration Expert SPM HD Expert	MOD140
DIA109	Balancing, single and dual plane	
DIA155	Shaft alignment	

Functions for Limited Use (Function & Use)

DIA295	SPM HD Expert, time and freq. domain analysis (3)
DIA297	Shock pulse method HDm/HDc (2)
DIA230	Shock pulse method dBm/dBc (1)
DIA231	Shock pulse method LR/HR (2)
DIA232	SPM Spectrum (2)
DIA233	Vibration ISO 10816 with spectrum (1)
DIA298	Vibration ISO 20283-5 (1)
DIA238	Orbit analysis (5), Shaft centerline plot (5)
DIA292	3 channel simultaneous vibration (6)
DIA293	Vibration Expert incl. HD Order Tracking, Time signal and 25.600 lines/40 KHz (no credit consumption) HD ENV (3) EVAM evaluated vibration analysis (2) Post trigger (25) Run up / coast down (50) Bump test (25) Frequency Response Function, FRF (25)
DIA294	Vibration Advanced incl. HD Order Tracking, Time signal and 12.800 lines/20 kHz (no credit consumption) HD ENV (3) FFT spectrum with symptoms (2) Post trigger (25)
DIA240	HD Analysis Vibration Expert (3–50) SPM HD Expert (3)
DIA209	Balancing, single and dual plane Single plane (4 runs: 16 / 2 runs: 42) Dual plane (80)
DIA255	Shaft alignment (30)

Credit consumption is stated within brackets.

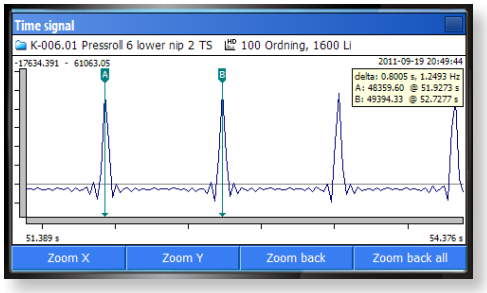
DIA290	Credits for limited functions
DIA291	Credits for limited functions, refill

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Leonova Diamond® – Shock pulse measurement, SPM HD®





Gear symptoms SPM HD time signal

The signal

Throughout their lifetime, bearings generate shocks in the interface between the loaded rolling element and the race-way. These shocks 'ring' the SPM transducer which outputs electric pulses proportional to the shock magnitude.

Unlike vibration transducers, the shock pulse transducer responds at its carefully tuned resonance frequency of about 32 kHz, enabling a calibrated measurement of the shock pulse amplitudes.

Shock pulse amplitude is due to three basic factors:

- Rolling velocity (bearing size and rpm)
- Oil film thickness (separation between the metal surfaces in the rolling interface). The oil film depends on lubricant supply and viscosity as well as alignment and pre-load.
- The mechanical state of the bearing surfaces (roughness, stress, damage, loose metal particle).

Input data

The effect of rolling velocity on the signal is neutralized by entering rpm and shaft diameter as input data, with 'reason-able accuracy'. This sets an initial value (HDi), the start of the ´normalized' condition scale.

Technical specifications

Measuring range:	–30 to 110 dBsv (44000 transducer)
Resolution:	0.2 dBsv
Accuracy:	± 1 dB
Transducer type:	SPM 40000/42000/44000 probe transducer and quick connector transducer for adapters
Input data:	rpm, plus bearing type and mean diameter (or ISO bearing number)
Output quantity:	HDm, HDc, Time Signal HD SPM Spectrum HD
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800, 25600
Measuring time:	1 to 10000 rev (default same as FFT)
Symptom enhance-ment factor:	Off, 1-10 (Default = off)

Output data

HDm/HDc (part of platform)

HDm is a scalar value expressed in decibels. It is the primary value to use to determine the severity of a bearing damage. It represents the highest shock pulses found during the measuring cycle. This value is also used for triggering alarms. HDc is a scalar value expressed in decibels. This value represents the level where 200 shocks/second are present. It is useful to determine lubrication condition.

Time Signal HD

Time signal HD is extremely useful to locate where in the bearing a possible damage is located. In many cases it is also possible to determine the nature of the damage (cracked inner race with spalling all around or a single crack etc.). The Time signal HD is a result of highly advanced digital algo-rithms where repetitive shocks are enhanced and random signals are suppressed.

SPM Spectrum HD

SPM Spectrum HD is the result of applying FFT algorithms on the Time Signal HD. The SPM HD spectrum is useful to determine where a possible bearing damage is located. It is also useful for trending purposes (applying symptom and band values).

High Definition Order Tracking

This function is primarily used for analysis on variable speed machines and adjusts extremely well to quick changes and variations in the RPM during measurement, see TD 403.

Evaluation

The initial value and the range of the three condition zones (green-yellow-red) was established empirically by testing bearings under variable operating conditions. The maximum value places the bearing into the condition zone. The height of the carpet value and delta (HDm – HDc) indicated lubrication quality or problems with bearing installation and alignment.

Part numbers

DIA195 Shock pulse method SPM HD Expert, unlimited use
DIA295 Shock pulse method SPM HD Expert, limited use
DIA197 Shock pulse method HDm/HDc, unlimited use
DIA297 Shock pulse method HDm/HDc, limited use

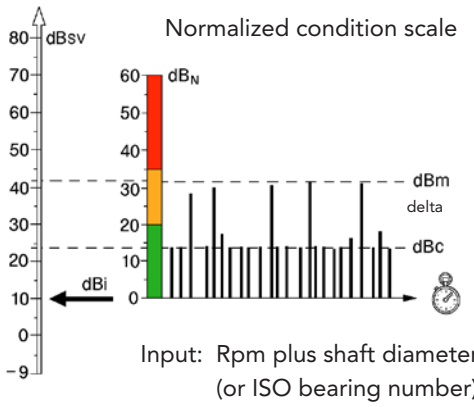
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Leonova Diamond® – Shock pulse measurement, dBm/dBc





Input: Rpm plus shaft diameter (or ISO bearing number)

For over 40 years, the original Shock Pulse Method (SPM) has been very successfully used to obtain a fast, easy and reliable diagnosis of the operating condition of rolling element bearings.

The signal

Throughout their lifetime, bearings generate shocks in the interface between the loaded rolling element and the raceway. These shocks 'ring' the SPM transducer which outputs electric pulses proportional to the shock magnitude.

Unlike vibration transducers, the shock pulse transducer responds at its carefully tuned resonance frequency of about 32 kHz, which allows a calibrated measurement of the shock pulse amplitudes.

Measurement

The shock pulse meter counts the rate of occurrence (incoming shock pulses per second) and varies the measuring threshold until two amplitude levels are determined:

- the shock carpet level (approx. 200 incoming shocks per second. This level is displayed as **dBc** (decibel carpet value).
- the maximum level (highest incoming shock under one second). This level is displayed as **dBm** (decibel maximum value). Using a blinking indicator or earphones, the operator can establish a peak value by increasing the measuring threshold until no signal is registered.

Because of the very large dynamic range, shock pulses are measured on a decibel scale (1000 x increase between 0 and 60 dB).

Shock pulse amplitude is due to three basic factors:

- Rolling velocity (bearing size and rpm)
- Oil film thickness (separation between the metal surfaces in the rolling interface). The oil film depends on lubricant supply and also on alignment and pre-load.
- The mechanical state of the bearing surfaces (roughness, stress, damage, loose metal particle).

Input data

The effect of rolling velocity on the signal is neutralized by giving rpm and shaft diameter as input data, with 'reasonable accuracy'. This sets an initial value (dBi), the start of the ´normalized' condition scale.

Evaluation

The initial value and the range of the three condition zones (green - yellow - red) was established empirically, by testing bearings under variable operating conditions. The maximum value places the bearing into the condition zone. The height of the carpet value and delta (dBm minus dBc) indicated lubrication quality or problems with bearing installation and alignment.

Technical specifications

Measuring time:	1.5 sec
Measuring range:	–9 to 99 dBsv
Resolution:	1 dBsv
Accuracy:	± 1 dB
Transducer types:	SPM 40000/42000/44000, probe transducer and quick connector transducer for adapters
Input data:	Rpm, shaft diameter (or ISO bearing number)
Output:	Maximum value dBm, evaluated green - yellow -red, carpet value dBc, peak value, audible shock pulse signal (earphones).

Part numbers

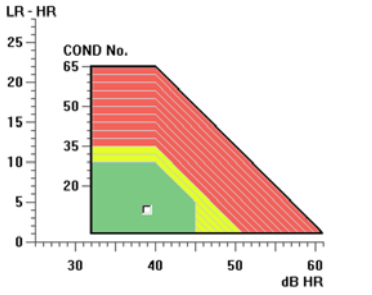
DIA130	Shock pulse method dBm/dBc, unlimited use
DIA230	Shock pulse method dBm/dBc, limited use

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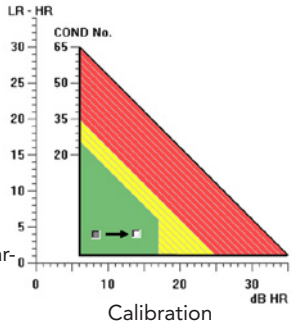
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Leonova Diamond® – Shock pulse measurement, LR/HR





Evaluation boxes determined by bearing geometry and speed



Calibration

The LR/HR method was developed from the original Shock Pulse Method for condition diagnosis of rolling element bearings. It allows a precision analysis of oil film condition in the rolling interface and contains computation models for finding the optimal lubricant. Poor lubrication is the root cause of most bearing failures.

Signal and measurement

Transducer and measuring procedure are the same as for the dBm/dBc method. The shock pulse meter counts the rate of occurrence (incoming shock pulses per second) and varies the gain until two amplitude levels are determined:

- HR = high rate of occurrence, quantifying the shock carpet (approx. 1000 incoming shocks per second).
- LR = low rate of occurrence, quantifying the strong shock pulses (approx. 40 incoming shocks per second).

LR and HR are 'raw values', measured in dBsv (decibel shock value).

Input data

The LR/HR method requires more precise data on the bearing, because bearing geometry, as well as size and speed, affect the shock carpet and thus the analysis of oil film condition in undamaged bearings. The rpm is needed, plus a definition of the bearing type and size. This is best input by stating the ISO bearing number, which links to the bearing catalogue in Condmaster.

Evaluation

After measurement Leonova returns

- a general description of bearing condition (CODE)
- a value for oil film condition (LUB)
- a value for surface damage (COND).

For time signal, use the DIA 195 module, see TD-361.

A LUB no. of 0 means dry running, the value increases with oil film thickness. A COND no. of around 30 indicates surface stress or early damage, the value increases with damage severity. The general assessment is:

CODE A Good bearing
CODE B Poor lubrication
CODE C Dry bearing, risk of damage
CODE D Damage.

A program part, LUBMASTER, uses the shock values plus data on lubricant type, viscosity, load and operating temperature to calculate the bearing's life expectancy under present condition. It also calculates the effect of changes in oil type and viscosity.

Calibration

The accuracy of the LR/HR method is increased by a calibration factor (COMP no.) used in case of bearings with minimal load or poor quality measuring points (in both cases the signal strength is below normal). On the basis of the bearing's catalogue data and the lubricant properties, Leonova computes the normal shock level for a good bearing and compensates for an abnormally low signal before returning the evaluation results.

Technical specifications

Measuring range:	–19 to 99 dBsv
Measuring time:	1.5 sec
Resolution:	1 dBsv
Accuracy:	± 1 dB
Transducer types:	SPM 40000/42000/44000, probe transducer and quick connector transducer for adapters
Input data:	rpm, plus bearing type and mean diameter (or ISO bearing number)
Output:	LR and HR (raw shock values), CODE A to D, evaluated green - yellow - red. LUB no. for oil film condition, COND no. for surface condition. (Time signal, use DIA 195.)

Part numbers

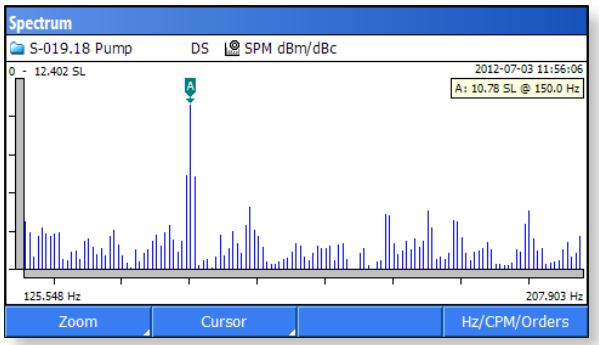
DIA131	Shock pulse method LR/HR, unlimited use
DIA231	Shock pulse method LR/HR, limited use

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Leonova Diamond® – SPM Spectrum





The purpose of SPM Spectrum is to verify the source of high shock pulse readings. Shocks generated by damaged bearings will typically have an occurrence pattern matching the ball pass frequency over the rotating race. Shocks from e. g. damaged gears have different patterns, while random shocks from disturbance sources have none.

Signal and measurement

The resonance frequency of the SPM shock pulse transducer, calibrated to 32 kHz, constitutes the ideal carrier wave for transients caused by shocks. The output of this transducer is the same type of demodulated signal produced by 'enveloping', with one important difference; both frequency and amplitude response of the SPM transducer are precisely tuned, so there is no need to find uncertain and shifting machine resonances to get a signal.

Leonova Diamond® first measures the shock amplitude by a shock pulse measurement with the dBm/dBc or the LR/HR method. The results are the bearing condition data, evaluated green - yellow - red.

The second measurement produces a time record that is subjected to a Fast Fourier Transform (FFT). The resulting spectrum is used mostly for pattern recognition. Spectrum line amplitudes are influenced by too many factors to be reliable condition indicators, so all condition evaluation is based on the dBm or the LR values.

One unit for amplitude in an SPM spectrum is S_D (Shock Distribution unit), where each spectrum is scaled so that the total RMS value of all spectrum lines = 100 S_D = the RMS value of the time record. The alternative is S_L (Shock Level unit), the RMS value of the frequency component in decibel. Alarm levels are manually set for each symptom to show evaluated results in green - yellow - red. Various types of spectra can be produced. The recommended setting is a spectrum with a resolution of at least 0.25 Hz, e. g. 3200 lines over 500 Hz, saving peaks only.

Input data

Pattern recognition demands precise data on the bearing and exact measurement of rpm. The rpm should be measured, not preset. The factors defining the bearing frequencies are obtained from the bearing catalogue in Condmaster by stating the ISO bearing number.

Evaluation

The frequency patterns of bearings are preset in Condmaster. Linking the symptom group 'Bearing' to the measuring point allows the user to highlight a bearing pattern by clicking on its name. Other symptoms can be added when appropriate, e. g. for gear mesh patterns. Finding a clear match of a bearing symptom in the spectrum is proof that the measured signal originates from the bearing.

Technical specifications

Compatible with:	dBm/dBc or LR/HR
Frequency range:	0 to 25, 32, 40, 50, 80,100, 125, 160, 200, 250, 320, 400, 500, 625, 800,1000, 1250, 1600, 2000, 2500, 4000, 5000, 8000,10000, 20000 Hz, (40000 Hz only with DIA193)
Number of spectrum lines:	400, 800, 1600, 3200, 6400, 12800, 25600
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Spectrum types displayed:	Linear, power
Averages:	Time synchronous, FFT linear, FFT peak-hold
Frequency units:	Hz, CPM, orders
Saving options for spectrum:	Full spectrum, peaks only
Amplitude scale unit:	S_D (Shock Distribution), S_L (Shock Level)
Pattern recognition:	Bearing frequencies and optional patterns highlighted in the spectrum. Automatic configuration of bearing symptoms linked to ISO bearing no.
Transducer type:	Shock pulse transducers with probe and quick connector, SPM 40000/42000/44000

Part numbers

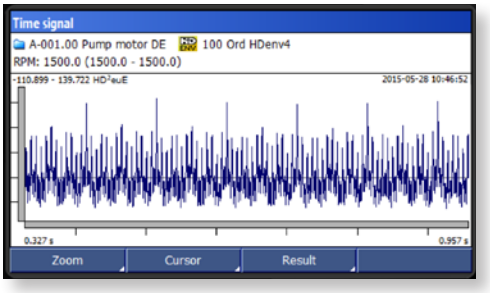
DIA132 SPM Spectrum, unlimited use
DIA232 SPM Spectrum, limited use

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Leonova Diamond® – HD ENV





HD ENV time signal

With Leonova, the HD ENV method is offered as an analysing function for either limited or unlimited use. It is a part of the packages Vibration Expert DIA193/293 (TD-365) and Vibration Advanced DIA194/294 (TD-459).

HD ENV is an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques – for example bearing damages and gear damage – the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes.

Input data:
A number of predefined filters are available to detect damages or anomalies in different stages of development; two of which are specifically designed for bearing monitoring and two of which are recommended for of non-bearing related problems.

Output data:
HD Real Peak
The unit of measurement is HD Real Peak, a scalar value expressed in decibels. Representing the true highest peak found in the enveloped signal, HD Real Peak is the primary value to use for determining the severity of a bearing or gear damage. It is also used for triggering alarms.

HD Env Time Signal
HD Env Time Signal is extremely useful to locate where in the bearing a possible damage is located. In many cases it is also possible to determine the nature of the damage (a single crack or spalling all around etc.).

HD Env Spectrum
HD Env Spectrum is the result of applying FFT algorithms on the Time Signal HD. The HD Env spectrum is useful to determine where a possible bearing damage is located. It is also useful for trending purposes (applying symptom and band values).

Patented algorithms:
Symptom enhancement
Symptom enhancement is an algorithm that looks for repetitive impacts in the time domain. As a result, random signals are suppressed and repetitive signals enhanced. The output is an HD Env Time signal, where relevant bearing and gear data are displayed.

High Definition Order Tracking
This function is primarily used for analysis on variable speed machines and adjusts extremely well to quick changes and variations in the RPM during measurement, see TD-403.

Random Impact Rejection
Randomly occurring high readings which may cause false alarms are filtered out by means of the random impact rejection algorithm.

Technical specifications

Frequency, upper*:	in orders
Env. high pass filters*:	100, 200, 500, 1000, 2000, 5000, 10 000 Hz
Env. band pass filters*:	Filter 1 (5-100 Hz) Filter 2 (50-1000 Hz) Filter 3 (500-10 000 Hz) Filter 4 (5000 - 40 000 Hz)
Averages:	Time synch
Spectrum lines*:	400, 800, 1600, 3200, 6400, 12800, 25600
Frequency units:	Hz, CPM, orders
Saving options:	Full spectrum, time signal and FFT, condition parameters
Transducer types:	Vibration transducer SLD144 or IEPE (ICP®) type transducers with voltage output, or DuoTech accelerometer

*Spectrum lines, frequency and envelope filter limits are regulated by what is included in the above mentioned packages.

Part numbers

DIA199 HD ENV, unlimited use**
DIA299 HD ENV, limited use**

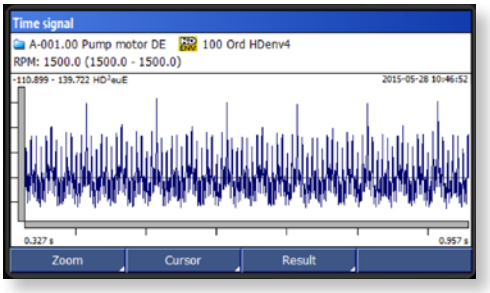
**Only for upgrading existing Vibration Expert DIA193/293 and Vibration Advanced DIA194/294 packages with HD ENV functionality.

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Leonova Diamond® – HD Analysis





HD ENV time signal

The HD Analysis module is a combination of the package Vibration Expert (DIA193/293, TD-365) and SPM HD Expert (DIA195/295, TD-361).

HD ENV

HD ENV is an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques - for example bearing damages and gear damage - the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes (see below). Signals buried in machine noise are revealed through high definition digital enveloping, extracting and enhancing the signals of interest from the overall machinery vibration signal while preserving the true highest peaks.

The unit of measurement is HD Real Peak, a scalar value expressed in decibels. Representing the true highest peak found in the enveloped signal, HD Real Peak is the primary value to use for determining the severity of a bearing or gear damage. It is also used for triggering alarms.

See TD-365 for more information about the Vibration Expert package, and TD-511 for more information about HD ENV.

SPM HD

SPM HD Expert is a complement to the SPM HDm/HDc and LR/HR techniques. Advanced digital technique, RPM-based sampling frequency and measuring time automatically adjusted to RPM makes SPM HD particularly well suited for measurement on low speed applications. Extraordinary signal quality and 24 bit A/D conversion provides razor-sharp resolution and exceptional detail in spectrums and time signals.

The SPM HD method produces different types of results:

- **HDm/HDc** are part of the Leonova Diamond platform. For further information, see technical data sheet TD-359.
- **Time Signal HD** is extremely useful to locate where in the bearing a possible damage is located. In many cases it is also possible to determine the nature of the damage (cracked inner race with spalling all around or a single crack etc.). The Time signal HD is a result of very advanced digital algorithms where repetitive shocks are enhanced and random signals are suppressed.
- **SPM Spectrum HD** is the result of applying FFT algorithms on the Time Signal HD. The SPM HD spectrum is useful to determine where a possible bearing damage is located. It is also useful for trending purposes (applying symptom and band values).

For more information about SPM HD, see TD-361.

Patented algorithms

HD ENV and SPM HD both incorporate sophisticated and patented algorithms which contribute to reliable and crystal clear readings:

- **High Definition Order Tracking**: Used primarily for analysis on variable speed machines, HD Order Tracking is capable of handling ±50% RPM variations during data aquisition. The number of orders to be covered is input by the user.
- **Symptom enhancement** looks for repetitive signals in the time domain. As a result, random signals are suppressed and repetitive signals enhanced.
- **Random impact rejection** filters out randomly occurring high readings which may cause false alarms.

Part numbers

DIA140 HD Analysis, unlimited use
DIA240 HD Analysis, limited use

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Leonova Diamond® – Vibration ISO 2372





Broadband vibration measurement is the most widely used and cost-efficient method for the diagnosis of general machine condition. There are two ISO recommendations concerning this type of machine condition monitoring; the much used ISO 2372 and the more recent ISO 10816, which is a ongoing replacement of the older standard.

In Leonova, vibration measurement according to ISO 2372 is a platform function, always included for unlimited use.

The features are:

- Machine condition is diagnosed on the basis of broad-band measurements returning an RMS value of vibration velocity in the frequency range of 10 to 1000 Hz. This is called vibration severity.
- Machines are grouped into six vibration classes.
- A table of limit values is presented for each vibration class, differentiating between acceptable vibration (green range), unsatisfactory vibration (yellow range), and vibration that will cause damage unless reduced (red range).
- Measurements are made in three direction (horizontal, vertical, axial). The highest value returned determines machine condition.
- Default limit values for the change from green to yellow and from yellow to red are set automatically when one of the six machine classes is input under the measuring point data.

ISO 10816 is offered as a choice, see TD-363.

Technical specifications

Measurement quantities:	Velocity, RMS value in mm/s over 10 to 1000 Hz
Transducer type:	Vibration transducer SLD144 or IEPE* (ICP®) type transducers with voltage output

* Integral Electronic PiezoElectric

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Leonova Diamond® – Vibration ISO 10816 with spectrum



Broadband vibration measurement is the most widely used and cost-efficient method for the diagnosis of general machine condition.

There are two ISO recommendations concerning machine condition monitoring by this type of measurement; the much used ISO 2372 and the more recent ISO 10816, which is an ongoing replacement of the older standard.

With Leonova, ISO 2372 measurement is a platform function, always included for unlimited use.

ISO 10816 is an option with ordering numbers DIA 133 (unlimited use) and DIA 233 (limited use).

Features of ISO 10816 are:

- Measurements are made in three directions (horizontal, vertical, axial).
- Machine condition is generally diagnosed on the basis of broadband vibration measurements returning an RMS value. ISO 10816 keeps the lower frequency range flexible between 2 and 10 Hz, depending on the machine type. The upper frequency is 1000 Hz.
- ISO 10816 operates with the term vibration magnitude, which, depending on the machine type, can be an RMS value of vibration velocity, acceleration or displacement. If two or more of these parameters are measured, vibration severity is the one returning the relative highest RMS value. For certain machines, ISO 10816 also recognizes peak-to-peak values as condition criteria.
- The standard consists of several parts, each treating a certain type of machines, with tables of limit values differentiating between acceptable vibration (green range), unsatisfactory vibration (yellow range), and vibration that will cause damage unless reduced (red range).

In Leonova, ISO part, machine group and foundation type are input using a multiple choice guide which displays the various ISO definitions and leads to the limit values.

Exceeding the requirements of the ISO standard, Leonova Diamond also provides a 1600 line spectrum up to 10 kHz.

Technical specifications

Measurement quantities:	Velocity, acceleration and displacement
Spectrum unit:	Velocity, mm/s or inch/s
Transducer type:	Vibration transducer SLD144 or IEPE* (ICP®) type transducers with voltage output
Quick mode:	Yes

* Integral Electronic PiezoElectric

Settings

Direction:	Horizontal, vertical, axial
Part:	2, 3, 4, 5, 6
Group:	2, 3, 4, 5, 6
Support:	Rigid, Flexible

Part numbers

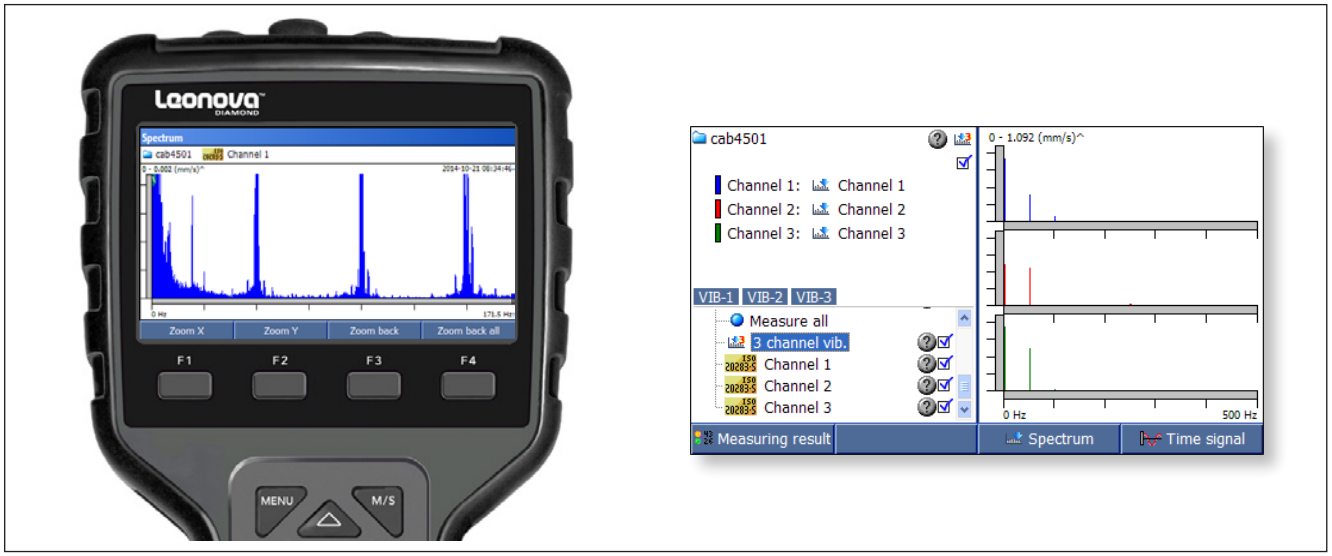
DIA133	Vibration ISO 10816 with spectrum, unlimited use
DIA233	Vibration ISO 10816 with spectrum, limited use

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Leonova Diamond® – Vibration ISO 20283-5



The International Standard ISO 20283-5 contains guidelines for the evaluation of vibration with regard to habitability on a passenger or merchant ship, as well as requirements for the instrumentation and the method of measurement in normally occupied spaces.

Shipboard vibration that interferes with duties or reduces comfort is objectionable and often results in adverse comments from crew and passengers. This International Standard gives the guidelines for evaluating the habitability of different areas on a ship. The habitability is evaluated by the overall frequency-weighted RMS vibration values from 1 Hz to 80 Hz.

Vibration data acquired in accordance with this International Standard are also useful for

- comparison with ship specifications
- comparison with other vessels
- further development and improvement of vibration standards.

It is recommended that the classification to be applied to the various areas of a ship be agreed between the interested parties (e.g. shipbuilder and ship owner) prior to any assessment of the habitability.

Leonova Diamond perform measurements and presents overall frequency-weighted RMS vibration values according to ISO20283-5 standard. These values are then to be exported in xml format via the Leonova Service program for evaluation in an external software program.

Vibration ISO 20283-5 for Leonova Diamond includes the following functionality:

- 3 channel simultaneous vibration monitoring
- Time signal
- Spectrum
- Waterfall diagram

Technical specifications

Frequency range:	0 Hz (DC) to 500 Hz
Spectrum lines:	6400
Spectrum unit:	Velocity, mm/s or inch/s
Transducer type:	Vibration transducer 90546 or IEPE* (ICP®) type transducers with voltage output
Time signal:	Acc
Spectrum:	Vel
Save:	Time signal and spectrum
Window:	Flat top
FFT type:	Amplitude
Averaging:	Linear
Overlap:	50%
Number of averages:	9

ISO weighting frequency: 1 to 80 Hz

* Integral Electronic PiezoElectric

Part numbers

DIA198	Vibration ISO 20283-5, unlimited use
DIA298	Vibration ISO 20283-5, limited use

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Leonova Diamond® – Vibration Expert



EVAM evaluated vibration analysis

- Condition parameters, which are measured and computed values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with the help of preset fault symptoms.
- Machine specific condition codes (green, yellow, red) and condition values, based on a statistical evaluation of the condition parameters and symptom values.

HD ENV

HD ENV an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques - for example bearing damages and gear damage - the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes.

Time signal

This option enables you to see the measured data in the time domain. This is useful in all kinds of analysis. Two cursors are available.

Run up/coast down, Bump test and FRF

Run up/coast down measurements, Bump test and Frequency Response Function (FRF) are three vibration analysis functions offered with Leonova Diamond®, included in the Vibration Expert package. The bump test is employed to check out the typical vibration response of a machine structure at standstill, by hitting it e. g. with rubber mallet (bump test). Run up/coast down records the changes in vibration while the machine is run up to operating speed or after it has been shut off and is slowing to a stop. All of these functions are selected from the menu of an ordinary vibration measurement assignment.

25600 lines/40 KHz

This option expands spectrum resolution to 25600 lines and the upper frequency limit to 40 KHz. Mostly for high speed applications and detection of resonances and harmonies in high frequencies.

Post trigger

This function enables your system to be armed and triggered to measure directly on the trigger point. When this function is enabled on the measurement, the system prepares the measurement with settling time and autogain adjustment, so when the trigger fires, the system can start measuring directly.

Trigger level: *0-1000 mm/s, m/s², µm*
Delay: *0-30 sec*

High Definition Order Tracking

High Definition Order Tracking is a part of the Vibration Expert package. For shock pulse measurements, it is included in the SPM HD module DIA195/295. This function is primarily used for analysis on variable speed machines. The method uses multiples of rotational speed (orders), rather than absolute frequency (Hz). The number of orders to be shown is input by the user. Leonova will then automatically set the sampling frequency to an exact multiple of the measured rpm. Order tracking will also minimize the risk of smearing when using FFT averaging.

The package consists of:

- EVAM evaluated vibration analysis (TD-401)
- HD ENV (TD-511)
- 25600 Lines/40 KHz
- Run up/coast down (TD-402)
- Bump test and Frequency Response Function (TD-402)
- High Definition Order Tracking (TD-403)
- Time signal
- Post trigger
- Live Phase
- Cepstrum Analysis
- Time Signal Recording

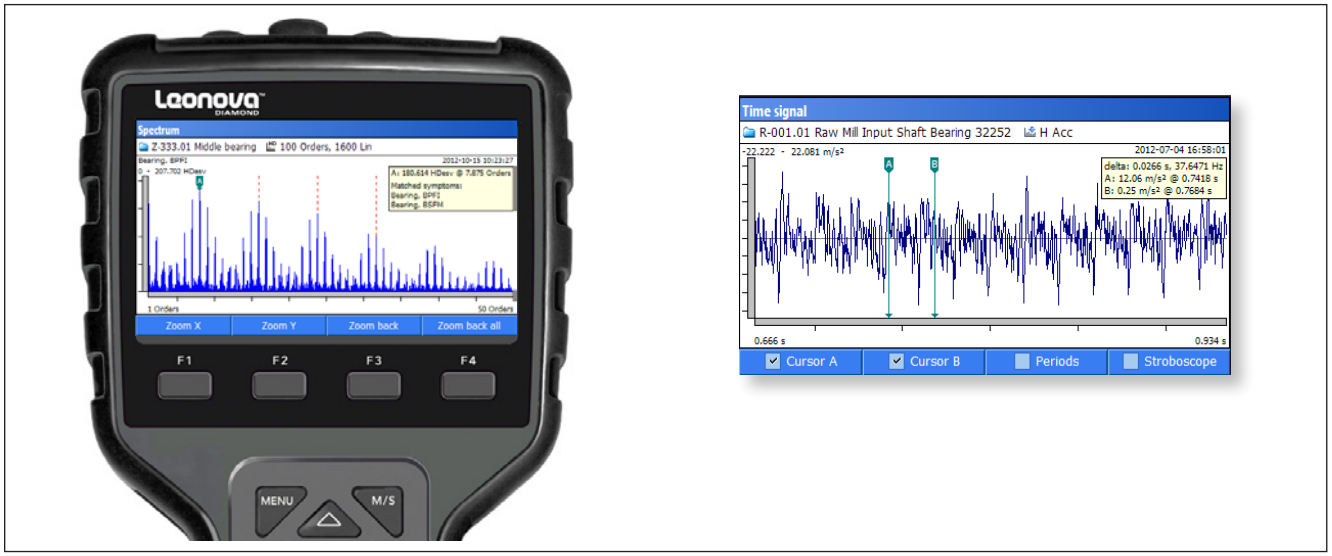
Part numbers

DIA193 Vibration Expert for unlimited use
DIA293 Vibration Expert for limited use

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Leonova Diamond® – Vibration Advanced



FFT Spectrum with Symptoms

FFT Spectrum with Symptoms is a vibration analysis function offered with Leonova. This function generates three sets of machine condition data:

- Condition parameters, which are measured and calculated values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with the help of preset fault symptoms.
- Trending of symptom values. Alarm levels are manually set for evaluation in green - yellow - red.

For each measuring point, the user can make an individual selection and define the type of data best suited for the surveillance of an individual machine.

HD ENV

HD ENV an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques - for example bearing damages and gear damage - the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes.

High Definition Order Tracking

High Definition Order Tracking is a part of the Vibration Advanced package. For shock pulse measurements, it is included in the SPM HD module DIA195. This function is primarily used for analysis on variable speed machines. The method uses multiples of rotational speed (orders), rather than absolute frequency (Hz). The number of orders to be shown is input by the user. Leonova will then automatically set the sampling frequency to an exact multiple of the measured rpm. Order tracking will also minimize the risk of smearing when using FFT averaging.

Time signal

This option enables you to see the measured data in the time domain. This is useful in all kinds of analysis. Two cursors are available.

Post trigger

This function enables your system to be armed and triggered to measure directly on the trigger point. When this function is enabled on the measurement, the system prepares the measurement with settling time and autogain adjustment, so when the trigger fires, the system can start measuring directly.

Trigger level: 0-1000 mm/s, m/s^2, µm
Delay: 0-30 sec

The package consists of:

- FFT spectrum with symptoms, 12800 lines/20 KHz (TD-460)
- HD ENV (TD-511)
- HD Order Tracking (TD-403)
- Time signal
- Post trigger
- Live Phase

Part numbers

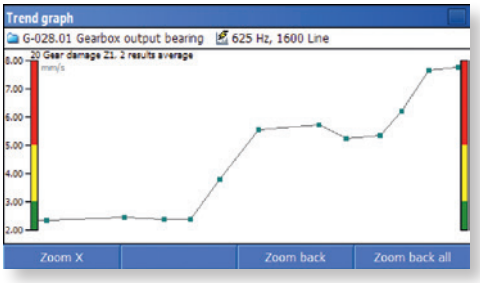
DIA194 Vibration Advanced for unlimited use
DIA294 Vibration Advanced for limited use

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Leonova Diamond® – EVAM evaluated vibration analysis





With Leonova, the EVAM method is offered as an analysing function for either limited or unlimited use. EVAM is a part of the Vibration Expert package DIA193/293 (TD-365).

The EVAM method generates three sets of machine condition data:

- Condition parameters, which are measured and calculated values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with the help of preset fault symptoms.
- Machine specific condition codes (green, yellow, red) and condition values, based on a statistical evaluation of the condition parameters and symptom values.

For each measuring point, the user can make an individual selection and define the type of data best suited for the surveillance of an individual machine.

Condition parameters

Condition parameters are measured for a selected frequency range. They can be individually activated and are shown in measuring result tables and as diagrams. Available are:

VEL	RMS value of vibration velocity
ACC	RMS value of vibration acceleration
DISP	RMS value of vibration displacement
CREST	Crest value, difference between peak and RMS
KURT	Kurtosis, the amount of transients in the vibration signal
SKEW	Skewness, the asymmetry of the vibration signal
NL1 - 4	Noise level in the four quarters of the frequency range.

Peak and peak-to-peak values are shown in the unit selected for the time signal.

Spectrum analysis with 'symptoms'

For easy pattern recognition in spectra, EVAM supplies a range of predefined 'fault symptoms'. These are instructions to highlight a spectrum line pattern and display the sum of the lines' RMS values as a symptom parameter (which can be evaluated and trended). Most symptoms are automatically configured by using the rpm as a variable. Some require an input, e. g. the number of vanes on a rotor. Suitable symptoms and symptom groups are selected from a menu in Condmaster when the measuring point is set up.

Machine specific condition codes

In Condmaster, alarm limits can be set on all active parameters. Once measuring results are collected, an EVAM 'criterion' can be created which compares new parameter values with the statistical mean value and displays a dimensionless condition value against a green - yellow - red scale.

Technical specifications

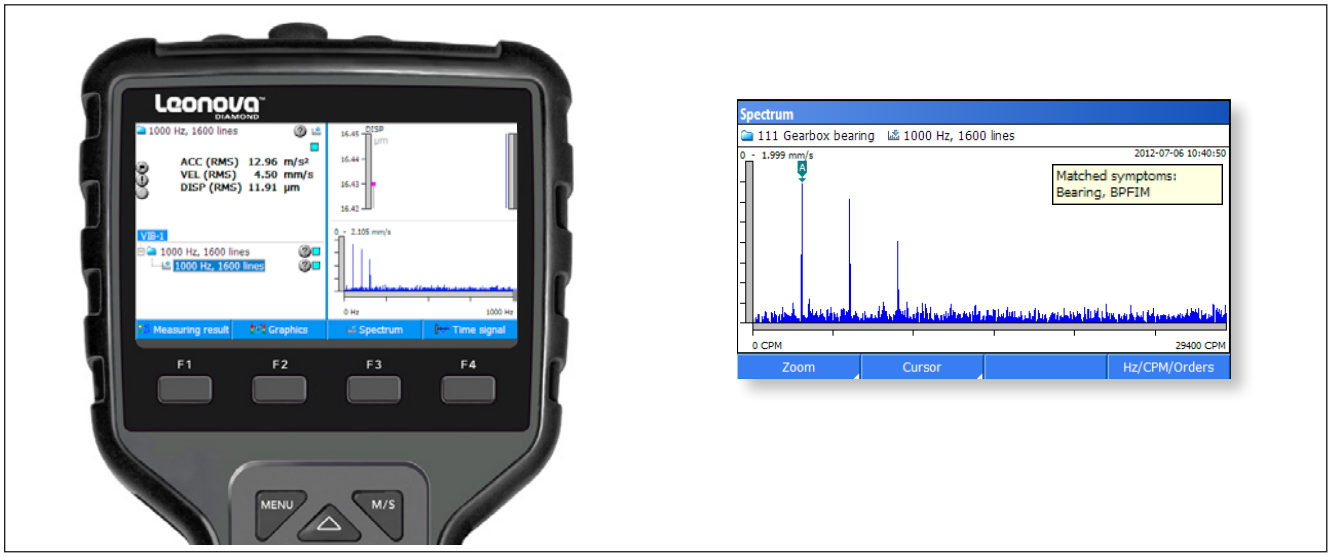
Frequency limit, lower:	0, 0.5, 2, 3, 5, 10, 20 100 or 200 Hz
Frequency limit, upper:	25, 32, 40, 50, 80,100, 125, 160, 200, 250, 320, 400, 500, 625, 800, 1000, 1250, 1600, 2000, 2500, 4000, 5000, 8000, 10 000, 20 000, 40 000 Hz
Envelope high pass filters:	100, 200, 500, 1000, 2000, 5000, 10 000 Hz
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	Time synch, FFT linear, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800, 25600
Frequency units:	Hz, CPM, orders
Quick mode:	Yes, can be set on/off
Saving options:	Full spectrum, time signal, time signal and FFT, condition parameters
Spectrum types displayed:	Linear, power, PSD, amplitude, cepstrum
Zoom:	True FFT zoom, visual zoom
Transducer types:	Vibration transducer SLD144 or IEPE (ICP®) type transducers with voltage output

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Leonova Diamond® – FFT spectrum with symptoms



FFT Spectrum with Symptoms is a vibration analysis function offered with Leonova Diamond, part of DIA194/294.

This function generates three sets of machine condition data:

- Condition parameters, which are measured and calculated values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with the preset fault symptoms.
- Trending of symptom values. Alarm levels are manually set for evaluation in green - yellow - red.

For each measuring point, the user can make an individual selection and define the type of data best suited for the surveillance of an individual machine.

Condition parameters

Condition parameters are measured for a selected frequency range. They can be individually activated and are shown in measuring result tables and as diagrams. Available are:

VEL	RMS value of vibration velocity
ACC	RMS value of vibration acceleration
DISP	RMS value of vibration displacement
CREST	Crest value, difference between peak and RMS
KURT	Kurtosis, the amount of transients in the vibration signal
SKEW	Skewness, the asymmetry of the vibration signal
NL1 - 4	Noise level in the four quarters of the frequency range.

Peak and peak-to-peak values are shown in the unit selected for the time signal.

Spectrum analysis with 'symptoms'

For easy pattern recognition in spectra, a range of ready made 'fault symptoms' are downloaded from Condmaster. These are instructions to highlight a spectrum line pattern and display the sum of the lines' RMS values as a symptom parameter (which can be trended).

Most symptoms are automatically configured by using the rpm as a variable, for some an input is needed, e. g. the number of vanes on a rotor.

A special symptom group are the bearing symptoms (showing e. g. ball pass frequencies over inner and outer race) for which the Condmaster bearing catalogue contains all need data.

Suitable symptoms and symptom groups are selected from a menu in Condmaster when the measuring point is set up.

Technical specifications

Frequency limit, lower:	0, 0.5, 2, 3, 5, 10, 20, 100 or 200 Hz
Frequency limit, upper:	8, 10, 16, 20, 25, 32, 40, 50, 80, 100, 125, 160, 200, 250, 320, 400, 500, 625, 800, 1000, 1250, 1600, 2000, 2500, 4000, 5000, 8000, 10 000, 20000 Hz
Band pass filters:	5-100, 50-1000, 500-10000, 5000-40000
Envelope high pass filters:	100, 200, 500, 1000, 2000, 5000, 10 000 Hz
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Frequency units:	Hz, CPM, orders
Quick mode:	Yes, can be set on/off
Saving options:	Full spectrum, time signal, time signal and FFT, condition parameters
Spectrum types:	linear, power, PSD, amplitude, cepstrum
Zoom:	visual zoom
Transducer types:	vibration transducer SLD144 or IEPE (ICP®) type transducers with voltage output

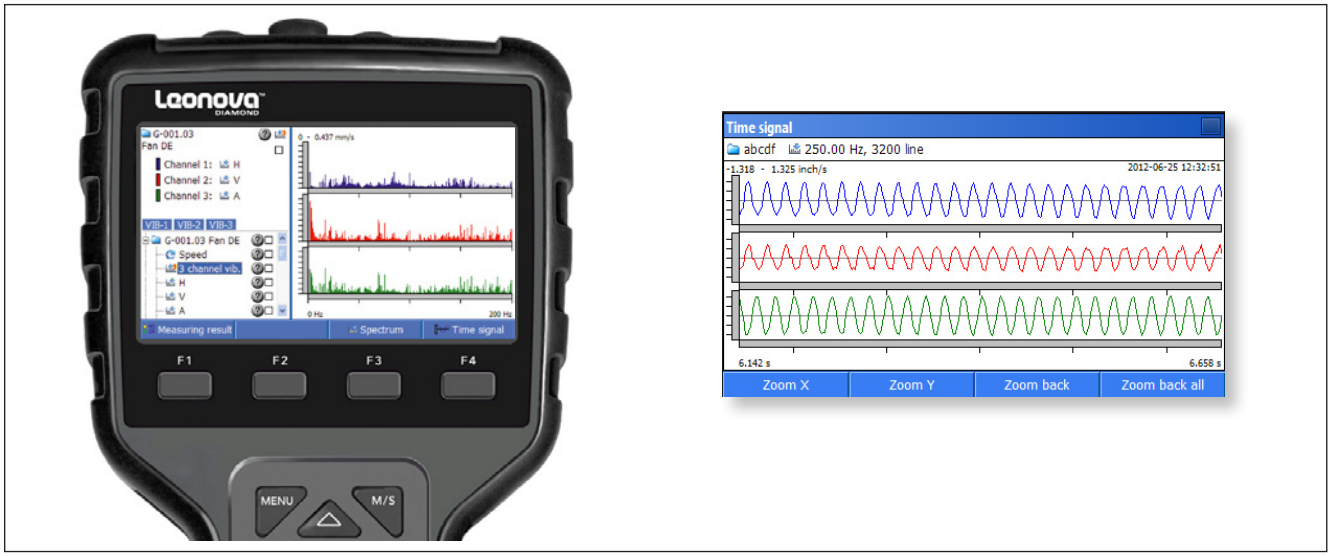
Part numbers

DIA194	Vibration Advanced, unlimited use
DIA294	Vibration Advanced, limited use

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Leonova Diamond® – 3 channel simultaneous vibration



Three channel simultaneous vibration monitoring is a Leonova Diamond® function for unlimited use (DIA192) or limited use (DIA292).

This type of measurement allows the user to study machine movement in three dimensions by observing the difference of the phase angles measured on the three channels. It can also save time by measuring three different assignments simultaneously. Three channel simultaneous vibration monitoring requires the Vibration Expert package (DIA193 and DIA293).

Measurement requires the setup of three vibration assignments with identical parameters. The three channel measuring cable CAB88 is used to connect the transducers to the Leonova vibration transducer input. The procedure is the same as for the corresponding measurement with one or two transducer(s).

After measurement, Leonova displays the RMS values for DISP, VEL and ACC for the channels. Three graphs are available for each measurement:

- Spectrum
- Time signal
- Phase spectrum

In the spectrum and time signal, the channels are overlayed in blue, red and green.

Normal setup is:

Z = channel 1

X = channel 2

Y = channel 3

Technical specifications

Frequency limit, lower:	0, 0.5, 2, 3, 5, 10, 20, 100 or 200 Hz
Frequency limit, upper:	25, 32, 40, 50, 80,100, 125, 160, 200, 250, 320, 400, 500, 625, 800, 1000, 1025, 1600, 2000, 2500, 4000, 5000, 8000, 10 000, 20 000, 40000Hz
Envelope high pass filters:	100, 200, 500, 1000, 2000, 5000, 10 000 Hz
Envelope band pass filters:	5-100, 50-1000, 500-10000, 5000-40000 Hz
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800, 25600
Saving options for spectrum:	Time signal, peaks only, full spectrum, time signal and FFT, condition parameters
Spectrum types displayed:	linear, power, PSD, amplitude, cepstrum
Zoom:	true FFT zoom, visual zoom
Transducer types:	Vibration transducer SLD144 or IEPE (ICP®) type transducers with voltage output

Part numbers

DIA192	3 channel vibration monitoring, unlimited use
DIA292	3 channel vibration monitoring, limited use
CAB88	3 channel split measuring cable, Lemo, 0.25 m
CAB110	Measuring cable, 8 pin-M12, 1.5 m, straight
CAB93	Measuring cable, 8 pin-2 pin, 1.5 m, straight
CAB82	Measuring cable, 8 pin-2 pin, 1.5 m, spiral

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Leonova Diamond® – High Definition Order Tracking



The effect of order tracking



Measurements with order tracking disabled on a machine with rpm variation of 10% (550 – 600 rpm) during data collection time.



The same machine measured with order tracking activated, with rpm variation of 10% (550 – 600 rpm) during data collection time.

High Definition Order Tracking is part of the modules Vibration Expert, Vibration Advanced, SPM HD Expert and HD Analysis. This function is primarily used for analysis on variable speed machines. The method uses multiples of rotational speed (orders), rather than absolute frequency (Hz). The number of orders to be shown is input by the user. Leonova will then automatically set the sampling frequency to an exact multiple of the measured rpm. Order tracking will also minimize the risk of smearing when using FFT averaging.

The purpose of using orders is to lock the display to the rotational speed (1X) and its multiples, which means that the ordered components in the spectrum always remain in the same position in the display even if the rotational speed varies during measurement.

Two or several spectra from the same machine with variable speed can therefore more easily be compared if they are expressed in orders. Using order tracking, the frequency range will always cover the symptoms of interest, regardless of the rotational speed of the machine.

High Definition Order Tracking adjusts extremely well to quick changes and variations in the RPM during measurement.

In the example shown above, the measuring point is configured for vibration analysis with order tracking. Under 'Measuring point data', Order tracking is marked and the upper frequency is input in orders. The lower frequency is input in Hz or CPM under 'Measuring point data'. 'Variable speed' must be marked and rpm has to be measured.

Leonova displays the spectrum within the selected number of orders. A number of measurements can be displayed in a three dimensional waterfall diagram, where 1X (rpm) and its harmonics remain in the same position in the diagram. The measurements are then saved by the user and can be transferred to Condmaster.

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Leonova Diamond® – Orbit analysis and Shaft Centerline Plot



Orbit analysis and Shaft centerline plot is a vibration measurement function offered with Leonova Diamond®, for either unlimited (DIA138) or limited use (DIA238). The resulting orbit graph shows the movement of the shaft's centerline and is used to detect failures like rubs, unbalance, misalignment or oil whip on machinery with journal bearings.

Measurements are normally made on the buffered outputs of a machine protection system via the split cable CAB89 and two measuring cables CAB97, connected to the vibration input, plus cable CAB95 connected to the tachometer input on Leonova Diamond. The buffered outputs, channel X, channel Y and tachometer signal are connected via BNC connectors.

Measurements can also be made with e. g. accelerometers to get a two dimensional graph of machine movement. This requires two channel simultaneous vibration measurement and two transducers placed at an angle of 90° to each other, and a trigger signal from a tachometer probe.

Settings include transducer type, signal unit and filter type, either bandpass (default) or lowpass. Orders is set to 1 by default, but the user can select from 1 to 5 orders. The number of revolutions parameter, max. 25, specifies the number of shaft revolutions to acquire and display in the orbit graph.

During measurement, the result window shows displacement in the x and y direction per revolution. When measurement is complete, the average of the measured number of revolutions is shown.The orbit graph shows an overlay of the graphs for each measured revolution and their average. The user can select each individual revolution as well as the average of all revolutions.

The selected graph is marked in blue, with a blue arrow showing the angle and the x/y values at that angle. The user can move the arrow on the screen using the instrument arrow keys.

When the orbit assignment is set up in Condmaster Ruby, alarm limits can be set on the X and Y axes, resulting in an evaluated measurement (green - yellow- red scale).

Shaft centerline plot is a function especially useful for assessment of lubrication during start-up of a machine with journal bearings, the plot displays changes in radial rotor position over a range of speed. Settings for Shaft centerline plots are made in Leonova Diamond. The results can be viewed in Condmaster after the measuring round is uploaded.

Technical specifications

Orbit analysis

Orders:	1 to 5, default 1
Filter types:	None, band pass, low pass
Signal unit:	DISP, VEL, ACC
Trig threshold:	Automatic
Measuring time:	1 to 25 revolutions
RPM range:	15 to 48 000 rpm
Transducer types:	Buffered outputs from API670 approved protection systems alternative vibration transducers type SLD or other transducers with matching IS parameters

Shaft centerline plot

Display functions:	Shaft centerline plot
Signal unit:	DISP
RPM range:	1 to 120 000 rpm
Measuring parameters:	rpm (start/stop), interval
Transducer types:	Displacement transducers or IEPE (ICP®) type transducers with voltage output, alternative buffered outputs from API670 approved protection systems

Part numbers

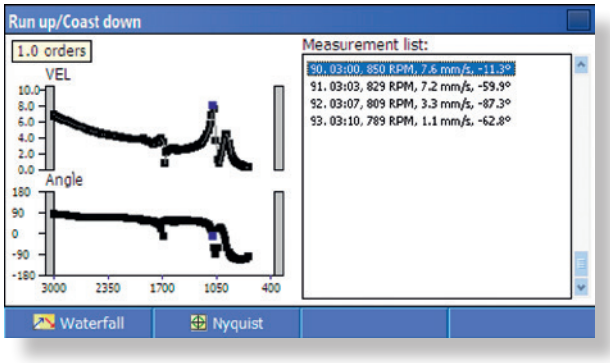
DIA138	Orbit analysis/Shaft Centerline Plot, unlimited use
DIA238	Orbit analysis/Shaft Centerline Plot, limited use
CAB89	2 channel vibration split cable, 8 pin, 0.25 m
CAB95	Tachometer cable, 5 pin-BNC, spiral 1.5 m
CAB97	Measuring cable, 8 pin-BNC, spiral 1.5 m

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Leonova Diamond® – Run up/coast down, Bump test and FRF





Run up / coast down measurements, Bump test and Frequency Response Function are three vibration analysis functions offered with Leonova Diamond, included in the module Vibration Expert DIA193/293 (see TD-365). The bump test is employed to check out the typical vibration response of a machine structure at standstill, by hitting it e. g. with rubber mallet (bump test). Run up/coast down records the changes in vibration while the machine is run up to operating speed or after it has been shut off and is slowing to a stop. Frequency Response Function (FRF) is used to measure the vibration response (natural frequencies) of a machine structure. All functions are selected from the menu of an ordinary vibration measurement assignment.

Run up / coast down

For this test, both the signal unit and the display unit for the spectrum can be selected. Leonova Diamond uses both digital and analog integration, so the signal unit can be set independent of the transducer type used. The measuring interval can be either time based (interval in seconds) or speed based (interval in rpm). The speed range is also chosen, e. g. 400 to 3000 rpm. The first result is a list of the numbered measurements, showing rpm and RMS vibration value. The date and time of the first measurement are displayed. For each individual measurement, a spectrum can be called up. Another list and diagram show the phase angles in degrees. Finally, the user can call up diagrams for vibration amplitude and angle, showing all measurements in time sequence. In all diagrams, a blue dot shows the position of the measurement marked on the list.

Bump test

The user sets the measuring range in Hz, which automatically sets the sampling time, e. g. 0.20 seconds for 2000 Hz/400 lines. A pre-trigging time, 5% to 25% of the sampling time, is also chosen. The gain level is set by hitting the machine frame with varying force. The peak amplitude of the measured signal is displayed (velocity in mm/s) and a trigger level can be set to 1% – 90% of the amplitude. The actual test returns an FFT spectrum and a time signal (sampling time plus pre-trigging time).

Frequency Response Function, FRF

Frequency Response Function (FRF) is used to measure the vibration response (natural frequencies) of a machine structure, similar to the 'Bump test'. FRF however is more sophisticated, measuring the response resulting from a known applied input by using an impact hammer and a vibration transducer connected to Leonova Diamond's vibration input using a split cable.

Technical specifications

Run up/coast down

Frequency limit, lower:	0.5, 2 10 or 100 Hz
Frequency limit, upper:	1 to 9999 orders
Measuring interval:	speed or time based
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Spectrum types displayed:	linear

Bump test

Frequency limit, lower:	0 Hz (DC)
Frequency limit, upper:	25 to 40 000Hz
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800, 25600
Spectrum types displayed:	linear
Pre-trigger time:	5%, 10%, 20%, 25% of sampling time
Transducer types:	Vibration transducer SLD144 or IEPE* (ICP®) type transducers with voltage output

* Integral Electronic PiezoElectric

Frequency Response Function (FRF)

Scale units:	Accelerance, Mobility, Compliance, Effective Mass, Impedance, Stiffness, Coherence, Phase
Frequency limit, lower:	0 Hz (DC)
Frequency limit, upper:	8 to 40 000 Hz
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800, 25600
Window types :	
Hammer	Rectangle, Half-sine, Gaussian,
Machine	Exponential, Rectangle
Pre-trigger time:	% of sampling time
Double hit detection:	% of impact force
Transducer line test:	bias
Impact hammer:	IEPE (ICP) type. Tranducer supply approx 2.5 mA

Part numbers

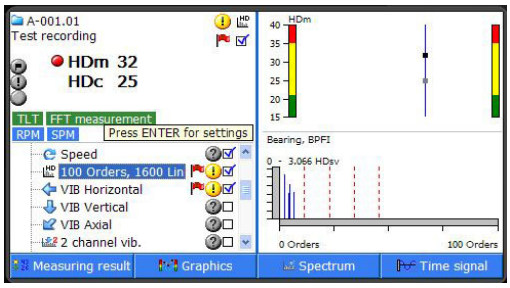
DIA193	Vibration Expert, unlimited use
DIA293	Vibration Expert, limited use

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Leonova Diamond® – Recording function





The Recording function is part of the platform, always included for unlimited use. It allows the user to measure and record measuring results over longer periods of time. The recording function is an analysis tool which can show the interaction of various condition parameters over time.

Leonova has six channels on four separate connectors, for

- shock pulse measurement
- speed and temperature measurement
- vibration (three channels)
- analog measurement

Simultaneous measurement can be done on up to four channels.

The recording function for a single quantity, e. g. temperature, is accessed and set up from the default file saved under the respective technique window. To record different quantities at the same time, a measuring point file with all the different techniques activated is required.

Under 'Total' in the recording window, the desired number of measurements is input, alternatively the total recording time in minutes.

Under 'Time between measurements' the interval is input in minutes. 0 minutes means 'as fast as possible'.

The measuring sequence is set by opening the list of available measuring techniques with NEW and selecting techniques in any order. A technique can be used more than once in the sequence.

Recording is started with the M/S key and can be terminated with the 'Cancel' key (F4).

Leonova displays the number of measurements taken and powers down when all are recorded. The batch is then saved by the user and can be transferred to Condmaster.

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Leonova Diamond® – Balancing



Single and dual plane balancing are optional Leonova functions for either limited or unlimited use. In case of limited use, credits are deducted for each vibration measurement.

Leonova guides step-by-step through the balancing procedure. One can shift the rotation direction and change the measured parameter from velocity to acceleration or displacement.

Single plane balancing, 4 runs

This method uses one measurement without trial weight to determine the vibration severity (mm/s RMS) of the rotor, followed by three measurements with trial weights at 0°, 120° and 240° to calculate the weight and position of the correction mass.

Single plane balancing, 2 runs

This method uses one measurement without trial weight to determine the vibration severity (mm/s RMS) of the rotor, followed by one measurement with a trial weight to calculate the weight and position of the correction mass. It requires time synchronised vibration measurement (trigger pulse supplied by a pulse from the SPM tachometer probe or a proximity switch) to find the relative phase angle between the two vibration measurements.

Dual plane balancing

The same two run method as used for single plane balancing, but with vibration measurement and weight correction in two planes. These measurements can be made by shifting the vibration transducer or by connecting two transducers.

For all methods, a final run can be made to check the balancing results and, if needed, get the data for further adjustments. Leonova then saves a balancing log file.

In addition to the RMS value, a spectrum is shown to help find the part of vibration that is due to unbalance. For the two run methods, the number of samples for obtaining a time synchronous average is set to 4, minimum.

Leonova calculates a number of alternatives for correcting the unbalance:

- Trial weight: Input rotor diameter, weight and rpm to obtain the suitable trial weight in grams.
- Split the correction mass: Input the number of rotor partitions to distribute the correction mass between two of them.
- Weight removal: Drill hole diameter and depth calculated for various materials.
- Radial displacement: Input the change in radial distance to recalculate the weight.
- Degrees to length: change from angle to length measured along the rotor circumference.
- Keep trial weight: Calculate the correction mass with the trial weight remaining in place.
- Sum up weights: Replace all correction masses on the rotor by one.

Part numbers

DIA109	Balancing, single and dual plane, unlimited use
DIA209	Balancing, single and dual plane, limited use

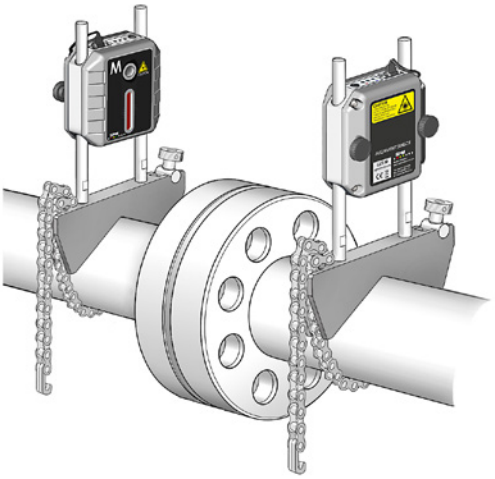
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Leonova Diamond® – Shaft alignment





LineLazer Alignment Kit LLA450

Shaft alignment is an optional Leonova function for either limited or unlimited use. In case of limited use, credits are deducted for each alignment assignment. The function is user friendly and easy to learn.

The LineLazer Alignment Kit LLA450 contains alignment sensors, brackets, chains, rods, battery charger, cables, Bluetooth dongle and a tape measure – all in a convenient carrying case. This kit fits a multitude of applications, e.g. compressors, gearboxes, generators, and pumps.

The alignment sensors provide maximum accuracy using a spread laser beam in combination with a 28.7 mm detector. Compensation values for thermal growth can be input. High precision inclinometers measure the angle of rotation of both assignment sensors at all times. This allows measurement in fully automatic mode, with much less than a half-turn of the shaft. Measurement results are displayed in 100ths of millimetres or 1000ths of an inch.

The Leonova instrument is the control and display unit. The alignment sensors communicate wirelessly with Leonova Diamond via Bluetooth. The interaction between the graphical display and the user is kept as simple as possible. A self-explanatory display based on icons and graphics guides the user to make a perfect shaft alignment. Leonova Diamond produces a log file with all alignment data for documentation and printing.

Measurement programs:

- Alignment of horizontally mounted machines (automatic measurement or manual prompts)
- Alignment of vertically and flange mounted machines
- Soft foot measurement
- Compensation for thermal growth
- Feet lock function
- Shaft alignment log

Part numbers

DIA155	Shaft alignment, unlimited use
DIA255	Shaft alignment, limited use

LineLazer Alignment Kit LLA450 (TD-525)

LLS10	1 pc.	Alignment sensor, S position (*TD-524*)
LLM10	1 pc.	Alignment sensor, M position (*TD-524*)
90624	1 pc.	Charger, dual USB, incl. interchangeble AC plugs, 100–240V AC, 50-60 Hz, 17 W
CAB94	2 pcs.	Charger cable, USB Type A to Mini-B USB, length 1.5 m
LLD10	1 pc.	Bluetooth dongle for Leonova Diamond
LLB25	2 pcs.	Shaft bracket for chain
LLB11	2 pcs.	Extension chain, length 1000 mm
LLB12	2 pcs.	Chain with tension adapter, length 500 mm
LLB13	1 set	Supporting rod, 80 mm, set of 4
LLB14	1 set	Supporting rod, 150 mm, set of 4
MAA70	1 pc.	Tape measure
TOL21	1 pc.	Torquing tool for chains and rods
81339	1 pc.	Plastic box
CAS25A-1	1 pc.	Carrying case, plastic with foam insert

LineLazer Alignment Kit LLA451

The LineLazer Alignment Kit LLA451 contains the same equipment as LLA450 but without the carrying case CAS25A-1.

Options

LLB26	Magnetic bracket

Spare parts

LLB20	Supporting rod, 80 mm
LLB21	Supporting rod, 150 mm

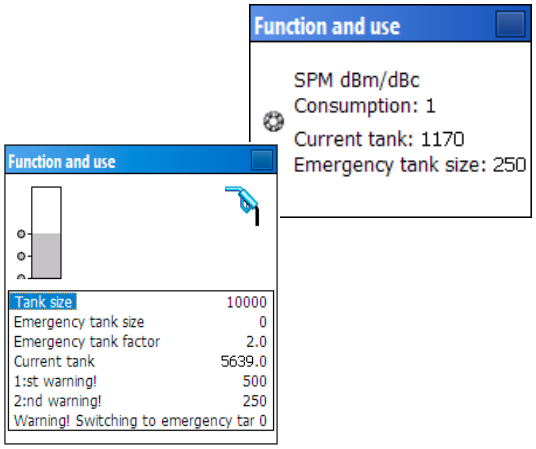
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Leonova Diamond® – Services





The service program Leonova.exe is part of the basic function package for Leonova Diamond. It is used to:

- Print and save balancing and alignment reports
- Load credits and/or functions from the file 'Leonova.txt'
- Upgrade a Leonova software package
- Display and print a credit log containing all events in connection with measurement credits, up to 10000
- Make and reload safety copies of the Leonova files (file extension .lsc)

The operation of the service program is very simple: connect Leonova to the PC, put it in communication mode, then click on the desired service function. Follow the guidance on the screen.

For example, a safety copy of the Leonova file can be sent to SPM for technical advice. Upon reload, you choose which part of your safety copy should be reloaded.

The file 'Leonova.txt' can contain measuring credits and/or Leonova functions that are new for the instrument or changed from limited to unlimited use. It is coded to fit the individual instrument and ordered via the local SPM distributor.

Part numbers

PRO52	Leonova Diamond Service Program
DIA290	Credits
DIA291	Credits refill

The credits required for a measuring round and the tank status are displayed in Leonova under 'Function and use'. There one can also set the values and time intervals for the ´tank low´ warnings.

The amount of credits deducted when the 'Measure' command is given depends on the method used, see table. For balancing, credits are deducted for each vibration reading. The table shows the min. requirement.

Functions with limited use	Credit consumption
SPM HD Expert	2
SPM HDm/HDc	2
Shock pulse method dBm/dBc	1
Shock pulse method LR/HR	2
SPM Spectrum	2
Vibration ISO 10816 with spectrum	1
HD Enveloping	3
EVAM evaluated vibration analysis	2
FFT spectrum with symptoms	2
3-channel vibration measurement	6
Post trigger	25
Orbit analysis / Shaft Centerline Plot	5
Run up / coast down	50
Bump test and Frequency Response Function	25
Balancing, single plain 4 runs	16
Balancing, single plain 2 runs	42
Balancing, dual plane	80
Shaft alignment	30

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Leonova Emerald® – Platform



EME400
EME403
EME405



CHA01/CHA02/
CHA03/CHA04



CAS28



16675



CAS35

Leonova Emerald® is a handheld machine condition analyser designed for use in harsh environments. Following functions are always included for unlimited use:

- Data logging with Condmaster® Ruby.
- Shock pulse method SPM HDm/HDc and/or SPM LR/HR.
- ISO 2372 vibration monitoring.
- One-channel vibration monitoring.
- Speed and temperature measurements.
- Stethoscope function.
- Measuring point identification with CondID® memory tags.
- Manual recording and checkpoints.

The main Leonova functions are user-selected, see TD-375. With synchronous measurement, enveloping, true zoom and up to a 12 800 line spectrum over DC up to 20 kHz, Leonova Emerald® has full vibration analysis capacity. SPM has also incorporated the evaluation tables of the new ISO 10816 standards for broadband measurement of vibration velocity, acceleration, and displacement. For single-rotor balancing, an easy-to-use graphical guide calculates balancing weights and their position.

Part numbers

EME400	Leonova Emerald, SPM HDm/HDc
EME403	Leonova Emerald, SPM LR/HR
EME405	Leonova Emerald, SPM HDm/HDc and LR/HR
BATT02-Std	Optional battery pack
16644	Battery adapter unit
CHA01	Battery charger incl. AC adapter, Euro-plug
CHA02	Battery charger incl. AC adapter, UK-plug
CHA03	Battery charger incl. AC adapter, US-plug
CHA04	Battery charger incl. AC adapter, AU-plug
93484	Car charger cable 12V
CAB94	Communication cable, USB-mini USB
16675	Belt clip, complete
16646	Shoulder strap
CAS28	Carrying case, soft with modular insert, 370x200x270 mm
CAS35	Carrying case/trolley case with two wheels, plastic with foam insert, 560x350x230 mm
81468	Code lock, TSA approved, for CAS35

Parts of the Leonova system are specified on the technical data sheets (TD) listed below:

Instrument specifications	TD-373
User-selected functions	TD-375
Shock pulse method SPM HD frequency & time-domain analysis	TD-435
SPM Shock pulse method dBm/dBc	TD-440
SPM Shock pulse method LR/HR	TD-436
SPM Spectrum®	TD-441
Vibration monitoring ISO 2372	TD-446
Vibration monitoring ISO 10816 with spectrum	TD-442
Recording	TD-444
Vibration Premium	TD-366
HD ENV	TD-512
FFT with symptoms	TD-367
HD Order tracking	TD-439
Vibration Supreme	TD-445
HD ENV	TD-512
EVAM Evaluated Vibration	TD-438
HD Order tracking	TD-439
HD Analysis	TD-515
Vibration Supreme	TD-445
Shock pulse method SPM HD	TD-435
Balancing, single plane	TD-443
Leonova Service Program	TD-437
Transducers and measuring cables	TD-377
Tachometer/Temperature probe	TD-380

Spare parts

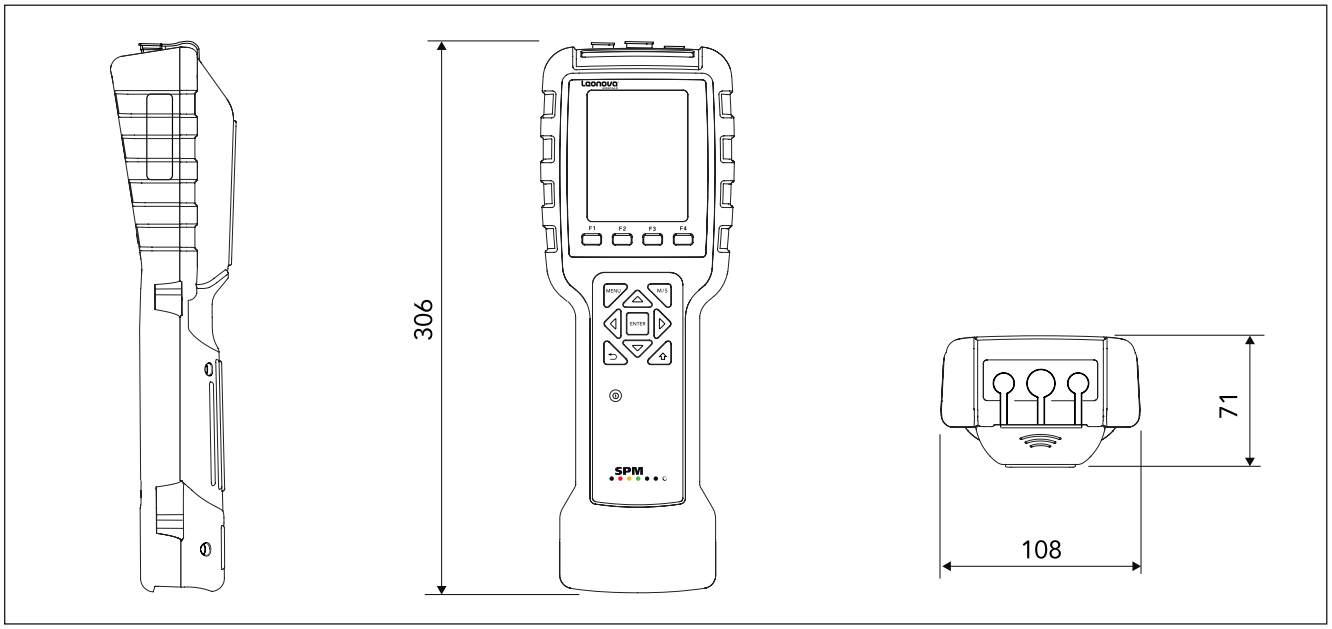
16686	Protection foil display
14661	Wrist strap
81469	Silica gel (moisture absorbent) for CAS35
90362	AC adapter, Euro-plug, 100-240 V AC
90380	AC adapter, UK-plug, 100-240 V AC
90379	AC adapter, US-plug, 100-240 V AC
90528	AC adapter, Australia plug, 100-240 V AC
16574	Battery charger
PRO52	Leonova Service Program
71971	Leonova Emerald User guide

Patents: www.spminstrument.com/patents

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Leonova Emerald® – Instrument specifications



Technical specifications

Housing:	ABS/PC/TPE, IP65
Dimensions:	306 x 108 x 71 mm
Weight:	860 g
Keypad:	Sealed, snap action
Display:	TFT colour, 240 x 320 pixels, 3.5 inch, adjustable backlight
Main processor:	400 MHz ARM
Memory:	256 MB RAM, 512 MB Flash, SD card 1 GB
Operating system:	Microsoft Windows® CE
DSP processor:	375 MHz floating point
Communication:	USB 2.0
Power supply:	Rechargeable Lithium-Ion battery pack, 5200 mAh or power adapter
Battery power:	For min. 18 hours normal use (20°C)
Operating temperature:	–20 to 55 °C (–4 to 122 °F), non condensing
Charging temperature:	0 to 45 °C (32 to 113 °F)
General features:	Language selection, battery status indication, transducer line test, metric or imperial units
Meas. point identification:	NFC transponder for communication with CondID™ tags, read/write distance max. 50 mm (2 inch)

Output/input

Headphones/microphone:	3.5 mm stereo plug
Communication:	Mini USB

Temperature measurement

Input:	TTP10 Tachometer/Temp. probe

Stethoscope

Transducer types:	Shock pulse and vibration transducers
Settings:	Filter, volume and gain

Vibration monitoring

Vibration channels:	1
Dynamic range:	< 120 dB, 24 bit A/D converter
Frequency range:	0 (DC) to 20 kHz
Resolution:	Max. 12 800 lines
Vibration transducer input:	< 24 Vpp. Transducer supply of 2,5 mA for IEPE (ICP) type can be set On/Off
Transducer types:	Any transducers (disp., vel. or acc.) with voltage output
Measuring techniqes:	ISO 2372, ISO 10816, HD ENV, FFT with symptoms, EVAM Evaluated Vibration Analysis, balancing

Bearing monitoring

Measuring range:	SPM HD: –30 to 110 dBsv (44000 transducer) dBm/dBc: –9 to 99 dBsv LR/HR: –19 to 99 dBsv
Resolution:	0,2 dB / HD, 1 dB / dBm/dBc and LR/HR
Transducer types:	SPM 40000, 42000, 44000, probe and quick connector transducers, DuoTech

Tachometer input

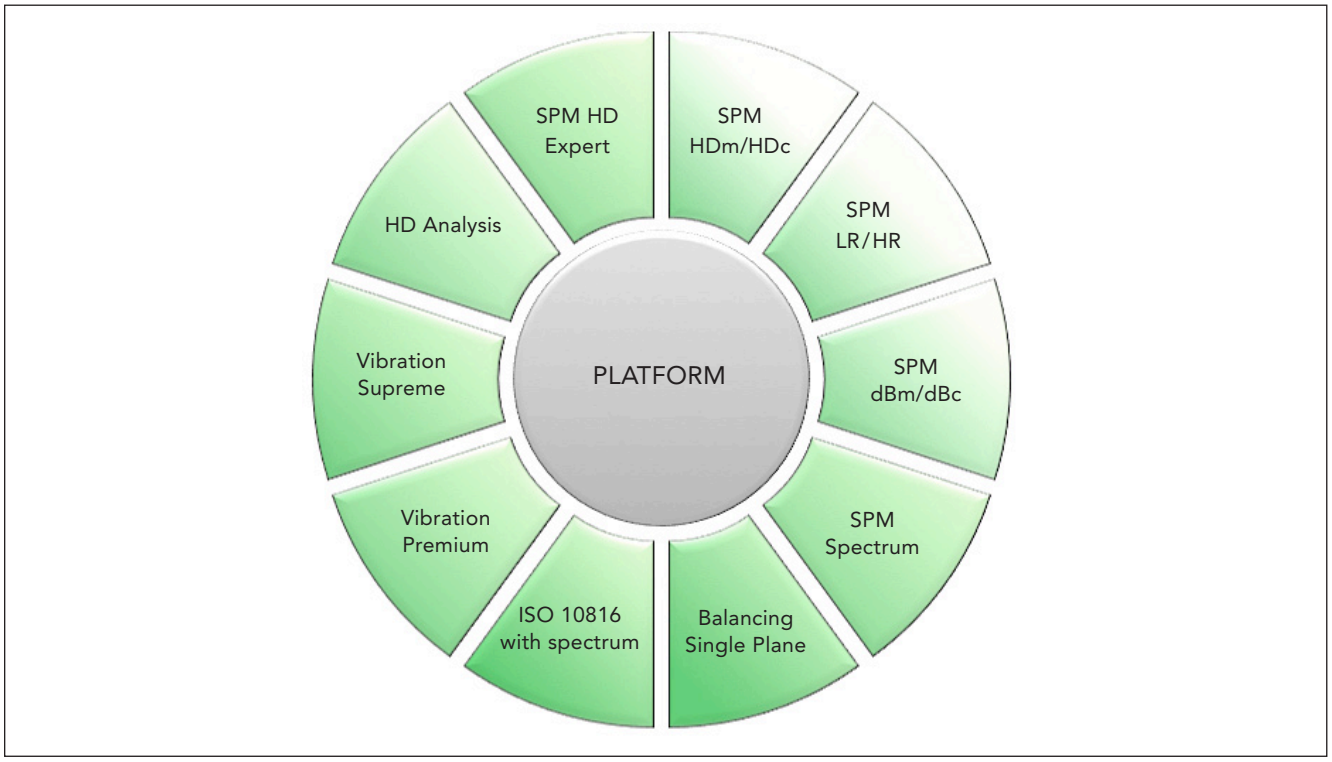
Measuring range:	1 to 150 000 PPM
Resolution:	1 pulse
Accuracy:	± (1 pulse + 0.01% of reading)
Transducer types:	SPM TTP10, TTL pulses, Keyphasor® and proximity switch NPN/PNP.
Output:	TTL output for stroboscope and 12 VDC

Patents: DE#60304328.3 - US#7,054,761 - US#7,167,814 - US#7,200,519 - US#7,301,616 - US#7,313,484 US#7,324,919 - US#7,711,519 - US#7,774,166 - DE#60336383.0 - US#7,949,496 - DE#60337804.8 GB#1474662 - GB#1474663 - DE#60338365.3 - ZA#2011/04946 - SE#0951017-3 - DE#60341502.4 GB#1474659 - SE#1000631-0 - US#8,762,104 - US#8,812,265 - US#8,810,396 - CN#ZL200980155994.1 CN#ZL201080019737.8 - KZ#020791 - RU#020791 - AU#2009330744 - RU#021908 - KZ#021908 US#9,200,980 - US#9,213,671 - CN#ZL201180006321.7 - KZ#022630 - RU#022630 - US#9,279,715 US#9,304,033 - KZ#024339 - RU#024339 - CN#ZL201380007381.X - AU#2015203801 - AU#2013215672 RU#201491377 - CN#ZL2012800347548 - US#6,873,931 - DE#602013021988.5 - DK/FI/FR/IT/NL/NO/ES/ GB#2810027 - SE#13744257.0 - AU# 2015203361 - RU# 027452 - GB# 2505984 - US# 9,772,219

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Leonova Emerald® – User-selected functions



To obtain the optimal performance range and instrument price for their purpose, Leonova users can select any or all of the condition diagnosis and maintenance functions below. Platform functions are always included.

Platform

- SPM HDm/HDc and/or SPM LR/HR
- RMS vibration, ISO 2372
- Speed measurement
- Temperature measurement
- Stethoscope function
- Measuring point identification with CondID® memory tags
- Recording
- Manual recording, free quantity
- Check points, free text
- Recording of vocal comments
- Supports up to 6400 lines, 10 kHz

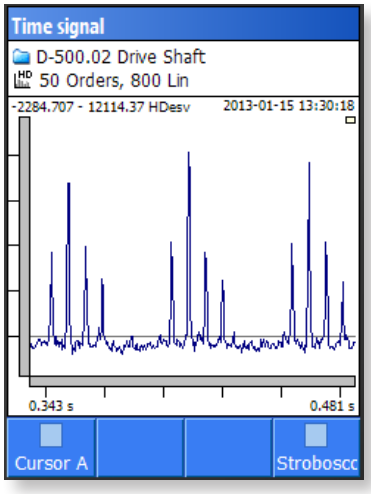
Optional functions		Module in Ruby
EME195	SPM HD Expert, freq. and domain analysis	MOD195
EME197	Shock pulse method HDm/HDc	(Platform)
EME130	Shock pulse method dBm/dBc	MOD130
EME131	Shock pulse method LR/HR	MOD131
EME132	SPM Spectrum	MOD132
EME133	Vibration ISO 10816 with spectrum	MOD133
EME134	Vibration Premium HD ENV FFT spectrum with symptoms 6400 lines, 10 kHz HD Order tracking Time signal Post trigger	MOD135
EME193	Vibration Supreme HD ENV EVAM evaluated vibration analysis 12800 lines, 20 kHz + all functions in EME134	MOD197
EME140	HD Analysis Vibration Supreme SPM HD Expert	MOD140
EME109	Balancing, single plane	

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Leonova Emerald® – Shock pulse measurement, SPM HD®





The signal

Throughout their lifetime, bearings generate shocks in the interface between the loaded rolling element and the raceway. These shocks 'ring' the SPM transducer which outputs electric pulses proportional to the shock magnitude.

Unlike vibration transducers, the shock pulse transducer responds at its carefully tuned resonance frequency of about 32 kHz, enabling a calibrated measurement of the shock pulse amplitudes.

Shock pulse amplitude is due to three basic factors:

- Rolling velocity (bearing size and rpm)
- Oil film thickness (separation between the metal surfaces in the rolling interface). The oil film depends on lubricant supply and viscosity as well as alignment and pre-load.
- The mechanical state of the bearing surfaces (roughness, stress, damage, loose metal particle).

Input data

The effect of rolling velocity on the signal is neutralized by entering rpm and shaft diameter as input data, with 'reasonable accuracy'. This sets an initial value (HDi), the start of the ´normalized' condition scale.

Technical data

Measuring range:	–30 to 110 dBsv (44000 transducer)
Resolution:	0.2 dB
Accuracy:	± 1 dB
Transducer type:	SPM 40000/42000/44000 probe transducer and quick connector transducer for adapters
Input data:	rpm, plus bearing type and mean diameter (or ISO bearing number)
Output quantity:	HDm, HDc, Time Signal HD SPM Spectrum HD
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Measuring time:	1 to 10000 rev (default same as FFT)
Symptom enhancement factor:	Off, 1-10 (Default = off)

Output data

HDm/HDc (part of platform)

HDm is a scalar value expressed in decibels. It is the primary value to use to determine the severity of a bearing damage. It represents the highest shock pulses found during the measuring cycle. This value is also used for triggering alarms. HDc is a scalar value expressed in decibels. This value represents the level where 200 shocks/second are present. It is useful to determine lubrication condition.

Time Signal HD (part of EME195)

Time signal HD is extremely useful to locate where in the bearing a possible damage is located. In many cases it is also possible to determine the nature of the damage (cracked inner race with spalling all around or a single crack etc.). The Time signal HD is a result of highly advanced digital algorithms where repetitive shocks are enhanced and random signals are suppressed.

SPM Spectrum HD (part of EME195)

SPM Spectrum HD is the result of applying FFT algorithms on the Time Signal HD. The SPM HD spectrum is useful to determine where a possible bearing damage is located. It is also useful for trending purposes (applying symptom and band values).

High Definition Order Tracking (part of EME195)

This function is primarily used for analysis on variable speed machines and adjusts extremely well to quick changes and variations in the RPM during measurement, see TD 439.

Evaluation

The initial value and the range of the three condition zones (green-yellow-red) was established empirically by testing bearings under variable operating conditions. The maximum value places the bearing into the condition zone. The height of the carpet value and delta (HDm – HDc) indicated lubrication quality or problems with bearing installation and alignment.

Part numbers

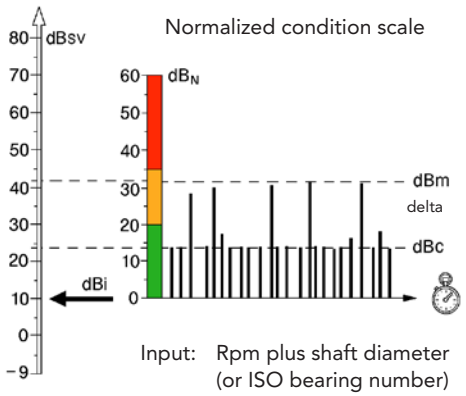
EME195 Shock pulse method SPM HD, Expert unlimited use

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Leonova Emerald® – Shock pulse measurement, dBm/dBc





For over 40 years, the original Shock Pulse Method (SPM) has been very successfully used to obtain a fast, easy and reliable diagnosis of the operating condition of rolling element bearings.

The signal

Throughout their lifetime, bearings generate shocks in the interface between the loaded rolling element and the raceway. These shocks 'ring' the SPM transducer which outputs electric pulses proportional to the shock magnitude.

Unlike vibration transducers, the shock pulse transducer responds at its carefully tuned resonance frequency of about 32 kHz, which allows a calibrated measurement of the shock pulse amplitudes.

Measurement

The shock pulse meter counts the rate of occurrence (incoming shock pulses per second) and varies the measuring threshold until two amplitude levels are determined:

- the maximum level (highest incoming shock under one second). This level is displayed as **dBm** (decibel maximum value). Using a blinking indicator or headphones, the operator can establish a peak value by increasing the measuring threshold until no signal is registered.
- the shock carpet level (approx. 200 incoming shocks per second. This level is displayed as **dBc** (decibel carpet value).

Because of the very large dynamic range, shock pulses are measured on a decibel scale (1000 x increase between 0 and 60 dB).

Shock pulse amplitude is due to three basic factors:

- Rolling velocity (bearing size and rpm)
- Oil film thickness (separation between the metal surfaces in the rolling interface). The oil film depends on lubricant supply and also on alignment and pre-load.
- The mechanical state of the bearing surfaces (roughness, stress, damage, loose metal particle).

Input data

The effect of rolling velocity on the signal is neutralized by giving rpm and shaft diameter as input data, with 'reasonable accuracy'. This sets an initial value (dBi), the start of the ´normalized' condition scale.

Evaluation

The initial value and the range of the three condition zones (green - yellow - red) was established empirically, by testing bearings under variable operating conditions. The maximum value places the bearing into the condition zone. The height of the carpet value and delta (dBm minus dBc) indicated lubrication quality or problems with bearing installation and alignment.

Technical specifications

Measuring time:	1.5 sec
Measuring range:	–9 to 99 dBsv
Resolution:	1 dBsv
Accuracy:	± 1 dB
Transducer types:	SPM 40000/42000/44000, probe transducer and quick connector transducer for adapters
Input data:	Rpm, shaft diameter (or ISO bearing number)
Output:	Maximum value dBm, evaluated green - yellow -red, carpet value dBc, peak value, audible shock pulse signal (headphones).

Part numbers

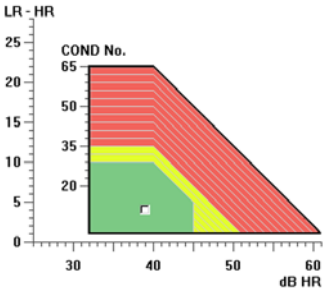
EME130 Shock pulse method dBm/dBc, unlimited use

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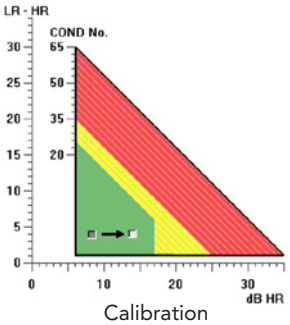
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Leonova Emerald® – Shock pulse measurement, LR/HR





Evaluation boxes determined by bearing geometry and speed



Calibration

The LR/HR method was developed from the original Shock Pulse Method for condition diagnosis of rolling element bearings. It allows a precision analysis of oil film condition in the rolling interface and contains computation models for finding the optimal lubricant. Poor lubrication is the root cause of most bearing failures.

Signal and measurement

Transducer and measuring procedure are the same as for the dBm/dBc method. The shock pulse meter counts the rate of occurrence (incoming shock pulses per second) and varies the gain until two amplitude levels are determined:

- LR = low rate of occurrence, quantifying the strong shock pulses (approx. 40 incoming shocks per second).
- HR = high rate of occurrence, quantifying the shock carpet (approx. 1000 incoming shocks per second).

LR and HR are 'raw values', measured in dBsv (decibel shock value).

Input data

The LR/HR method requires more precise data on the bearing, because bearing geometry, as well as size and speed, affect the shock carpet and thus the analysis of oil film condition in undamaged bearings. The rpm is needed, plus a definition of the bearing type and size. This is best input by stating the ISO bearing number, which links to the bearing catalogue in Condmaster.

Evaluation

After measurement Leonova returns

- a general description of bearing condition (CODE)
- a value for oil film condition (LUB)
- a value for surface damage (COND).

For time signal and FFT, use the EME195 module (TD-435).

A LUB no. of 0 means dry running, the value increases with oil film thickness. A COND no. of around 30 indicates surface stress or early damage, the value increases with damage severity. The general assessment is:

CODE A Good bearing
CODE B Poor lubrication
CODE C Dry bearing, risk of damage
CODE D Damage.

A program part, LUBMASTER, uses the shock values plus data on lubricant type, viscosity, load and operating temperature to calculate the bearing's life expectancy under present condition. It also calculates the effect of changes in oil type and viscosity.

Calibration

The accuracy of the LR/HR method is increased by a calibration factor (COMP no.) used in case of bearings with minimal load or poor quality measuring points (in both cases the signal strength is below normal). On the basis of the bearing's catalogue data and the lubricant properties, Leonova computes the normal shock level for a good bearing and compensates for an abnormally low signal before returning the evaluation results.

Technical specifications

Measuring range: –19 to 99 dBsv
Measuring time: 1.5 sec
Resolution: 1 dBsv
Accuracy: ± 1 dB
Transducer type: SPM 40000/42000/44000, probe transducer and quick connector transducer for adapters
Input data: rpm, plus bearing type and mean diameter (or ISO bearing number)
Output: LR and HR (raw shock values), CODE A to D, evaluated green - yellow - red.LUB no. for oil film condition, COND no. for surface condition.
(Time signal, use EME195.)

Part numbers

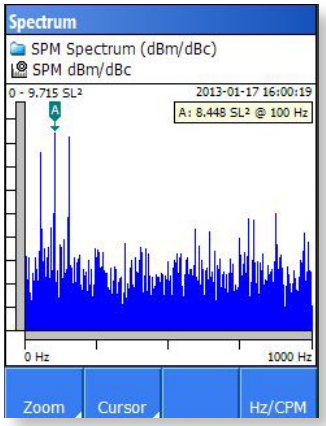
EME131 Shock pulse method LR/HR, unlimited use

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Leonova Emerald® – SPM Spectrum





The purpose of SPM Spectrum is to verify the source of high shock pulse readings. Shocks generated by damaged bearings will typically have an occurrence pattern matching the ball pass frequency over the rotating race. Shocks from e. g. damaged gears have different patterns, while random shocks from disturbance sources have none.

Signal and measurement

The resonance frequency of the SPM shock pulse transducer, calibrated to 32 kHz, constitutes the ideal carrier wave for transients caused by shocks. The output of this transducer is the same type of demodulated signal produced by 'enveloping', with one important difference; both frequency and amplitude response of the SPM transducer are precisely tuned, so there is no need to find uncertain and shifting machine resonances to get a signal.

Leonova Emerald® measures the shock amplitude by a shock pulse measurement with the dBm/dBc or the LR/HR method. The results are the bearing condition data, evaluated green - yellow - red.

Simultaneously measurement produces a time record that is subjected to a Fast Fourier Transform (FFT). The resulting spectrum is used mostly for pattern recognition. Spectrum line amplitudes are influenced by too many factors to be reliable condition indicators, so all condition evaluation is based on the dBm or the LR values.

One unit for amplitude in an SPM spectrum is S_D (Shock Distribution unit), where each spectrum is scaled so that the total RMS value of all spectrum lines = 100 S_D = the RMS value of the time record. The alternative is S_L (Shock Level unit), the RMS value of the frequency component in decibel. Alarm levels are manually set for each symptom to show evaluated results in green - yellow - red. Various types of spectra can be produced. The recommended setting is a spectrum with a resolution of at least 0.25 Hz, e. g. 3200 lines over 500 Hz, saving peaks only.

Input data

Pattern recognition demands precise data on the bearing and exact measurement of rpm. The rpm should be measured, not preset. The factors defining the bearing frequencies are obtained from the bearing catalogue in Condmaster by stating the ISO bearing number.

Evaluation

The frequency patterns of bearings are preset in Condmaster. Linking the symptom group 'Bearing' to the measuring point allows the user to highlight a bearing pattern by clicking on its name. Other symptoms can be added when appropriate, e. g. for gear mesh patterns. Finding a clear match of a bearing symptom in the spectrum is proof that the measured signal originates from the bearing.

Technical specifications

Compatible with:	dBm/dBc or LR/HR
Frequency range:	0 to 8, 10, 16, 20, 25, 32, 40, 50, 80, 100, 125, 160, 200, 250, 320, 400, 500, 625, 800,1000, 1250, 1600, 2000, 2500, 4000, 5000, 8000,10000, 20000 Hz
Number of spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Spectrum types displayed:	Linear, power
Averages:	FFT linear, FFT peak-hold
Frequency units:	Hz, CPM, orders
Saving options, spectrum:	Full spectrum, peaks only
Amplitude scale unit:	S_D (Shock Distribution), S_L (Shock Level)
Pattern recognition:	Bearing frequencies and optional patterns highlighted in the spectrum. Automatic configuration of bearing symptoms linked to ISO bearing no.
Transducer type:	Shock pulse transducers with probe and quick connector, SPM 40000/42000/44000

Part numbers

EME132 SPM Spectrum, unlimited use

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Leonova Emerald® – HD ENV



With Leonova, the HD ENV method is offered as an analysing function for unlimited use. It is a part of the packages Vibration Premium EME134 (TD-366) and Vibration Supreme EME193 (TD-445).

HD ENV is an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques – for example bearing damages and gear damage – the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes.

Input data:
A number of predefined filters are available to detect damages or anomalies in different stages of development; two of which are specifically designed for bearing monitoring and two of which are recommended for of non-bearing related problems.

Output data:
HD Real Peak
The unit of measurement is HD Real Peak, a scalar value expressed in decibels. Representing the true highest peak found in the enveloped signal, HD Real Peak is the primary value to use for determining the severity of a bearing or gear damage. It is also used for triggering alarms.

HD Env Time Signal
HD Env Time Signal is extremely useful to locate where in the bearing a possible damage is located. In many cases it is also possible to determine the nature of the damage (a single crack or spalling all around etc.).

HD Env Spectrum
HD Env Spectrum is the result of applying FFT algorithms on the Time Signal HD. The HD Env spectrum is useful to determine where a possible bearing damage is located. It is also useful for trending purposes (applying symptom and band values).

Patented algorithms:
Symptom enhancement
Symptom enhancement is an algorithm that looks for repetitive impacts in the time domain. As a result, random signals are suppressed and repetitive signals enhanced. The output is an HD Env Time signal, where relevant bearing and gear data are displayed.

High Definition Order Tracking
This function is primarily used for analysis on variable speed machines and adjusts extremely well to quick changes and variations in the RPM during measurement, see TD-439.

Random Impact Rejection
Randomly occurring high readings which may cause false alarms are filtered out by means of the random impact rejection algorithm.

Technical specifications

Frequency upper*:	in orders
Env. high pass filters*:	100, 200, 500, 1000, 2000, 5000, 10 000 Hz
Env. band pass filters*:	Filter 1 (5-100 Hz) Filter 2 (50-1000 Hz) Filter 3 (500-10 000 Hz) Filter 4 (5000 - 20 000 Hz)
Averages:	Time synch
Spectrum lines*:	400, 800, 1600, 3200, 6400, 12800
Frequency units:	Hz, CPM, orders
Saving options:	Full spectrum, time signal and FFT, condition parameters
Transducer types:	Vibration transducer SLD144 or IEPE (ICP®) type transducers with voltage output, or DuoTech accelerometer

*Spectrum lines, frequency and envelope filter limits are regulated by what is included in the above mentioned packages.

Part numbers

EME199	HD ENV, unlimited use**

**Only for upgrading existing Vibration Premium EME134 and Vibration Supreme EME193 packages with HD ENV functionality.

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Leonova Emerald® – HD Analysis



The HD Analysis module is a combination of the Vibration Supreme package (EME193, TD-445) and SPM HD Expert (EME195, TD-435).

HD ENV

HD ENV is an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques - for example bearing damages and gear damage - the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes (see below). Signals buried in machine noise are revealed through high definition digital enveloping, extracting and enhancing the signals of interest from the overall machinery vibration signal while preserving the true highest peaks.

The unit of measurement is HD Real Peak, a scalar value expressed in decibels. Representing the true highest peak found in the enveloped signal, HD Real Peak is the primary value to use for determining the severity of a bearing or gear damage. It is also used for triggering alarms.

See TD-445 for more information about the Vibration Supreme package, and TD-512 for more information about HD ENV.

SPM HD

SPM HD Expert is a complement to the SPM HDm/HDc and LR/HR techniques. Advanced digital technique, RPM-based sampling frequency and measuring time automatically adjusted to RPM makes SPM HD particularly well suited for measurement on low speed applications. Extraordinary signal quality and 24 bit A/D conversion provides razor-sharp resolution and exceptional detail in spectrums and time signals.

The SPM HD method produces four different types of results:

- **HDm/HDc** are part of the Leonova Emerald platform. For further information, see technical data sheet TD-371.
- **Time Signal HD** is extremely useful to locate where in the bearing a possible damage is located. In many cases it is also possible to determine the nature of the damage (cracked inner race with spalling all around or a single crack etc.). The Time signal HD is a result of very advanced digital algorithms where repetitive shocks are enhanced and random signals are suppressed.
- **SPM Spectrum HD** is the result of applying FFT algorithms on the Time Signal HD. The SPM HD spectrum is useful to determine where a possible bearing damage is located. It is also useful for trending purposes (applying symptom and band values).

For more information about SPM HD, see TD-435.

Patented algorithms

HD ENV and SPM HD both incorporate sophisticated and patented algorithms which contribute to reliable and crystal clear readings:

- **High Definition Order Tracking**: Used primarily for analysis on variable speed machines, HD Order Tracking is capable of handling ±50% RPM variations during data aquisition. The number of orders to be covered is input by the user.
- **Symptom enhancement** looks for repetitive signals in the time domain. As a result, random signals are suppressed and repetitive signals enhanced.
- **Random impact rejection** filters out randomly occurring high readings which may cause false alarms.

Part numbers

EME140 HD Analysis

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Leonova Emerald® – Recording function



Recording is an Leonova function included in the platform. It allows the user to measure and record measuring results over longer periods of time, up to 50 hours. The recording function is an analysis tool which can show the interaction of various condition parameters over time.

Leonova has three channels on three separate connectors, for:

- shock pulse measurement
- speed and temperature measurement
- vibration (one channel).

Simultaneous measurement can be done on up to two channels.

The recording function for a single quantity, e. g. temperature, is accessed and set up from the default file saved under the respective technique window. To record different quantities at the same time, a measuring point file with all the different techniques activated is required.

Under 'Total' in the recording window, the desired number of measurements is input, alternatively the total recording time in minutes.

Under 'Time between measurements' the interval is input in minutes. 0 minutes means 'as fast as possible'.

The measuring sequence is set by opening the list of available measuring techniques with NEW and selecting techniques in any order. A technique can be used more than once in the sequence.

Recording is started with the M/S key and can be terminated with the 'Cancel' key (F4).

Leonova displays the number of measurements taken and powers down when all are recorded. The batch is then saved by the user and can be transferred to Condmaster.

The Recording function is part of the platform, always included for unlimited use.

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Leonova Emerald® – Vibration ISO 2372





Broadband vibration measurement is the most widely used and cost-efficient method for the diagnosis of general machine condition. There are two ISO recommendations concerning this type of machine condition monitoring; the much used ISO 2372 and the more recent ISO 10816, which is a ongoing replacement of the older standard.

In Leonova, vibration measurement according to ISO 2372 is a platform function, always included for unlimited use.

The features are:

- Machine condition is diagnosed on the basis of broad-band measurements returning an RMS value of vibration velocity in the frequency range of 10 to 1000 Hz. This is called vibration severity.
- Machines are grouped into six vibration classes.
- A table of limit values is presented for each vibration class, differentiating between acceptable vibration (green range), unsatisfactory vibration (yellow range), and vibration that will cause damage unless reduced (red range).
- Measurements are made in three direction (horizontal, vertical, axial). The highest value returned determines machine condition.
- Default limit values for the change from green to yellow and from yellow to red are set automatically when one of the six machine classes is input under the measuring point data.

ISO 10816 is offered as an option, see TD-442.

Technical specifications

Measurement quantities:	Velocity, RMS value in mm/s over 10 to 1000 Hz
Transducer type:	Vibration transducer SLD144 or IEPE* (ICP®) type transducers with voltage output

* Integral Electronic PiezoElectric

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Leonova Emerald® – Vibration ISO 10816 with spectrum



Vibration Velocity RMS		Group 4 Integrated Driver		Group 3 External Driver		Group 2 Motors 160 ≤ H < 315 mm		Group 1 Motors H ≥ 315 mm	
mm/s	inch/s	Rigid	Flexible	Rigid	Flexible	Rigid	Flexible	Rigid	Flexible
18	0.71								
11	0.43								
7.1	0.28								
4.5	0.18								
3.5	0.14								
2.8	0.11								
2.3	0.09								
1.4	0.06								
0.71	0.03								

Broadband vibration measurement is the most widely used and cost-efficient method for the diagnosis of general machine condition.

There are two ISO recommendations concerning machine condition monitoring by this type of measurement; the much used ISO 2372 and the more recent ISO 10816, which is an ongoing replacement of the older standard.

With Leonova, ISO 2372 measurement is a platform function, always included for unlimited use.

ISO 10816 is an option with ordering numbers EME 133 (unlimited use).

Features of ISO 10816 are:

- Measurements are made in three directions (horizontal, vertical, axial).
- Machine condition is generally diagnosed on the basis of broadband vibration measurements returning an RMS value. ISO 10816 keeps the lower frequency range flexible between 2 and 10 Hz, depending on the machine type. The upper frequency is 1000 Hz.
- ISO 10816 operates with the term vibration magnitude, which, depending on the machine type, can be an RMS value of vibration velocity, acceleration or displacement. If two or more of these parameters are measured, vibration severity is the one returning the relative highest RMS value. For certain machines, ISO 10816 also recognizes peak-to-peak values as condition criteria.
- The standard consists of several parts, each treating a certain type of machines, with tables of limit values differentiating between acceptable vibration (green range), unsatisfactory vibration (yellow range), and vibration that will cause damage unless reduced (red range).

In Leonova, ISO part, machine group and foundation type are input using a multiple choice guide which displays the various ISO definitions and leads to the limit values.

Exceeding the requirements of the ISO standard, Leonova Emerald also provides a 1600 line spectrum.

Technical specifications

Measurement quantities:	Velocity, acceleration, and displacement
Spectrum unit:	Velocity, mm/s or inch/s
Transducer type:	Vibration transducer SLD144 or IEPE* (ICP®) type transducers with voltage output
Quick mode:	Yes, can be set on/off

* Integral Electronic PiezoElectric

Settings	
Direction:	Horizontal, vertical, axial
Part:	2, 3, 4, 5, 6
Group:	2, 3, 4, 5, 6
Support:	Rigid, Flexible

Part numbers

EME133 Vibration ISO10816 with spectrum, unlimited use

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Leonova Emerald® – Vibration Premium



The effect of order tracking



Measurements with order tracking disabled on a machine with rpm variation of 10% (550 – 600 rpm) during data collection time.



High Definition Order Tracking

High Definition Order Tracking is a part of the Vibration Premium package. For shock pulse measurements, it is included in the SPM HD module EME195. This function is primarily used for analysis on variable speed machines. The method uses multiples of rotational speed (orders), rather than absolute frequency (Hz). The number of orders to be shown is input by the user. Leonova will then automatically set the sampling frequency to an exact multiple of the measured rpm. Order tracking will also minimize the risk of smearing when using FFT averaging.

FFT with Symptoms

FFT Spectrum with Symptoms is a vibration analysis function offered with Leonova.

This function generates three sets of machine condition data:

- Condition parameters, which are measured and calculated values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with the help of preset fault symptoms.
- Trending of symptom values. Alarm levels are manually set for evaluation in green - yellow - red.

For each measuring point, the user can make an individual selection and define the type of data best suited for the surveillance of an individual machine.

HD ENV

HD ENV an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques - for example bearing damages and gear damage - the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes.

Time signal

This option enables you to see the measured data in the time domain. This is useful in all kinds of analysis. Two cursors are available.

Post trigger

This function enables your system to be armed and triggered to measure directly on the trigger point. When this function is enabled on the measurement, the system prepares the measurement with settling time and autogain adjustment, so when the trigger fires, the system can start measuring directly.

Trigger level: *0-1000 mm/s, m/s², µm*
Delay: *0-30 sec*

The package consists of:

- FFT with symptoms (TD-367)
- High Definition Order Tracking (TD-439)
- HD ENV (TD-512)
- Time signal
- Post trigger

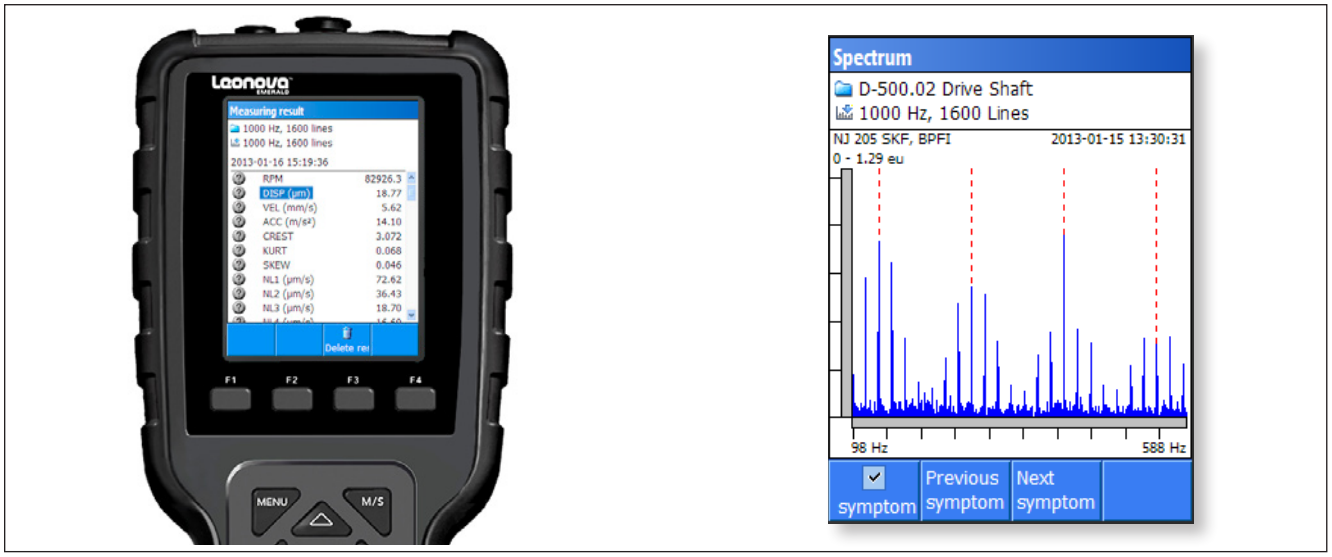
Part numbers

EME134 Vibration Premium

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Leonova Emerald® – Vibration Supreme



EVAM evaluated vibration analysis:
With Leonova, the EVAM method is offered as an analysing function for unlimited use. EVAM is a part of the Vibration Supreme package EME193.

- Condition parameters, which are measured and computed values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with the help of preset fault symptoms.
- Machine specific condition codes (green, yellow, red) and condition values, based on a statistical evaluation of the condition parameters and symptom values.

For each measuring point, the user can make an individual selection and define the type of data best suited for the surveillance of an individual machine.

Machine specific condition codes
In Condmaster, alarm limits can be set on all active parameters. Once measuring results are collected, an EVAM 'criterion' can be created that compares new parameter values with the statistical mean value and displays a dimensionless condition value against a green - yellow - red scale.

HD ENV
HD ENV an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques - for example bearing damages and gear damage - the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes.

High Definition Order Tracking
High Definition Order Tracking is a part of the Vibration Supreme package. For shock pulse measurements, it is included in the SPM HD module EME195. This function is primarily used for analysis on variable speed machines.

The method uses multiples of rotational speed (orders), rather than absolute frequency (Hz). The number of orders to be shown is input by the user. Leonova will then automatically set the sampling frequency to an exact multiple of the measured rpm. Order tracking will also minimize the risk of smearing when using FFT averaging.

12800 lines/20 KHz
This option expands spectrum resolution to 12800 lines and the upper frequency limit to 20KHz. Mostly for high speed applications and detection of resonances and harmonies in high frequencies.

Time signal
This option enables you to see the measured data in the time domain. This is useful in all kinds of analysis. Two cursors are available.

Post trigger
This function enables your system to be armed and triggered to measure directly on the trigger point. When this function is enabled on the measurement, the system prepares the measurement with settling time and autogain adjustment, so when the trigger fires, the system can start measuring directly.

Trigger level:	0-1000 mm/s, m/s^2, µm
Delay:	0-30 sec

The package consists of:

- EVAM evaluated vibration analysis (TD-438)
- HD ENV (TD-512)
- High Definition Order Tracking (TD-439)
- 12800 Lines/20 KHz
- Time signal
- Post trigger

Part numbers
EME193 Vibration Supreme

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Leonova Emerald® – FFT spectrum with symptoms



FFT Spectrum with Symptoms is a vibration analysis function offered with Leonova, part of EME134 or EME193.

This function generates three sets of machine condition data:

- Condition parameters, which are measured and calculated values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with the help of preset fault symptoms.
- Trending of symptom values. Alarm levels are manually set for evaluation in green - yellow - red.

For each measuring point, the user can make an individual selection and define the type of data best suited for the surveillance of an individual machine.

Condition parameters

Condition parameters are measured for a selected frequency range. They can be individually activated and are shown in measuring result tables and as diagrams. Available are:

VEL	RMS value of vibration velocity
ACC	RMS value of vibration acceleration
DISP	RMS value of vibration displacement
CREST	Crest value, difference between peak and RMS
KURT	Kurtosis, the amount of transients in the vibration signal
SKEW	Skewness, the asymmetry of the vibration signal
NL1 - 4	Noise level in the four quarters of the frequency range.

Peak and peak-to-peak values are shown in the unit selected for the time signal.

Spectrum analysis with 'symptoms'

For easy pattern recognition in spectra, a range of ready made 'fault symptoms' are downloaded from Condmaster. These are instructions to highlight a spectrum line pattern and display the sum of the lines' RMS values as a symptom parameter (which can be trended).

Most symptoms are automatically configured by using the rpm as a variable, for some an input is needed, e. g. the number of vanes on a rotor.

A special symptom group are the bearing symptoms (showing e.g. ball pass frequencies over inner and outer race) for which the Condmaster bearing catalogue contains all need data.

Suitable symptoms and symptom groups are selected from a menu in Condmaster when the measuring point is set up.

Technical specifications

Frequency limit, lower:	0, 0.5, 2, 3, 5, 10, 20, 100 or 200 Hz
Frequency limit, upper:	8, 10, 16, 20, 25, 32, 40, 50, 80, 100, 125, 160, 200, 250, 320, 400, 500, 625, 800, 1000, 1250, 1600, 2000, 2500, 4000, 5000, 8000, 10 000 Hz
Band pass filters:	5-100, 50-1000, 500-10000, 5000-40000
Envelope high pass filters:	100, 200, 500, 1000, 2000, 5000, 10 000 Hz
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	Time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400
Frequency units:	Hz, CPM, orders
Quick mode:	Yes, can be set on/off
Saving options:	Full spectrum, time signal, time signal and FFT, condition parameters
Spectrum types displayed:	Linear, power, PSD
Zoom:	Visual zoom
Transducer types:	Vibration transducer SLD144 or IEPE (ICP®) type transducers with voltage output

As options, the frequency range can be extended to 20000 Hz/12800 spectrum lines with EME193.

Part numbers

EME134 Vibration Premium

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Leonova Emerald® – EVAM evaluated vibration analysis



With Leonova Emerald®, the EVAM method is offered as an analysing function for unlimited use. EVAM is a part of the Vibration Supreme package EME193 (TD-445).

The EVAM method generates three sets of machine condition data:

- Condition parameters, which are measured and calculated values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with the help of preset fault symptoms.
- Machine specific condition codes (green, yellow, red) and condition values, based on a statistical evaluation of the condition parameters and symptom values.

For each measuring point, the user can make an individual selection and define the type of data best suited for the surveillance of an individual machine.

Condition parameters

Condition parameters are measured for a selected frequency range. They can be individually activated and are shown in measuring result tables and as diagrams. Available are:

VEL	RMS value of vibration velocity
ACC	RMS value of vibration acceleration
DISP	RMS value of vibration displacement
CREST	Crest value, difference between peak and RMS
KURT	Kurtosis, the amount of transients in the vibration signal
SKEW	Skewness, the asymmetry of the vibration signal
NL1 - 4	Noise level in the four quarters of the frequency range.

Peak and peak-to-peak values are shown in the unit selected for the time signal.

Spectrum analysis with 'symptoms'

For easy pattern recognition in spectra, EVAM supplies a range of predefined 'fault symptoms'. These are instructions to highlight a spectrum line pattern and display the sum of the lines' RMS values as a symptom parameter (which can be evaluated and trended). Most symptoms are automatically configured by using the rpm as a variable. Some require an input, e. g. the number of vanes on a rotor. Suitable symptoms and symptom groups are selected from a menu in Condmaster when the measuring point is set up.

Machine specific condition codes

In Condmaster, alarm limits can be set on all active parameters. Once measuring results are collected, an EVAM 'criterion' can be created which compares new parameter values with the statistical mean value and displays a dimensionless condition value against a green - yellow - red scale.

Technical specifications

Frequency limit, lower:	0, 0.5, 2, 3, 5, 10, 20 100 or 200 Hz
Frequency limit, upper:	8,10,16, 20, 25, 32, 40, 50, 80,100, 125, 160, 200, 250, 320, 400, 500, 625, 800, 1000, 1250, 1600, 2000, 2500, 4000, 5000, 8000, 10 000, 20 000 Hz
Envelope high pass filters:	100, 200, 500, 1000, 2000, 5000, 10 000 Hz
Envelope bandpass filters:	5-100, 50-1000, 500-10 000, 5000-40 000 Hz
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	Time synch, FFT linear, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Frequency units:	Hz, CPM, orders
Quick mode:	Yes, can be set on/off
Saving options:	Full spectrum, time signal, time signal and FFT, condition parameters
Spectrum types displayed:	Linear, power, PSD, amplitude
Zoom:	True FFT zoom, visual zoom
Transducer types:	Vibration transducer SLD144 or any IEPE (ICP®) type transducers with voltage output

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Leonova Emerald® – High Definition Order Tracking



The effect of order tracking



Measurements with order tracking disabled on a machine with rpm variation of 10% (550 – 600 rpm) during data collection time.



The same machine measured with order tracking activated, with rpm variation of 10% (550 – 600 rpm) during data collection time.

High Definition Order Tracking is part of the modules Vibration Premium EME134 (TD-366), Vibration Supreme EME193 (TD-445), HD Analysis EME140 (TD-515) and SPM HD Expert EME195 (TD-435). This function is primarily used for analysis on variable speed machines. The method uses multiples of rotational speed (orders), rather than absolute frequency (Hz). The number of orders to be shown is input by the user. Leonova will then automatically set the sampling frequency to an exact multiple of the measured rpm. Order tracking will also minimize the risk of smearing when using FFT averaging.

The purpose of using orders is to lock the display to the rotational speed (1X) and its multiples, which means that the ordered components in the spectrum always remain in the same position in the display even if the rotational speed varies during measurement.

Two or several spectra from the same machine with variable speed can therefore more easily be compared if they are expressed in orders. Using order tracking, the frequency range will always cover the symptoms of interest, regardless of the rotational speed of the machine.

High Definition Order Tracking adjusts extremely well to quick changes and variations in the RPM during measurement.

In the example shown above, the measuring point is configured for vibration analysis with order tracking. Under 'Measuring point data', Order tracking is marked and the upper frequency is input in orders. The lower frequency is input in Hz or CPM under 'Measuring point data'. 'Variable speed' must be marked and rpm has to be measured.

Leonova displays the spectrum within the selected number of orders. A number of measurements can be displayed in a three dimensional waterfall diagram, where 1X (rpm) and its harmonics remain in the same position in the diagram. The measurements are then saved by the user and can be transferred to Condmaster.

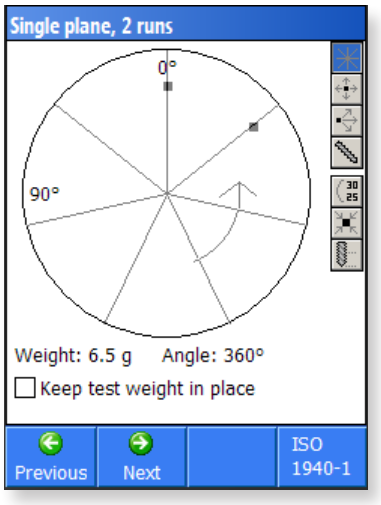
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Leonova Emerald® – Balancing





Single plane balancing are optional Leonova Emerald functions for unlimited use.

Leonova guides step-by-step through the balancing procedure. One can shift the rotation direction and change the measured parameter from velocity to acceleration or displacement.

Single plane balancing, 4 runs
This method uses one measurement without trial weight to determine the vibration severity (mm/s RMS) of the rotor, followed by three measurements with trial weights at 0°, 120° and 240° to calculate the weight and position of the correction mass.

Single plane balancing, 2 runs
This method uses one measurement without trial weight to determine the vibration severity (mm/s RMS) of the rotor, followed by one measurement with a trial weight to calculate the weight and position of the correction mass. It requires time synchronised vibration measurement (trigger pulse supplied by a pulse from the SPM tachometer probe or a proximity switch) to find the relative phase angle between the two vibration measurements.

Leonova calculates a number of alternatives for correcting the unbalance:

- Trial weight: Input rotor diameter, weight and rpm to obtain the suitable trial weight in grams.
- Split the correction mass: Input the number of rotor partitions to distribute the correction mass between two of them.
- Weight removal: Drill hole diameter and depth calculated for various materials.
- Radial displacement: Input the change in radial distance to recalculate the weight.
- Degrees to length: change from angle to length measured along the rotor circumference.
- Keep trial weight: Calculate the correction mass with the trial weight remaining in place.
- Sum up weights: Replace all correction masses on the rotor by one.

Part numbers

EME109 Balancing, single plane, unlimited use

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Leonova Emerald® – Services



The service program Leonova.exe is part of the basic function package for Leonova Emerald. It is used to:

- Print and save balancing reports
- Upgrade a Leonova software package
- Make and reload safety copies of the Leonova files (file extension.lsc)

The operation of the service program is very simple: connect Leonova to the PC, put it in communication mode, then click on the desired service function. Follow the guidance on the screen.

For example, a safety copy of the Leonova file can be sent to SPM Instrument for technical advice. Upon reload, you choose which part of your safety copy should be reloaded.

The file 'Leonova.txt' can contain Leonova functions that are new for the instrument. It is coded to fit the individual instrument and ordered via the local SPM Instrument distributor.

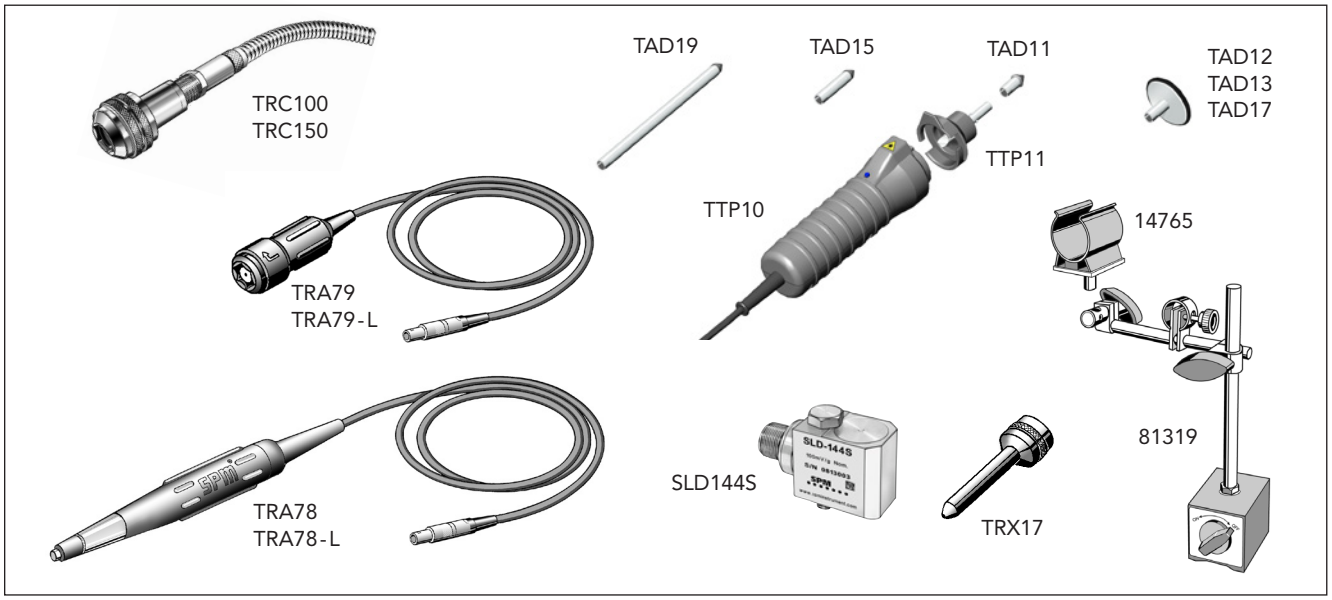
Part numbers

PRO52 Leonova Service Program

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Leonova Diamond®/Emerald® – Transducers and measuring cables



Shock pulse monitoring

CAB80	Measuring cable, mini coax - BNC slip on, 1.5 m
CAB81	Measuring cable, mini coax - BNC 1.5 m
CAB101	Measuring cable, mini coax - TNC, 1.5 m
TRA78	Shock pulse transducer with probe, cable length 1.5 m (TD-400)
TRA78-L	Shock pulse transducer with probe, L=cable length, max. 20 m (TD-400)
TRA79	Shock pulse transducer with quick connector for measuring adapters, cable length 1.5 m (TD-410)
TRA79-L	Shock pulse transducer with quick connector for adapters, L=cable length, max. 20 m (TD-410)
EAR12	Headphones with headband (TD-404)
EAR13	Headpones with helmet brackets (TD-404)
EAR15	Headphones with neckband (TD-404)
EAR16	Headset with headband (TD-382)
EAR17	Headset with helmet brackets (TD-382)
EAR18	Headset with neckband (TD-382)
EAS10	Hygiene set for headset and headphones

Vibration monitoring

SLD144S	Vibration transducer with side entry, M8
TRC100	DuoTech accelerometer excl. cable (TD-518)
TRC150	DuoTech accelerometer excl. cable (TD-551)
TRX17	Probe for SLD vibration transducer, M8
CAB110	Measuring cable, 8 pin-M12, 1.5 m, straight
CAB93	Measuring cable, 8 pin-2 pin, 1.5 m, straight
CAB108-L	Measuring cable, 8 pin-M12, L=2, 5, 10 or 20 (length in meter), straight
CAB109-L	Measuring cable, 8 pin-M12, L=2, 5, 10 or 20 (length in meter), angled
CAB82	Measuring cable, 8 pin-2 pin, 1.5 m, spiral
CAB83	Measuring cable, 8 pin-2 pin 10 m
CAB83-L	Measuring cable, 8 pin-2 pin (L=length in meter)
CAB89	2 channel split cable, 8 pin, 0.25 m (Diamond)
CAB88	3 channel split cable, 8 pin, 0.25 m (Diamond)
CAB97	Measuring cable, 8 pin-BNC, 1.5 m, spiral

Vibration transducers, see TD-260.
Magnetic mounting bases, see TD-548.

Current and voltage monitoring

CAB85	Cable for analog signals, 5 pin -2 x banana, 1.5 m, spiral (Diamond)

Speed and temperature monitoring

TTP10	Tachometer/Temp. Probe, 1.5m cable (TD-380)
TTP12	Tachometer/Temp. Probe, 5m cable (TD-380)
TAD11	Contact center, rpm, short, 30 mm
TAD15	Contact center, rpm, long, 60 mm
TAD19	Contact center, rpm, extra long, 170 mm
TAD12	Contact wheel m/min.
TAD13	Contact wheel yd./min
TAD17	Contact wheel ft./min
TAD16	Reflecting tape, 5 sheets
CAB90	Stroboscope cable 5 pin-phones 3.5 mm, 1.5 m, spiral
CAB92	Proximity switch cable, 5 pin-M12, 1.5 m, spiral
CAB95	Keyphasor cable 5 pin-BNC 1.5 m, spiral

Proximity sensors, see TD-383 and TD-384.

Balancing

81319	Magnetic base
14765	Holder for tachometer probe TTP10

Spare parts

13108	Sleeve for probe tip (TRA78)
TTP11	Contact adapter for TTP10
CAB79	Cable for TRA78, 1.5 m
CAB100	Cable for TTP10, 1.5 m, spiral
CAB103	Cable for TRA79, 1.5 m
CAB105	Cable for TTP12, 5 m

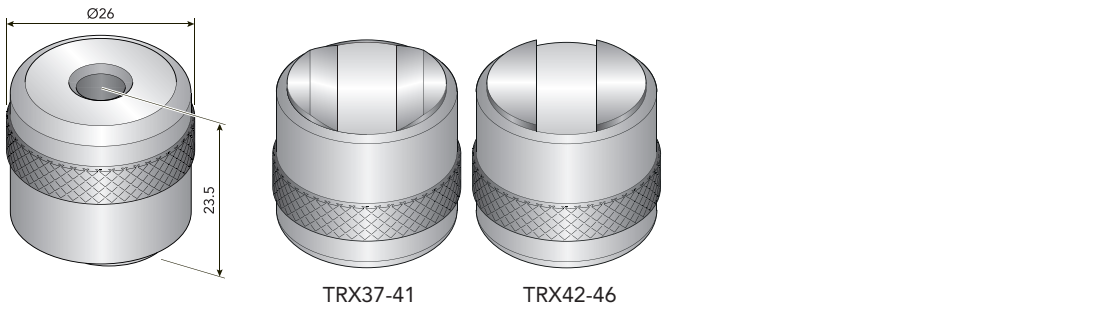
Others

CAB94	USB communication cable, 1 m
CAB96	Communication cable for 'iLearn'
LLA450	LineLazer Alignment Kit (TD-525) (Diamond)

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Magnetic mounting bases



1. Notched only for TRX52
2. Notched only for TRX58

Two-rail, 25 mm diameter, 13 kg (29 lbs) pull strength
The two rail type magnetic mounting bases are usually utilized on curved surfaces, such as motor and compressor housings, although they are also suitable for flat surfaces.

TRX37	Magnetic mounting base, M6
TRX38	Magnetic mounting base, M8
TRX39	Magnetic mounting base, M10
TRX40	Magnetic mounting base, UNF 1/4
TRX41	Magnetic mounting base, UNC 5/16

Flat, 25 mm diameter, 13 kg (29 lbs) pull strength
The flat magnetic mounting bases are optimal for smooth, flat surfaces.

TRX42	Magnetic mounting base, M6
TRX43	Magnetic mounting base, M8
TRX44	Magnetic mounting base, M10
TRX45	Magnetic mounting base, UNF 1/4
TRX46	Magnetic mounting base, UNC 5/16

Two-rail, 35 mm diameter, 25 kg (55 lbs) pull strength
The two rail type magnetic mounting bases are usually utilized on curved surfaces, such as motor and compressor housings, although they are also suitable for flat surfaces. A large diameter enables magnetic mounting on two heat sinks for an electric motor, for example.

TRX47	Magnetic mounting base, M6
TRX48	Magnetic mounting base, M8
TRX49	Magnetic mounting base, M10
TRX50	Magnetic mounting base, UNF 1/4
TRX51	Magnetic mounting base, UNC 5/16
TRX52	Magnetic mounting base for triaxial transducers, UNF 10-32

Three-rail, 25 mm diameter, 10 kg (22 lbs) pull strength
The three rail type magnetic mounting base are usually utilized on curved or uneven surfaces.

TRX53	Magnetic mounting base, M6
TRX54	Magnetic mounting base, M8
TRX55	Magnetic mounting base, M10
TRX56	Magnetic mounting base, UNF 1/4
TRX57	Magnetic mounting base, UNC 5/16
TRX58	Magnetic mounting base for triaxial transducers, UNF 10-32

Technical specifications

Material:	stainless steel
Temperature:	up to 100 °C
Grip:	knurled edge

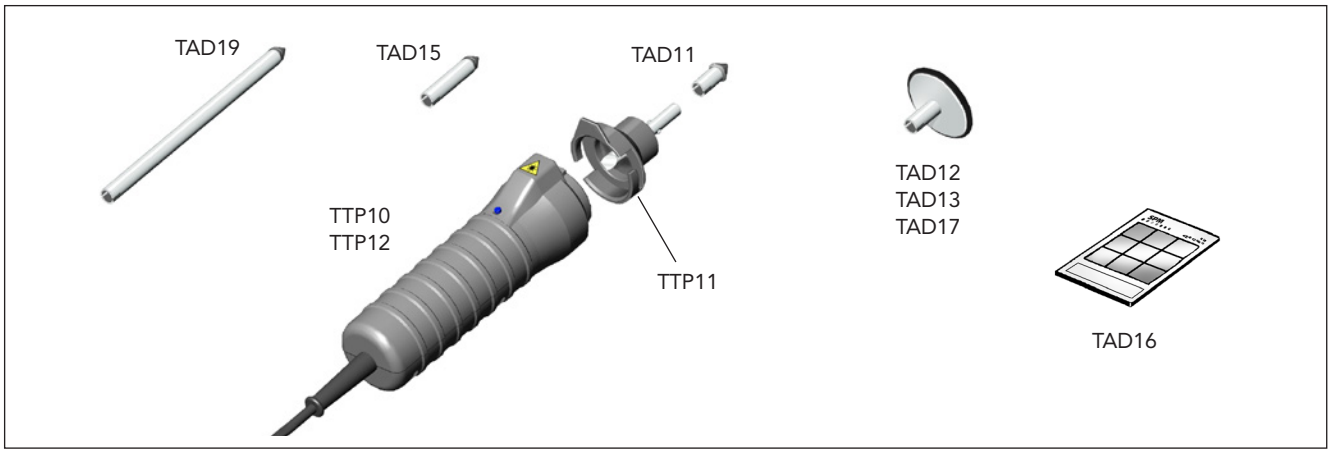
Options

16065	Mounting disc for 26 mm diameter magnetic mounting base (TRX37-46 and TRX53-58)
18033	Mounting disc for 35 mm diameter magnetic mounting base (TRX47-52)

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Tachometer and Temperature Probe TTP10 / TTP12



The Tachometer and Temperature Probe TTP10/12 is used together with Leonova Diamond® and Emerald® instruments for optical or contact measurement of the rate of rotation and for contact measurement of peripheral speed. It also has a built-in temperature sensor.

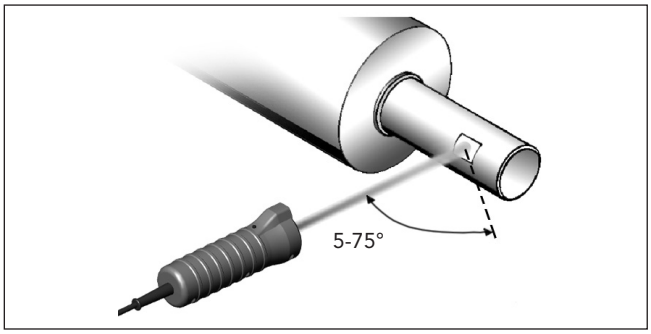
Optical measurement of the rate of rotation
A laser light beam is directed against a reflecting tape on the rotating object, from a distance of 30-2000 mm and from an angle of 5-75°.

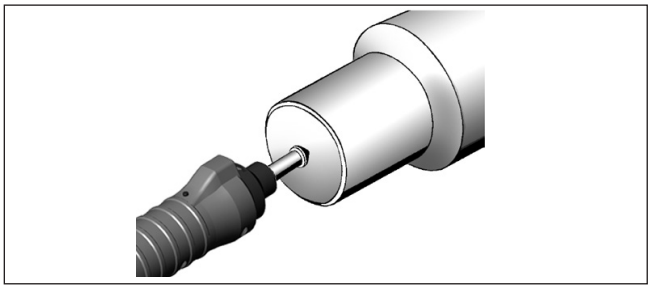
Contact measurement of rpm
The contact adapter TTP11 with a rubber tipped contact center, TAD-11/15/19, is attached onto the probe and then held against the center of a shaft end or a wheel.

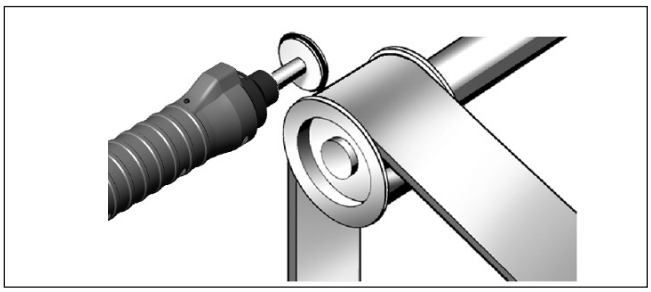
Contact measurement of peripheral speed
The contact adapter TTP11 with contact wheel is held against the circumference of a shaft, a belt, etc. The speed is read out in units, depending on which contact wheel is used: TAD-12/13/17.

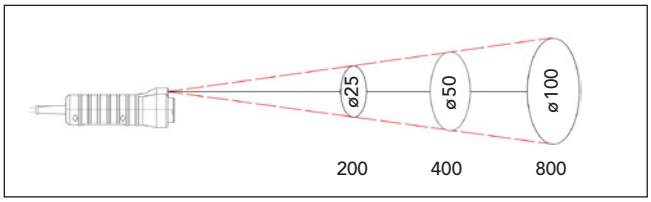
Temperature measurement

The Tachometer and Temperature Probe TTP10/12 is also used together with Leonova Diamond/Emerald for temperature measurements with a thermopile element in the range –20 to +300 °C.









Part numbers

TTP10	Tachometer and Temperature Probe, incl. TTP11 and cable, spiral 1–2 m
TTP12	Tachometer and Temperature Probe, incl. TTP11 and cable, straight 5 m
TAD11	Contact center, rpm, short, 30 mm
TAD15	Contact center, rpm, long, 60 mm
TAD19	Contact center, rpm, extra long, 170 mm
TAD12	Contact wheel m/min.
TAD13	Contact wheel yd./min
TAD17	Contact wheel ft./min
TAD16	Reflecting tape for thin shafts, 5 sheets
TTP11	Contact adapter (spare part)
CAB100	Cable, spiral (spare part for TTP10)

Technical specifications

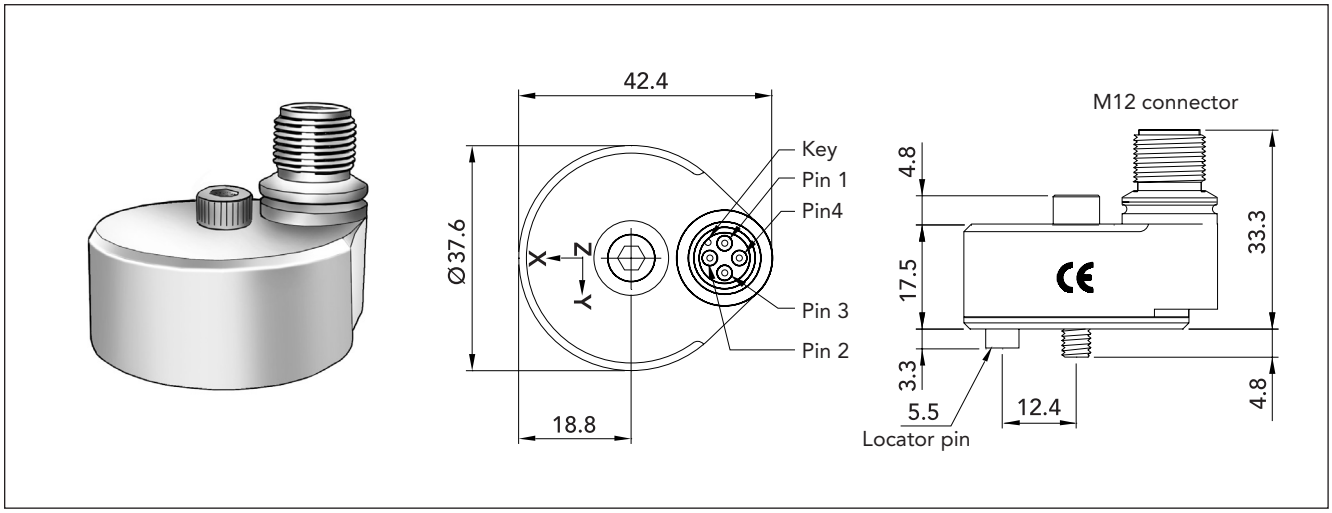
Measuring range, rpm	max. 100 000 (pulses) optical
Measuring distance, rpm	30 to 2000 mm
Indicator, rpm	blue LED
Measuring range, temp.	–20 to +300 °C
Measuring accuracy, temp.	± 2,5° C*
Dimensions	137 x 50 mm, 179 x 50 mm incl. TTP11
Operating temperature	0 to + 40 °C
Weight	160 g (TTP10), 300 g (TTP12)
D:S	8:1

* If RF emission is present at 625MHz to 655MHz, the accuracy is possibly reduced to ±2.5°C – 10% of full scale

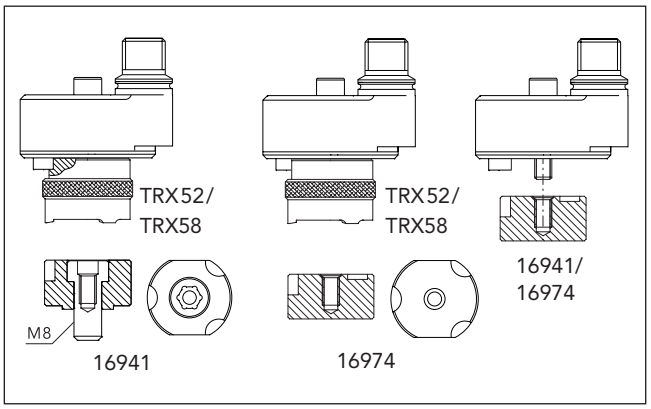
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Triaxial Vibration Transducer 90546



SPM 90546 is a low noise triaxial vibration transducer in rugged design with broad frequency response. It features a versatile M12 connector and an external case in a thick shell for high resistance to impact. Designed for both route-based and permanent-mount applications, this triaxial accelerometer hosts three general purpose, 100 mV/g vibration sensors with ±10% sensitivity tolerance. It has EMI/RFI and ESD protection.



Technical specifications

Dynamic

Sensitivity, ± 10%, 25° C		100 mV/g
Acceleration range		60 g peak
Amplitude nonlinearity		1%
Frequency response:		
Z Axis ± 3 dB		2-10 000 Hz
X and Y axis ± 3 dB		2-7000 Hz
Transverse sensitivity, max		7% of axial

Electrical

Power requirement:		
Voltage source		18-30 VDC
Current regulating diode		2-5 mA
Electrical noise, equiv. g nominal:		
Broadband 2.5 Hz to 25 kHz		160 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	2.0 µg/√Hz
	1000 Hz	1.5 µg/√Hz
Output impedance, max		400 Ω
Bias output voltage		12 VDC
Grounding		Case isolated, internally shielded
Turn-on time		<1 sec

Environmental

Temperature range	–50 to 120 °C
Vibration limit	500 g peak
Shock limit	5000 g peak
Electromagnetic sensitivity, equiv. g.	100 µg/gauss
Sealing	Hermetic
Base strain sensitivity, max	0.0005 g/µstrain

Physical

Weight	124 g
Case material	316L stainless steel
Mounting	UNF10-32
Output connector	4 pin, M12 male
Mating connector	M12S female
Recommended cabling	4 conductor, shielded
Accessories supplied	Captive screw, calibration data

Connections

Axis X, power/signal	Connector pin 1
Axis Y, power/signal	Connector pin 2
Axis Z, power/signal	Connector pin 3
Common (all channels)	Connector pin 4
Ground	Shell

Part numbers

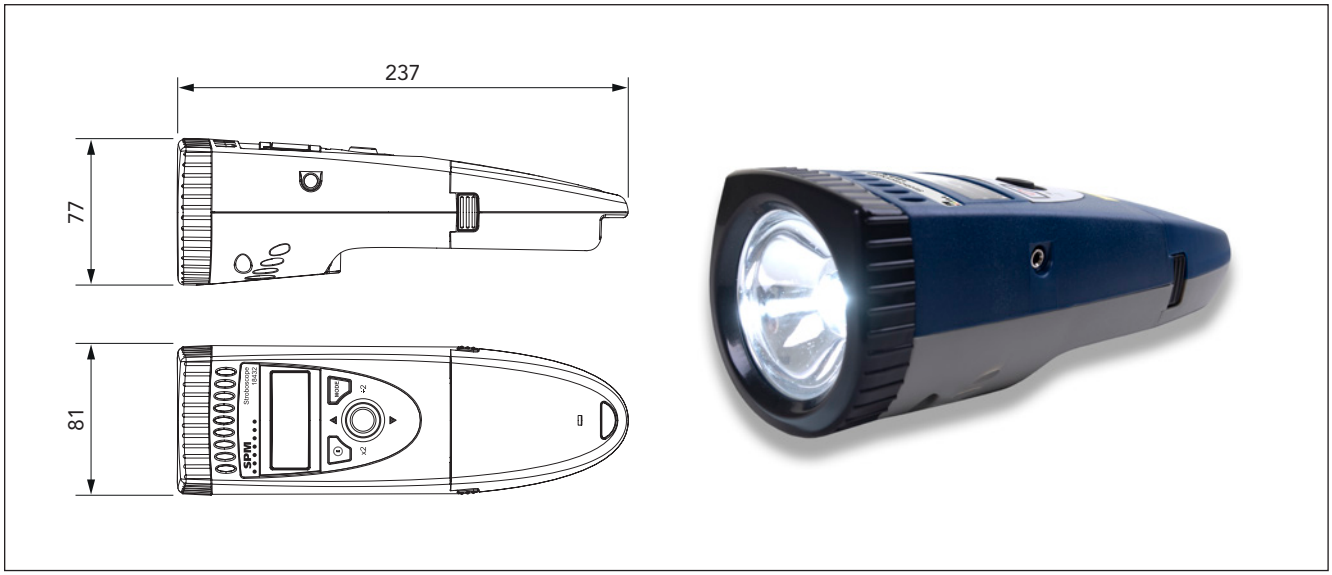
90546	Triaxial vibration transducer
CAB91	Cable for 90546, 8-pin/4-pin M12 connectors
16941	Mounting foot for 90546, screw
16974	Mounting foot for 90546, glue
90510	Connector M12S female, straight

Magnetic mounting bases for triaxial transducers, see TD-548.

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Stroboscope 18432



18432 is a sophisticated stroboscope with many functions, yet remains easy to use. The stroboscope provides excellent brightness, exceptional features, robust construction and extra long battery life. The unique one-touch joystick-type button allows simple operation for fast fractional RPM tuning.

The large, bright, backlit, 6-digit alphanumeric LCD display shows the flash rate and operational mode for internal tuning, external TTL pulse input, tachometer display and x2 ÷2 functions. Eight memory positions offers rapid recall of user-defined frequencies.

The stroboscope has a removable, rechargeable battery pack that provides up to two hours of continuous use, depending on the flash rate.

Technical specifications

Internal mode

Flash range:	100 to 12500 fpm
Accuracy:	the greater of ±0.5 fpm or ±0.01% of reading
Resolution:	0.1 fpm
Display update:	continuous

External/tachometer mode

Flash range:	5.0 to 12500 fpm - external flash rates to 0 are acceptable
Tachometer:	5 to 250000 rpm - no flash
Accuracy:	the greater of ±0.1 fpm or ±0.01% of reading
Display update:	approx. 1 second
External input:	0 to 5 volt TTL compatible (12V pk max), 1 µsec min pulse width, positive edge triggered

General

Flash lamp life:	approx. 100 million flashes
Flash duration:	10 to 30 microseconds
Display:	6 digit alphanumeric backlit LCD
Indicators:	low battery, on target indicator, locked on, external mode, tachometer mode, ÷2 ×2
Adjustment:	four quadrant pressure sensitive joystick button adjusts flash rate, x2 and ÷2
Battery:	removable 6Vdc rechargeable NiM battery pack
Light power:	150 mJ/flash up to 3000 fpm, 7.9 Watts @ 6000 fpm
Memory:	saves eight programmable flash rates and last flash rate at power down
Output pulse:	350 µsec positive pulse, 5 Vdc typical
Operation time:	approx. 120 min @ 1800 fpm and 60 min @ 6000 fpm with fully charged batteries
Recharge time:	approx. 4 h
Battery charger:	100 to 240 VAC (50 to 60 Hz), incl. four interchangeable adapters
Weight:	544 g (incl. battery)

Part numbers

18432	Stroboscope incl. battery pack and carrying case
CAB90	Stroboscope cable for Leonova Diamond/Emerald 5 pin - phones 3.5 mm, 1.5 m, spiral

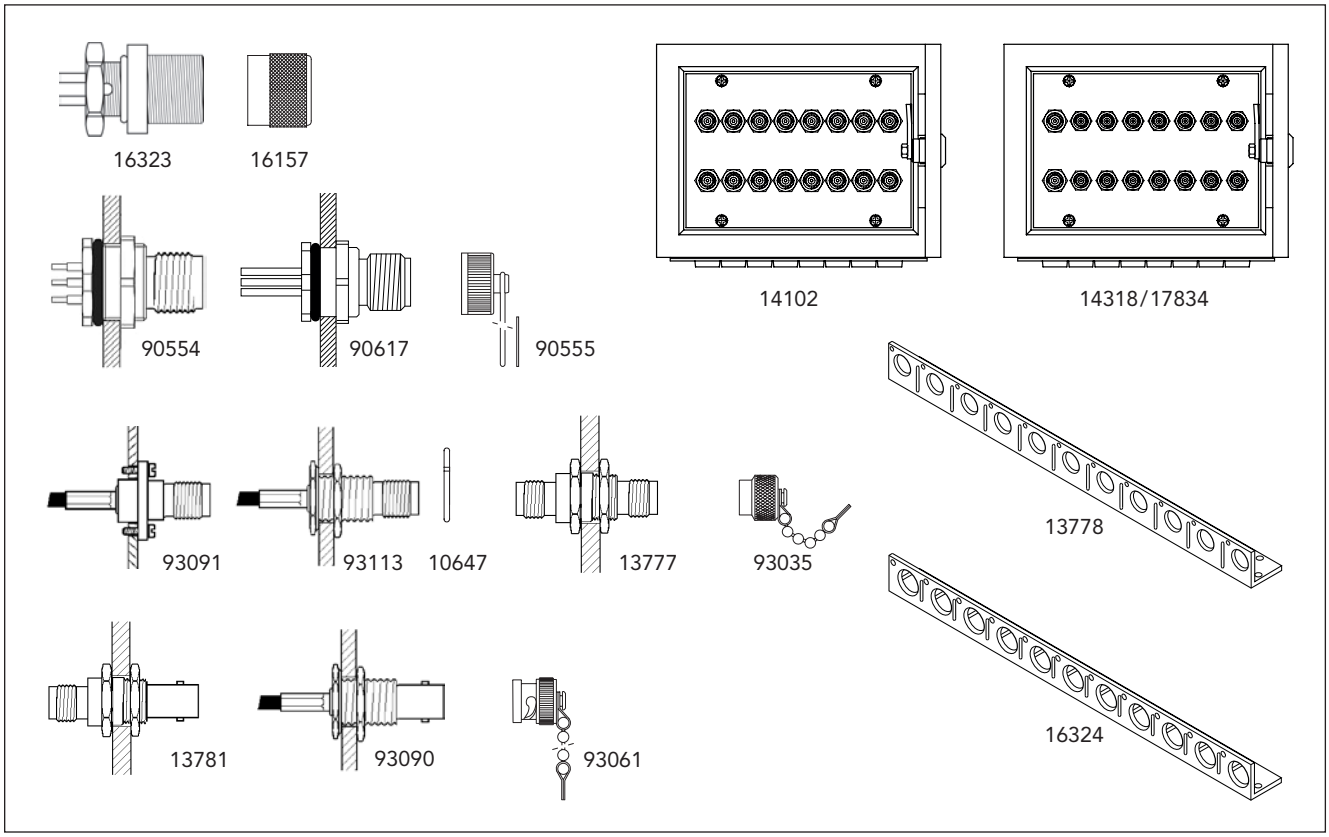
Spare parts

90666	Rechargeable NiMH battery pack
90667	Xenon lamps, 2 pcs

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Accessories for remote measuring points

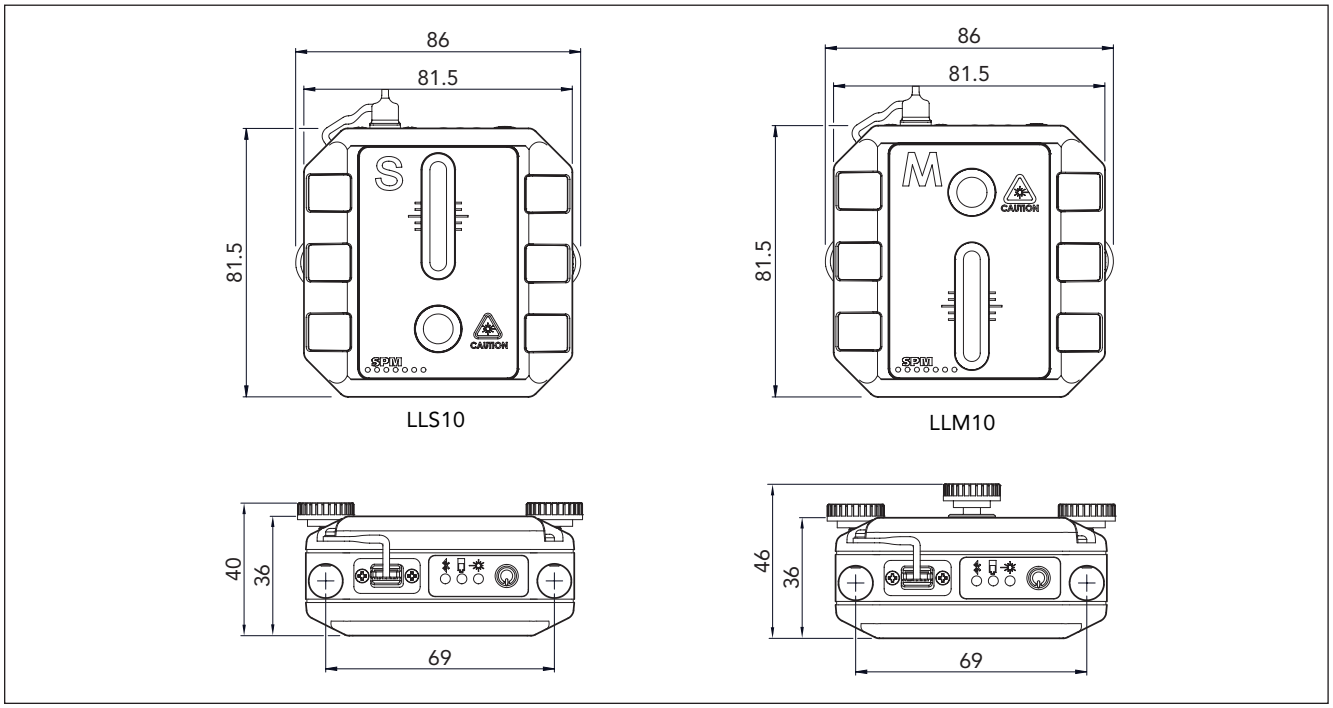


Part number	Description	Connector type	Backing	Mounting	Cap	IP class	DIA/EME measuring cable	TD sheet
90554	Connector	M12	Solder	Counternut	90555	IP67	CAB92	TD384
90617	Connector	M12	Cable 0.5 m	Counternut	90555	IP67	CAB92	TD384
90555	Protection cap	M12						TD480
13777	Connector	TNC	TNC	Counternut	93035/10647	IP64, mated	CAB80/CAB81	TD081
93091	Connector	TNC	Crimp	Flange	93035/10647	IP64, mated	CAB80/CAB81	TD019
93113	Connector	TNC	Crimp	Counternut	93035/10647	IP68, mated	CAB80/CAB81	TD019
10647	Attaching ring for 93113							TD154
93035	Protection cap	TNC						TD081
13781	Connector	BNC	TNC	Counternut	93061	IP64, mated	CAB80/CAB101	TD081
93090	Connector	BNC	Crimp	Counternut	93061	IP64, mated	CAB80/CAB101	TD019
93061	Protection cap	BNC						TD154
16323	Connector	2-pin	Crimp	Counternut	16157		CAB93	TD154
16157	Protection cap	2-pin						
14102	Terminal cabinet	16 M12		Counternut				TD154
14318	Terminal cabinet	2 M12, 14 BNC/TNC/2-pin		Counternut		IP66		TD154
17834	Terminal cabinet, IS version	2 M12, 14 BNC/TNC/2-pin		Counternut		IP66		TD561
13778	Terminal bracket	BNC/TNC/2-pin		Counternut				TD154
16324	Terminal bracket	M12		Counternut				TD154

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LineLazer alignment sensors



The alignment sensors LLS10 and LLM10 are two measuring units for shaft alignment either with the multi-function datalogger Leonova Diamond or with the LineLazer app. The alignment sensors are identical with exception of the position of laser detector and the knob for adjustment of the laser on the alignment sensor marked M. The sensors communicate wirelessly with Leonova Diamond and the LineLazer app via Bluetooth.

The alignment sensors provide maximum accuracy using a spread laser beam in combination with a 28.7 mm detector. Through digital filtering, the laser beam can be distinguished from interfering light sources. Both alignment sensors are transmitters/detectors.

The alignment sensors have dual axis high precision inclinometers which measure the angle of rotation of both alignment sensors at all times. This allows measurement in fully automatic mode, with much less than a half-turn of the shaft. Measurement results are displayed in 100ths of millimetres or 1000ths of an inch.

The alignment sensor control panel has LED indicators showing battery status and communication mode. The batteries are recharged with the USB charger 90624.

The LineLazer alignment kits contains alignment sensors, brackets, chains, rods, battery charger, cables and a tape measure – all in a convenient carrying case. The Bluetooth dongle LLD10 for Leonova Diamond is included in LineLazer alignment kit LLA450 and LLA451. These kits fits a multitude of applications, e.g. compressors, gearboxes, generators and pumps.

Technical specifications

Laser type:	line laser, visible red light
Laser output power:	≤1 mW
Laser safety class:	Class II
Laser wavelength:	635 nm (Typ.)
Detector type:	CMOS Linear image sensor
Detector resolution:	7 µm
Detector accuracy:	≤ 0.3% ±7µm
Detector protection:	optical filtering (from ambient light)
Detector size (length):	approx. 28.7 mm (≈1.13 in)
Measuring range:	up to 10 m (32.8 ft)
Inclinometer type:	MEMS
Inclinometer resolution:	0.01°
Inclinometer accuracy:	≤ ±0.2°
Firmware:	built in self diagnosis and functions for calibration, signal processing
Internal batteries:	Li-ion, rechargable
Operating time:	> 12 hours normal use
Operating temp.:	−10 to +50 °C (14 to 122 °F)
Keyboard:	sealed membrane
Control indicators:	LED, red/yellow/blue
Connector type:	mini-B USB for communication and battery charge
Communication:	Bluetooth v4.0 Class II
Housing:	PC plastic/anodized aluminium
Protection:	IP65
Dimensions:	LLS10; 86x81.5x40mm (3.4x3.2x1.6 in) LLM10; 86x81.5x46mm (3.4x3.2x1.8 in)
Weight:	approx. 230 g

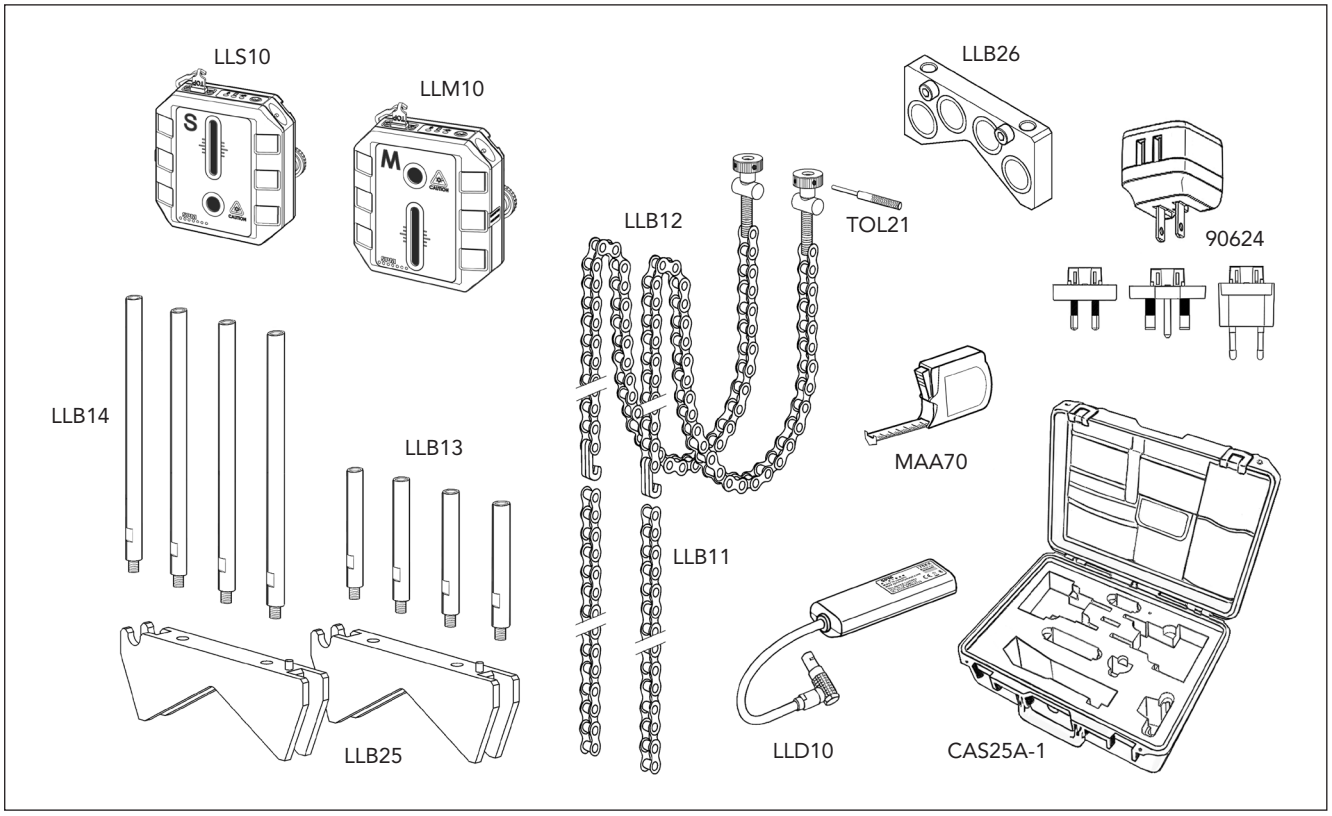
Part numbers

LLA450	LineLazer alignment kit for Leonova Diamond (TD-525)
LLA451	LineLazer alignment kit for Leonova Diamond, without carrying case (TD-525)
LLA500	Alignment kit for LineLazer alignment app (TD-578)

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LineLazer Alignment kit



The LineLazer Alignment kit LLA450 contains alignment sensors, brackets, chains, rods, battery charger, cables, Bluetooth dongle and a tape measure – all in a convenient carrying case. This kit fits a multitude of applications, e.g. compressors, gearboxes, generators, and pumps. Compensation values for thermal growth can be input. High precision inclinometers measure the angle of rotation of both detector units at all times. This allows measurement in fully automatic mode, with much less than a half-turn of the shaft. Measurement results are displayed in 100ths of millimetres or 1000ths of an inch. Specifications for the alignment sensors, *see TD-524*.

LineLazer Alignment kit LLA450 for Leonova Diamond

LLS10	1 pc.	Alignment sensor, S position (TD-524)
LLM10	1 pc.	Alignment sensor, M position (TD-524)
90624	1 pc.	Charger, dual USB, incl. interchangeble AC plugs, 100–240V AC, 50-60 Hz, 17W
CAB94	2 pcs.	Charger cable, USB Type A to Mini-B USB, length 1.5 m
LLD10	1 pc.	Bluetooth dongle for Leonova Diamond
LLB25	2 pcs.	Shaft bracket for chain
LLB11	2 pcs.	Extension chain, length 1000 mm
LLB12	2 pcs.	Chain with tension adapter, length 500 mm
LLB13	1 set	Supporting rod, 80 mm, set of 4
LLB14	1 set	Supporting rod, 150 mm, set of 4
MAA70	1 pc.	Tape measure
TOL21	1 pc.	Torquing tool for chains and rods
81339	1 pc.	Plastic box
CAS25A-1	1 pc.	Carrying case, plastic with foam insert

Options

LLB26	Magnetic bracket

Spare parts

LLB20	Supporting rod, 80 mm
LLB21	Supporting rod, 150 mm

LineLazer Alignment Kit LLA451 for Leonova Diamond

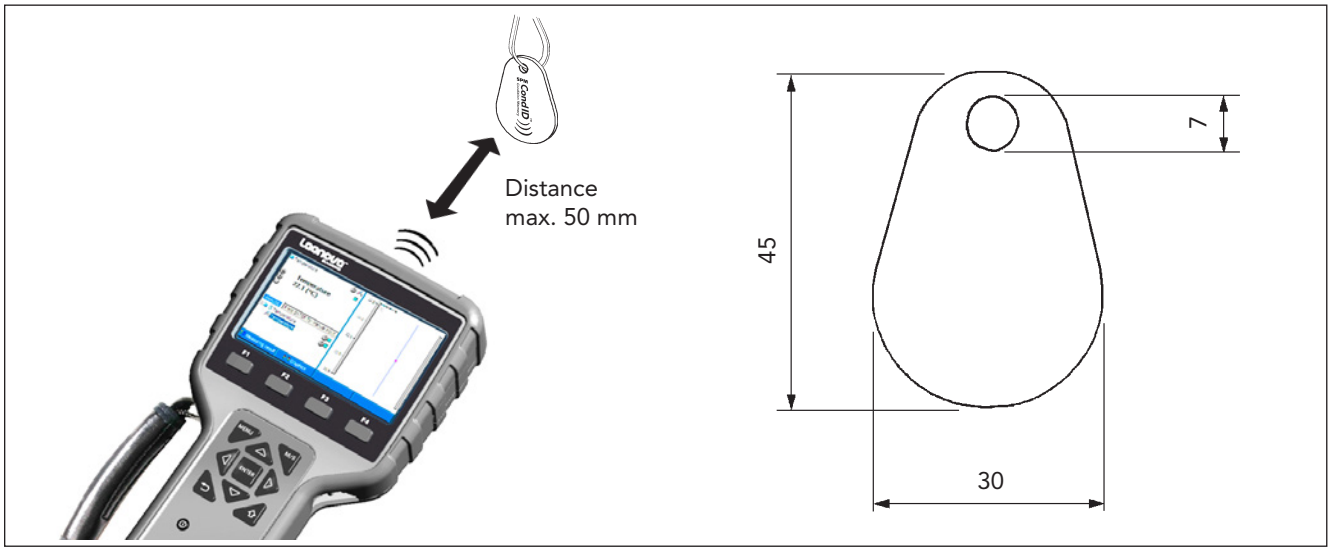
The LineLazer Alignment Kit LLA451 contains the same equipment as LLA450 but without the carrying case CAS25A-1.

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CondID® – Condition Memory



CondID® is a contact free memory tag used for measuring point recognition and condition memory, used with Leonova Infinity and the "Logger" and "Expert" versions of Tester T30 and Analyzer A30. Leonova Diamond and Leonova Emerald can not write data to CondID, but the tags can be used for measuring point recognition.

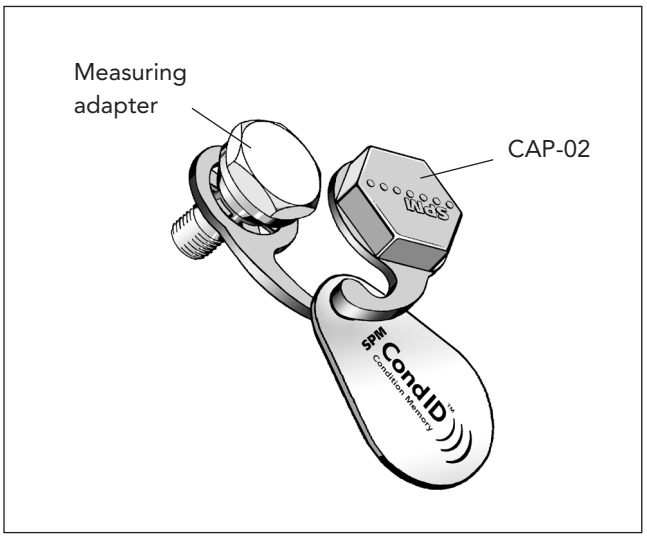
The memory tag is hung on the adapter cap or strapped in a suitable place on the machine. It should not be mounted flat against a metal surface. A distance of min. 3 mm between metal surfaces and CondID is recommended.

CondID responds to a recognition signal when an SPM datalogger is held close to the tag. It contains all basic data for its measuring point: number, name, and all measuring techniques connected with it, complete with all input data. If the measuring point is already loaded in the datalogger, it will be displayed, else it will be added to those in the data logger memory. CondID also saves the measuring results when the WRITE function is used after taking the readings.

SPM data loggers automatically receive a communication code from Condmaster when a measuring round is downloaded. Using the WRITE function, the data for the displayed measuring point are sent to a tag, thus linking it to the measuring point. On uploading the round to Condmaster, the measuring point is marked with a CondID icon. To break the link, one simply removes this icon before downloading the point. The tag can then be linked with another point.

All tags are safeguarded and can only be read with SPM instruments. In addition, the user can set read and write passwords in Condmaster. These passwords are automatically sent to data logger and tag.

The tag memory is 116 characters. If this is exceeded, e.g. by long measuring point names, a menu will show that exceeding data is excluded, starting with truncating the measuring point name. The user can then edit the measuring point data to fit the tag memory.



Specifications:

Memory:	116 bytes
Supported techniques:	dBm/dBc, LR/HR, ISO2372, ISO10816, EVAM/FFT, RPM, user defined 1 & 2 and checkpoints (A30/T30, Leonova Infinity)
Resonance frequency:	125 ±6 kHz
Reading distance:	max. 50 mm
Material:	Glass fibre reinforced epoxy
Protection class:	IP66
Operating temperature	–40 to 85 °C
Environment:	Suitable for indoors and outdoors use
Dimensions:	30 x 45 x 2 mm
Part number:	SPM 14489

Patent no.: ZL97195901.3, US#6,499,349, US#6,725,723

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Headphones in eardefenders



EAR12



EAR13



EAR15

EAR12/13/15 are specially selected headphones providing excellent sound reproduction even in noisy environments.

- Individually sprung headband wires of stainless sprung steel provide an even distribution of pressure around the ears. Steel headband wires retain their resilience better than plastic through a wide temperature range.
- Low, two-point fasteners and easy height adjustment with no protruding parts.
- Soft, wide foam and fluid-filled sealing rings with built-in pressure-evening channels provide low pressure, effective sealing and ideal comfort.
- Connection cord, 0.5 to 1.6 m, with a 3.5 mm stereoplug.

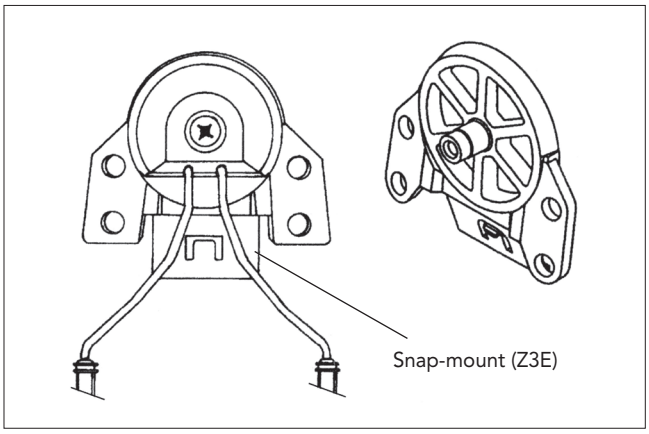
The headphones are tested and approved in accordance with PPE directive (EU)2016/425, RoHS directive 2011/65/EU, LVD directive 2014/35/EU, and EMC directive 2014/30/EU to meet the demands for CE labelling.

Heaphones with headband, EAR12
EAR12 is a headphone set with two earphones. It has a collapsible headband for convenient storage when you are not using the headphones with eardefenders.

Heaphones with neckband, EAR15
EAR15 is a headphone set with two earphones. It is equipped with neckband for use with or without helmet.

Headphones for helmet, EAR13
The headphones EAR13 is a headphone set with one connected earphone. The headphones fit most safety helmets available in the market today. The headphones have standard snap-mounts (Z3E) and are adapted to a specific helmet by a simple manipulation.

To mount the headphone, snap the helmet attachment into the slot on the helmet. Note, The cups can be set in three positions: working position, ventilation position and parking position. When in use, the cups must be placed in working position. Press the wires inward until you hear a click on both sides. Make sure that the cup and the headband wire in working position are not pressing on the helmet lining or the edge of your hardhat so that leakage can occur. Parking position should not be used if the cups are damp inside after an intense period of use.



Part numbers

EAR12	Headphones with headband
EAR13	Headpones with helmet brackets
EAR15	Headphone with neckband
EAS10	Hygiene set (consists of two sets of attenuating cushions and snap-in sealing rings)

Spare parts

90683	Connection cord with 3.5 mm stereoplug

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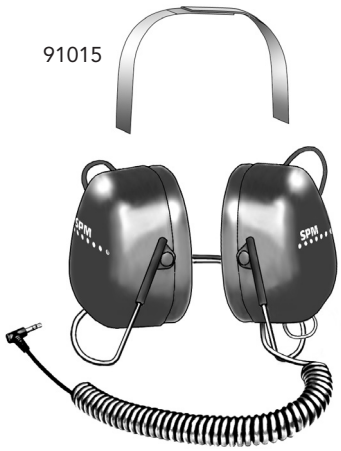
Headset with microphone



EAR-16



EAR-17



EAR-18

EAR16/17/18 are specially selected headsets for Leonova Diamond/Emerald, providing excellent sound reproduction even in noisy environments. The headphones are equipped with microphone for voice recording of comments to the measuring points.

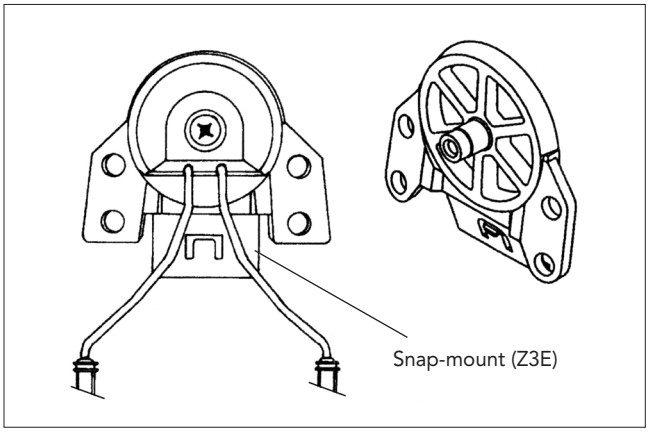
- Individually sprung headband wires of stainless sprung steel provide an even distribution of pressure around the ears. Steel headband wires retain their resilience better than plastic through a wide temperature range.
- Low, two-point fasteners and easy height adjustment with no protruding parts.
- Soft, wide foam and fluid-filled sealing rings with built-in pressure-equalizing channels provide low pressure, effective sealing and ideal comfort.
- Connection cord, 0.75 to 1.4 m, of soft spiral polyurethane with a 3.5 mm stereo plug.

The headsets are tested and approved in accordance with PPE directive 89/686/EEC and EMC directive 89/336/EEC to meet the demands for CE labelling.

Headset with headband, EAR16
EAR16 is a headset with two parallel connected earphones and a microphone. It has a collapsible headband for convenient storage when you are not using the headset.

Headset, EAR18
EAR18 is a headset with two parallel connected earphones and a microphone. It has a neckband for use with or without helmet. A soft headband with velcro is optional.

Headset for helmet, EAR17
The headset with microphone EAR17 is a headset with two parallel connected earphones and a microphone. The headset fits most safety helmets available in the market today. The headphones have standard snap-mounts (Z3E) and are adapted to a specific helmet by simple manipulation.



To mount the headphone, snap the helmet attachment into the slot on the helmet. Note! The cups can be set in three positions: working position, ventilation position and parking position. When in use, the cups must be placed in working position. Press the wires inward until you hear a click on both sides. Make sure that the cup and the headband wire in working position are not pressing on the helmet lining or the edge of your hard hat so that leakage can occur. Parking position should not be used if the cups are damp inside after an intense period of use.

Part numbers

EAR16	Headset with headband
EAR17	Headset with helmet brackets
EAR18	Headset with neckband
EAS11	Hygiene set (consists of two sets of attenuating cushions and snap-in sealing rings.)
91015	Headband with velcro for EAR18

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SPM Electronic Stethoscope ELS14



The SPM Electronic Stethoscope ELS14 is a sensitive and easy to use listening device for locating the source of mechanical noise. Bearing condition, gear and pump noise and the operation of relays and solenoids are just a few of the many sounds that may be identified, amplified and assessed.

Low, middle, high or no filter can be selected in order to single out relevant frequencies.

The stethoscope comes with an internal microSD card and recording capabilities, enabling sounds to be played back from the device and also stored as sound files for later or further evaluation.

Headphones equipped with ear defenders effectively shut out ambient noise.

Part numbers

ELS14KIT	Complete kit: electronic stethoscope ELS14 incl. batteries and SD card, probe set ELT10, headphones EAR12 and carrying case CAS24.
ELS14	Electronic Stethoscope incl. batteries and SD card
ELT10	Probe set, 60 and 290 mm
EAR12	Headphones with eardefenders
EAR13	Headphones with eardefenders for helmet
EAR15	Headphones with eardefenders with neckband
CAS24	Carrying case, plastic with modular insert, 326x222x116 mm

Spare parts

EAS10	Hygiene set (consists of two sets of attenuating cushions and snap-in sealing rings)
90604	Memory card, microSD 32 GB, incl. SD adapter
90683	Connection cord with 3.5 mm stereoplug

Technical specifications

Frequency range:	30 Hz to 20 kHz
Enclosure:	PC/ABS, IP55
Keypad:	sealed, snap action
LED indicators:	power on, volume, filter mode, recording, low battery
Volume control:	adjustable in 10 steps
Auto power off:	10 min after use
Filters:	low, middle, high, unfiltered
Recording:	max. 10 files, up to 7.5 min./file
File format:	WAV
Memory:	microSD card, 32 GB
Output connector:	3.5 mm stereo mini plug for headphones
Battery:	2xAA / R6 cells
Battery life:	> 30 hours (continuous use)
Ambient temp.:	–10° to + 60 °C (14° to 140 °F)
Dimensions:	213x48x38 mm excl. probe
Weight:	295 g incl. batteries and 60 mm probe

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SPM
condition monitoring solutions

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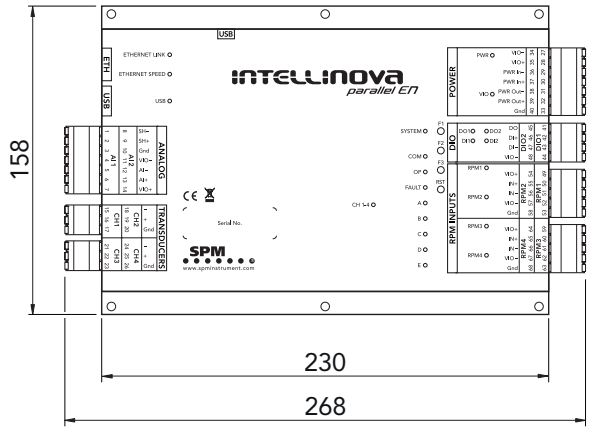


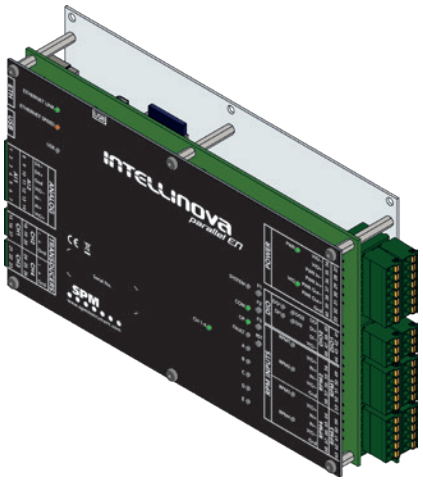
Continuous Monitoring Systems

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Intellinova® Parallel EN – System unit INCEN4





The Intellinova Parallel EN system unit is a powerful measuring unit for continuous monitoring of machine condition. The unit communicates with Condmaster Ruby® via standard Ethernet. For a complete online monitoring solution, including INCEN4 system unit, cabinet, Wi-Fi communication accessory*, and cooling fan accessory for operating temperature up to +60 °C, *see technical data sheet TD-654*.

By collecting vibration and/or shock pulse readings from up to four channels connected in parallel to one digital signal processor, and four RPM channels, INCEN4 allows condition measurement on complex applications. Utilizing dual-processor capacity on four channels in parallel provides maximum flexibility. Two digital inputs and two digital outputs can be used for connection to machine stop, alarm light, or other external devices, directly or via external relays. The system unit also has two analog inputs that can be used to accept process parameters.

Group Measurement enables measurement assignments to trigger multiple system units. The Live View in Condmaster Ruby is used for monitoring the state of all connected devices.

The system unit is equipped with parallel measuring logic, alarm, storing, and analysis logic. The unit has status LED indicators and a USB connection for the setup of the system.

The communication application Condmaster Entity Server (CES) transmits measuring assignments to and reads the results from, the system unit. CES also controls measurement operations, data processing, and storage.

Both vibration and shock pulse measurements can be performed using DuoTech® accelerometers.

Technical specifications

Communication:	USB 2.1, Ethernet TCP/IP, 1000 Mbps
Power range:	12 to 35 V DC, max. 50 W
Operating temperature:	−20 to +50 °C (−4 to +122 °F)
Storage temperature:	−20 to +85 °C (−4 to +185 °F)
Relative humidity:	10 to 90% (non-condensing)
Dimensions (w x h x d):	268x158x43 mm (10.6x6.2x1.7 in)

Condition monitoring

Measuring channels:	4, parallel
Measuring methods:	ISO2372, ISO10816, HD ENV, FFT with symptoms, EVAM vibration analysis, SPM HD, LR/HR HD, Orbit
Measuring functions:	Time based measurement, Group measurement, Linked measurement, Idle time measurement, etc.
Frequency range:	DC to 40 kHz
Measuring range:	≥60g peak-peak (using 100mV/g transducer)
Resolution:	0.0015m/s^2 RMS (using 100mV/g transducer)
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800, 25600
Transducer type:	SLD type vibration transducers, DuoTech accelerometers, or IEPE (ICP) type transducers

RPM

Inputs:	4, parallel
Transducer type:	proximity switch or tachometer sensor
Measuring range:	0.1 to 1 500 000 rpm (when 1 pulse/rev)

Digital channels

Inputs/outputs:	2/2

Analog channels

Inputs:	2
Measuring range:	0 to 20 mA or 0 to 10 V

Part number INCEN4

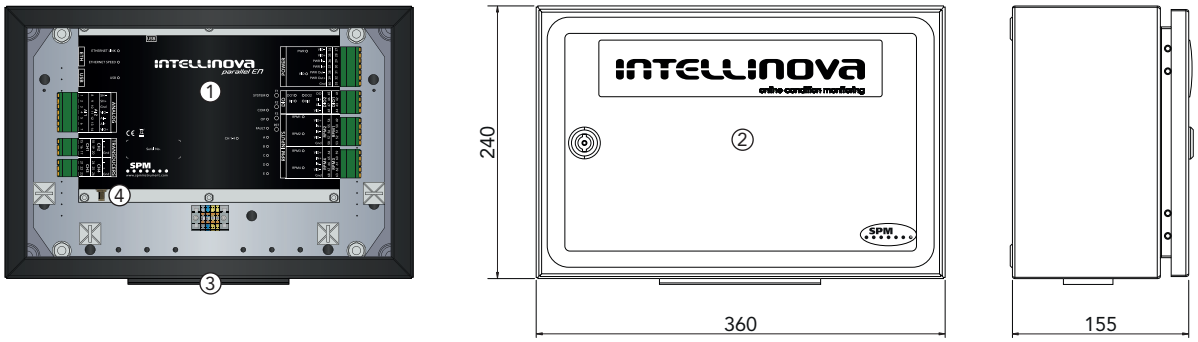
* Can only be included when ordering a system unit. Can not be ordered afterwards

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Intellinova® Parallel EN – System INSEN4



1. System unit INCEN4
2. Cabinet IND4
3. Cable entry plate
4. Wi-Fi antenna connector, INO57*

INSEN4 is an advanced online system for continuous monitoring of machine condition. The Intellinova system is comprised of system unit INCEN4, cabinet IND4, internal cabling, power supply unit, and terminals for power supply.

By collecting vibration and/or shock pulse readings from up to four channels connected in parallel to one digital signal processor, and four RPM channels, INCEN4 allows condition measurement on complex applications. Two digital inputs and two digital outputs can be used for connection to machine stop, alarm light, or other external devices, directly or via external relays. The system unit also has two analog inputs that can be used to accept process parameters.

The system communicates with Condmaster Ruby via standard Ethernet. The Group Measurement function enables measurement assignments to trigger multiple system units. In Condmaster, the Live View is used for monitoring the state of all connected devices.

The system unit is equipped with parallel measuring logic, alarm, storing, and analysis logic. It has status LED indicators and USB connection for setup of the system. Technical specifications for INCEN4, *see technical data sheet TD-653*.

IND4 is an industrial enclosure designed for encapsulation of INCEN4. The cabinet, intended for wall mounting, is robust and sealed for use in harsh environments.

Technical specifications

Design, enclosure:	powder-coated, IP65
Power supply unit:	100-240VAC/24VDC, 60W, 50-60 Hz
Cable entries:	16x6.5 mm, 4x12.1 mm, 4x16.1 mm
Weight:	approx. 6.75 kg (14.88 lbs)

Part numbers

INSEN4	Intellinova Parallel EN system (INCEN4+IND4)
INCEN4	System unit
IND4	Cabinet in powder-coated steel, 360x240x155 mm (14.2x9.4x6.1 in)

Accessories

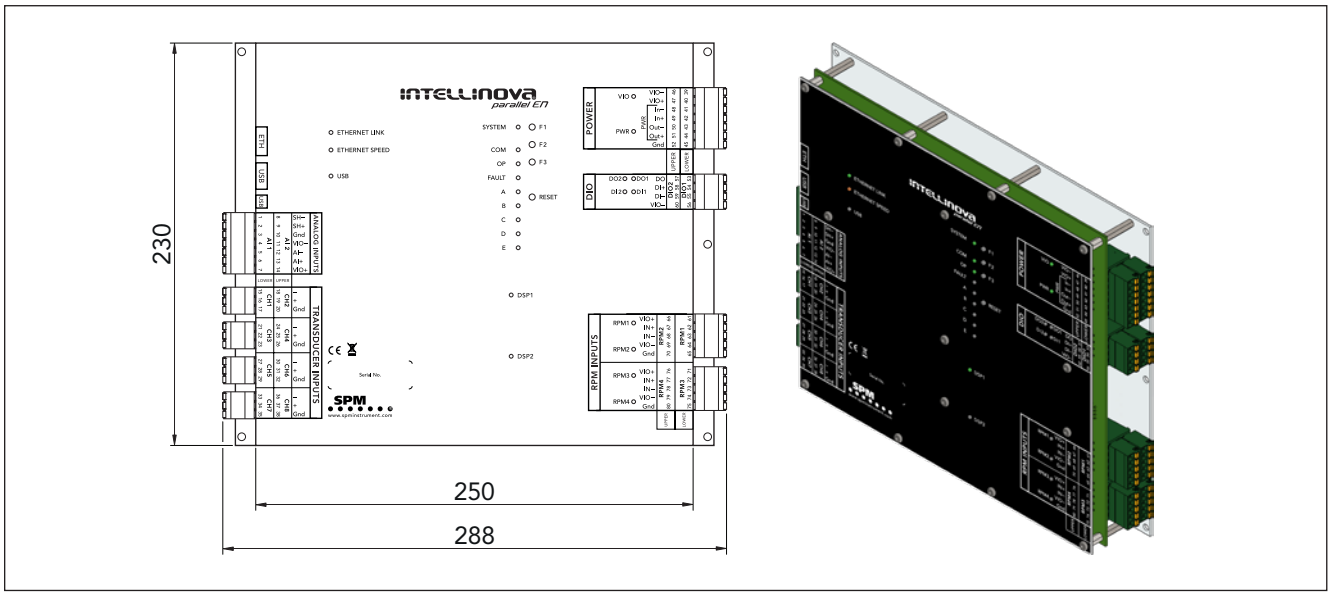
INO57	Wi-Fi communication* (TD-656)
INO58	Cooling fan for operating temp. up to +60 °C
INO59	Wi-Fi antenna for INO57 (TD-656)
81325	Mounting braces, 4 pcs

* Can only be included when ordering a system unit. Can not be ordered afterwards

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Intellinova® Parallel EN – System unit INCEN8



The Intellinova Parallel EN system unit is a powerful measuring unit for continuous monitoring of machine condition. The unit communicates with Condmaster Ruby® via standard Ethernet in a LAN network. For a complete online monitoring solution, including INCEN8 system unit, cabinet, and Wi-Fi communication accessory*, *see technical data sheet TD-566*.

By collecting vibration and/or shock pulse readings from up to eight channels connected in parallel to two digital signal processors, and four RPM channels, INCEN8 allows condition measurement on complex applications. Utilizing dual processor capacity on eight channels in parallel provides maximum flexibility. Two digital inputs and two digital outputs can be used for connection to machine stop, alarm light, or other external devices, directly or via external relays. The system unit also has two analog inputs that can be used to accept process parameters.

Group Measurement enables measurement assignments to trigger multiple system units. The Live View in Condmaster Ruby is used for monitoring the state of all connected devices.

The system unit is equipped with parallel measuring logic, alarm, storing and analysis logic. The unit has status LED indicators and USB connection for setup of the system.

The communication application Condmaster Entity Server transmits measuring assignments to, and reads the results from, the system unit. The Entity Server also controls the measurement operations, data processing and storage.

Both vibration and shock pulse measurements can be performed using DuoTech® accelerometers.

Technical specifications

Communication:	USB 2.1, Ethernet TCP/IP, 1000 Mbps
Power range:	12 to 35 V DC, max. 50 W
Operating temperature:	−20 to +60 °C (−4 to +140 °F)
Storage temperature:	−20 to +85 °C (−4 to +185 °F)
Relative humidity:	10 to 90% (non-condensing)
Dimensions (w x h x d):	288x230x40 mm (11.3x9.1x1.6 in)

Condition monitoring

Measuring channels:	8, parallel
Measuring methods:	ISO2372, ISO10816, HD ENV, FFT with symptoms, EVAM vibration analysis, SPM HD, LR/HR HD, Orbit
Measuring functions:	Time based measurement, Group measurement, Linked measurement, Idle time measurement, etc.
Frequency range:	DC to 40 kHz
Measuring range:	≥60g peak-peak (using 100mV/g transducer)
Resolution:	0.0015m/s² RMS (using 100mV/g transducer)
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800, 25600
Transducer type:	SLD144, SLC144 DuoTech or IEPE (ICP) type transducers

RPM

Inputs:	4, parallel
Transducer type:	proximity switch or tachometer sensor
Measuring range:	0.1 to 1 500 000 rpm (when 1 pulse/rev)

Digital channels

Inputs/outputs:	2/2

Analog channels

Inputs:	2
Measuring range:	0 to 20 mA or 0 to 10 V

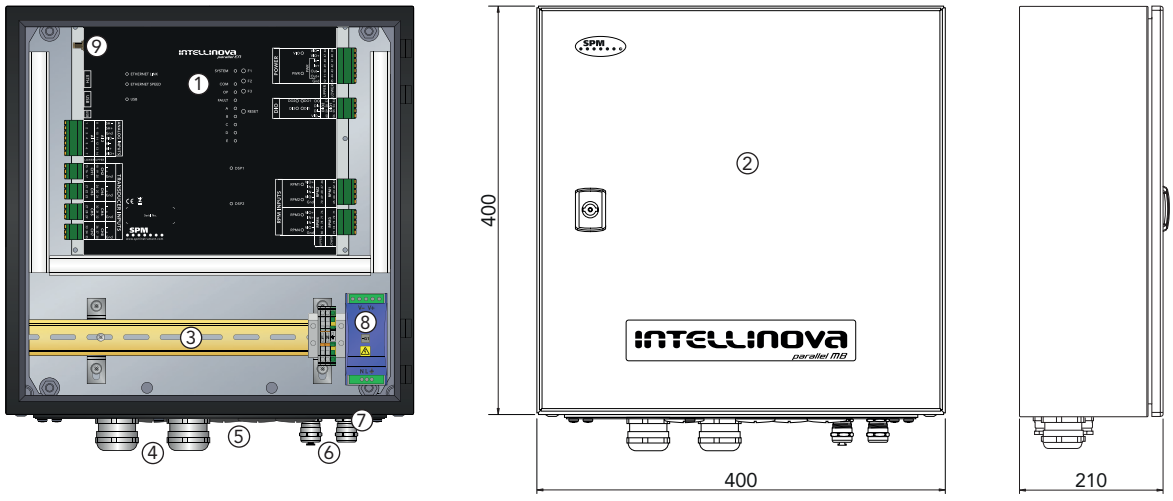
Part number INCEN8

* Can only be included when ordering a system unit. Can not be ordered afterwards

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Intellinova® Parallel EN – System INSEN8



1. System unit INCEN8
2. Cabinet IND8
3. DIN rail
4. 2x cable inlet PG29
5. 4x blind plug PG29
6. 2x cable inlet PG11
7. 1x blind plug PG11
8. Power supply unit
9. Wi-Fi antenna connector, INO57*

INSEN8 is an advanced online system for continuous monitoring of machine condition. The Intellinova system is comprised of system unit INCEN8, cabinet IND8, internal cabling and terminals for power supply. It is complete with power supply unit and DIN rail.

By collecting vibration and/or shock pulse readings from up to eight channels connected in parallel to two digital signal processors, and four RPM channels, the system allows condition measurement on complex applications. Utilizing dual processor capacity on eight channels in parallel provides maximum flexibility. Two digital inputs and two digital outputs can be used for connection to machine stop, alarm light, or other external devices, directly or via external relays. The system also has two analog inputs which can be used to accept process parameters.

The system communicates with Condmaster Ruby via standard Ethernet. The Group Measurement function enables measurement assignments to trigger multiple system units. In Condmaster, the Live View is used for monitoring the state of all connected devices.

The system unit is equipped with parallel measuring logic, alarm, storing and analysis logic. It has status LED indicators and USB connection for setup of the system. Technical specifications for INCEN8, *see technical data sheet TD-565*. Accessories for INSEN8, *see technical data sheet TD-289*.

IND8 is an industrial enclosure designed for encapsulation of INCEN8. The cabinet, intended for wall mounting, is robust and sealed for use in harsh environments.

Technical specifications

Design, enclosure:	powder-coated/stainless steel, IP65
Power supply unit:	100-240VAC/24VDC, 60W, 50-60 Hz
Cable channels:	3 pcs, plastic
Cable inlets:	2xPG29 2xPG11
Weight:	approx. 11 kg (24 lbs)

Part numbers

INSEN8	Intellinova Parallel EN system (INCEN8+IND8)
INSEN8SS	Intellinova Parallel EN system (INCEN8+IND8SS)
INCEN8	System unit
IND8	Cabinet in powder-coated steel, 400x400x210 mm (15.7x15.7x8.3 in)
IND8SS	Cabinet in stainless steel, 400x400x210 mm (15.7x15.7x8.3 in)

Options

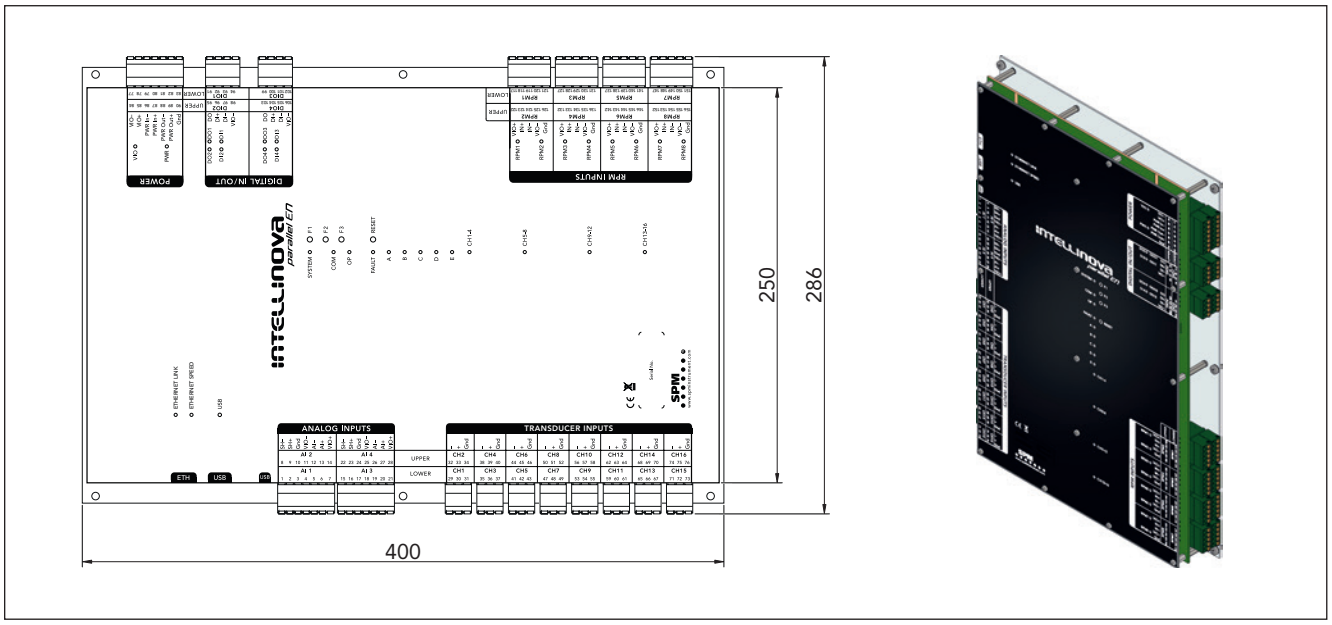
INO16	Relay for external alarm, 2 poles (TD-290)
INO32	Power switch, incl. cabling
INO33	Displacement signal interface (TD-549)
INO34	Wireless 4G router (TD-550)
INO35	LAN Ethernet switch (TD-503)
INO57	Wi-Fi communication* (TD-656)
INO59	Wi-Fi antenna for INO57 (TD-656)
15885	Cable inlet, PG11, for cable 6-11.5 mm, IP68, brass/nickel-plated, Neoprene sealing (TD-289)
18034	Cable inlet, PG29, for 8 measuring cables diam. 5.5 mm, IP65, brass/nickel-plated (TD-289)
18035	Cable inlet, PG29, diam. 16-26 mm, IP68, brass/nickel-plated (TD-289)
81325	Mounting braces, 4 pcs

* Can only be included when ordering a system unit. Can not be ordered afterwards

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Intellinova® Parallel EN – System unit INCEN16



The Intellinova Parallel EN system unit is a powerful measuring unit for continuous monitoring of machine condition. The unit communicates with Condmaster Ruby® via standard Ethernet. For a complete online monitoring solution, including system unit INCEN16, cabinet IND16, and Wi-Fi communication accessory*, *see technical data sheet TD-545*.

By collecting vibration and/or shock pulse readings from up to sixteen parallel channels and eight RPM channels, the system allows condition measurement on complex applications. Four digital inputs and four digital outputs can be used for connection to machine stop, alarm light, or other external devices, directly or via external relays. The system also has four analog inputs that can be used to accept process parameters.

Group Measurement enables measurement assignments to trigger multiple system units. The Live View in Condmaster Ruby is used for monitoring the state of all connected devices.

The system unit is equipped with a parallel measuring logic, alarm, storing, and analysis logic. The unit has status LED indicators and a USB connection for the setup of the system.

The communication application Condmaster Entity Server transmits measuring assignments to, and reads the results from, the system unit. The Entity Server also controls the measurement operations, data processing, and storage.

Both vibration and shock pulse measurements can be performed using DuoTech® accelerometers.

Technical specifications

Communication:	USB 2.1, Ethernet TCP/IP, 1000 Mbps
Power range:	12 to 35 V DC, max. 50 W
Operating temperature:	−20 to +60 °C (−4 to +140 °F)
Storage temperature:	−20 to +85 °C (−4 to +185 °F)
Relative humidity:	10 to 90% (non-condensing)

Condition monitoring

Measuring channels:	16, parallel
Measuring methods:	ISO2372, ISO10816, HD ENV, FFT with symptoms, EVAM vibration analysis, SPM HD, LR/HR HD, Orbit
Measuring functions:	Time based measurement, Group measurement, Linked measurement, Idle time measurement, etc.
Frequency range:	DC to 40 kHz
Measuring range:	≥60g peak-peak (using 100mV/g transducer)
Resolution:	0.0015m/s^2 RMS (using 100mV/g transducer)
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800, 25600
Transducer type:	SLD144, SLC144 DuoTech or IEPE (ICP) type transducers

RPM

Inputs:	8, parallel
Transducer type:	proximity switch or tachometer sensor
Measuring range:	0.1 to 1 500 000 rpm (when 1 pulse/rev)

Digital channels

Inputs/outputs:	4/4

Analog channels

Inputs:	4
Measuring range:	0 to 20 mA or 0 to 10 V

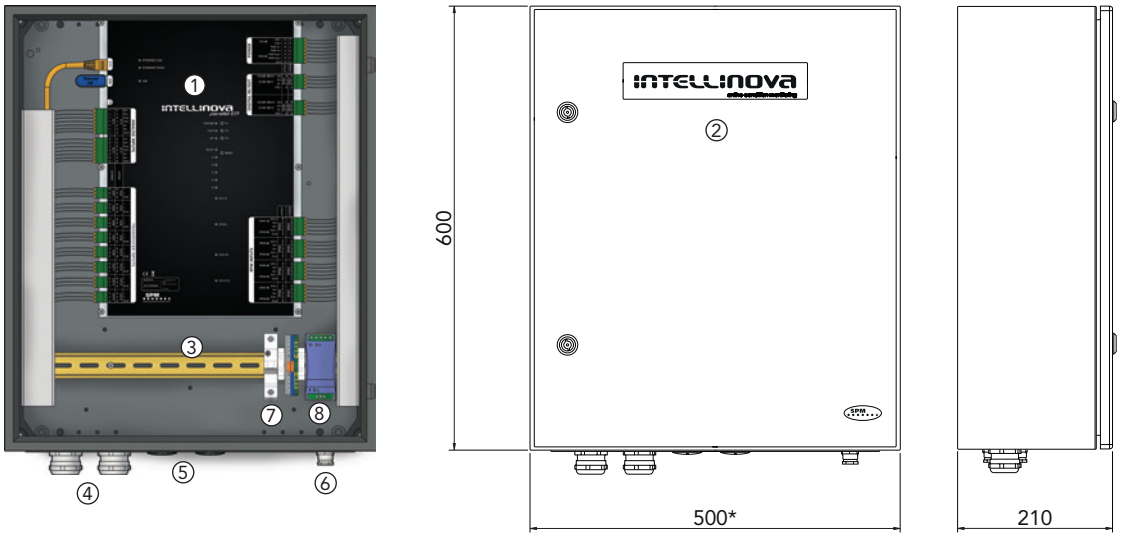
Part number INCEN16

* Can only be included when ordering a system unit. Can not be ordered afterwards.

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Intellinova® Parallel EN – System INSEN16



1. System unit INCEN16
2. Cabinet IND16
3. DIN rail
4. Cable inlets 18034 (PG29)
5. Blind plugs for additional inlets
6. Cable inlets 15885 (PG11) and 18122 (M20)
7. Power switch (optional)
8. Power supply unit

*600 mm in stainless steel

INSEN16 is an advanced online system for continuous monitoring of machine condition. The Intellinova system is comprised of system unit INCEN16, cabinet IND16, internal cabling, and terminals for power supply. It is complete with a power supply unit and DIN rail.

By collecting vibration and/or shock pulse readings from up to 16 parallel channels and eight RPM channels, the system allows condition measurement on complex applications. Four digital inputs and four digital outputs can be used for connection to machine stop, alarm light, or other external devices, directly or via external relays. The system also has four analog inputs which can be used to accept process parameters.

The system communicates with Condmaster Ruby via standard Ethernet. The Group Measurement function enables measurement assignments to trigger multiple system units. In Condmaster, the Live View is used for monitoring the state of all connected devices.

The system unit is equipped with a parallel measuring logic, alarm, storing, and analysis logic. It has status LED indicators and a USB connection for the setup of the system. Technical specifications for INCEN16, *see technical data sheet TD-543*. Accessories for INSEN16, *see technical data sheet TD-289*.

IND16 is an industrial enclosure in powder-coated steel designed for encapsulation of INCEN16. The cabinet, intended for wall mounting, is robust and sealed for use in harsh environments. It is also available in stainless steel.

Technical specifications

Design, enclosure:	powder-coated steel or stainless steel, IP65
Power supply unit:	100-240VAC/24VDC, 60W, 50-60 Hz
Cable channels:	2 pcs, plastic
Cable inlets:	2xPG29 (18034) 1xPG11 (15885) 1xM20 (18122)
Weight:	approx. 22 kg (49 lbs)

Part numbers

INSEN16	Intellinova Parallel EN system (INCEN16+IND16)
INSEN16SS	Intellinova Parallel EN system (INCEN16+IND16SS)
INCEN16	System unit
IND16	Cabinet in powder-coated steel, 500x600x210 mm (19.7x23.6x8.3 in)
IND16SS	Cabinet in stainless steel, 600x600x210 mm (23.6x23.6x8.3 in)

Accessories

INO16	Relay for external alarm, 2 poles (TD-290)
INO32	Power switch, incl. cabling
INO33	Displacement signal interface (TD-549)
INO34	Wireless 4G router* (TD-550)
INO35	Gigabit switch* (TD-503)
INO57	Wi-Fi communication** (TD-656)
INO59	Wi-Fi antenna for INO57 (TD-656)
15808	Cable inlet, PG7, for cable 2.5-6.5 mm, IP68, brass/nickel-plated, Neoprene sealing (TD-289)
15885	Cable inlet, PG11, for cable 6-11.5 mm, IP68, brass/nickel-plated, Neoprene sealing (TD-289)
18034	Cable inlet, PG29, for 8 measuring cables diam. 5.5 mm, IP65, brass/nickel-plated (TD-289)
18035	Cable inlet, PG29, diam. 16-26 mm, IP68, brass/nickel-plated (TD-289)
18122	Cable inlet, M20, for cable 4-10 mm, IP68, brass/nickel-plated, Neoprene sealing
81325	Mounting braces, 4 pcs

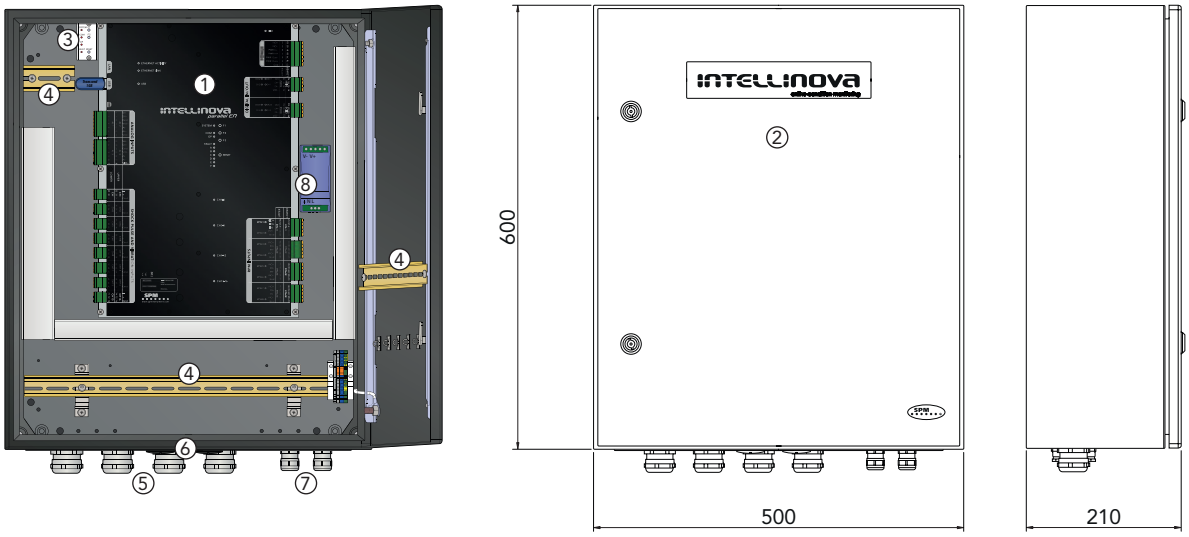
* INO34 and INO35 cannot be used together

** Can only be included when ordering a system unit. Can not be ordered afterwards.

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Intellinova® Parallel EN – System INSEN32



1. INCEN32 (2xINCEN16 system units)
2. Cabinet IND32
3. LED panel for lower system unit, INO53
4. DIN rails
5. Cable inlets PG29
6. Blind plugs for additional inlets
7. Cable inlets PG11 and M20
8. Power supply unit

INSEN32 is an advanced online system for continuous monitoring of machine condition. The Intellinova system is comprised of INCEN32 (2xINCEN16 system units), cabinet IND32, internal cabling, and terminals for power supply. It is complete with a power supply unit and DIN rail.

By collecting vibration and/or shock pulse readings from up to 32 parallel channels and 16 RPM channels, the system allows condition measurement on complex applications. Eight digital inputs and eight digital outputs can be used for connection to machine stop, alarm light, or other external devices, directly or via external relays. The system also has eight analog inputs which can be used to accept process parameters.

The system communicates with Condmaster Ruby via standard Ethernet. The Group Measurement function enables measurement assignments to trigger multiple system units. In Condmaster, the Live View is used for monitoring the state of all connected devices.

The system unit is equipped with a parallel measuring logic, alarm, storing, and analysis logic. It has status LED indicators and a USB connection for the setup of the system. Technical specifications for INCEN16, *see technical data sheet TD-543*. Accessories for INSEN32, *see technical data sheet TD-289*.

IND32 is an industrial enclosure in powder-coated steel designed for encapsulation of two system units INCEN16. The cabinet, intended for wall mounting, is robust and sealed for use in harsh environments.

Technical specifications

Design, enclosure:	powder-coated steel, IP65
Power supply unit:	100-240VAC/24VDC, 60W, 50-60 Hz
Cable channels:	3 pcs, plastic
Cable inlets:	4xPG29 (18034) 1xPG11 (15885) 2xM20 (18122)
Weight:	approx. 22 kg (49 lbs)

Part numbers

INSEN32	Intellinova Parallel EN system (INCEN32+IND32)
INCEN32	2xINCEN16 system units
IND32	Cabinet in powder-coated steel, 500x600x210 mm (19.7x23.6x8.3 in)

Spare parts

INO53	LED panel for the lower system unit

Accessories

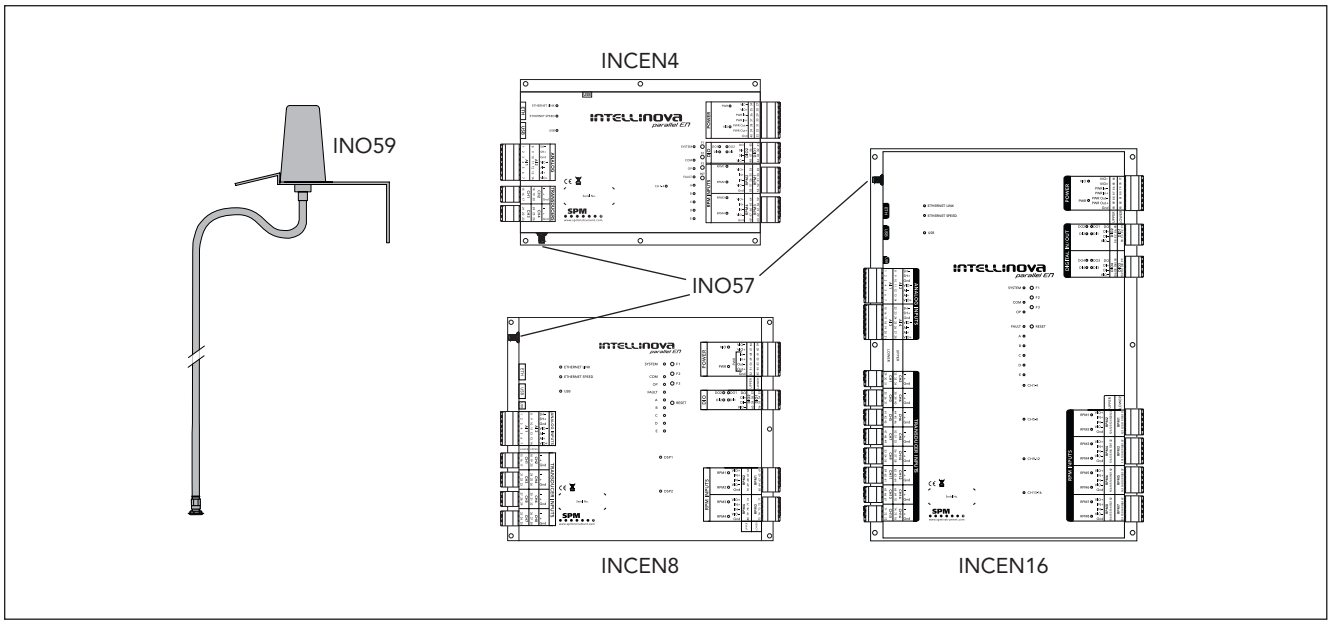
INO16	Relay for external alarm, 2 poles (TD-290)
INO17	Key phasor interface, incl. 12V power supply unit*
INO32	Power switch, incl. cabling
INO33	Displacement signal interface (TD-549)
INO34	Wireless 4G router** (TD-550)
INO35	Gigabit switch** (TD-503)
INO51	Terminal blocks 72 pcs, incl. cabling
INO57	Wi-Fi communication*** (TD-656)
INO59	Wi-Fi antenna for INO57 (2 pcs needed) (TD-656)
15808	Cable inlet, PG7, for cable 2.5-6.5 mm, IP68, brass/nickel-plated, Neoprene sealing (TD-289)
15885	Cable inlet, PG11, for cable 6-11.5 mm, IP68, brass/nickel-plated, Neoprene sealing (TD-289)
18034	Cable inlet, PG29, for 8 measuring cables diam. 5.5 mm, IP65, brass/nickel-plated (TD-289)
18035	Cable inlet, PG29, diam. 16-26 mm, IP68, brass/nickel-plated (TD-289)
18122	Cable inlet, M20, for cable 4-10 mm, IP68, brass/nickel-plated, Neoprene sealing
81325	Mounting braces, 4 pcs

* INO17 will not fit in the cabinet if INO51 is used
** INO34 and INO35 cannot be used together
*** Only available when ordering a system, not afterwards

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Intellinova® Parallel EN – Wi-Fi communication



The INO57 accessory enables Wi-Fi communication for Intellinova Parallel EN system units (INCEN4, INCEN8, and INCEN16). The associated INO59 includes an external omnidirectional antenna and a 5 m antenna cable.

For system units where INO57 is installed, only one communication connection can be used at a time: Ethernet connection (network cable) or Wi-Fi connection (INO57). Simultaneous use of Wi-Fi communication and Ethernet communication is not supported.

INO57 cannot be retrofitted. Therefore, INO57 must be ordered in connection with ordering the Intellinova Parallel EN system unit.

To use INO57, one Wi-Fi antenna per system unit is required. 2 pcs of INO59 must be ordered for INSEN32.

Only dynamic IP addressing (DHCP) is supported. Static IP is not supported.

NOTE: INO57 requires Condmaster Ruby 2022 (or later).

Technical specifications

Frequency band:	2.4 GHz & 5 GHz
Security:	WPA/WPA2-PSK
Wi-Fi standards:	802.11a/b/g/n/ac
IP addressing:	DHCP

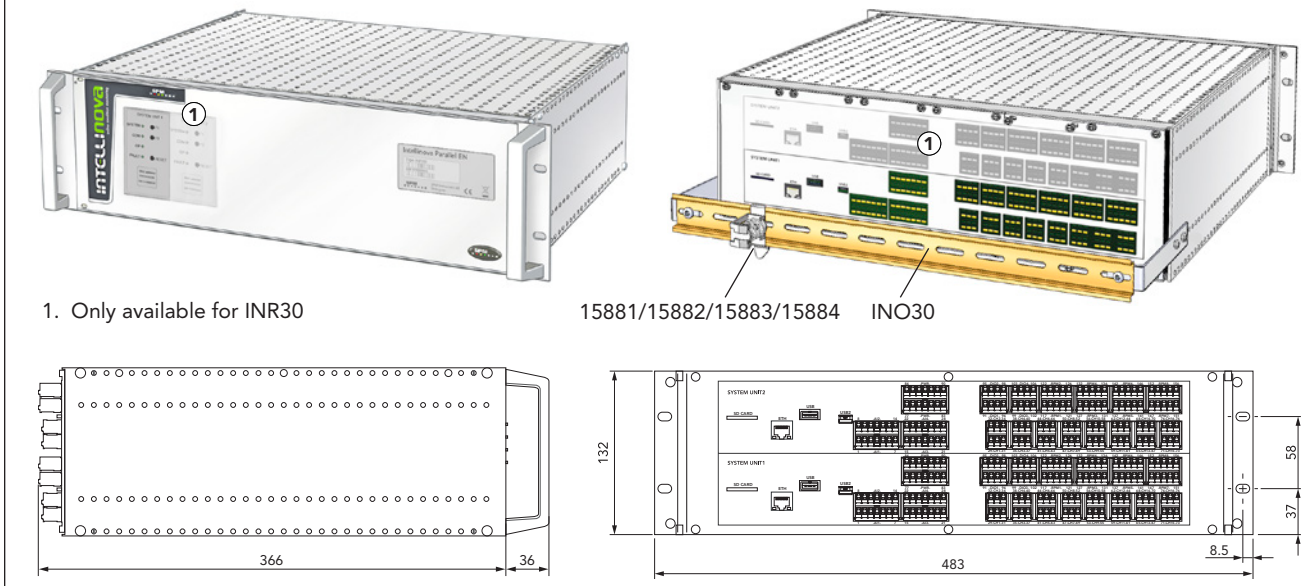
Part numbers

INO57	Wi-Fi communication, antenna connection
INO59	Wi-Fi antenna incl. 5 m cable for INO57

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Intellinova® Parallel EN – Systems for 19" Rack



Intellinova Parallel EN is an advanced online system for continuous monitoring of machine condition. The Intellinova systems for 19 inch rack mounting allow either one (INR31) or two (INR30) built-in system units, INCEN16. The back panels are equipped with Ethernet connection and terminals for external power supply, analog inputs and digital inputs/outputs. INR30/INR31 has LED indicators on the front panel showing its status. Power supply unit, earth rail and clamping yokes are ordered separately. The accessories are intended for mounting on the DIN rail included in INO30.

By collecting vibration and/or shock pulse readings from up to 16/32* parallel channels and 8/16* RPM channels, the system allows condition measurement on complex applications. Four/eight* digital inputs and four/eight* digital outputs can be used for connection to machine stop, alarm light, or other external devices, directly or via external relays. The system also has four/eight* analog inputs which can be used to accept process parameters.

The system communicates with Condmaster Ruby via standard Ethernet in a LAN network. The Group Measurement function enables measurement assignments to trigger multiple system units. In Condmaster, the Live View is used for monitoring the state of all connected devices.

The system units have parallel measuring logic, alarm, storing and analysis logic. INCEN16 has USB connection for setup of the system. Technical specifications for INCEN16, *see technical data sheet TD-543*.

*Depending on whether INR31 (first number) or INR30 (second number) is used.

Technical specifications

Design, enclosure:	Clear-Chromated Aluminium, IP20
Power supply:	12 to 35 V DC, 50 W
Operating temperature:	–20 to +55 °C (–4 to 131 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	483 (19") x 132 (3U) x 366 mm
Weight:	approx. 5.2 kg (11.5 lbs)

Part numbers

INR30	Intellinova Parallel EN rack system (2xINCEN16, rack-mounted)
INR31	Intellinova Parallel EN rack system (1xINCEN16, rack-mounted)

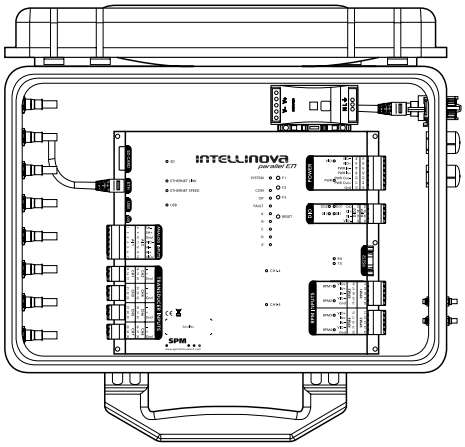
Options

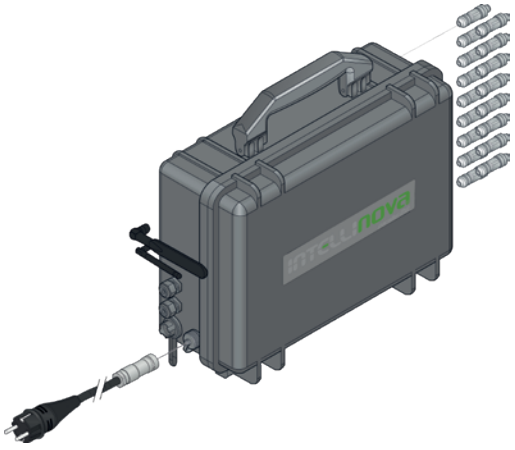
INO16	Relay for external alarm, 2 poles (TD-290)
INO17	Key Phasor Interface, 2 channels (TD-299)
INO28	Power supply unit, 100 to 240 V, 50 W (TD-323)
INO30	Earth rail with mounting brackets, DIN
INO33	Displacement signal interface (TD-549)
INO34	Wireless 4G router (TD-550)
INO35	Gigabit switch (TD-549)
15881	Clamping yoke for earth rail, DIN, cable 3-8 mm
15882	Clamping yoke for earth rail, DIN, cable 4-13.5 mm
15883	Clamping yoke for earth rail, DIN, cable 10-20 mm
15884	Clamping yoke for earth rail, DIN, cable 15-32 mm
90419	SD card, 2 GB

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Intellinova® Parallel EN – Portable system, INSEN8 P





The portable Intellinova system INSEN8 P is comprised of the system unit INCEN8 (see TD-565) mounted in a sturdy MIL standard plastic carrying case INO55 with connectors, internal measuring cables and a power supply unit. The case fits a full-blown Intellinova system, using all the same components as the non-portable version and with all the features.

INSEN8 P allows rapid installation and is ideal for test installations, temporary monitoring of critical machines, etc. The portable system can also be used as a multichannel logger with data acquisition based on various triggers when connected to a network.

The carrying case has M12 connectors for eight transducer inputs, four RPM inputs, two analog inputs, and two digital inputs/outputs. The case has exterior power supply inlet and network connector.

The Intellinova system unit is equipped with parallel measuring logic, alarm, storing and analysis logic. It has status LED indicators and USB connection for setup of the system.

Both vibration and shock pulse measurements can be performed using DuoTech® accelerometers.

Technical specifications

Design, case:	copolymer, neoprene seals, automatic purge valve, IP67
Operating temperature:	–20 to +60 °C (–4 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Input connectors:	8xM12 for condition monitoring, 4xM12 for RPM inputs, 2xM12 for analog inputs, 2xM12 for digital inputs/outputs, network connector RJ45
Power supply:	100 to 240 V AC/24 VDC, 50/60 Hz, max. 10 A
Power inlet:	M12 inlet with cable connector CEE 7/7, 2 m
Dimensions (w x h x d):	464x366x176 mm (18.4x14.4x6.9 inches)
Weight:	approx. 7.5 kg (16.5 lbs) including system unit

Part numbers

INSEN8 P	Portable online system (INCEN8+INO55), incl. connectors, internal measuring cables, power cable EU, and power supply unit
INCEN8	System unit (TD-565)
INO55	Carrying case (excl. INCEN8)

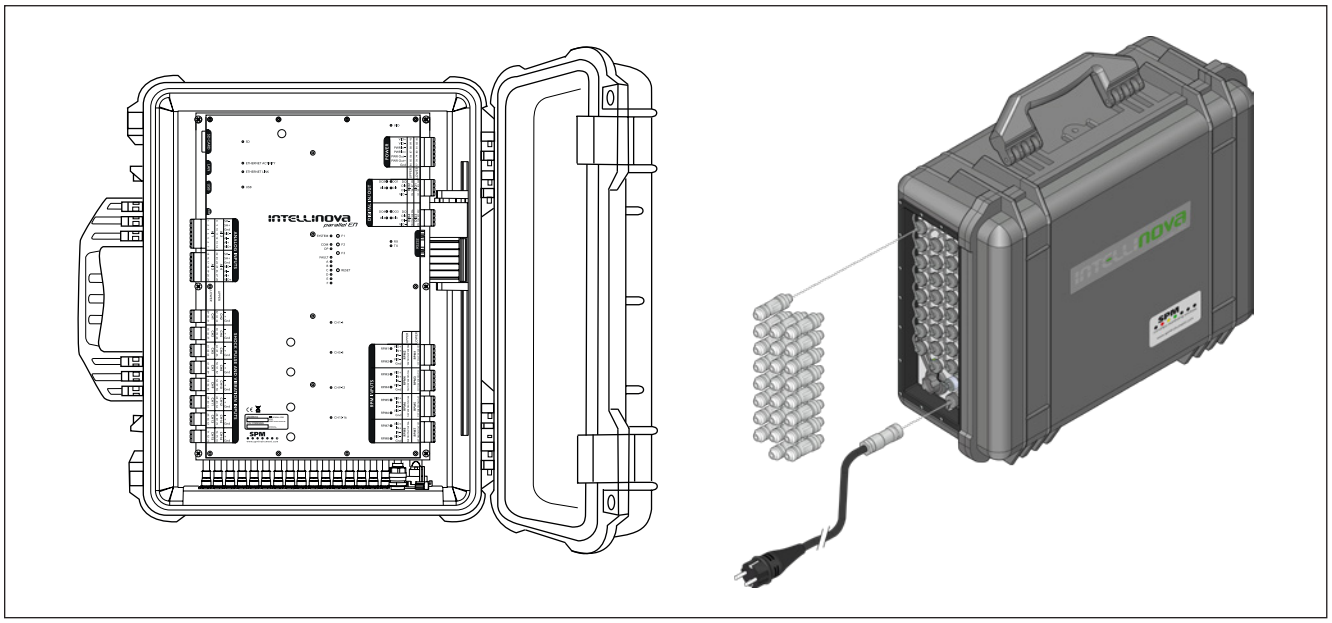
Options

INO56	Wireless router 90679, incl. 4G and Wi-Fi antennas (TD-632)

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Intellinova® Parallel EN – Portable system



The portable system INSEN16 P is comprised of a system unit INCEN16 mounted in a sturdy MIL standard plastic carrying case INO50 with connectors, internal measuring cables and a power supply unit. The case fits a full-blown Intellinova system, using all the same components as the non-portable version and with all the features.

INSEN16 P allows rapid installation and is ideal for test installations, temporary monitoring of critical machines, etc. It can also be used as a multichannel logger with data acquisition based on various triggers when connected to a network.

The carrying case has M12 connectors for 16 transducer inputs, four RPM inputs, two analog inputs and two digital inputs/outputs. The case has exterior power supply inlet and network connector.

The system unit is equipped with parallel measuring logic, alarm, storing and analysis logic. It has status LED indicators and USB connection for setup of the system. Technical specifications for INCEN16, *see technical data sheet TD-543*.

Both vibration and shock pulse measurements can be performed using DuoTech® accelerometers.

Technical specifications

Design, case:	copolymer, neoprene seals, automatic purge valve, IP67
Operating temperature:	–20 to +60 °C (–4 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Input connectors:	16×M12 for condition monitoring, 4×M12 for RPM inputs, 2×M12 for analog inputs, 2×M12 for digital inputs/outputs, network connector RJ45
Power supply:	100 to 240 V AC/24 VDC, 50/60 Hz, max. 10 A
Power inlet:	M12 inlet with cable connector CEE 7/7, 2 m
Dimensions (w x h x d):	530×437×217 mm (20.9×17.2×8.5 inches)
Weight:	approx. 10 kg (22 lbs) including system unit

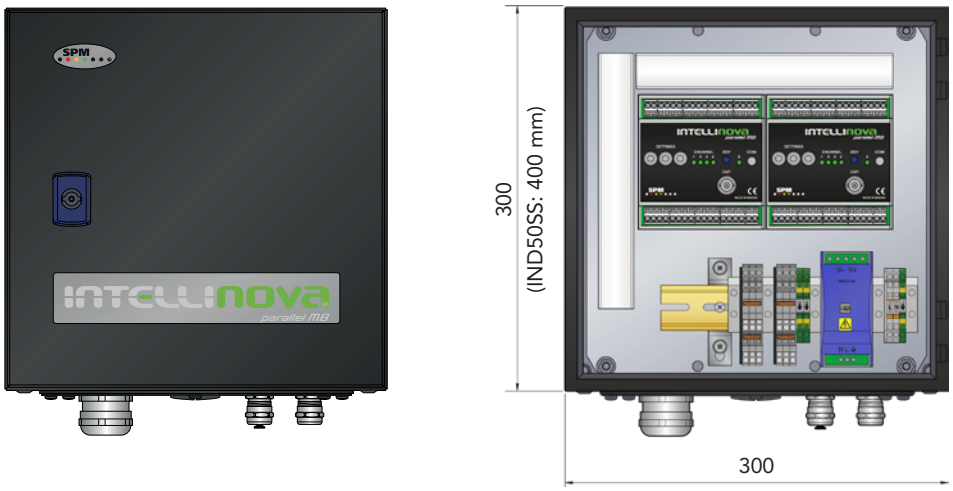
Part numbers

INSEN16 P	Portable online system (INCEN16+INO50)
INCEN16	System unit (TD-543)
INO50	Case (excl. INCEN16) incl. 24 pcs M12 connectors
INO52	Wireless 4G router, omni-directional antenna 90460, connector and 10 m cable (TD-550)

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Intellinova® Parallel MB – System INS50



System INS50 consists of an industrial enclosure designed for encapsulation of up to two Intellinova Parallel INSMB4V units. The cabinet is equipped with a power supply unit and terminal blocks for power connection. Measurement units and WLAN Ethernet unit or 4G router can be included in the prepared cabinet.

The cabinet, intended for wall installation, is sealed for use in harsh environments. It has a flange with cable inlets for measuring cables, power supply, and communication cables.

Intellinova Parallel MB measurement unit is described on the technical data sheet TD-517.

Technical specifications

Design, enclosure:	powder-coated steel (IND50) or stainless steel (IND50SS), IP65
Communication:	Ethernet TCP/IP, 100 Mbit
DIN rails:	for up to two INSMB4V units, plus one rail for terminals and power supply unit
Cable inlets:	2xPG29 3xPG11
Power supply unit:	100 to 240 V AC/24 V DC, 60 W, 50 to 60 Hz
Terminal blocks:	3 pcs for connection of the power supply unit and 3 pcs for connection of Modbus and internal power supply unit
Operating temperature:	0 to +50 °C (32 to 122 °F)
Storage temperature:	−20 to +70 °C (−4 to 158 °F)
Relative humidity:	10% to 90% (non-condensing)
Cable channels:	2 pcs, plastic
Dimensions (w x h x d):	300x300x210 mm (IND50) 300x400x210 mm (IND50SS)
Weight:	approx. 11 kg (IND50) or 9 kg (IND50SS) incl. Intellinova Parallel MB measurement units

Part numbers

IND50	Cabinet in powder-coated steel, incl. power supply unit and cabling
IND50SS	Cabinet in stainless steel, incl. power supply unit and cabling

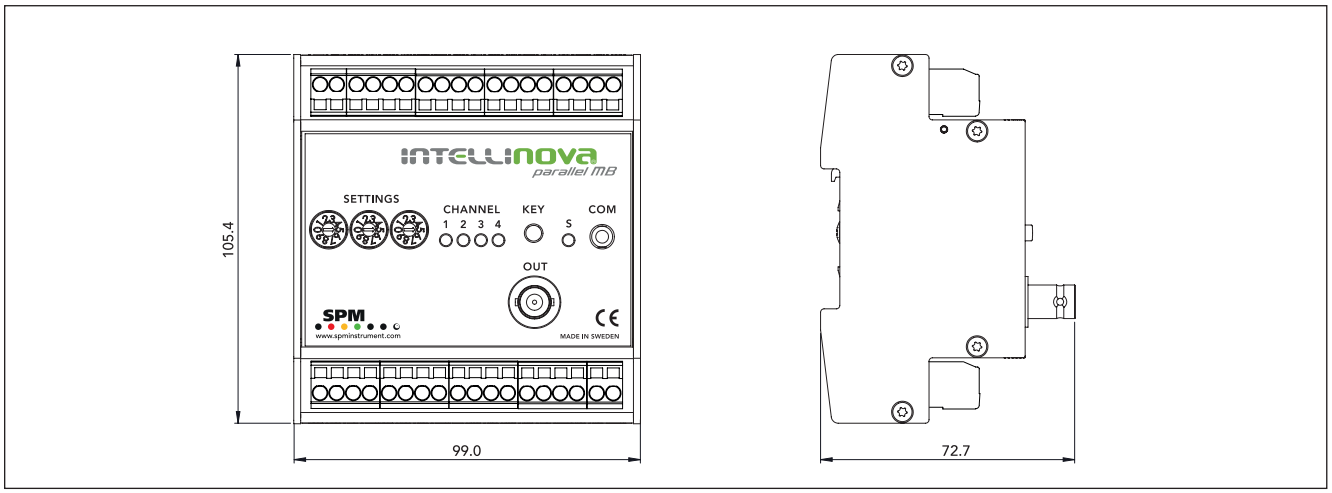
Options

INO40	INSMB4V unit(s) incl. cabling, installed in cabinet
INO47	WLAN Ethernet unit, installed in cabinet
INO48	4G router incl. cabling, installed in cabinet (TD-550)
PRO230	Offline configuration software
15484	Communication cable, USB - 3.5 stereo plug
90458	External antenna cable with connectors, 10 m
90460	Omni-directional antenna for INO48
90500	External antenna cable with connectors, 0.75 m
90580	External antenna cable with connectors, 2 m
90598	Antenna and 5 m cable for INO47

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Intellinova® Parallel MB VIB/Dual technology – INSMB4V



Intellinova Parallel MB VIB/Dual technology is a small unit for parallel measurement on four channels, monitoring operating condition by means of:

- Vibration measurement (ACC, VEL, DISP rms, HD ENV)
- Symptom values (BPFO etc.)
- Spectrum
- Time signal
- Shock pulse measurement incl. lubrication condition (HDm/HDc, LR/HR)

The ACC, VEL and DISP rms values are measured within a user defined frequency range. The symptoms are defined by the user as a fundamental frequency and its harmonics where sidebands can be included. A spectrum or time signal can also be generated for further processing. A cumulative moving average is calculated for all measured parameters and symptoms. These averages can also be used to trigger alarms. Both vibration and shock pulse measurements can be performed using DuoTech accelerometers that use a standard IEPE interface.

A DIO (Digital Input Output) configured as an input can be used to activate a measurement. Measuring results and symptom values are compared with an alarm level set up and can activate any of the 6 DIOs which can control, e.g. a relay. Alarms can be set with or without delay, based either on time or number of measurements. The unit can be set up to repeat its configured measurements as often as possible, and a LED for every channel indicates the status of the latest measurement. Two RPM inputs can be used for measurements based on order tracking.

The unit can operate in online or offline mode, selected by rotary switches on the front. When set to online mode, the unit operates as a Modbus RTU where the Modbus master configures the measurements and reads the result. When run in offline mode, the measurements are defined in an internal text file created in the configuration software PRO230. The text file can contain a large number of unique configurations selected with the rotary switches on the front panel. The text file is transferred to the unit using the COM port, which is also used for updating the firmware.

Technical specifications

Measuring channels:	4, measuring in parallel
Measuring range, VIB:	> 50 g peak-peak (using 100 mV/g transducers)
Measuring range, SPM:	0 to 75 dB
Resolution:	7 µg /√Hz 0.5 - 40 000 Hz using 100 mV/g transducers
Spectrum lines:	400, 800, 1600, 3200, 6400, 12 800
Transducer type, VIB:	SLD, SLC DuoTech or standard IEPE type accelerometer
Transducer type, SPM:	SLC DuoTech accelerometer
RPM channels:	RPM 1 and RPM 2 (parallel meas.), proximity switches, 1 - 120 000 rpm (when 1 pulse/rev.)
Digital In/Out:	6, configurable as input or output
Digital output:	24 V/0.8 A per channel, max 3 A all channels
Alarm delay type 1:	0 to 1000 measurements
Alarm delay type 2:	0 to 1800 s (= 30 min)
Status indicatiors:	green/red LED for every channel indicating condition status and one LED for overall status
Communication:	Modbus RTU
Isolated output:	BNC connector that the user can select to connect to channel 1 - 4
Power supply:	24 VDC (15 to 36 V)
Power consumption:	<3 W
Temperature range:	0 to 50 °C
Enclosure:	aluminum
Mounting:	DIN rail
Dimensions:	105.4 x 99.0 x 72.7 mm
Weight:	370 g
Cable lengths:	VIB, SPM, RPM, DIO < 30 m

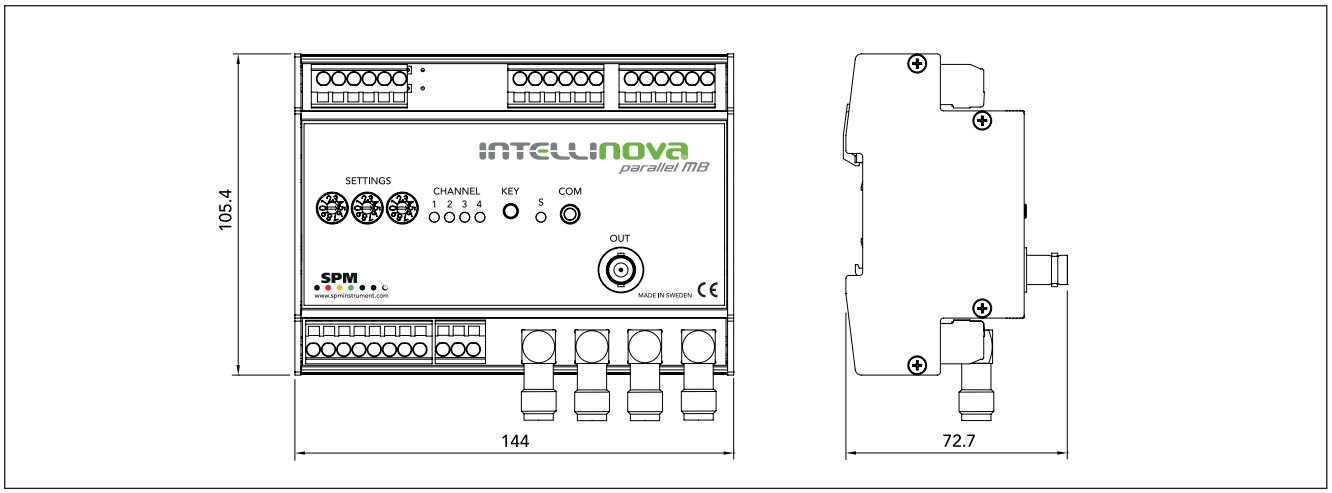
Accessories

15484	Communication cable, USB - 3.5 stereo plug
PRO230	Offline configuration software

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Intellinova® Parallel MB SPM – INSMB4S



Intellinova Parallel MB SPM is a small unit for parallel measurement on four channels, monitoring operating condition by means of:

- Shock pulse measurement incl. lubrication condition (HDm/HDc, LR/HR, dBm/dBc)
- Symptom values (BPFO, etc.)
- Spectrum
- Time signal

Shock pulse values are raw values that after normalization show the status of e.g. a bearing. Symptom is an rms value based on a fundamental frequency and a number of harmonics with or without sidebands. A spectrum or a time signal can also be generated for further processing. A cumulative moving average is calculated for all measured parameters and symptoms. These averages can also be used to trigger alarms.

A DIO (Digital Input Output) configured as an input can be used to activate a measurement. Alarms can be set with or without delay, based either on time or number of measurements. Measuring results and symptom values are compared with the alarm level set up and can activate any of the 6 DIOs that can control a relay. The unit can be set up to repeat its configured measurements as often as possible, and the status of the latest reading is indicated with a LED for every channel. Two RPM inputs can be used for measurements based on order tracking.

The unit can operate in online or offline mode, selected by rotary switches on the front. When set to online mode, the unit operates as a Modbus RTU where the Modbus master configures the measurements and reads the result. When run in offline mode, the measurements are defined in an internal text file, which can contain a large number of unique configurations selected with the rotary switches. The text file is transferred to the unit using the COM port, which is also used for updating the firmware.

Technical specifications

Measuring channels:	4, measuring in parallel, TNC connectors
Measuring range:	–20 to 75 dB
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Transducer type:	SPM 44000 series
RPM channels:	RPM1 and RPM2 (parallel meas.), proximity switches, 1-120 000 rpm (when 1 pulse/rev.)
DIO:	6, configurable as input or output
Digital output:	24 V/0.8 A per channel, max 3 A all channels
Alarm delay type 1:	0 to 1000 measurements
Alarm delay type 2:	0 to 1800 s (=30 min)
Status indicators:	green/red LED for every channel indicating condition status and one LED for overall status
Communication:	Modbus RTU
Isolated output:	BNC connector that the user can select to connect to channel 1-4
Voltage supply:	24 VDC (15-36V, not distributed DC supply)
Power consumption:	5 W
Temperature range:	–40 to +70 °C
Enclosure:	aluminum
Mounting:	DIN rail
Dimensions:	144x105.4x72.7 mm
Weight:	550 g
Cable lengths:	SPM, RPM, DIO <30 m

Accessories

15484	Communication cable, USB-3.5 stereo plug
PRO230	Offline configuration software

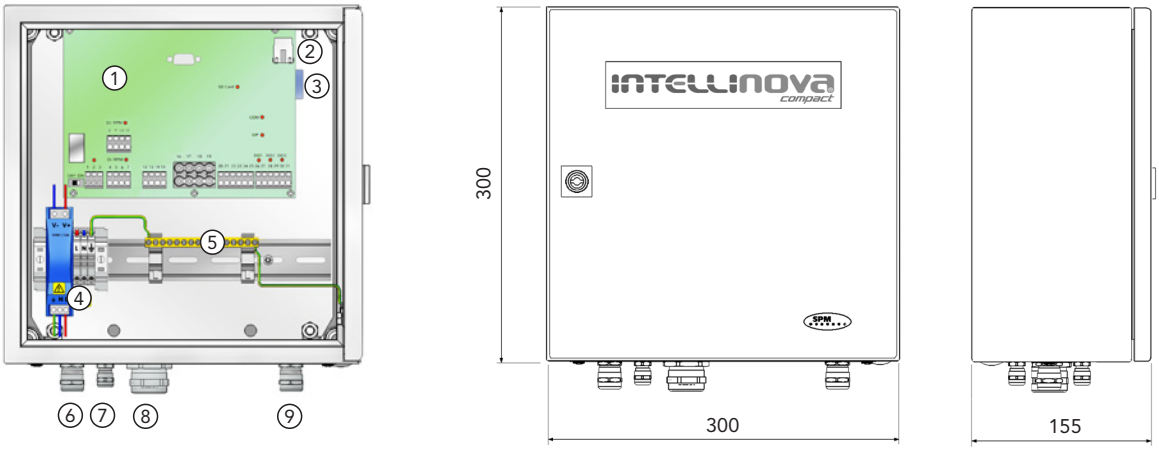
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Intellinova® Compact – System Unit INS06



1. Circuit board with input and output terminals
2. Ethernet LAN connector RJ45
3. SD memory card
4. Power supply unit on DIN rail
5. Earth rail with screw terminals
6. Inlet Pg11 for power supply cable*
7. Inlets 2 x Pg7 for RPM/DI cables*
8. Inlet M25 for 6 measuring cables*
9. Inlet M20 for network cable*

*for stainless steel (INS06SS), see below

The system unit INS06 in the Intellinova Compact series is a small and advanced measuring unit for continuous monitoring of machine condition. The system unit is complete with power supply unit, DIN rail with screw terminals for earth connections and space for optional equipment. The enclosure is intended for wall mounting and sealed IP66 for use in harsh environments.

INS06 measures bearing condition on four channels, vibration on two channels and analog signals on three channels. Two RPM transducers can be connected and linked to measuring assignments set up in Condmaster®Ruby. The unit has three digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc.

The unit is equipped with multiplexing measuring logic, alarm, storing and analysis logic. It is connected via standard Ethernet in a LAN network. The circuit board is equipped with status LED indicators and an SD memory card used for data buffering and setup of the unit.

Technical specifications

Design, enclosure:	enamelled steel (INS06) or stainless steel (INS06SS), IP66
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps
Power supply unit:	100 to 240 V AC, Output 12 V DC, 1.5 A
Operating temperature:	–20 to +60 °C (–4 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	INS06: 300x300x155 mm (11.8x11.8x6.1 in) INS06SS: 380x380x210 mm (15x15x8.3 in)
Cable inlets:	INS06: 2xPg7, Pg11, M25, M20 INS06SS: 4xM16, 2xM25, M20
Weight:	INS06: approx. 6.7 kg (14.8 lbs) INS06SS: approx 11.7 kg (26 lbs)

Bearing Monitoring

Measuring methods:	SPM HD, LR/HR HD
Measuring channels:	4, multiplexing
Measuring range SPM HD:	–20 to 80 dBsv
Measuring range LR/HR:	–19 to 80 dBsv
Amplitude scale unit:	HDm/HDc, LR/HR, Time Signal HD, SPM Spectrum HD
Transducer line test:	TLT test
Input connectors:	for coaxial cables with connector 12775
Transducer type:	SPM 44000 series, only for coaxial cables

Vibration Monitoring

Measuring methods:	ISO 2372, ISO 10816, HD ENV, FFT with symptoms, EVAM
Measuring channels:	2, multiplexing
Frequency range:	DC to 40 kHz
Measuring range:	≥60 g peak-peak (using 100 mV/g transd.)
Resolution:	0.0015 m/s² RMS (using 100 mV/g transd.)
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Transducer type:	SLD144, SLC144 DuoTech or IEPE (ICP®) type transducers with a nominal bias output voltage of 10 to 14 V DC

Digital Inputs

Digital/RPM inputs:	2 channels, multiplexing
RPM transducer type:	proximity switches, supply 12 V DC
RPM measuring range:	0.1 to 120 000 rpm (when 1 pulse/rev.)

Digital Outputs

Digital outputs:	3, open collector, user configurable

Analog Inputs

Input channels:	3
Measurement range:	0 to 20 mA
Resolution:	0.01 mA (12 bit)
Meas. accuracy:	± (1% +0.1 mA)
Input resistance:	current 100 Ω
Cable length:	max. 100 m

Part numbers

INS06	Intellinova Compact system unit, enamelled steel
INS06SS	Intellinova Compact system unit, stainless steel

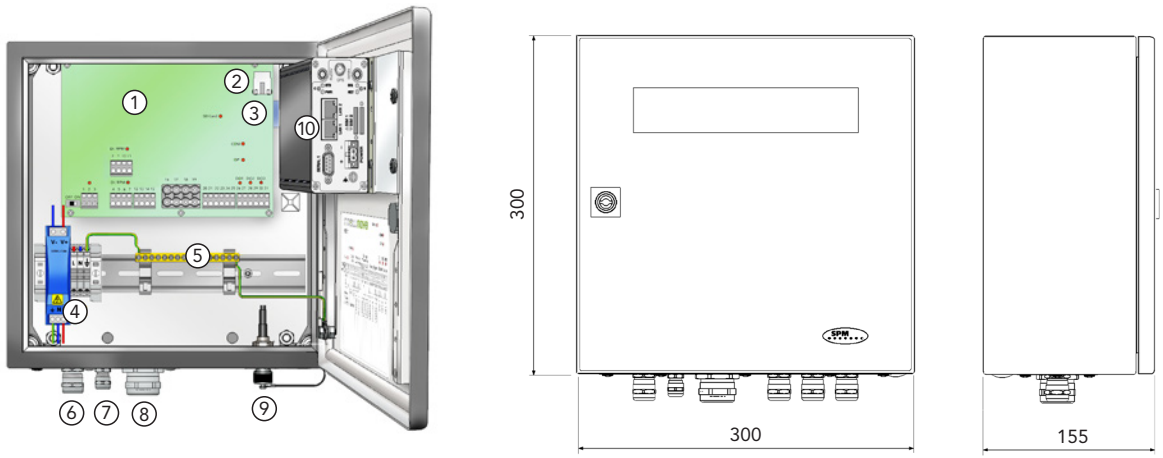
Accessories

12775	Connector for coaxial cable
IND09	Stand for portable system unit (TD-349)
IND14	Relay for external alarm, 2 poles (TD-386)
IND19	Magnets for wall mounting, 3 pcs
81444	Mounting braces for wall mounting, 4 pcs.
90015	Rogowski coil for current measurement (TD-335)

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Intellinova® Compact – System Unit INS06W



1. Circuit board with in- and output terminals
2. Ethernet LAN connector RJ45
3. SD memory card
4. Power supply unit on DIN rail
5. Earth rail with screw terminals
6. Inlet Pg11 for power supply cable
7. Inlets 2 x Pg7 for RPM/DI cables
8. Inlet M32 for 6 measuring cables
9. Connector for external antenna
10. 4G router

The system unit INS06W in the Intellinova Compact series is a small and advanced measuring unit for continuous monitoring of machine condition. It is complete with power supply unit, 4G router, external antenna, DIN rail with screw terminals for earth connections and space for optional equipment. The enclosure, intended for wall mounting, is robust and sealed for use in harsh environments.

INS06W measures bearing condition on four channels, vibration on two channels and analog signals on three channels. Two RPM transducers can be connected and linked to measuring assignments set up in Condmaster®. The unit has three digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc The circuit board is equipped with status LED indicators and a SD memory card used for data buffering and setup of the system unit.

The built-in 4G router is designed to provide remote connectivity across mobile networks. It is connected via a 10/100 Ethernet switch and supports a wide variety of wireless standards. Specifications for the 4G router 90645 is stated on the technical data sheet TD-550.

Technical specifications

Design, enclosure:	enamelled steel, IP66
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps
Wireless:	4G router incl. omni-directional antenna and 0.75 m antenna cable (TD-550)
Power supply unit:	100 to 240 V AC, Output 12 V DC, 1.5 A
Operating temperature:	–20 to +60 °C (–4 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	300 x 300 x 155 mm (11.8 x 11.8 x 6.1 in)
Weight:	approx. 8.2 kg (18 lbs)

Bearing Monitoring

Measuring methods:	SPM HD, LR/HR HD
Measuring channels:	4, multiplexing
Measuring range SPM HD:	–20 to 80 dBsv
Measuring range LR/HR:	–19 to 80 dBsv
Amplitude scale unit:	HDm/HDc, LR/HR, Time Signal HD, SPM Spectrum HD
Transducer line test:	TLT test
Input connectors:	for coaxial cables with connector 12775
Transducer type:	SPM 44000 series, only for use with coaxial cable

Vibration Monitoring

Measuring methods:	ISO 2372, ISO 10816, HD ENV, FFT with symptoms, EVAM
Measuring channels:	2, multiplexing
Frequency range:	DC to 40 kHz
Measuring range:	≥ 60 g peak-peak (using 100 mV/g transducer)
Resolution:	0.0015 m/s² RMS (using 100 mV/g transducer)
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Transducer type:	SLD144, SLC144 DuoTech or IEPE (ICP®) type transducers with a nominal bias output voltage of 10 to 14 V DC

Digital Inputs

Digital/RPM inputs:	2 channels, multiplexing
RPM transducer type:	proximity switches, supply 12 V DC
RPM measuring range:	0.1 to 120 000 rpm (when 1 pulse/rev.)

Digital Outputs

Digital outputs:	3, open collector, user configurable

Analog Inputs

Input channels:	3
Measurement range:	0 to 20 mA
Resolution:	0.01 mA (12 bit)
Meas. accuracy:	± (1% +0.1 mA)
Input resistance:	current 100 Ω
Cable length:	max. 100 m

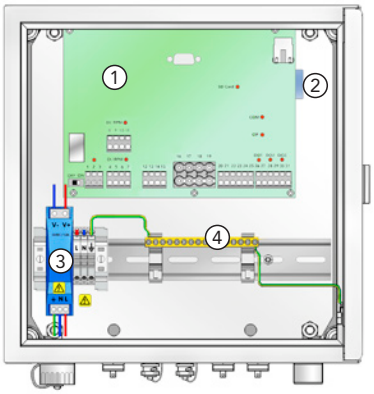
Accessories

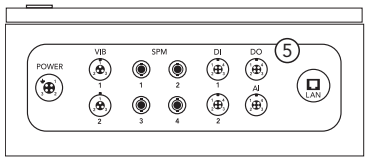
12775	Connector for coaxial cable
IND09	Stand for portable system unit (TD-349)
IND14	Relay for external alarm, 2 poles (TD-386)
IND19	Magnets for wall mounting, 3 pcs
81444	Mounting braces for wall mounting, 4 pcs.
90015	Rogowski coil for current measurement (TD-335)
90458	Antenna cable, 10 m

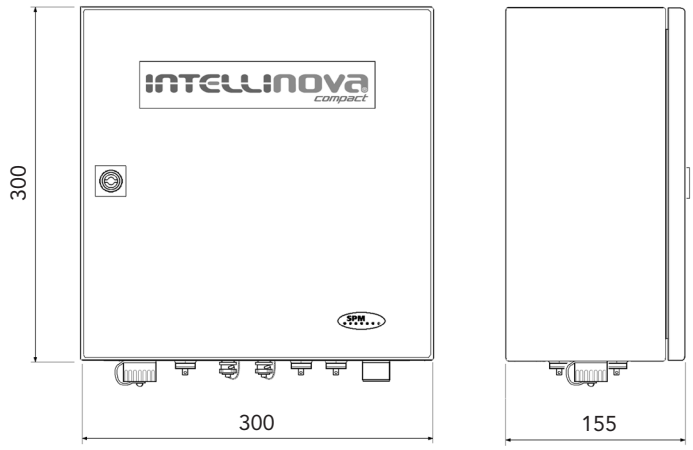
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Intellinova® Compact – System Unit INS06-C







1. Circuit board
2. SD memory card
3. Power supply unit on DIN rail
4. Earth rail with screw terminals
5. Gland plate with input and output connectors

Intellinova Compact INS06-C is a small and advanced measuring unit for continuous monitoring of machine condition. INS06-C has the same specifications as INS06, except that it is equipped with input and output connectors on the gland plate. The unit is complete with power supply unit, internal wiring and DIN rail with space for optional equipment. The enclosure is robust and sealed IP66 for use in harsh environments.

INS06-C measures bearing condition on four channels, vibration on two channels and analog signals on three channels. Two RPM transducers can be connected and linked to measuring assignments set up in Condmaster® Ruby. The unit has three digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc.

The unit is equipped with multiplexing measuring logic, alarm, storing and analysis logic. It is connected via standard Ethernet in a LAN network. The circuit board is equipped with status LED indicators and an SD memory card used for data buffering and setup of the unit.

Technical specifications

Design, enclosure:	enamelled steel, IP66
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps
LAN connector:	RJ45 BULGIN PX0834/B
Power supply unit:	100 to 240 V AC, Output 12 V DC, 1.5 A
Power supply connector:	AMPHENOL C16-1 3p+EP
Operating temperature:	–20 to +60 °C (–4 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	300 x 300 x 155 mm (11.8 x 11.8 x 6.1 in)
Weight:	approx. 6.7 kg (14.8 lbs)

Bearing Monitoring

Measuring method:	SPM HD, LR/HR HD
Measuring channels:	4, multiplexing
Measuring range SPM HD:	-20 to 80 dBsv
Measuring range LR/HR:	-19 to 80 dBsv
Amplitude scale unit:	HDm/HDc, LR/HR, Time Signal HD, SPM Spectrum HD
Transducer line test:	TLT test
Input connectors (4):	BNC
Transducer type:	SPM 44000 series, only for use with coaxial cables

Vibration Monitoring

Measuring methods:	ISO 2372, ISO10816, HD ENV, FFT with symptoms, EVAM
Measuring channels:	2, multiplexing
Frequency range:	DC to 40 kHz
Measuring range:	≥60 g peak-peak (using 100 mV/g transducer)
Resolution:	0.0015 m/s² RMS (using 100 mV/g transducer)
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Input connectors (2):	LEMO 1K 3-pin
Transducer type:	SLD144, SLC144 DuoTech or IEPE (ICP®) type transducers with a nominal bias output voltage of 10 to 14 V DC

Digital Inputs DI

Digital inputs on CBA:	2 channels, multiplexing
RPM transducer type:	proximity switches, supply 12 V DC
RPM measuring range:	0.1 to 120 000 rpm (when 1 pulse/rev.)
Input connectors (2):	LEMO 1K 4-pin

Digital Outputs DO

Digital outputs on CBA:	3, open collector, user configurable
Output connector (1):	LEMO 1K 4-pin for 2 DO channels

Analog Inputs AI

Input channels on CBA:	3
Measurement range:	0 to 20 mA
Resolution:	0.01 mA (12 bit)
Meas. accuracy:	± (1% +0.1 mA)
Input resistance:	current 100 Ω
Cable length:	max. 100 m
Input connector (1):	LEMO 1K 4-pin for 1 AI channel

Accessories

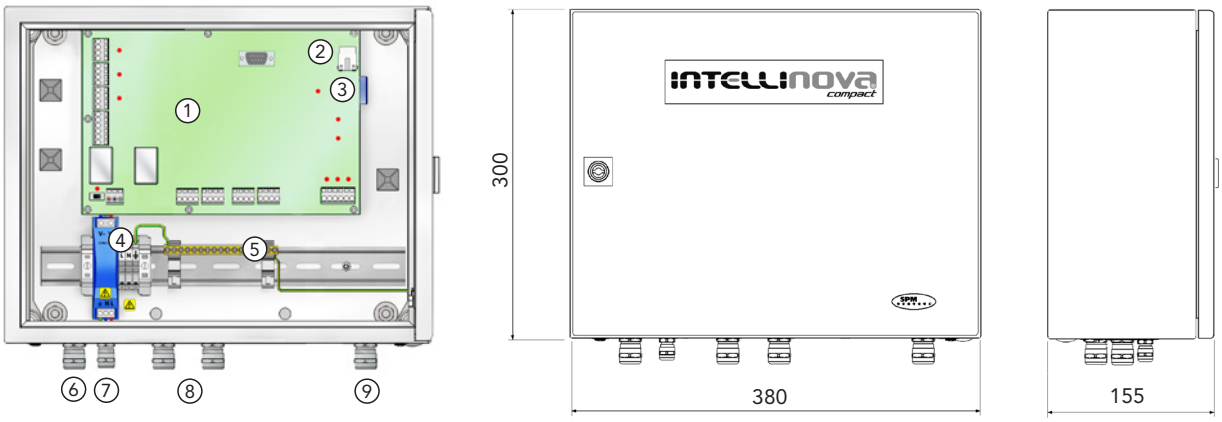
IND09	Stand for portable system unit (TD-349)
IND14	Relay for external alarm, 2 poles (TD-386)
IND19	Magnets for wall mounting, 3 pcs
81444	Mounting braces for wall mounting, 4 pcs.
90015	Rogowski coil for current measurement (TD-335)

Suitable cables and connectors, see TD-398.

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Intellinova® Compact – System Unit INS08V



1. Circuit board with in- and output terminals
2. Ethernet LAN connector RJ45
3. SD memory card
4. Power supply unit on DIN rail
5. Earth rail with screw terminals
6. Inlet Pg11 for power supply cable
7. Inlets 3 x Pg7 for DI/RPM cables
8. Inlets 2x Pg20 for 8 measuring cables
9. Inlet M20 for network cable

The system unit INS08V in the Intellinova Compact series is a small and advanced measuring unit for continuous monitoring of machine condition. The system unit is complete with power supply unit, DIN rail with screw terminals for earth connections and space for optional equipment. The enclosure is intended for wall mounting and sealed IP66 for use in harsh environments.

INS08V measures vibration on eight channels and analog signals on three channels. Three RPM transducers can be connected and linked to measuring assignments set up in Condmaster®.

The unit has three digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc.

The unit is equipped with multiplexing measuring logic, alarm, storing and analysis logic. It is connected via standard Ethernet in a LAN network. The circuit board is equipped with status LED indicators and an SD memory card used for data buffering and setup of the system unit.

Both vibration and shock pulse (HDm/HDc) measurements can be performed using DuoTech® accelerometers.

Technical specifications

Design, enclosure:	enamelled steel (INS08V) or stainless steel (INS08VSS), IP66
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps
Power supply unit:	100 to 240 V AC, Output 12 V DC, 1.5 A
Operating temperature:	-20 to +60 °C (-4 to 140 °F)
Storage temperature:	-20 to +80 °C (-4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	INS08V: 380x300x155 mm (15x11.8x6.1 in) INS08VSS: 380x380x210 mm (15x15x8.3 in)
Weight:	INS08V: approx. 8.2 kg (18 lbs) INS08VSS: approx. 11.7 kg (26 lbs)

Vibration Monitoring

Measuring methods:	ISO 2372, ISO10816, HD ENV, FFT with symptoms, EVAM
Measuring channels:	8, multiplexing
Frequency range:	DC to 40 kHz
Measuring range:	≥60 g peak-peak (using 100 mV/g transducer)
Resolution:	0.0015 m/s² RMS (using 100 mV/g transducer)
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Transducer type:	SLD144, SLC144 DuoTech or IEPE (ICP®) type transducers with a nominal bias output voltage of 10 to 14 V DC

Digital Inputs

Digital/RPM inputs:	3 channels, multiplexing
RPM transducer type:	proximity switches, supply 12 V DC
RPM measuring range:	0.1 to 120 000 rpm (when 1 pulse/rev.)

Digital Outputs

Digital outputs:	3, open collector, user configurable

Analog Inputs

Input channels:	3
Measurement range:	0 to 20 mA
Resolution:	0.01 mA (12 bit)
Meas. accuracy:	± (1% +0.1 mA)
Input resistance:	current 100 Ω
Cable length:	max. 100 m

Part numbers

INS08V	Intellinova Compact system unit, enamelled steel
INS08VSS	Intellinova Compact system unit, stainless steel

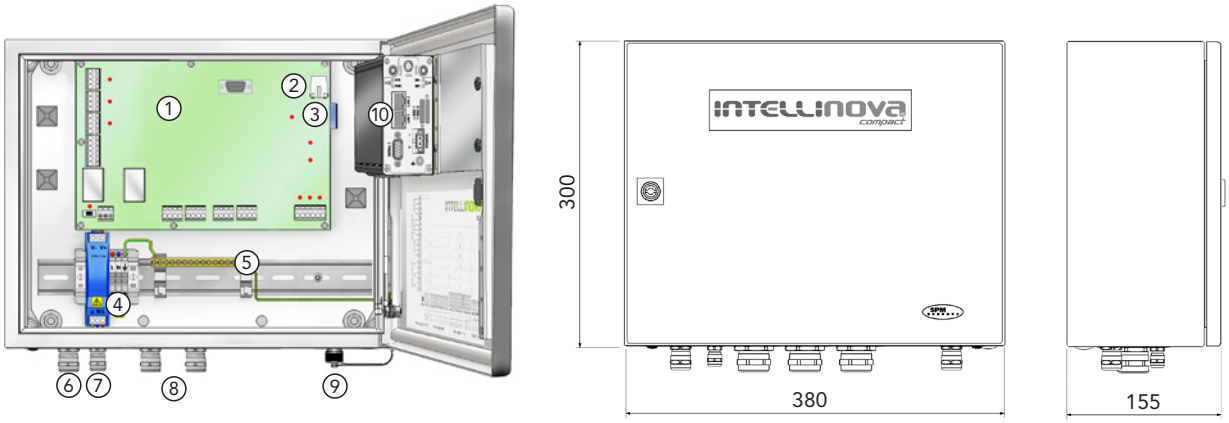
Accessories

IND08	Stand for portable system unit (TD-349)
IND14	Relay for external alarm, 2 poles (TD-386)
IND19	Magnets for wall mounting, 3 pcs
81444	Mounting braces for wall mounting, 4 pcs.
90015	Rogowski coil for current measurement (TD-335)

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Intellinova® Compact – System unit INS08VW



1. Circuit board with in- and output terminals
2. Ethernet LAN connector RJ45
3. SD memory card
4. Power supply unit on DIN rail
5. Earth rail with screw terminals
6. Inlet Pg11 for power supply cable
7. Inlets 3xPg7 for RPM/DI cables
8. Inlets 2xPg20 for 8 measuring cables
9. Connector for external antenna
10. 4G router

The system unit INS08VW in the Intellinova Compact series is a small and advanced measuring unit for continuous monitoring of machine condition. It is complete with power supply unit, 4G router, external antenna, DIN rail with screw terminals for earth connections and space for optional equipment. The enclosure, intended for wall mounting, is robust and sealed for use in harsh environments.

INS08VW measures vibration on eight channels and analog signals on three channels. Up to three RPM transducers can be connected and linked to measuring assignments set up in Condmaster®. The unit has three digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc. The circuit board is equipped with status LED indicators and an SD memory card used for data buffering and setup of the system unit.

The built-in 4G router is designed to provide remote connectivity across mobile networks. It is connected via a 10/100 Ethernet switch and supports a wide variety of wireless standards. Specifications for the 4G router 90645 is stated on the technical data sheet TD-550.

Technical specifications

Design, enclosure:	enamelled steel, IP66
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps
Wireless:	4G router incl. omni-directional antenna and antenna cable (TD-550)
Power supply unit:	100 to 240 V AC, Output 12 VDC, 1.5 A
Operating temp.:	–20 to +60 °C (–4 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	380x300x155 mm (15x11.8x6.1 in)
Weight:	approx. 8.7 kg (19.2 lbs)

Vibration Monitoring

Measuring methods:	ISO 2372, ISO10816, HD ENV, FFT with symptoms, EVAM
Measuring channels:	8, multiplexing
Frequency range:	DC to 40 kHz
Measuring range:	≥60 g peak-peak (using 100 mV/g transducer)
Resolution:	0.0015 m/s² RMS (using 100 mV/g transducer)
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Transducer type:	SLD144, SLC144 DuoTech or IEPE (ICP®) type transducers with a nominal bias output voltage of 10 to 14 V DC

Digital Inputs

Digital/RPM inputs:	3 channels, multiplexing
RPM transducer type:	proximity switches, supply 12 V DC
RPM measuring range:	0.1 to 120 000 rpm (when 1 pulse/rev.)

Digital Outputs

Digital outputs:	3, open collector, user configurable

Analog Inputs

Input channels:	3
Measurement range:	0 to 20 mA
Resolution:	0.01 mA (12 bit)
Meas. accuracy:	± (1% +0.1 mA)
Input resistance:	current 100 Ω
Cable length:	max. 100 m

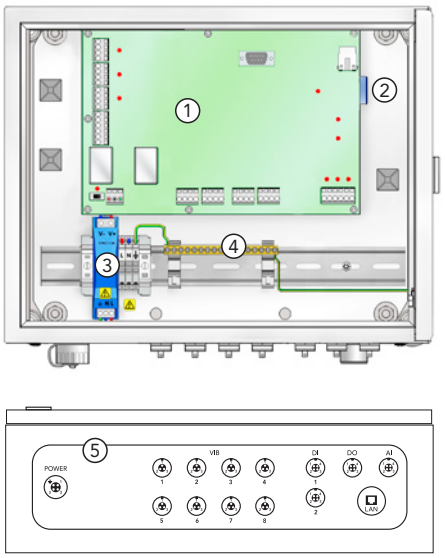
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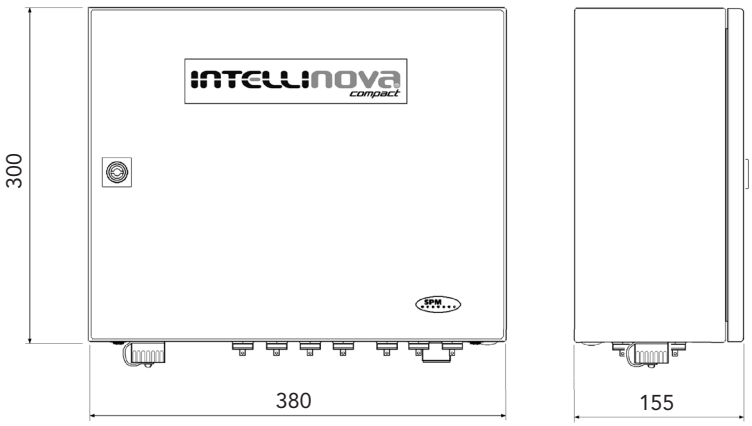
IND08	Stand for portable system unit (TD-349)
IND14	Relay for external alarm, 2 poles (TD-386)
IND19	Magnets for wall mounting, 3 pcs
81444	Mounting braces for wall mounting, 4 pcs.
90015	Rogowski coil for current measurement (TD-335)
90458	Antenna cable, 10 m

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Intellinova® Compact – System Unit INS08V-C





1. Circuit board
2. SD memory card
3. Power supply unit on DIN rail
4. Earth rail with screw terminals
5. Gland plate with input and output connectors

Intellinova Compact INS08V-C is a small and advanced measuring unit for continuous monitoring of machine condition. INS08V-C has the same specifications as INS08V, except that it is equipped with input and output connectors on the gland plate. The unit is complete with power supply unit, internal wiring and DIN rail with space for optional equipment. The enclosure is robust and sealed IP66 for use in harsh environments.

INS08V-C measures vibration on eight channels and analog signals on three channels. Up to three RPM transducers can be connected and linked to measuring assignments set up in Condmaster®.

The unit has three digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc.

The unit is equipped with multiplexing measuring logic, alarm, storing and analysis logic. It is connected via standard Ethernet in a LAN network. The circuit board is equipped with status LED indicators and an SD memory card used for data buffering and setup of the system unit.

Both vibration and shock pulse (HDm/HDc) measurements can be performed using DuoTech® accelerometers.

Technical specifications

Design, enclosure:	enamelled steel, IP66
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps
LAN connector:	RJ45 BULGIN PX0834/B
Power supply unit:	100 to 240 V AC, Output 12 V DC, 1.5 A
Power supply connector:	AMPHENOL C16-1 3p+EP
Operating temperature:	–20 to +60 °C (–4 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	380 x 300 x 155 mm (15 x 11.8 x 6.1 in)
Weight:	approx.8.2 kg (18 lbs)

Vibration Monitoring

Measuring methods:	ISO 2372, ISO10816, HD ENV, FFT with symptoms, EVAM
Measuring channels:	8, multiplexing
Frequency range:	DC to 40 kHz
Measuring range:	≥60 g peak-peak (using 100 mV/g transducer)
Resolution:	0.0015 m/s² RMS (using 100 mV/g transducer)
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Input connectors (8):	LEMO 1K 3-pin
Transducer type:	SLD144, SLC144 DuoTech or IEPE (ICP®) type transducers with a nominal bias output voltage of 10 to 14 V DC

Digital Inputs DI

Digital inputs on CBA:	3 channels, multiplexing
RPM transducer type:	proximity switches, supply 12 V DC
RPM measuring range:	0.1 to 120 000 rpm (when 1 pulse/rev.)
Input connectors (2):	LEMO 1K 4-pin for 2 DI channels

Digital Outputs DO

Digital outputs on CBA:	3, open collector, user configurable
Output connector (1):	LEMO 1K 4-pin for 2 DO channels

Analog Inputs AI

Input channels on CBA:	3
Measurement range:	0 to 20 mA
Resolution:	0.01 mA (12 bit)
Meas. accuracy:	± (1% +0.1 mA)
Input resistance:	current 100 Ω
Cable length:	max. 100 m
Input connector (1):	LEMO 1K 4-pin for 1 AI channel

Accessories

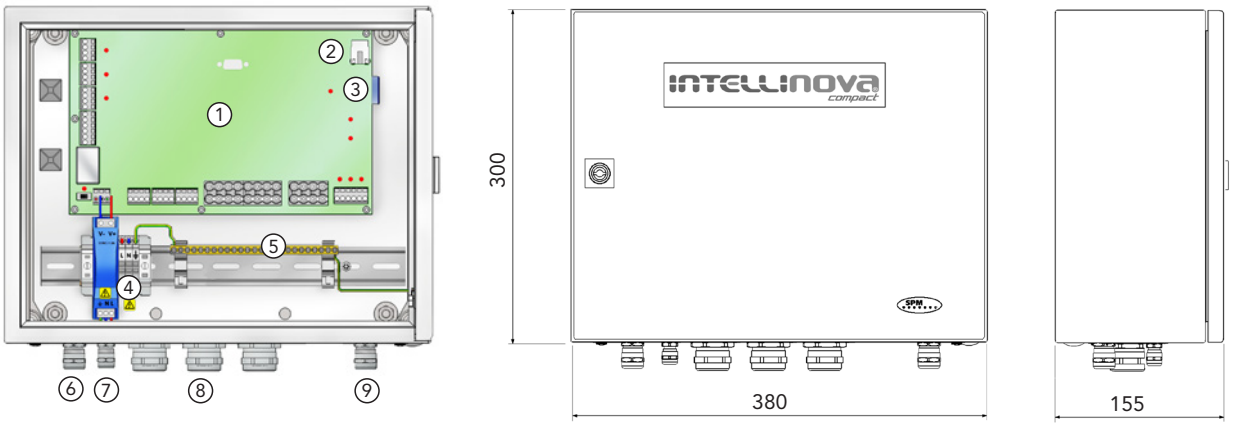
IND08	Stand for portable system unit (TD-349)
IND14	Relay for external alarm, 2 poles (TD-386)
IND19	Magnets for wall mounting, 3 pcs
81444	Mounting braces for wall mounting, 4 pcs.
90015	Rogowski coil for current measurement (TD-335)

Suitable cables and connectors, see TD-398.

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Intellinova® Compact – System Unit INS18



1. Circuit board with input and output terminals
2. Ethernet LAN connector RJ45
3. SD memory card
4. Power supply unit on DIN rail
5. Earth rail with screw terminals
6. Inlet Pg11 for power supply cable*
7. Inlets 3 x Pg7 for DI/RPM cables*
8. Inlets 3 x M25 for 18 measuring cables*
9. Inlet M20 for network cable*

*for stainless steel (INS18SS), see below

The system unit INS18 in the Intellinova Compact series is a small and advanced measuring unit for continuous monitoring of machine condition. The system unit is complete with power supply unit, DIN rail with screw terminals for earth connections and space for optional equipment. The enclosure is intended for wall mounting and sealed IP66 for use in harsh environments.

INS18 measures bearing condition on twelve channels, vibration on six channels and analog signals on three channels. Three RPM transducers can be connected and linked to measuring assignments set up in Condmaster®Ruby. The unit has three digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc.

The unit is equipped with multiplexing measuring logic, alarm, storing and analysis logic. It is connected via standard Ethernet in a LAN network. The circuit board is equipped with status LED indicators and an SD memory card used for data buffering and setup of the unit.

Technical specifications

Design, enclosure:	enamelled steel (INS18) or stainless steel (INS18SS), IP66
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps
Power supply unit:	100 to 240 V AC, Output 12 V DC, 1.5 A
Operating temperature:	–20 to +60 °C (–4 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	INS18: 380x300x155 mm (15x11.8x6.1 in) INS18SS: 380x380x210 mm (15x15x8.3 in)
Cable inlets:	INS18: 3xPg7, Pg11, 3xM25, M20 INS18SS: 4xM16, 5xM25, M20
Weight:	INS18: approx. 8.2 kg (18 lbs) INS18SS: approx. 11,7 kg (26 lbs)

Bearing Monitoring

Measuring methods:	SPM HD, LR/HR HD
Measuring channels:	12, multiplexing
Measuring range SPM HD:	–20 to 80 dBsv
Measuring range LR/HR:	–19 to 80 dBsv
Amplitude scale unit:	HDm/HDc, LR/HR, Time Signal HD, SPM Spectrum HD
Transducer line test:	TLT test
Input connectors:	for coaxial cables with connector 12775
Transducer type:	SPM 44000 series, only for coaxial cables

Vibration Monitoring

Measuring methods:	ISO 2372, ISO10816, HD ENV, FFT with symptoms, EVAM
Measuring channels:	6, multiplexing
Frequency range:	DC to 40 kHz
Measuring range:	≥60 g peak-peak (using 100 mV/g transd.)
Resolution:	0.0015 m/s² RMS (using 100 mV/g transd.)
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Transducer type:	SLD144, SLC144 DuoTech or IEPE (ICP®) type transducers with a nominal bias output voltage of 10 to 14 V DC

Digital Inputs

Digital/RPM inputs:	3 channels, multiplexing
RPM transducer type:	proximity switches, supply 12 V DC
RPM measuring range:	0.1 to 120 000 rpm (when 1 pulse/rev.)

Digital Outputs

Digital outputs:	3, open collector, user configurable

Analog Inputs

Input channels:	3
Measurement range:	0 to 20 mA
Resolution:	0.01 mA (12 bit)
Meas. accuracy:	± (1% +0.1 mA)
Input resistance:	current 100 Ω
Cable length:	max. 100 m

Part numbers

INS18	Intellinova Compact system unit, enamelled steel
INS18SS	Intellinova Compact system unit, stainless steel

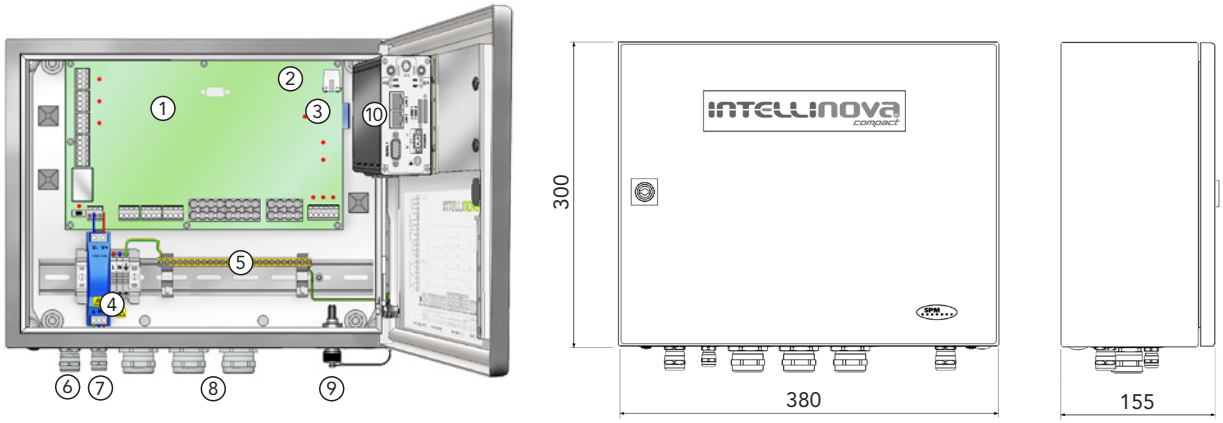
Accessories

12775	Connector for coaxial cable
IND08	Stand for portable system unit (TD-349)
IND14	Relay for external alarm, 2 poles (TD-386)
IND19	Magnets for wall mounting, 3 pcs
81444	Mounting braces for wall mounting, 4 pcs.
90015	Rogowski coil for current measurement (TD-335)

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Intellinova® Compact – System Unit INS18W



1. Circuit board with input and output terminals
2. Ethernet LAN connector RJ45
3. SD memory card
4. Power supply unit on DIN rail
5. Earth rail with screw terminals
6. Inlet Pg11 for power supply cable
7. Inlets 3 x Pg7 for RPM/DI cables
8. Inlets 3 x M32 for 18 measuring cables
9. Connector for external antenna
10. 4G router

The system unit INS18W in the Intellinova Compact series is a small and advanced measuring unit for continuous monitoring of machine condition. It is complete with power supply unit, 4G router, external antenna, DIN rail with screw terminals for earth connections and space for optional equipment. The enclosure, intended for wall mounting, is robust and sealed for use in harsh environments.

INS18W measures bearing condition on twelve channels, vibration on six channels and analog signals on three channels. Up to three RPM transducers can be connected and linked to measuring assignments set up in Condmaster®. The unit has three digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc The circuit board is equipped with status LED indicators and an SD memory card used for data buffering and setup of the system unit.

The built-in 4G router is designed to provide remote connectivity across mobile networks. It is connected via a 10/100 Ethernet switch and supports a wide variety of wireless standards. Specifications for the 4G router 90645 is stated on the technical data sheet TD-550.

Technical specifications

Design, enclosure:	enamelled steel, IP66
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps
Wireless:	4G router incl. omni-directional antenna and 0.75 m antenna cable (TD-550)
Power supply unit:	100 to 240 V AC, Output 12 V DC, 1.5 A
Operating temperature:	–20 to +60 °C (–4 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	380 x 300 x 155 mm (15 x 11.8 x 6.1 in)
Weight:	approx. 9.8 kg (21 lbs)

Bearing Monitoring

Measuring methods:	SPM HD, LR/HR HD
Measuring channels:	12, multiplexing
Measuring range SPM HD:	–20 to 80 dBsv
Measuring range LR/HR:	–19 to 80 dBsv
Amplitude scale unit:	HDm/HDc, LR/HR, Time Signal HD, SPM Spectrum HD
Transducer line test:	TLT test
Input connectors:	for coaxial cables with connector 12775
Transducer type:	SPM 44000 series, only for use with coaxial cable

Vibration Monitoring

Measuring methods:	ISO 2372, ISO10816, HD ENV, FFT with symptoms, EVAM
Measuring channels:	6, multiplexing
Frequency range:	DC to 40 kHz
Measuring range:	≥60 g peak-peak (using 100 mV/g transducer)
Resolution:	0.0015 m/s² RMS (using 100 mV/g transducer)
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Transducer type:	SLD144, SLC144 DuoTech or IEPE (ICP®) type transducers with a nominal bias output voltage of 10 to 14 V DC

Digital Inputs

Digital/RPM inputs:	3 channels, multiplexing
RPM transducer type:	proximity switches, supply 12 V DC
RPM measuring range:	0.1 to 120 000 rpm (when 1 pulse/rev.)

Digital Outputs

Digital outputs:	3, open collector, user configurable

Analog Inputs

Input channels:	3
Measurement range:	0 to 20 mA
Resolution:	0.01 mA (12 bit)
Meas. accuracy:	± (1% +0.1 mA)
Input resistance:	current 100 Ω
Cable length:	max. 100 m

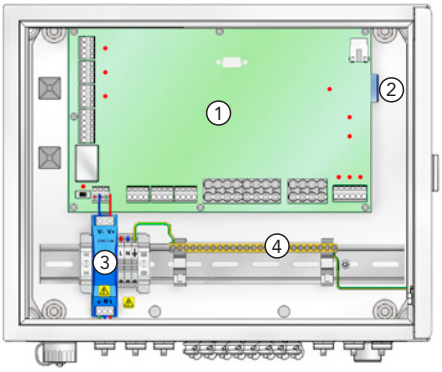
Accessories

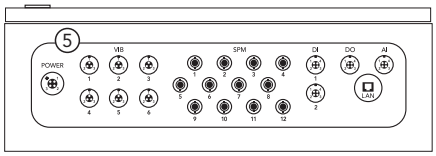
12775	Connector for coaxial cable
IND08	Stand for portable system unit (TD-349)
IND14	Relay for external alarm, 2 poles (TD-386)
IND19	Magnets for wall mounting, 3 pcs
81444	Mounting braces for wall mounting, 4 pcs.
90015	Rogowski coil for current measurement (TD-335)
90458	Antenna cable, 10 m

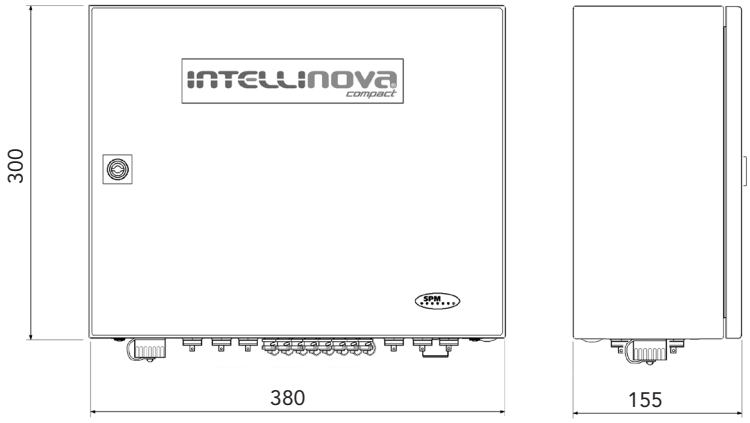
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Intellinova® Compact – System Unit INS18-C







1. Circuit board
2. SD memory card
3. Power supply unit on DIN rail
4. Earth rail with screw terminals
5. Gland plate with input and output connectors

Intellinova Compact INS18-C is a small and advanced measuring unit for continuous monitoring of machine condition. INS18-C has the same specifications as INS18, except that it is equipped with input and output connectors on the gland plate. The unit is complete with power supply unit, internal wiring and DIN rail with space for optional equipment. The enclosure is robust and sealed IP66 for use in harsh environments.

INS18-C measures bearing condition on twelve channels, vibration on six channels and analog signals on three channels. Up to three RPM transducers can be connected and linked to measuring assignments set up in Condmaster® The unit has three digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc.

The unit is equipped with multiplexing measuring logic, alarm, storing and analysis logic. It is connected via standard Ethernet in a LAN network. The circuit board is equipped with status LED indicators and an SD memory card used for data buffering and setup of the unit.

Technical specifications

Design, enclosure:	enamelled steel, IP66
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps
LAN connector:	RJ45 BULGIN PX0834/B
Power supply unit:	100 to 240 V AC, Output 12 V DC, 1.5 A
Power supply connector:	AMPHENOL C16-1 3p+EP
Operating temperature:	–20 to +60 °C (–4 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	380 x 300 x 155 mm (15 x 11.8 x 6.1 in)
Weight:	approx.8.2 kg (18 lbs)

Bearing Monitoring

Measuring method:	SPM HD, LR/HR HD
Measuring channels:	12, multiplexing
Measuring range SPM HD:	–20 to 80 dBsv
Measuring range LR/HR:	–19 to 80 dBsv
Amplitude scale unit:	HDm/HDc, LR/HR, Time Signal HD, SPM Spectrum HD
Transducer line test:	TLT test
Input connectors (12):	BNC
Transducer type:	SPM 44000 series, only for use with coaxial cables

Vibration Monitoring

Measuring methods:	ISO 2372, ISO10816, HD ENV, FFT with symptoms, EVAM
Measuring channels:	6, multiplexing
Frequency range:	DC to 40 kHz
Measuring range:	≥60 g peak-peak (using 100 mV/g transducer)
Resolution:	0.0015 m/s² RMS (using 100 mV/g transducer)
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Input connectors (6):	LEMO 1K 3-pin
Transducer type:	SLD144, SLC144 DuoTech or IEPE (ICP®) type transducers with a nominal bias output voltage of 10 to 14 V DC

Digital Inputs DI

Digital inputs on CBA:	3 channels, multiplexing
RPM transducer type:	proximity switches, supply 12 V DC
RPM measuring range:	0.1 to 120 000 rpm (when 1 pulse/rev.)
Input connectors (2):	LEMO 1K 4-pin for 2 DI channels

Digital Outputs DO

Digital outputs on CBA:	3, open collector, user configurable
Output connector (1):	LEMO 1K 4-pin for 2 DO channels

Analog Inputs AI

Input channels on CBA:	3
Measurement range:	0 to 20 mA
Resolution:	0.01 mA (12 bit)
Meas. accuracy:	± (1% +0.1 mA)
Input resistance:	current 100 Ω
Cable length:	max. 100 m
Input connector (1):	LEMO 1K 4-pin for 1 AI channel

Accessories

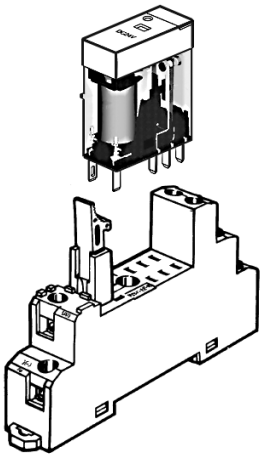
IND08	Stand for portable system unit (TD-349)
IND14	Relay for external alarm, 2 poles (TD-386)
IND19	Magnets for wall mounting, 3 pcs
81444	Mounting braces for wall mounting, 4 pcs.
90015	Rogowski coil for current measurement (TD-335)

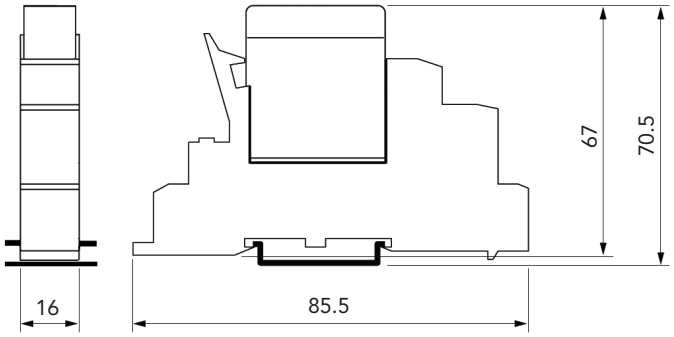
Suitable cables and connectors, see TD-398.

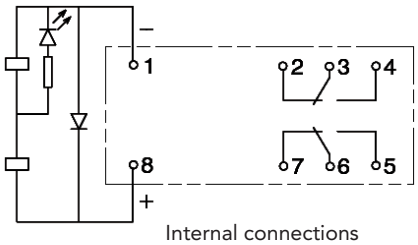
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Intellinova® Compact – Relay IND14





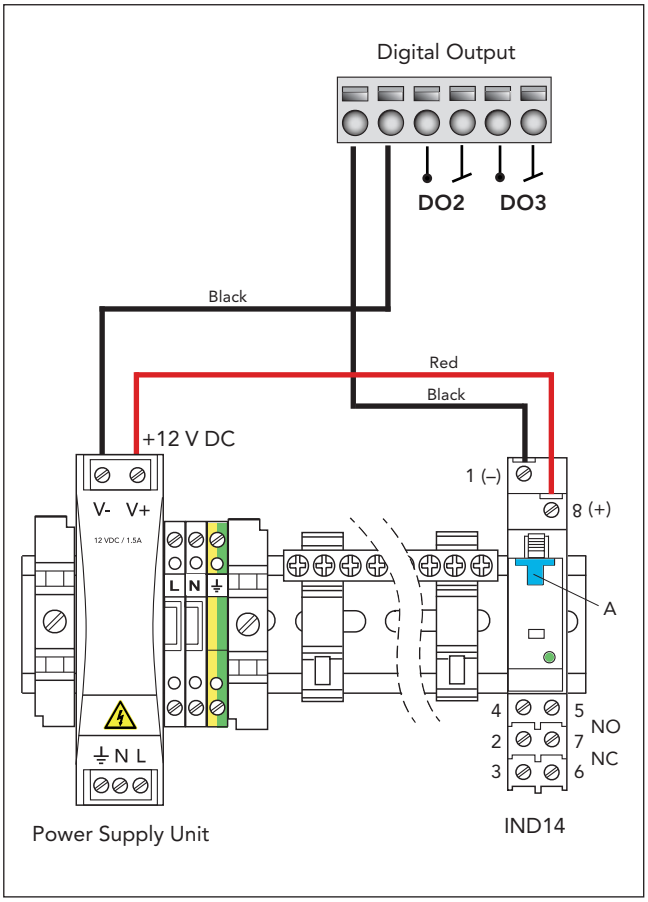


Internal connections

IND14 is a slim relay of plug-in type mounted in a socket for DIN rail mounting. It has a LED indicator showing mechanical operation and a test button (A). The relay is delivered with socket and internal cabling for Intellinova Compact.

Technical specifications

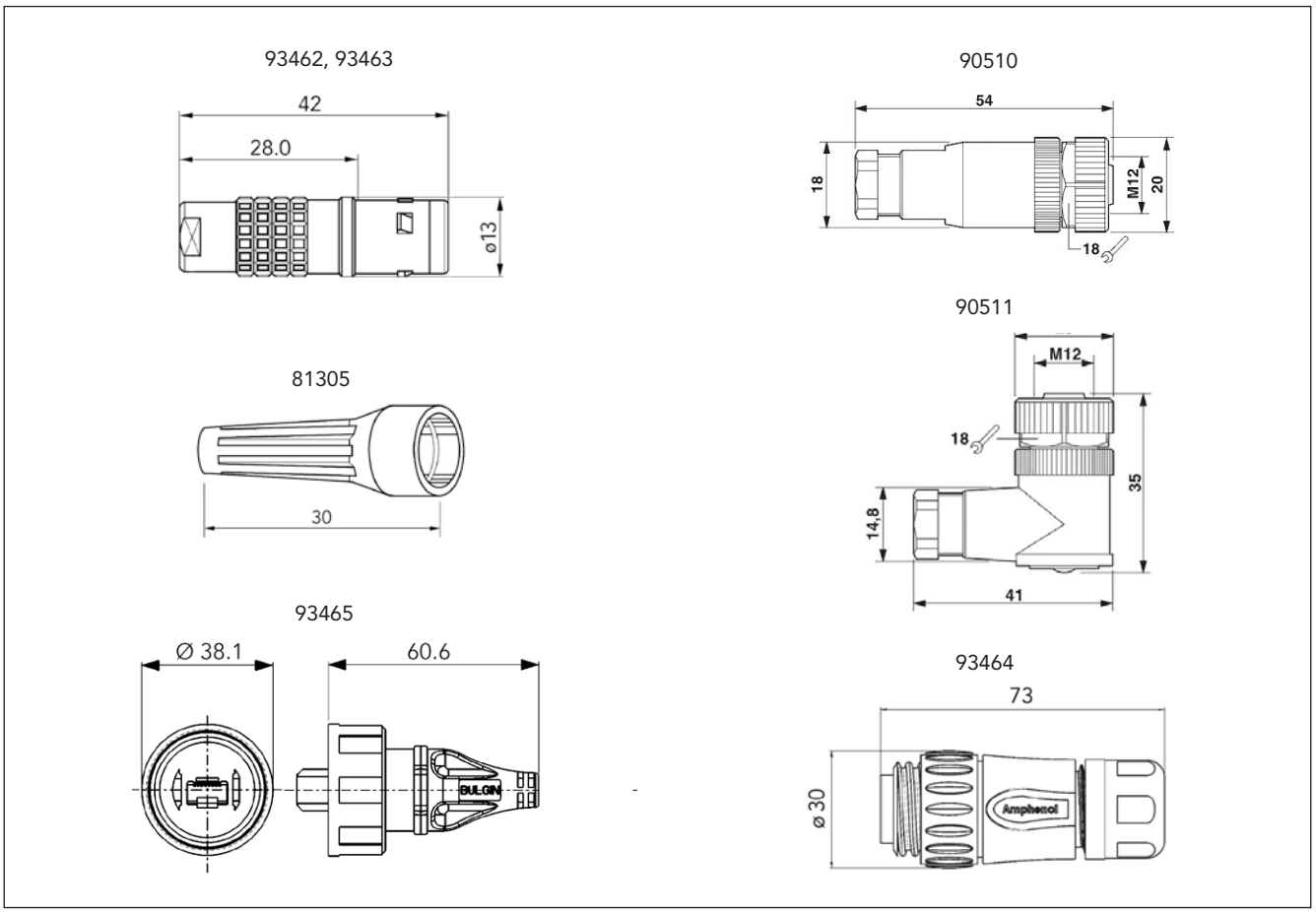
Poles:	2
Rated coil voltage:	12 VDC
Rated coil current:	43.2 mA
Power consumption:	0.53 W
Load:	resistive load (cosϕ =1), inductive load (cosϕ =0.4; L/R=7 ms)
Rated load:	resistive; 5A/250 VAC, 5A/30 VDC inductive; 2A/250 VAC, 3A/30 VDC
Rated carry current:	5 A
Max. switching voltage:	380 VAC, 125 VDC
Max. switching current:	5 A
Max. switching power:	resistive; 1250 VA, 150 W inductive; 500 VA, 90 W
Amb. temperature:	–40° to 70 °C (no condensation)
Amb. humidity:	5% to 85% (operating)
Dimensions:	85.5x67x16 mm
Mounting:	DIN rail
Approved standards:	UL508 (File No. E41643), IEC/VDE (EN61810), CSA 22.2 No.0, No.14 (File No. LR311928), LR



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Intellinova® Compact INS**C – Cables and Connectors



Part numbers

13008	Cable connector TNC for coaxial cable (TD-009)
93060	Cable connector BNC for coaxial cable (TD-019)
81018	Cable protection for BNC connector (TD-018)
90267-L	Coaxial cable RG58 (TD-393)
47126-L	Coaxial cable (90267) with connectors 93060 / 13008 (SPM)
16100	Cable connector 2-pin, jack (TD-314)
93462	Cable connector LEMO 1K 3-pin (VIB) max 0.50 mm², cable diam. 4.6-5.0 mm
93463	Cable connector LEMO 1K 4-pin (DI, DO, AI) max 0.34 mm², cable diam. 4.6-5.0 mm
81305	Cable protection for LEMO connector
90381-L	Twisted pair cable, 2 wires with 1 shield (TD-394)
90443-L	Twisted cable, 3 wires with 1 shield (TD-394)
90386-L	Twisted cable, 4 wires with 1 shield (TD-394)
46124-L	Twisted pair cable 90381 with connectors, 16100 (2-pin) / 93462 (3-pin) (VIB)
90510	Connector, 4-position straight female for inductive proximity switches (TD-384)
90511	Connector, 4-position angled female for inductive proximity switches (TD-384)
46127-L	Cable for DO/DI (90386) with connector 93463 / open end
46128-L	Cable for AI (90443) with connector 93463 / open end
46129-L	Cable for proximity switch, cable 90386 with connectors 93463 / 90510 (straight)
46130-L	Cable for proximity switch, cable 90386 with connectors 93463 / 90511 (angled)
93465	LAN connector RJ45, Cat 5e, IP68, BULGIN PX0834/B, max. 0.20 mm², cable diam. 3.5-8 mm
93475	LAN cable, Cat 5e, 5 m, with connectors 93465 / RJ45 standard
93464	Power cable connector AMPHENOL C16-1 3p+PE, 0.75-2.5 mm², cable diam. 6-9 mm
46123	Power cable US, 2 m (93464 / US connector)
46125	Power cable UK, 2 m (93464 / UK connector)
46126	Power cable EU, 2 m (93464 / EU connector)

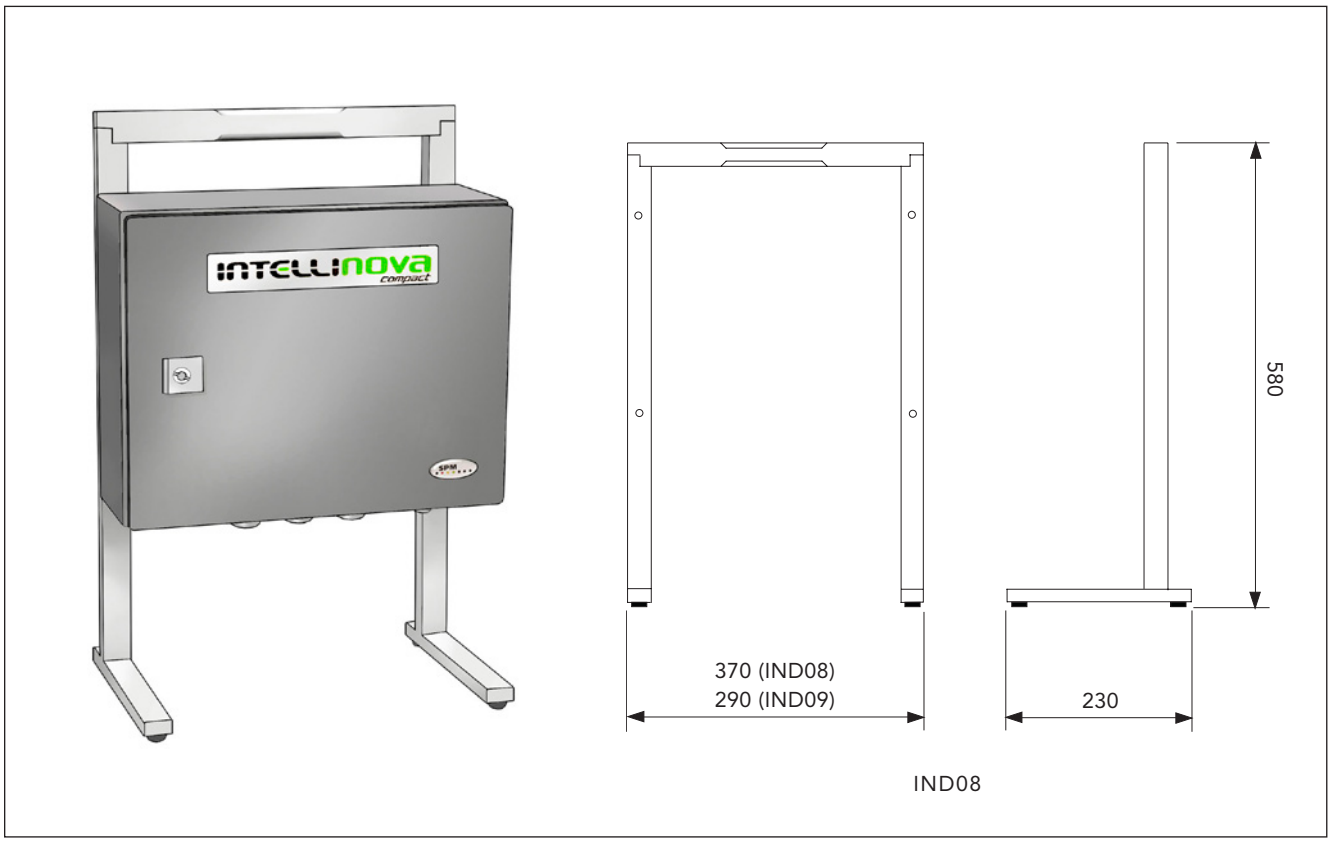
Note! When ordering cables, state the desired length (L) in meters.

SPM

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Intellinova® Compact – Stand for Portable System Unit



IND08

The stands IND08 and IND09 are mounted on the Intellinova Compact system units for conversion to portable units. Portable units allow rapid installation and are ideal for test installations, temporary monitoring of critical machines, etc.

They can also be used as multichannel loggers with data acquisition based on various triggers, stand-alone or in networks. The stands are made of polished aluminium and are easily mounted on the system units with four screws.

Technical specifications

Dimensions (w x h x d):	370x580x230 mm (IND08)
	290x580x230 mm (IND09)
Weight:	approx. 2.2 kg (4.9 lbs)

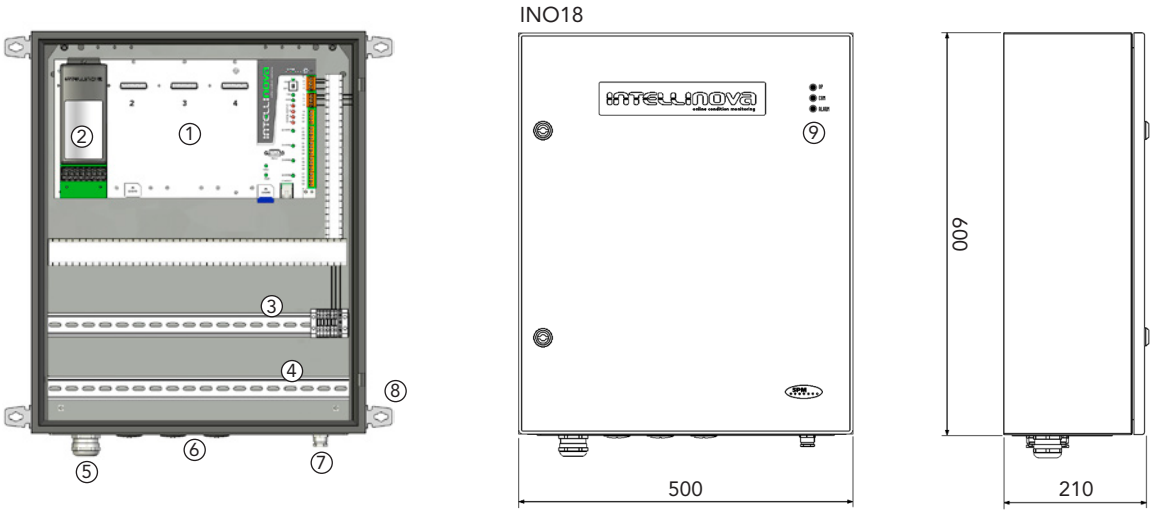
Part numbers

IND08	Stand for System Unit INS08, INS12 and INS18
IND09	Stand for System Unit INS06

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Intellinova® – System unit



1. Commander unit INC40
2. Monitoring unit
3. DIN rail with terminal blocks
4. Earth rail, DIN
5. Cable inlet PG29
6. Blind plugs for additional inlets
7. Cable inlet PG11
8. Mounting braces (option)
9. Status LED indicators (option)

The Intellinova system unit is comprised of an industrial enclosure, a commander unit INC40, internal cabling and terminals for power supply. Up to four monitoring units can be mounted and are ordered separately. The enclosure, intended for wall mounting, is robust and sealed for use in harsh environments. The operating temperature range is 0° to +55 °C (32° to 131 °F) and the storage temperature range is −20° to +80° C (−4° to +176 °F).

The unit has a flange with one cable inlet for eight measuring cables plus two cable inlets for power supply and network connection. It has three blind plugs where additional cable inlets (Pg29) for up to 32 measuring cables can be mounted.

Holes for cable inlets intended for digital in- and output connections have to be drilled. The DIN rail has terminal blocks and cabling for connection of power supply. The unit has an earth rail (DIN) where the measuring cable shields should be connected. The unit is equipped with plastic cable channels. Power supply unit, status LED indicators, accessories for DIN rails, internal cabling and cable inlets are ordered separately.

Technical specifications and accessories for the Commander Unit, *see technical data sheet TD-271*. The various types of monitoring units, *see technical data sheet TD-272 to TD-275*. Accessories for INS10, *see technical data sheet TD-289*.

Part numbers

INS10	System unit (INC40+INO18)
INS11	System unit (INC40+INO22)
INC40	Commander unit (TD-271)
INO18	Cabinet for commander unit INC40 (TD-320) 500x600x210 mm (19.7x23.6x8.3 in)
INO22	Cabinet for commander unit INC40 (TD-322) 480x480x155 mm (18.9x18.9x6.1 in)

Monitoring units

INB80	Bearing Monitoring Unit for SPM transducers of type 40000, coax cables (TD-272)
INB80T	Bearing Monitoring Unit for SPM transducers of type 40000, pair cables (TD-272)
INB82	Bearing Monitoring Unit for SPM transducers of type 42000, coax cables (TD-272)
INB82T	Bearing Monitoring Unit for SPM transducers of type 42000, pair cables (TD-272)
INV80A	Vibration Monitoring Unit (TD-273)
INAI10	Analog Monitoring Unit (TD-274)
INAO80	Analog Output Unit (TD-275)

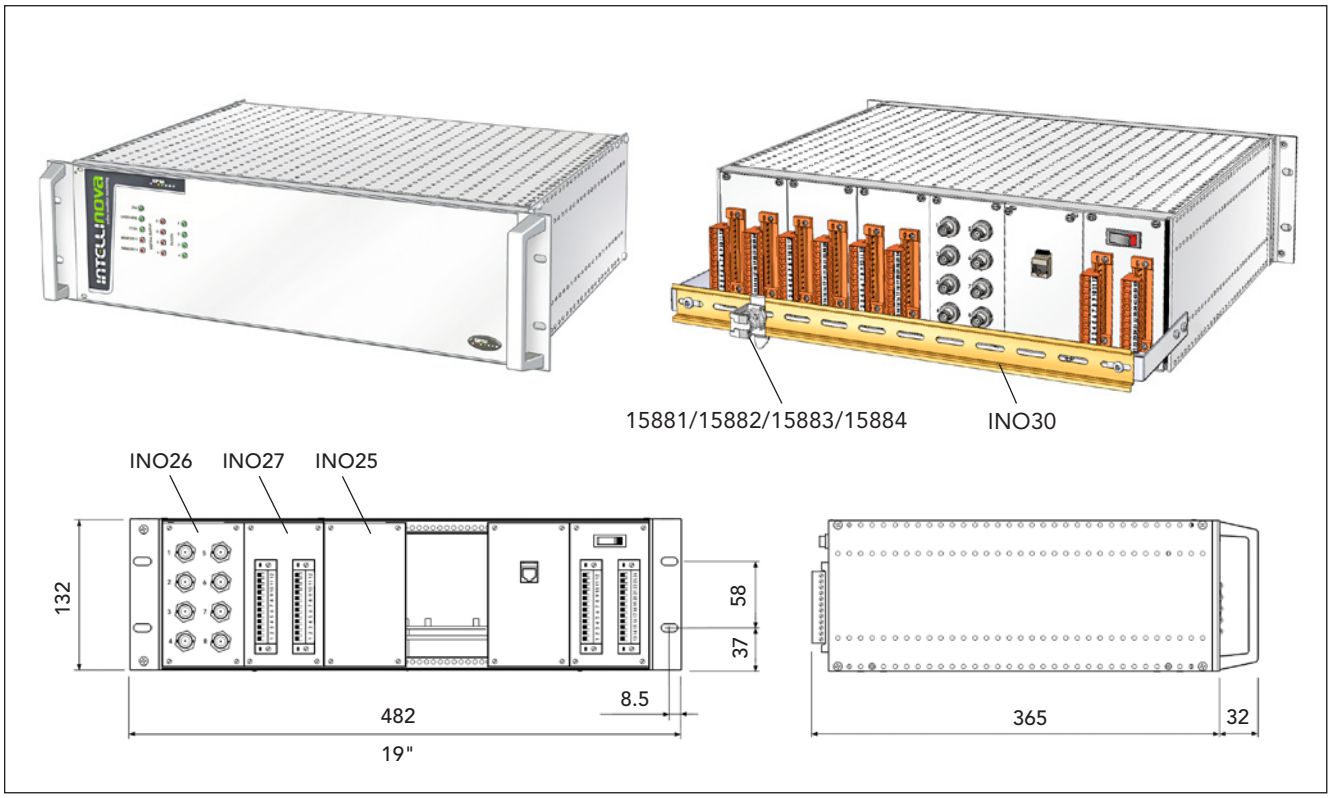
Options

INO11	Power supply unit, 18 W (TD-288)
INO12	Power supply unit, 50 W (TD-288)
INO13	Internal cabling with terminal blocks for digital outputs, 3 channels
INO14	Internal cabling with terminal blocks for digital inputs, 4 channels
INO16	Relay for external alarm, 2 poles (TD-290)
INO17	Key Phasor Interface, 2 channels (TD-299)
INO31	Wireless 4G router 90645 (TD-550), compl. set with antenna and 10 m antenna cable
INO37	Status LED indicators
81325	Mounting braces, 4 pcs

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Intellinova® – System Unit INR20 for 19" Rack



INR20 is an Intellinova System Unit for 19 inch rack mounting. It has a built-in Commander Unit INC41 with sockets for up to four monitoring units. The back panels are equipped with terminal blocks and internal cabling for connection of power supply and digital in- and outputs. The system unit has LED indicators on the front panel showing its status.

Monitoring units, back panels with internal cabling and power supply unit are ordered separately.

Technical specifications for the Commander Unit are stated on data sheet TD-271. The various types of monitoring units are described on the data sheets TD-272 to TD-275.

Technical specifications, INR20

Design, enclosure:	anodised aluminium, ventilated
Power supply:	18 to 36 V DC, nom. 24 V DC
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Terminals on back panels:	network connection RJ45, screw terminal blocks for power supply and digital in- and outputs
Dimensions (w x h x d):	482 (19") x 132 (3U) x 365 mm
Weight:	approx. 4 kg (9 lbs)

Part numbers

INR20	System unit (INO24 + INC41)
INC41	Commander Unit
INO24	Subrack for Commander Unit INC41
INB80	Bearing Monitoring Unit for SPM transducers of type 40000/coaxial cable (TD-272)
INB80T	Bearing Monitoring Unit for SPM transducers of type 40000/pair cable (TD-272)
INB82	Bearing Monitoring Unit for SPM transducers of type 42000/coaxial cable (TD-272)
INB82T	Bearing Monitoring Unit for SPM transducers of type 42000/pair cable (TD-272)
INV80A	Vibration Monitoring Unit, screw terminals (TD-273)
INAI10	Analog Monitoring Unit (TD-274)
INAO80	Analog Output Unit (TD-275)
INO25	Blank back panel, (w x h) 70.5 x 128.5 mm
INO26	Back panel with eight BNC connectors and internal cabling suitable for INB80 and INB82
INO27	Back panel with two screw terminal blocks and internal cabling suitable for INB80T, INB82T, INV80A, INAI10 and INAO80
INO28	Power supply unit, 100 to 240 V, 50 W (TD-323)
INO30	Earth rail with mounting brackets, DIN
15881	Clamping yoke for earth rail, DIN, cable 3-8 mm
15882	Clamping yoke for earth rail, DIN, cable 4-13,5 mm
15883	Clamping yoke for earth rail, DIN, cable 10-20 mm
15884	Clamping yoke for earth rail, DIN, cable 15-32 mm

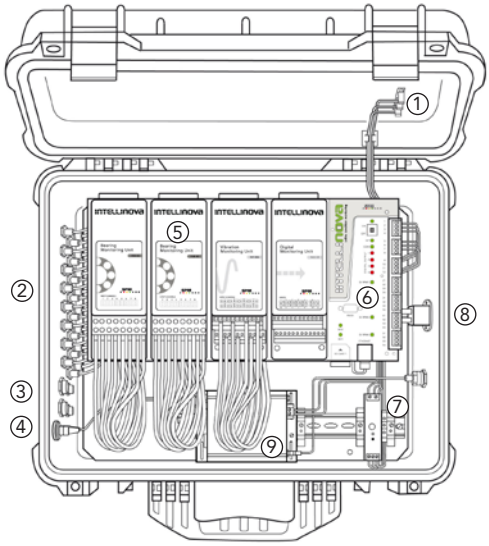
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Intellinova® – Portable System Unit

INO29





1. Status LED indicators
2. Transducer inputs
3. Cable inlets
4. Network connector
5. Monitoring units
6. Commander Unit INC40
7. Power supply unit
8. Power supply inlet with switch
9. Wireless 4G router

The Portable System Unit INP20 is comprised of a Commander Unit (INC40) mounted in a sturdy MIL standard plastic carrying case (INO23 or INO29 with wireless 4G router) with connectors, internal measuring cables and a power supply unit. The case fits a fullblown Intellinova system, using all the same components as the non-portable version and with all the features.

This system unit allows rapid installation and is ideal for test installations, temporary monitoring of critical machines, etc. It can also be used as a multichannel logger with data acquisition based on various triggers, stand-alone or in networks.

The carrying case has TNC jack connectors for bearing monitoring on 16 channels (two monitoring units), 2-pin plug connectors for vibration monitoring on 8 channels (one monitoring unit) and cable inlets for connection of one analog monitoring unit. The case has exterior power supply inlet with switch, network connector and status indicators. Monitoring units are ordered separately. Power supply cable is not included.

Technical specifications for the Commander Unit are stated on data sheet TD-271. The various types of monitoring units are described on the data sheets TD-272 to TD-275.

Technical specifications, INP20

Design, case:	copolymer, neoprene seals, automatic purge valve, IP67
Operating temperature:	0 to +60 °C (32 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Input connectors:	16 x TNC jack (for coax cables), 8 x 2-pin plug (for pair cables), network connector RJ45
Cable inlets:	2xPG7 and 2xPG11
Power supply:	100 to 240 V AC (85 to 265 V AC), 50/60 Hz, max. 10 A
Power inlet:	IEC inlet with line switch
Dimensions (w x h x d):	530 x 437 x 217 mm (20.9 x 17.2 x 8.5 inches)
Weight:	approx. 9 kg (20 lbs) with monitoring units

Part numbers

INP20	Portable System Unit (INC40+INO23)
INC40	Commander Unit (TD-271)
INO23	Case (without INC40 and monitoring units)
INO29	Case (without INC40 and monitoring units) incl. wireless 4G router 90645 (TD-550), omni-directional antenna 90460, connectors and 10 m cable

Monitoring units

INB80	Bearing Monitoring Unit for SPM transducers of type 40000, coax cables (TD-272)
INB82	Bearing Monitoring Unit for SPM transducers of type 42000, coax cables (TD-272)
INV80A	Vibration Monitoring Unit (TD-273)
INAI10	Analog Monitoring Unit (TD-274)
INAO80	Analog Output Unit (TD-275)

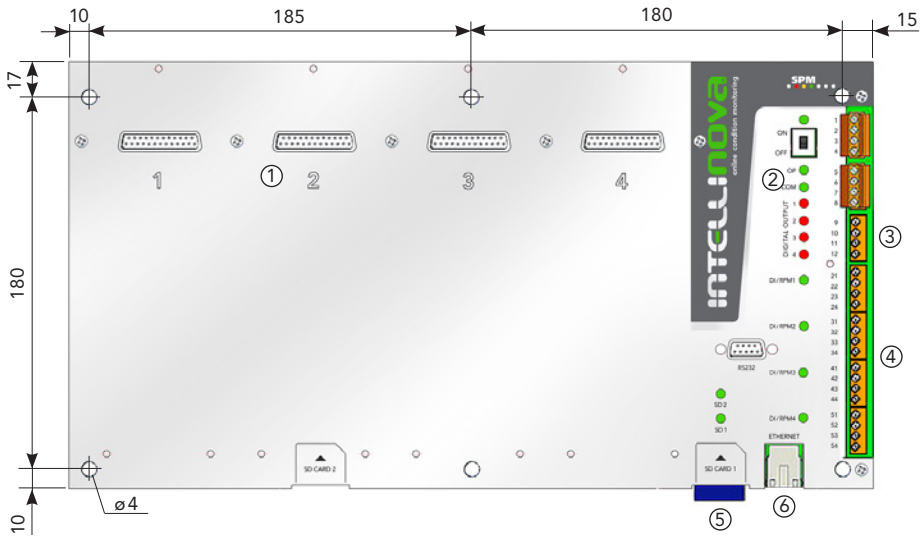
Accessories

90027	Power supply cable, Euro-plug

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Intellinova® – Commander Unit INC40/INC41



1. Sockets for monitoring units
2. Output status indicators
3. Digital outputs
4. Digital inputs
5. SD memory card
6. Ethernet LAN connection, RJ45

The Intellinova Commander Unit is a flexible and modular platform, which controls and communicates with the monitoring units for continuous moniring of machine condition. Up to four monitoring units with normally eight channels each can be plugged into the Commander Unit. Monitoring units are ordered separately and are described on the technical data sheets TD-272 to TD-275. INC40 is intended for mounting in standard Intellinova cabinets and INC41 is intended for mounting in 19" subrack INO24.

The Commander Unit is equipped with multiplexing measuring logic, alarm, storing and analysis logic. It is connected via standard Ethernet in a LAN network.

The unit has four digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc. Up to four RPM transducers can be connected and linked to measuring assignments set up in Condmaster®.

The communication program LinX transmits measuring assignments to and reads the results from the Commander Unit, and controls the measuring operations, data processing and storage. A service laptop with the Field Support Software (FSS) can be connected for service and setup via an Ethernet port. Data access to process and control systems can be implemented via OPC client/server technology. The unit can be used off-line and is equipped with SD memory card for buffering and back-up.

The measuring assignments are set up in Condmaster running under Windows. Condmaster also handles portable SPM dataloggers and existing SPM online systems. SQL Server is used as database handler.

Technical specifications

Monitoring units:	sockets for 4 monitoring units
Digital/RPM inputs:	4 channels
RPM transducer type:	proximity switches, supply 12 V DC
RPM measuring range:	1 to 120 000 rpm
Digital output:	2 status and 4 user configurable
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps, RJ45
Power supply:	18 to 36 V DC, nom. 24 V DC
Power consumption:	max. 21 W (6 W available for rpm transducers), typical 3 W without measuring units and rpm transducers
Operating temperature:	0 to +60 °C (32 to 140 °F)
Storage temperature:	−20 to +80 °C (−4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	390 x 207 x 40 mm (15.4 x 8.2 x 1.5 inches)
Weight:	approx. 750 g without monitoring units

Part numbers

INC40 Commander Unit for standard cabinets including mounting screws with spacers and 2 screw terminals for power supply and status indicators

INC41 Commander Unit for 19" subrack INO24 including mounting screws with spacers and 2 screw terminals for power supply and status indicators

Accessories

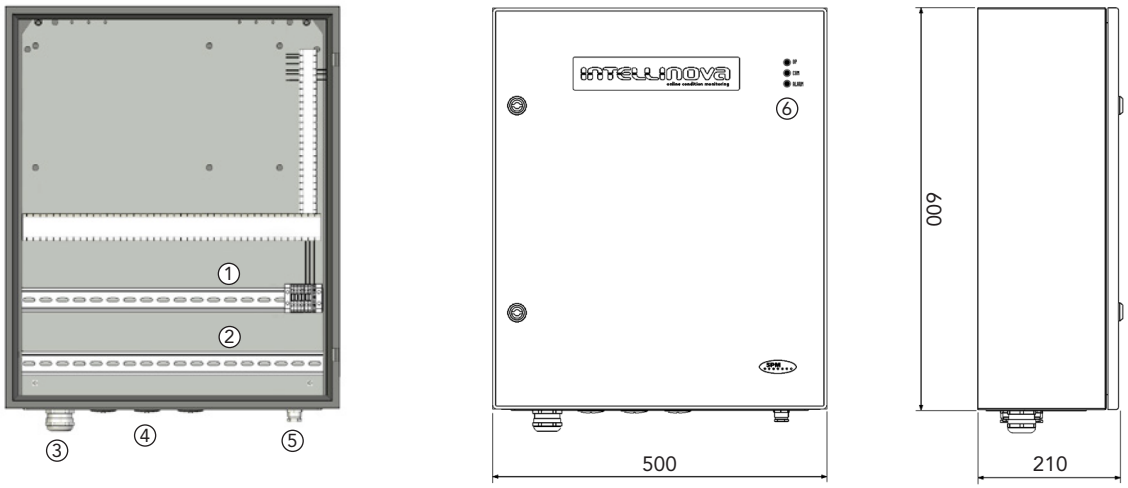
93384 Screw terminal, 4 pins, for connection of digital inputs/RPM and digital outputs

90419 SD memory card, 2 GB

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Intellinova® – Cabinet INO18



1. DIN rail with terminal blocks
2. Earth rail, DIN
3. Cable inlet PG29
4. Blind plugs for additional inlets
5. Cable inlet PG11
6. Status LED indicators (accessory)

Cabinet INO18 is an industrial enclosure designed for encapsulation of Intellinova Commander Unit INC40. It has internal cabling for INC40 and terminal blocks for power supply. The cabinet, intended for wall mounting, is robust and sealed for use in harsh environments.

The cabinet has a flange with one cable inlet for eight measuring cables plus two cable inlets for power supply and network connection. It has three blind plugs where additional cable inlets (PG29) for up to 32 measuring cables can be mounted. Holes for cable inlets intended for digital inputs and output connections have to be drilled. The cabinet has an earth rail (DIN) where the measuring cable shields should be connected. It is equipped with plastic cable channels. Power supply unit, status LED indicators, accessories for DIN rails, internal cabling and cable inlets are ordered separately.

Commander Unit INC40 is ordered separately and is described on the technical data sheet TD-271. The cabinet INO18 complete with mounted Commander Unit INC40 has part number INS10, see data sheet TD-270.

Technical specifications, INO18

Design, enclosure:	enamelled steel, IP66
Cable inlets:	1 x PG29 for 8 measuring cables 2 x PG11 for power supply and network cables
Terminals:	7 terminal blocks for connection of power supply cables
Dimensions (w x h x d):	500 x 600 x 210 mm (19.7 x 23.6 x 8.3 inches)
Mounting holes:	4 with diameter 8.5 mm, spacing (w x h) 460 x 560 mm
Weight:	approx. 20 kg (44 lbs)

Part numbers

INO18	Cabinet for Commander Unit INC40
INC40	Commander Unit (TD-271)
INS10	Complete system unit; Commander Unit INC40 mounted in Cabinet INO18 (TD-270)

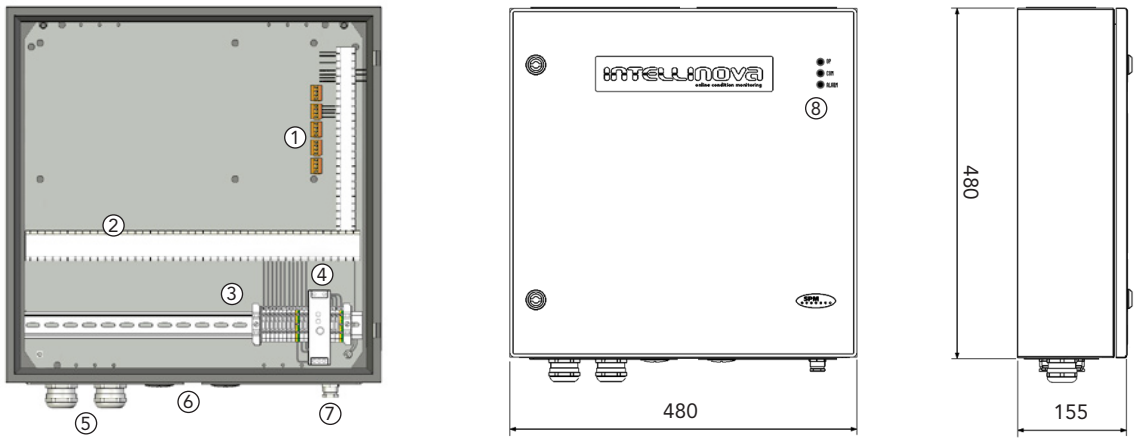
Accessories

INO11	Power supply unit, 18 W (TD-288)
INO12	Power supply unit, 50 W (TD-288)
INO13	Internal cabling with terminal blocks for digital outputs, 3 channels
INO14	Internal cabling with terminal blocks for digital inputs, 4 channels
INO16	Relay for external alarm, 2 poles (TD-290)
INO17	Key Phasor Interface, 2 channels
INO31	4G router 90645 incl. omni-directional antenna and 0.75 m antenna cable (TD-550)
INO37	Status LED indicators
81325	Mounting braces, 4 pcs

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Intellinova® – Cabinet INO22



1. Screw terminals for INC40
2. Plastic cable channels
3. DIN rail with terminal blocks
4. Power supply unit INO11
5. Cable inlet PG29 (8xØ5,5 mm)
6. Blind plugs for additional inlets
7. Cable inlet PG11 for power supply and M20 for network cable
8. Status LED indicators (option)

Cabinet INO22 is a small industrial enclosure designed for encapsulation of Intellinova commander unit INC40 in narrow spaces. It has internal cabling for INC40, power supply unit and terminal blocks for connection of digital inputs/rpm and power supply. The cabinet, intended for wall mounting, is robust and sealed for use in harsh environments.

The cabinet has flanges with two cable inlets for up to sixteen measuring cables plus two cable inlets for power supply and network connection. It has two blind plugs where additional cable inlets (PG29) can be mounted. Holes for cable inlets intended for digital input and output connections have to be drilled. The cabinet is equipped with plastic cable channels and status indicators on the lid. Additional cable inlets, terminal blocks and internal cabling are ordered separately.

Cabinet INO22 complete with mounted commander unit INC40 has part number INS11, see technical data sheet TD-270. The commander unit INC40 can be ordered separately, see technical data sheet TD-271. Power supply unit INO11 is described on technical data sheet TD-288.

Technical specifications

Design, enclosure:	enamelled steel, IP66
Power supply unit:	
Input voltage	100 to 240 V AC (85 to 265 V AC)
Frequency	50/60 Hz, max. 10 A
Output	+24 V DC, 18 W
Cable inlets:	2xPG29 for 16 measuring cables 1xPG11 for power supply 1xM20 for network cable
Terminals:	14 terminal blocks with internal cabling for connection of power supply and one channel DI/RPM plus four screw terminals 93384 for INC40 without internal cabling
Dimensions (w x h x d):	480x480x155 mm (18.9x18.9x6.1 inches)
Mounting holes:	four with diameter 8.5 mm, spacing (w x h) 440x440 mm
Weight:	approx. 15 kg (33 lbs)

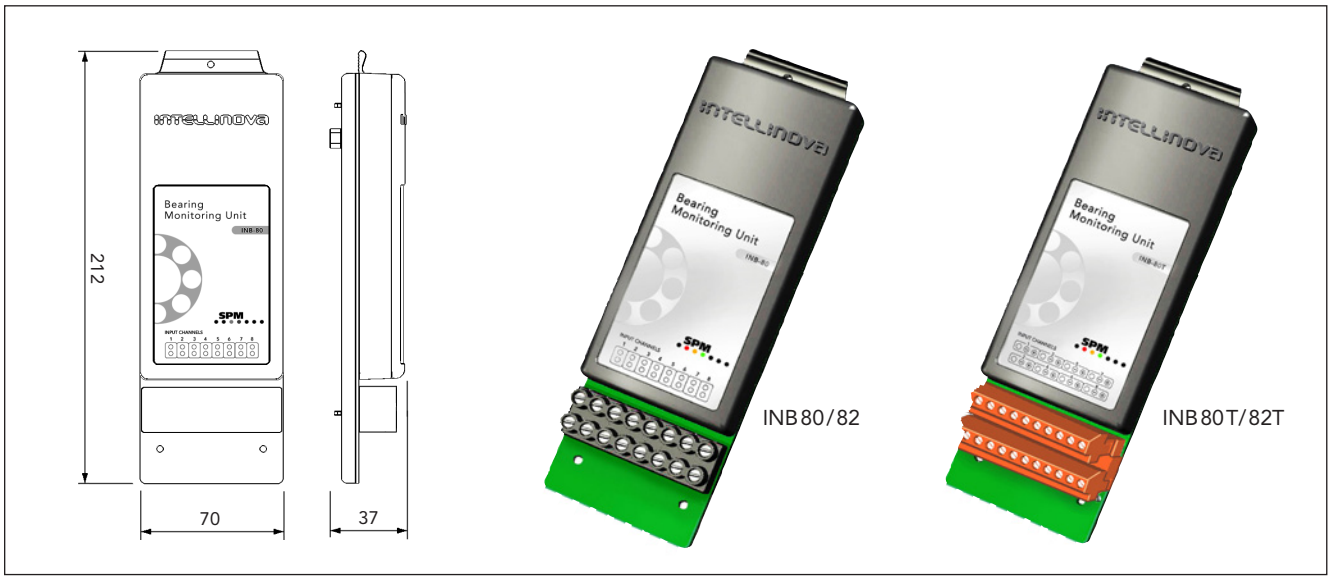
Options

INO37	Status LED indicators
81325	Mounting braces, 4 pcs

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Intellinova® – Bearing Monitoring Unit



The Bearing Monitoring Unit is a part of the Intellinova System and has eight channels for continuous monitoring of bearing condition. It measures shock pulses according to the True SPM method and supports SPM Spectrum and SPM HD. The unit is simply plugged into the socket in the Intellinova Commander Unit. Measuring methods, measuring time, alarm limits, alarm delay etc. are set up in Condmaster.

Four versions of the Bearing Monitoring Unit are available. INB80 and INB82 have input connectors for coaxial cables. INB80 is intended for shock pulse transducers of type 40000 (cable length max. 4 m) and INB82 is intended for shock pulse transducers of type 42000 (cable length max. 100 m).

INB80T and INB82T have input connectors for twisted pair cables. INB80T is intended for shock pulse transducers of type 40000 (cable length max. 4 m) and INB82T is intended for shock pulse transducers of type 42000 (cable length max. 100 m).

Signal processing

The resonance frequency of the SPM shock pulse transducer, calibrated to 32 kHz, constitutes the ideal carrier wave for transients caused by shocks. The output of this transducer is the same type of demodulated signal produced by 'enveloping', with this important difference: both frequency and amplitude response of the SPM transducer are precisely tuned, so there is no need to find uncertain and shifting machine resonances to get a signal.

Intellinova measures the shock amplitude by a shock pulse measurement with the dBm/dBc or the LR/HR method and the results are bearing condition data for condition evaluation. The measurement also produces a time record which can be analyzed using SPM Spectrum. The resulting spectrum is used mostly for pattern recognition. The technique SPM HD generates a signal with razor-sharp resolution and is particularly well suited for condition monitoring on low speed applications.

Technical specifications

Measuring methods:	dBm/dBc, LR/HR, SPM Spectrum, SPM®HD
Measuring channels:	8, multiplexing
Measuring range:	–9 to 99 dBsv , –19 to 99 LRHR
Measuring time:	approx. 2 sec. per channel dBm/dBc, approx. 20 sec. LR/HR
Frequency range:	0 to 100, 200, 500, 1000, 2000, 5000, 10 000, 20 000, 40 000 Hz
Number of spectrum lines:	400, 800, 1600, 3200, 6400, 12 800
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Spectrum types displayed:	linear, power
Averages:	time synchronous, FFT linear, FFT peak-hold
Frequency units:	Hz, CPM
Saving options for spectrum:	full spectrum, peaks only
Amplitude scale unit:	S_D (Shock Distribution), S_L (Shock Level), HDesv
Scaling:	linear or logarithmic X and Y axis
Zoom:	true FFT zoom, visual zoom
Pattern recognition:	bearing frequencies and optional patterns highlighted in the spectrum. Automatic configuration of bearing symptoms linked to ISO bearing no.
Input connectors:	for coaxial cables on INB 80/82, for pair cables on INB 80T/82T
Transducer line test:	TLT test
Design:	encapsulated circuit board, not protected
Power consumption:	max. 1.5 W, typical 0.8 W
Operating temperature:	0 to +60 °C (32 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Mounting:	plug-in connector and holding screws for attachment in INC40/INC41
Dimensions:	212 x 70 x 37 mm
Weight:	approx. 200 g

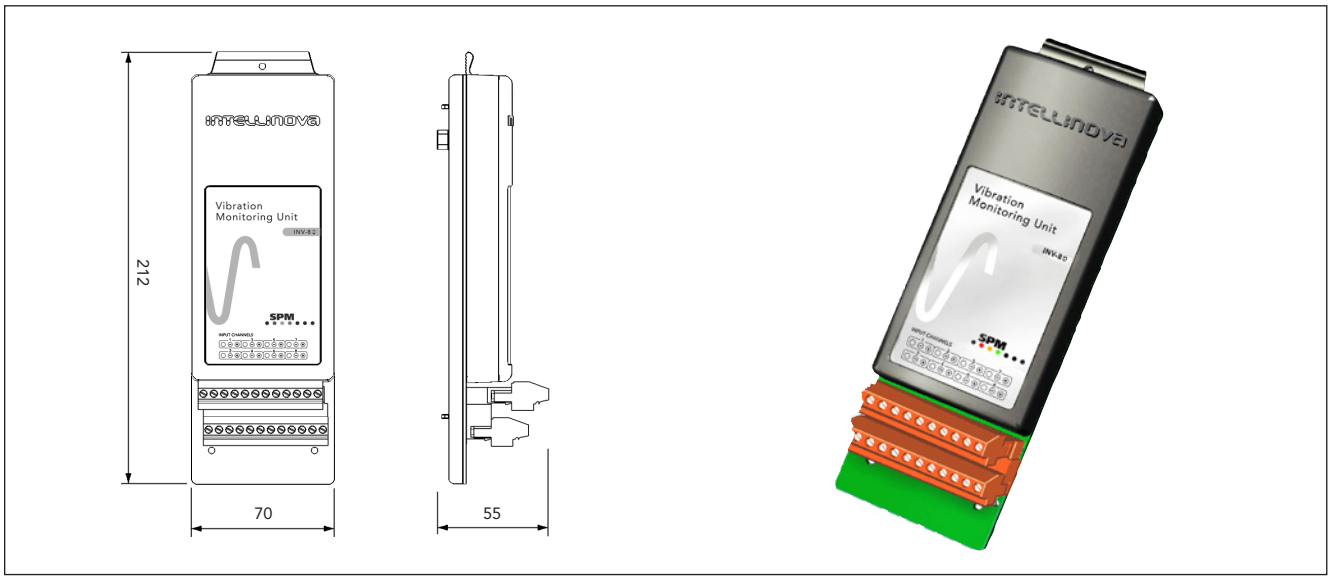
Part numbers

INB80	Bearing Monit. Unit, transducers type 40000/coax cable
INB82	Bearing Monit. Unit, transducers type 42000/coax cable
INB80T	Bearing Monit. Unit, transducers type 40000/pair cable
INB82T	Bearing Monit. Unit, transducers type 42000/pair cable
12775	Connector for coaxial cable (INB 80/82)

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Intellinova® – Vibration Monitoring Unit INV80A



The Vibration Monitoring Unit INV80A is a part of the Intellinova System and has eight channels for continuous monitoring of vibrations. The unit is simply plugged into the socket in the Intellinova Commander Unit. Measuring time, alarm limits, alarm delay etc. are set up in Condmaster®.

It supports broad band vibration measurement, both ISO 2372 and the more recent ISO 10816, the most cost-efficient method for the diagnosis of general machine condition.

It also supports HD ENV, FFT with symptoms and EVAM (Evaluated Vibration Analysis Method). HD ENV is capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques, for example bearing and gear damages. The EVAM method generates condition parameters describing various aspects of machine vibration, vibration spectra where significant line patterns are highlighted and evaluated plus machine specific condition codes and condition values, based on a statistical evaluation of the condition parameters and symptom values.

Two channel simultaneous vibration monitoring requires that either the measuring technique 'FFT with symptoms' or 'EVAM' is active in Condmaster. This type of measurement allows the user to study machine movement in two dimensions by observing the difference of the phase angles measured on the two channels.

Orbit analysis is a vibration measurement function offered with the Vibration Monitoring Unit. The resulting orbit graph shows the movement of the shaft's centerline and is used to detect failures like rubs, unbalance, misalignment or oil whip on machinery with journal bearings. Required are two channel simultaneous vibration measurement and two transducers placed at an angle of 90° to each other, plus a trigger signal from a tachometer probe.

Both vibration and shock pulse (HDm/HDc) measurements can be performed using DuoTech® accelerometers.

Technical data

Measuring methods:	ISO 2372, ISO10816, HD ENV, FFT with symptoms, EVAM, 2-channel vib, orbit
Measuring channels:	8, multiplexing, 2 simultaneous
Design:	encapsulated circuit board, not protected
Input connectors:	screw terminals
Power consumption:	max. 1.5 W, typical 0.8 W
Operating temp.:	0 to +60 °C (32 to 140 °F)
Storage temp.:	-20 to +80 °C (-4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Mounting:	plug-in connector and holding screws for attachment in Commander Unit INC40/41
Dimensions:	212 x 70 x 55 mm
Weight:	approx. 200 g

Vibration analysis

Freq. limit, lower:	0.5, 2, 10 or 100 Hz
Freq. limit, upper:	100, 200, 500, 1000, 2000, 5000, 10 000, 20 000, 40 000 Hz
Envelope HP filters:	100, 200, 500, 1000, 2000, 5000, 10 000 Hz
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Transducer types:	SLD144, SLC144 DuoTech or IEPE (ICP®) type transducers with voltage output

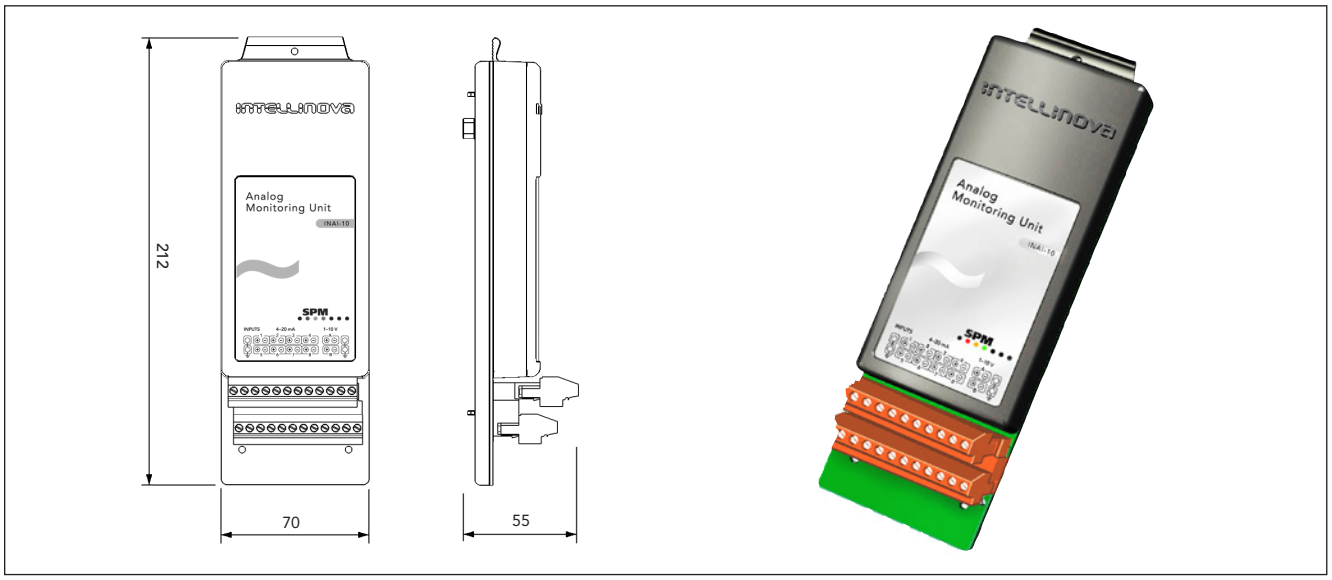
Orbit analysis

Orders:	1 to 5, default 1
Filter types:	None, band pass, low pass
Signal unit:	DISP, VEL, ACC
Measuring time:	1 to 25 revolutions
Transducer types:	Buffered outputs from API670 approved protection systems, alt. transducers SLD144 or IEPE (ICP®) type transducers with voltage output

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Intellinova® – Analog Monitoring Unit INAI10



The Analog Monitoring Unit INAI10 is a part of the Intellinova system and has ten channels for continuous monitoring of analog signals. It measures 0 to 20 mA on eight channels and 0 to 10 V DC on two channels.

The unit is simply plugged into the socket in the Intellinova Commander Unit. Measuring units, range, quantities, alarm limits etc. are set up in Condmaster®.

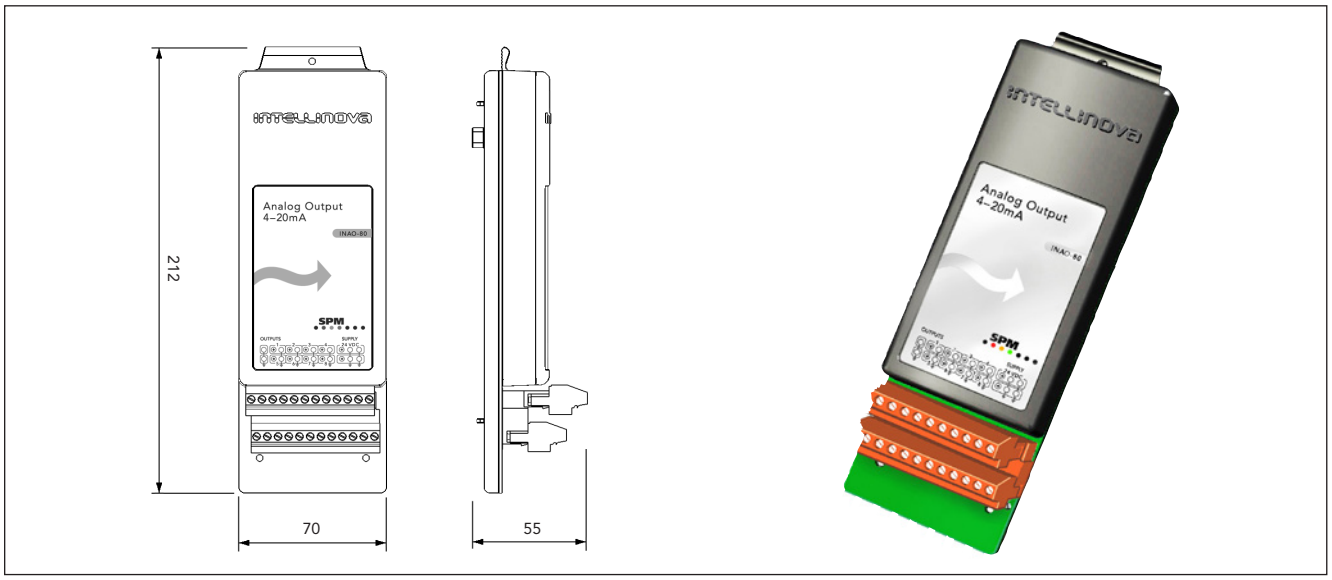
Technical data

Current inputs:	8 channels, multiplexing
Voltage inputs:	2 channels, multiplexing
Input resistance:	current 100 Ω, voltage 86 kΩ
Measuring time:	approx. 1 sec. per channel
Measurement range:	0 to 20 mA, 0 to 10 V DC
Resolution:	0.01 mA, 0.02 V
Meas. accuracy:	± (1% +0.1 mA), ± (1% +0.1 V)
Design:	encapsulated circuit board, not protected
Input connectors:	screw terminal
Power consumption:	max. 0.5 W, typical 0.2 W
Operating temperature:	0 to +60 °C (32 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Mounting:	plug-in connector and holding screws for attachment in Commander Unit
Dimensions:	212 x 70 x 55 mm
Weight:	approx. 200 g

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Intellinova® – Analog Output Unit INAO 80



The Analog Output Unit INAO 80 is a part of the Intellinova System and has eight current outputs. The unit is simply plugged into the socket in the Intellinova Commander Unit.

The unit converts the measuring values from the monitoring units to analog signals 4 – 20 mA for connection to PLC, DCS or other control systems.

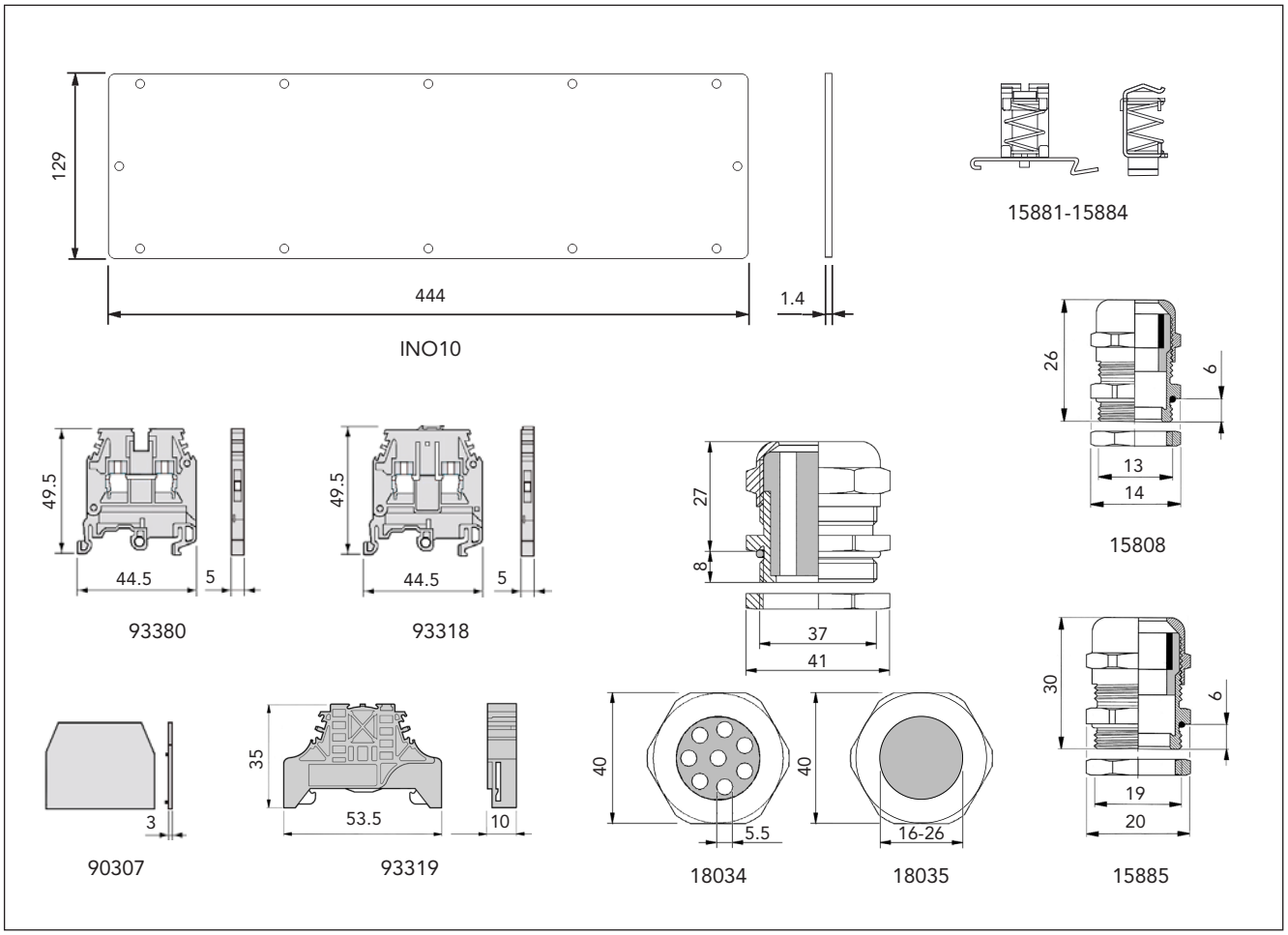
Technical specifications

Analog outputs:	8
Output:	4 to 20 mA
Power supply:	18 to 36 V DC, nom. 24 V DC
Ouput connectors:	screw terminal
Design:	encapsulated circuit board, not protected
Power consumption:	0.1 W from INC40 and 2 W from external power supply
Operating temperature:	0 to +60 °C (32 to 140 °F)
Storage temperature:	-20 to +80 °C (-4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Mounting:	plug-in connector and holding screws for attachment in Commander Unit
Dimensions:	212 x 70 x 55 mm
Weight:	approx. 200 g

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Intellinova® – Accessories



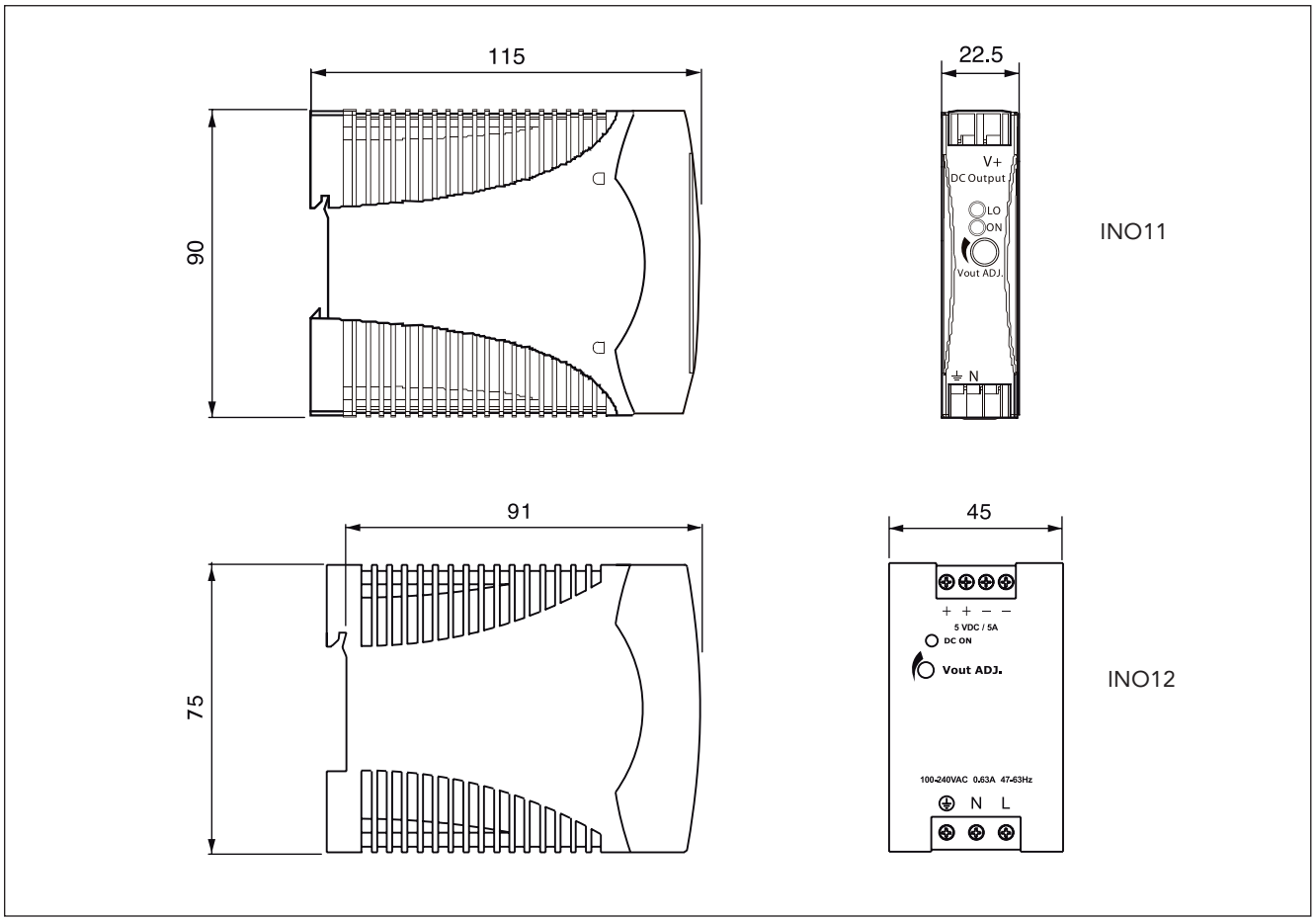
Part numbers

INO10	Blind flange for Intellinova cabinet INO18/IND16
15881	Clamping yoke for earth rail, DIN, cable 3-8 mm
15882	Clamping yoke for earth rail, DIN, cable 4-13.5 mm
15883	Clamping yoke for earth rail, DIN, cable 10-20 mm
15884	Clamping yoke for earth rail, DIN, cable 15-32 mm
15808	Cable inlet, Pg7, for cable 2.5-6.5 mm, IP68, brass/nickel-plated, Neoprene sealing
15885	Cable inlet, Pg11, for cable 6-11.5 mm, IP68, brass/nickel-plated, Neoprene sealing
18034	Cable inlet, Pg29, for 8 measuring cables diam. 5.5 mm, IP65, brass/nickel-plated, PVC sealing
18035	Cable inlet, Pg29, diam. 16-26 mm, IP68, brass/nickel-plated, PVC sealing
18122	Cable inlet, M20, for cable 4-10 mm, IP68, brass/nickel-plated, Neoprene sealing. Suitable for network cables with connector
93380	Terminal block for DIN rail, nom. area 2.5 mm^2
93318	Switch block for DIN rail, nom. area 2.5 mm^2
90307	End section for switch and terminal block
93319	End stop for DIN rail

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Intellinova® – Power Supply Units



The power supply units in the Intellinova system are intended for mounting on standard DIN rail. INO11 is used to supply a standard Intellinova System Unit with a power consumption of max. 18 W.

INO12 is required when supplying a System Unit and optional equipment with power consumption up to max. 50 W. The units are delivered complete with internal cabling and terminal blocks for DIN rail.

Technical specifications, INO11

Rated input voltage:	100 to 240 V AC (85 to 265 VAC)
Frequency:	50/60 Hz
Power rating:	18 W
Rated otput voltage:	+ 24 V DC
Voltage adjustment range:	–10% to +20%
Output current:	750 mA
Protection:	input fuse, over load, over voltage, output short circuit
Ambient temperature:	–10 to +70 °C
Storage temperature:	–25 to +85 °C (with no icing or condensation)
Relative humidity:	20% to 95% RH
Dimensions (w x h x d):	22.5 x 90 x 115 mm
Approved standards:	UL/cUL (UL508/UL1310 Listed, Class 2 Power Supply), TUV (EN60950), CE (EN5008-1/ EN55022 for EMI, EN50082-1/ EN55024 for EMS), FCC (Class B)

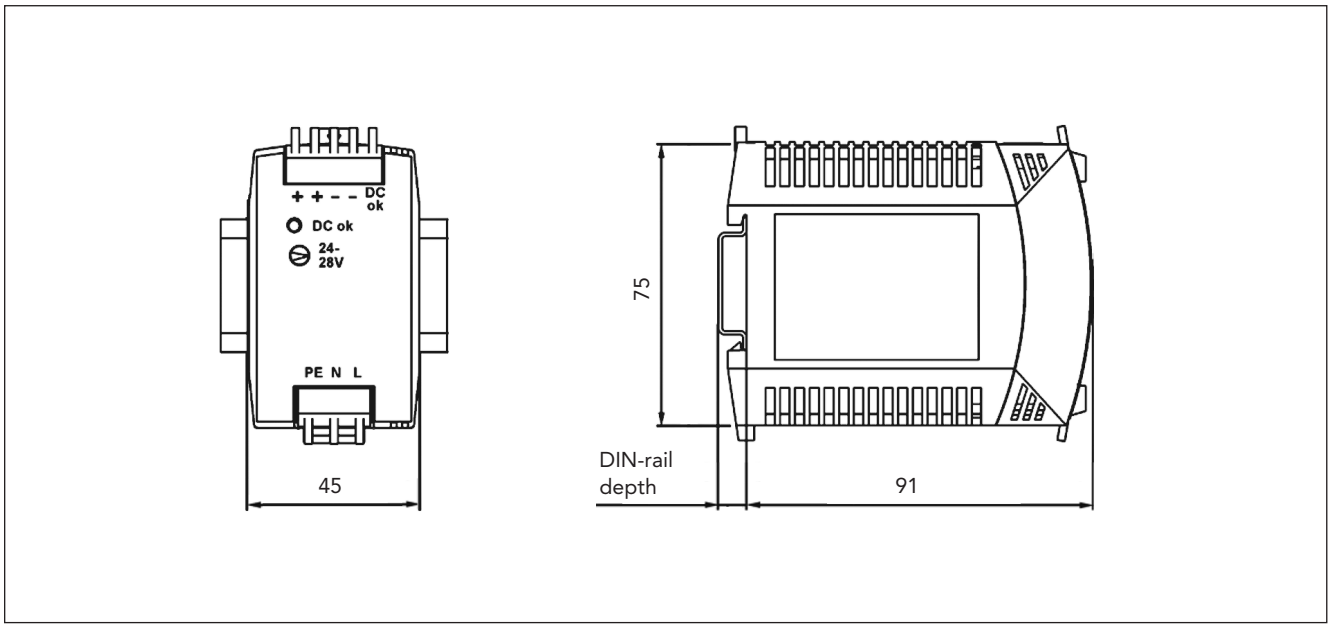
Technical specifications, INO12

Rated input voltage:	100 to 240 VAC (85 to 264 VAC)
Frequency:	47/63 Hz
Power rating:	50 W
Rated output voltage:	+ 24 V DC
Voltage adjustment range:	22.5 to 28.5 V
Rated output current:	2.1 A
Protection:	input fuse, over load, over voltage
Ambient temperature:	–10 to +71 °C
Storage temperature:	–25 to +85 °C (non condensation)
Relative humidity:	20% to 90% RH
Dimensions (w x h x d):	45 x 75 x 91 mm
Approved standards:	UL60950-1, UL508, NEC Class 2(2), EN60950-1, CE Mark Emissions - EN55011, EN55022 class B Radiated & Conducted, EN61000-6-3 Immunity - EN61000-6-2, EN61000-4-2 Level 4, EN61000-4-3, EN61000-4-6 Level 3, EN61000-4-4 Level 4 (I/P) Level 3 (O/P), EN61000-4-5 Level 4, EN61000-4-8, EN61000-4-11

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Intellinova® – Power Supply Unit INO28



INO28 is a compact design power supply unit for simple mounting on a DIN rail outside an Intellinova System Unit for 19" rack. Quick connect spring-clamp terminals makes the unit easy to install. DIN rail and cables are not included.

A rugged electrical and mechanical design as well as high immunity against electrical disturbances on the mains provides reliable output power. This offers superior protection for the equipment when exposed to a critical industrial environment.

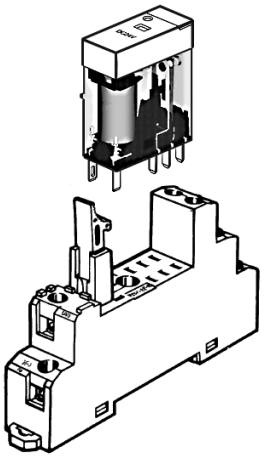
Technical specifications, INO28

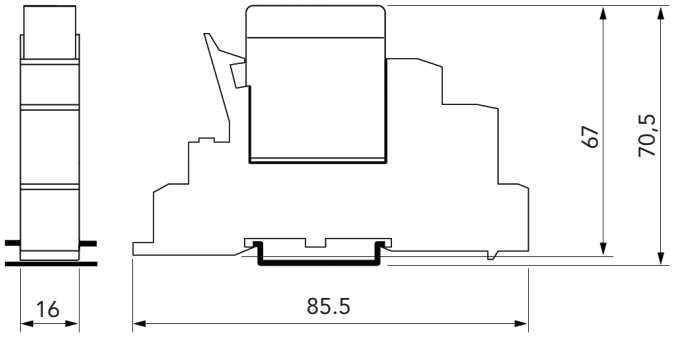
Rated input voltage:	100 to 240 V AC (85 to 375 V AC)
Frequency:	50/60 Hz ±6%
Power rating:	50 W
Rated output voltage:	+ 24 V DC
Voltage adjustment range:	24 to 28 V DC
Output current:	2.1 to 1.8 A
Protection:	over-load, over-voltage, no-load and short-circuits
Ambient temperature:	–10 to +70 °C
Storage temperature:	–40 to +85 °C (with no icing or condensation)
Relative humidity:	5% to 95% RH (IEC 60068-2-30)
Dimensions (w x h x d):	45 x 75 x 91 mm (1.77 x 2.95 x 3.58 in)
Approved standards:	IEC 60950-1, IEC 60601-1, UL 508 (listed), UL 60950-1 (recognized E137006), NEC Class 2 (listed), UL 1604 (recognized E246877), Marine (category: C, EMC2), SEMI F47 (120 Vac or 208 Vac input)

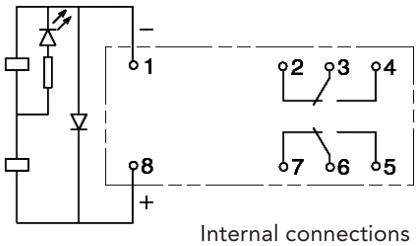
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Intellinova® – Relay INO16





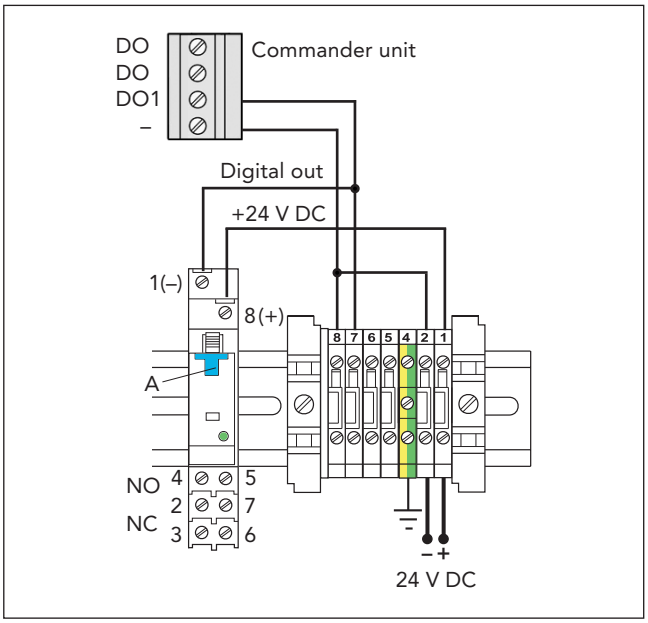


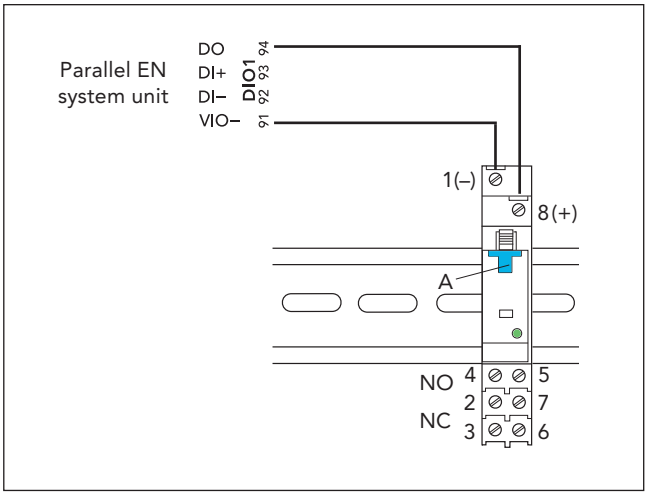
Internal connections

INO16 is a slim relay of plug-in type mounted in a socket for DIN rail mounting. It has a LED indicator showing mechanical operation and a test button (A). The relay is delivered complete with socket and internal cabling for Intellinova system unit.

Technical specifications

Poles:	2
Rated coil voltage:	24 VDC
Rated coil current:	21.6 mA
Power consumption:	0.53 W
Load:	resistive load (cosϕ =1), inductive load (cosϕ =0.4; L/R=7 ms)
Rated load:	resistive; 5A/250 VAC, 5A/30 VDC inductive; 2A/250 VAC, 3A/30 VDC
Rated carry current:	5 A
Max. switching voltage:	380 VAC, 125 VDC
Max. switching current:	5 A
Max. switching power:	resistive; 1250 VA, 150 W inductive; 500 VA, 90 W
Amb. temperature:	–40° to 70 °C (non-condensing)
Amb. humidity:	5% to 85% (operating)
Dimensions:	85.5x67x16 mm
Mounting:	DIN rail
Approved standards:	UL508 (File No. E41643), IEC/VDE (EN61810), CSA 22.2 No.0, No.14 (File No. LR311928), LR

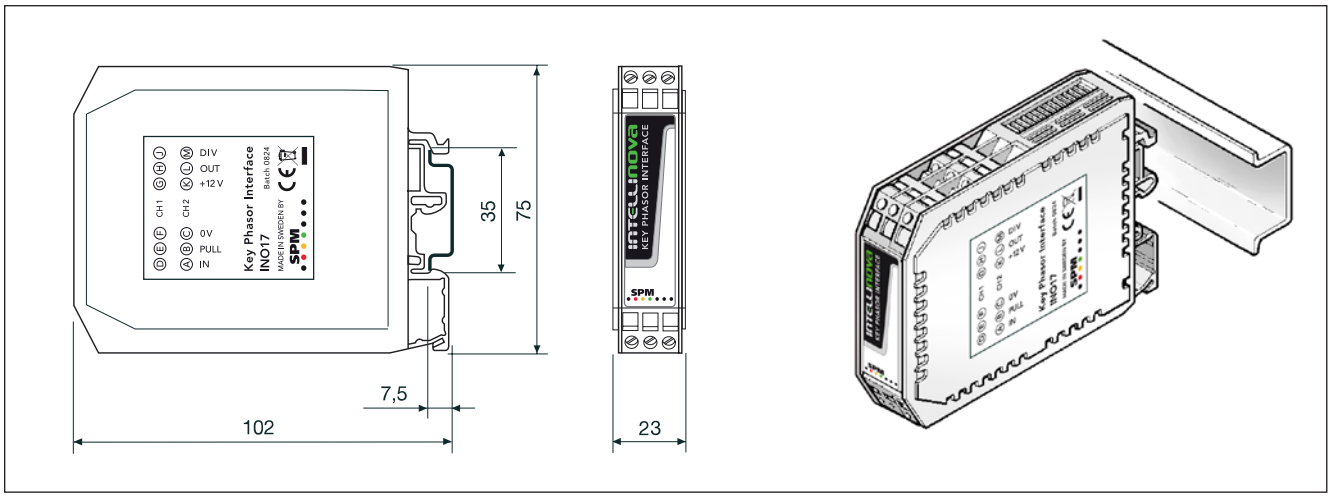




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Intellinova® – Key phasor interface INO17



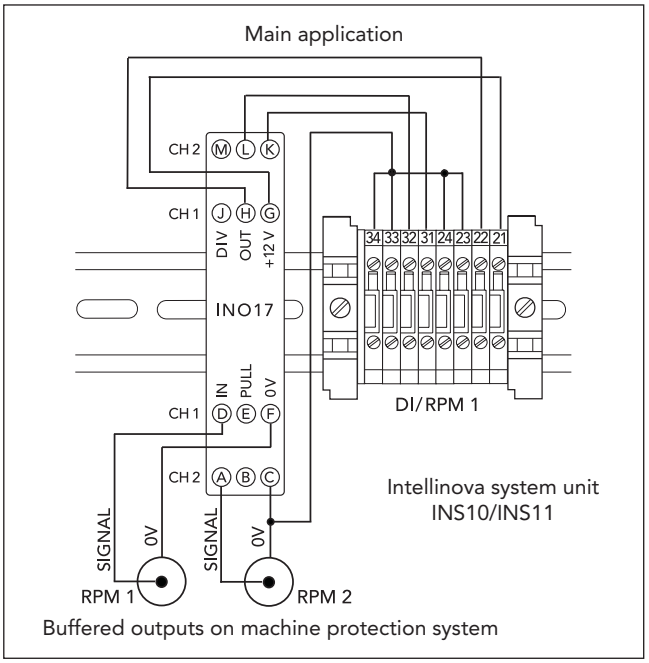
INO17 is a tachometer sensor interface ideal for connecting the Intellinova online system to buffered outputs of a machine protection system. It has two input channels with common 12V power supply from Intellinova. The interface has three main functions:

1. It converts signals from proximity probes (Eddy current) via buffered outputs of a machine protection system. The interface will automatically find the voltage threshold for the various sensors.

2. When using sensors with high output frequency the 'DIV' output can be used for division of the frequency to 1/10 of the input signal. Additional division to 1/100 can be made by connecting both channels in series.

3. When the interface is connected to an open collector output the 'PULL' input can be used to ensure the trigger level and filter out noise.

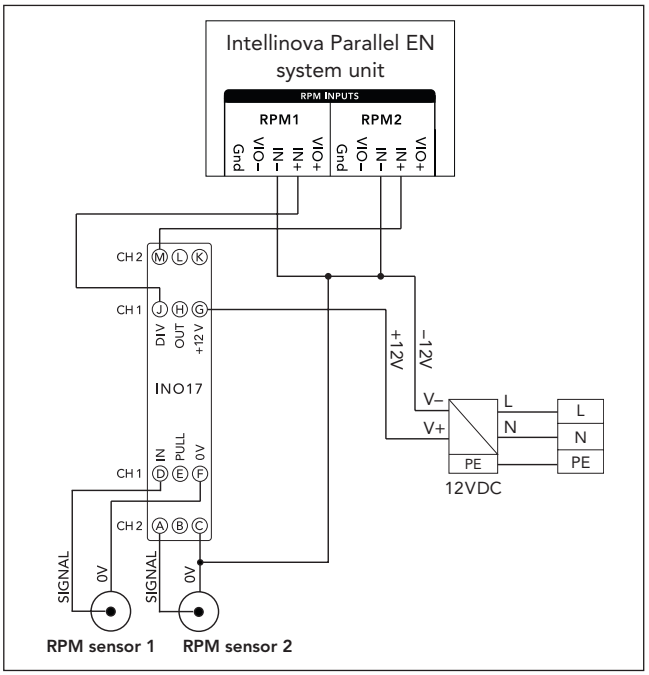
INO17 is intended for DIN rail mounting and is delivered with internal cabling for connection to the Intellinova system unit.



Buffered outputs on machine protection system

Technical specifications

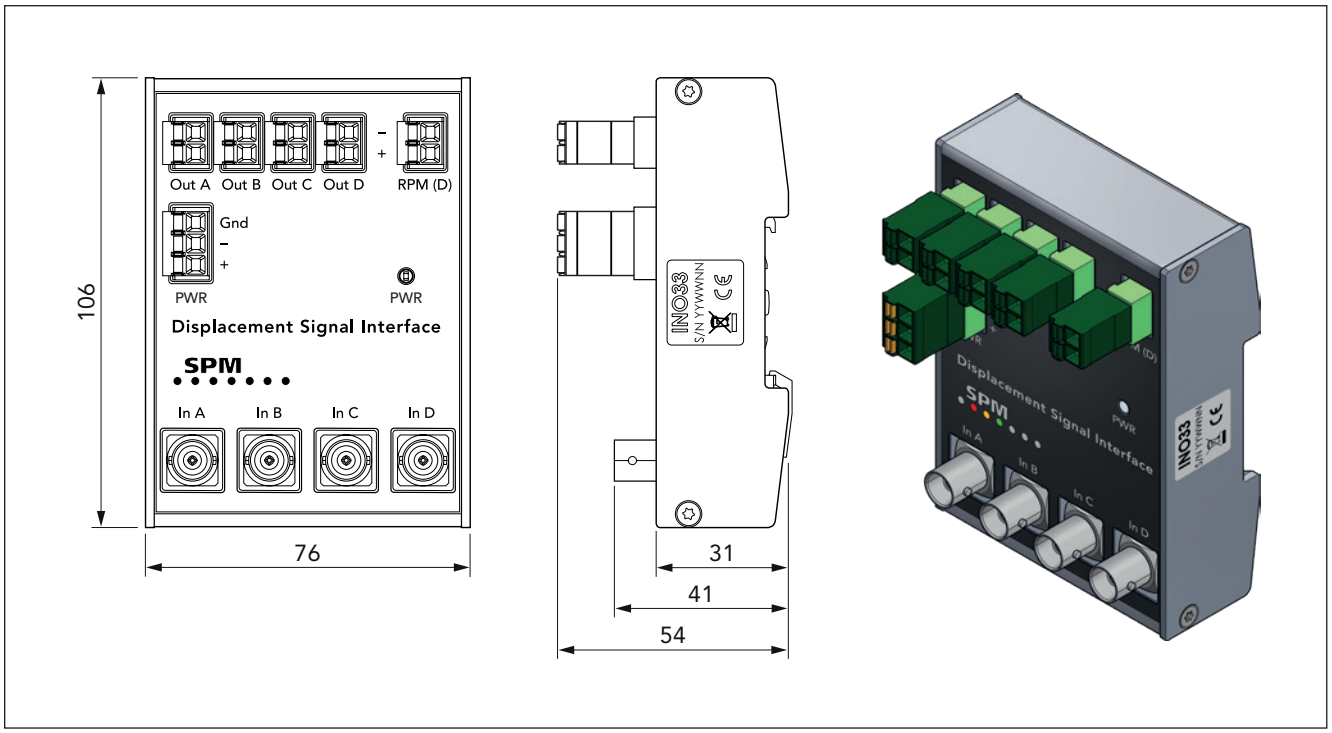
Power supply:	12 VDC
Power consumption:	0.3 W
Pulse frequency:	max. 100 kHz at 50% duty cycle
Pulse amplitude:	min. 2V
Input pulse:	low level –33 V to +2.5 V high level –22 V to +33 V
Amb. temperature:	0° to 60 °C (non-condensing)
Amb. humidity:	10% to 90% (operating)
Dimensions:	102x23x75 mm
Mounting:	DIN rail 35 mm



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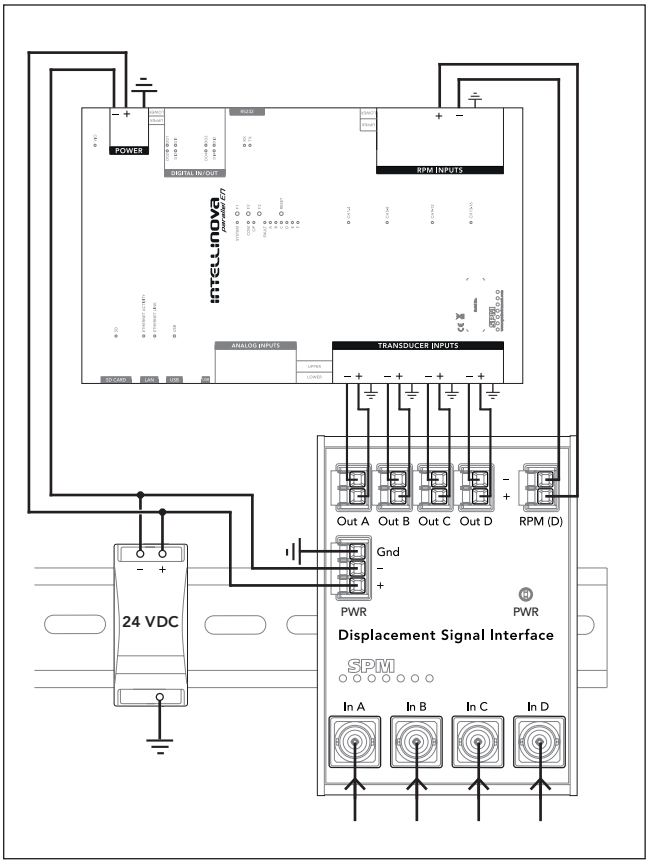
Intellinova – Displacement signal interface



The displacement signal interface is an adapter that enables connection of inductive proximity sensors to the online system Intellinova Parallel EN. INO33 converts up to four signals from inductive proximity sensors, via buffered outputs of a machine protection system, for connection to the transducer inputs of Intellinova Parallel EN system unit (*TD-543*).

A keyphasor signal can be received from the rotating shaft to input **In D**, provided that the generated once-per-revolution voltage pulse is at least 2 V with a minimum pulse width of 5 us. The channel D output to INCEN16 is then available on **Out D** while there is a speed signal available on **RPM (D)**.

INO33 is intended for DIN rail mounting and is delivered with internal cabling for connection to the transducer inputs on INCEN16. It is powered with 18-36 V and preferably uses the same power supply as INCEN16.



Technical specifications

Power supply:	18-36 VDC
Power consumption:	max. 1.5 W
Ambient temperature:	0° to 60 °C
Ambient humidity:	10% to 90% (operating)
Dimensions:	106x76x54 mm
Mounting:	DIN rail, 35 mm
Input signal:	negative –25 V to 0 V positive 0 V to 25 V
Signal frequency/speed:	0 Hz to 10 kHz/600 000 RPM
Pulse amplitude:	min. 2 V
Pulse frequency:	0.1 Hz to 10 kHz
Duty cycle, pulse:	min. 1% and/or min. 5 us pulse width

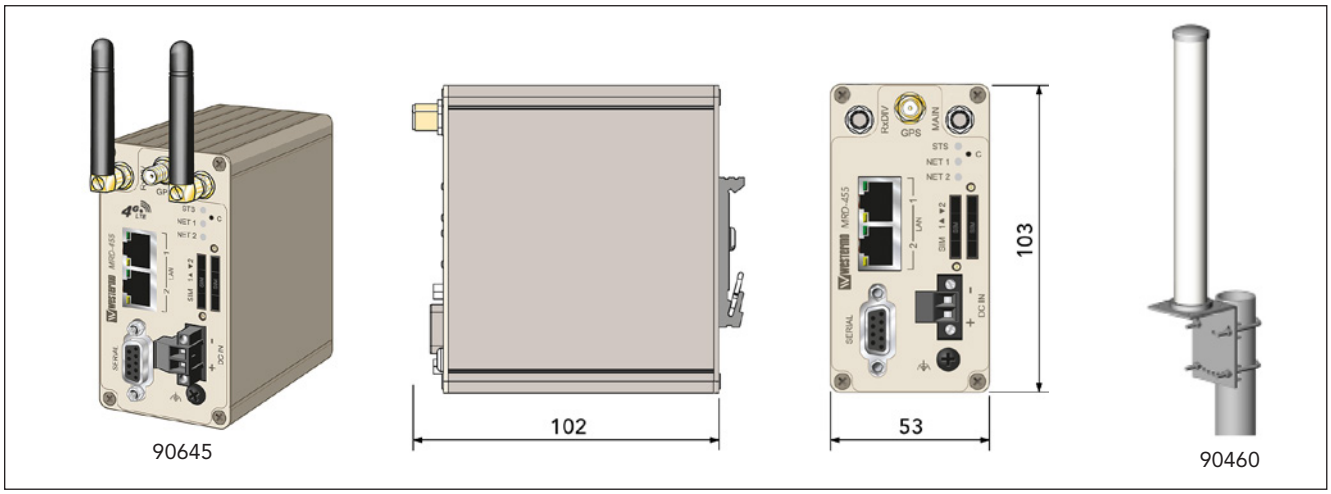
Part numbers

INO33 Displacement signal interface

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Intellinova® – 4G Router 90645



90645 is an industrial mobile broadband GPRS/EDGE/3G/4G LTE router that uses the Internet to cost effectively interconnect systems, allowing HMI, PLCs, sensors etc. to communicate with each other.

A compact design bundled with all interfaces and LEDs in the front make the unit extremely well suited for industrial applications. With isolation between the PSU and the Ethernet and serial ports the router protects against issues caused by ground loops.

The dual SIM support in the device ensures that site connectivity is not dependent on a single carrier, should something happen the unit just switches to the other SIM.

The router offers protection of transmissions from malicious eavesdroppers via encrypted communication tunnels (VPN), and features a simple, yet powerful, packet inspection firewall.

Technical specifications

Dimension W x H x D	53x103x103 mm (2.08x4.05x4.05 in)
Weight	0.4 kg
Degree of protection	IP40
Power (isolated)	
Operating voltage	10 to 60 VDC
Rated voltage	12 to 48 VDC
Rated current	140 mA @ 24 VDC
Interfaces	
RS-232	1 x 300 bit/s to 115.2 kbit/s
Ethernet TX	2 x 10 Mbit/s or 100 Mbit/s
SIM	2 x SIM slots (3 volts SIM supported)
Antennas	Main and GPS
Connection	SMA female
Temperature	
Operating	–40 to +70°C (–40 to +158°F)
Storage & Transport	–40 to +85°C (–40 to +185°F)
Ethernet Technologies	IEEE 802.3 for 10BaseT, IEEE 802.3u for 100BaseTX
Cellular Technologies	Circuit Switched Data mode (CSD) GSM, GPRS Multi-slot class 12, mobile station class B, PBCCH support, coding schemes CS 1-4, EDGE Multi-slot class 12 (max 236.8 kbit/s), mobile station class B, modulation and coding scheme MCS 1-9, 3G (WCDMA / UMTS) 384 kbit/s downlink / uplink HSDPA up to 42.0 Mbit/s downlink, HSUPA up to 5.7 Mbit/s uplink, 4G LTE up to 100 Mbit/s downlink, 4G LTE up to 50 Mbit/s uplink
Serial Port Technologies	RS-232, Serial Over IP (Serial Extender and Virtual Serial Port), Modem emulation, AT command interpreter, MODBUS, DNP3, SMS
Layer-2 QoS	IEEE 802.1p Class of Service
IP Routing, Firewall, VPN and Cyber Security	Static IP routing Dynamic IP routing, RIPv1/v2 VRRP GRE Stateful inspection Firewall / ACL, NAT, Port Forwarding 25 x IPsec VPN, PSK & X.509, Fail-over 1 x L2TP client 1 x PPTP client 1 x OpenVPN / SSL VPN client Simple Certificate Enrollment Protocol RADIUS PPP Dial in/Dial out
Manageability	Management tools: Web interface (HTTP and HTTPS), Command Line Interface (CLI) via SSHv2 and TELNET, SNMPv1/v2c/v3, SMS Control Flexible alarm/event handling system Syslog (log files and remote syslog server) SNTP (NTP client) DHCP client DHCP server DDNS (Dynamic DNS update client)

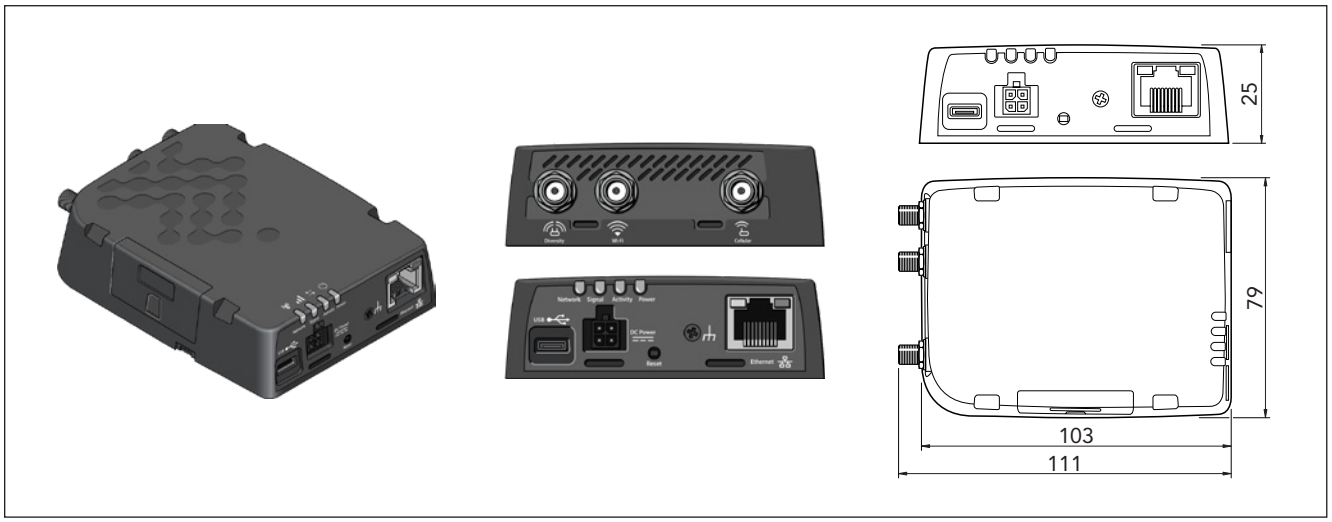
Options

90460	Omni-directional antenna for 4G router 90645
90451	Network cable for 4G router, shielded, 0.3 m
90457	Internal antenna cable with connectors, 0.3 m
90500	External antenna cable with connectors, 0.75 m
90580	External antenna cable with connectors, 2 m
90458	External antenna cable with connectors, 10 m
93001	Bulkhead adapter for antenna cable
93002	Dust cap for bulkhead adapter 93001

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4G/Wi-Fi router 90679



The 4G/Wi-Fi router 90679 is a compact LTE and LTE-M/NB-IoT router, which offers out-of-the-box connectivity that is simple to install, and easy to manage.

90679 provides purpose-built, secure, managed LTE networking. 90679 is ideal for connecting industrial, remote data logging and sensing equipment in protected locations, and enables processing of IoT data at the edge.

The router is designed to meet the environmental and performance requirements of industrial applications, while delivering superior reliability and uninterrupted operation in fixed, indoor and protected outdoor environments.

Technical specifications

4G frequency band:	2100(B1), 1800(B3), 2600(B7), 900(B8), 800(B20), 700(B28)
3G frequency band:	2100(B1), 900(B8)
2G frequency band:	900, 1800
Firewall:	NAT mode or fully transparent mode
Applications:	SMS, Telnet/SSH, Telnet, SMTP, SNMP, SNTP
Speed 4G (LTE):	uplink: 50 Mbps, downlink: 150 Mbps
Speed 3G (HSPA+):	uplink: 5.76 Mbps, downlink: 21 Mbps
VPN:	IPsec, GRE, and OpenVPN Client, up to five concurrent tunnels, Split Tunnel, Dead Peer Detection (DPD)
Wi-Fi:	Dual Band 2.4/5GHz Wi-Fi, 802.11 b/g/n/ac (Wave2 Client Mode), support for 10 clients, WPA2 Enterprise, Access Point or Client Mode, Single SSID Support
Connections:	1 pc RJ45: Gigabit LAN with 10/100/1000 Mbps Ethernet, 1 pc micro-USB, 1 pc I/O via power connector. Digital/analog input.
Operating temp.:	−30° to +65 °C (−22° to +149 °F)
Storage temp.:	−40° to +85 °C (−40° to +185 °F)
Power supply:	7-36V DC (DC cable included)
Antennas:	3G/4G (SMA), Wi-Fi (RP-SMA)
Dimensions:	111x79x25 mm
Weight:	397 g

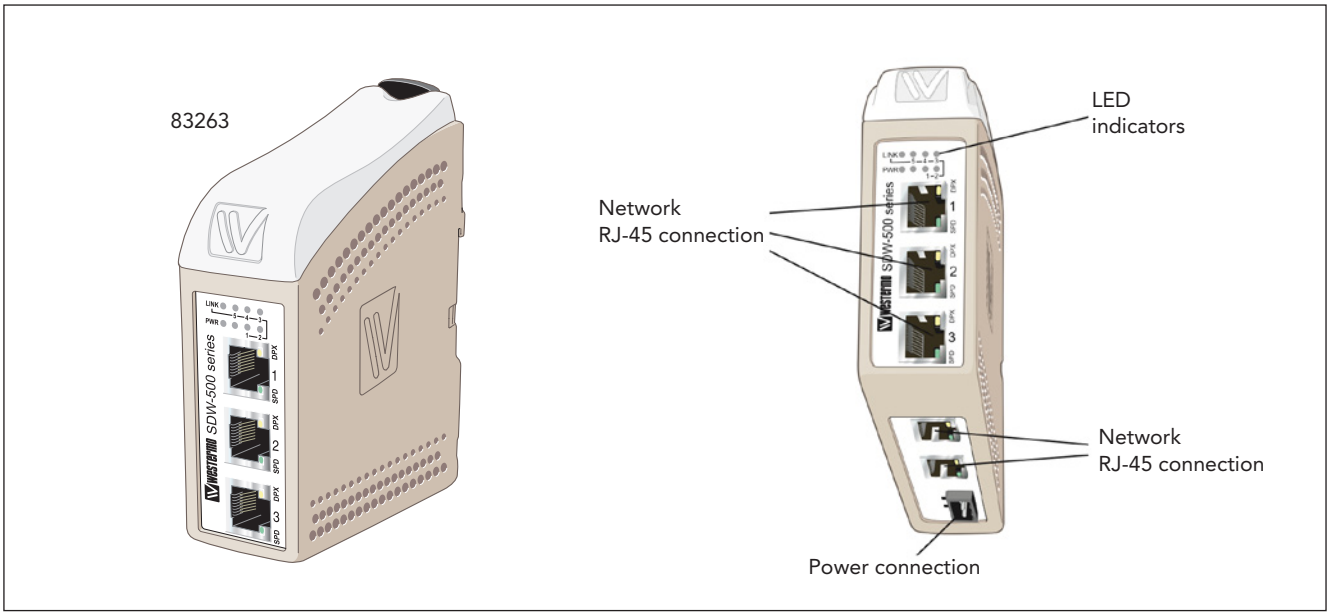
Part numbers

90679	Wireless 4G/Wi-Fi router

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Ethernet switch 83263



83263 is an unmanaged 5 port industrial Ethernet switch designed for easy use in heavy duty industrial applications. The units supports 802.1Q long packets which allows all standard industrial Ethernet protocols to be used. Total galvanic isolation between each port is reinforced by the unique isolation provided between each chassis screen helping to avoid ground loop currents.

Network diagnostics are simplified with the inclusion of port mirroring on one port allowing data flow through the switch to be monitored using a network analyzer. All five ports can have data rate and flow control locked by DIP switch which can eliminate problems with old legacy Ethernet equipment that is unable to support auto negotiation.

Technical specifications

Dimensions:	34 x 123 x 121 mm (1.33 x 4.84 x 4.76 in)
Weight:	0.25 kg
Degree of protection:	IP 21
Operating voltage:	9.6 – 57.6 VDC
Rated current:	320 mA @ 12VDC
Ethernet TX:	5 x RJ-45, 10 Mbit/s or 100 Mbit/s
Temp. range:	–25 to +70 °C (–13 to +158 °F)

Agency approvals and standards compliance

EMC	EN 61000-6-2, Immunity industrial environments EN 61000-6-3, Emission residential environments EN 61000-6-4, Emission industrial environments E-Mark, Road Vehicles, 10R-04 7216 (optional art. no 3644-6001)
Safety	UL 60950-1, 1st Edition
Marine	DNV Standard for Certification no. 2.4

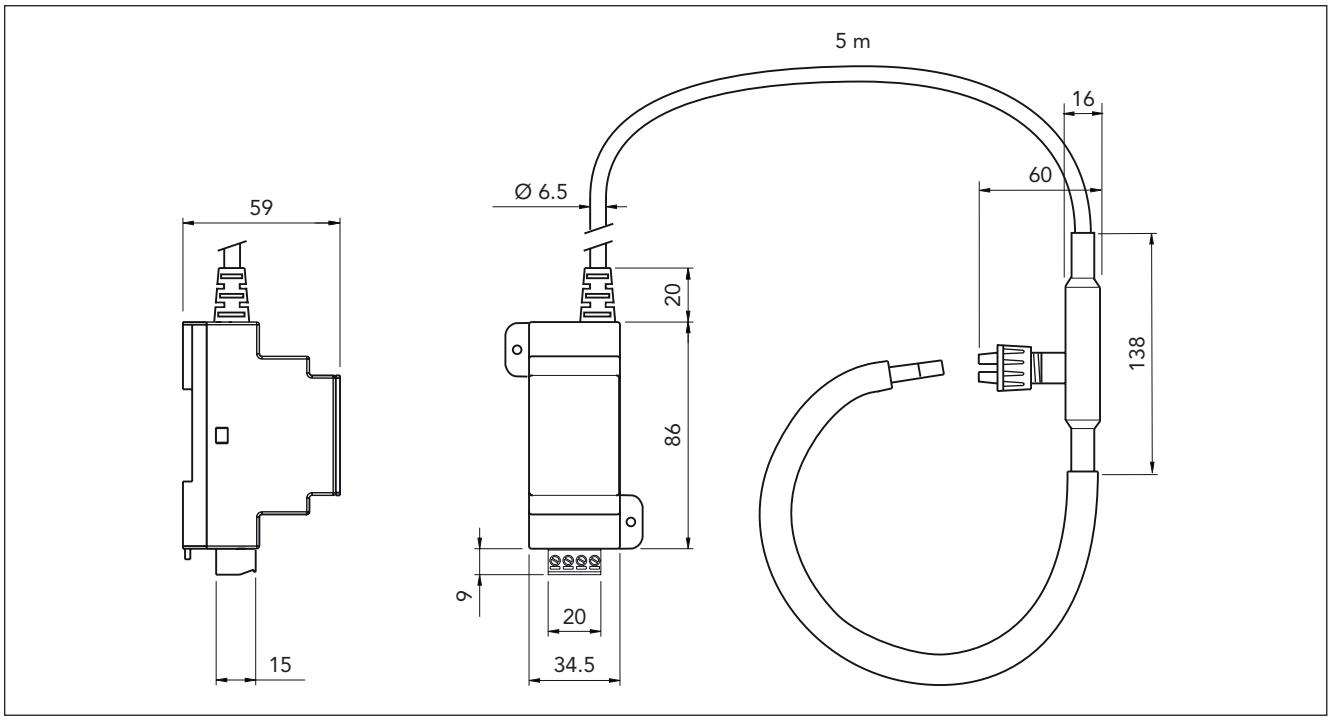
Part numbers

83263	Ethernet switch with RJ-45 connection

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Intellinova® – Rogowski Coil 90015



The Rogowski Coil is an industrially specified AC current transducer for permanent installation. It combines the benefits of a thin, flexible, clip-around coil sensor with a signal conditioner providing true rms measurement of AC current.

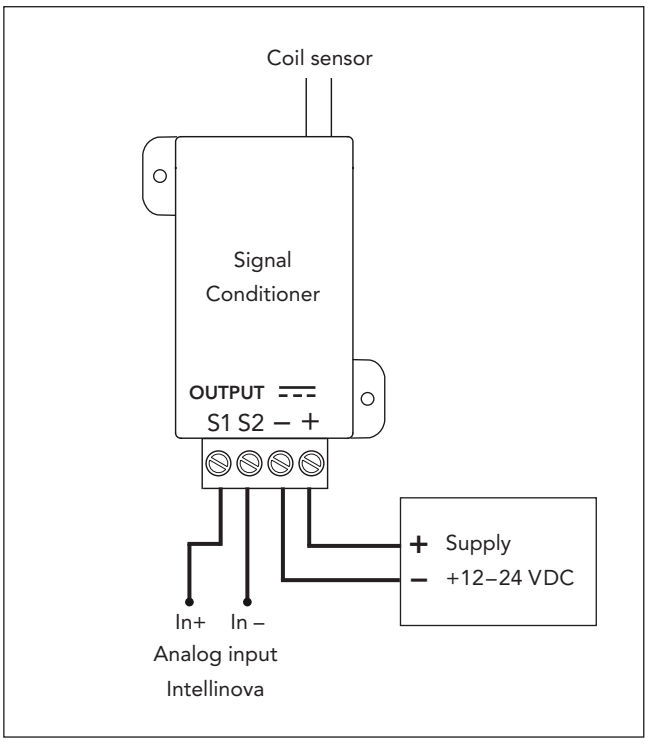
The Rogowski coil is specified with industry standard output 4-20mA, making it ideal for use with the Intellinova online conition monitoring system.

Featuring

- True rms measurement of AC current up to 2500 A
- Easy to install flexible "clip-around" sensor
- Fully isolated measurement
- Safety approvals EN61010

Technical specifications

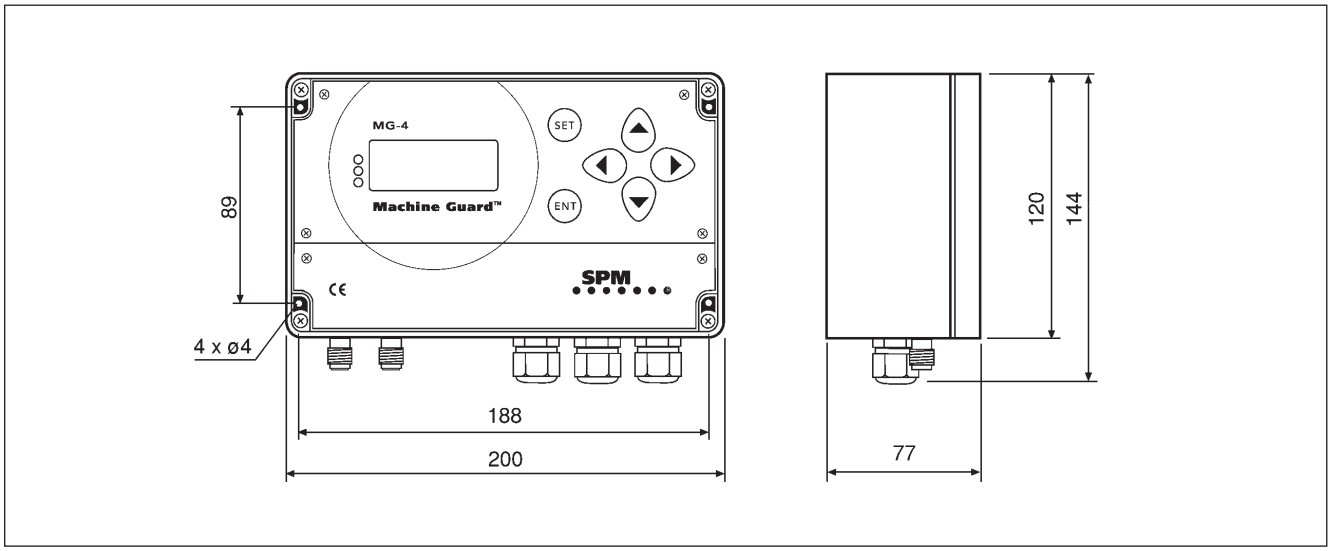
Rated current (rms):	2500 A
Rated output:	4–20 mA (full scale FS)
Output limit:	150% FS (7.5 V or 28 mA)
Supply voltage:	12 VDC (–10%) to 24 VDC (+20%)
Power consumption:	0.7 W
Operating temperature:	–5 °C to +65 °C
Bandwidth (-3dB):	2 Hz to 100 kHz
Max. response time:	1000 ms
Accuracy:	±1.5% at 25 °C
Output load:	<300 Ohm
Coil insulation voltage:	10 kV
Coil length:	300 mm (11.8")
Cable length:	5 m
Output connectors:	Screw terminals
Wire size:	0.5 to 4.0 mm^2
Mounting:	DIN rail or panel mount (M4)
Weight:	470 g
Standards and approvals:	Complies with EN 61010:2001, EMC EN 61326, CE marked



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Machine Guard MG4-02A



Machine Guard MG4-02A is a stand-alone measuring unit for continuous monitoring of bearing condition on two channels. It measures shock pulses according to the true SPM method.

Machine Guard MG4-02A provides:

- Two programmable alarm levels per channel and status display (green - yellow - red light)
- Display of measured value with continuous updates
- Analog output current 4-20 mA with programmable range or complete data on LAN (Modbus network using RTU)
- Relays 250 V (1) and 125 V (4) with programmable alarm levels.

MG4 has a casing for wall mounting, IP65. It can be supplied with mains power or be connected to a PLC. Shock pulse transducers are connected to the TNC connectors via coaxial cables. Measuring time, alarm levels, alarm delay and the channel/relay combinations are programmed, using the push buttons on the front panel.

The following options are selected on ordering the unit:

Power supply:

- 230 Vac, 115 Vac or 15 to 30 Vac/Vdc

Bearing channel:

- dBm/dBc or LR/HR technique

As an option the MG4 can be equipped with a RS-485 port for sending data via a LAN network. MG4 units equipped for network have no analog outputs.

Technical specifications

SPM channels:	2, multiplexing
Analog outputs (2):	4-20 mA, selective range, no galvanic separation
Main relay (1):	250 Vac, 5 A, 1250 VA
Secondary relays (4):	125 Vac, 1 A, 60 VA, 150 Vdc, 1 A, 30 W
Power supply:	230 Vac, 115 Vac or 15-30 Vac/Vdc
Power consumption:	max. 6 VA
Temperature range:	0° to 50 °C (32° to 122 °F)
Casing:	Polycarbonate/PVC, IP65
TNC connectors:	Silver plated brass, 10–15 µ
Display screen:	LCD, 4 x16 characters, back-lighted
Status display:	Green, yellow, red LED
Dimensions:	200x144x77 mm
Weight:	1140 grams

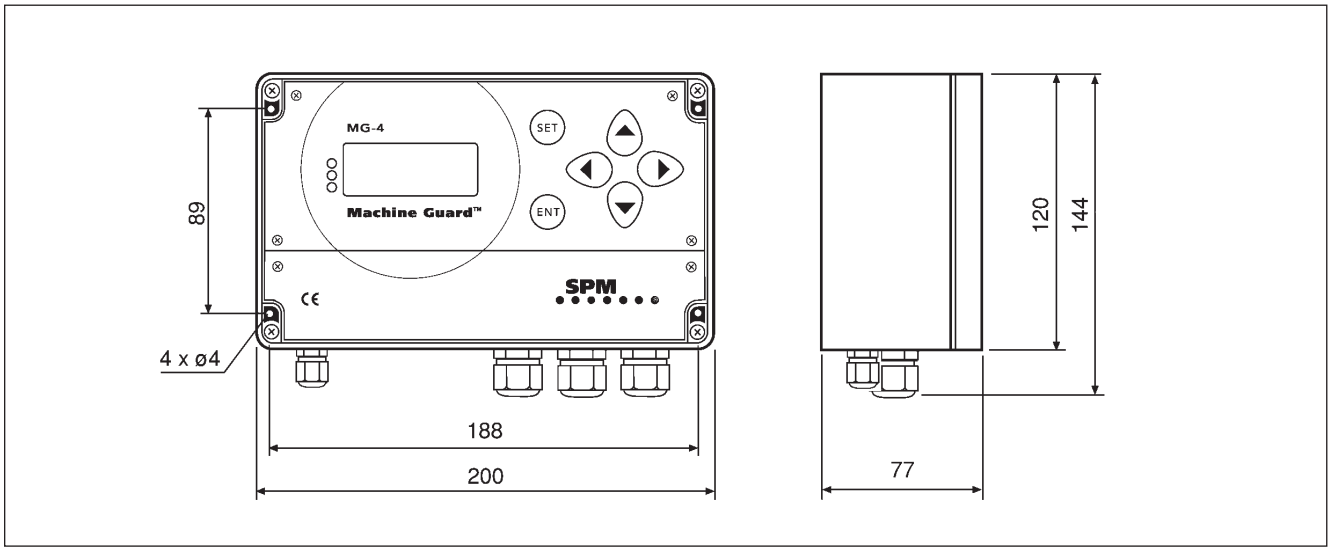
Bearing channel (SPM)

SPM method:	dBm/dBc or LR/HR, evaluated
Measuring range:	0 to 99 dBsv
Resolution:	1 dBsv
Alarm limits:	2, programmable
Alarm delay:	0 to 600 seconds, steps of 2 s
Fault indication:	Transducer line test of measuring circuit quality
Transducer type:	SPM 40000 or 42000

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Machine Guard MG4-1A



Machine Guard MG4-1A is a stand-alone measuring unit for continuous monitoring of machine vibration on one channel. It measures vibration severity (true RMS value of vibration velocity) according to ISO 10816.

Machine Guard MG4-1A provides:

- Two programmable alarm levels and status display (green - yellow - red light)
- Display of measured value with continuous updates
- Analog output current 4 - 20 mA with programmable range or complete data on LAN (Modbus network using RTU)
- Relays 250 V (1) and 125 V (2) with programmable alarm levels.

MG4 has a casing for wall mounting, IP65. It can be supplied with mains power or be connected to a PLC. Measuring time, alarm levels, alarm delay and the channel/relay combinations are programmed, using the push buttons on the front panel. It has a cable inlet of type M12 for vibration transducer connected with twisted pair cable but can be equipped with TNC connector (option) for coaxial cable.

The following options are selected on ordering the unit:

Power supply:

- 230 Vac, 115 Vac or 15 to 30 Vac/Vdc

Vibration channel:

- Frequency range 3-1000, 3-2000, 10-1000, 10-2000 or 100-1000 Hz

As an option the MG4 can be equipped with a RS-485 port for sending data via a LAN network. MG4 units equipped for network have no analog outputs.

Technical specifications

Vibration channels:	1
Analog outputs (1):	4-20 mA, selective range, no galvanic separation
Main relay (1):	250 Vac, 5 A, 1250 VA
Secondary relays (2):	125 Vac, 1 A, 60 VA, 150 Vdc, 1 A, 30 W
Power supply:	230 Vac, 115 Vac or 15 to 30 Vac/Vdc
Power consumption:	max. 6 VA
Temperature range:	0° to 50 °C (32° to 122 °F)
Casing:	Polycarbonate/PVC, IP65
TNC connector (option):	Silver plated brass, 10–15 µ
Display screen:	LCD, 4 x 16 characters, back-lighted
Status display:	Green, yellow, red LED
Dimensions:	200 x 144 x 77 mm
Weight:	1060 grams

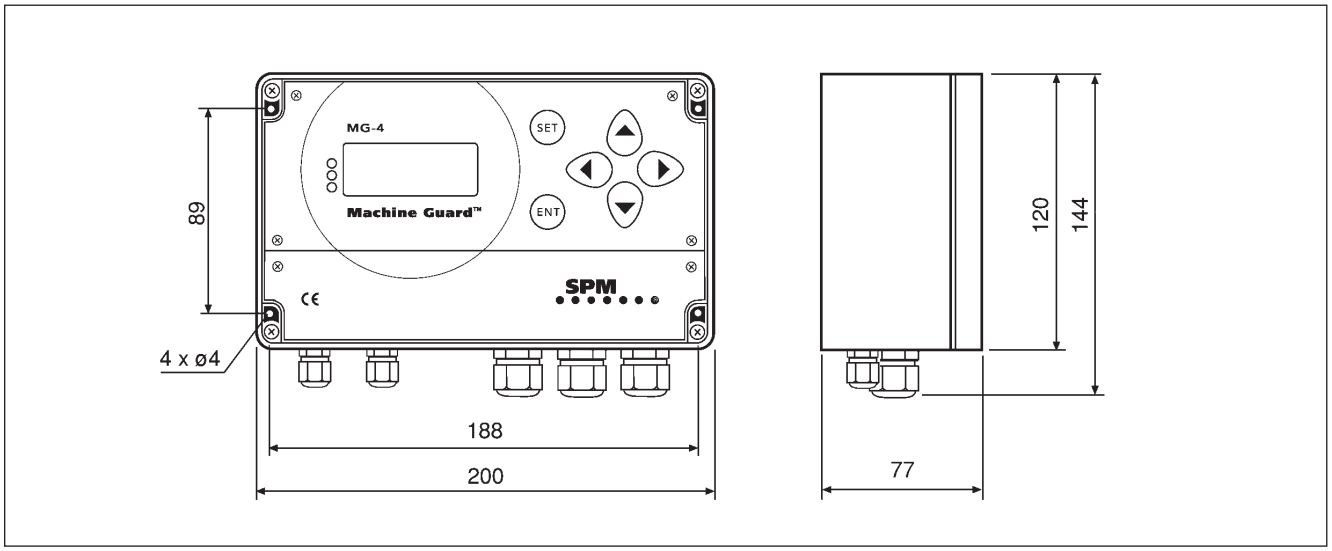
Vibration channel (VIB)

Measuring range:	0.5 to 49.9 mm/s RMS (0 to 1.9 inch/s RMS)
Resolution:	0.1 mm/s (0.01 inch/s)
Frequency range:	3-1000, 3-2000, 10-1000, 10-2000 or 100-1000 Hz
Measuring time:	Programmable 1 to 15 s
Alarm limits:	2, programmable
Alarm delay:	0 to 600 seconds, steps of 2 s
Fault indication:	Transducer line test for short and open circuit
Transducer type:	IEPE (ICP®) with bias 2 to 18 V DC and sensitivity 0.9 to 12.0 mV/m/s^2, type SLD or TRV-18/19/20/21 with isolated installation foot TRX-18/19

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Machine Guard MG4-2A



Machine Guard MG4-2A is a stand-alone measuring unit for continuous monitoring of machine vibration on two channels. It measures vibration severity (true RMS value of vibration velocity) according to ISO 10816.

Machine Guard MG4-2A provides:

- Two programmable alarm levels per channel and status display (green - yellow - red light)
- Display of measured value with continuous updates
- Analog output current 4 - 20 mA with programmable range or complete data on LAN (Modbus network using RTU)
- Relays 250 V (1) and 125 V (4) with programmable alarm levels.

MG4 has a casing for wall mounting, IP65. It can be supplied with mains power or be connected to a PLC. Measuring time, alarm levels, alarm delay and the channel/relay combinations are programmed, using the push buttons on the front panel. It has cable inlets of type M12 for vibration transducers connected with twisted pair cables but can be equipped with TNC connectors (option) for coaxial cables.

The following options are selected on ordering the unit:

Power supply:

- 230 Vac, 115 Vac or 15 to 30 Vac/Vdc

Vibration channel:

- Frequency range 3-1000, 3-2000, 10-1000, 10-2000 or 100-1000 Hz

As an option the MG4 can be equipped with a RS-485 port for sending data via a LAN network. MG4 units equipped for network have no analog outputs.

Technical specifications

Vibration channels:	2, multiplexing
Analog outputs (2):	4-20 mA, selective range, no galvanic separation
Main relay (1):	250 Vac, 5 A, 1250 VA
Secondary relays (4):	125 Vac, 1 A, 60 VA, 150 Vdc, 1 A, 30 W
Power supply:	230 Vac, 115 Vac or 15 to 30 Vac/Vdc
Power consumption:	max. 6 VA
Temperature range:	0° to 50 °C (32° to 122 °F)
Casing:	Polycarbonate/PVC, IP65
TNC connectors (option):	Silver plated brass, 10–15 µ
Display screen:	LCD, 4 x 16 characters, back-lighted
Status display:	Green, yellow, red LED
Dimensions:	200 x 144 x 77 mm
Weight:	1070 grams

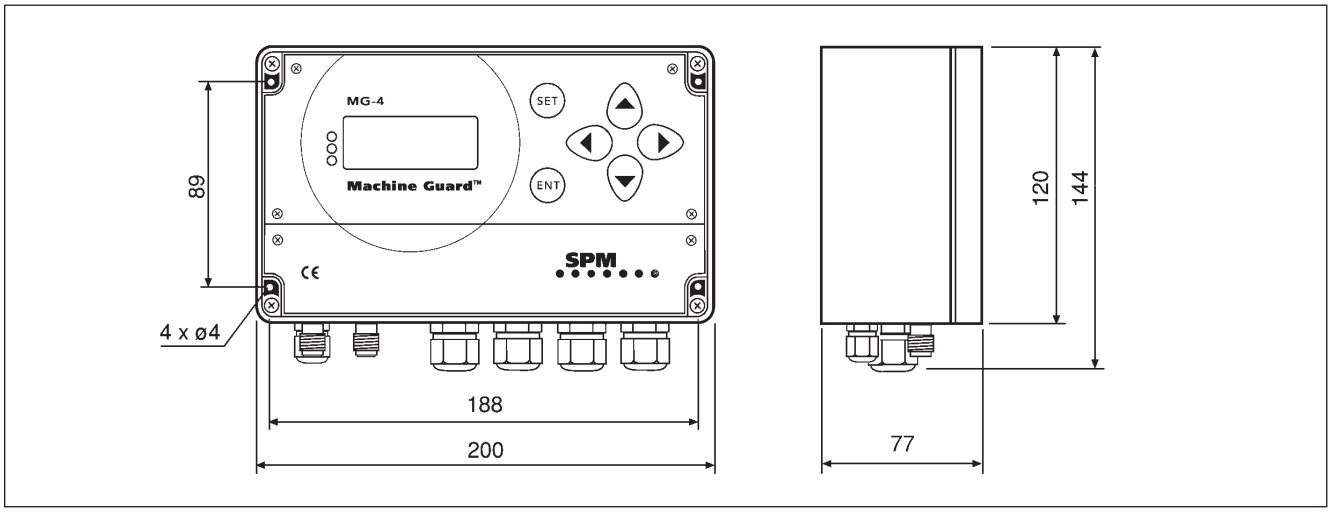
Vibration channel (VIB)

Measuring range:	0.5 to 49.9 mm/s RMS (0 to 1.9 inch/s RMS)
Resolution:	0.1 mm/s (0.01 inch/s)
Frequency range:	3-1000, 3-2000, 10-1000, 10-2000 or 100-1000 Hz
Measuring time:	Programmable 1 to 15 s
Alarm limits:	2, programmable
Alarm delay:	0 to 600 seconds, steps of 2 s
Fault indication:	Transducer line test for short and open circuit
Transducer type:	IEPE (ICP®) with bias 2 to 18 V DC and sensitivity 0.9 to 12.0 mV/m/s^2, type SLD or TRV-18/19/20/21 with isolated installation foot TRX-18/19

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Machine Guard MG4-12A



Machine Guard MG4-12A is a stand-alone measuring unit for continuous monitoring of machine vibration (one channel) and bearing condition (two channels). It measures vibration severity (true RMS value of vibration velocity) according to ISO 10816 and shock pulses according to the true SPM method.

Machine Guard MG4-12A provides:

- Two programmable alarm levels per channel and status display (green - yellow - red light)
- Display of measured value with continuous updates
- Analog output current 4 - 20 mA with programmable range or complete data on LAN (Modbus network using RTU)
- Relays 250 V (1) and 125 V (4) with programmable alarm levels.

MG4 has a casing for wall mounting, IP65. It can be supplied with mains power or be connected to a PLC. Measuring time, alarm levels, alarm delay and the channel/relay combinations are programmed, using the push buttons on the front panel. It has a cable inlet of type M12 for vibration transducer connected with twisted pair cable but can be equipped with TNC connector (option) for coaxial cable.

The following options are selected on ordering the unit:

Power supply:

- 230 Vac, 115 Vac or 15 to 30 Vac/Vdc

Vibration channel:

- Frequency range 3-1000, 3-2000, 10-1000, 10-2000 or 100-1000 Hz

Bearing channel:

- dBm/dBc or LR/HR technique

As an option the MG4 can be equipped with a RS-485 port for sending data via a LAN network. MG4 units equipped for network have no analog outputs.

Technical specifications

Vibration channels:	1
SPM channels:	2, multiplexing
Analog outputs (3):	4-20 mA, selective range, no galvanic separation
Main relay (1):	250 Vac, 5 A, 1250 VA
Secondary relays (4):	125 Vac, 1 A, 60 VA, 150 Vdc, 1 A, 30 W
Power supply:	230 Vac, 115 Vac or 15-30 Vac/Vdc
Power consumption:	max. 6 VA
Temperature range:	0° to 50 °C (32° to 122 °F)
Casing:	Polycarbonate/PVC, IP65
TNC connectors:	Silver plated brass, 10–15 µ
Display screen:	LCD, 4x16 characters, backlighted
Status display:	Green, yellow, red LED
Dimensions:	200 x 144 x 77 mm
Weight:	1140 grams

Vibration channel (VIB)

Measuring range:	0.5 to 49.9 mm/s RMS (0 to 1.9 inch/s RMS)
Resolution:	0.1 mm/s (0.01 inch/s)
Frequency range:	3-1000, 3-2000, 10-1000, 10-2000 or 100-1000 Hz
Measuring time:	Programmable 1 to 15 s
Alarm limits:	2, programmable
Alarm delay:	0 to 600 seconds, steps of 2 s
Fault indication:	Transducer line test for short and open circuit
Transducer type:	IEPE (ICP®) with bias 2-18 V DC and sensitivity 0.9-12.0 mV/m/s^2, type SLD or TRV-18/19/20/21 with isolated installation foot TRX18/19

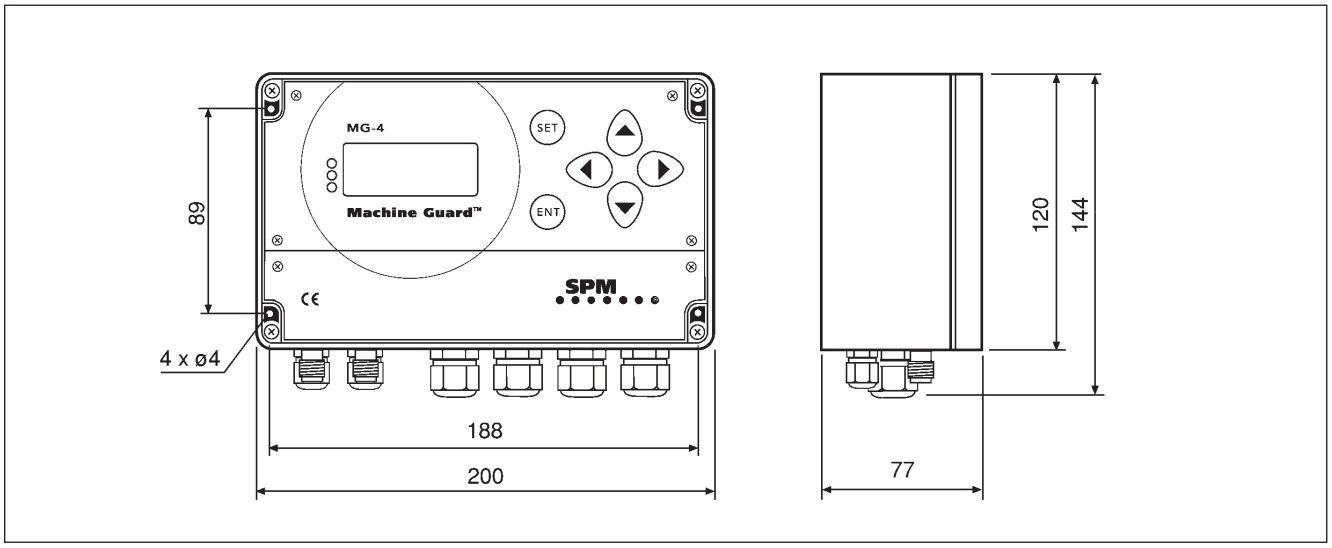
Bearing channel (SPM)

SPM method:	dBm/dBc or LR/HR, evaluated
Measuring range:	0 to 99 dBsv
Resolution:	1 dBsv
Alarm limits:	2, programmable
Alarm delay:	0 to 600 seconds, steps of 2 s
Fault indication:	Transducer line test of measuring circuit quality
Transducer type:	SPM 40000 or 42000

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Machine Guard MG4-22A



Machine Guard MG4-22A is a stand-alone measuring unit for continuous monitoring of machine vibration (two channels) and bearing condition (two channels). It measures vibration severity (true RMS value of vibration velocity) according to ISO 10816 and shock pulses according to the true SPM method.

Machine Guard MG4-22A provides:

- Two programmable alarm levels per channel and status display (green - yellow - red light)
- Display of measured value with continuous updates
- Analog output current 4 - 20 mA with programmable range or complete data on LAN (Modbus network using RTU)
- Relays 250 V (1) and 125 V (4) with programmable alarm levels.

MG4 has a casing for wall mounting, IP65. It can be supplied with mains power or be connected to a PLC. Measuring time, alarm levels, alarm delay and the channel/relay combinations are programmed, using the push buttons on the front panel. It has cable inlets of type M12 for vibration transducers connected with twisted pair cables but can be equipped with TNC connectors (option) for coaxial cables.

The following options are selected on ordering the unit:

Power supply:

- 230 Vac, 115 Vac or 15 to 30 Vac/Vdc

Vibration channel:

- Frequency range 3-1000, 3-2000, 10-1000, 10-2000 or 100-1000 Hz

Bearing channel:

- dBm/dBc or LR/HR technique

As an option the MG4 can be equipped with a RS-485 port for sending data via a LAN network. MG4 units equipped for network have no analog outputs.

Technical specifications

Vibration channels:	2, multiplexing
SPM channels:	2, multiplexing
Analog outputs (4):	4-20 mA, selective range, no galvanic separation
Main relay (1):	250 Vac, 5 A, 1250 VA
Secondary relays (4):	125 Vac, 1 A, 60 VA, 150 Vdc, 1 A, 30 W
Power supply:	230 Vac, 115 Vac or 15-30 Vac/Vdc
Power consumption:	max. 6 VA
Temperature range:	0° to 50° C (32° to 122° F)
Casing:	Polycarbonate/PVC, IP65
TNC connectors:	Silver plated brass, 10–15 µ
Display screen:	LCD, 4x16 characters, back-lighted
Status display:	Green, yellow, red LED
Dimensions:	200 x 144 x 77 mm
Weight:	1150 grams

Vibration channel (VIB)

Measuring range:	0.5 to 49.9 mm/s RMS (0 to 1.9 inch/s RMS)
Resolution:	0.1 mm/s (0.01 inch/s)
Frequency range:	3-1000, 3-2000, 10-1000, 10-2000 or 100-1000 Hz
Measuring time:	Programmable 1 to 15 s
Alarm limits:	2, programmable
Alarm delay:	0 to 600 seconds, steps of 2 s
Fault indication:	Transducer line test for short and open circuit
Transducer type:	IEPE (ICP®) with bias 2 to 18 V DC and sensitivity 0.9 to 12.0 mV/m/s², type SLD or TRV-18/19/20/21 with isolated installation foot TRX-18/19

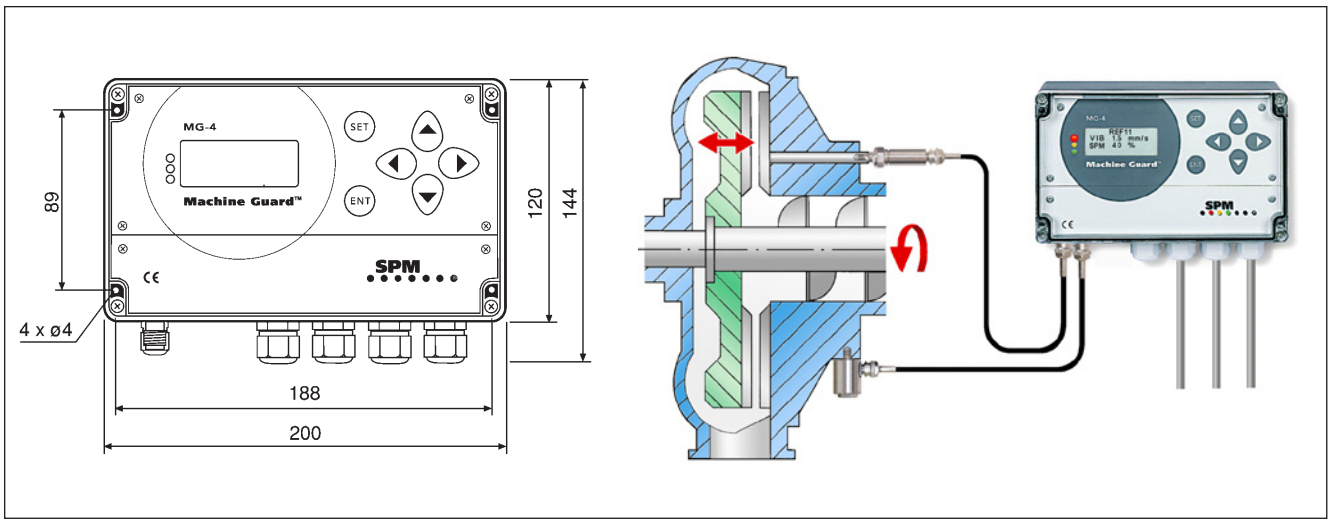
Bearing channel (SPM)

SPM method:	dBm/dBc or LR/HR, evaluated
Measuring range:	0 to 99 dBsv
Resolution:	1 dBsv
Alarm limits:	2, programmable
Alarm delay:	0 to 600 seconds, steps of 2 s
Fault indication:	Transducer line test of measuring circuit quality
Transducer type:	SPM 40000 or 42000

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Machine Guard MG4-REF11 A



Machine Guard MG4-REF11 A is a measuring unit for continuous monitoring of mechanical shocks arising when the disc segments in a refiner touches each other (one channel) and machine vibration (one channel). It measures vibration severity (true RMS value of vibration velocity) according to ISO 2372. It provides, for each channel:

- Status display (green - red light) and system fault (yellow light)
- Display of measured value with continuous updates
- Analog output current 4-20 mA with programmable range
- Relay action at two programmable alarm levels (red alarm)

A shock pulse transducer is fixed to the refiner housing so that mechanical shocks from the segments are transmitted to the transducer with a minimum of reduction. The transducer signal is transmitted via the cables to the MG4-REF11 A electronics which analyse the frequency of occurrence and magnitude.

When the unit is in its normal measuring mode, the green - red status light shows the status of the channel with the worst condition. The yellow status light indicates system fault. The display shows the measuring result on both channels.

During normal operation the instrument reading is 20 to 60 %. If the discs run together, corresponding to an instrument reading above 70 %, a relay is activated and a signal is given to open the disc gap.

The measuring results can be put on any of the available analog output channels and connected with any of the relays.

MG4-REF11 A has a casing for wall mounting, IP65. It can be connected to a PLC via the analog outputs. Measuring time, alarm levels, alarm delay and the channel/relay combinations are programmed, using the push buttons on the front panel. Power supply, 230 Vac or 115 Vac, and type of shock pulse transducer are selected on ordering the unit.

Technical specifications

Vibration monitoring:	1 channel
Shock pulse monitoring:	1 channel
Analog outputs (4):	4 - 20 mA, selective range, VIB (1), Shock Level (1), dBc (1), dBm (1), no galvanic separation
Main relay (1):	250 Vac, 5 A, 1250 VA
Secondary relays (4):	125 Vac, 1 A, 60 VA, 150 Vdc, 1 A, 30 W
Power supply:	230 Vac or 115 Vac
Power consumption:	max. 6 VA
Temperature range:	0° to 50° C (32° to 122° F)
Casing:	Polycarbonate/PVC, IP65
TNC connector:	Silver plated brass, 10–15 µ
Display screen:	LCD, 4x16 characters, backlighted
Status display:	Green, yellow, red LED
Dimensions:	200 x 144 x 77 mm
Weight:	1140 grams

Vibration channel (VIB)

Measuring range:	0.5 to 49.9 mm/s RMS (0 to 1.9 inch/s RMS)
Resolution:	0.1 mm/s (0.01 inch/s)
Frequency range:	10 to 1000 Hz
Measuring time:	Programmable 1 to 15 sec
Alarm limits:	2, programmable, A1 (max) and A2 (min)
Alarm delay:	0 to 600 seconds, steps of 2 s
Fault indication:	Transducer line test for short and open circuit
Transducer type:	IEPE (ICP®) with bias 2 to 18 V DC and sensitivity 0.9 to 12.0 mV/m/s², type SLD or TRV-18/19/20/21 with isolated installation foot TRX-18/19

Shock pulse channel (SPM)

SPM method:	dBm/dBc
Measuring time:	approx. 0.4 s
Measuring range:	0 to 99 dBsv
Resolution:	1 dBsv
Alarm limits:	2, programmable A1 (max) and A2 (min)
Alarm delay:	0 to 600 seconds, steps of 2 s
Fault indication:	Transducer line test of measuring circuit quality, every 2 min.
Transducer type:	SPM 42000

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MG4-XXA – Cable specifications

SPM measurements

Article number	Connector transducer	Accessories transducer	Cable	Protection tube	Connector MG4	Accessories MG4	IP class	Max. temp.	Transducer type	TD sheet
45011	93022	81018	90005		93022	81018		70°C	40000/42000	TD-019 TD-393
45012	93022	10473	90005		93022	81018		70°C	40000/42000	TD-019 TD-393
46144	15291	81018	90005		15291	81018	IP67	70°C	40000/42000	TD-257 TD-393
46096	13008		90005		13008		IP67	70°C	40000/42000	TD-009 TD-393
46143	17155	15716	90005	81385	17155	15716	IP67	70°C	40000/42000	TD-462 TD-393

SPM measurements - High temperature cable

45300	93022	82166	90267		93022	82166		165°C	40000/42000	TD-019 TD-393
47125	13008		90267		13008		IP67	150°C	40000/42000	TD-009 TD-393
46139	17155	15716	90267	81385	17155	15716	IP67	150°C	40000/42000	TD-462 TD-393

VIB measurements

45011	93022	81018	90005		93022	81018		70°C	TRV	TD-019 TD-393
45012	93022	10473	90005		93022	81018		70°C	TRV	TD-019 TD-393
46144	15291	81018	90005		15291	81018	IP67	70°C	TRV	TD-257 TD-393
46096	13008		90005		13008		IP67	70°C	TRV	TD-009 TD-393
46143	17155	15716	90005	81385	17155	15716	IP67	70°C	TRV	TD-462 TD-393
46099	15168		90389		open		IP67	90°C	SLD	TD-217 TD-394
46138	15168	15716	90389	81385	open	15762	IP67	90°C	SLD	TD-217 TD-394
46147	16100		90389		open		IP67	90°C	SLD	TD-314 TD-394
46148	16100	15716	90389	81385	open	15762	IP67	90°C	SLD	TD-314 TD-393

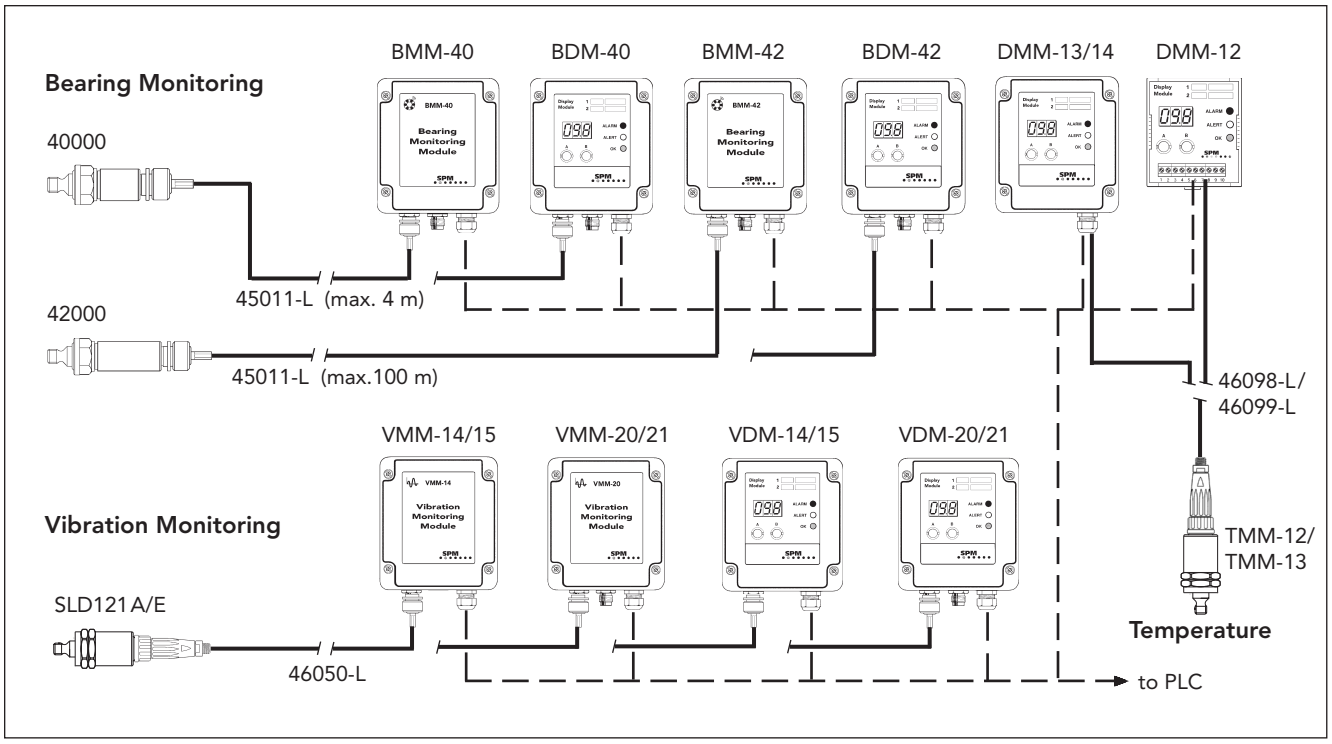
VIB measurements - High temperature cable

45300	93022	82166	90267		93022	82166		165°C	TRV	TD-019 TD-393
47125	13008		90267		13008		IP67	150°C	TRV	TD-009 TD-393
46139	17155	15716	90267	81385	17155	15716	IP67	150°C	TRV	TD-462 TD-393
46098	15168		90381		open		IP67	125°C	SLD	TD-217 TD-394
46151	16100		90381		open		IP67	125°C	SLD	TD-314 TD-394
46140	16100	15716	90381	81385	open	15762	IP67	125°C	SLD	TD-314 TD-394

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CMM System - Encapsulated Modules



The CMM System

The CMM system is a permanently installed, continuous condition monitoring system, consisting of transducers, converters, and combined display and control modules.

The transducers measure bearing condition (shock pulse method), vibration severity (ISO 10816), and temperature.

The converters, with or without display of measured value, transform the shock pulse and vibration transducer signals into 4 to 20 mA analog signals. The temperature transmitter has an output of 4 to 20 mA.

The display modules (DMM) have two input channels for 4 to 20 mA, and two relay outputs (24 V/100 mA).

Display Modules

DMM-12	2 channels, 4-20 mA in, 2 relays (24 V/100 mA), for 35 mm DIN rail
DMM-13	2 channels, 4-20 mA in, 2 relays (24 V/100 mA), in cabinet IP 65, 1 x Pg11 cable inlet
DMM-14	Identical with DMM-13 but with 1 x Pg11 plus 2 x Pg7 cable inlets

Vibration Monitoring Modules

VMM-14	1 channel, 10-1000 Hz
VMM-15	1 channel, 3 -1000 Hz
VMM-20	2 channels, 10-1000 Hz
VMM-21	2 channels, 3 -1000 Hz
VDM-14	1 channel with display, 10-1000 Hz
VDM-15	1 channel with display, 3 -1000 Hz
VDM-20	2 channels with display, 10-1000 Hz
VDM-21	2 channels with display, 3 -1000 Hz

Bearing Monitoring Modules

BMM-40	2 channels, for transducer 40000 (max. cable length L = 4 m)
BMM-42	2 channels, for transducer 42000 (max. cable length L = 100 m)
BDM-40	2 channels with display, for transducer 40000 (max. cable length L = 4 m)
BDM-42	2 channels with display, for transducer 42000 (max. cable length L = 100 m)

Transducers and cables

SLD121A	Vibration transducer, M8
SLD121E	Vibration transducer, UNF 1/4"
TRV-18	Vibration transducer, M8
TRV-19	Vibration transducer, UNF 1/4"
TRX-18	Insulation foot for vibration transducer TRV-18
TRX-19	Insulation foot for vibration transducer TRV-19
40000	Shock Pulse Transducer
42000	Shock Pulse Transducer with matching unit
45011-L	Coaxial cable with connectors, TNC-TNC, temp. range −10° to +70 °C (L = length in meters)
46050-L	Coaxial cable with connectors, TNC-SMB, temp. range −10° to +70 °C (L = length in meters)
TMM-12	4-20 mA Temperature transmitter, M8
TMM-13	4-20 mA Temperature transmitter, UNC 5/16"
46098-L	Twisted pair cable for TMM-12/13, −65 to 200 °C
46099-L	Twisted pair cable for TMM-12/13, −40 to 90 °C

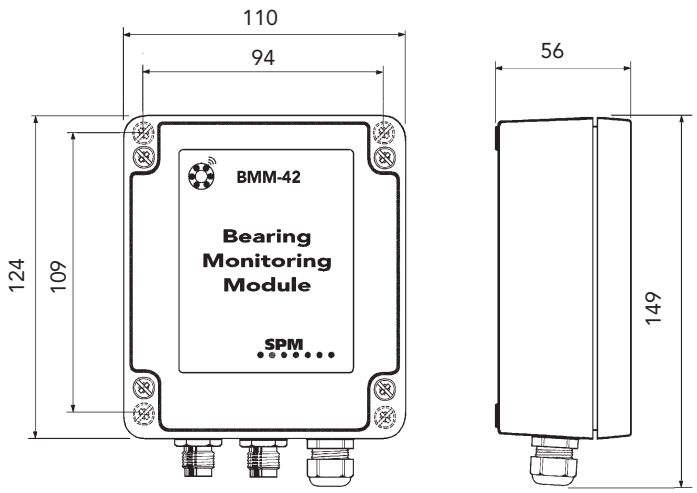
Accessories

14141	Cabinet with mounting rails for DMM-12
14142	Mounting rail, 35 mm DIN, length 357 mm
OMR-10	Power supply module for 35 mm DIN rail, 15 W, 24 V, 0.6 A

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CMM System - Bearing Monitoring Module BMM



Module	Transducer	Cable length
BMM-40	40000	max. 4 m
BMM-42	42000	max. 100 m

Bearing Monitoring Modules BMM are converters with two channels which output 4-20 mA proportional to the un-normalized maximum value of the shock pulses measured on a bearing. The measuring time is approximately 1 second per channel. The measuring range for both channels together can be jumper set to either 0 to 80 or 20 to 100 dBsv.

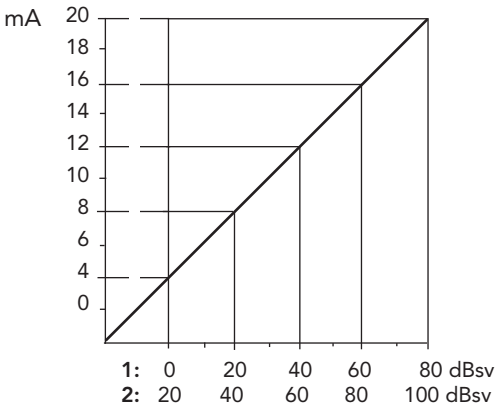
The 4-20 mA current can be supplied to an display module of type DMM, to a PLC or to a computer controlled monitoring system (e.g. SPM's CMS System).

There are two versions:

- BMM-40 for shock pulse transducer type 40000. The coaxial cable used between transducer and module is max. 4 m.
- BMM-42 for shock pulse transducer type 42000. The coaxial cable used between transducer and module is max. 100 m.

The modules are wall mounted and supplied with 12 to 24 V DC. A transducer line fault is indicated by an output of ≤ 1 mA. This output can be changed to 4 mA by a jumper setting, which is common for both channels.

Signal conversion



Technical specifications

Measuring method:	SPM dBm, unnormalized maximum value
Measuring channels:	2, multiplexing
Measuring range 1:	0 to 80 dBsv (5 dB /mA, 0.2 mA/dB)
Measuring range 2:	20 to 100 dBsv (6.25 dB/mA, 0.16 mA/dB)
Measuring time:	approx. 1 second per channel
Transducer type:	40000 (BMM-40), 42000 (BMM-42)
Transducer cable:	coaxial cable, 90005-L, or 90267-L (L = length in m)
Analog output:	4 to 20 mA, no galvanic separation
Fault indication:	≤ 1 mA out = interrupted or faulty transducer line
Loop resistance:	100 Ω. Higher resistance will reduce signal accuracy (max. 400 Ω at 12 V, 800 Ω at 24 V)
Power supply:	12 to 24V DC (±10%, tested according to EN 50082-2)
Supply current:	max. 0.1 A
Cable inlet:	IP65 at ø 5.5 to 10 mm
Input connectors:	silver-plated brass, 10 to 15 µ
Housing:	polycarbonate, IP65
Vibration exposure:	max 5 mm/s RMS
Temperature range:	0° to 55 °C
Dimensions:	110 x 149 x 56 mm
Mounting screws:	4 screws, ø 4 mm, spacing 109 x 94 mm
Weight:	300 g

SPM

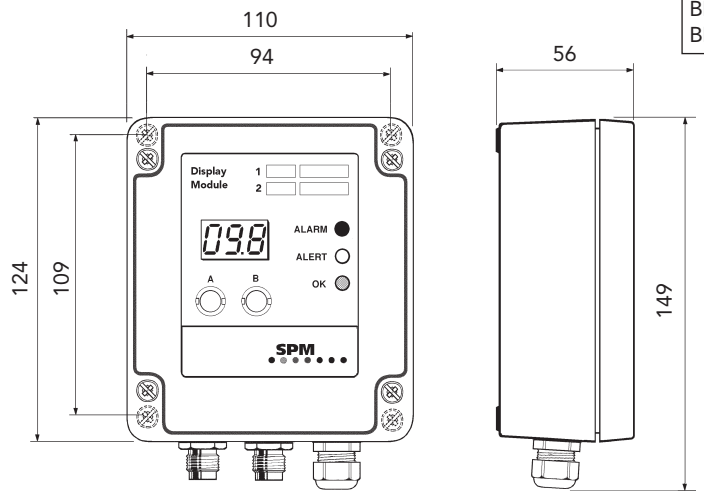
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CMM System – Bearing Display Module BDM

Module	Transducer	Cable length
BDM-40A	40000	max. 4 m
BDM-42A	42000	max. 100 m



Bearing Display Modules BDM have two functions:

- they measure bearing condition (unnormalized maximum value) on two channels and convert the result into an analog 4-20 mA signal which can be sent to a PLC.
- they display analog 4-20 mA signals as a 3 digit measured value. All units have two inputs for analog 4-20 mA, connected to the value display, the condition display and the alarm relays. The analog signal normally comes from the module's measuring channels, but can even come from external sources.

There are two versions:

- BDM-40A for shock pulse transducer type 40000. The coaxial cable between transducer and module is max. 4 m.
- BDM-42A for shock pulse transducer type 42000. The coaxial cable between transducer and module is max. 100 m.

The measuring range for both channels can be jumper set to either 0 to 80 or 20 to 100 dBsv. The modules are wall mounted and supplied with 12 to 24 V DC. A transducer line fault is indicated by an output of ≤ 1 mA. This output can be disconnected by a jumper setting.

The display circuit acts as a programmable ampere meter with two channels. Using two push-buttons, one can select preprogrammed measuring units and ranges from a list and set two alarm levels (with alarm delay) for each channel. These are connected to the condition display (green–yellow –red) and to two relay outputs.

The relays can be controlled by either display channel. In one channel mode, both relays are slaved to a single display channel and provide relay switching at two levels (ALERT and ALARM). In two channel mode, each display channel uses one relay which switches at the ALARM level.

Technical specifications

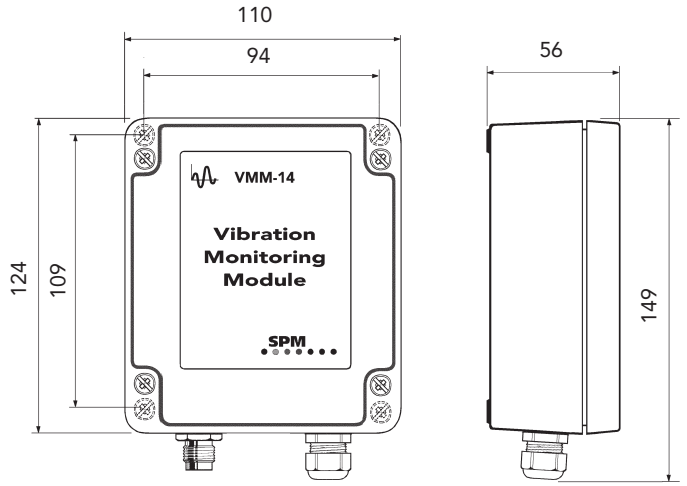
Measuring method:	SPM dBm, unnormalized maximum value
Measuring channels:	2, multiplexing
Measuring range 1:	0 to 80 dBsv (5 dB /mA, 0.2mA/dB)
Measuring range 2:	20 to 100 dBsv (6.25 dB/mA, 0.16 mA/dB)
Measuring time:	approx. 1 second per channel
Transducer type:	40000 (BDM-40A), 42000 (BDM-42A)
Transducer cable:	coaxial cable, 90005-L, or 90267-L (L = length in m)
Analog output:	4 to 20 mA, no galvanic separation
Fault indication:	≤1 mA out = interrupted or faulty transducer line
Loop resistance:	100 Ω. Higher resistance will reduce signal accuracy (max. 400 Ω at 12 V, 800 Ω at 24 V)
Power supply:	12 to 24V DC (± 10%, tested according to EN 50082-2)
Supply current:	max 0.15 A
Cable inlet:	IP 65 at ø 5.5 to 10 mm
Input connectors:	silver plated brass, 10 to 15 µ
Housing:	polycarbonate, IP65
Temperature range:	0° to 55 °C
Vibration exposure:	max 5 mm/s RMS
Dimensions:	110 x 149 x 56 mm
Mounting screws:	4 screws, ø4 mm, spacing 109 x 94 mm
Weight:	400 g
Signal to display:	4 to 20 mA, 2 channels
Relays:	2, max. 24 V/100 mA
Value display:	3 digits LED
Condition display:	green, yellow, and red LED
Alarm limits:	2 per input channel, set with push-buttons
Push-buttons:	2, for display control, alarm limit and alarm delay setting

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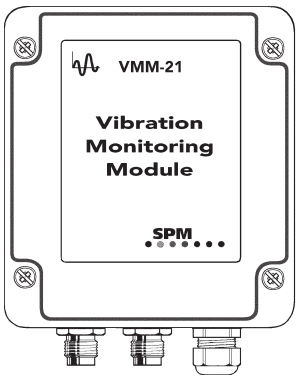
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CMM System – Vibration Monitoring Module VMM

Module	Channels	Freq. range
VMM-14	1	10 - 1000 Hz
VMM-15	1	3 - 1000 Hz
VMM-20	2	10 - 1000 Hz
VMM-21	2	3 - 1000 Hz



VMM-14/15



VMM-20/21

Vibration Monitoring Modules VMM are programmable converters which supply a 4-20 mA signal proportional to the RMS-value of vibration velocity. There are four versions:

VMM-14: 1 channel, frequency range 10 - 1000 Hz
VMM-15: 1 channel, frequency range 3 - 1000 Hz
VMM-20: 2 channels, frequency range 10 - 1000 Hz
VMM-21: 2 channels, frequency range 3 - 1000 Hz.

The frequency range of 3 to 1000 Hz is suitable for machines with rotational speed down to 180 r.p.m.

The measuring range can be DIP switch set to either 0 to 5, 0 to 10, 0 to 20 or 0 to 40 mm/s.

The 4-20 mA output can be supplied to a display module type DMM, to a PLC or to a computer controlled monitoring system (e.g. SPM's CMS System).

A transducer line fault causes an output of <1 mA. If this should interfere with PLC operations, the min. output can be jumper set to 4 mA, individually for each channel.

The vibration transducer is connected via coaxial cable with TNC connectors. The module is wall mounted with 4 screws ø 4 mm and supplied with 12 to 24 V DC. The cable inlet is tight for cable diameters 5.5 to 10 mm.

Technical specifications

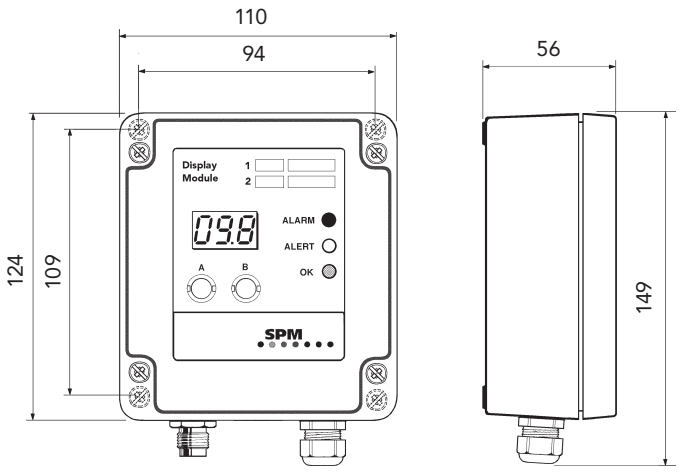
Measuring method:	vibration severity similar to ISO 10816 (modified frequency range, VMM-15/21)
Channels:	1 (VMM-14/15), 2 (VMM-20/21)
Measuring range 1:	0 - 5 mm/s (0 -0.19 inch/s)
Resolution:	3.2 mA = 1 mm/s; 1 mA = 0.313 mm/s
Measuring range 2:	0 - 10mm/s (0 - 0.39 inch/s)
Resolution:	1.6 mA = 1 mm/s; 1 mA = 0.625 mm/s
Measuring range 3:	0 - 20mm/s (0 - 0.78 inch/s)
Resolution:	0.8 mA = 1 mm/s; 1 mA = 1.25 mm/s
Measuring range 4:	0 - 40mm/s (0 - 1,57 inch/s)
Resolution:	0.4 mA = 1 mm/s; 1 mA = 2.5 mm/s
Frequency range:	10 to 1000 Hz (VMM-14/20) 3 to 1000 Hz (VMM-15/21)
Transducer type:	TRV-18/19, SLD121
Transducer cable:	coaxial cable, SPM 90005-L , or 90267-L, (L = max. 50 m)
Analog output:	4 to 20 mA, no galvanic separation
Fault indication:	≤ 1 mA out for open or short circuit
Loop resistance:	100 Ω. Higher resistance will reduce signal accuracy (max. 400 Ω at 12 V, 800 Ω at 24 V)
Power supply:	12 to 24V DC (± 10%, according to EN 50082-2)
Supply current:	max 0.1 A
Cable inlet:	IP 65 at ø 5.5 to 10 mm
Input connectors:	silver-plated brass, 10 to 15 µ
Housing:	polycarbonate, IP65
Temperature range:	0° to 55 °C
Dimensions:	110 x 149 x 56 mm
Mounting screws:	4 screws, ø 4 mm, spacing 109 x 94 mm
Weight:	300 g

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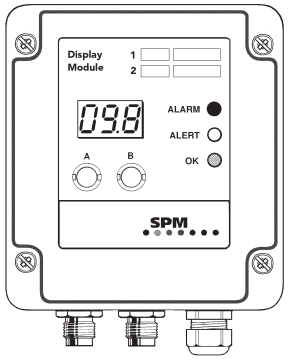
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CMM System - Vibration Display Module VDM

Module	Channels	Freq. range
VDM-14A	1	10 - 1000 Hz
VDM-15A	1	3 - 1000 Hz
VDM-20A	2	10 - 1000 Hz
VDM-21A	2	3 - 1000 Hz



VDM-14/15



VDM-20/21

Vibration Display Modules VDM have two functions:

- they measure the RMS-value of vibration velocity on one or two channels and convert it to an analog 4-20 mA signal which can be sent to a PLC.
- they display analog 4-20 mA signals as a 3 digit measured value. All units have two inputs for analog 4-20 mA, connected to the value display, the condition display and the alarm relays. The analog signal normally comes from the unit's measuring channel(s), but can even come from external sources.

There are four versions:
VDM-14A: 1 vibration channel, frequency range 10-1000 Hz
VDM-15A: 1 vibration channel, frequency range 3-1000 Hz
VDM-20A: 2 vibration channels, frequency range 10-1000 Hz
VDM-21A: 2 vibration channels, frequency range 3-1000 Hz.

The vibration transducer is connected via coaxial cable. The module is wall mounted and supplied with 12 to 24 V DC. The cable inlet is tight for cable diameters 5.5 to 10 mm. A transducer line fault causes an output of <1 mA. If this should interfere with PLC operations, the min. output can be jumper set to 4 mA, individually for each measuring channel.

The display circuit acts as a programmable ampere meter with two channels. Using two push-buttons, one can select preprogrammed measuring units and ranges from a list and set two alarm levels (with alarm delay) for each channel. These are connected to the condition display (green - yellow - red) and to two relay outputs. The relays can be controlled by either display channel. In one channel mode, both relays are slaved to a single display channel and provide relay switching at two levels (ALERT and ALARM). In two channel mode, each display channel uses one relay which switches at the ALARM level.

Technical data

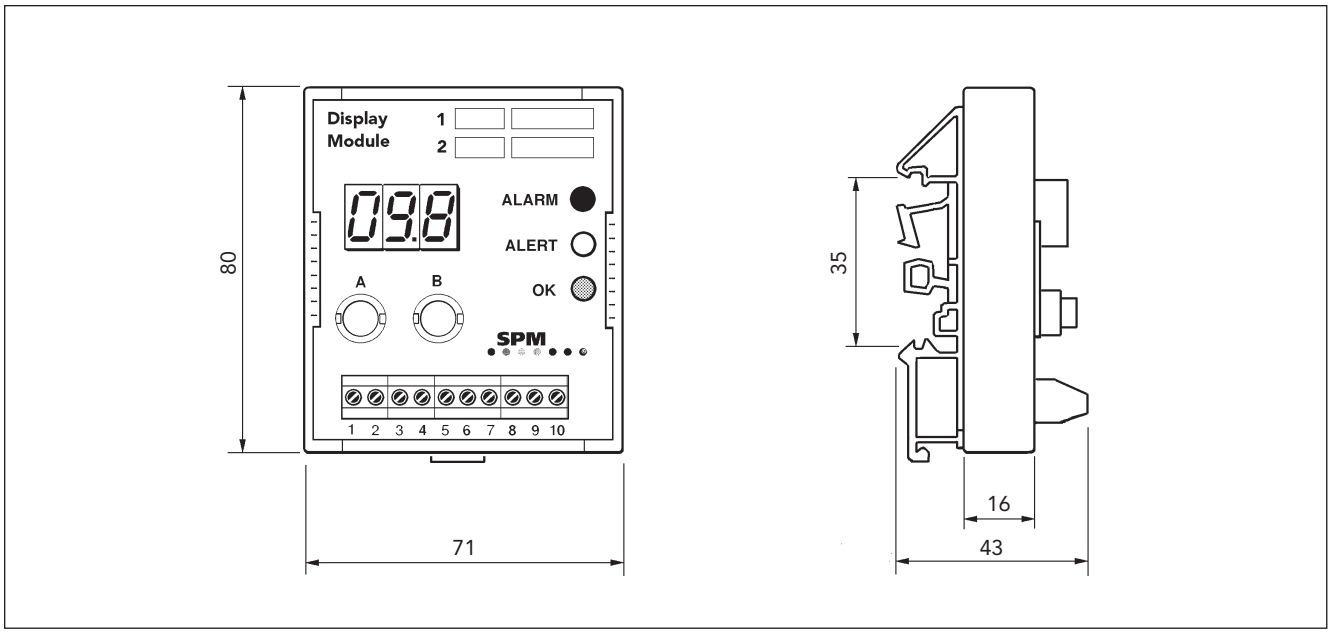
Measuring method:	vibration severity similar to ISO 10816 (modified lower freq., VDM-15A/21A)
Vibration channels:	1 (VDM-14A/15A), 2 (VDM-20A/21A)
Measuring range 1:	0-5 mm/s (0-0,19 inch/s)
Resolution:	3,2 mA = 1 mm/s; 1 mA = 0,313 mm/s
Measuring range 2:	0-10mm/s (0-0,39 inch/s)
Resolution:	1,6 mA = 1 mm/s; 1 mA = 0,625 mm/s
Measuring range 3:	0-20mm/s (0-0,78 inch/s)
Resolution:	0,8 mA = 1 mm/s; 1 mA = 1,25 mm/s
Measuring range 4:	0-40mm/s (0-1,57 inch/s)
Resolution:	0,4 mA = 1 mm/s; 1 mA = 2,5 mm/s
Frequency range:	10 to 1000 Hz (VDM-14A/20A) 3 to 1000 Hz (VDM-15A/21A)
Transducer type:	TRV-18/19, SLD121
Transducer cable:	coaxial cable, SPM 90005-L , or 90267-L (L= max. 50 m)
Analog output:	4 to 20 mA, no galvanic separation
Fault indication:	≤ 1 mA out for open or short circuit
Loop resistance:	100 Ω. Higher resistance will reduce signal accuracy (max. 400 Ω at 12 V, 800 Ω at 24 V)
Power supply:	12 to 24V DC (± 10%, tested according to EN 50082-2), max 0.15 A
Housing:	polycarbonate, IP65
Temperature range:	0 to 55 °C
Vibration exposure:	max. 5 mm/s RMS
Cable inlet:	IP 65 at ø 5.5 to 10 mm
Input connectors:	silver plated brass, 10 to 15 µ
Dimensions:	110 x 149 x 56 mm
Mounting screws:	4 screws, ø 4 mm, spacing 109 x 94 mm
Weight:	400 g
Signal to display:	4 to 20 mA, 2 channels
Relays:	2, max. 24 V/100 mA
Value display:	3 digits, LED
Condition display:	green, yellow, and red LED
Alarm limits:	2 per display channel
Push-buttons:	2, for display control and programming

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CMM System – Display Module DMM-12



DMM-12 is a condition display module for 4-20 mA analog signals. Measured quantities and ranges are selected from a preprogrammed list (13 programs) or from user defined programs (7 programs).

The display module is clipped onto a standard mounting rail in a control cabinet or similar, and supplied with 12 to 24 V DC, source referred to earth.

The display module has two input channels and two relay outputs. The relays can be controlled by either input channel. In one channel mode, both relays are slaved to a single input channel and provide relay switching at two levels (ALERT and ALARM). In two channel mode, each input channel uses one relay which switches at a preset ALARM level.

Programmable parameters for each input channel are the measuring range, the two alarm levels ALERT and ALARM, and the alarm delay. These are input using two push buttons. Power failure will not erase the program.

Condition display is provided by three coloured LEDs. The green LED is on while measured values are below the ALERT level. Measured values between ALERT and ALARM on either channel trigger a yellow LED, and a red LED lights up when a measured value exceeds an ALARM level. A blinking yellow LED indicates a system fault (incoming signal below 4 mA).

The measured value is displayed with three digits. In two channel mode the status LED's and the display alternates between the two channels and shows the channel number followed by the measured value on this channel.

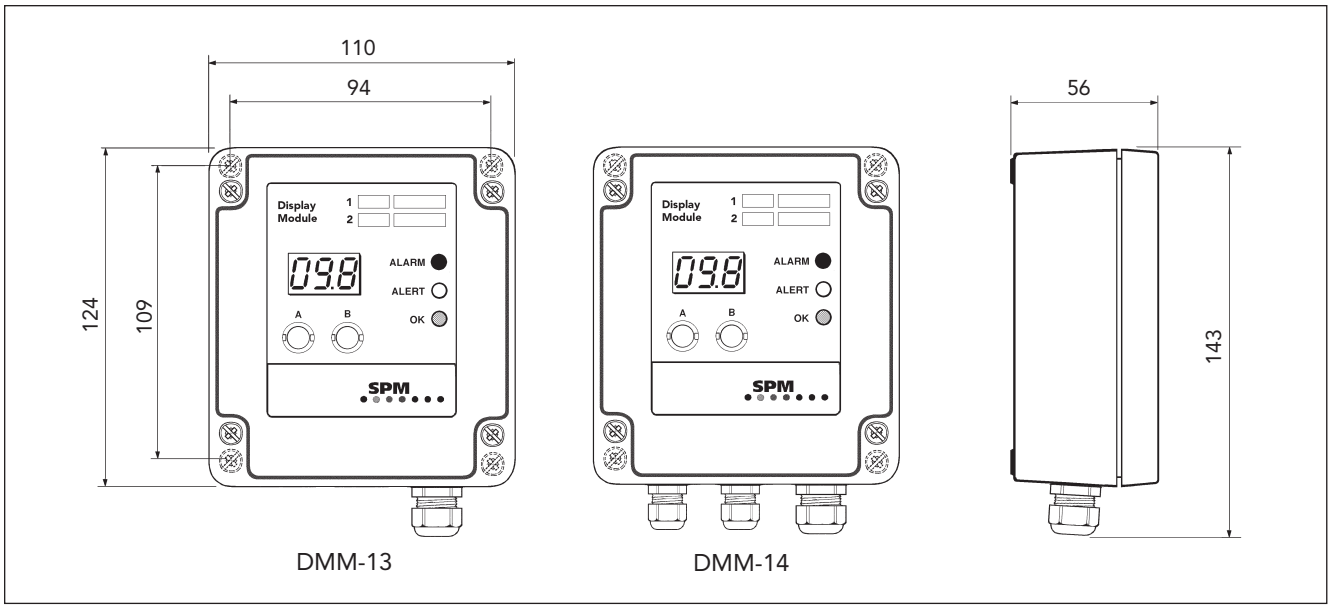
Technical specifications

Input channels:	2
Input signals:	4 to 20 mA
Relays (2):	24V/100 mA
Measuring range:	selected to match the signal input
Value display:	3 digits, LED
Status display:	green, yellow, and red LED
Alarm limits:	2 per input channel, set with push-buttons
Alarm delay:	0 - 600 seconds for each alarm level
Push-buttons:	2, for display control and programming
Fault indication:	blinking yellow LED = signal below 4 mA
Power supply:	12 to 24V DC (±10%, tested according to EN50082-2)
Supply current:	max 0.1 A
Vibration exposure:	max. 5 mm/s RMS
Housing:	polyamide, not protected
Temperature range:	0° to 55° C
Dimensions:	80 x 71 x 43 mm
Mounting:	clip on to 35 mm DIN rail
Weight:	100 g

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CMM System – Display Module DMM-13/14



DMM-13 and DMM-14 are condition display modules for 4-20 mA analog signals. Measured quantities and ranges are selected from a preprogrammed list (13 programs) or from user defined programs (7 programs). DMM-14 has two extra cable inlets of type Pg7.

The display module can be wall mounted separately or in a control cabinet or similar. It is supplied with 12 to 24 V DC.

The display module has two input channels and two relay outputs. The relays can be controlled by either input channel. In one channel mode, both relays are slaved to a single input channel and provide relay switching at two levels (ALERT and ALARM). In two channel mode, each input channel uses one relay which switches at a preset ALARM level.

Programmable parameters for each input channel are the measuring range, the two alarm levels ALERT and ALARM, and the alarm delay. These are input using two push buttons. Power failure will not erase the program.

Condition display is provided by three coloured LEDs. The green LED is on while measured values are below the ALERT level. Measured values between ALERT and ALARM on either channel trigger a yellow LED, and a red LED lights up when a measured value exceeds the ALARM level. A blinking yellow LED indicates a system fault (incoming signal below 4 mA).

The measured value is displayed with three digits. In two channel mode the status LED's and the display alternates between the two channels and shows the channel number followed by the measured value on this channel.

Technical data

Input channels:	2
Input signals:	4 to 20 mA
Relays (2):	24V / 100 mA
Measuring range:	selected to match the signal input
Value display:	3 digits, LED
Status display:	green, yellow, and red LED
Alarm limits:	2 per input channel, set with push-buttons
Alarm delay:	0 - 600 seconds for each alarm level
Push-buttons:	2, for display control and programming
Fault indication:	blinking yellow LED = signal below 4 mA
Power supply:	12 to 24V DC (±10%, tested according to EN50082-2)
Supply current:	max. 0.1 A
Vibration exposure:	max. 5 mm/s RMS
Cable inlets:	Pg11, IP65 at ø5.5 to 10 mm
	Pg7, IP65 at ø3 to 6.5 mm (DMM-14)
Housing:	polycarbonate, IP 65
Temperature range:	0° to 55° C
Dimensions:	110 x 143 x 56 mm
Mounting:	4 screws, ø4 mm, spacing 109x94 mm
Weight:	320 g

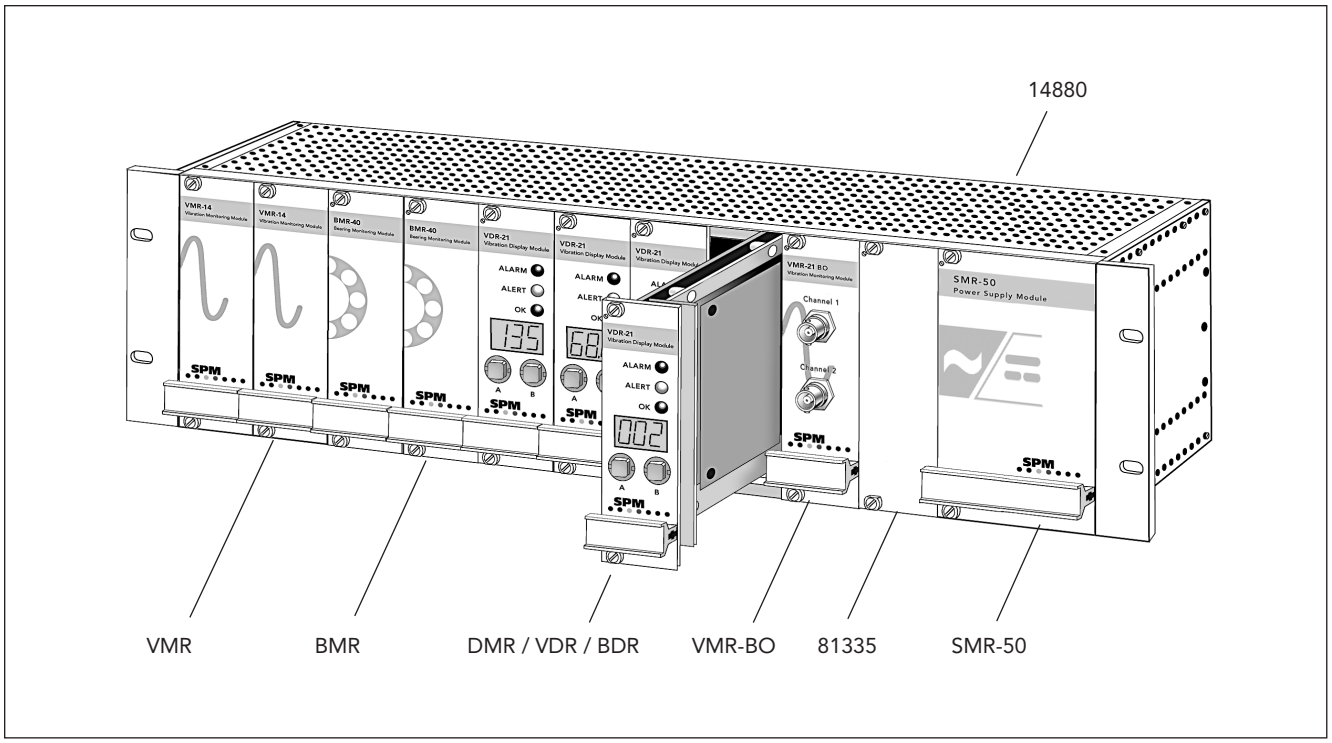
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CMM System – Modules for Rack Mounting



The CMM System

The CMM system is a permanently installed, continuous condition monitoring system, consisting of transducers, converters, power supply modules, and combined display and control modules.

The transducers measure bearing condition (shock pulse method), vibration severity (ISO 10816), and temperature. The converters, with or without display of measured value, transform the shock pulse and vibration transducer signals into 4 to 20 mA analog signals. The temperature transducer has an output of 4 to 20 mA. The display modules (DMR) have two input channels for 4 to 20 mA, and two relay outputs (24 V / 100 mA).

This line of modules is intended for rack mounting. The 19" subrack holds up to 12 modules (7HP).

Vibration Monitoring Rack Modules

VMR-14	1 channel, 10-1000 Hz
VMR-15	1 channel, 3-1000 Hz
VMR-20	2 channels,10-1000 Hz
VMR-21	2 channels, 3-1000 Hz
VMR-14 BO	1 channel, 10-1000 Hz, with bypass output
VMR-15 BO	1 channel, 3-1000 Hz, with bypass output
VMR-20 BO	2 channels,10-1000 Hz, with bypass output
VMR-21 BO	2 channels, 3-1000 Hz, with bypass output
VDR-14	1 channel with display, 10-1000 Hz
VDR-15	1 channel with display, 3-1000 Hz
VDR-20	2 channels with display, 10-1000 Hz
VDR-21	2 channels with display, 3-1000 Hz

Bearing Monitoring Rack Modules

BMR-40	2 channels, for transducer 40000 (max. cable length L = 4 m)
BMR-42	2 channels, for transducer 42000 (max. cable length L = 100 m)
BDR-40	2 channels with display, for transducer 40000 (max. cable length L = 4 m)
BDR-42	2 channels with display, for transducer 42000 (max. cable length L = 100 m)

Display Module for Rack

DMR-14	2 channels, 4-20 mA in, 2 relays (24 V/100 mA)

Accessories

14880	19" subrack, 3U high, compl. with cover plates
SMR-50	Power supply module, 115/230 VAC/24 VDC
81335	Blank panel, 3U x 7HP

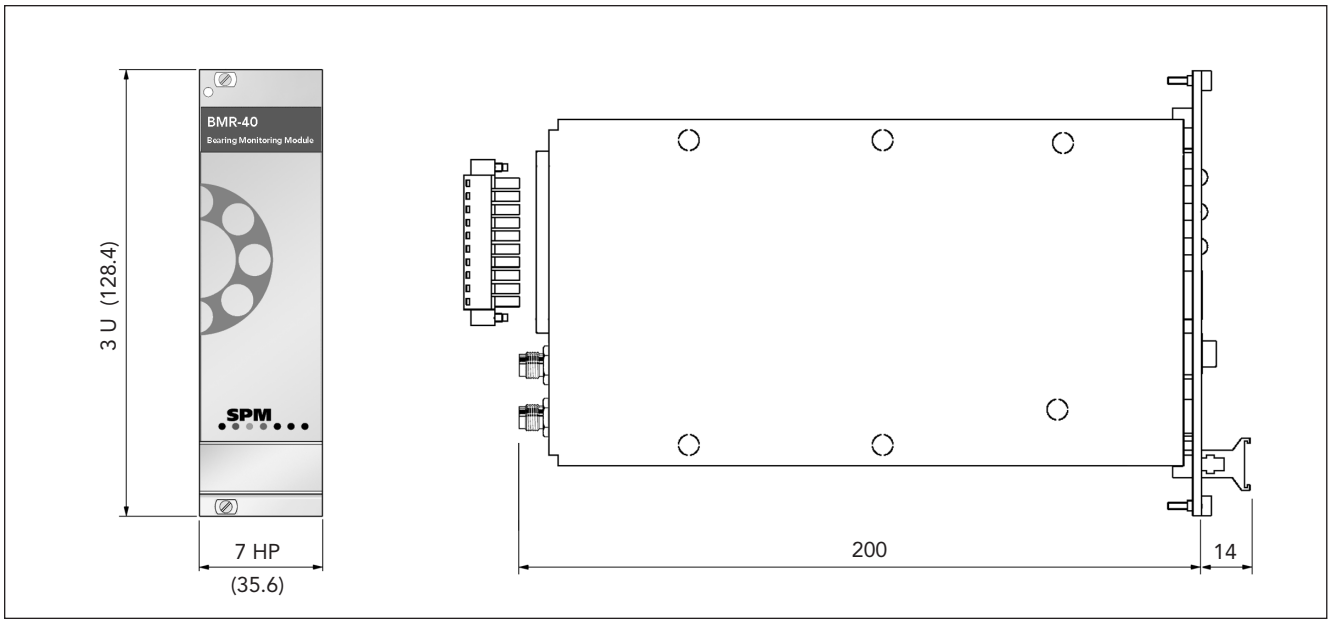
Transducers and cables

TRV-18	Vibration transducer, M8
TRV-19	Vibration transducer, UNF 1/4"
TRX-18	Insulation foot for vibration transducer TRV-18
TRX-19	Insulation foot for vibration transducer TRV-19
40000	Shock pulse transducer
42000	Shock pulse transducer with matching unit
45011-L	Coaxial cable with connectors, temp. range –10° to +70°C (L = length in meters)
45300-L	Coaxial cable with connectors, temp. range –40° to +125° C (L = length in meters)
TMM-10	Temperature transducer, –16° to +120° C
90296-L	Twinned cable for TMM-10, max. 125° C

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CMM System – Bearing Monitoring Rack Module BMR



Bearing Monitoring Rack Modules BMR are converters with two channels which output 4-20 mA proportional to the unnormalized maximum value of the shock pulses measured on a bearing. The measuring time is approximately 1 second per channel. The measuring range for both channels together can be jumper set to either 0 to 80 or 20 to 100 dBsv.

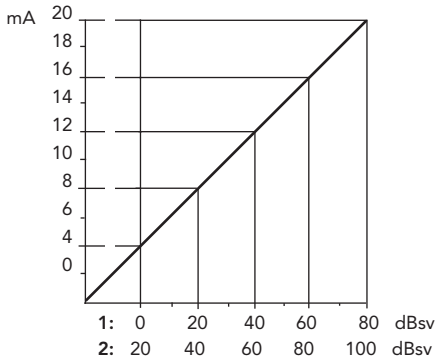
The 4-20 mA current can be supplied to an display module of type DMM/DMR, to a PLC or to a computer controlled monitoring system (e.g. SPM's CMS System).

There are two versions:

- BMR-40 for shock pulse transducer type 40000. The coaxial cable used between transducer and module is max. 4 m.
- BMR-42 for shock pulse transducer type 42000. The coaxial cable used between transducer and module is max. 100 m.

The modules are mounted in standard 19" racks and supplied with 12 to 24 V DC. A transducer line fault is indicated by an output of ≤ 1 mA. This output can be changed to 4 mA by a jumper setting common for both channels.

Signal conversion



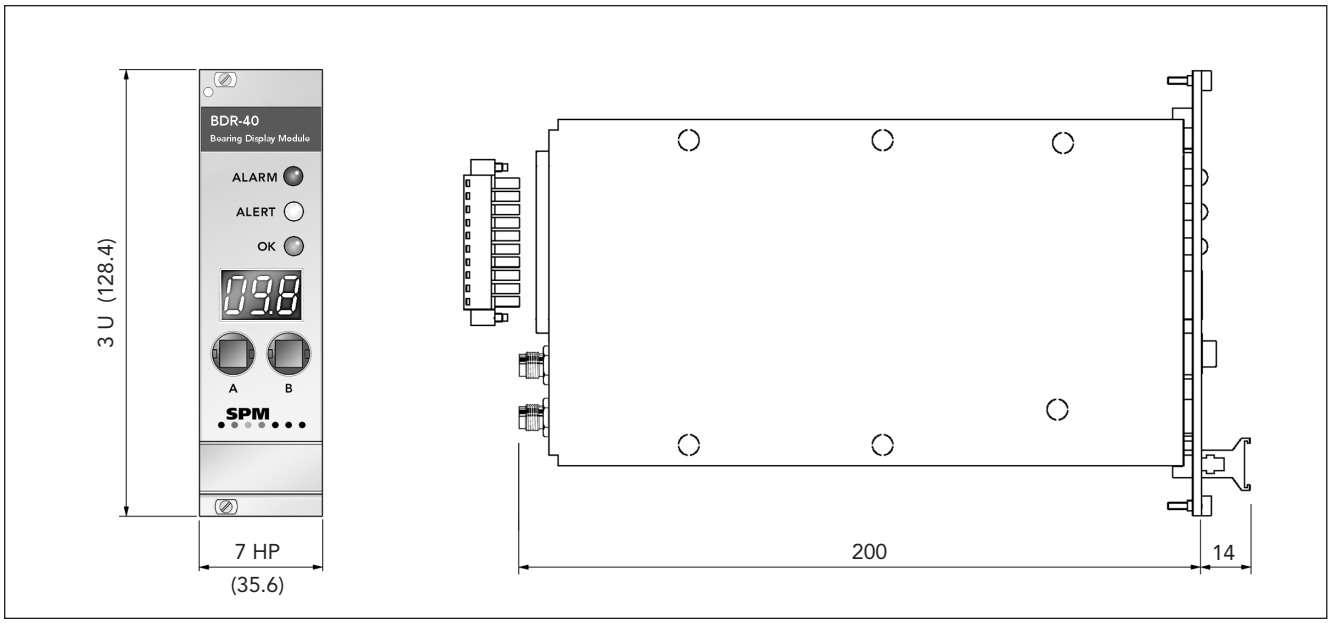
Technical data

Measuring method:	SPM dBm, unnormalized maximum value
Measuring channels:	2, multiplexing
Measuring range 1:	0 to 80 dBsv (5 dB /mA, 0.2 mA/dB)
Measuring range 2:	20 to 100 dBsv (4 mA ≤ 20 dBsv)
Measuring time:	approx. 1 second per channel
Transducer type:	SPM 40000 (BMR-40), SPM 42000 (BMR-42)
Transducer cable:	coaxial cable, SPM 90005-L, or SPM 90267-L (L = length in m)
Analog output:	4 to 20 mA, no galvanic separation
Fault indication:	≤ 1 mA out = interrupted or faulty transducer line
Loop resistance:	100 Ω. Higher resistance will reduce signal accuracy (max. 400 Ω at 12 V, 800 Ω at 24 V)
Power supply:	12 to 24V DC (±10%, tested according to EN 50082-2)
Supply current:	max. 0.1 A
Temperature range:	0° to 55° C
Vibration exposure:	max 5 mm/s RMS
Design:	anodised aluminium, not protected
Input connectors:	TNC, silver plated brass, 10 - 15 µ
Output connectors:	screw terminals for cable max. 1.5 mm^2, connector plug included
Mounting:	19" rack
Dimensions:	3 U x 7 HP x 214 mm, DIN 41494
Weight:	250 g

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CMM System – Bearing Display Rack Module BDR



Bearing Display Rack Modules BDR have two functions:

- they measure bearing condition (unnormalized maximum value) on two channels and convert the result into an analog 4-20 mA signal which can be sent to a PLC.
- they display the analog 4-20 mA signal as a 3 digit measured value. All units have two inputs for analog 4-20 mA, connected to the value display, the condition display and the alarm relays. The analog signal normally comes from the module's measuring channels, but can even come from external sources.

There are two versions:

- BDR-40 for shock pulse transducer type 40000. The coaxial cable between transducer and module is max. 4 m.
- BDR-42 for shock pulse transducer type 42000. The coaxial cable between transducer and module is max. 100 m.

The measuring range for both channels can be jumper set to either 0 to 80 or 20 to 100 dBsv. The modules are mounted in standard 19" racks and supplied with 12 to 24 VDC. A transducer line fault is indicated by an output of ≤1 mA. This output can be disconnected by a jumper setting.

The display circuit acts as a programmable ampere meter with two channels. Using two push-buttons, one can select preprogrammed measuring units and ranges from a list and set two alarm levels (with alarm delay) for each channel. These are connected to the condition display (green–yellow –red) and to two relay outputs.

The relays can be controlled by either display channel. In one channel mode, both relays are slaved to a single display channel and provide relay switching at two levels (ALERT and ALARM). In two channel mode, each display channel uses one relay which switches at the ALARM level.

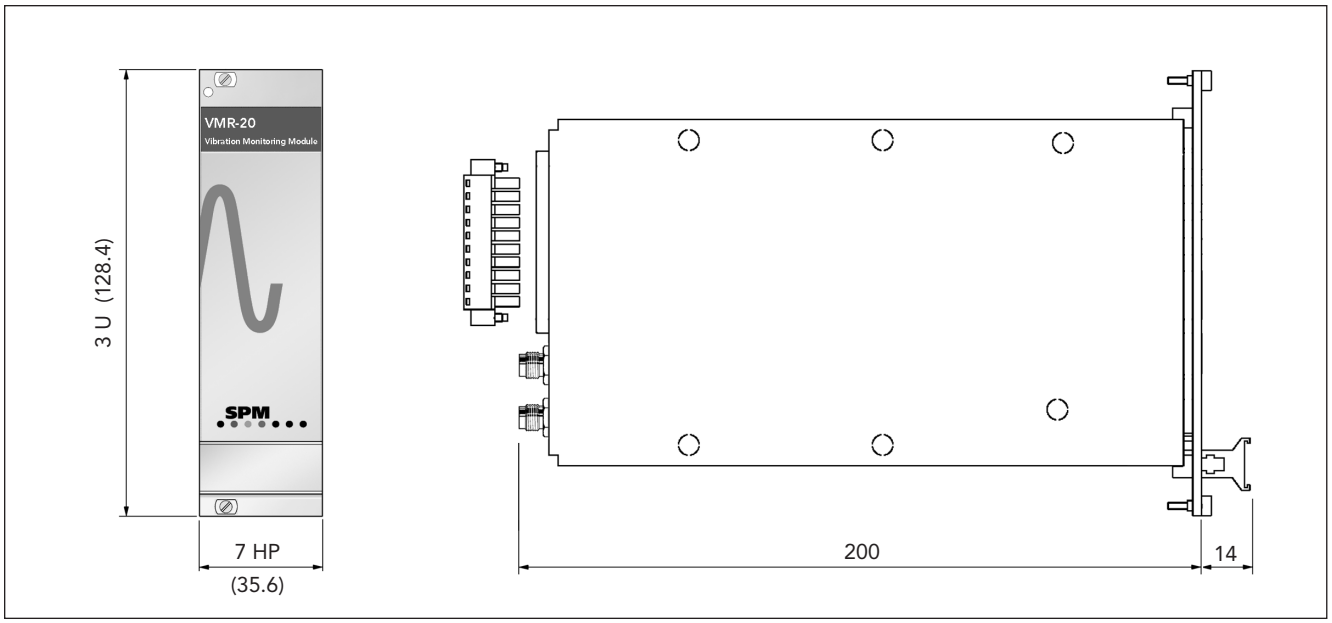
Technical specifications

Measuring method:	SPM dBm, unnormalized maximum value
Measuring channels:	2, multiplexing
Measuring range 1:	0 to 80 dBsv (5 dB /mA, 0.2mA/dB)
Measuring range 2:	20 to 100 dBsv (4 mA ≤ 20 dBsv)
Measuring time:	approx. 1 second per channel
Transducer type:	SPM 40000 (BDR-40), SPM 42000 (BDR-42)
Transducer cable:	coaxial cable, SPM 90005-L, or 90267-L (L = length in m)
Analog output:	4 to 20 mA, no galvanic separation
Fault indication:	≤1 mA out = interrupted or faulty transducer line
Loop resistance:	100 Ω. Higher resistance will reduce signal accuracy (max. 400 Ω at 12 V, 800 Ω at 24 V)
Power supply:	12 to 24V DC (± 10%, tested according to EN 50082-2)
Supply current:	max 0.15 A
Temperature range:	0° to 55° C
Vibration exposure:	max 5 mm/s RMS
Design:	anodised aluminium, not protected
Input connectors:	TNC, silver plated brass, 10-15 µ
Output connectors:	screw terminals for cable max. 1.5 mm^2, connector plug included
Mounting:	19" rack
Dimensions:	3 U x 7 HP x 214 mm, DIN 41494
Weight:	300 g
Signal to display:	4 to 20 mA, 2 channels
Relays:	2, max. 24 V/100 mA
Value display:	3 digits LED
Condition display:	green, yellow, and red LED
Alarm limits:	2 per input channel, set with push-buttons
Push-buttons:	2, for display control, alarm limit and alarm delay setting

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CMM System – Vibration Monitoring Rack Module VMR



Vibration Monitoring Rack Modules VMR are programmable converters which supply a 4-20 mA signal proportional to the RMS-value of vibration velocity.

There are four versions:

- VMR-14: 1 channel, frequency range 10–1000 Hz
- VMR-15: 1 channel, frequency range 3–1000 Hz
- VMR-20: 2 channels, frequency range 10–1000 Hz
- VMR-21: 2 channels, frequency range 3–1000 Hz.

The frequency range of 3 to 1000 Hz is suitable for machines with rotational speed down to 180 r.p.m.

The measuring range can be DIP switch set to either 0 to 5, 0 to 10, 0 to 20 or 0 to 40 mm/s.

The 4-20 mA output can be supplied to a display module type DMM/DMR, to a PLC or to a computer controlled monitoring system (e.g. SPM's CMS System).

A transducer line fault causes an output of <1 mA. If this should interfere with PLC operations, the min. output can be jumper set to 4 mA, individually for each channel.

The vibration transducer is connected via coaxial cable with TNC connector. The modules are mounted in standard 19" rack and supplied with 12 to 24 V DC.

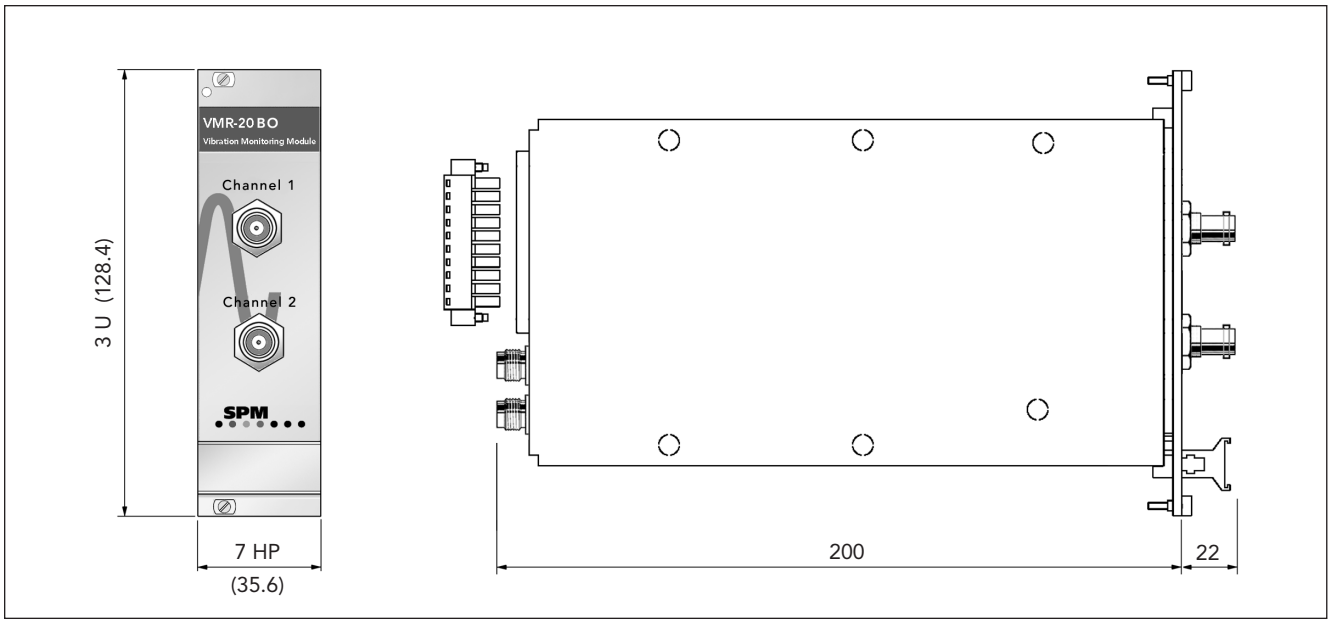
Technical specifications

Measuring method:	vibration severity similar to ISO 10816 (modified frequency range, VMR-15/21)
Channels:	1 (VMR-14/15), 2 (VMR-20/21)
Measuring range 1:	0 - 5 mm/s (0 -0.19 inch/s)
Resolution:	3.2 mA = 1 mm/s; 1 mA = 0.313 mm/s
Measuring range 2:	0 - 10mm/s (0 - 0.39 inch/s)
Resolution:	1.6 mA = 1 mm/s; 1 mA = 0.625 mm/s
Measuring range 3:	0 - 20mm/s (0 - 0.78 inch/s)
Resolution:	0.8 mA = 1 mm/s; 1 mA = 1.25 mm/s
Measuring range 4:	0 - 40mm/s (0 - 1,57 inch/s)
Resolution:	0.4 mA = 1 mm/s; 1 mA = 2.5 mm/s
Frequency range:	10 to 1000 Hz (VMR-14/20) 3 to 1000 Hz (VMR-15/21)
Transducer type:	SLD121, TRV18, TRV19
Transducer cable:	coaxial cable, SPM 90005-L , or 90267-L, (L = max. 50 m)
Analog output:	4 to 20 mA, no galvanic separation
Fault indication:	≤ 1 mA out for open or short circuit
Loop resistance:	100 Ω. Higher resistance will reduce signal accuracy (max. 400 Ω at 12 V, 800 Ω at 24 V)
Power supply:	12 to 24V DC (±10%, according to EN 50082-2)
Supply current:	max 0.1 A
Temperature range:	0° to 55° C
Vibration exposure:	max. 5 mm/s RMS
Design:	anodised aluminium, not protected
Input connectors:	TNC, silver plated brass, 10–15 µ
Output connectors:	screw terminals for cable max. 1.5 mm², connector plug included
Mounting:	19" rack
Dimensions:	3 U x 7 HP x 214 mm, DIN 41494
Weight:	200 g (VMR-14/15) 250 g (VMR-20/21)

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CMM System – Vibration Monitoring Rack Module VMR-BO



Vibration Monitoring Rack Modules VMR-BO are programmable converters which supply a 4-20 mA signal proportional to the RMS-value of vibration velocity. They have bypass outputs for connection of portable instruments.

There are four versions:

- VMR-14 BO: 1 channel, frequency range 10–1000 Hz
- VMR-15 BO: 1 channel, frequency range 3–1000 Hz
- VMR-20 BO: 2 channels, frequency range 10–1000 Hz
- VMR-21 BO: 2 channels, frequency range 3–1000 Hz.

The frequency range of 3 to 1000 Hz is suitable for machines with rotational speed down to 180 r.p.m.

The measuring range can be DIP switch set to either 0 to 5, 0 to 10, 0 to 20 or 0 to 40 mm/s.

The 4-20 mA output can be supplied to a display module type DMM/DMR, to a PLC or to a computer controlled monitoring system (e.g. SPM's CMS System).

A transducer line fault causes an output of <1 mA. If this should interfere with PLC operations, the min. output can be jumper set to 4 mA, individually for each channel.

The vibration transducer is connected via coaxial cable with TNC connector. The modules are mounted in standard 19" rack and supplied with 12 to 24 V DC.

The portable instrument SPM Leonova (or similar) can be connected to the pypass outputs on the front panel via a coaxial cable with BNC connectors.

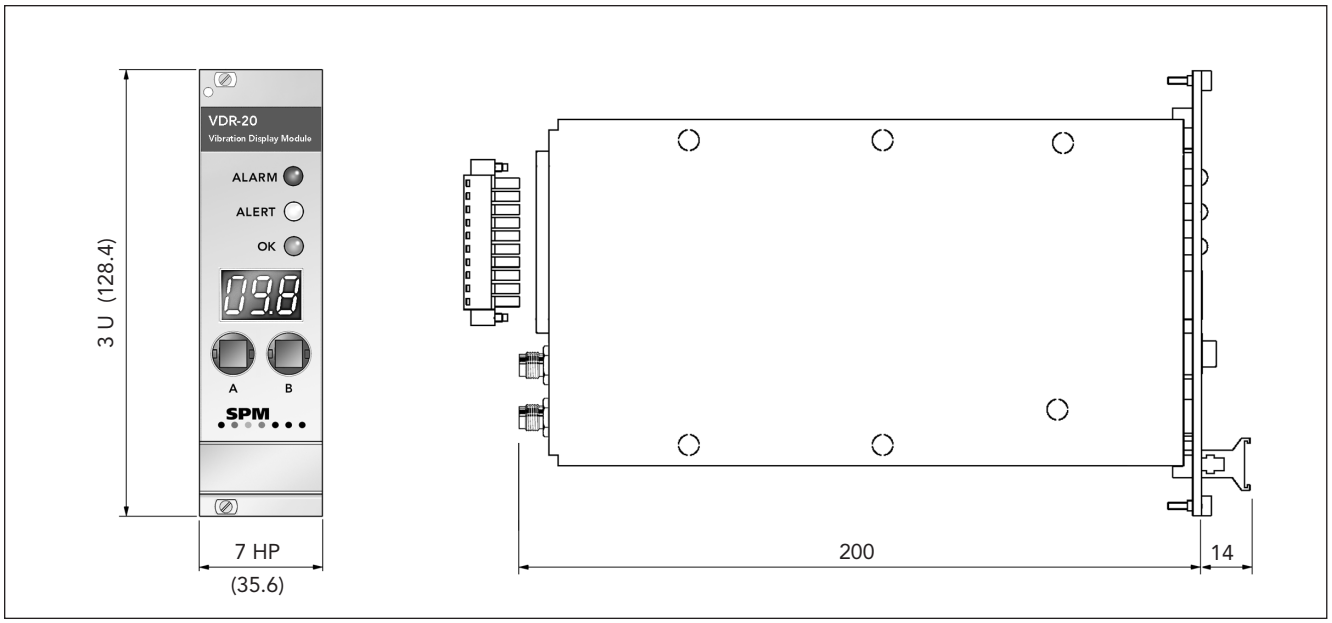
Technical specifications

Measuring method:	vibration severity similar to ISO 10816 (modified frequency range, VMR-15/21 BO)
Channels:	1 (VMR-14/15 BO), 2 (VMR-20/21 BO)
Measuring range 1:	0 - 5 mm/s (0 -0.19 inch/s)
Resolution:	3.2 mA = 1 mm/s; 1 mA = 0.313 mm/s
Measuring range 2:	0 - 10mm/s (0 - 0.39 inch/s)
Resolution:	1.6 mA = 1 mm/s; 1 mA = 0.625 mm/s
Measuring range 3:	0 - 20mm/s (0 - 0.78 inch/s)
Resolution:	0.8 mA = 1 mm/s; 1 mA = 1.25 mm/s
Measuring range 4:	0 - 40mm/s (0 - 1,57 inch/s)
Resolution:	0.4 mA = 1 mm/s; 1 mA = 2.5 mm/s
Frequency range:	10 to 1000 Hz (VMR-14/20) 3 to 1000 Hz (VMR-15/21)
Transducer type:	SLD121, TRV18, TRV19
Transducer cable:	coaxial cable, SPM 90005-L , or 90267-L, (L = max. 50 m)
Analog output:	4 to 20 mA, no galvanic separation
Fault indication:	≤ 1 mA out for open or short circuit
Loop resistance:	100 Ω. Higher resistance will reduce signal accuracy (max. 400 Ω at 12 V, 800 Ω at 24 V)
Power supply:	12 to 24V DC (± 10%, according to EN 50082-2)
Supply current:	max 0.1 A
Temperature range:	0° to 55° C
Vibration exposure:	max. 5 mm/s RMS
Design:	anodised aluminium, not protected
Input connectors:	TNC, silver plated brass, 10–15 µ
Output connectors:	screw terminals for cable max. 1.5 mm², connector plug included
Bypass outputs:	BNC connectors for connection of SPM Leonova or similar instrument
Mounting:	19" rack
Dimensions:	3 U x 7 HP x 222 mm, DIN 41494
Weight:	210 g (VMR-14 BO/15 BO) 350 g (VMR-20 BO/21 BO)

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CMM System – Vibration Display Rack Module VDR



Vibration Display Rack Modules VDR have two functions:

- they measure the RMS-value of vibration velocity on one or two channels and convert it to an analog 4-20 mA signal which can be sent to a PLC.
- they display the analog 4-20 mA signal as a 3 digit measured value. All units have two inputs for analog 4-20 mA, connected to the value display, the condition display and the alarm relays. The analog signal normally comes from the unit's measuring channel(s), but can even come from external sources.

There are four versions:

- VDR-14: 1 vibration channel, frequency range 10-1000 Hz
- VDR-15: 1 vibration channel, frequency range 3-1000 Hz
- VDR-20: 2 vibration channels, frequency range 10-1000 Hz
- VDR-21: 2 vibration channels, frequency range 3-1000 Hz.

The vibration transducer is connected via coaxial cable. The modules are mounted in standard 19" racks and supplied with 12 to 24 V DC. The cable inlet is tight for cable diameters 5.5 to 10 mm. A transducer line fault causes an output of <1 mA. If this should interfere with PLC operations, the min. output can be jumper set to 4 mA, individually for each measuring channel.

The display circuit acts as a programmable ampere meter with two channels. Using two push-buttons, one can select preprogrammed measuring units and ranges from a list and set two alarm levels (with alarm delay) for each channel. These are connected to the condition display (green - yellow - red) and to two relay outputs. The relays can be controlled by either display channel. In one channel mode, both relays are slaved to a single display channel and provide relay switching at two levels (ALERT and ALARM). In two channel mode, each display channel uses one relay which switches at the ALARM level.

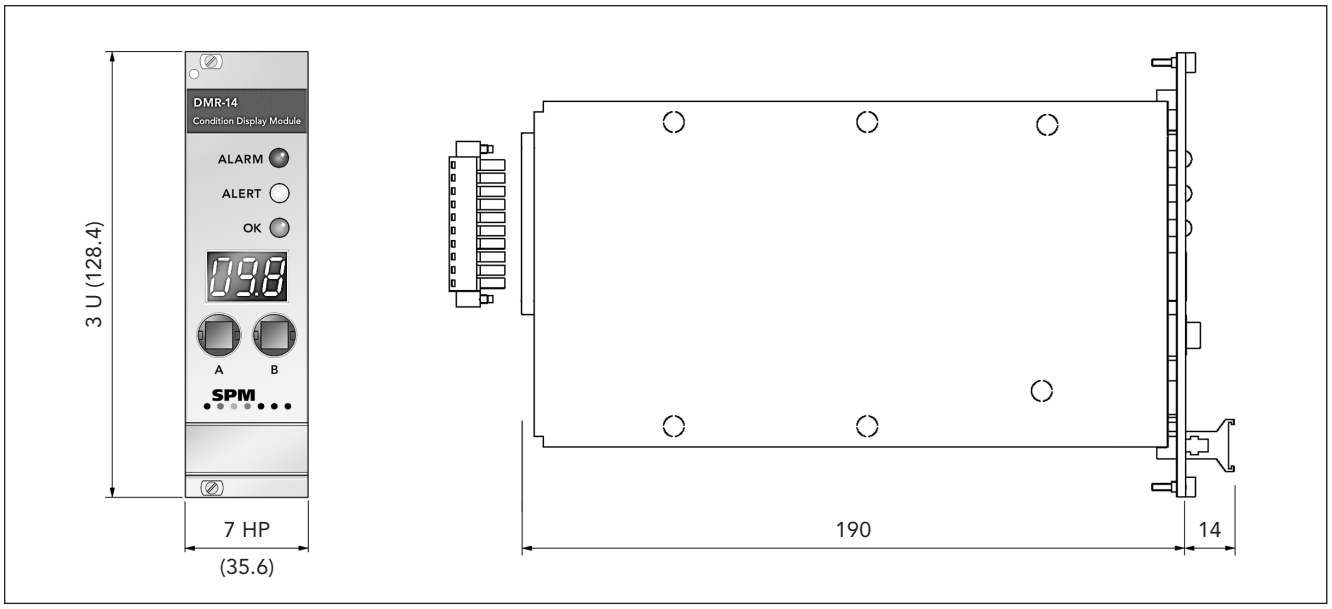
Technical data

Measuring method:	vibration severity similar to ISO 10816 (modified lower freq., VDR-15/21)
Vibration channels:	1 (VDR-14/15), 2 (VDR-20/21)
Measuring range 1: Resolution:	0-5 mm/s (0-0,19 inch/s) 3,2 mA = 1 mm/s; 1 mA = 0,313 mm/s
Measuring range 2: Resolution:	0-10mm/s (0-0,39 inch/s) 1,6 mA = 1 mm/s; 1 mA = 0,625 mm/s
Measuring range 3: Resolution:	0-20mm/s (0-0,78 inch/s) 0,8 mA = 1 mm/s; 1 mA = 1,25 mm/s
Measuring range 4: Resolution:	0-40mm/s (0-1,57 inch/s) 0,4 mA = 1 mm/s; 1 mA = 2,5 mm/s
Frequency range:	10 to 1000 Hz (VDR-14/20) 3 to 1000 Hz (VDR-15/21)
Transducer type:	SLD121, TRV18, TRV19
Transducer cable:	coaxial cable, SPM 90005-L , or 90267-L (L= max. 50 m)
Analog output:	4 to 20 mA, no galvanic separation
Fault indication:	≤ 1 mA out for open or short circuit
Loop resistance:	100 Ω. Higher resistance will reduce signal accuracy (max. 400 Ω at 12 V, 800 Ω at 24 V)
Power supply:	12 to 24V DC (± 10%, tested according to EN 50082-2), max 0.15 A
Design:	anodised aluminium, not protected
Input connectors:	TNC, silver plated brass, 10-15 µ
Output connectors:	screw terminals for cable max. 1.5 mm^2, connector plug included
Temperature range:	0 to 55 °C
Vibration exposure:	max. 5 mm/s RMS
Mounting:	19" rack
Dimensions:	3 U x 7 HP x 214 mm, DIN 41494
Weight:	200 g (VDR-14/15), 300 g (VDR-20/21)
Signal to display:	4 to 20 mA, 2 channels
Relays:	2, max. 24 V/100 mA
Value display:	3 digits, LED
Condition display:	green, yellow, and red LED
Alarm limits:	2 per display channel
Push-buttons:	2, for display control and programming

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CMM System – Display Module for Rack DMR-14



DMR-14 is a condition display module for 4-20 mA analog signals. Measured quantities and ranges are selected from a preprogrammed list (13 programs) or from user defined programs (7 programs).

The display module is intended for mounting in standard 19" racks. It is supplied with 12 to 24 V DC, source referred to earth.

The display module has two input channels and two relay outputs. The relays can be controlled by either input channel. In one channel mode, both relays are slaved to a single input channel and provide relay switching at two levels (ALERT and ALARM). In two channel mode, each input channel uses one relay which switches at a preset ALARM level.

Programmable parameters for each input channel are the measuring range, the two alarm levels ALERT and ALARM, and the alarm delay. These are input using two push buttons. Power failure will not erase the program.

Condition display is provided by three coloured LEDs. The green LED is on while measured values are below the ALERT level. Measured values between ALERT and ALARM on either channel trigger a yellow LED, and a red LED lights up when a measured value exceeds an ALARM level. A blinking yellow LED indicates a system fault (incoming signal below 4 mA).

The measured value is displayed with three digits. In two channel mode the status LED's and the display alternate between the two channels and show the channel number followed by the measured value on this channel.

Technical specifications

Input channels:	2
Input signals:	4 to 20 mA
Output channels:	2 relays, 24V / 100 mA
Measuring range:	selected to match the signal input
Value display:	3 digits, LED
Condition display:	green, yellow, and red LED
Alarm limits:	2 per input channel, set with pushbuttons
Alarm delay:	0 - 600 seconds for each alarm level
Push-buttons:	2, for display control and programming
Line continuity:	blinking yellow LED = signal below 4 mA (faulty or interrupted input circuit)
Masuring resistance:	47 Ω
Power supply:	12 to 24 V DC (±10%, tested according to EN 50082-2)
Supply current:	max. 0.1 A
Temperature range:	0° to 55° C
Vibration exposure:	max. 5 mm/s RMS
Design:	anodised aluminium, not protected
Input/output connectors:	screw terminals for cable max. 1.5 mm2, connector plug included
Mounting:	19" rack
Dimensions:	3 U x 7 HP x 204 mm, DIN 41494
Weight:	200 g

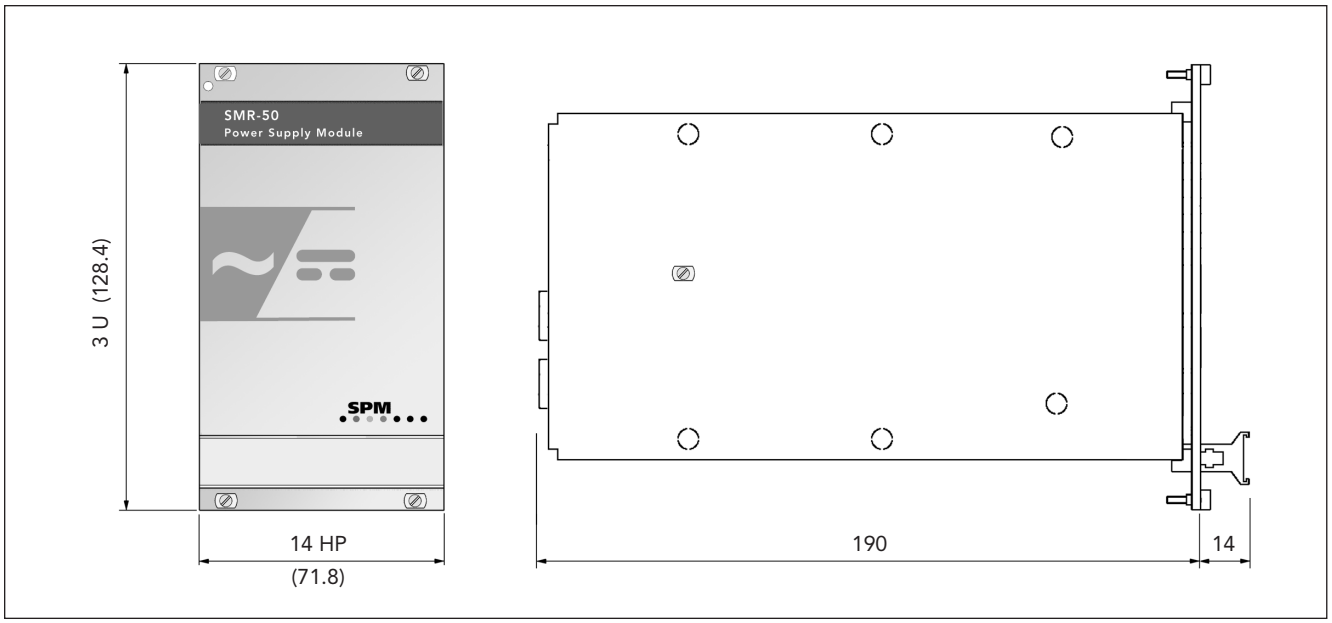
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CMM System – Power Supply Module SMR-50



SMR-50 is a 40W switching power supply module with output for up to ten CMM modules. It has built in EMI filter and short circuit/overload/over voltage protection with foldback limiting.

The power supply module is mounted in a standard 19 inch rack (SPM 14880). It has an universal AC input for 85 to 264 V AC.

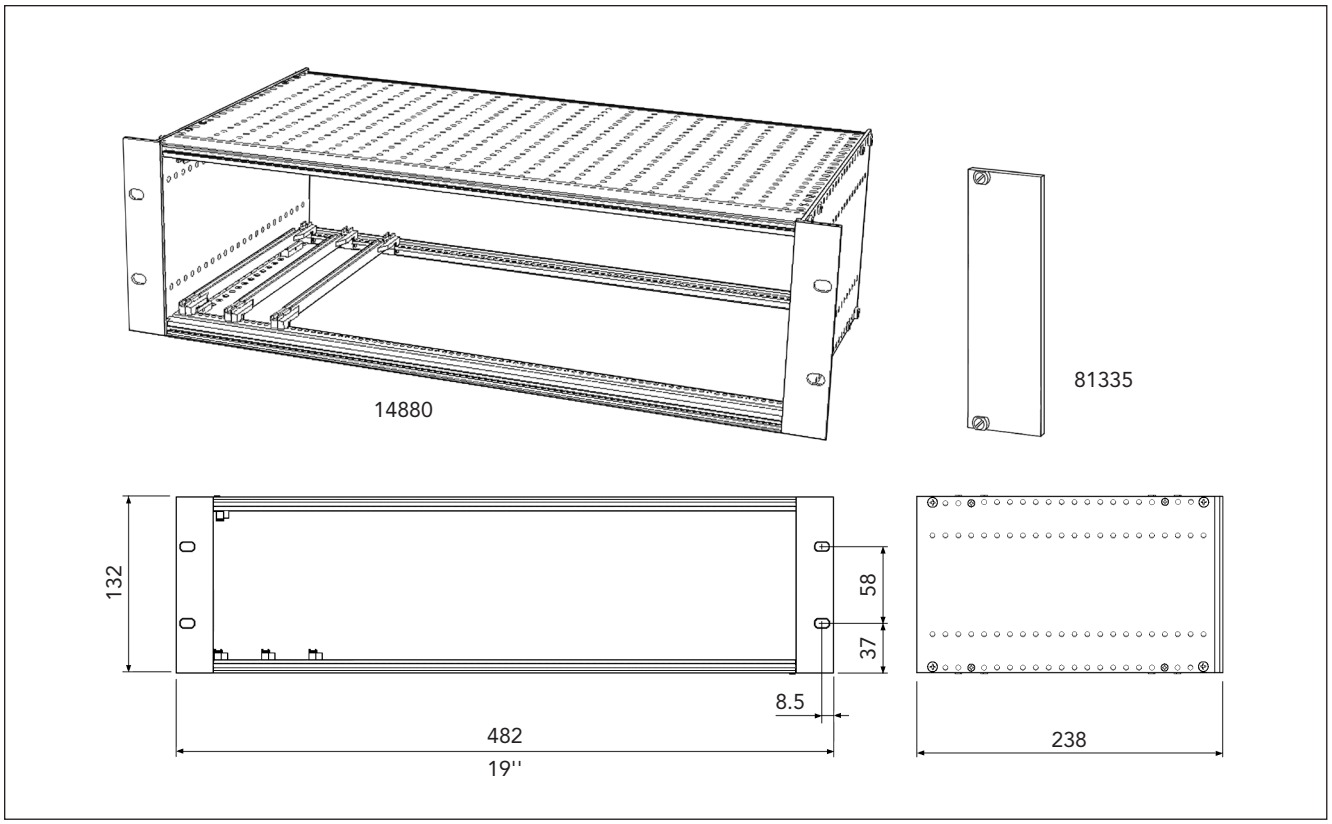
Technical specifications

Input voltage:	85 to 264 VAC, 1.2 to 0.6 A
Input frequency:	47 to 63 Hz
Output:	24 V (±10% ADJ), 1.8 A
Rated power:	43W
Working temperature:	0 to 50°C at 100%, –10°C at 80%, 60°C at 60%
Storage temperature:	–20 to 85°C
Operation humidity:	20 to 90% RH
Storage humidity:	10 to 95% RH
EMI Standards:	Compliance to EN55022, Class B
EMC Standards:	EN61000-4-2, 3, 4, 5; ENV50204, EN55024
Approvals:	UL1012, UL60950-1, TUV EN60950-1
Vibration exposure:	max. 5 mm/s RMS
Design:	anodised aluminium, shielded
Mounting:	19" rack, screw terminals
Dimensions:	3 U x 14 HP x 204 mm, DIN 41494
Weight:	approx. 600 g

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CMM System – Subrack 14880



SPM 14880 is a standard 19 inch subrack for up to twelve CMM monitoring modules (7HP) or ten monitoring modules plus the power supply unit SMR-50 (14HP). The subrack has an open back plane for cable connections.

Empty spaces can be filled up with blank front panels, SPM 81335 (3U x 7HP). The subrack is delivered complete with bottom plate, vented top plate and twelve module slots for mounting of CMM rack modules.

Technical specifications

Material:	anodised aluminium
Dimensions:	482 x 132 x 238 mm
Weight:	1600 g

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SPM
condition monitoring solutions

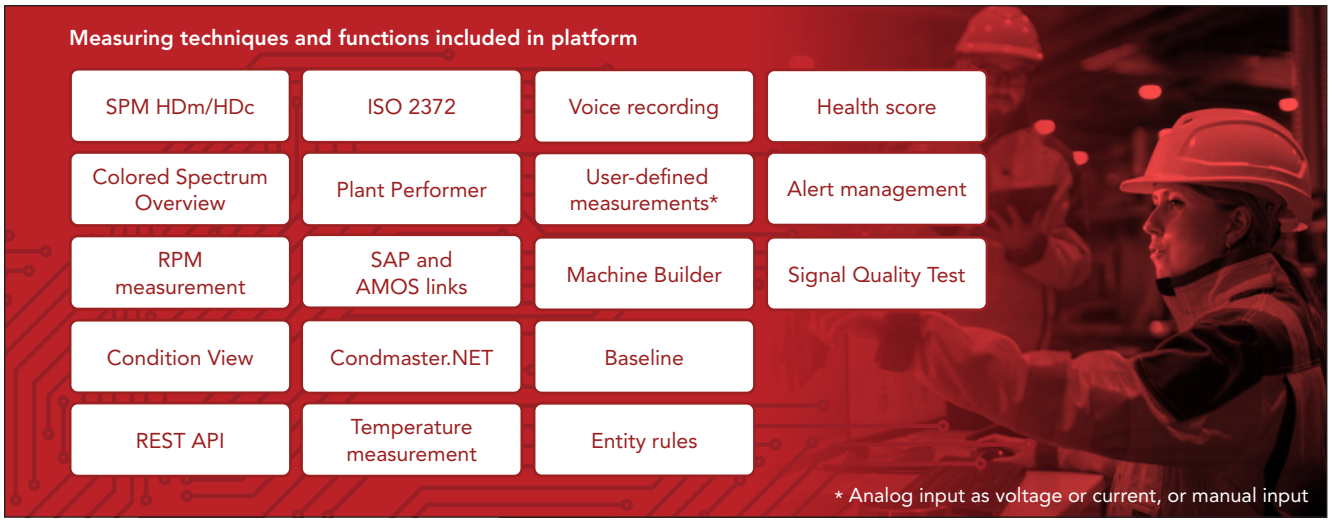


Software

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Condmaster® Ruby – Platform



Condmaster Ruby is a comprehensive condition monitoring and predictive maintenance program. Module built, it can be tailored to your selected hardware.

Condmaster Ruby communicates with all SPM handheld data logging instruments and Ethernet-compatible online systems for continuous condition monitoring. The software works under Windows 8 or later and uses SQL Server 2016 or later (SQL Server 2019 Express Edition is included in the installation media, managing up to 10 GB of data).

The measuring techniques included in the platform are:

- Shock pulse technology SPM HDm/HDc. The scalar decibel value HDm represents the highest shock pulses found during the measuring cycle, and is the primary value for determining the severity of bearing damage, and also to trigger alerts. HDc, also a scalar dB value, is useful to determine lubrication conditions.
- ISO2372 vibration measurement.
- Two user-defined measurements, with a special input window for temperature (data input as analog voltage or current, or manual).
- RPM measurement.
- Temperature measurement.

The basic program functions are:

- Checkpoint (free text describing maintenance activity). It also has a runtime counter for machine operating hours.
- Contact-free identification tags, CondID®, can be loaded with basic data and the latest measuring results.
- Measuring point definition, using a customer-defined numbering system and including input data for all active measuring techniques.
- Graphical overview, showing measuring point location as a hierarchical structure and/or with pictures, from plants down to machines or measuring point level.
- Measuring rounds and communication with portable measuring devices (data logging, time planning).
- Alert messages and lists, statistics, and reports.
- REST API, a web-based service enabling other resources, systems, or devices to access Condmaster data for further processing or analysis.
- The stand-alone features Health score, Alerts, Machine Builder, Signal Quality Test, Baseline, and Entity rules form the Decision Support System (TD-612).
- Condmaster.NET, a web application and downloadable mobile app that provides easy access to measurement data through a user-friendly interface.
- Condition View combines multiple graphs in one window.
- SAP and AMOS links send alert messages to the receiving software and accept a work order number in return.
- Plant Performer compiles and visualizes statistics relating to technical and economic KPIs for display, evaluation, and printing in Condmaster.NET.
- Colored Spectrum Overview shows large numbers of spectrums over a longer period and provides a good overall picture of machine condition development.
- Voice recording of comments linked to measuring points.
- Display of all measuring results as graphics and lists.

Further modules can be added as needed, see TD-584.

Minimum system requirements for Condmaster Ruby:

- Windows 8 or later (Windows 8, 64-bit or later if SQL Server 2016 is installed on the same computer)
- 1 GHz 32-bit (x86) or 64-bit (x64) processor
- 1 GB RAM (32-bit) or 2 GB RAM (64-bit)
- 15 GB free disc space
- Microsoft SQL Server 2016 or later

NOTE: Microsoft SQL Server 2016 requires Windows 8 (64-bit) or later with at least 1.4 GHz CPU. Condmaster Entity Server (CES) requires 64-bit Windows. LinX (handling online systems) and CES require higher data performance.

For recommended system requirements, see *Condmaster Ruby Installation and system administration* manual, 72301.

Part numbers

PRO400	Condmaster Ruby, Platform, CD
PRO400-USB	Condmaster Ruby, Platform, USB

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Condmaster® Ruby – Modules

Measuring techniques and functions included in platform

SPM HDm/HDc	ISO 2372	Voice recording	Health score	Colored Spectrum Overview	Plant Performer
User-defined measurements*	Alert management	RPM measurement	SAP and AMOS links	Machine Builder	Signal Quality Test
Condition View	Condmaster.NET	Baseline	REST API	Temperature measurement	Entity rules

Additional measuring techniques and functions ordered separately

dBm/dBc	LR/HR and Lubmaster	SPM Spectrum	SPM HD Expert	ISO 10816	Virtual Online Unit
FFT with symptoms	EVAM incl. Condition Manager	HD Analysis	Online	Run up/Coast down Bump test, FRF	High resolution and frequency
Orbit analysis, Shaft Centerline Plot	LR/HR HD and Lubmaster	HD ENV	ISO 20283-5	Rule-Based Evaluation, RBE	Multi-channel measurement

* Analog input as voltage or current, or manual input

Condmaster Ruby is modular and its functionality can be tailored to specific requirements and personal preference. Modules can be ordered at any time as update files.

For further information on the Condmaster Ruby platform and the measuring techniques and functions included in the platform, see technical datasheet TD-583.

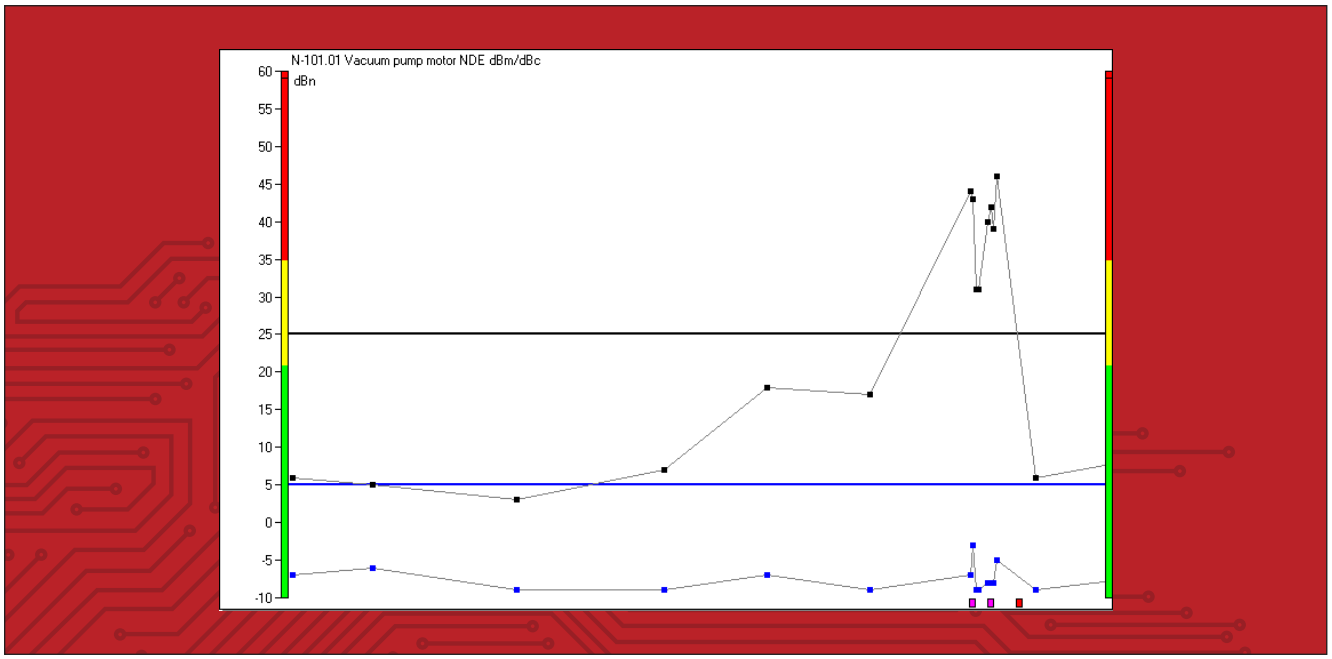
TD sheet	Module	Part numbers	Tester T30	Analyzer A30	Leonova Infinity	Leonova Emerald	Leonova Diamond	Intellinova Standard	Intellinova Compact	Intellinova Parallel EN	Airius
TD-583	Platform	PRO400	●	●	●	●	●	●	●	●	●
TD-585	dBm/dBc	MOD130	●		●	●	●	●			
TD-586	LR/HR and Lubmaster	MOD131		●	●	●	●	●			
TD-587	SPM Spectrum	MOD132			●	●	●	●			
TD-588	SPM HD Expert	MOD195				●	●	●	●	●	
TD-589	Vibration ISO 10816	MOD133			●	●	●	●	●	●	●
TD-590	FFT with symptoms	MOD134	●*	●**	●	●	●	●	●	●	●
TD-591	EVAM incl. Condition Manager	MOD135	●*	●**	●	●	●	●	●	●	●
TD-592	Multi-channel measurements *****	MOD192					●			●	●
TD-593	Run up/Coast down, Bump test, FRF	MOD137			●		●	●***	●***		
TD-594	Orbit analysis, Shaft Centerline Plot	MOD138			●****		●	●****		● ****	
TD-595	High resolution and frequency *****	MOD194					●			●	
TD-596	Rule-Based Evaluation, RBE	MOD181	●	●	●	●	●	●	●	●	●
TD-599	Online	MOD187						●	●	●	●
TD-603	Vibration Expert	MOD193					●				
TD-604	Vibration Supreme	MOD197				●					
TD-606	LR/HR HD and Lubmaster	MOD131+MOD195				●	●	●	●	●	
TD-607	Vibration ISO 20283-5	MOD198					●				
TD-608	HD ENV	MOD199				●	●	●	●	●	
TD-609	HD Analysis	MOD140				●	●	●	●	●	
TD-610	Virtual Online Unit ******	MOD200									

* T30-3 ** A30-3
*** Run up/Coast down only **** Orbit analysis only
***** The number of measuring channels as well as the maximum resolution and frequency range depends on the measuring equipment. ****** Virtual Online Unit is used to import values from various systems or units, see TD-610.

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Condmaster® Ruby – dBm/dBc



For more than 50 years, the Shock Pulse Method (SPM) has successfully provided a fast, easy and reliable diagnosis of the operating condition of rolling element bearings.

The signal

Throughout their lifetime, bearings generate shocks in the interface between the loaded rolling element and the raceway. These shocks 'ring' the SPM transducer which outputs electric pulses proportional to the shock magnitude.

The shock pulse transducer responds at its carefully tuned resonance frequency of about 32 kHz, which allows a calibrated measurement of the shock pulse amplitudes.

Measurement

The shock pulse meter counts the rate of occurrence (incoming shock pulses per second) and varies the measuring threshold until two amplitude levels are determined:

- dBc (decibel carpet value): The shock carpet level (approx. 200 incoming shocks per second).
- dBm (decibel maximum value): the maximum level (highest incoming chock during the measuring time). Using a blinking indicator or earphones, a peak value can be established by increasing the measuring threshold until no signal is registered.

Because of the very large dynamic range, shock pulses are measured on a decibel scale (1000 x increase between 0 and 60 dB).

Shock pulse amplitude is due to three basic factors:

- Rolling velocity (bearing size and rpm)
- Oil film thickness (separation between the metal surfaces in the rolling interface). The oil film depends on lubricant supply and also on alignment and pre-load.
- The mechanical state of the bearing surfaces (roughness, stress, damage, loose metal particle).

Input data

The effect of rolling velocity on the signal is neutralized by giving rpm and shaft diameter as input data, with 'reasonable accuracy'. This sets an initial value (dBi), the start of the ´normalized' condition scale.

Evaluation

The initial value and the range of the three condition zones (green – yellow – red) was empirically established by testing bearings under variable operating conditions. The maximum value places the bearing into the condition zone. The height of the carpet value and delta (dBm minus dBc) indicated lubrication quality or problems with bearing installation and alignment.

Part numbers

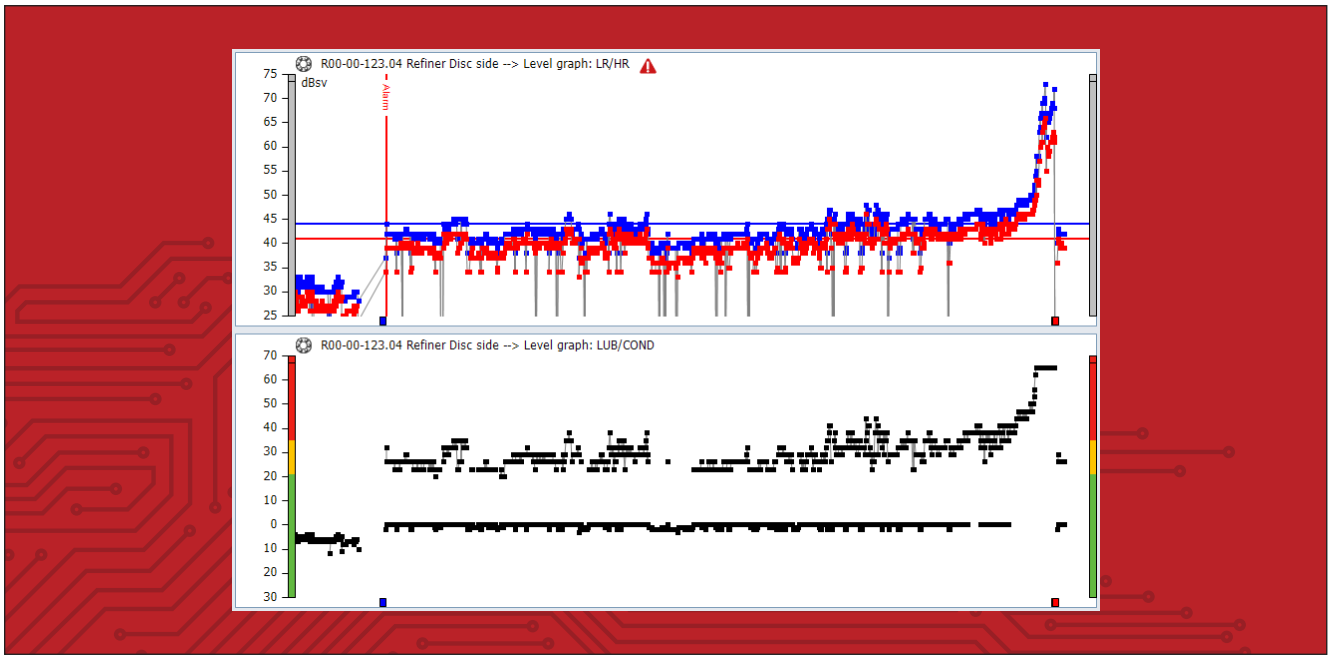
MOD130 dBm/dBc

SPM

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Condmaster® Ruby – LR/HR and Lubmaster



The LR/HR method was developed from the original Shock Pulse Method for condition diagnosis of rolling element bearings. It allows a precision analysis of oil film condition in the rolling interface and contains calculation models for finding the optimal lubricant. Poor lubrication is the root cause of most bearing failures.

Signal and measurement

Transducer and measuring procedure are the same as for dBm/dBc (TD-585). The shock pulse meter counts the rate of occurrence (incoming shock pulses per second) and varies the gain until two amplitude levels are determined:

- LR: low rate of occurrence, quantifying the strong shock pulses (approx. 40 incoming shocks per second).
- HR: high rate of occurrence, quantifying the shock carpet (approx. 1000 incoming shocks per second).

LR/HR are 'raw values', measured in dBsv (decibel shock value).

Input data

LR/HR requires more precise data on the bearing, because bearing geometry, as well as size and speed, affects the shock carpet and thus the analysis of oil film condition in undamaged bearings. The rpm is needed, plus a definition of the bearing type and size. This is best input by stating the ISO bearing number, which links to the bearing catalogue in Condmaster Ruby.

Evaluation

After measurement the measuring device returns

- a general description of bearing condition (CODE)
- a value for oil film condition (LUB)
- a value for surface damage (COND).

A LUB no. of 0 means dry running, the value increases with oil film thickness. A COND no. of around 30 indicates surface stress or early damage, the value increases with damage severity. The general assessment is:

CODE A	Good bearing
CODE B	Poor lubrication
CODE C	Damage in early stage
CODE D	Damage

A program part, LUBMASTER, uses the shock values plus data on lubricant type, viscosity, load and operating temperature to calculate the bearing's life expectancy under present condition. It also calculates the effect of changes in oil type and viscosity.

Calibration

The accuracy of LR/HR is increased by a calibration factor (COMP no.) used in case of bearings with minimal load or poor quality measuring points (in both cases the signal strength is below normal). On the basis of the bearing's catalogue data and the lubricant properties, Leonova calculates the normal shock level for a good bearing and compensates for an abnormally low signal before returning the evaluation results.

Part numbers

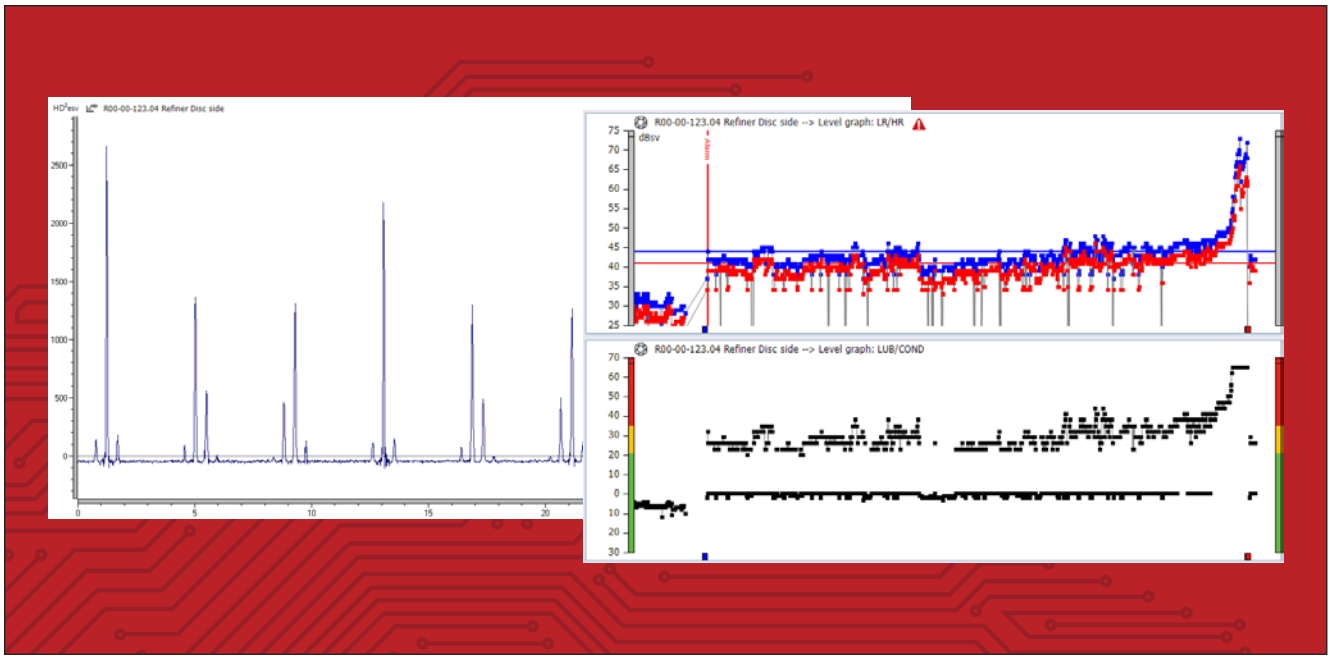
MOD131 LR/HR and Lubmaster

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Condmaster® Ruby – LR/HR HD and Lubmaster



LR/HR HD is a combination of the modules LR/HR (MOD131) and SPM HD Expert (MOD195).

Like the LR/HR method (TD-586), LR/HR HD provides diagnosis of rolling element bearings and precision analysis of oil film condition in the rolling interface, and contains calculation models for finding the optimal lubricant. Further benefits of the LR/HR HD method include:

- Signal processing with state-of-the-art 24-bit A/D conversion in combination with HD technology yields spectrum and time signals with razor-sharp resolution and exceptional level of detail.
- High Definition Order Tracking for analysis on variable speed machines providing reliable data and crystal clear measuring results even when RPM varies greatly during the course of measurement.
- Symptom Enhancement – an algorithm that looks for repetitive impacts in the time domain. As a result, random signals are suppressed and repetitive signals are enhanced in order to display relevant data.

Signal and measurement

Transducer and measuring procedure are the same as for the dBm/dBc method (TD-585) and the LR/HR method The shock pulse meter counts the rate of occurrence (incoming shock pulses per second) and varies the gain until two amplitude levels are determined:

- LR: low rate of occurrence, quantifying the strong shock pulses (approx. 40 incoming shocks per second).
- HR: high rate of occurrence, quantifying the shock carpet (approx. 1000 incoming shocks per second).

LR and HR are 'raw values', measured in dBsv (decibel shock value).

Input data

The rpm is needed, plus a definition of the bearing type and size. This is best input by stating the ISO bearing number, which links to the bearing catalogue in Condmaster.

Evaluation

After measurement the measuring device returns

- a general description of bearing condition (CODE)
- a value for oil film condition (LUB)
- a value for surface damage (COND).

A LUB no. of 0 means dry running, the value increases with oil film thickness. A COND no. of around 30 indicates surface stress or early damage, the value increases with damage severity. The general assessment is:

CODE A	Good bearing
CODE B	Poor lubrication
CODE C	Damage in early stage
CODE D	Damage

A program part, LUBMASTER, uses the shock values plus data on lubricant type, viscosity, load and operating temperature to calculate the bearing's life expectancy under present condition. It also calculates the effect of changes in oil type and viscosity.

Calibration

The accuracy of the LR/HR HD method is increased by a calibration factor (COMP no.) used in case of bearings with minimal load or poor quality measuring points (in both cases the signal strength is below normal). On the basis of the bearing's catalogue data and the lubricant properties, the instrument calculates the normal shock level for a good bearing and compensates for an abnormally low signal before returning the evaluation results.

Part numbers

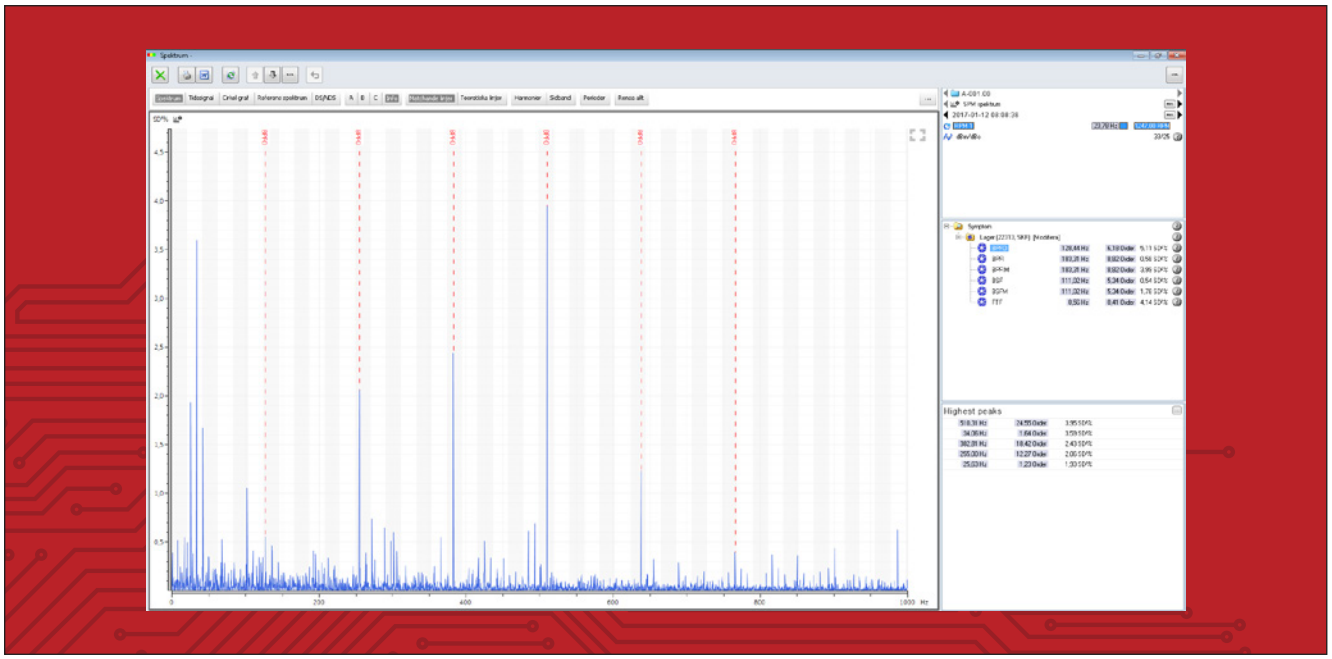
MOD131 LR/HR
MOD195 SPM HD Expert

SPM

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Condmaster® Ruby – SPM Spectrum



The SPM Spectrum measuring technique is a complement to the SPM dBm/dBc and LR/HR techniques. The purpose of SPM Spectrum is to verify the source of high shock pulse readings. Shocks generated by damaged bearings will typically have an occurrence pattern matching the ball pass frequency over the rotating race. Shocks from e.g. damaged gears have different patterns, while random shocks from disturbance sources normally do not coincide with the pattern of the machine element of interest.

Signal and measurement

The resonance frequency of the SPM shock pulse transducer, calibrated to 32 kHz, constitutes the ideal carrier wave for transients caused by shocks. The output of this transducer is the same type of demodulated signal produced by 'enveloping', with this important difference: both frequency and amplitude response of the SPM transducer are precisely tuned, so there is no need to find uncertain and shifting machine resonances to get a signal.

The measuring system measures the shock amplitude by a shock pulse measurement with the dBm/dBc or the LR/HR method. The results are the bearing condition data, evaluated in green – yellow – red.

The second measurement produces a time record that is subjected to a Fast Fourier Transform (FFT). The resulting spectrum is used mostly for pattern recognition. Spectrum line amplitudes are influenced by too many factors to be reliable condition indicators, so all condition evaluation is based on the dBm or the HR values.

One unit for amplitude in an SPM spectrum is SD (Shock Distribution unit), where each spectrum is scaled so that the total RMS value of all spectrum lines = 100 SD = the RMS value of the time record. The alternative is SL (Shock Level unit), the RMS value of the frequency component in decibel. Alert levels are manually set for each symptom to show evaluated results in green – yellow – red. Various types of spectra can be produced.

Input data

Pattern recognition demands precise data on the bearing and exact measurement of the rpm. The rpm should preferably be measured, not preset. The factors that define the bearing frequencies are obtained from the bearing catalogue in Condmaster by stating the ISO bearing number.

Evaluation

The frequency patterns of bearings are preset in Condmaster Ruby. Linking the symptom group 'Bearing' to the measuring point allows the user to highlight a bearing pattern by selecting its name. Other symptoms may be added when appropriate, e.g. for gear mesh patterns. Finding a clear match of a bearing symptom in the spectrum is proof that the measured signal originates from the bearing.

Part numbers

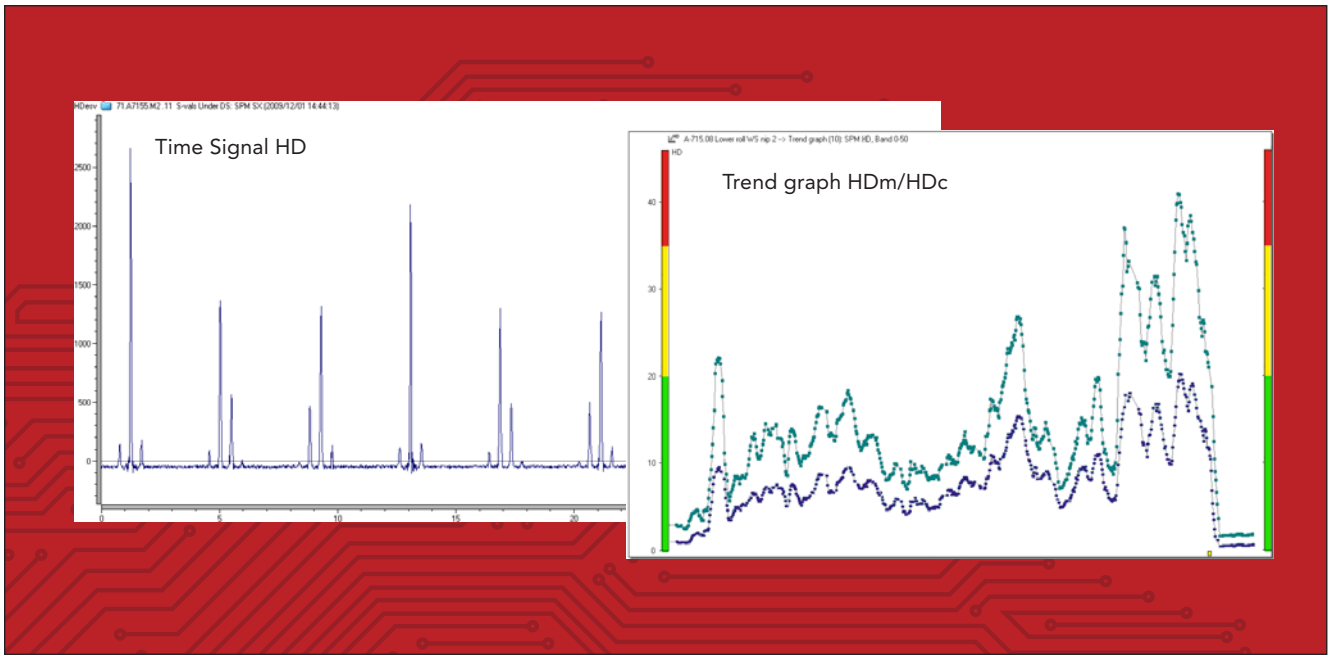
MOD132 SPM Spectrum

NOTE: MOD130 or MOD131 is required for the function to work.

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Condmaster® Ruby – SPM HD® Expert



SPM HD Expert is a complement to SPM HDm/HDc and LR/HR. Advanced digital technique, RPM-based sampling frequency and measuring time automatically adjusted to RPM makes SPM HD particularly well suited for measurement on low speed applications. Extraordinary signal quality and 24 bit A/D conversion provides razor-sharp resolution and exceptional detail in spectrums and time signals.

The signal

Throughout their lifetime, bearings generate shocks in the interface between the loaded rolling element and the raceway. These shocks 'ring' the SPM transducer which outputs electric pulses proportional to the shock magnitude.

Shock pulse amplitude is due to three basic factors:

- Rolling velocity (bearing size and rpm).
- Oil film thickness (separation between the metal surfaces in the rolling interface). The oil film depends on lubricant supply and viscosity as well as alignment and pre-load.
- The mechanical state of the bearing surfaces (roughness, stress, damage, loose metal particle).

Input data

The effect of rolling velocity on the signal is neutralized by entering rpm and shaft diameter as input data, with 'reasonable accuracy'. This sets an initial value (HDi), the start of the ´normalized' condition scale.

High Definition Order Tracking is a function used with Leonova Diamond, Leonova Emerald and Intellinova, primarily for analysis on variable speed machines. The method uses multiples of rotational speed (orders), rather than absolute frequency (Hz). The number of orders to be covered is input by the user. HD Order Tracking also minimizes the risk of smearing in the spectrums.

Condition Manager enables users to experiment freely in order to find the optimal alert setup for any given application. This "learning phase" can continue until the criteria is saved. When it is saved, the criteria is activated and Condmaster starts to evaluate measuring results according to the criteria setup. If at some later time it turns out the alert settings yield unsatisfactory results, the criteria can be edited.

Output data

The SPM HD method produces different types of results:

- **HDm/HDc** is part of the Condmaster Ruby platform (TD-583).
- **Time Signal HD** is extremely useful to locate where in the bearing a possible damage is located. In many cases it is also possible to determine the nature of the damage (cracked inner race with spalling all around or a single crack etc.). The Time signal HD is a result of very advanced digital algorithms where repetitive shocks are enhanced and random signals are suppressed.
- **SPM Spectrum HD** is the result of applying FFT algorithms on the Time Signal HD. The SPM HD spectrum is useful to determine where a possible bearing damage is located. It is also useful for trending purposes (applying symptom and band values).

Evaluation

The initial value and the range of the three condition zones (green – yellow – red) was empirically established by testing bearings under variable operating conditions. The maximum value places the bearing into the condition zone. The height of the carpet value and delta (HDm minus HDc) indicates lubrication quality or problems with bearing installation and alignment.

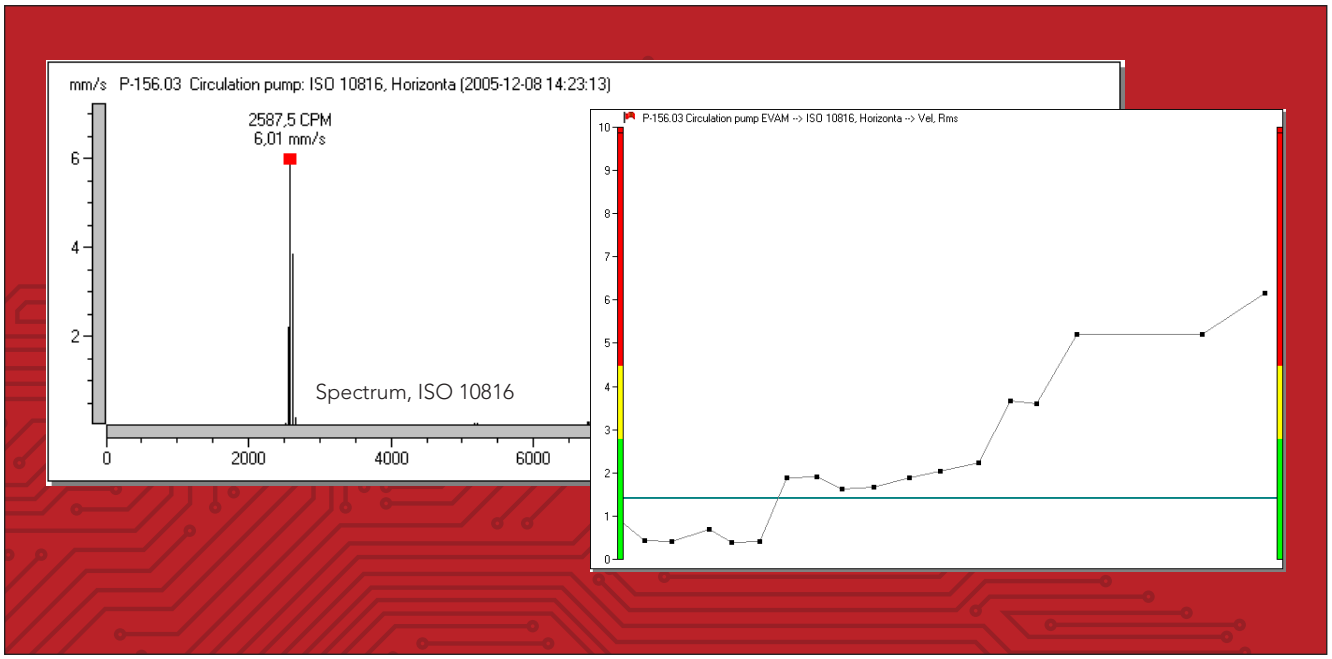
Part numbers

MOD195 SPM HD Expert

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Condmaster® Ruby – Vibration ISO standard 10816



Broadband vibration measurement is the most widely used and cost-efficient method for the diagnosis of general machine condition.

There are two ISO recommendations concerning machine condition monitoring by this type of measurement: the much used ISO 2372 and the more recent ISO 10816, which is a replacement of the older standard.

ISO 2372 measurement is always included in the Condmaster Ruby platform (TD-583), while ISO 10816 can be ordered as a module (TD-584) through part number MOD133.

Features of ISO 10816 are:

- Measurements are made in three direction (horizontal, vertical, axial).
- Machine condition is generally diagnosed on the basis of broadband vibration measurements returning an RMS value. ISO 10816 keeps the lower frequency range flexible between 2 and 10 Hz, depending on the machine type. The upper frequency is 1000 Hz.
- ISO 10816 operates with the term vibration magnitude, which, depending on the machine type, can be an RMS value of vibration velocity, acceleration or displacement. If two or more of these parameters are measured, vibration severity is the one returning the relative highest RMS value. For certain machines, ISO 10816 also recognises peak-to-peak values as condition criteria.
- The standard consists of several parts, each treating a certain type of machines, with tables of limit values differentiating between acceptable vibration (green range), unsatisfactory vibration (yellow range), and vibration that will cause damage unless reduced (red range).

In Condmaster Ruby, ISO part, machine group and foundation type are entered using a multiple-choice guide that displays the various ISO definitions and leads to the limit values.

Exceeding the requirements of the ISO standard, Condmaster Ruby also provides a 1600 line spectrum.

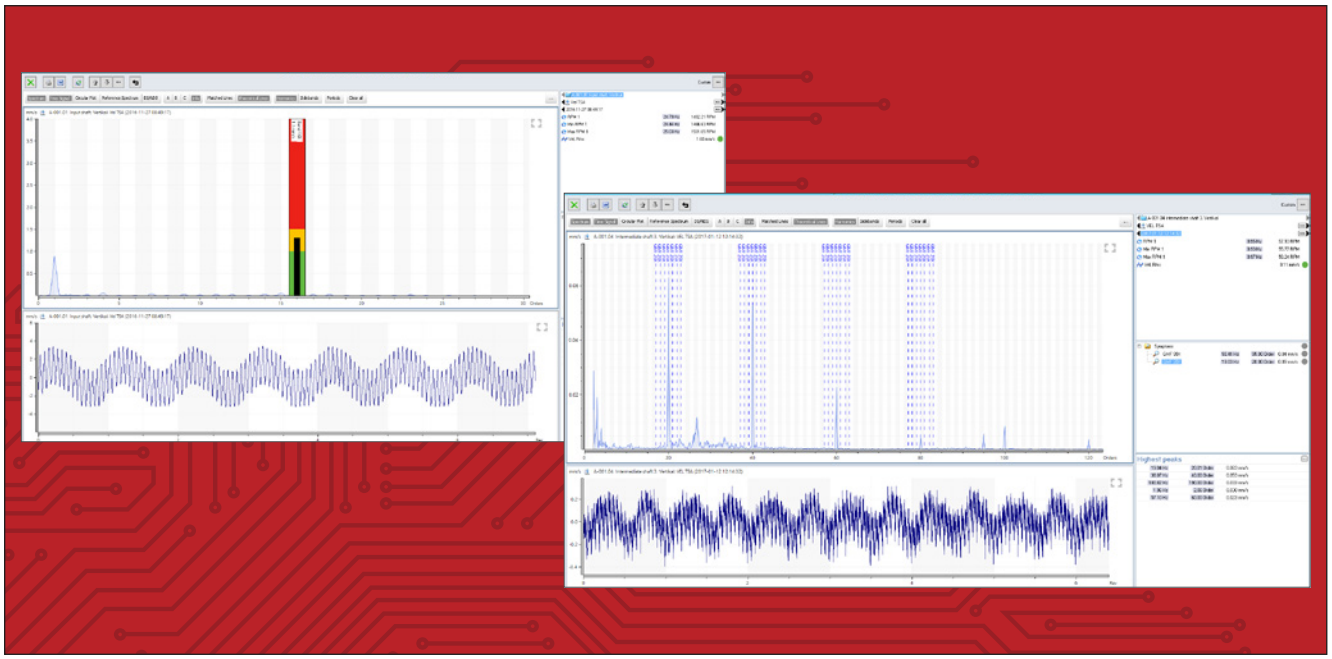
Part numbers

MOD133 VIB ISO 10816 and spectrum

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Condmaster® Ruby – FFT with symptoms



FFT Spectrum with symptoms is a vibration analysis function offered with Leonova and Intellinova. It is a reduced form of EVAM (TD-591), lacking the statistical evaluation by means of criteria.

This function generates three sets of machine condition data:

- Condition parameters, which are measured and calculated values from the time domain, describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with preset fault symptoms.
- Trending of symptom values. Alert levels are manually set for evaluation in green – yellow – red.

For each measuring point, users can make an individual selection and define the type of data best suited for the monitoring of an individual machine. Alternatives include

- FFT
- enveloping HD ENV
- time synchronous averaging
- band values and averaging of measurement results for improved alert reliability. Random high readings caused by resonance or other sources of disturbance are filtered out, minimizing the number of false alerts.

Condition parameters are measured for a selected frequency range. They can be individually activated and are shown in measuring result tables and as diagrams. Available are:

VEL	RMS value of vibration velocity
ACC	RMS value of vibration acceleration
DISP	RMS value of vibration displacement
CREST	Crest value, difference between peak and RMS
KURT	Kurtosis, the amount of transients in the vibration signal
SKEW	Skewness, the asymmetry of the vibration signal
NL1 - 4	Noise level in the four quarters of the frequency range

Peak and peak-to-peak values are shown in the unit selected for the time signal. Values can be displayed in dB according to European or US Navy standard as well as user defined.

Spectrum analysis with symptoms: For easy pattern recognition in spectra, a range of ready made 'symptoms' are available in Condmaster Ruby. These are instructions to highlight a spectrum line pattern and display the sum of the lines' RMS values as a symptom parameter (which can be trended). Most symptoms are automatically configured by using the rpm as a variable, for some an input is needed, e.g. the number of vanes on a rotor.

Phase is a time delay expressed in degrees of rotation. Leonova or Intellinova calculates the time delay between the passage of the tachometer pulse and the peak of the frequency component of interest from the vibration transducer at the speed of rotation. The value presented is a relative angle, not an absolute, because there is no compensation for phase lag in the transducer or the electronic circuits. Phase difference in between two signals can also be displayed.

HD ENV (TD-608) is an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques – for example bearing damages and gear damage – the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes.

Order Tracking is primarily used for analysis on variable speed machines. The method uses multiples of rotational speed (orders), rather than absolute frequency (Hz). The number of orders is input by the user. Order Tracking also minimizes the risk of smearing in spectrums.

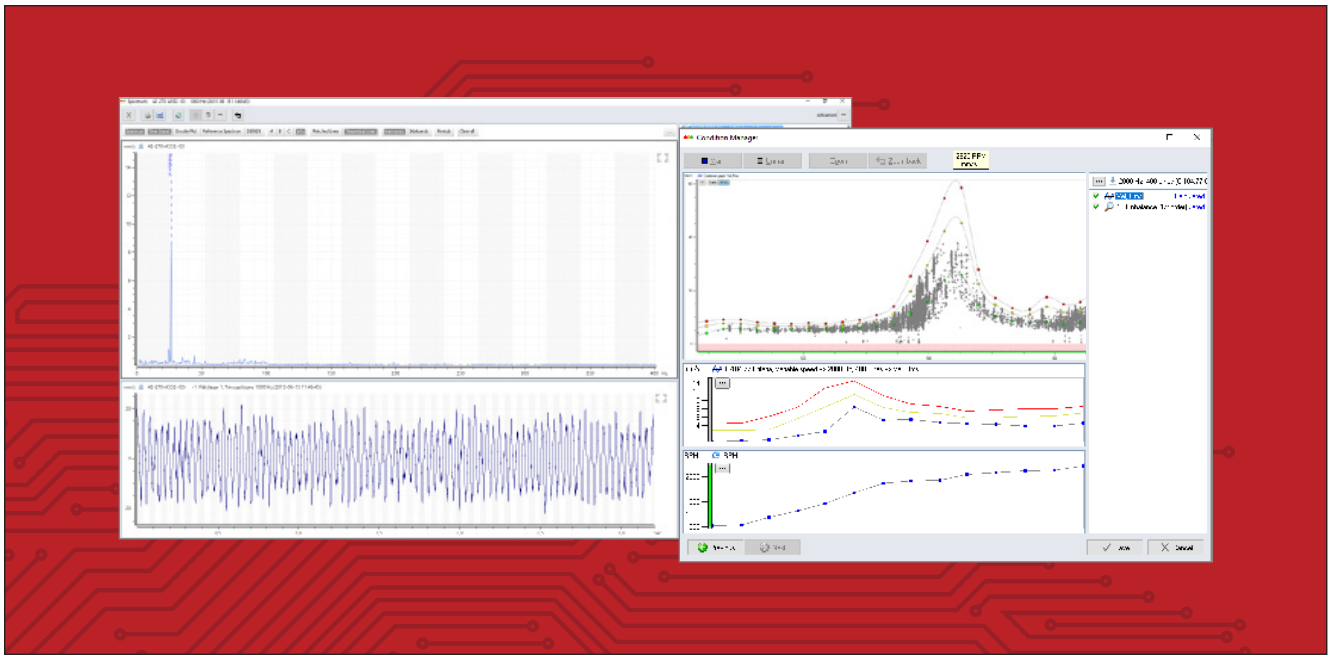
Part numbers

MOD134 FFT with symptoms, incl. HD ENV

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Condmaster® Ruby – EVAM incl. Condition Manager



With Leonova and Intellinova, EVAM (Evaluated Vibration Analysis Method) is offered as an analysing function. The method generates three sets of machine condition data:

- Condition parameters, which are measured and calculated values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with the preset fault symptoms.
- Machine specific condition codes (green – yellow – red) and condition values, based on a statistical evaluation of the condition parameters and symptom values.

For each measuring point, the user can make an individual selection and define the type of data best suited for the surveillance of an individual machine. Alternatives include

- enveloping HD ENV
- time synchronous averaging
- band values and averaging of measurement results for improved alert reliability. The number of false alerts is minimized by filtering out randomly high readings caused by disturbance.

Condition parameters are measured for a selected frequency range. They can be individually activated and are shown in measuring result tables and as diagrams. Available are:

VEL	RMS value of vibration velocity
ACC	RMS value of vibration acceleration
DISP	RMS value of vibration displacement
CREST	Crest value, difference between peak and RMS
KURT	Kurtosis, the amount of transients in the vibration signal
SKEW	Skewness, the asymmetry of the vibration signal
NL1 - 4	Noise level in the four quarters of the frequency range

Peak and peak-to-peak values are shown in the unit selected for the time signal. Values can be displayed in dB according to European or US Navy standard as well as user defined.

For easy pattern recognition in spectra, EVAM supplies a range of ready-made 'fault symptoms'. These are instructions to highlight a spectrum line pattern and display the sum of the lines' RMS values as a symptom parameter (which can be evaluated and trended). Most symptoms are automatically configured by using the rpm as a variable. Suitable symptoms and symptom groups are selected in Condmaster Ruby when the measuring point is set up. As an alternative, cepstrum analysis can be used for gearboxes.

In Condmaster Ruby, alert limits can be set on all active parameters. Once measuring results are collected, an EVAM 'criterion' can be created that compares new parameter values with the statistical mean value and displays a dimensionless condition value against a green – yellow – red scale.

Phase is a time delay expressed in degrees of rotation. Leonova or Intellinova calculates the time delay between the passage of the tachometer pulse and the peak of the frequency component of interest from the vibration transducer at the speed of rotation. The value presented is a relative angle, not an absolute, because there is no compensation for phase lag in the transducer or the electronic circuits. Phase difference in between two signals can also be displayed.

HD ENV (TD-608) is capable of detecting machine problems at a very early stage, which are generally hard to find in good time with non-enveloping technologies – the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes.

Order Tracking is primarily used for analysis on variable speed machines. The method uses multiples of rotational speed (orders), rather than absolute frequency (Hz). The number of orders is input by the user. Order Tracking also minimizes the risk of smearing in spectrums.

Part numbers

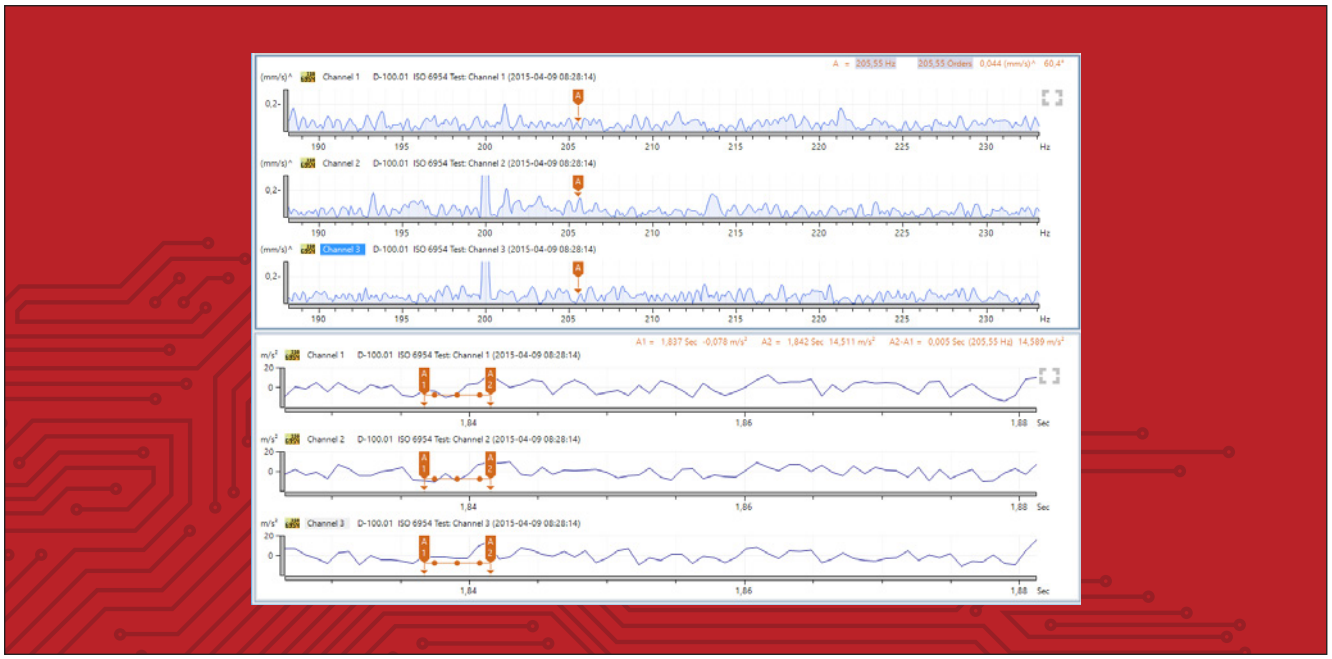
MOD135 EVAM incl. Condition Manager and HD ENV

SPM

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Condmaster® Ruby – Multi-channel simultaneous vibration



Multi-channel simultaneous vibration monitoring, including both two-channel and three-channel measurements, is a module function in Condmaster Ruby that requires either 'FFT with symptoms' or 'EVAM' to be active.

This type of measurement allows the user to study machine movement in two/three dimensions by observing the difference of the phase angles measured on the channels.

Measurement requires the set-up of two/three vibration measuring assignments with identical parameters. A multi-channel measuring cable is used to connect both transducers to the Leonova vibration transducer input. The procedure is the same as for the corresponding measurement with a single transducer. For Intellinova Parallel EN, a multi-channel measurement must be set up within the same group of four channels, i.e. within channel 1-4, 5-8, 9-12 or 13-16.

Condmaster Ruby displays the RMS values for DISP, VEL and ACC for all channels. Three graphs are available for each measurement:

- Spectrum.
- Phase spectrum.
- Time signal.

The image is showing the spectrum and the time signal for the channels.

The two cursors show the difference in phase angle at the actual frequency. A phase is a time delay expressed in degrees of rotation. Leonova or Intellinova calculates the time delay between the passage of the tachometer pulse and the peak of the frequency component of interest from the vibration transducer at the speed of rotation. The value presented is a relative angle, not an absolute, because there is no compensation for phase lag in the transducer or the electronic circuits.

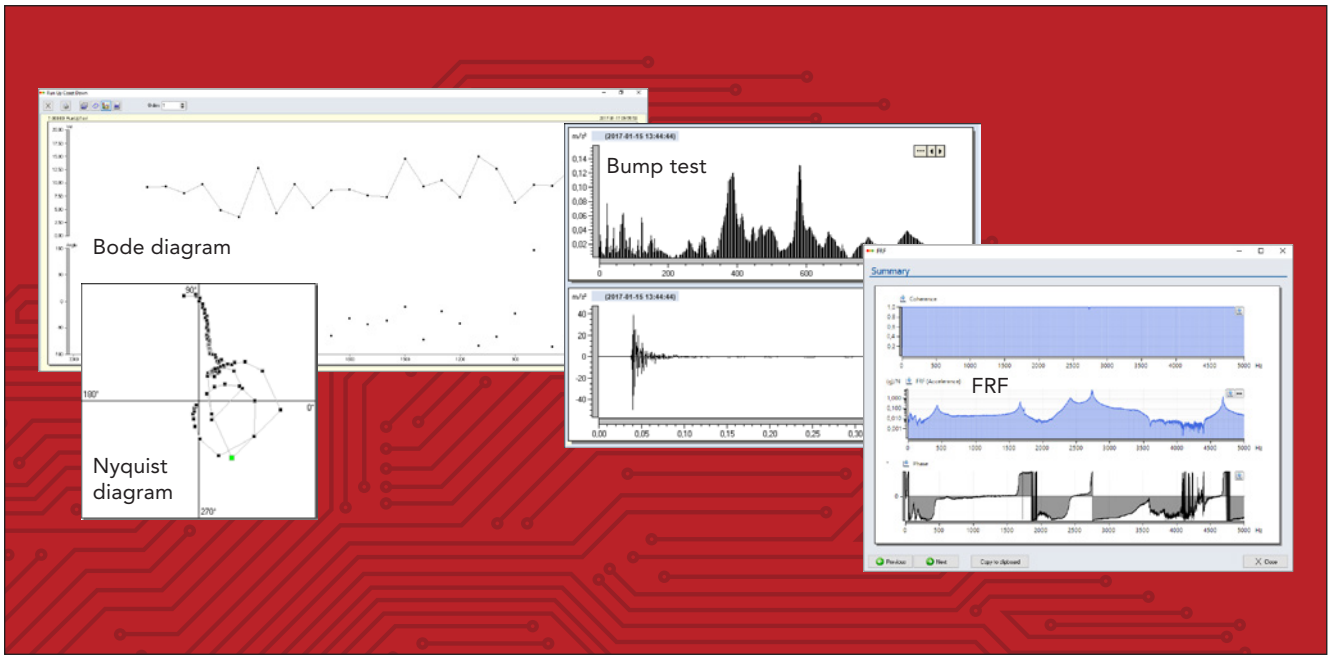
Part numbers

MOD192 Multi-channel simultaneous vibration

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Condmaster® Ruby – Run up/Coast down, Bump test, FRF



Run up/coast down measurements, Bump test and FRF are vibration analysis functions offered as a module for Leonova and Intellinova.

Run up/coast down records the changes in vibration while the machine is run up to operating speed or after it has been shut off and is slowing down.

For this test, both the signal unit and the unit for the spectrum can be selected. The measuring interval can be either time based (interval in seconds) or speed based (interval in rpm). The speed range is also chosen, e.g. 400 to 3000 rpm.

Waterfall diagram can be viewed after the measurement is done. For each individual measurement, a spectrum can be called up.

Nyquist diagram shows the phase angle and amplitude. A phase is a time delay expressed in degrees of rotation. Leonova calculates the time delay between the passage of the tachometer pulse and the peak of the frequency component of interest from the vibration transducer at the speed of rotation. The value presented is a relative angle, not an absolute, because there is no compensation for phase lag in the transducer or the electronic circuits.

Bode diagram can be selected for vibration amplitude and angle, showing all measurements in time sequence. In all diagrams, a blue dot shows the position of the measurement marked on the list.

Bump test is employed to check out the typical vibration response of a machine structure at standstill, by hitting it e.g. with rubber mallet (bump test).

The user sets the measuring range in Hz, which automatically sets the sampling time, e.g. 0.20 seconds for 2000 Hz/400 lines. A pre-trigging time, 5% to 25% of the sampling time, is also chosen.

The peak amplitude of the measured signal is displayed (velocity in mm/s) and a trigger level can be set to 1% – 90% of the amplitude.

The actual test returns an FFT spectrum and a time signal (sampling time plus pre-trigging time). The spectrum can be stored as reference spectrum for any measuring assignment.

Frequency Response Function (FRF) is used to measure the vibration response (natural frequencies) of a machine structure, similar to the 'Bump test'. FRF however is more sophisticated, measuring the response resulting from a known applied input by using an impact hammer and a vibration transducer connected to Leonova Diamond's vibration input using a split cable.

The FRF measuring assignment is set up in Leonova Diamond and the settings and measuring results can be viewed in Condmaster Ruby after the measuring round is uploaded.

Part numbers

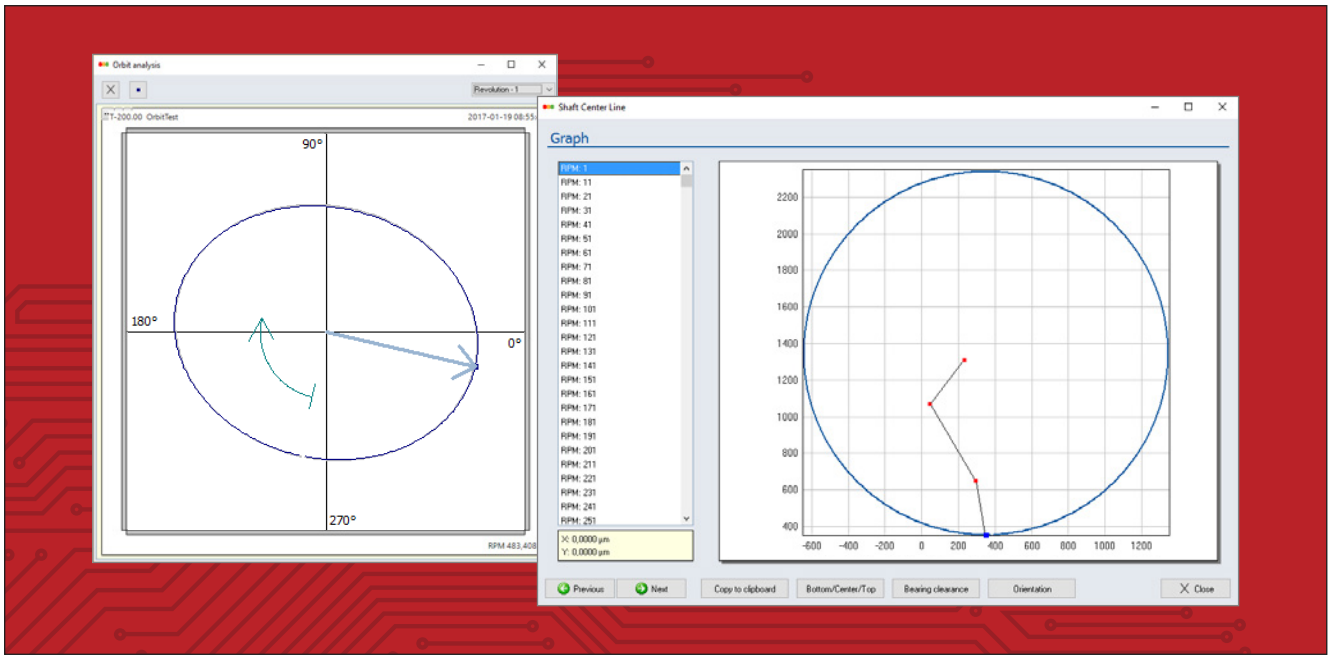
MOD137 Run up/Coast down, Bump test and FRF

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Condmaster® Ruby – Orbit Analysis and Shaft Centerline Plot



Orbit Analysis is a vibration measurement function offered as a module for Condmaster Ruby. The resulting orbit graph shows the movement of the shaft's centerline and is used to detect failures like rubs, unbalance, misalignment or oil whip on machinery with journal bearings.

Measurements are normally performed with Leonova Diamond, Intellinova Standard or Intellinova Parallel EN on the buffered outputs of a machine protection system. Intellinova Parallel EN requires a Displacement Signal Interface (TD-549) for measurements on buffered outputs of a machine protection system.

Measurements can also be made with e.g. accelerometers to get a two-dimensional graph of the mechanical forces on the bearing housing. Required are two channel simultaneous vibration measurement and two transducers placed at an angle of 90° to each other, plus a trigger signal from a tachometer probe.

Settings include transducer type, signal unit and filter type, either bandpass (default) or lowpass. Orders is set to 1 by default, but the user can select from 1 to 5 orders. The number of revolutions parameter, max. 25, specifies the number of shaft revolutions to acquire and display in the orbit graph.

The orbit graph shows an overlay of the graphs for each measured revolution plus their average. The user can select each individual revolution as well as the average of all revolutions.

The selected graph is marked blue, with a blue arrow showing the angle and the x/y values at that angle. The user can move the arrow on the screen in the orbit graph.

When the orbit assignment is set up in Condmaster Ruby, alert limits can be set on the X and Y axis, resulting in an evaluated measurement (green – yellow – red scale).

Shaft Centerline Plot is a function available with Leonova Diamond. Especially useful for assessment of lubrication during start-up of a machine with journal bearings, the plot displays changes in radial rotor position over a range of speed. Settings for Shaft centerline plots are made in Leonova Diamond. The results can be viewed in Condmaster Ruby after the measuring round is uploaded.

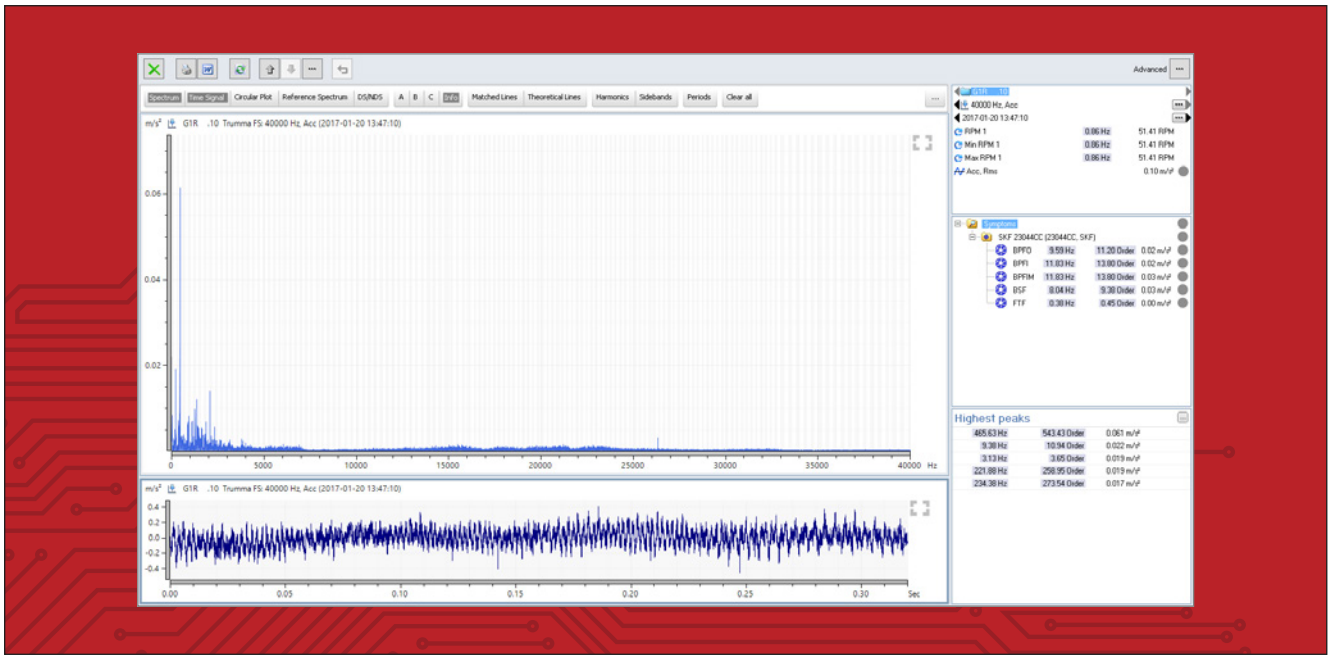
Part numbers

MOD138 Orbit analysis and Shaft Centerline Plot

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Condmaster® Ruby – Extended resolution and frequency range



When higher resolution and frequency range are required for FFT with symptoms, EVAM, SPM HD Expert or SPM Spectrum, e.g. when monitoring high-speed gearboxes in turbines, MOD194 extends the maximum of these parameters. The lower frequency limit is then 0, 0.5, 2, 10 or 100 Hz. The upper limit is 40 000 Hz. The number of spectrum lines can be extended to max. 12 800 or 25 600.

To highlight low energy signals, the dB unit can be selected.

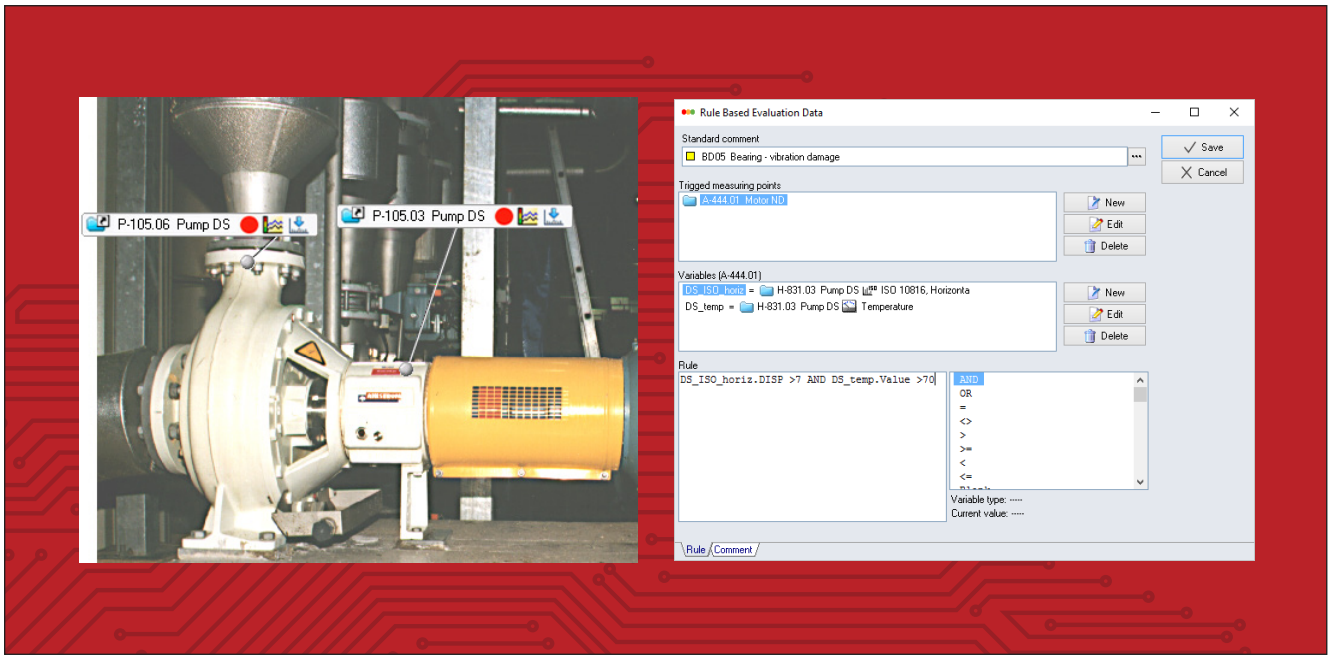
Part numbers

MOD194 12 800 or 25 600 lines, 40 kHz

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Condmaster® Ruby – Rule-Based Evaluation, RBE



Rule-Based Evaluation (RBE) is a module in Condmaster Ruby. The purpose of RBE is to give the user guidance on what to do when certain alert conditions are met. RBE is an excellent tool in Product Integrated Maintenance (PIM).

RBE items concist of standard comments and user-defined texts to set up alert parameters for triggered measuring points. Pictures can be attached to illustrate.

Each RBE item consists of a standard comment, one or more trigged measuring points, one or more variables and a rule that specifies under what conditions the alert should be triggered. Measuring points can be added and deleted as required. When the conditions of a specific alert are met, the alert is triggered, suggesting appropriate measures.

If for instance there are high readings on a pump housing, the reason is most likely cavitation. If this condition arises, RBE could be set up to rectify the problem. The suggested actions might be to open valves, change speed or other relevant measures to correct the faulty condition.

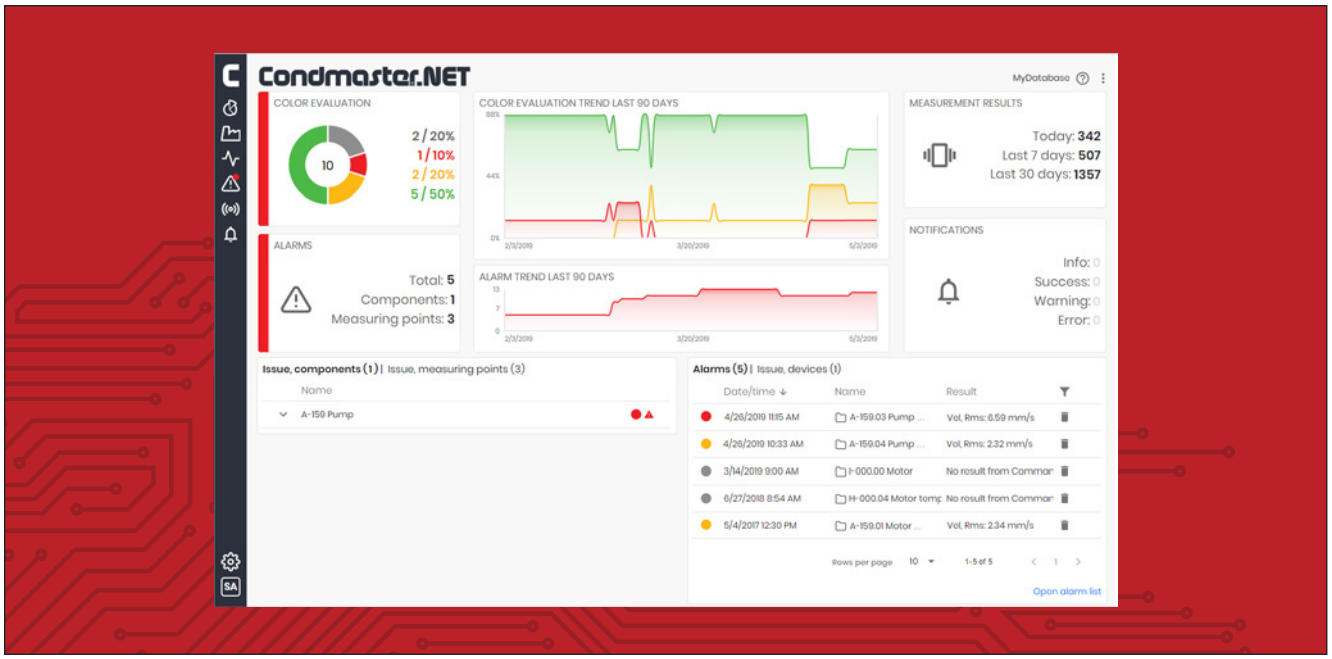
Part numbers

MOD181 Rule-Based Evaluation, RBE

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Condmaster® Ruby – Condmaster.NET



Condmaster.NET, which is included in the Condmaster Ruby platform (TD-583), is a web application and downloadable app that can be used to access Condmaster Ruby data from all types of devices.

Condmaster.NET presents an intuitive and easily accessible overview of color evaluation and alerts and offers basic analysis functionality. Application-specific, customized dashboards to visualize and monitor process data can be created on request.

Condmaster.NET provides Condmaster Ruby users at all levels access to condition monitoring data on computers, tablets, and smartphones from anywhere in the world:

- Get a quick overview of the condition of critical assets in your plant.
- View the current condition status of all measuring points, as well as alerts and issues on machine, component, and measuring point level.
- Perform basic analysis of your condition monitoring program using spectrums, time signals, trends, and alerts.
- View Plant Performer (TD-598) statistics – an effective tool to visualize the benefits of condition monitoring as well as its technical and economic impact.

Depending on the functions offered by your Condmaster Ruby system:

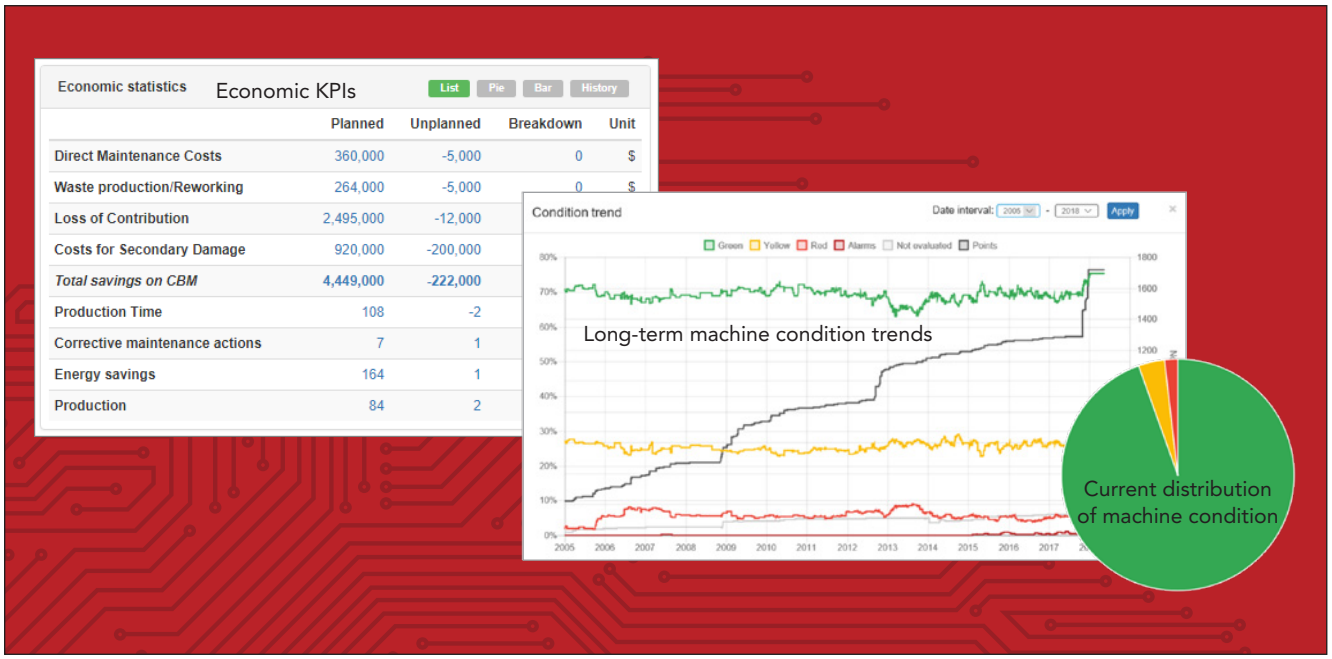
- Manage online measuring devices and view their activity in real-time.
- Monitor manufacturing process data in real-time.
- Use customized dashboards for a tailored overview of current condition status.

For the Airius vibration sensor (TD-567), Condmaster.NET is available as a cloud service (TD-580). Users can log onto Condmaster.NET to view spectrums, time signals, trends, and alerts – all based on data residing in SPM Cloud.

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Condmaster® Ruby – Plant Performer™



Plant Performer compiles and visualizes statistics relating to technical and economic KPIs (Key Performance Indicators) in the OEE/TEEP area for display and evaluation in Condmaster.NET. Plant Performer, a part of the Condmaster Ruby platform (TD-583), demonstrates the benefits of condition monitoring and communicates its technical and economic impact to all levels of the organization.

Basic data, including machine types, for the generation of Plant Performer statistics is entered in Condmaster Ruby. When corrective measures is taken, users enter information in a Corrective maintenance comment, which is then used to generate economic KPI statistics, such as Direct Maintenance Costs, Loss of Contribution, and Costs for Secondary Damage.

Technical KPIs are created at the measuring point level and linked to folders in the Measuring Point Tree. They can be calculated for all or a subset of machine types. For instance, the overall vibration level for electrical motors in a department, or an entire plant, calculated at user-defined intervals. Plant Performer offers the possibility to follow up on MTBF (Mean Time Between Failure), as well prewarning and planning times, per machine type.

Plant Performer includes database statistics, such as the number of measuring points or measuring rounds, or database size.

Statistics can be viewed at aggregate or database level with drill-down options, presented in lists, as pie or bar charts, and in timelines. Filter options can be used for a more narrow selection of data.

For economic statistics and machine condition trends, data can include either a specific year or all historic data, while current machine condition and database statistics provide a snapshot of the current situation.

Statistics from an unlimited number of Condmaster databases can be exported and imported into Plant Performer – such as from other divisions, production units, plants, or an entire group – for easy comparison of data.

Plant Performer data can be exported from Condmaster Entity Server to other systems by means of an application programming interface (API).

Statistical examples include:

- Total Loss of Contribution.
- Overall vibration level for a department/for all fans/for entire plant, etc.
- Operating condition (green – yellow – red) for all electrical motors.
- Number of fans in alert condition.
- MTBF for centrifugal pumps with criticality A.

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Condmaster® Ruby – Online



The online module in Condmaster Ruby enables the software to communicate with all Ethernet compatible online systems, equipped with a user-selected combination of measuring units for bearing and/or vibration monitoring and/or units for analog and digital signals. The module also works for the Airius wireless vibration sensor and the CMS online system.

The core of the online systems is Condmaster Ruby that receives the measuring results from all condition monitoring devices for evaluation and presentation.

The online module offers advanced measurement, filtering and alert options. These are used to set the system up to measure only when required, to discard what is insignificant and to raise only well-justified alerts. Part number MOD187 also activates the Seamless and Time Signal Recording functions.

Based on extensive empirical data, international standards and machine statistics, the evaluation result is an easy-to-understand color code, highlighting potential trouble spots. By calibrating and adjusting limit values, the automatic evaluation process can be tuned with great precision and get an immediate, reliable diagnosis.

Part numbers

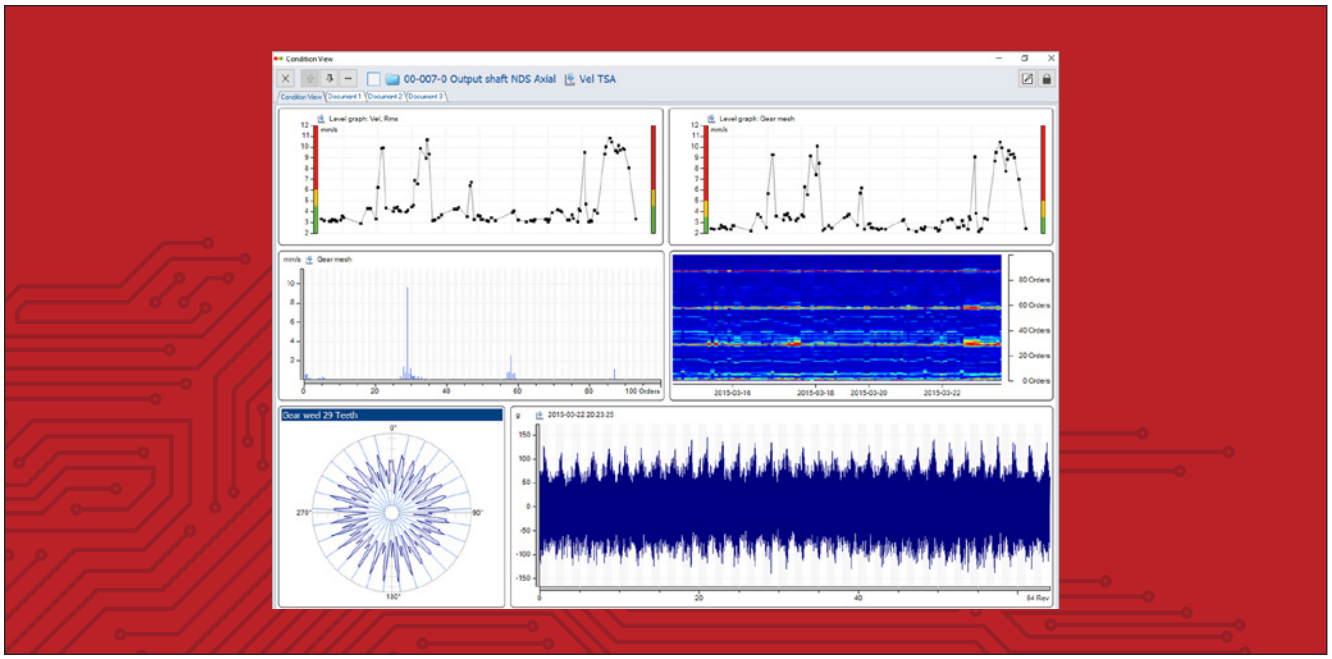
MOD187 Condmaster Ruby, Online

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Condmaster® Ruby – Condition View



Condition View is a flexible and powerful function that makes it possible to combine multiple graphs in Condmaster into a single window for presentation and further analysis. The function can be used to show current machine condition, recent condition development or maintenance actions, e.g. to clarify or justify planned maintenance activities.

Condition View provides a useful overview of the most interesting condition data and any complementary information for a particular measuring point. For one or more measuring points, trend graphs, spectrums, time signals, Colored Spectrum Overview graphs, and circular plots, etc. can be combined as desired. It is also possible to include different measuring techniques in the same view.

The default settings of the Condition View function can be modified to suit customer preferences.

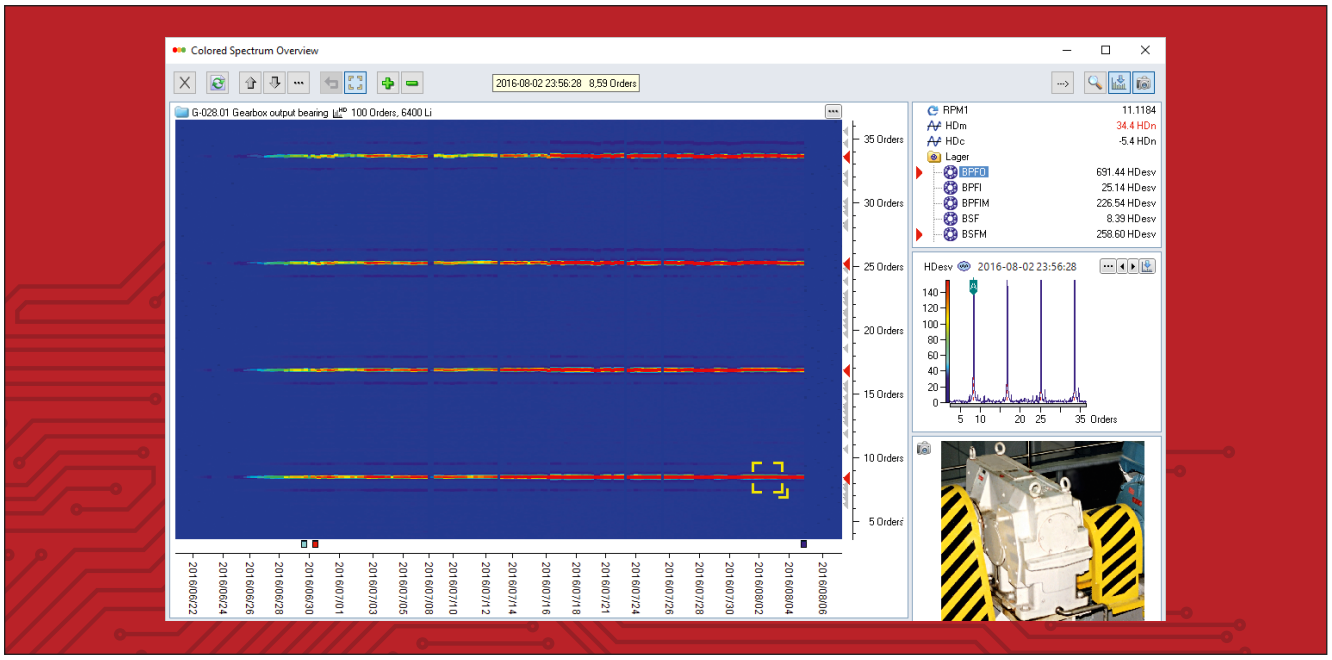
The function is user-friendly, with ability to set cursors, zoom and rescale graphs directly in Condition View mode, and quickly navigate from there to individual graphic functions. The content can be printed and/or saved as MS Word files. Condition View also offers the possibility to customize and export its content, including cursors and notes, to the Condition View Report function as a basis for report generation.

The Condition View function is part of the Condmaster Ruby platform (TD-584).

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Condmaster® Ruby – Colored Spectrum Overview



Colored Spectrum Overview is included in the Condmaster Ruby platform (TD-583).

The purpose of Colored Spectrum Overview is to simplify the process of identifying in spectrums the patterns and trends which indicate damages. It clearly distinguishes between signals that are always present in the machine and signals caused by developing damages. The module function provides a good overall picture of the machine condition development.

The overview shows multiple spectrums over a longer period of time. Spectrums is viewed in orders, CPM or Hz.

Among many features in Colored Spectrum Overview are:

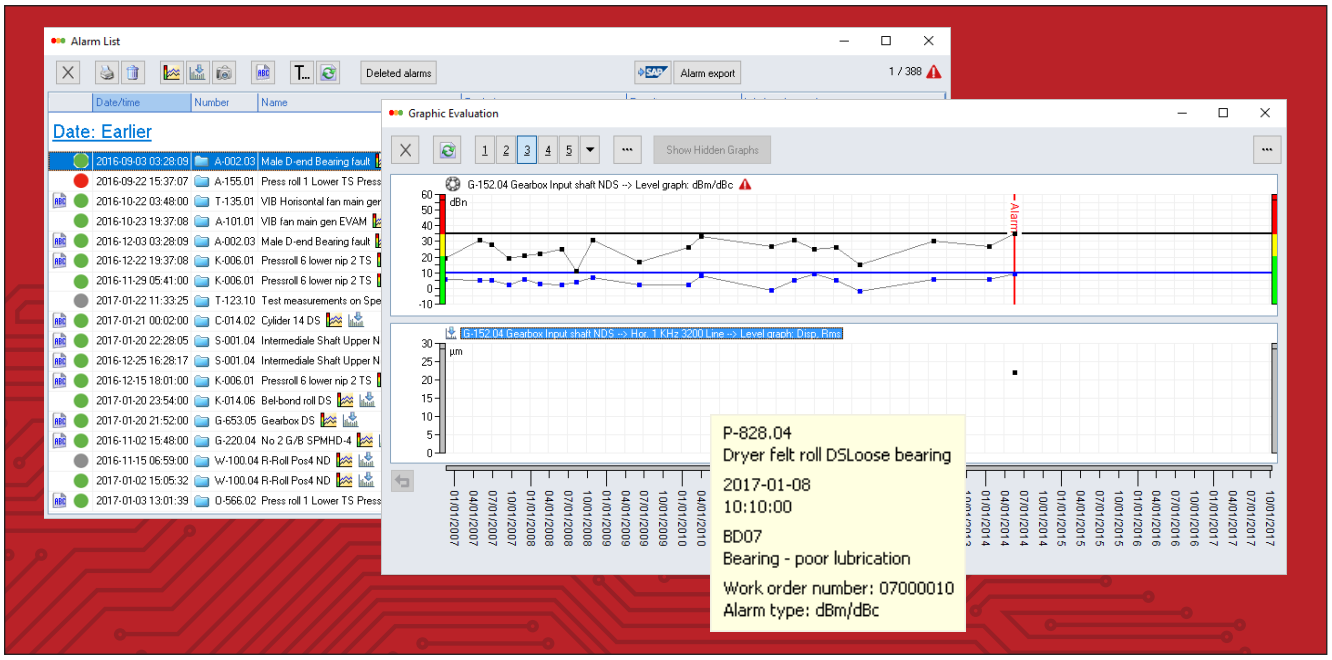
- Zooming possibilities in x, y and z axes.
- Logarithmic or power spectrum.
- Symptoms activation to simplify damage identification.

In the overview, harmonics are always shown. Sidebands can be activated by the user.

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Condmaster® Ruby – SAP and AMOS links



The SAP and AMOS links are included in the Condmaster Ruby platform (TD-583).

The function provides a link to SAP and/or AMOS software. Clicking the **Alert export** (for AMOS) or **SAP** button on the Condmaster alert list sends the marked alert message to the receiving software. Returned is a SAP or AMOS work order number that locks the alert, until a second message from SAP or AMOS deletes the alert and sets a comment on the Condmaster measuring point, stating what has been done. In addition, the Condmaster measuring point setup now contains an optional field for SAP equipment numbers.

The operation requires no extra data input. The Condmaster operator simply presses the **SAP** or **Alert export** button when an alert merits a work order. The SAP or AMOS operator responds by sending a Standard Comment to a text file.

Standard Comments are a user-defined register of short messages in Condmaster, e.g. “Bearing replaced”. The SAP/AMOS operator can add free text. On receiving the comment, Condmaster deletes the alert. The comment is added to the list of comments under the measuring point and is visible in the measuring result diagram.

Specific functions are required in the SAP/AMOS software for the communication to work properly. These functions are not provided by SPM Instrument AB, only a protocol description of the functions as seen from Condmaster.

Running the AMOS link requires a CBM module in AMOS. A register of planned actions equivalent to that in Condmaster must be implemented, and component numbers need to be the same in both systems.

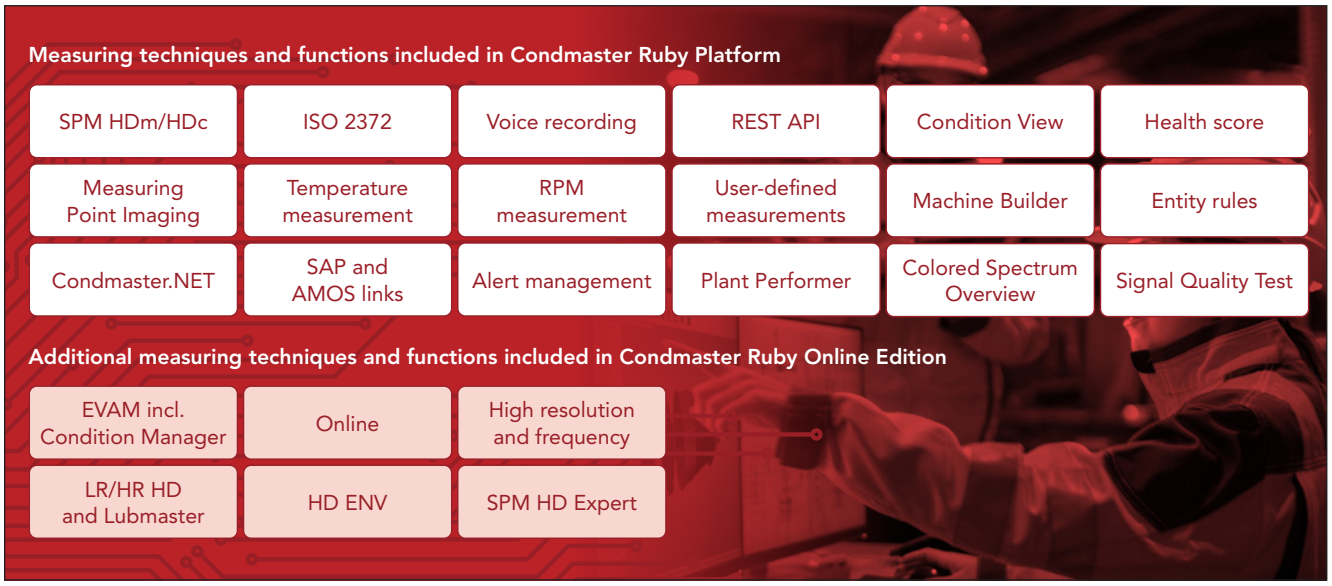
Z_Condmaster is the function that needs to be implemented in SAP software. Condmaster calls Z-Condmaster in SAP and sends the measuring point and alert information. SAP creates a work order and a file where Condmaster reads the SAP work order number. This file can be saved anywhere locally or on the server. It is normally placed in the Condmaster directory. The path has to be set in Condmaster.

There is no extra data input required on the SAP side. Condmaster measuring point numbers and Standard Comment codes are available to SAP software via a command to the SQL server that controls the Condmaster database.

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Condmaster® Ruby – Online Edition



Condmaster Ruby Online Edition is a customized and expanded version of the Condmaster Ruby Platform. The Online Edition version is intended for online system users. There is a fixed price for the Condmaster license depending on the number of connected online units.

Condmaster Ruby Platform, PRO400

The Condmaster Ruby Platform (TD-583) includes the measuring techniques SPM HDm/HDc, VIB ISO 2372, and two user-defined measurements (data input as analogue voltage or current, or manual). It also has a runtime counter for the operating hours of a machine. Measuring Point Imaging enables user to connect images to measuring points. Condmaster.NET is a web application and downloadable mobile app that provides easy access to measurement data through a user-friendly interface.

In addition to the Condmaster Ruby Platform, the Online Edition includes the following modules:

Online, MOD187

The online module (TD-599) allows the software to communicate with online units and offers advanced measurement, filtering and alert options. These are used to set the system up to measure only when required, to discard what is insignificant and to raise only well-justified alerts.

SPM HD Expert, MOD195

SPM HD (TD-588) is successfully used for fast, easy and reliable diagnosis of bearing condition. Advanced digital technique and RPM-based sampling frequency makes SPM HD particularly well suited for measurement on low-speed applications.

LR/HR HD, MOD131+MOD195

The LR/HR HD method (TD-586) was developed from the original shock pulse method for condition diagnosis of rolling element bearings. It allows a precision analysis of oil film condition in the rolling interface and contains calculation models for finding the optimal lubricant.

EVAM, MOD135

EVAM (TD-591) stands for Evaluated Vibration Analysis Method and generates three sets of machine condition data:

- Condition parameters, calculated values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are highlighted and evaluated with preset fault symptoms. Time signals are available for deeper analysis.
- Machine-specific condition codes (green – yellow – red) and condition values, based on a statistical evaluation of the condition parameters and symptom values.

HD ENV, MOD199

For each measuring point, the user can define the type of data best suited for the individual machine. Alternatives include HD ENV (TD-608), time synchronous averaging, band alerts and averaging of measurement results for improved alert reliability.

Extended resolution and freqency range, MOD194

The number of spectrum lines can be extended to a maximum of 12 800 or 25 600. The upper frequency limit is 40 kHz. For further information, see TD-595.

Supported products

All versions of the following products are supported:

- Intellinova Standard
- Intellinova Compact
- Intellinova Parallel EN
- Airius

Part numbers

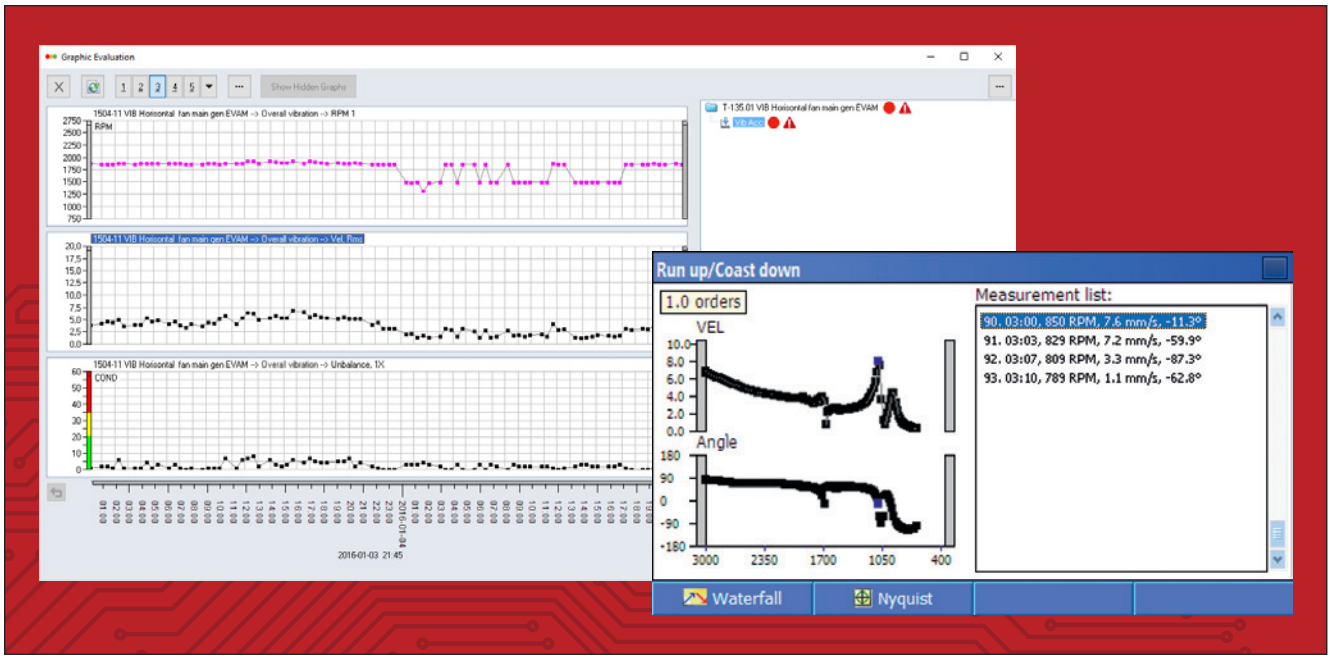
PRO411	License for 1 online unit* CD
PRO412	License for 2 online units*, CD
PRO413	License for 3 online units*, CD
PRO414	License for 4 online units*, CD
PRO410	Upgrade for 1 additional online unit*, CD
PROXXX-USB	Add -USB to get the software on USB

*Every online unit (regardless of which type) counts as one connected unit.

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Condmaster® Ruby – Vibration Expert



Vibration Expert is a module in Condmaster Ruby for use with the portable instrument Leonova Diamond. As a combination of modules MOD135, MOD137 and MOD194, the Vibration Expert module contains:

EVAM (TD-591) generates three sets of machine condition data:

- Condition parameters, which are measured and calculated values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with the preset fault symptoms.
- Machine specific condition codes (green – yellow – red) and condition values, based on a statistical evaluation of the condition parameters and symptom values.

For each measuring point, the user can make an individual selection and define the type of data best suited for the surveillance of an individual machine. Alternatives include

- HD ENV
- Time Synchronous Averaging (TSA)
- Band values and averaging of measurement results for improved alert reliability.

Random high readings caused by disturbance are filtered out, minimizing the number of false alerts. As an alternative to spectrum analysis, cepstrum analysis can be used for gearboxes.

HD ENV (TD-608) is an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques – for example bearing damages and gear damage – the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes.

Run up/coast down (TD-593) records the changes in vibration while the machine is run up to operating speed or after it has been shut off and is slowing down.

For this test, both the signal unit and the unit for the spectrum can be selected.

Bump test (TD-593) is employed to check out the typical vibration response of a machine structure at standstill, by hitting it e.g. with rubber mallet (bump test).

Frequency Response Function, FRF (TD-593), is used to measure the vibration response (natural frequencies) of a machine structure, similar to the 'Bump test'. FRF however is more sophisticated, measuring the response resulting from a known applied input by using an impact hammer and a vibration transducer connected to Leonova Diamond's vibration input using a split cable.

Extended resolution and frequency range (TD-595) are sometimes required for FFT with symptoms, EVAM, SPM HD Expert or HD ENV, e.g. when monitoring high-speed gearboxes in turbines. Vibration Expert provides 25 600 lines and 40 KHz.

Order Tracking is primarily used for analysis on variable speed machines. The method uses multiples of rotational speed (orders), rather than absolute frequency (Hz). The number of orders is input by the user. Order Tracking also minimizes the risk of smearing in spectrums.

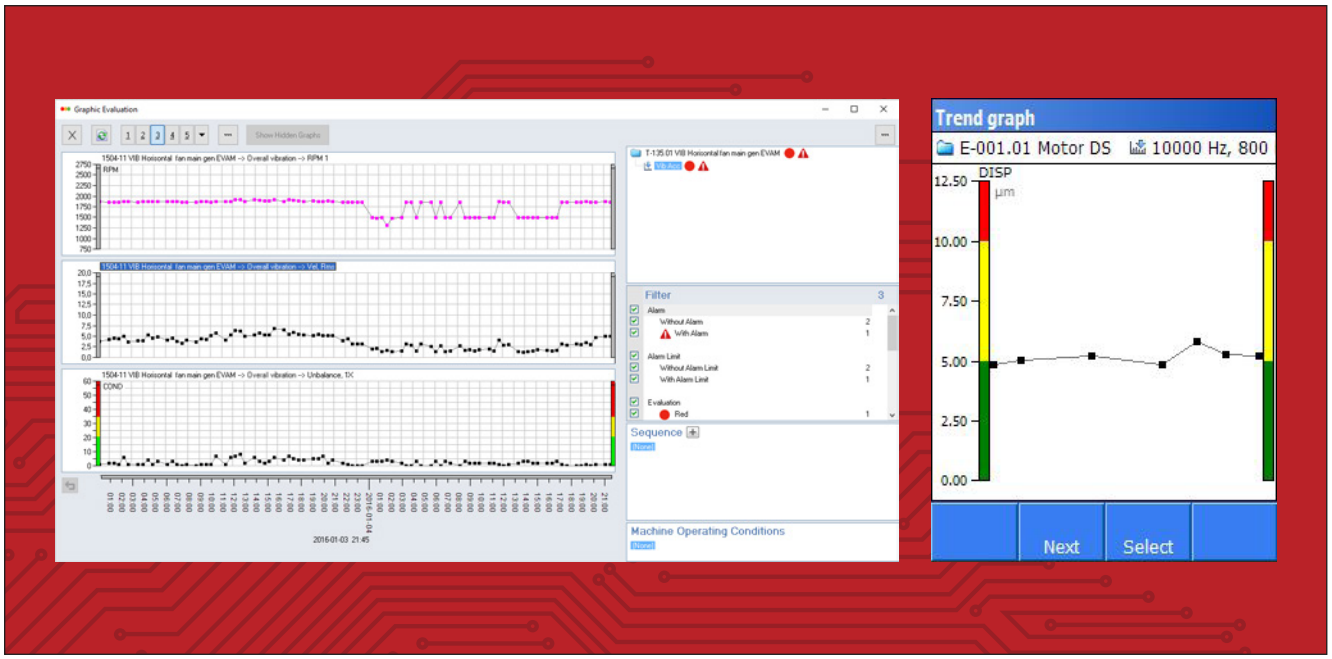
Part numbers

MOD193 Vibration Expert

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Condmaster® Ruby – Vibration Supreme



Vibration Supreme is a module in Condmaster Ruby for use with the portable instrument Leonova Emerald. As a combination of modules MOD135, MOD137, MOD139 and MOD199, the Vibration Supreme module contains:

EVAM (TD-591) generates three sets of machine condition data:

- Condition parameters, which are measured and calculated values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with the preset fault symptoms.
- Machine specific condition codes (green – yellow – red) and condition values, based on a statistical evaluation of the condition parameters and symptom values.

For each measuring point, the user can make an individual selection and define the type of data best suited for the surveillance of an individual machine. Alternatives include

- HD ENV
- Time Synchronous Averaging (TSA)
- Band values and averaging of measurement results for improved alert reliability.

Random high readings caused by disturbance are filtered out, minimizing the number of false alerts. As an alternative to spectrum analysis, cepstrum analysis can be used for gearboxes.

HD ENV (TD-608) is an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques – for example bearing damages and gear damage – the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes.

Extended resolution and frequency range (TD-595) are sometimes required for FFT with symptoms, EVAM, SPM HD Expert or HD ENV, e.g. when monitoring high-speed gearboxes in turbines. Vibration Supreme provides 12 800 lines and 40 KHz.

Order Tracking is primarily used for analysis on variable speed machines. The method uses multiples of rotational speed (orders), rather than absolute frequency (Hz). The number of orders is input by the user. Order Tracking also minimizes the risk of smearing in spectrums.

Part numbers

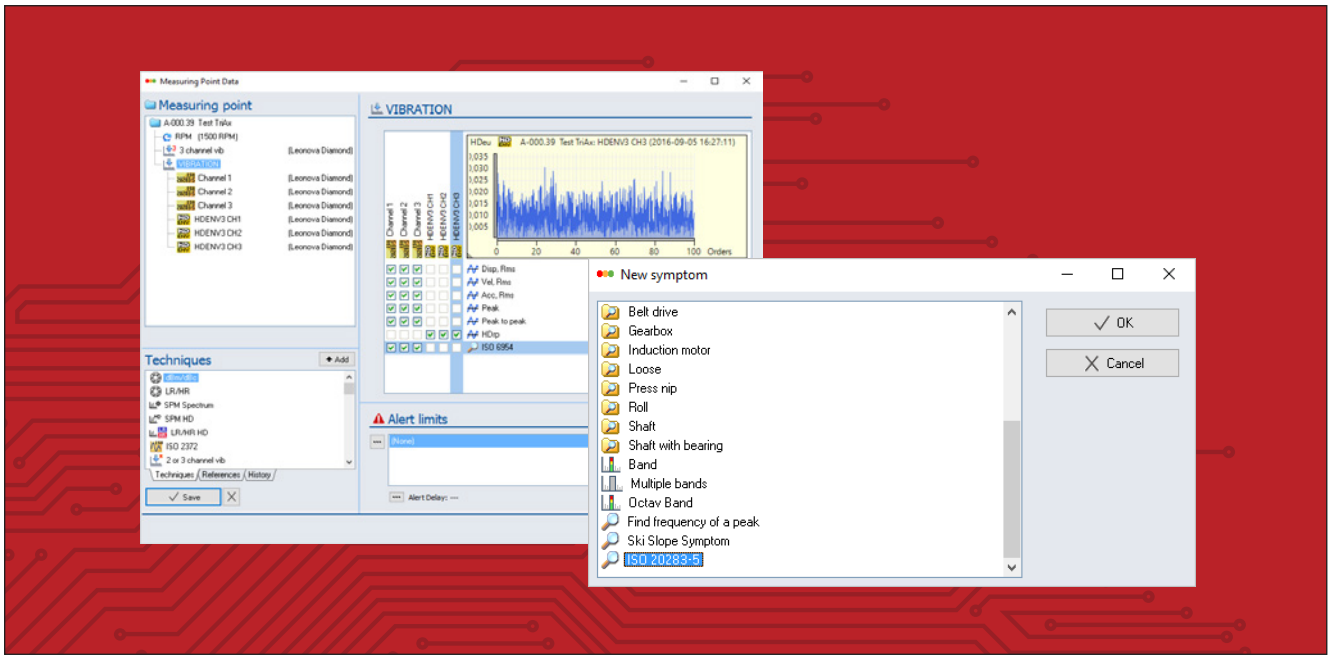
MOD197 Vibration Supreme

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Condmaster® Ruby – Vibration ISO 20283-5



The International Standard ISO 20283-5 contains guidelines for the evaluation of vibration with regard to habitability on a passenger or merchant ship, as well as requirements for the instrumentation and the method of measurement in normally occupied spaces.

Shipboard vibration interfering with duties or reducing comfort is objectionable and often results in adverse comments from crew and passengers. This international ISO standard gives the guidelines for evaluating the habitability of different areas on a ship. The habitability is evaluated by the overall frequency-weighted RMS vibration values from 1 Hz to 80 Hz.

Vibration data acquired in accordance with this international standard are also useful for

- comparison with ship specifications
- comparison with other vessels
- further development and improvement of vibration standards.

It is recommended that the classification to be applied to the various areas of a ship be agreed between the interested parties (e.g. shipbuilder and shipowner) prior to any assessment of habitability.

Measuring rounds can be set up using three-channel vibration assignments with ISO 20283-5 as a symptom. Results from measurements and overall frequency-weighted RMS vibration values measured according to ISO 20283-5 can be presented in Condmaster Ruby, but the evaluation is to be handled in an external software program.

Features of ISO 20283-5 are:

- Vibration measurement in three directions (horizontal, vertical, axial).
- Frequency 0 Hz (DC) to 500 Hz.
- Frequency-weighted RMS value 1 to 80 Hz.
- Time signal.
- Spectrum, 6400 lines.

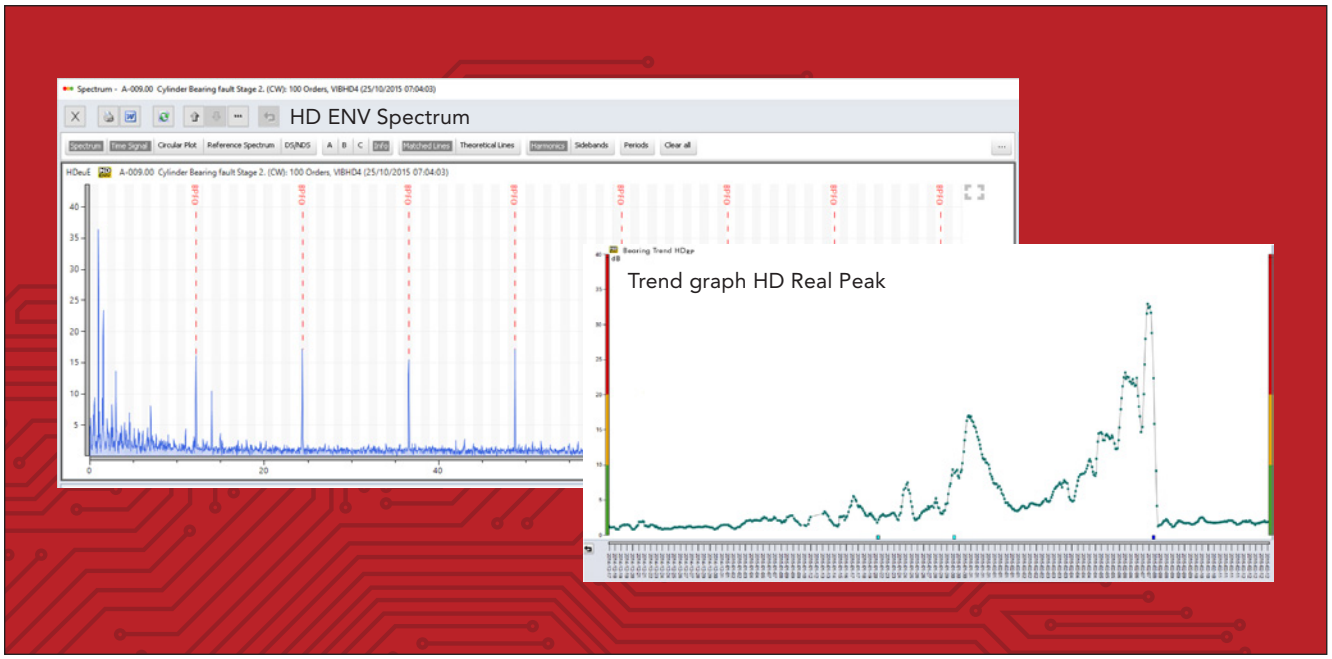
Part numbers

MOD198 Vibration ISO 20283-5

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Condmaster® Ruby – HD ENV



HD ENV is an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques – for example bearing damages and gear damage – the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes. Signals buried in machine noise are revealed through high definition digital enveloping, extracting and enhancing the signals of interest from the overall machinery vibration signal while preserving the true highest peaks.

Input data

The setup of HD ENV measurements in Condmaster Ruby is straightforward. A number of predefined filters are available to detect damages or anomalies in different stages of development; two of which are designed specifically for bearing monitoring and two which are recommended for detection of non-bearing related problems.

High Definition Order Tracking

HD Order Tracking is used with Leonova Diamond, Leonova Emerald and Intellinova, primarily for analysis on variable speed machines. The method uses multiples of rotational speed (orders) – rather than absolute frequency (Hz) – and is capable of handling ±50% RPM variations during data aquisition. The number of orders to be covered is input by the user. HD Order Tracking provides reliable data and crystal clear measuring results even when RPM varies greatly during the course of measurement.

Symptom enhancement

Symptom enhancement is an algorithm that looks for repetitive impacts in the time domain. As a result, random signals are suppressed and repetitive signals enhanced. The output is an HD Env Time signal, where relevant bearing and gear data are displayed. Using HD Order Tracking and symptom enhancement, applying FFT on the signal is very useful to determine the source of the signal.

Random Impact Rejection

Randomly occurring high readings which may cause false alerts are filtered out by means of the random impact rejection algorithm.

Output data

The unit of measurement is HD Real Peak, a scalar value expressed in decibels. Representing the true highest peak found in the envelope signal, HD Real Peak is the primary value to use for determining the severity of a bearing or gear damage. It is also used for triggering alerts.

HD ENV is very suitable for detecting equipment damages which typically have short development times, for instance due to high rotational speed or high temperature industrial environments.

The HD ENV module requires either the EVAM (MOD135) or FFT with symptoms (MOD134) module to also be in use.

Part numbers

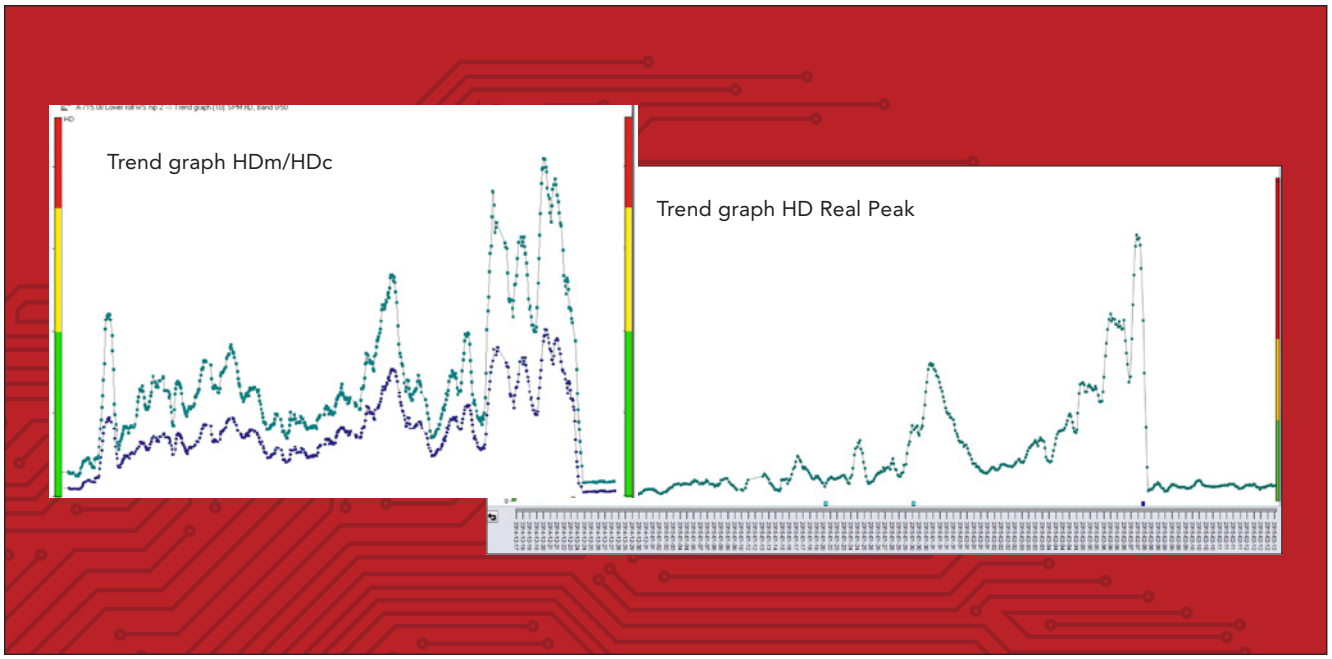
MOD199 HD ENV

NOTE: A new license with MOD135 (EVAM) and/or MOD134 (FFT with symptoms) automatically includes HD ENV. Only use MOD199 for upgrading an existing license (Condmaster Ruby 2014 or older) that already has MOD135 and/or MOD134.

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Condmaster® Ruby – HD Analysis



The HD Analysis module is a combination of the modules SPM HD Expert (MOD195) and Vibration Expert (MOD193) for use with the portable instruments Leonova Diamond and Leonova Emerald.

SPM HD Expert (TD-588) is a complement to SPM HDm/HDc and LR/HR. Advanced digital technique, RPM-based sampling frequency and measuring time automatically adjusted to RPM makes SPM HD particularly well suited for measurement on low-speed applications. Extraordinary signal quality and 24 bit A/D conversion provides razor-sharp resolution and exceptional detail in spectrums and time signals.

The SPM HD method produces different types of results:

- **HDm/HDc** are part of the Condmaster Ruby platform (TD-583).
- **Time Signal HD** is extremely useful to locate where in the bearing a possible damage is located. In many cases it is also possible to determine the nature of the damage (cracked inner race with spalling all around or a single crack etc.). The Time signal HD is a result of very advanced digital algorithms where repetitive shocks are enhanced and random signals are suppressed.
- **SPM Spectrum HD** is the result of applying FFT algorithms on the Time Signal HD. The SPM HD spectrum is useful to determine where a possible bearing damage is located. It is also useful for trending purposes (applying symptom and band values).

EVAM (TD-591) generates three sets of condition data:

- Condition parameters, which are measured and calculated values describing various aspects of machine vibration.
- Vibration spectra where significant line patterns are found, highlighted and evaluated with the preset fault symptoms.
- Machine specific condition codes (green, yellow, red) and condition values, based on a statistical evaluation of the condition parameters and symptom values.

HD ENV (TD-608) is an ideal complement to conventional vibration techniques. Capable of detecting at a very early stage such machine problems which are generally difficult to find in good time with non-enveloping techniques - for example bearing damages and gear damage - the method utilizes cleverly engineered algorithms for digital signal processing to obtain optimal data for trending purposes.

Run up/coast down (TD-593) records the changes in vibration while the machine is run up to operating speed or after it has been shut off and is slowing down.

Bump test (TD-593) is employed to check out the typical vibration response of a machine structure at standstill, by hitting it e.g. with rubber mallet (bump test).

Frequency Response Function, FRF (TD-593), is used to measure the vibration response (natural frequencies) of a machine structure, similar to the 'Bump test'. FRF however is more sophisticated, measuring the response resulting from a known applied input by using an impact hammer and a vibration transducer connected to Leonova Diamond's vibration input using a split cable.

Extended resolution and frequency range (TD-595) are sometimes required for EVAM, SPM HD Expert and HD ENV, e.g. when monitoring high-speed gearboxes in turbines, MOD140 provides 25.600 lines and 40 KHz.

Part numbers

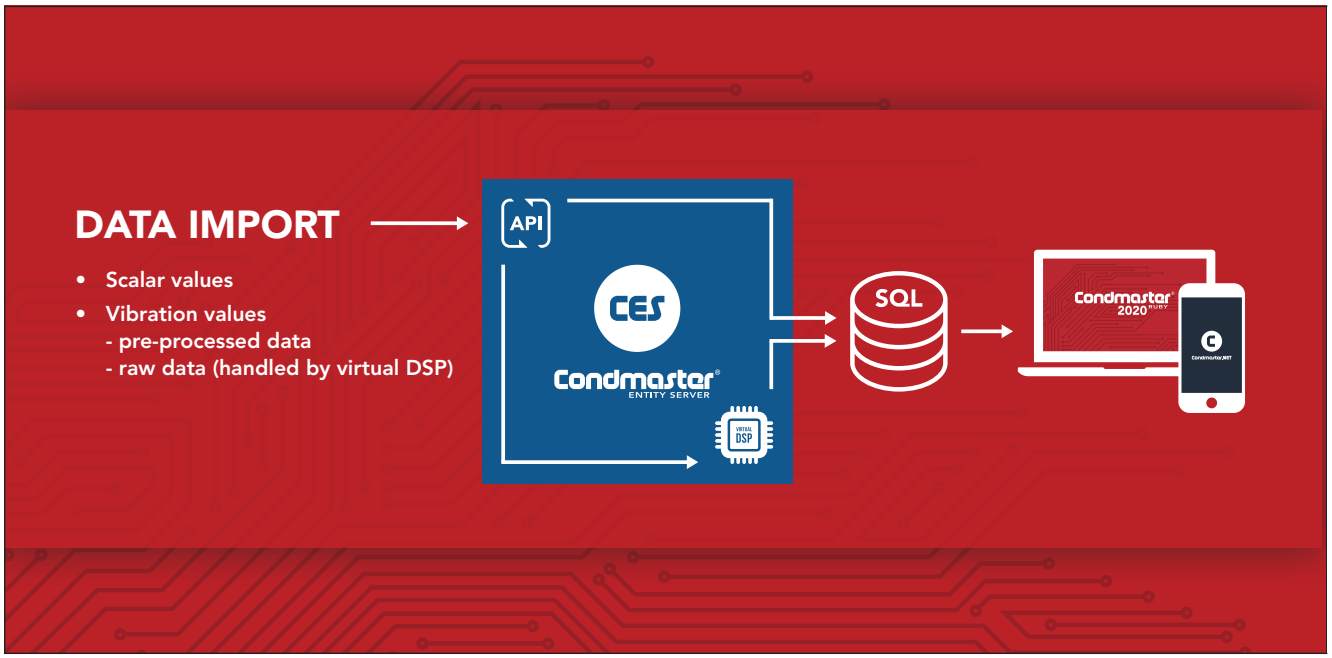
MOD140 HD Analysis

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Condmaster® Ruby – Virtual Online Unit



Virtual Online Unit enables the import of measuring results from other systems or units via the Condmaster Entity Server (CES) API. This opens up the opportunity to import measurement results from a variety of measuring devices not directly supported by Condmaster.

The vibration and user-defined measurement techniques are supported. While measurement assignment setting restrictions apply, vibration data from almost any source can be imported into Condmaster.

More specifically, possible data to import via CES API are scalar values (via the user-defined measurement technique) and vibration values (via the vibration measurement technique). Vibration values can be pre-processed data or raw data. Scalar values and pre-processed vibration values are received by the CES API and then saved directly to the SQL Server database. Raw vibration values are received by the CES API and then passes the virtual DSP in CES before being saved in the SQL Server database.

Virtual Online Unit makes it easy to set up measurement assignments defining the imported data. The data do not have to match the measurement assignment settings when it comes to sampling frequencies and sampling rates; our advanced algorithms automatically decimate and transform the imported data into the correct format.

Once in Condmaster, the system handles this data in the same way as data from SPM measurement systems. That means, among other things, that the imported data can be analyzed using Condmaster's all advanced features such as Colored Spectrum Overview, etc.

Part numbers

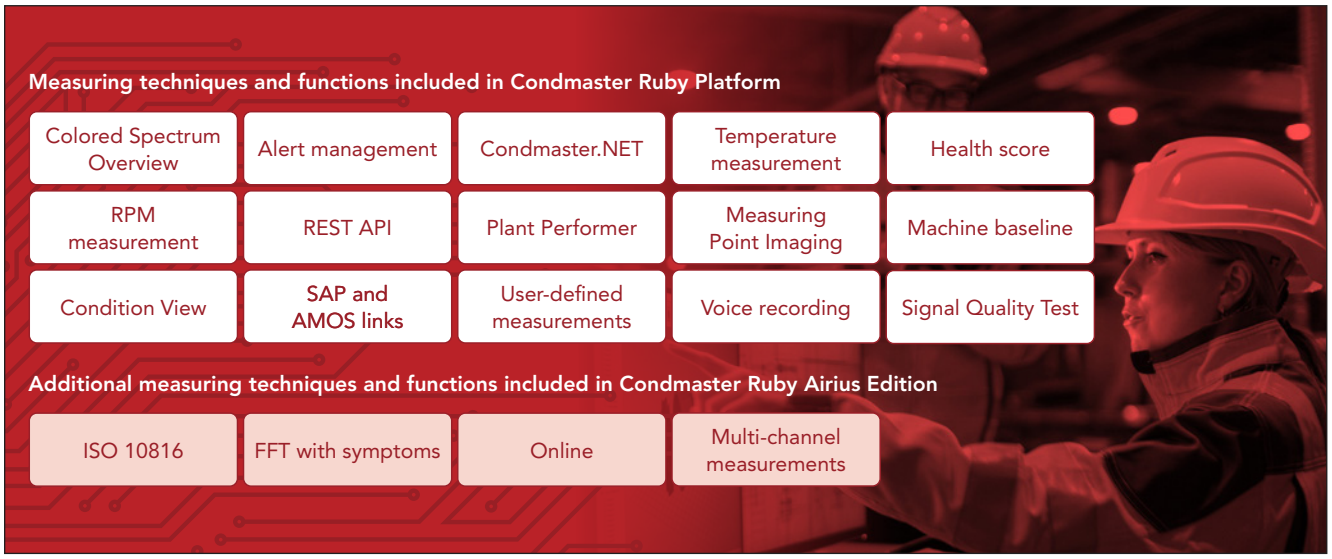
MOD200 Virtual Online Unit

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Condmaster® Ruby – Airius Edition



Airius Edition is a customization of the Condmaster Ruby software with measuring techniques and functions tailored for use with Airius wireless vibration sensors. The Condmaster licenses have fixed prices that depend on the number of connected Airius sensors.

Condmaster Ruby Platform, PRO400
The Condmaster Ruby Platform (TD-583) includes two user-defined measurements (data input as analogue voltage or current, or manual) and a runtime counter for the operating hours of a machine. Measuring Point Imaging enables users to connect images to measuring points. Condmaster.NET is a web application and downloadable mobile app that provides easy access to measurement data through a user-friendly interface.

In addition to the Condmaster Ruby Platform, the Airius Edition includes the following modules:

Vibration ISO 10816, MOD133
The vibration ISO 10816 module (TD-589) provides a cost-efficient method for the diagnosis of machine condition. Measurements are made in three directions. Machine condition is diagnosed based on broadband measurements that return an RMS value. ISO 10816 operates with the term vibration magnitude, which, depending on the machine type, can be an RMS value of vibration velocity, acceleration, or displacement.

FFT with symptoms, MOD134
The FFT with symptoms module (TD-590) enables a vibration analysis function that generates three sets of machine condition data: condition parameters, vibration spectra, and trending of symptom values.

Online, MOD187
The online module (TD-599) allows the Condmaster Ruby to communicate with all Airius wireless vibration sensors and offers advanced measurement, filtering and alert options. These are used to set up the system to measure only when required, to discard what is insignificant and to raise only well-justified alerts.

Multi-channel measurements, MOD192
The multi-channel simultaneous vibration module (TD-592) includes both two-channel and three-channel measurements, which allows the user to study machine movement in two or three dimensions by observing the difference of the phase angles measured on the channels.

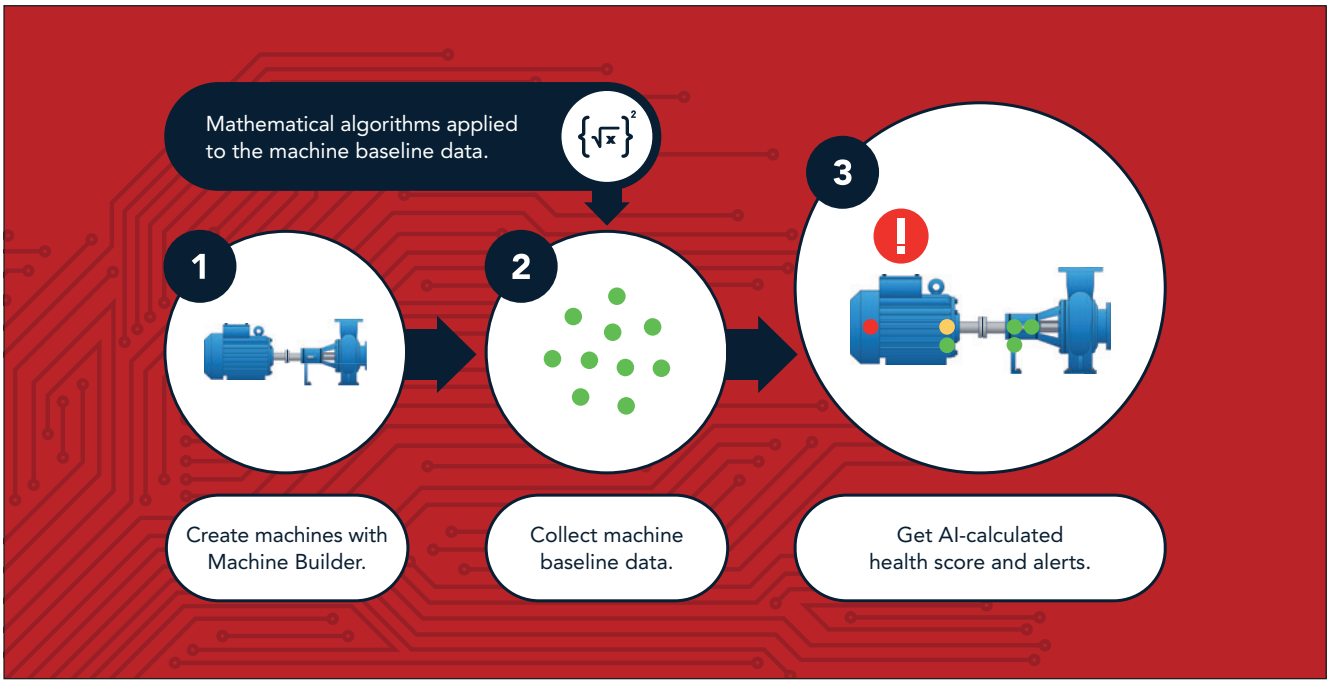
Part numbers

PRO421	License for up to 6 Airius sensors, CD
PRO422	License for up to 12 Airius sensors, CD
PRO423	License for up to 18 Airius sensors, CD
PRO424	License for up to 24 Airius sensors, CD
PRO420	Upgrade for 6 additional Airius sensors, CD
PRO420X	Additional user for a license
PRO42X-USB	Add -USB to get the software on USB

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Condmaster® Ruby – Decision Support System



The Decision Support System (DSS) provides users with predictions about machine damage and general machine health.

The overall purpose of the DSS is to relieve maintenance personnel from having to deal with vast amounts of measurement data to analyze and find insights into root causes and problem-solving. Instead, the DSS uses artificial intelligence, statistical analysis, and other algorithms to mine this data for information, automatically detecting the patterns that most warrant maintenance efforts. The DSS minimizes the time required for a correct assessment of machine condition without users needing in-depth knowledge of data analysis, and guides the user to informed and effective decisions.

The highly automated DSS learns from past operations and uses collected data to continuously provide better predictions.

In Condmaster Ruby, these standalone features form DSS:

- **Machine Builder**, where complete machines can be created from a component library. The feature generates suitable measuring points, measurement assignments, and machine fault symptoms. Assembled machines are added to the Graphical Overview as illustrations with associated color zones.
- **Signal Quality Test**, a background process that continuously checks for ski slopes and bias problems. The function can also identify issues with faulty or incorrectly connected transducers. The main purpose is to determine if the signal is of good quality.
- **Machine baseline**, where normal machine behavior can be determined. The machine baseline data, collected during a learning phase, can be used to automatically calculate deviations and potentially raise alerts for the machine fault symptoms and condition parameters.
- **Health score** is calculated by applying mathematical algorithms to the collected baseline data. The health score is presented in blue-green-yellow-orange-red-dark red colors for a detailed evaluation. The health score corresponds to a normalized floating-point value from 0 to 1, where 0.2 – visualized in green – represents the normal condition of the machine baseline.
- **Alerts** inform users about deviating machine conditions, highlighted DSS predictions, and other device events. Alerts offer flexible handling of actions based on the condition and criticality of the machine, which includes setting priority levels and status indications on individual alerts.
- **Entity rules** (optional), a feature that is used as a hub for expanding and customizing Condmaster with event-driven functions, as well as creating custom integrations with other IIoT systems. With Entity rules, it is possible to monitor a variety of events and automatically invoke actions based on these events.

All features of the DSS are included in the Condmaster Ruby platform. For further information, see technical data sheet TD-583.

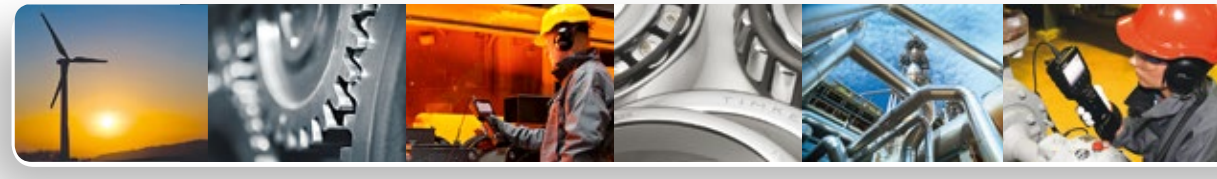
SPM

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SPM
condition monitoring solutions

4

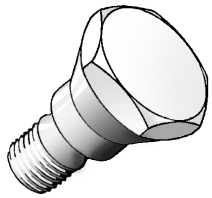


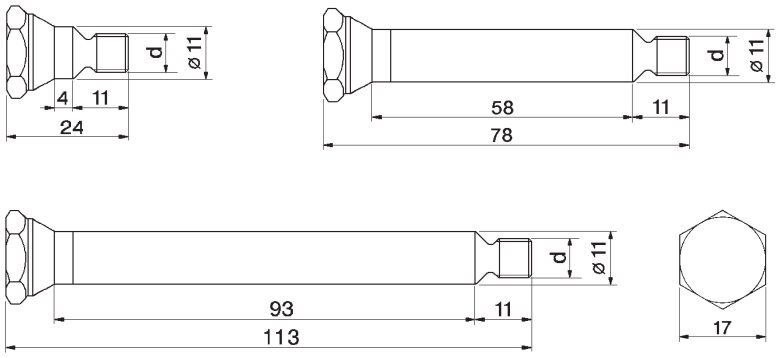
Shock Pulse Transducers, Adapters and Tools

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Standard adapters





d = M8x1.25 / UNC 5/16 -18

Adapters are solid bolts which are mounted in countersunk and threaded holes in the bearing housings. They form the connecting points for a transducer with quick connector, TRA-30 and equivalent.

Standard adapters are available in three lengths and various thread sizes, see part numbers below. The material is either stainless steel or zinc-plated steel.

Part numbers

The following types of adapters are available:

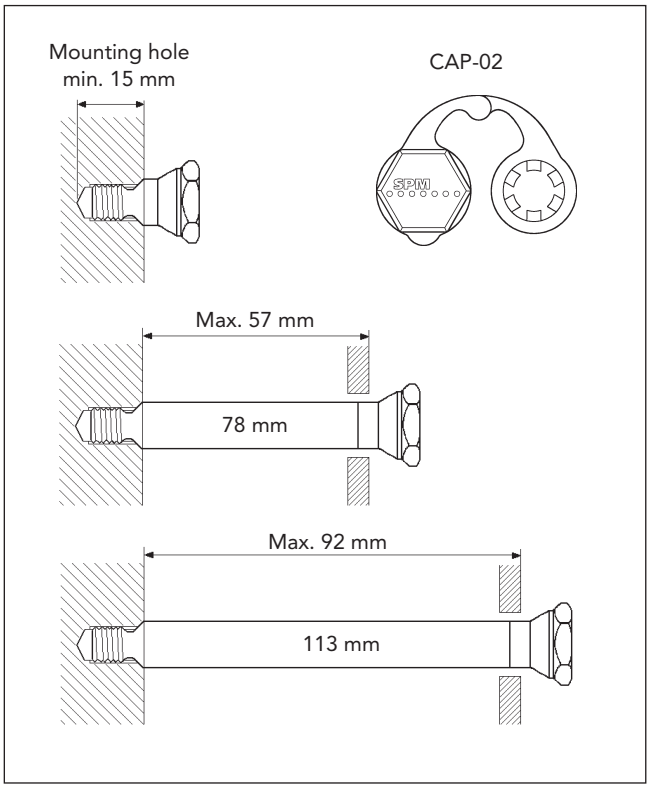
32000	Zinc-plated, M8 x 1.25, 24 mm
32100	Zinc-plated, M8 x 1.25, 78 mm
32200	Zinc-plated, M8 x 1.25, 113 mm
33000	Zinc-plated, UNC 5/16 -18, 24 mm
33200	Zinc-plated, UNC 5/16 -18, 113 mm
32010	Stainless steel, M8 x 1.25, 24 mm
32110	Stainless steel, M8 x 1.25, 78 mm
32210	Stainless steel, M8 x 1.25, 113 mm
33010	Stainless steel, UNC 5/16 -18, 24 mm
CAP-02	Dust cap for adapters

Technical specifications

Material, stainless steel	SS2346, AISI303 (EN:1.4305)
Material, zinc-plated	12 µm Zn
Torque	15 Nm

Mounting tools

82053	Countersink with fixed pilot for M8
81027	Holder for countersink
81028	Countersink, angle 90°, ø 12 mm
81031	Pilot for M8
81032	Pilot for UNC 5/16"



To drill the mounting hole, use drill bits:

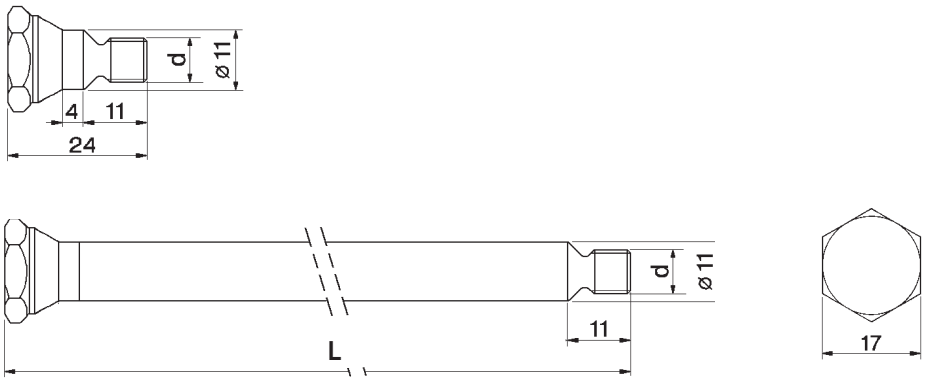
6.9 mm	for M8
6.6 mm	for UNC 5/16"

Torque the adapter with a torque wrench and a 17 mm socket (SPM 81086).

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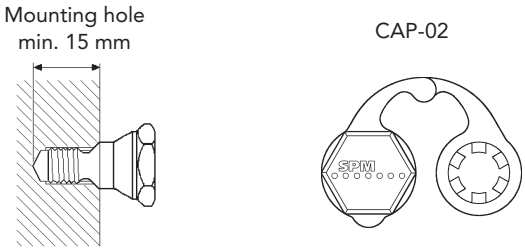
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Non-standard adapters



d = M6x1.0 / M8x1.25 / UNC 5/16 -18 / M10x1.5

Adapters are solid bolts which are mounted in countersunk and threaded holes in the bearing housings. They form the connecting points for a transducer with quick connector, TRA-30 and equivalent. For standard adapters, see technical data sheet TD-001.



Part numbers

32300	Zinc-plated, M8, L=202 mm
34300	Zinc-plated, M10, L=202 mm
32400	Zinc-plated, M8, L=291 mm
33100	Zinc-plated, UNC 5/16 -18, L=78 mm
30010	Stainless steel, M6, L=24 mm
30110	Stainless steel, M6, L=78 mm
32310	Stainless steel, M8, L=202 mm
32410	Stainless steel, M8, L=291 mm
33110	Stainless steel, UNC 5/16 -18, L=78 mm
33210	Stainless steel, UNC 5/16 -18, L=113 mm
33310	Stainless steel, UNC 5/16 -18, L=202 mm
33410	Stainless steel, UNC 5/16 -18, L=291 mm
34010	Stainless steel, M10, L=24 mm
34210	Stainless steel, M10, L=113 mm
34310	Stainless steel, M10, L=202 mm
CAP-02	Dust cap for adapters

Technical specifications

Material, stainless steel:	SS2346, AISI303 (EN:1.4305)
Material, zinc-plated:	12 µm Zn
Torque:	15 Nm

Mounting tools

82053	Countersink with fixed pilot for M8
81027	Holder for countersink
81028	Countersink, angle 90°, ø 12 mm
81030	Pilot for M6
81031	Pilot for M8
81033	Pilot for M10
81032	Pilot for UNC 5/16"

To drill the mounting hole, use drill bits:

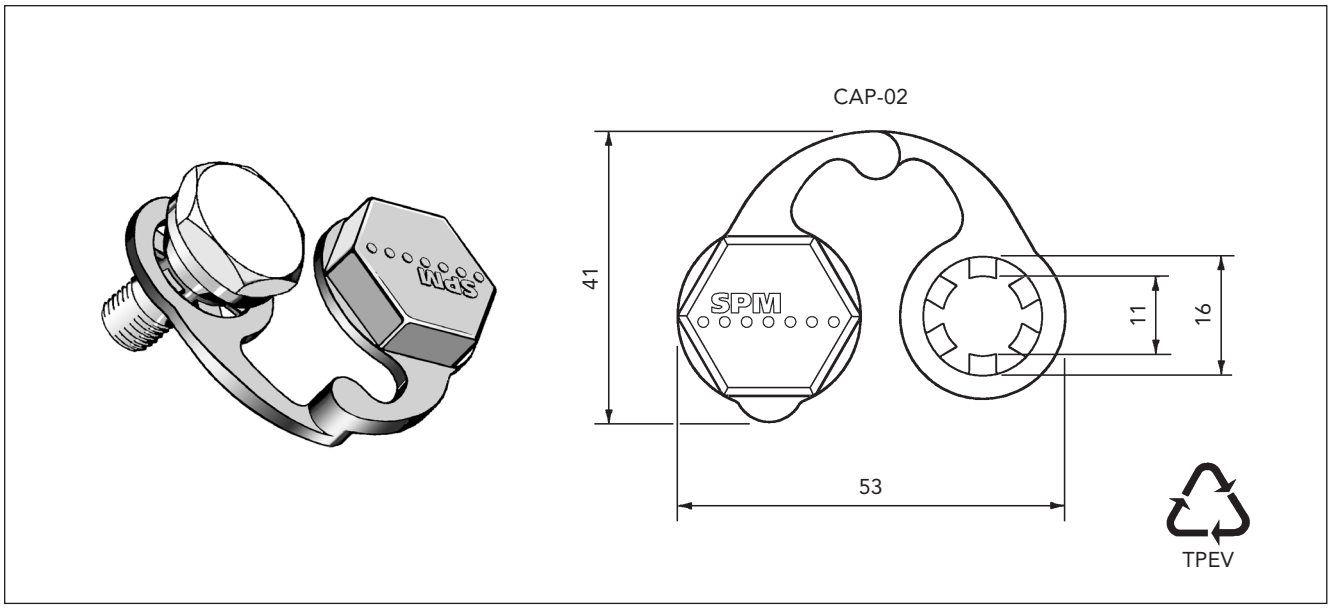
5.0 mm	for M6
6.9 mm	for M8
6.6 mm	for UNC 5/16"
8.6 mm	for M10

Torque the adapter with a torque wrench and a 17 mm socket (81086).

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Adapter Cap



The adapter cap CAP-02, made of red santoprene, protects the contact surface of adapters from dirt, paint, and damage.

A clean and undamaged adapter surface is essential for the correct transmission of shock pulses from the bearing to the measuring instrument. CAP-02 fits all types of SPM adapters.

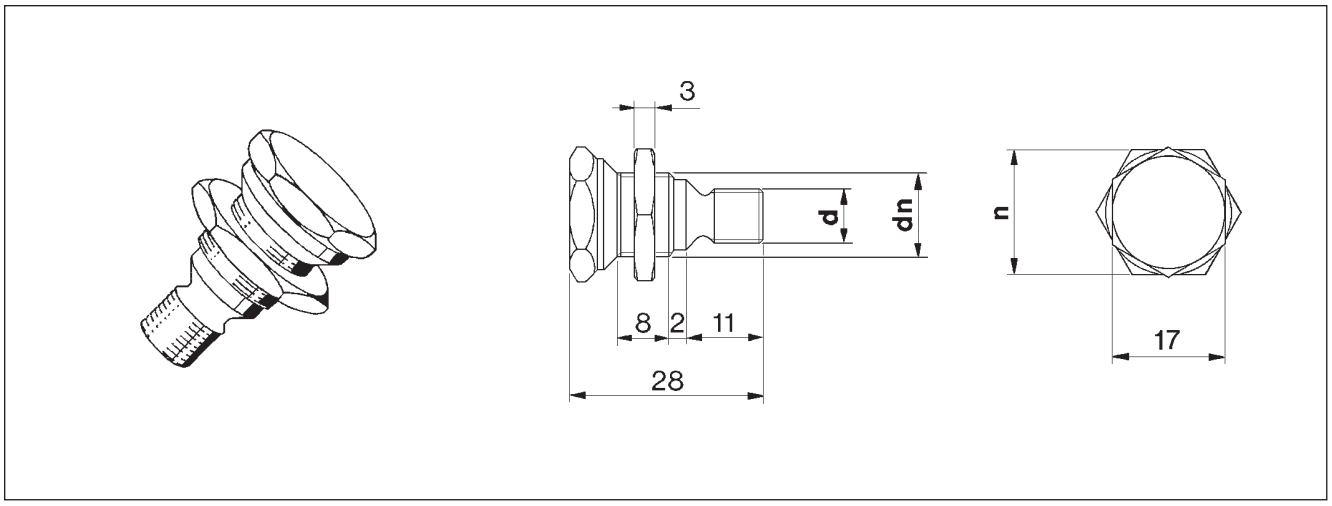
Technical specifications

Material:	Santoprene (TPEV)
Temperature range:	–60 to 135 °C
Weight:	2.5 g

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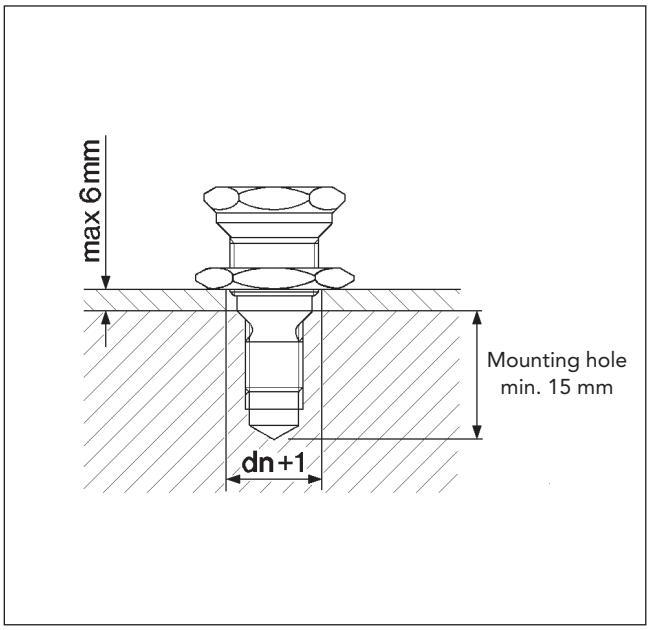
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Adapters with lock nut



Adapters with lock nut are solid bolts of stainless steel. They are intended to replace existing mounting bolts or screws for protective covers, etc., with a thickness up to 6 mm. Adapters with lock nut are mounted in countersunk and threaded holes in the bearing housings. They form connecting points for the transducer with quick connector, TRA-30 and equivalent.

Adapters with lock nut are available in thread sizes from M8 to M12, see ordering numbers below. The table contains adapter thread size (d), lock nut threads (dn), and the width (n) across the flats of the lock nut.



Ordering numbers

32511	d = M8 x 1.25	dn = 12	n = 19
34511	d = M10 x 1.5	dn = 14	n = 19
36511	d = M12 x 1.75	dn = 16	n = 22

Technical data

Material	Stainless steel, SS 2346, AISI 303 (EN:1.4305)
Adapter torque M8	15 Nm
Lock nut torque M8	12 Nm
Adapter torque M10	20 Nm
Lock nut torque M10	15 Nm
Adapter torque M12	30 Nm
Lock nut torque M12	20 Nm

Torque the adapter with a torque wrench and a 17 mm socket, then the lock nut with a 19 (22) mm long socket.

Mounting tools

82053	Countersink with fixed pilot for M8
81027	Holder for countersink
81028	Countersink, angle 90°, ø 12 (M6-M10)
81029	Countersink, angle 90°, ø 15 (M12)
81031	Pilot for M8
81033	Pilot for M10
81035	Pilot for M12
81085	Torque wrench
81086	Sockets 17 mm

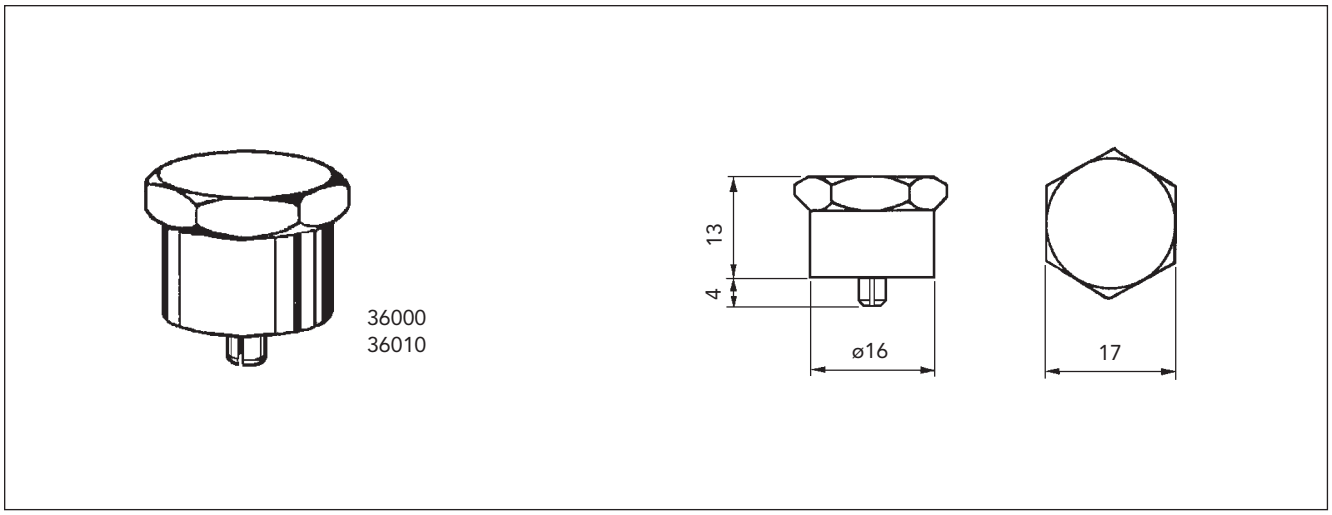
To drill the mounting hole, use drill bits:

6.9 mm	for M8
8.6 mm	for M10
10.3 mm	for M12

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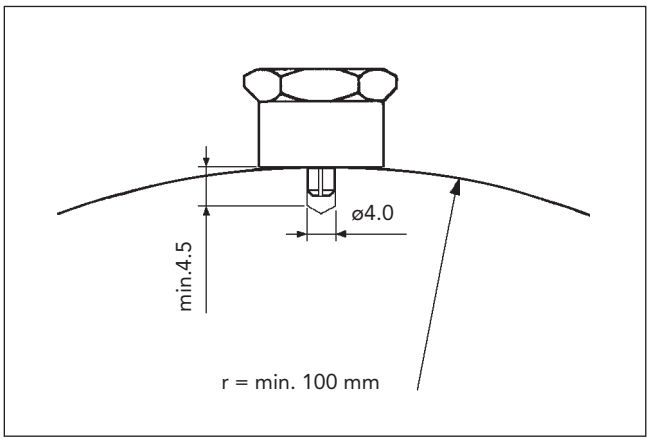
Glue-on adapter



Glue-on adapters have the same measuring characteristics as threaded adapters and connect to the transducer TRA-30. They have a flat, circular base with a removable tubular pin for unloading and fixing, and are attached to the measuring point with a suitable adhesive.

A glue-on adapter can replace the corresponding tapered adapter:

- on thinwalled housings
- where drilling would affect equipment warranties (mount without the tubular pin).



Mounting

Choose a measuring point in accordance with the SPM rules.

Use a 4.0 mm drill for the mounting hole and make it 4.5 mm deep. The contact surface has to be plane, clean and free from paint. It should be planed with a counterbore, min. diameter 16 mm.

The recommended adhesives are 3M DP810, Loctite 638 or 480, to be applied according to the manufacturer's instruction. Put adhesive into the mounting hole as well as onto the adapter's seat surface. To avoid damage to the adapters's contact surface, use a mallet of soft material to tap it down into the mounting hole and press its seat surface against the material of the bearing housing.

If necessary, the adapter can be mounted without the tubular pin. Press it firmly against the bearing housing until the adhesive has sufficiently hardened to hold the adapter's weight.

Wait until the adhesive has completely hardened before connecting a transducer.

Technical specifications

Material, stainless steel:	SS2346, AISI303 (EN:1.4305)
Material, zink-plated:	SS 1914, 15 mm Zn
Seat surface:	ø16 mm
Tubular pin:	Spring steel, for hole ø 4.0 mm
Weight:	22 g
Adhesive:	3M DP810, Loctite 638, Loctite 480 or similar

Part numbers

36000	Glue-on adapter, zink-plated
36010	Glue-on adapter, stainless steel

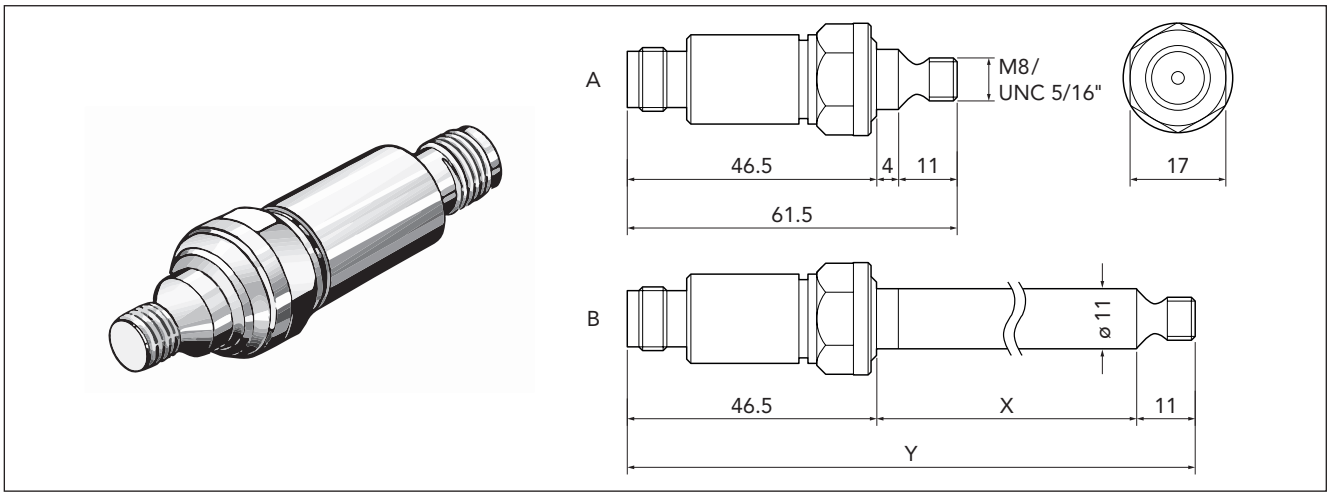
Mounting tools

TOM-11	Counterbore, 16 mm
81274	Holder for counterbore
14602	Pilot, 4 mm
90472	Adhesive, 3M DP810 (50 ml)

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Standard shock pulse transducers

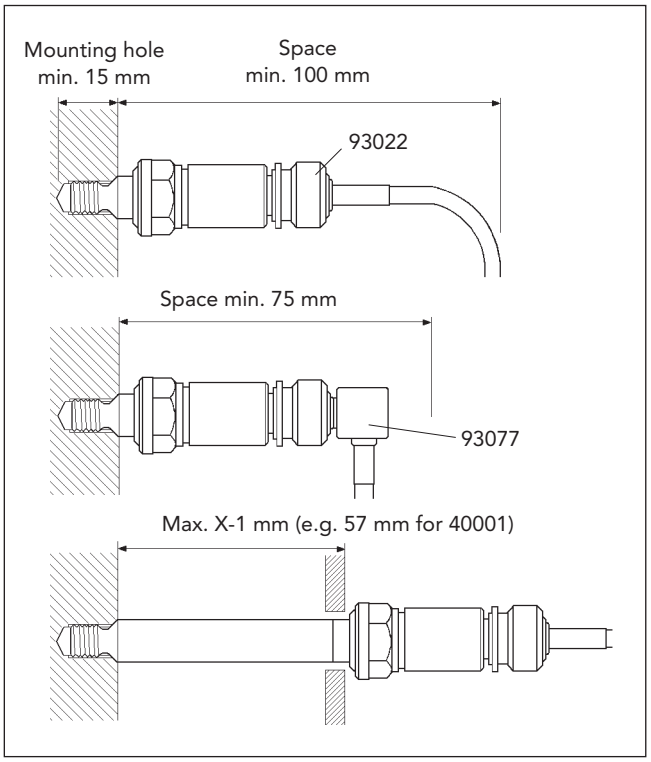


Standard shock pulse transducers are used in all permanent SPM installations for bearing monitoring. They are installed in countersunk mounting holes on the bearing housings.

A shock pulse transducer converts the shock pulses emitted by the bearing into electric signals. A coaxial cable connects the transducer to a measuring terminal or measuring unit. The maximum cable length is 4 m.

Transducer housing and base are made of stainless acid-proof steel, suitable for aggressive environments. The standard thread size is M8, with UNC 5/16" as an alternative. The standard length (A) is 61.5 mm. Extended transducers (B) are used to reach bearing housings beneath protective covers.

The transducer is normally connected with TNC plug 93022. In moist environments, the coaxial cable must be connected with sealing TNC plug 13008. TNC angle plug 93077 can be used in narrow spaces.



Part numbers

40000	Standard shock pulse transducer, M8 x1.25
40001	Standard shock pulse transducer, M8 x1.25, extended: X = 58 mm; Y = 115.5 mm
40006	Standard shock pulse transducer, M8 x1.25, extended: X = 93 mm; Y = 150.5 mm
40008	Standard shock pulse transducer, M8 x1.25, extended: X = 271 mm; Y = 328.5 mm
40009	Standard shock pulse transducer, M8 x1.25, extended: X = 220 mm; Y = 277.5 mm
40100	Standard shock pulse transducer, UNC 5/16-18
40101	Standard shock pulse transducer, UNC 5/16-18, extended: X = 58 mm; Y = 115.5 mm

Technical specifications

Measuring range:	max. 100 dBsv
Housing, base:	stainless acid-proof steel, Sandvik Grade:1802, EN:1.4523
Design:	Sealed
Connector tightness:	IP65 with TNC connector IP67 with connector 13008
Temperature range:	–30 °C to +150 °C
External overpressure:	max. 1 MPa (10 bar)
Torque:	15 Nm
Connector:	TNC jack
Weight:	55 g

Mounting tools

82053	Countersink with a fixed pilot for M8
81027	Holder for countersink
81028	Countersink, angle 90°, 12 mm diameter
81031	Pilot for M8
81032	Pilot for UNC 5/16"

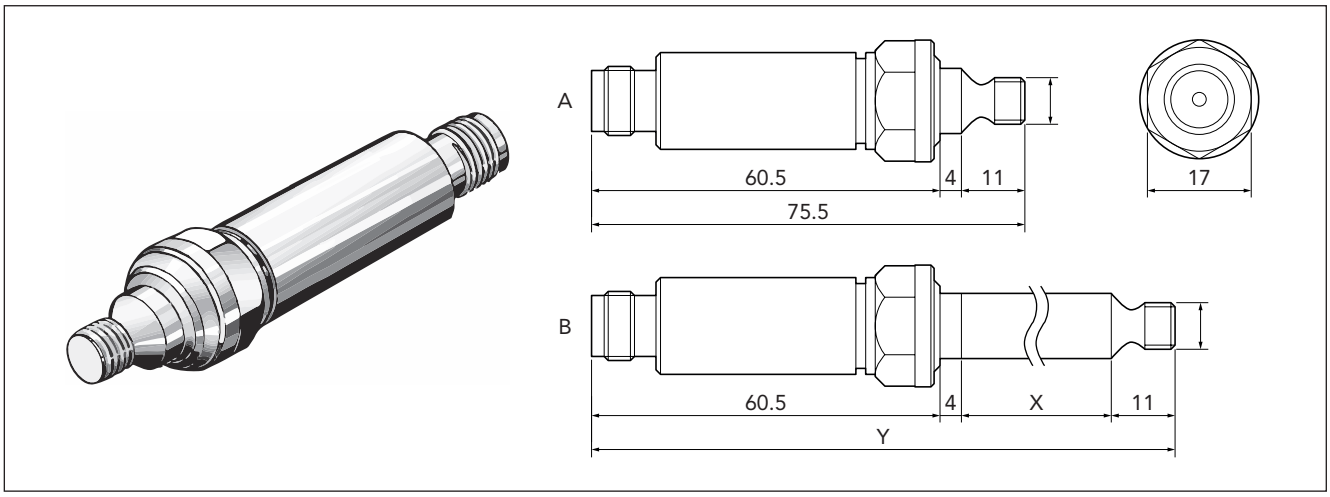
To drill the mounting hole, use drill bits 6.9 mm for M8 or 6.6 mm for UNC5/16".

Tighten and unscrew the transducer with a torque wrench and a long 17 mm socket (81086).

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Shock pulse transducer with TMU

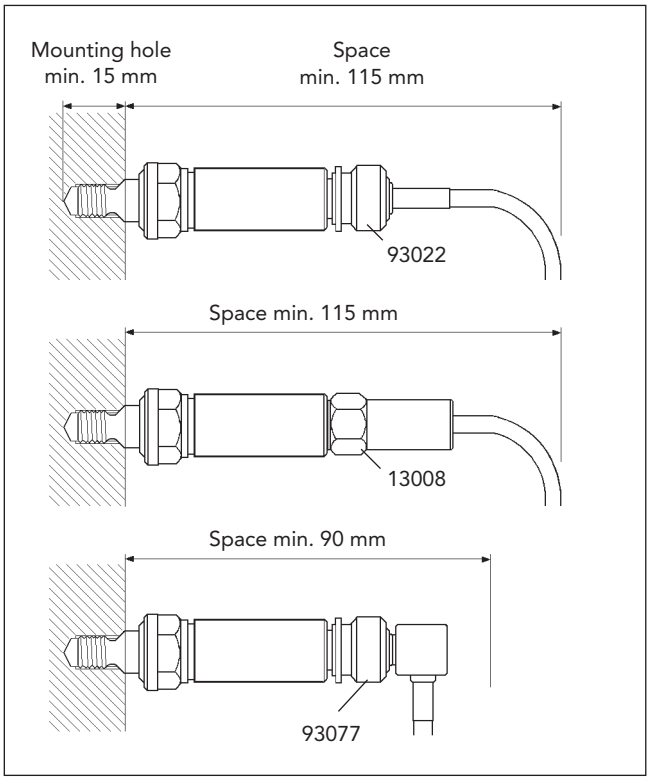


The shock pulse transducer with Transducer Matching Unit (TMU) is used in permanent SPM installations for bearing monitoring, in cases where the cable length between the transducer and measuring unit exceeds 4 m. This allows a cable length of max. 100 m. The transducer with TMU is installed in a countersunk mounting hole on the bearing housing, in the same way as standard transducers.

A shock pulse transducer with TMU converts the shock pulses emitted by the bearing into an electric signal and stabilizes the signal for transmission via a long cable. A coaxial cable connects the transducer to a measuring terminal or measuring unit.

Transducer housing and base are made of stainless, acid-proof steel, suitable for aggressive environments. The thread size is M8, with UNC 5/16" as an alternative. The standard length (A) is 75.5 mm. Extended transducers (B) are used to reach bearing housings beneath protective covers.

The transducer is normally connected with TNC plug 93022. In moist environments, the coaxial cable must be connected with sealing TNC plug 13008. TNC angle plug 93077 can be used in narrow spaces.



Part numbers

42000	Shock pulse transducer with TMU, M8x1.25
42006	Shock pulse transducer with TMU, M8x1.25, extended: X = 54 mm; Y = 129.5 mm
42007	Shock pulse transducer with TMU, M8x1.25, extended: X ≈ 290 mm; Y ≈ 365.5 mm
42008	Shock pulse transducer with TMU, M8x1.25, extended: X = 89 mm; Y = 164.5 mm
42100	Shock pulse transducer with TMU, UNC 5/16-18

Technical specifications

Measuring range:	max. 100 dBsv
Housing, base:	stainless acid-proof steel, Sandvik Grade:1802, EN:1.4523
Design:	sealed
Connector tightness:	IP65 with TNC connector IP67 with connector 13008
Temperature range:	–30 °C to +100 °C
External overpressure:	max. 0.7 MPa (7 bar)
Torque:	15 Nm
Connector:	TNC jack
Weight:	67 g

Installation tools

82053	Countersink with a fixed pilot for M8
81027	Holder for countersink
81028	Countersink, angle 90°, 12 mm diameter
81031	Pilot for M8
81032	Pilot for UNC 5/16"

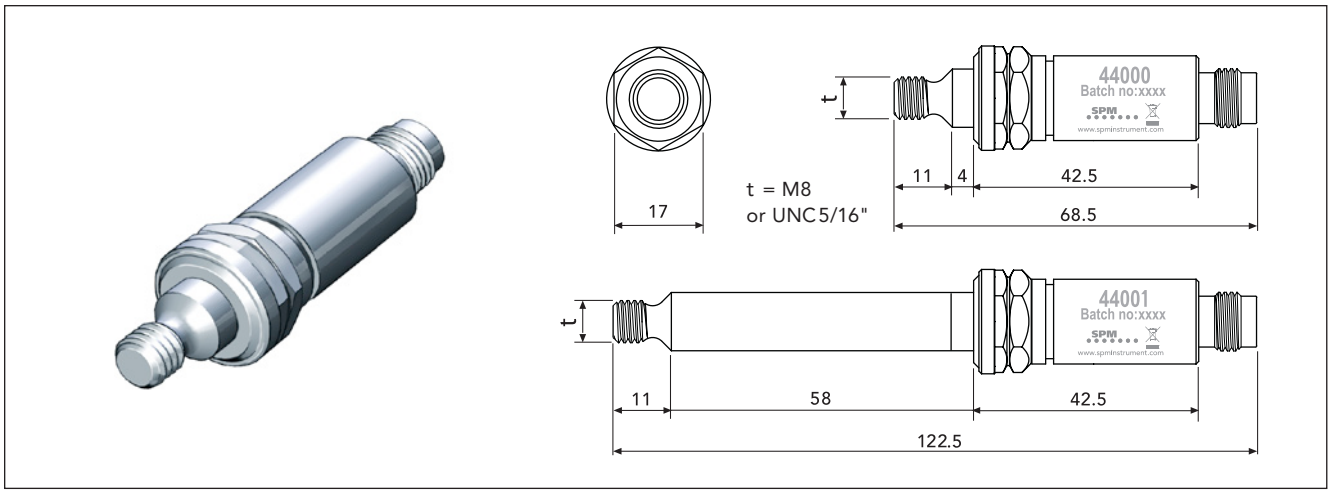
To drill the mounting hole, use drill bits 6.9 mm for M8, 6.6 mm for UNC 5/16".

Tighten and unscrew the transducer with a torque wrench and a long 17 mm socket (81086).

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Shock Pulse Transducers Series 44000

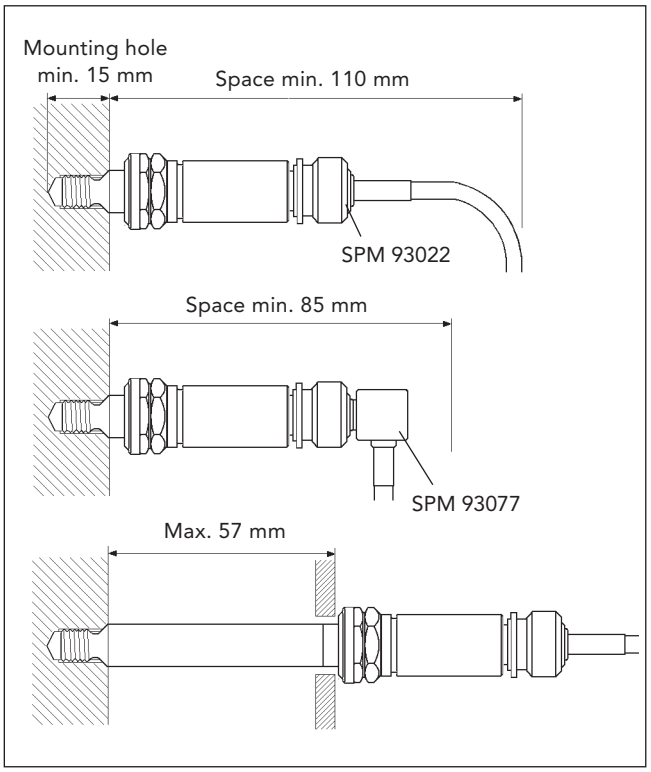


The shock pulse transducers series 44000 are used for bearing monitoring with the portable instruments Leonova Diamond/Emerald and in permanent SPM installations with the online system Intellinova Compact. The transducers are installed in countersunk mounting holes on the bearing housings.

A shock pulse transducer converts the shock pulses emitted by the bearing into an electric signals. A coaxial cable connects the transducer with the measuring unit. Max. cable length is 100 m.

Transducer housing and base are made of stainless, acid proof steel, suitable for aggressive environments. Standard thread size is M8, with UNC 5/16" as an alternative. The extended transducer can be used to reach bearing housings beneath protective covers.

The transducer is connected with a TNC plug (93022). A TNC angle plug (93077) can be used in narrow spaces. To prevent cable corrosion in moist environments, the cable must be connected with a sealed TNC plug.



Part numbers

44000	Shock pulse transducer, M8 x1.25
44100	Shock pulse transducer, UNC 5/16-18
44001	Shock pulse transducer, M8 x1.25, extended
44101	Shock pulse transducer, UNC 5/16-18, extended

Technical specifications

Measuring range:	max. 100 dBsv
Housing, base:	stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Design:	sealed
Connector type:	TNC jack
Connector tightness:	IP65, IP67 with sealed TNC connector (IP67 or higher)
Cable length:	max. 100 m
Temperature range:	–30 °C to +150 °C
External overpressure:	max. 1 MPa (10 bar)
Mounting torque:	15 Nm, max. 20 Nm
Weight:	61 g

Mounting tools

82053	Countersink with fixed pilot for M8
81027	Holder for countersink
81028	Countersink, angle 90°, 12 mm dia.
81031	Pilot for M8
81032	Pilot for UNC 5/16"

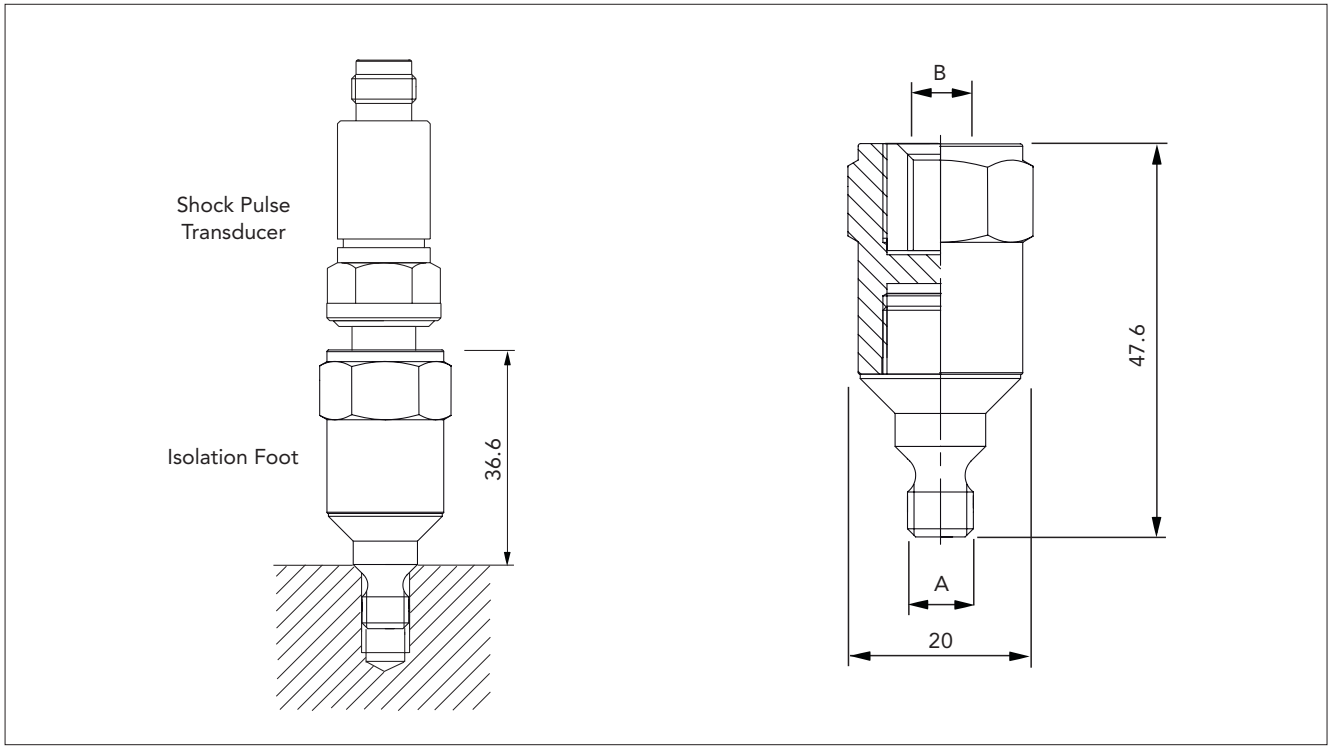
To drill the mounting hole, use drill bits 6.9 mm for M8, 6.6 mm for UNC 5/16".

Torque and unscrew the transducer with a torque wrench and a long 17 mm socket (SPM 81086).

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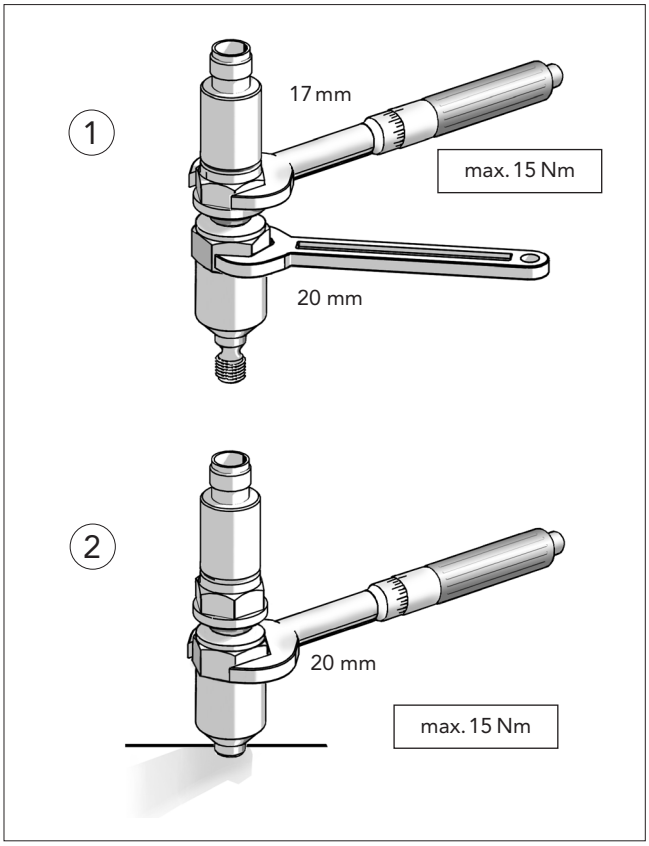
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Isolation Foot for Shock Pulse Transducers



The isolation foot is intended for SPM Shock Pulse Transducers and should be used to provide electric isolation. The reason is that differences in earth potential between transducer and measuring equipment can cause measuring faults. Transducers connected to the online system Intellinova Compact Ex must always be fitted with isolation feet.

The isolation foot is installed in a countersunk mounting hole, in the same way as a standard transducer. First mount the transducer on the isolation foot to avoid damage to the isolation material, see the illustration beside. The isolation exceed 1 Mohm at 500 V.



Technical data

Material:	Stainless acid proof steel SS-EN 10 088-3 (SS2382) / composite
Temperature range:	–25 to +125 °C (–13 to +257 °F)
Torque:	max. 15 Nm

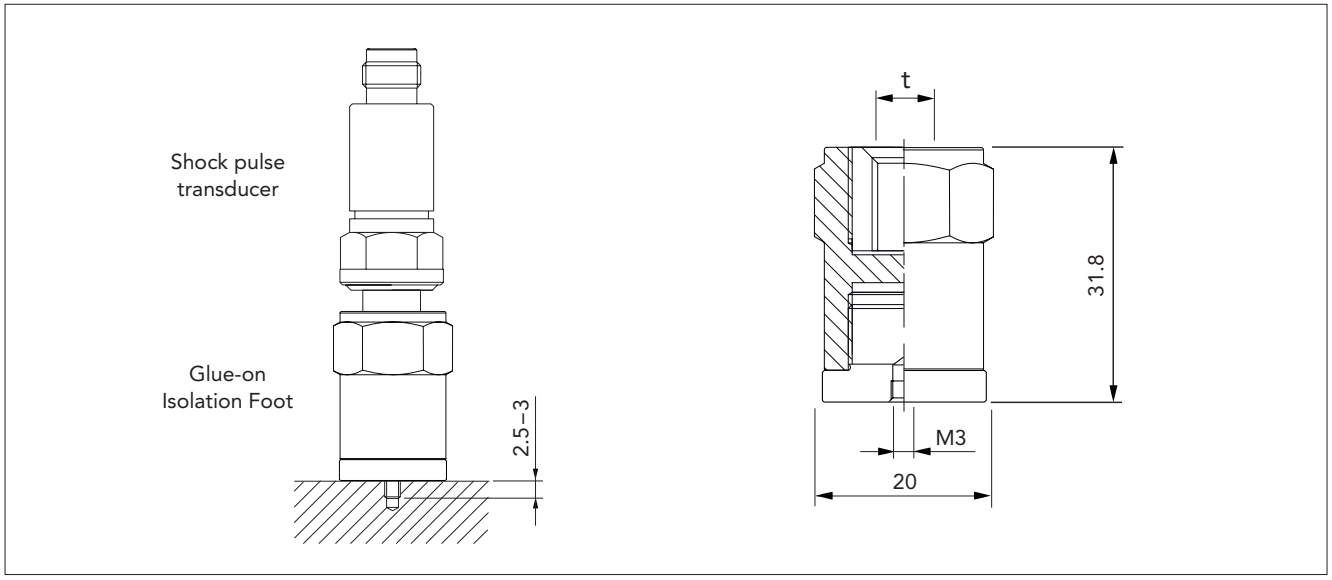
Part numbers

Part no.	Thread A	Thread B
16598	M8 x 1.25	M8 x 1.25
16599	UNC 5/16"-18	UNC 5/16"-18
16656	UNF 1/4"-28	UNC 5/16"-18

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Glue-on isolation foot for shock pulse transducers



The glue-on isolation foot is intended for shock pulse transducers and should be used to provide electric isolation. The reason is that differences in earth potential between transducer and measuring equipment can cause measuring faults. Transducers connected to the online system Intellinova Compact Ex must always be fitted with isolation feet. They have a flat, circular base which is glued to the measuring point, and an M3 screw for unloading and fixing. The screw can be removed when not needed.

Mounting

The isolation foot is mounted against a smooth, flat surface on the machine. Use a 2.7 mm drill for the mounting hole and make it 4.5 mm deep. Always plane the surface with a counterbore, min. diameter 20 mm.

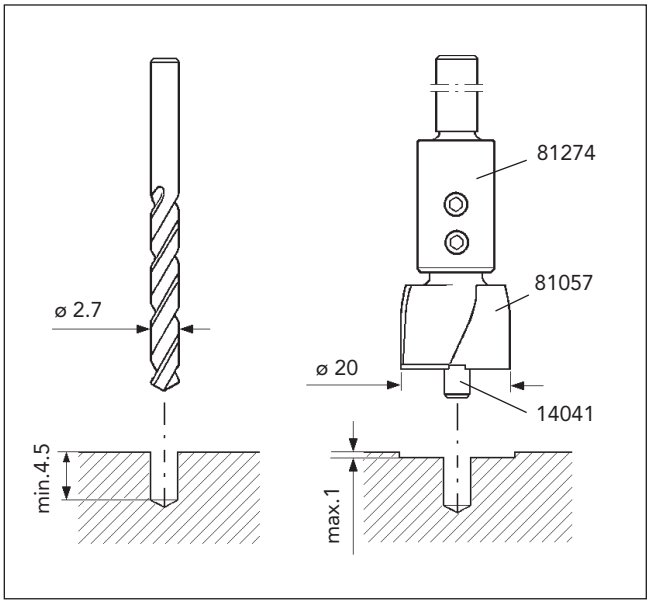
Note!

Mechanical installation in potentially explosive atmosphere must be performed in accordance with applicable regulations.

The recommended adhesives are 3M DP810, Loctite 638 or Loctite 480. Please read the instructions for use and follow them carefully. Screw the isolation foot by hand into the mounting hole. The screw is self-threading. In narrow spaces a 17 mm socket (SPM 81086) may be used. The torque should not be more than 1 Nm. Wait until the adhesive has hardened before mounting the transducer.

Technical specifications

Material:	Stainless acid proof steel, SS-EN 10 088-3 (SS2382)
Temperature range:	–25 to +125 °C (–13 to +257 °F)
Recommended adhesive:	3M DP810, Loctite 638 or 480



Part numbers

17406	Glue-on Isolation Foot, M8 x 1.25 (t)
17411	Glue-on Isolation Foot, UNC 5/16-18 (t)

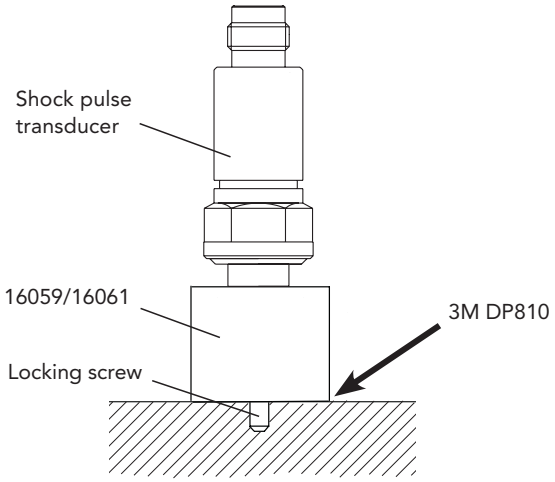
Tools

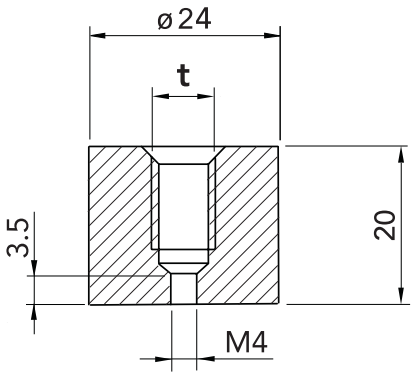
81274	Holder for counterbore
81057	Counterbore, diameter 20 mm
14041	Pilot, diameter 2.7 mm
81086	Socket, 17 mm
90472	Adhesive, 3M DP810 (50 ml)

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Glue-on Mounting Foot for Shock Pulse Transducers and DuoTech





The glue-on mounting foot is used when mounting shock pulse transducers or DuoTech on thinwalled bearing housings and on machines where the drilling of standard mounting holes would affect equipment warranties. The mounting foot has a flat, circular base which is glued to the measuring point, and an M4 screw for unloading and fixing. Mounting foot 16059 has M8x1.25 thread and adapter 16061 has UNC 5/16-18 for transducer mounting.

Mounting

The foot is mounted against a flat, clean and unpainted surface on the machine. Use a 3.4 mm drill for the mounting hole and make it 6 mm deep. Always plane the surface with a counterbore, min. diameter 25 mm.

The recommended adhesive is 3M DP810. Please read the instructions for use and follow it carefully. Screw the self-threading screw into the mounting hole. Wait until the adhesive has hardened before mounting the transducer on the mounting foot .

Technical specifications

Design:	Stainless acid proof steel, SS2382
Transducer thread (t):	16059; M8x1.25 16061; UNC 5/16-18
Locking screw:	M4, length 6 mm
Recommended adhesive:	3M DP810
Torque limit, transducer:	10 Nm (7.4 lbf/ft)

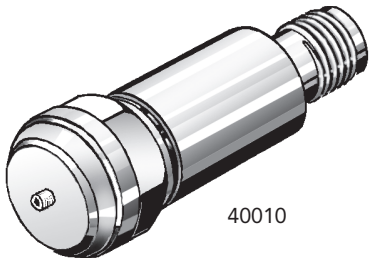
Part numbers

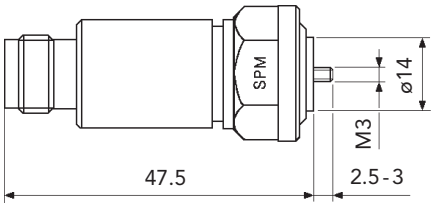
16059	Glue-on mounting foot, M8 x 1.25
16061	Glue-on mounting foot, UNC 5/16-18
90472	Adhesive, 3M DP810 (50 ml)
90501	Dispensing gun for adhesive
90473	Mixing tube for dispensing gun 90501

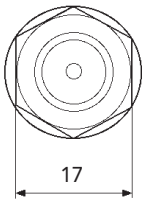
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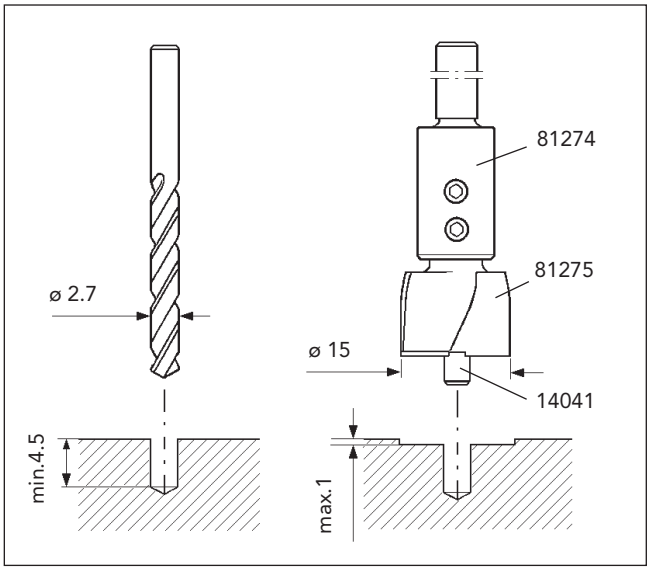
Glue-on shock pulse transducer 40010







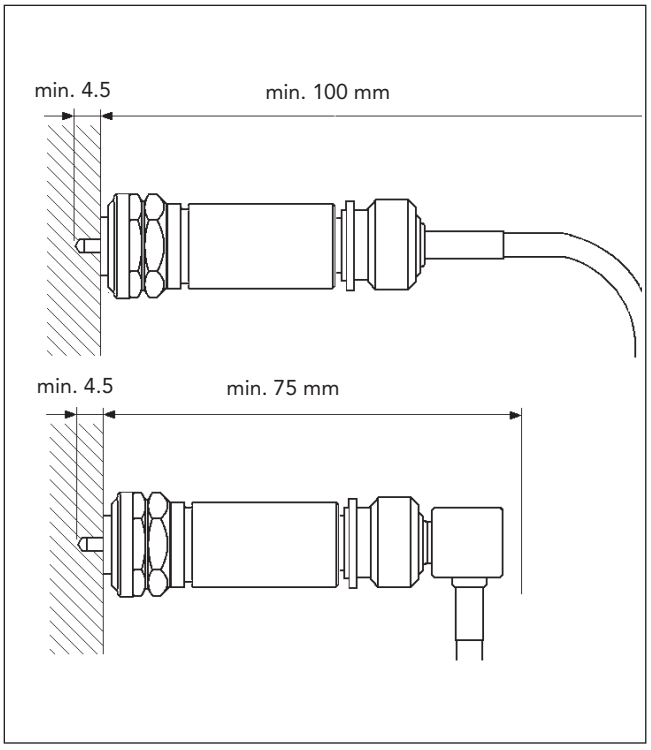
Glue-on transducers 40010 can replace standard transducers on thinwalled bearing housings and on machines where the drilling of standard mounting holes would affect equipment warranties. They have the same measuring characteristics as standard transducers, but a flat, circular base which is glued to the measuring point, and an M3 screw for unloading and fixing.



Mounting

The transducer is mounted against a smooth, flat surface on the machine. Use a 2.7 mm drill for the mounting hole and make it 4.5 mm deep. Always plane the surface with a counterbore, min. diameter 15 mm.

The recommended adhesives are 3M DP810, Loctite 638 or Loctite 480. Please read the instructions for use and follow them carefully. Screw the transducer by hand into the mounting hole. The screw is self-threading. In narrow spaces a 17 mm socket (SPM 81086) may be used. The torque should not be more than 1 Nm. Wait until the adhesive has hardened before connecting the cable.



Technical specifications

Measuring range:	Max. 100 dBsv
Housing, base:	Stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Design:	Sealed
Connector tightness:	IP65 with TNC connector IP 67 with conn. SPM13008
Temperature range:	–30 °C to +150 °C
External overpressure:	Max. 1 MPa (10 bar)
Recommended adhesive:	3M DP810, Loctite 638 or 480
Connector:	TNC
Weight:	50 g

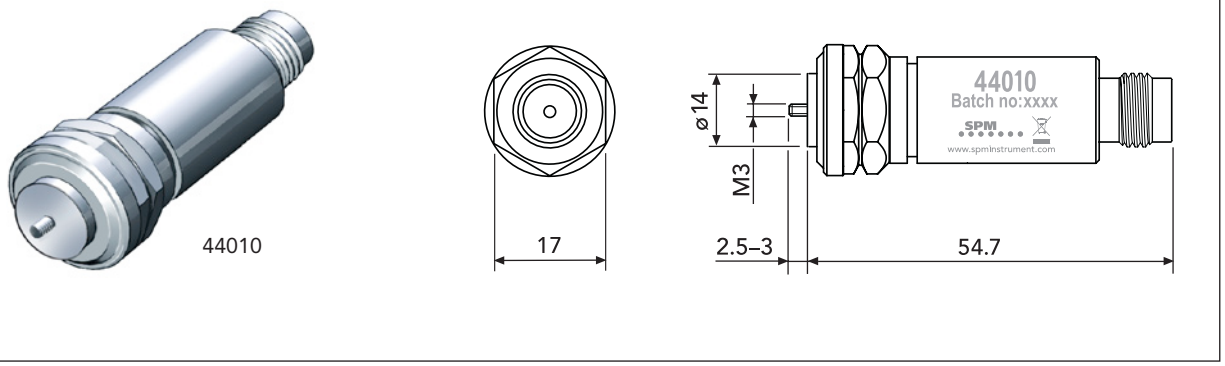
Tools

14042	Counterbore, complete
81274	Holder for counterbore
81275	Counterbore, diameter 15 mm
14041	Pilot, diameter 2.7 mm
81086	Socket, 17 mm
90472	Adhesive, 3M DP810 (50 ml)

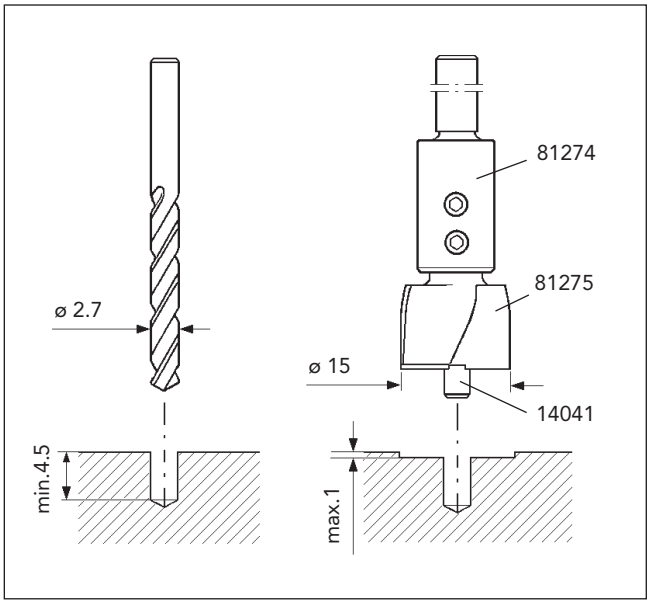
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Glue-on Shock Pulse Transducer SPM 44010



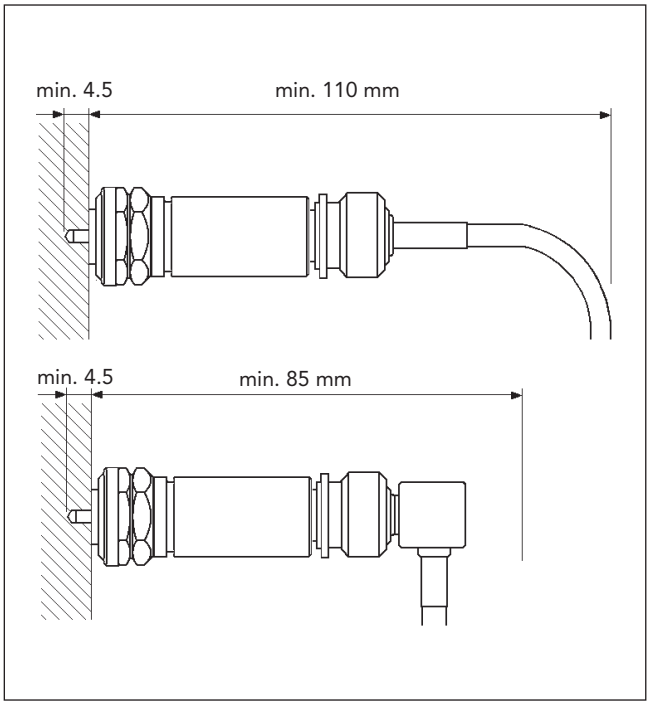
Glue-on transducers 44010 can replace standard transducers on thinwalled bearing housings and on machines where the drilling of standard mounting holes would affect equipment warranties. They have the same measuring characteristics as standard transducers, but a flat, circular base which is glued to the measuring point, and an M3 screw for unloading and fixing.



Mounting

The transducer is mounted against a smooth, flat surface on the machine. Use a 2.7 mm drill for the mounting hole and make it 4.5 mm deep. Always plane the surface with a counterbore, min. diameter 15 mm.

The recommended adhesives are 3M DP810, Loctite 638 or Loctite 480. Please read the instructions for use and follow them carefully. Screw the transducer by hand into the mounting hole. The screw is self-threading. In narrow spaces a 17 mm socket (SPM 81086) may be used. The torque should not be more than 1 Nm. Wait until the adhesive has hardened before connecting the cable.



Technical specifications

Measuring range:	Max. 100 dBsv
Housing, base:	Stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Design:	Sealed
Connector:	TNC
Connector tightness:	IP65, IP67 with sealed TNC connector (IP67 or higher)
Cable length:	max. 100 m
Temperature range:	–30 °C to +150 °C
External overpressure:	Max. 1 MPa (10 bar)
Recommended adhesive:	3M DP810, Loctite 638 or 480

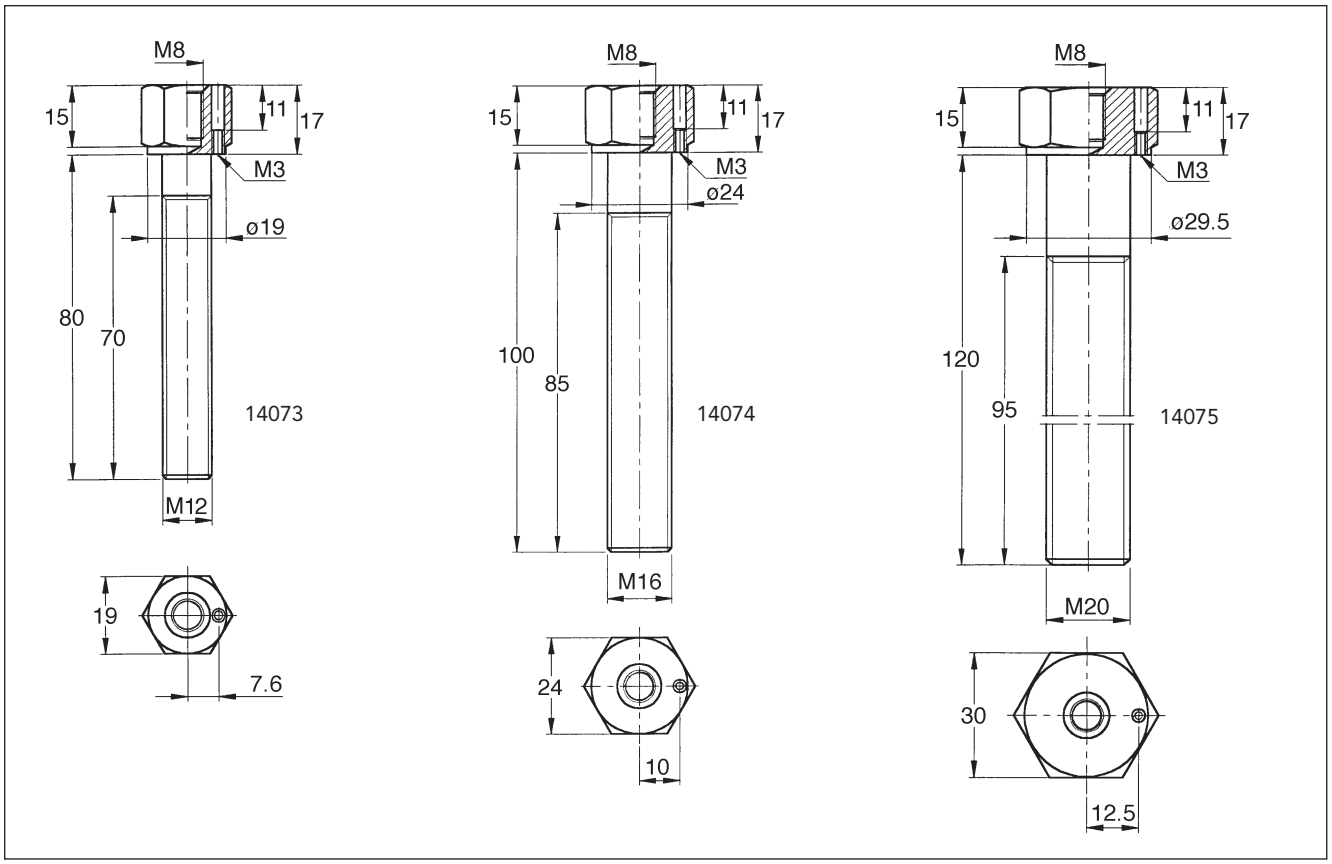
Tools

14042	Counterbore, complete
81274	Holder for counterbore
81275	Counterbore, diameter 15 mm
14041	Pilot, diameter 2.7 mm
81086	Socket, 17 mm
90472	Adhesive, 3M DP810 (50 ml)

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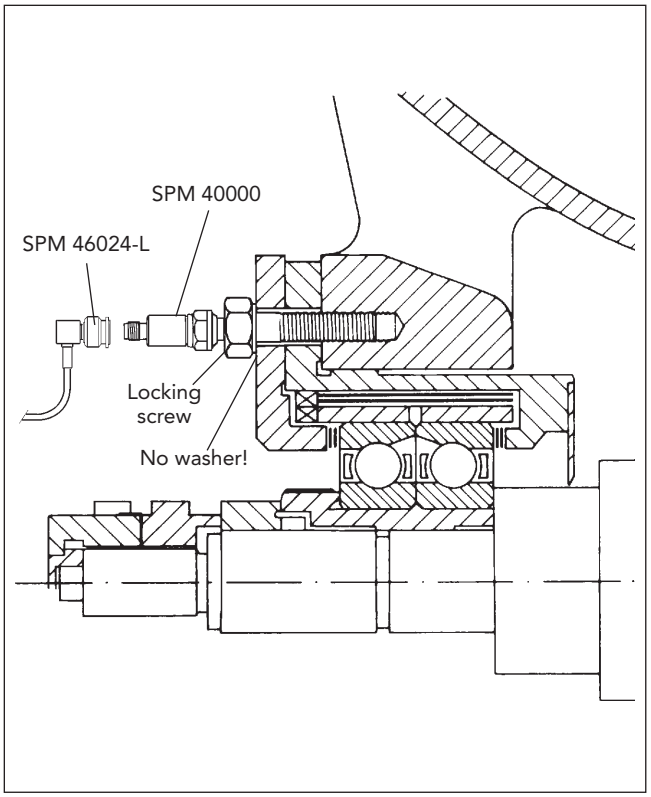
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Special Bolts for Shock Pulse Transducers



Special bolts for shock pulse transducers are used in permanent SPM installations for bearing monitoring. The typical application is turbo chargers, where they function as holding bolts for bearing caps and receivers for standard shock pulse transducers with M8 threads (SPM 40000).

The bolts are made of high-tensile steel and must be mounted without washers. Each bolt is delivered with an M3 locking screw and an Allen key for this screw. The locking screw is secured in its hole. Bolts must not be re-used after unscrewing.



Technical specfications

Material: High-tensile steel, SS-EN 2244-05, EN 10083-3:2006, 42CrMo4

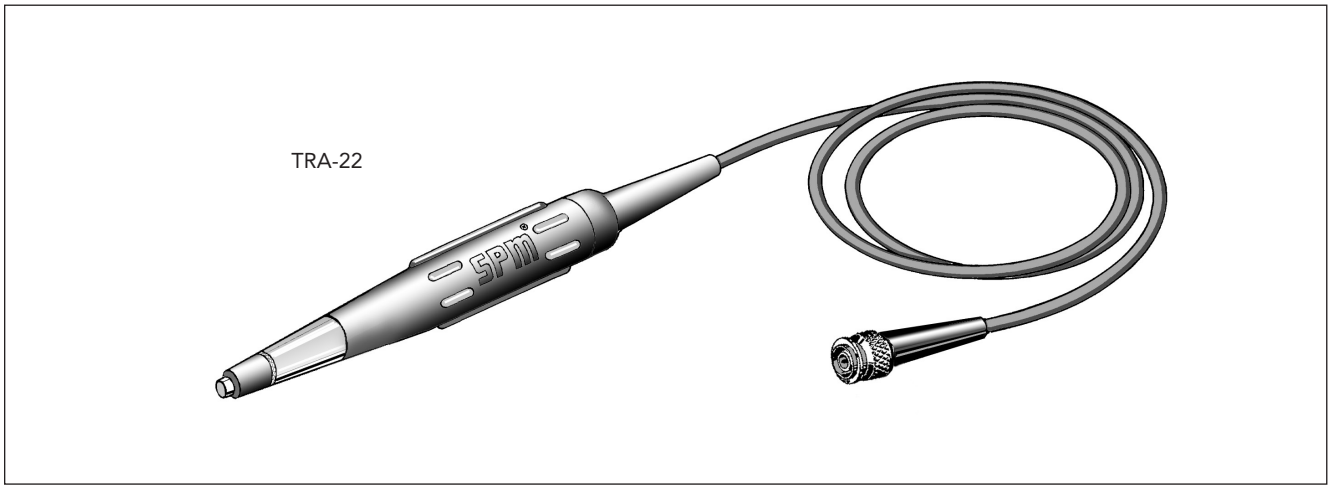
Locking screw: SK6SS, M3 x 6

Turbo type	Bolt Art. no.	Thread size	Torque max.	Cable length (L)	Cable Art. no.
VTR 454	14073	M12	100 Nm	450 mm	46024-0.45
VTR 501	14073	M12	100 Nm	550 mm	46024-0.55
VTR 564	14074	M16	230 Nm	550 mm	46024-0.55
VTR 714	14075	M20	350 Nm	650 mm	46024-0.65

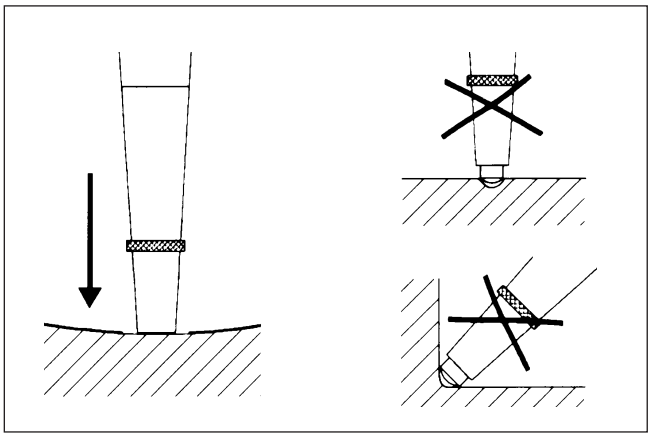
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Shock Pulse Transducer with Probe TRA-22

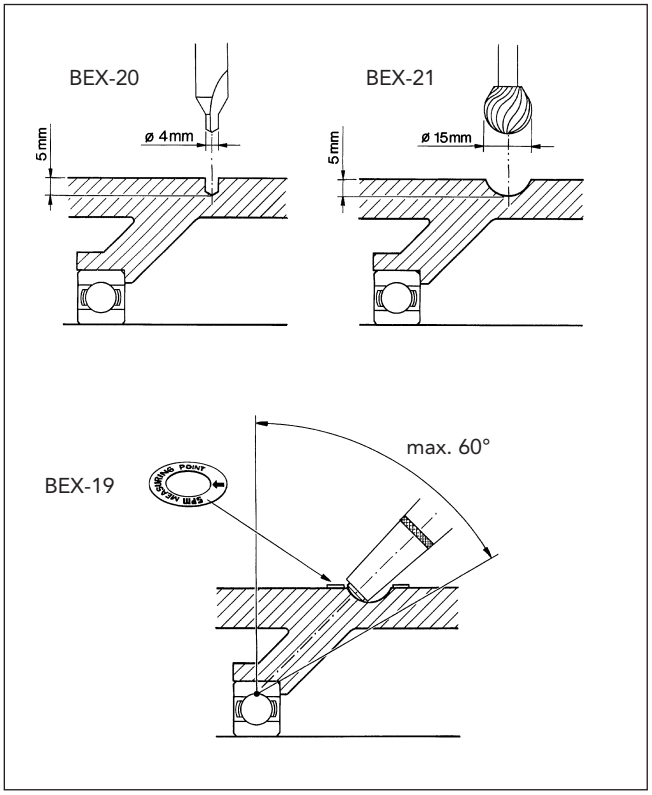


TRA-22 is a hand-held probe, which is used together with Shock Pulse Tester T30 (T2000/T2001) and Shock Pulse Analyzer A30 (A2010/A2011). The probe is directionally sensitive and must be held aligned against the bearing and not deviate from this direction by more than ±5°. The temperature range is −30° to +70 °C. The probe tip is spring loaded and moves within a sleeve made of chloroprene rubber (neoprene) and tolerates 110 °C (230 °F).



Measuring points for the probe transducer should be located directly on the bearing housing and the signal path should be in a direct line to the contact area. The strongest shock pulses are emitted from the loaded region of the rolling interface in the bearing. The loaded region for radial load covers a sector of ±45° from the load direction, for axial load the region is 360°. Since the transfer of shock pulses to the bearing housing is limited by the width of the bearing, direct radiation of pulses will be restricted to a sector of ±60° from the perpendicular to the rolling surface. Measuring points should be clearly marked, for instance with the SPM marker BEX-19.

To maintain a steady pressure on the tip, press the probe tip against the measuring point until the rubber sleeve is in contact with the surface. Avoid pressing the probe tip against cavaties and fillets which are smaller than the probe tip.



Part numbers

TRA-22	Shock pulse transducer, probe assembly
BEX-19	Measuring point marker
BEX-20	Center drill
BEX-21	Rotary file

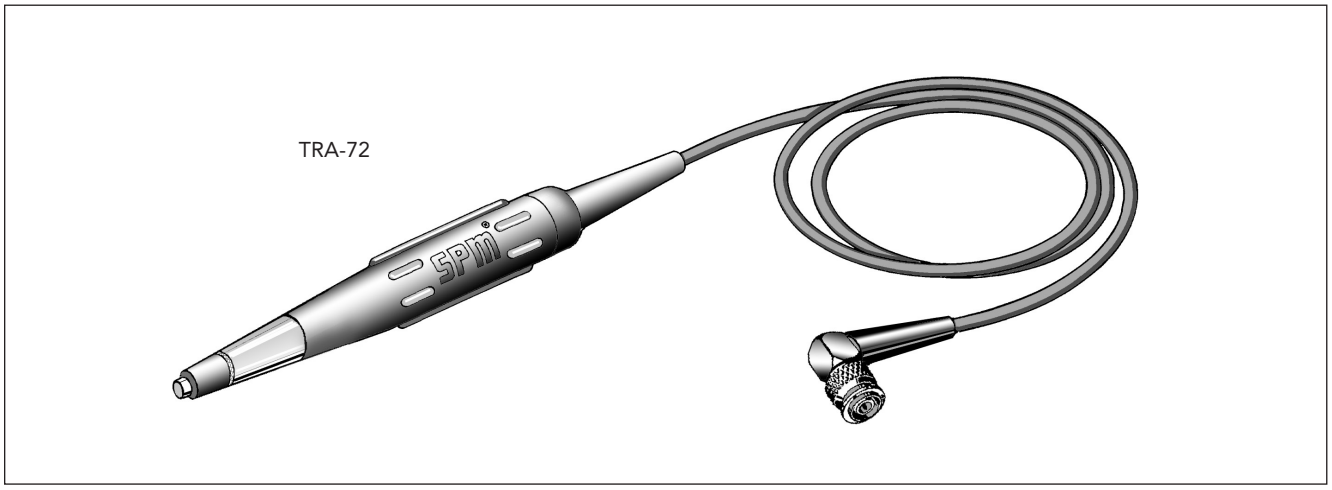
Spare parts

TRA-15	Transducer with probe
BAX-10	Probe handle
CAB-06	Cable for TRA-22
13108	Sleeve for probe tip

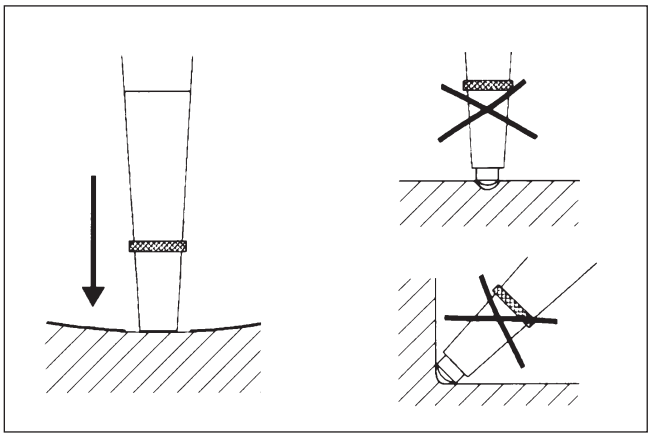
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Shock Pulse Transducer with Probe TRA-72

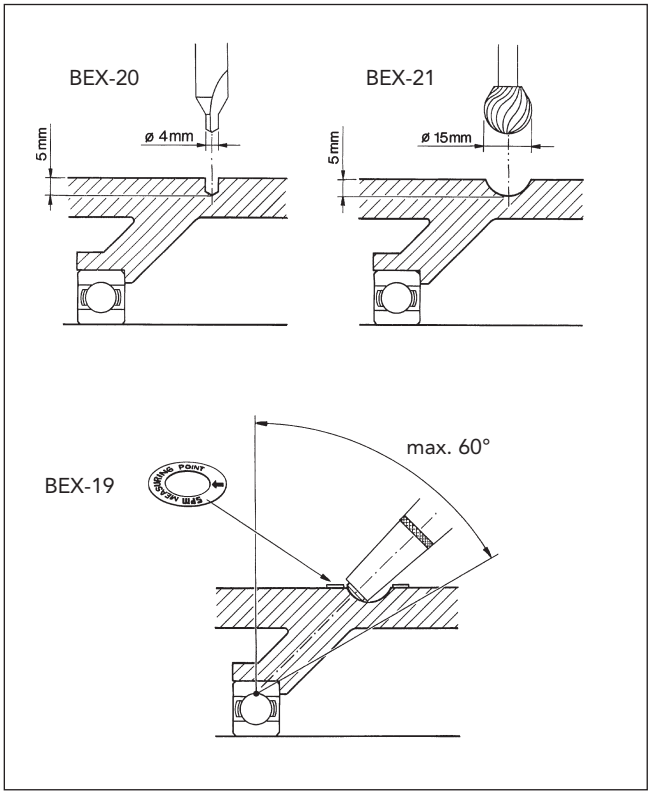


TRA-72 is a hand-held probe, which is used together with Leonova. The probe is directionally sensitive and must be held aligned against the bearing and not deviate from this direction by more than ±5°. The temperature range is -30° to +70° C. The probe tip is spring loaded and moves within a sleeve made of chloroprene rubber (neoprene) and tolerates 110° C (230° F).



Measuring points for the probe transducer should be located directly on the bearing housing and the signal path should be in a direct line to the contact area. The strongest shock pulses are emitted from the loaded region of the rolling interface in the bearing. The loaded region for radial load covers a sector of ±45° from the load direction, for axial load the region is 360°. Since the transfer of shock pulses to the bearing housing is limited by the width of the bearing, direct radiation of pulses will be restricted to a sector of ±60° from the perpendicular to the rolling surface. Measuring points should be clearly marked, for instance with the SPM marker BEX-19.

To maintain a steady pressure on the tip, press the probe tip against the measuring point until the rubber sleeve is in contact with the surface. Avoid pressing the probe tip against cavaties and fillets which are smaller than the probe tip.



Part numbers

TRA-72	Shock pulse transducer, probe assembly
BEX-19	Measuring point marker
BEX-20	Center drill
BEX-21	Rotary file

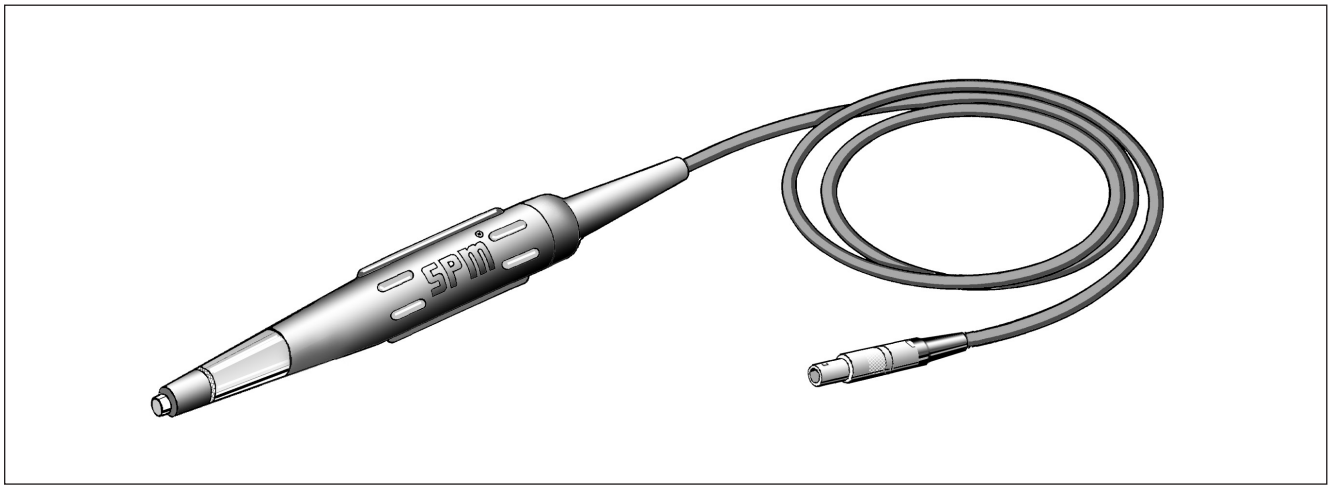
Spare parts

TRA-15	Transducer with probe
BAX-10	Probe handle
CAB-37	Cable for TRA-72, 1.5 m (5 ft)
13108	Sleeve for probe tip

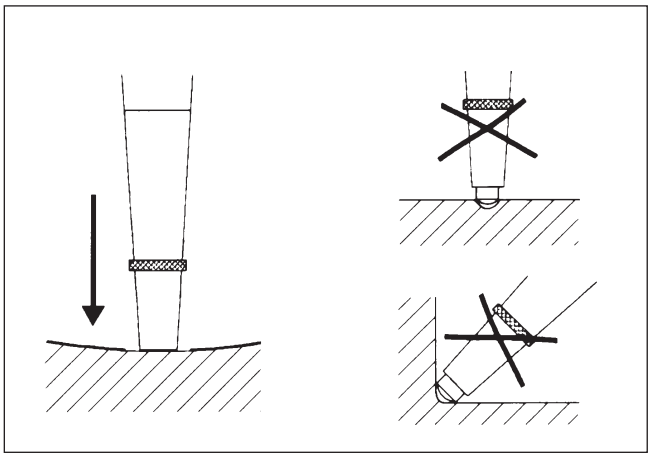
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Shock Pulse Transducer with Probe TRA-73

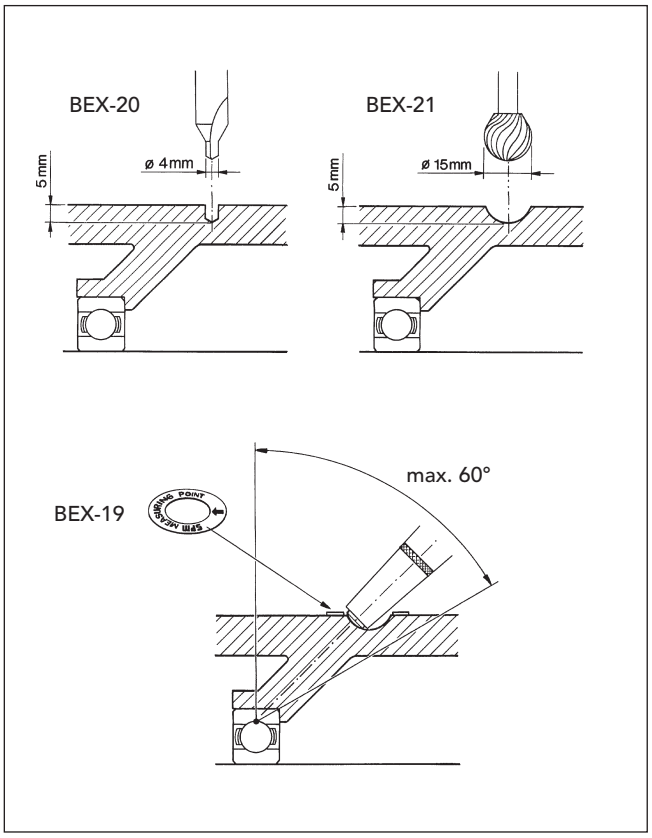


TRA-73 is a hand-held probe, which is used together with BearingChecker. The probe is directionally sensitive and must be held aligned against the bearing and not deviate from this direction by more than ±5°. The probe tip is spring loaded and moves within a sleeve made of chloroprene rubber (neoprene) and tolerates 110 °C (230 °F).



Measuring points for the probe transducer should be located directly on the bearing housing and the signal path should be in a direct line to the contact area. The strongest shock pulses are emitted from the loaded region of the rolling interface in the bearing. The loaded region for radial load covers a sector of ±45° from the load direction, for axial load the region is 360°. Since the transfer of shock pulses to the bearing housing is limited by the width of the bearing, direct radiation of pulses will be restricted to a sector of ±60° from the perpendicular to the rolling surface. Measuring points should be clearly marked, for instance with the SPM marker BEX-19.

To maintain a steady pressure on the tip, press the probe tip against the measuring point until the rubber sleeve is in contact with the surface. Avoid pressing the probe tip against cavaties and fillets which are smaller than the probe tip.



Technical specifications

Coaxial cable	PVC, length 1.5 m (5 ft)
Connector	Mini coax
Temperature range	–30° to +70° C.
Dimensions	260 x 25 mm (10.2 x 1 in)
Weight	275 g (9.7 oz)

Part numbers

TRA-73	Shock pulse transducer, probe assembly
BEX-19	Measuring point marker
BEX-20	Center drill
BEX-21	Rotary file

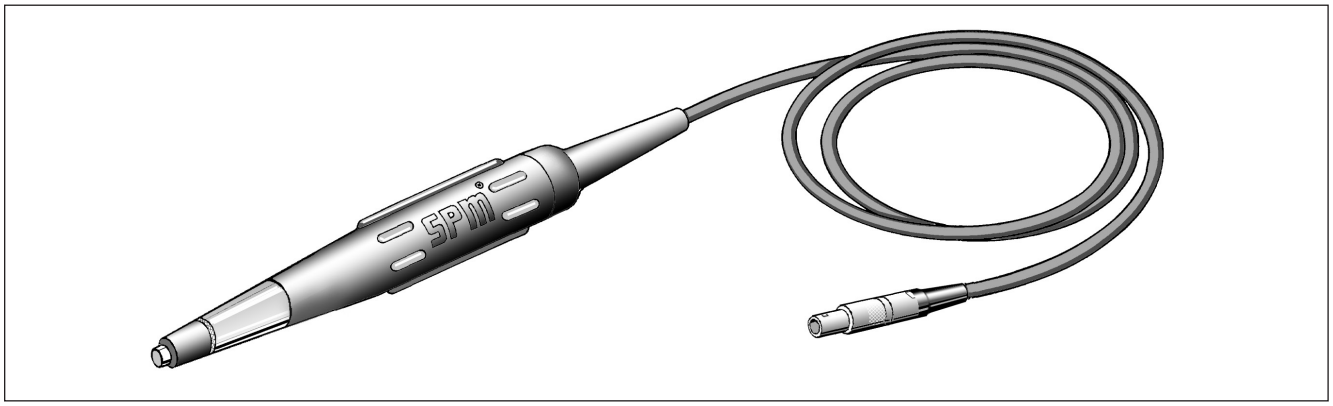
Spare parts

TRA-15	Transducer with probe
BAX-10	Probe handle
CAB-73	Cable, mini coax connector, 1.5 m (5 ft)
13108	Sleeve for probe tip

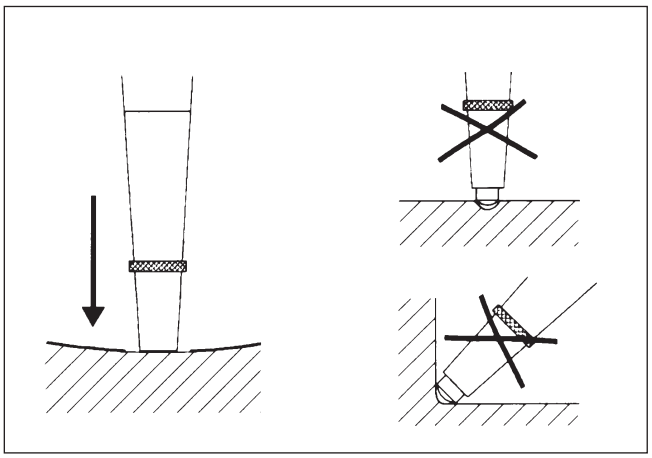
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Shock Pulse Transducer with Probe TRA78

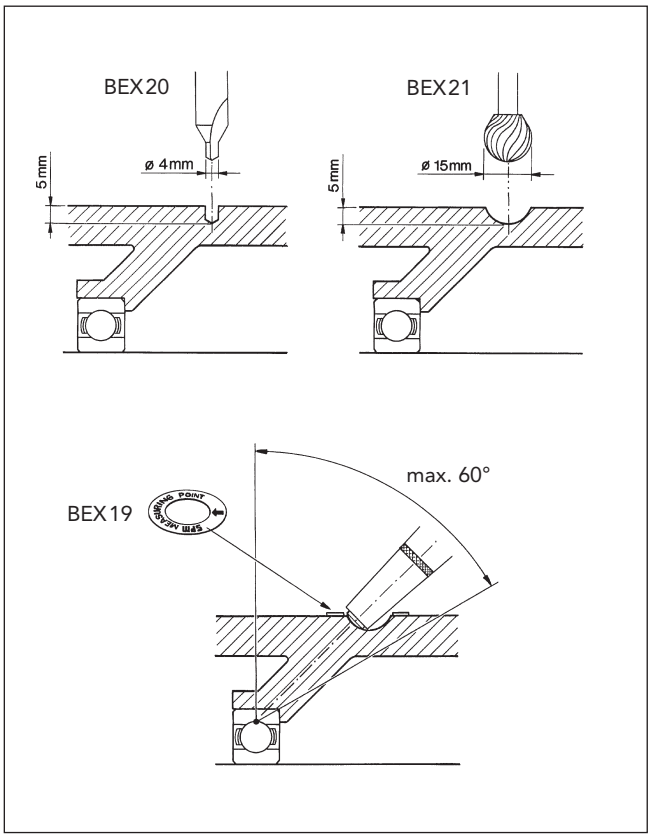


TRA78 is a handheld probe, used together with Leonova Diamond® and Emerald®. The probe is directionally sensitive and must be held aligned against the bearing and not deviate from this direction by more than ±5°. The probe tip is spring loaded and moves within a sleeve made of chloroprene rubber (neoprene) and tolerates 110 °C (230 °F). Standard cable length is 1.5 m. Other lengths up to 20 m can be ordered.



Measuring points for the probe transducer should be located directly on the bearing housing and the signal path should be in a direct line to the contact area. The strongest shock pulses are emitted from the loaded region of the rolling interface in the bearing. The loaded region for radial load covers a sector of ±45° from the load direction. For axial load the region is 360°. Since the transfer of shock pulses to the bearing housing is limited by the width of the bearing, direct radiation of pulses will be restricted to a sector of ±60° from the perpendicular to the rolling surface. Measuring points should be clearly marked, for instance with the SPM marker BEX19.

To maintain a steady pressure on the tip, press the probe tip against the measuring point until the rubber sleeve is in contact with the surface. Avoid pressing the probe tip against cavities and fillets which are smaller than the probe tip.



Technical specifications

Coaxial cable:	PVC, standard length 1.5 m (5 ft) or other length, max 20 m (65.6 ft.)
Measuring range:	Max. 85 dBsv
Temp. range:	–30° to +70 °C
Connector:	Mini coax
Dimensions:	260 x 25 mm (10.2 x 1 in)
Weight:	275 g (9.7 oz)

Part numbers

TRA78	Shock pulse transd. with probe, cable length 1.5 m
TRA78-L	Shock pulse transd. with probe, L = cable length, max 20 m
BEX19	Measuring point marker
BEX20	Center drill
BEX21	Rotary file

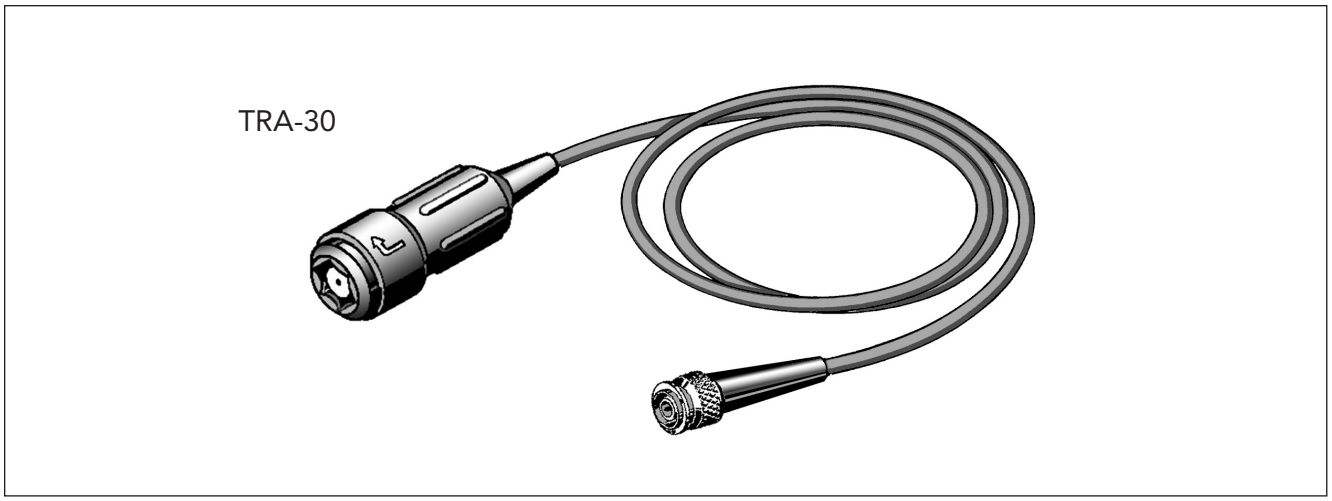
Spare parts

TRA15	Transducer with probe
16626	Probe handle
CAB79	Cable for TRA78, mini coax connector, 1.5 m (5 ft)
13108	Sleeve for probe tip

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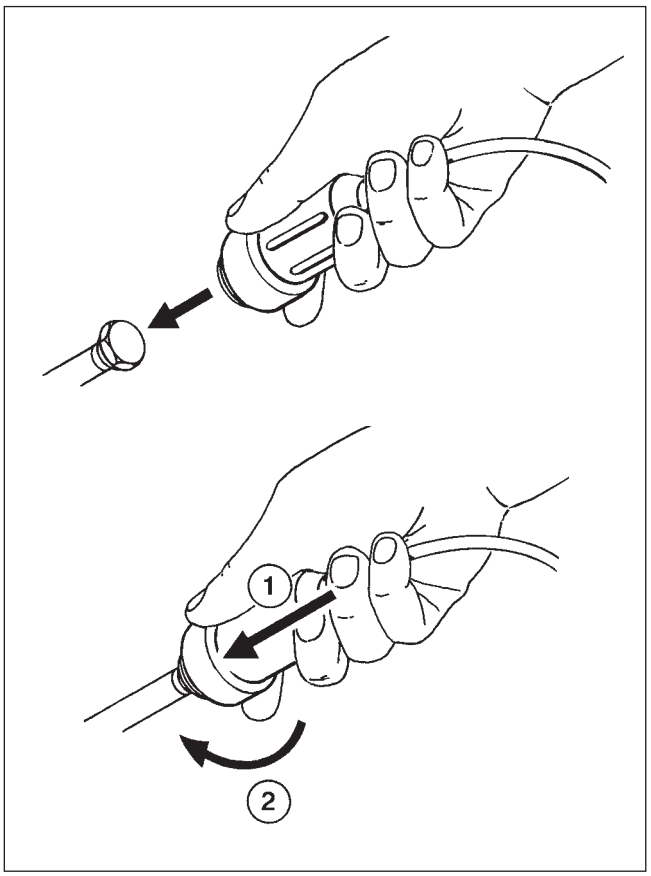
Shock pulse transducer with quick connector TRA-30



TRA-30 is a shock pulse transducer with quick connector. It is used for measurements on permanently installed adapters. The quick connector forms a bayonet connection together with the adapter.

To attach the TRA-30 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

Twist counter clockwise to unfasten the transducer.



Technical data

Measuring range	Max. 100 dBsv
Design	Sealed
Temperature range	−30° to +70 °C
Material, spanner	Blacknited steel
Handle cover	Urethan
Coaxial cable	PVC, length 1.5 m
Connector	TNC
Weight	250 g

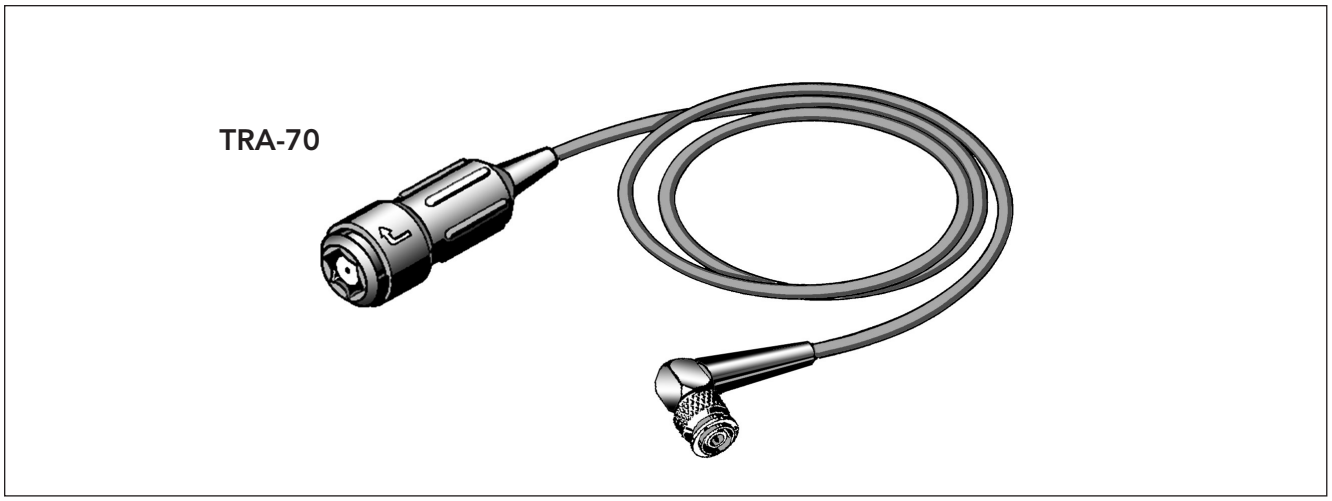
Part numbers

TRA-30	Transducer with quick connector, incl. cable
CAB-30	Cable for TRA-30

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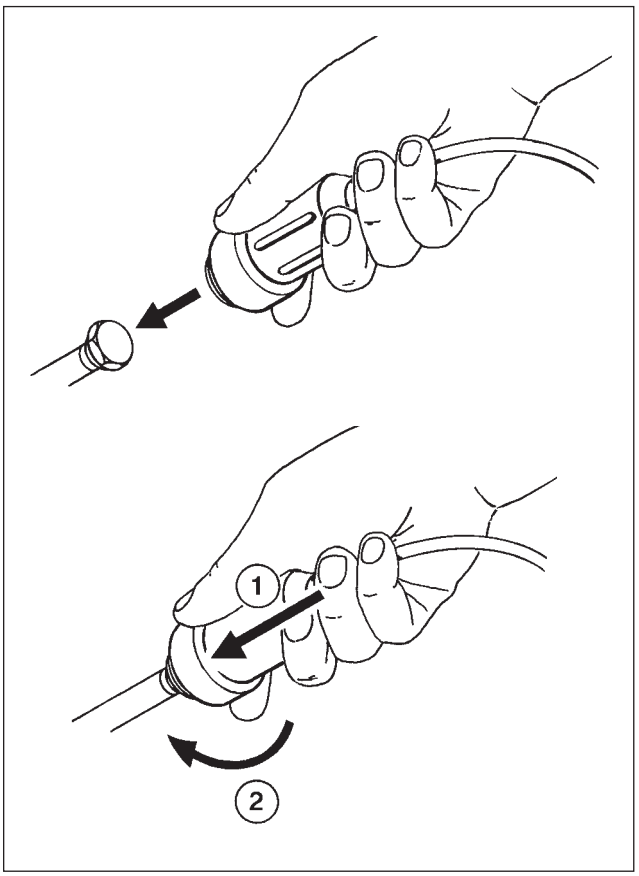
Shock pulse transducer with quick connector TRA-70



TRA-70 is a shock pulse transducer with quick connector for measurements on permanently installed adapters. The transducer can be used together with the handheld instrument Leonova. The quick connector forms a bayonet connection together with the permanently installed adapter.

To attach the TRA-70 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

Twist counter clockwise to unfasten the transducer.



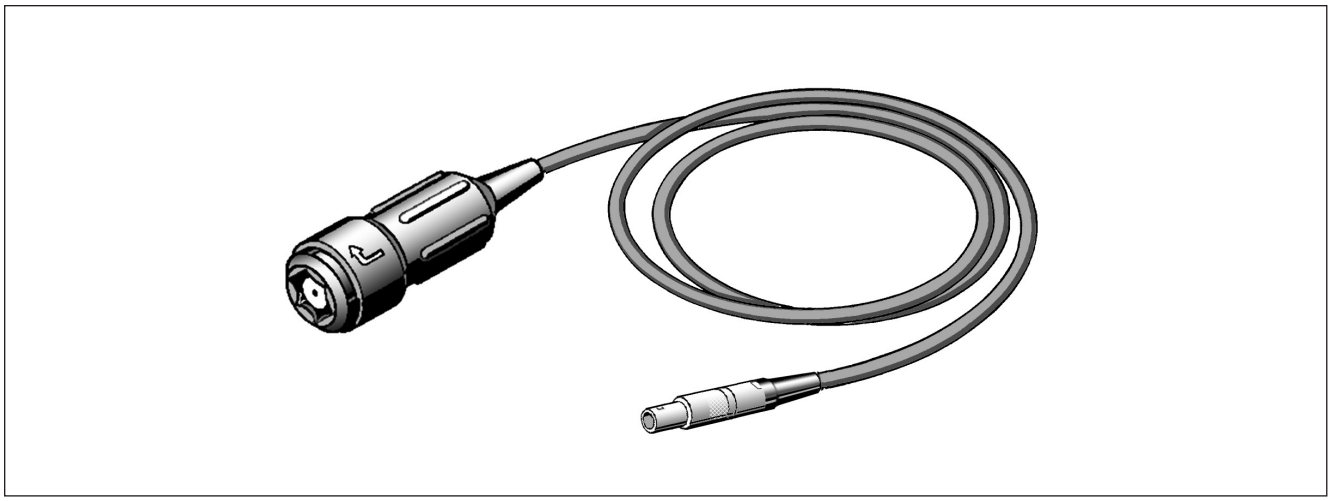
Technical data

Measuring range	Max. 100 dBsv
Design	Sealed
Temperature range	–30° to +70° C
Material, spanner	Blacknited steel
Handle cover	Urethan
Coaxial cable	PVC, length 1.5 m
Connector	BNC
Weight	250 g

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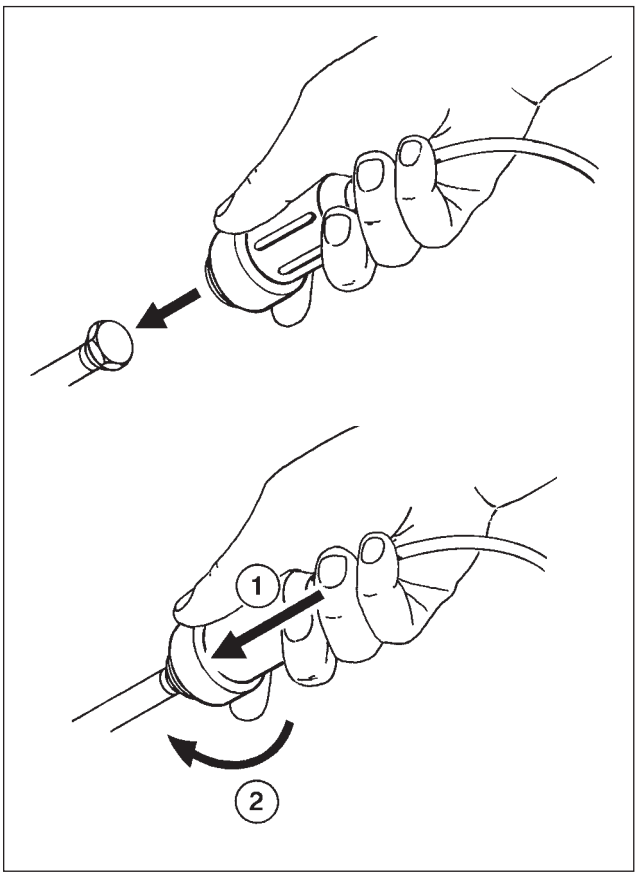
Shock pulse transducer with quick connector TRA-74



TRA-74 is a shock pulse transducer with quick connector for measurements on permanently installed adapters. The transducer can be used together with the handheld instrument BearingChecker. The quick connector forms a bayonet connection together with the permanently installed adapter.

To attach the TRA-74 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

Twist counter clockwise to unfasten the transducer.



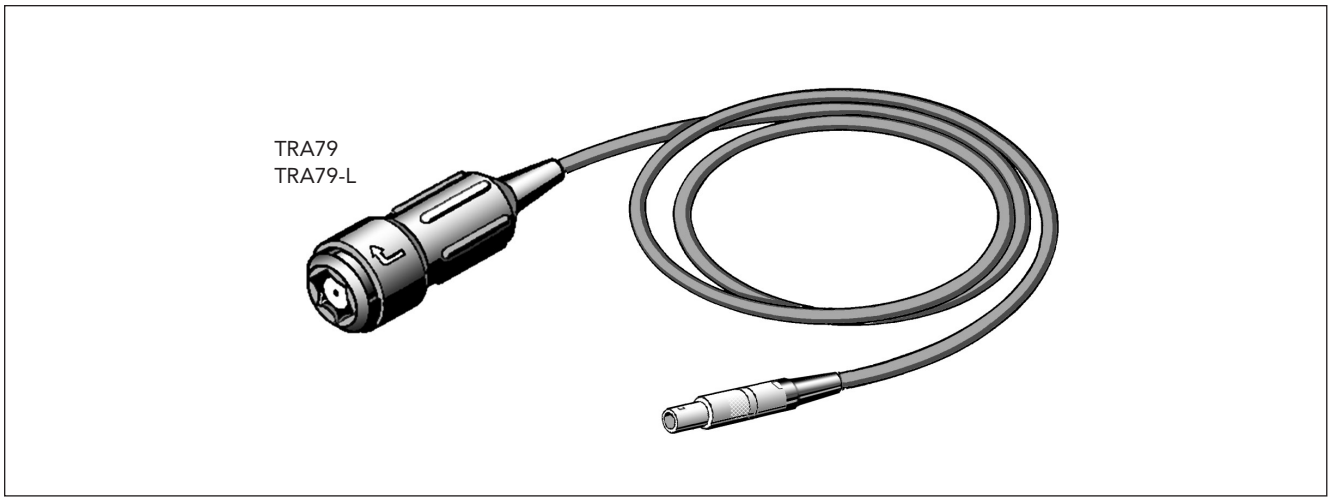
Technical specifications

Measuring range	Max. 100 dBsv
Design	Sealed
Temperature range	–30° to +70° C (–22° to +158° F)
Material, spanner	Blacknited steel
Handle cover	Urethan
Coaxial cable	PVC, length 1.5 m (5 ft)
Connector	Mini coax
Dimensions	90 x 30 mm (1.2 x 3.5 in)
Weight	203 g (7.2 oz)

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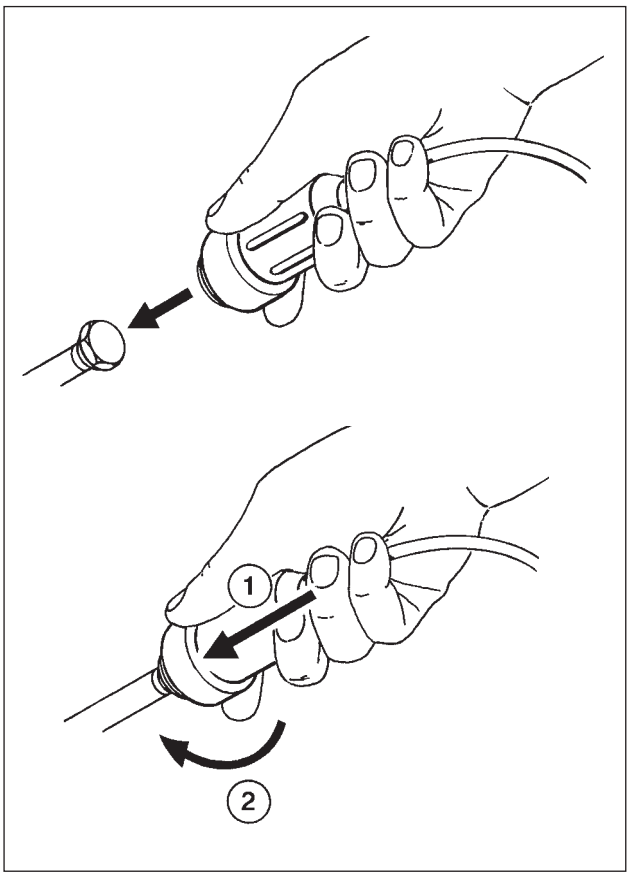
Shock pulse transducer with quick connector TRA79



TRA79 is a shock pulse transducer with quick connector, used together with the handheld instrument Leonova Diamond® and Emerald®, for measurements on permanently installed adapters. The quick connector forms a bayonet connection together with the permanently installed adapter. Standard cable length is 1.5 m. Other lengths up to 20 m can be ordered.

To attach the TRA79 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

Twist counter clockwise to unfasten the transducer.



Technical specifications

Measuring range:	Max. 100 dBsv
Design:	Sealed
Temperature range:	–30° to +70 °C (–22° to +158 °F)
Material, spanner:	Black oxide steel
Handle cover:	Polyurethane
Coaxial cable:	PVC, standard length 1.5 m (5 ft) or other length, max 20 m (65.6 ft.)
Connector:	Mini coax
Dimensions:	90x30 mm (1.2x3.5 in)
Weight:	210 g (7,4 oz)

Part numbers

TRA79	Shock pulse transducer with quick connector, cable length 1.5 m
TRA79-L	Shock pulse transducer with quick connector, L=cable length, max. 20 m

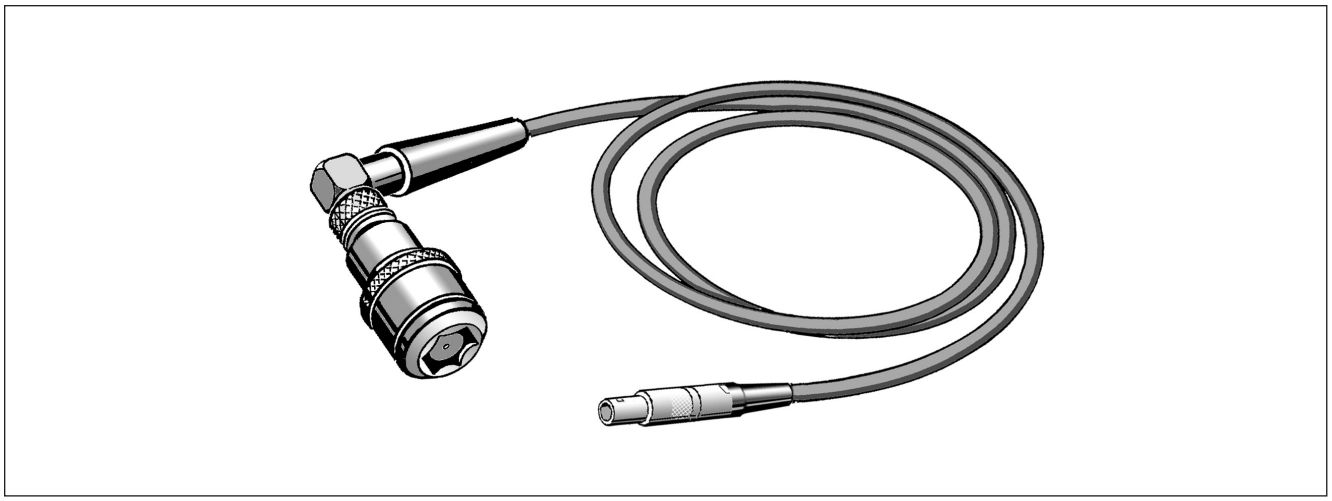
Spare part

CAB103	Cable for TRA79, 1.5 m, mini coax. connector

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Transducer with quick connector TRA75

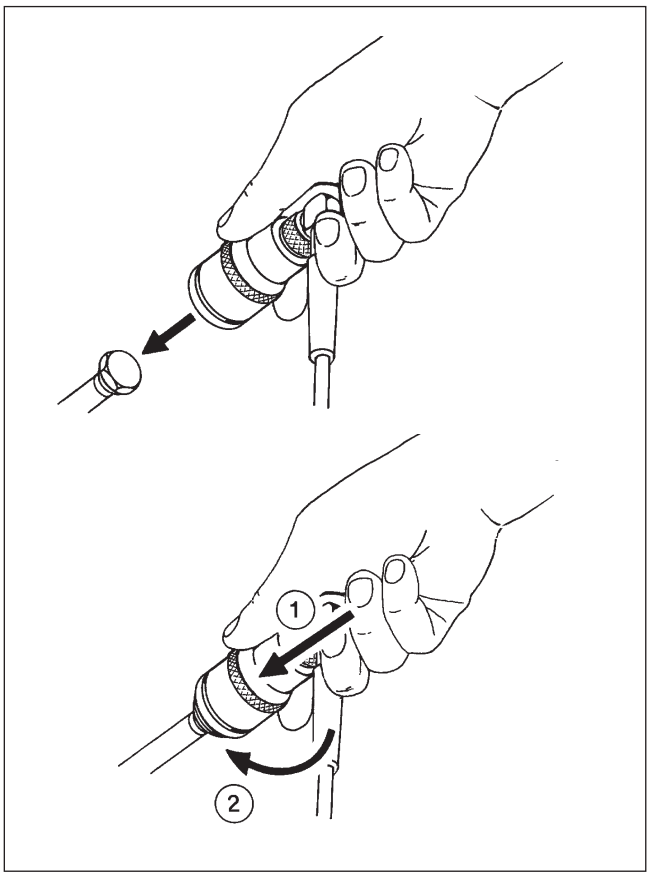


TRA75 is a shock pulse transducer with quick connector for BearingChecker, specially designed for narrow spaces.

On TRA75, the cable is fitted with an angle connector, making this transducer about 30 mm shorter than the standard model TRA74. In all other respects, the two models are identical.

To attach the TRA75 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

Twist counter clockwise to unfasten the transducer.



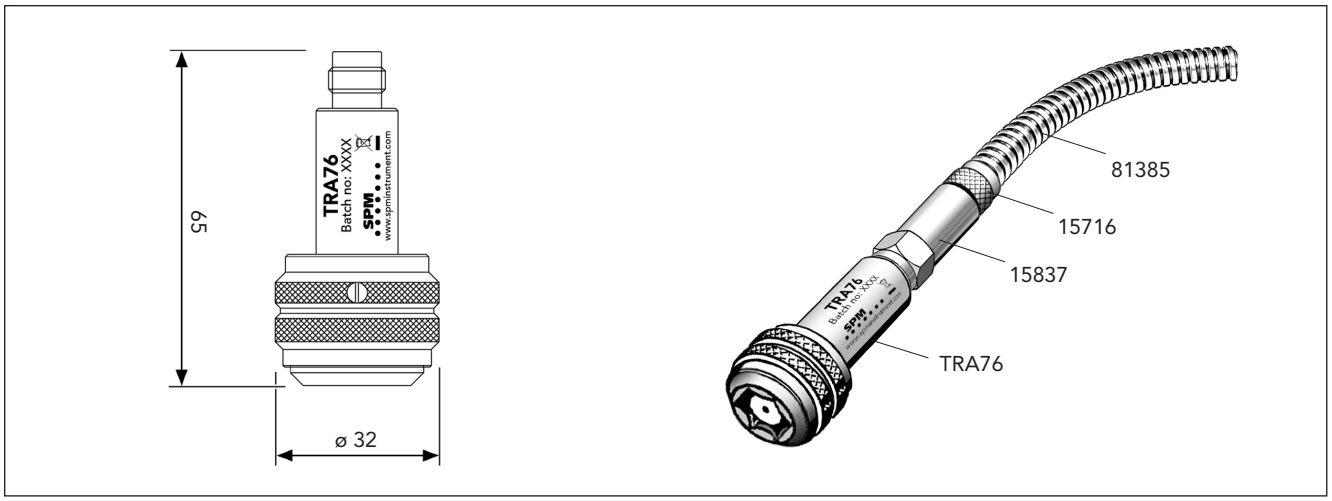
Technical specifications

Measuring range:	Max. 100 dBsv
Design:	Sealed
Temperature range:	–30° to +70° C (–22° to +158° F)
Material, spanner:	Blacknited steel
Material, handle:	Stainless steel
Coaxial cable:	PVC, length 1.5 m (4.9 ft)
Connector:	Mini coax
Length, transducer:	70 mm (2.8 in)
Weight:	200 g (7 oz)

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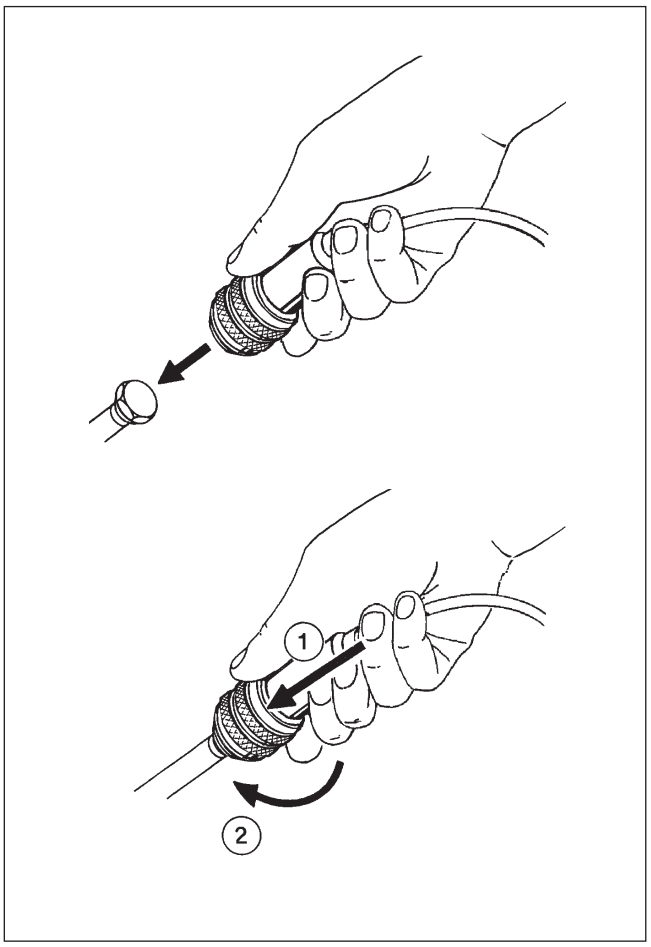
Sealed Transducer with Quick Connector and TMU



TRA-76 is a sealed shock pulse transducer with quick connector, specially designed for applications where the measuring cable is longer than 4 m. It has a built-in transducer matching unit (TMU) which allows a cable length of up to 100 m between the transducer and the measuring device. TRA-76 fits all SPM adapters.

If transducer and measuring cable are used in moist environments, it is necessary to equip the cable with a sealing TNC cable plug SPM 15837.

To attach the transducer to an adapter, push the transducer firmly onto the adapter and twist it clockwise. Twist counter clockwise to unfasten the transducer.



Technical specifications

Measuring range:	max. 100 dBsv
Design:	sealed IP67
Temperature range:	–30° to +100 °C (–22° to +212 °F)
Material:	stainless acid proof steel
Sealings:	Viton (fluor rubber)
Connector:	TNC plug
Weight:	130 g (4.6 oz)

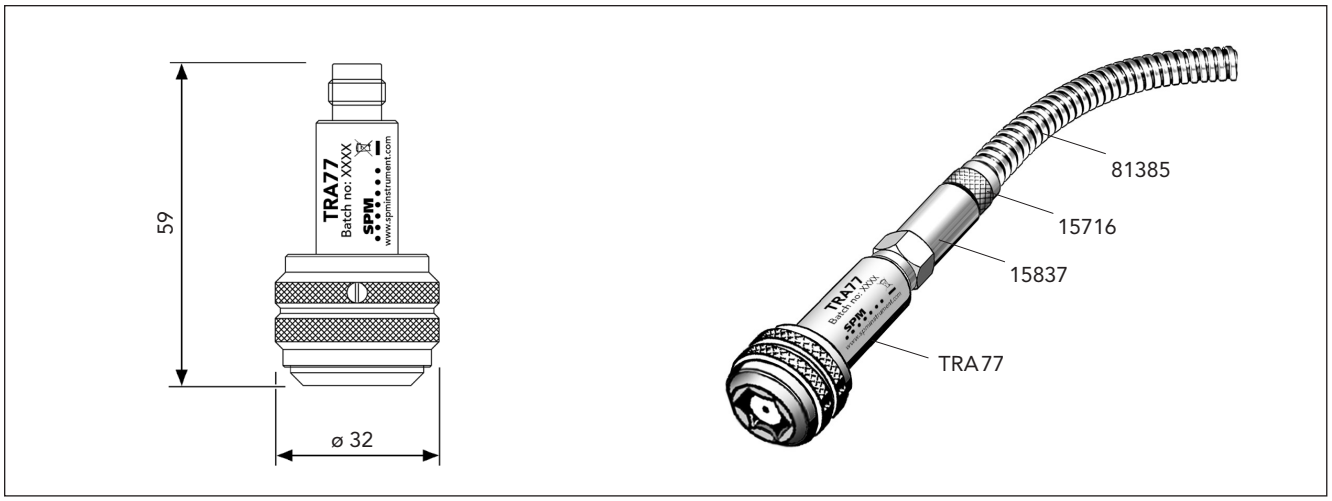
Part numbers

TRA-76	Sealed shock pulse transducer with quick connector for SPM adapters
15837	TNC cable plug, stainless steel, IP67
90005-L	Coaxial cable without connectors, –25 to +70 °C (L=length in meters)
90267-L	Coaxial cable without connectors, –55 to +150 °C (L=length in meters)
81385	Protection tube, outer diameter 9.3 mm, stainless acid proof steel
15716	Sleve for protection tube, stainless steel, required to enable dismounting of the protection tube

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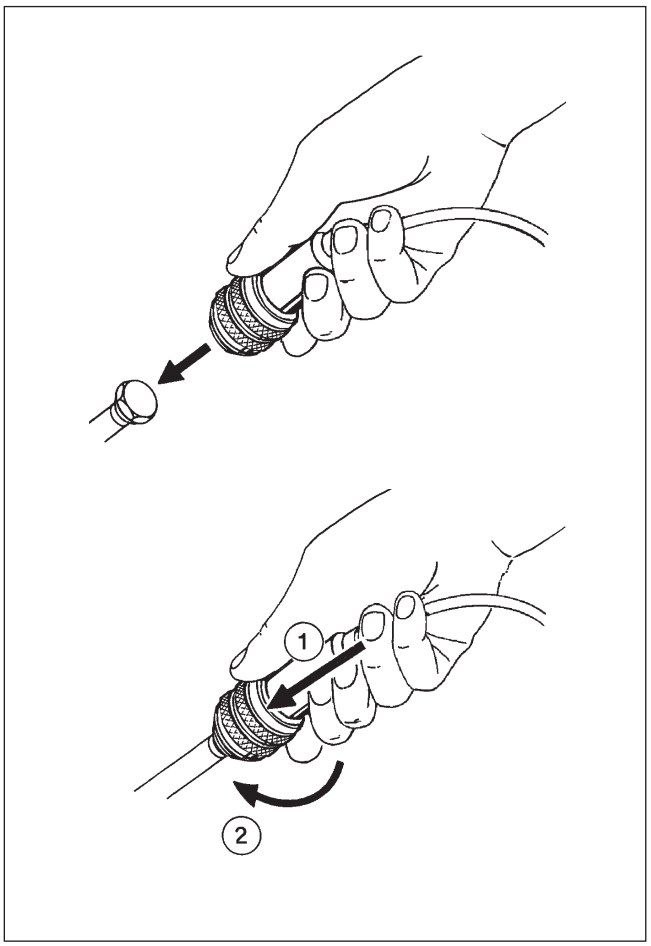
Transducer with Quick Connector TRA77



TRA77 is a sealed shock pulse transducer with quick connector for measurements on permanently installed adapters. It is used for bearing monitoring with the online system Intellinova Compact. A coaxial cable connects the transducer with the measuring unit. Max. cable length is 100 m.

A coaxial cable with a sealed TNC plug (15837) and a protection tube (81385) is recommended to prevent damages and cable corrosion in moist environments.

To attach the transducer to an adapter, push the transducer firmly onto the adapter and twist it clockwise. Twist counter clockwise to unfasten the transducer.



Technical specifications

Measuring range:	max. 100 dBsv
Design:	sealed IP67
Temperature range:	–30° to + 100 °C (–22° to +212 °F)
Material:	stainless acid proof steel
Sealings:	Viton (fluor rubber)
Connector type:	TNC plug
Cable length:	max. 100 m
Weight:	130 g (4.6 oz)

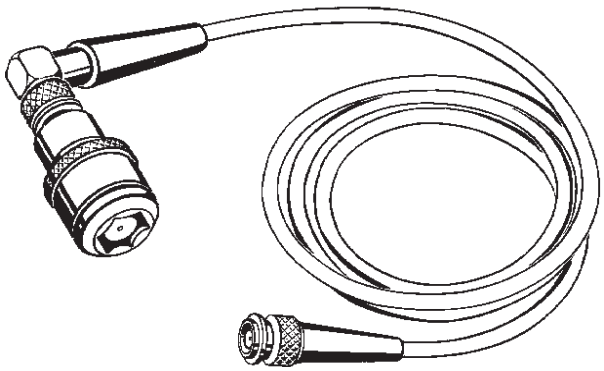
Part numbers

TRA77	Sealed shock pulse transducer with quick connector for SPM adapters
15837	TNC cable plug, stainless steel, IP67
90005-L	Coaxial cable without connectors, –25 to +70 °C (L=length in meters)
90267-L	Coaxial cable without connectors, –55 to +150 °C (L=length in meters)
81385	Protection tube, outer diameter 9.3 mm, stainless acid proof steel
15716	Sleeve for protection tube, stainless steel, required to enable dismounting of the protection tube

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Transducer with quick connector TRA-31



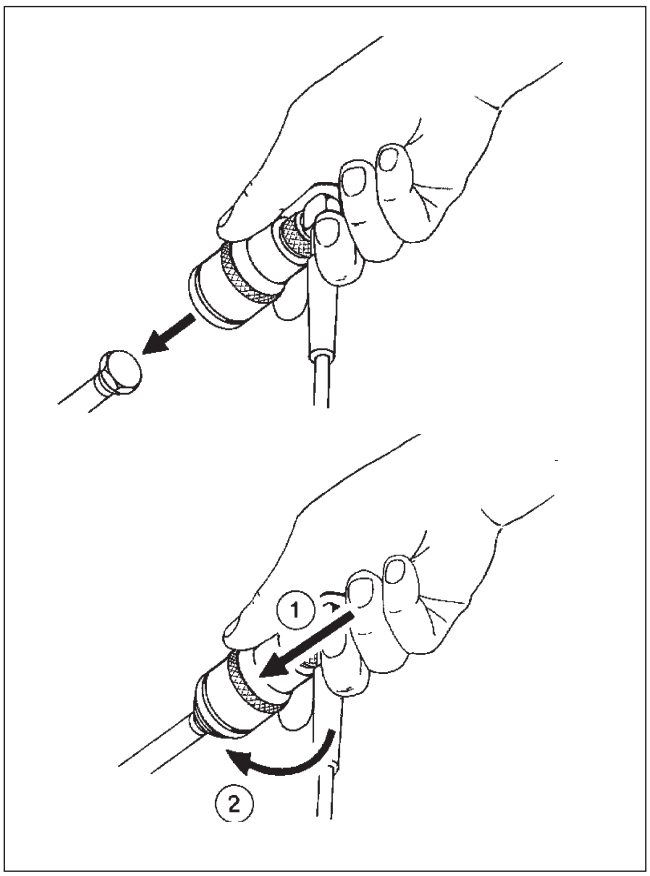
TRA-31

TRA-31 is a shock pulse transducer with quick connector, specially designed for narrow spaces.

On TRA-31, the cable is fitted with an angle connector, making this transducer about 30 mm shorter than the standard model TRA-30. In all other respects, the two models are identical.

To attach the TRA-31 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

Twist counter clockwise to unfasten the transducer.



Technical data

Measuring range	Max. 100 dBsv
Design	Sealed
Temperature range	-30° to +70° C
Material, spanner	Blacknited steel
Material, handle	Stainless steel
Coaxial cable	PVC, length 1.5 m
Connectors	TNC
Length	70 mm
Weight	220 g

Part numbers

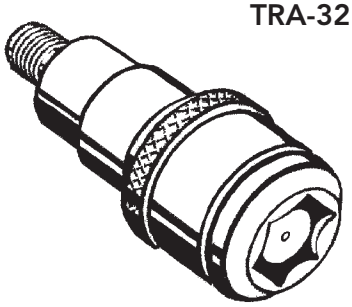
TRA-31 Transducer with quick connector incl. cable
46012-1.5 Cable for TRA-31

SPM

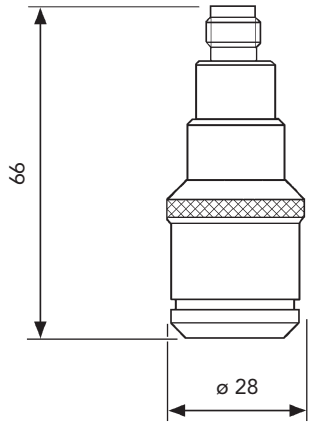
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Transducer with quick connector and TMU



TRA-32



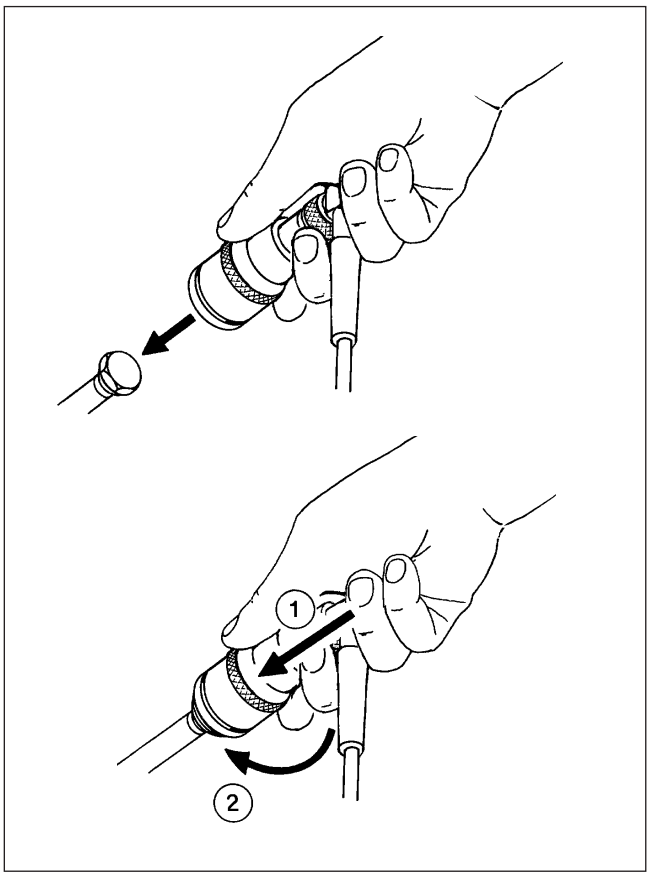
TRA-32 is a shock pulse transducer with quick connector, specially designed for applications where the measuring cable is longer than 4 m.

TRA-32 has a built-in transducer matching unit (TMU) which allows a cable length of up to 100 m between the transducer and the shock pulse meter. TRA-32 fits all SPM adapters.

If transducer and measuring cable are used in moist environments, it is necessary to equip the cable with a sealing TNC cable plug 13008.

To attach the TRA-32 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

Twist counter clockwise to unfasten the transducer.



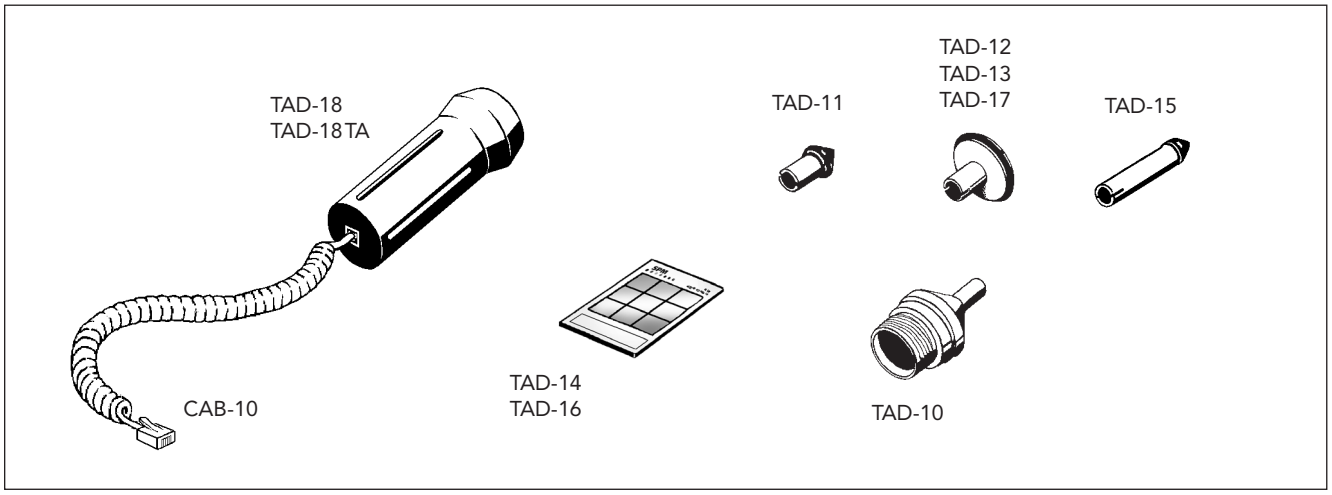
Technical specifications

Measuring range:	max. 100 dBsv
Design:	sealed
Temperature range:	−30° to +100 °C
Material, spanner:	blacknited steel
Material, handle:	stainless steel
Connector:	TNC
Max. cable length:	100 m

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Tachometer Probe TAD-18 / TAD-18TA



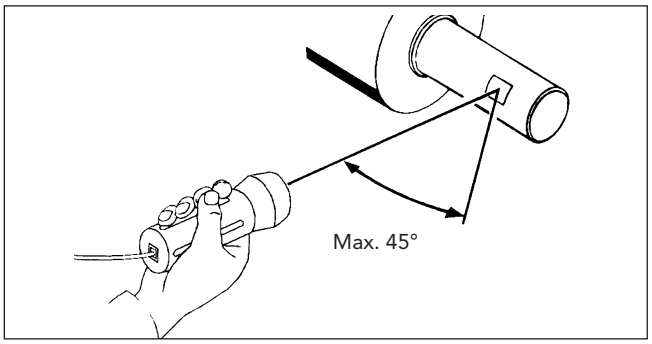
The Tachometer Probe TAD-18/TAD-18TA is used together with SPM's hand-held instruments for optical measurement of the rate of rotation and for contact measurement of as well the rate of rotation as the peripheral speed.

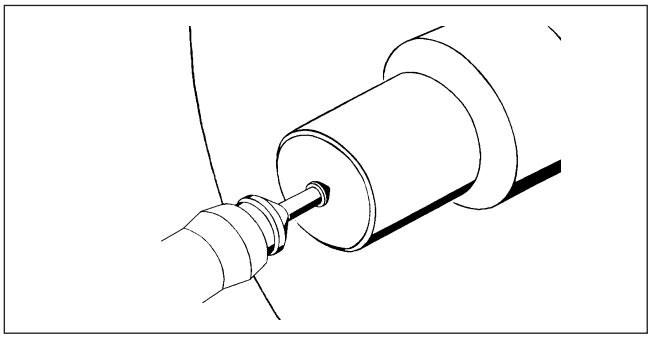
Optical measurement of the rate of rotation
A light beam is directed against a reflecting tape on the rotating object, from a distance of max. 0.6 m and from an angle of max. 45°.

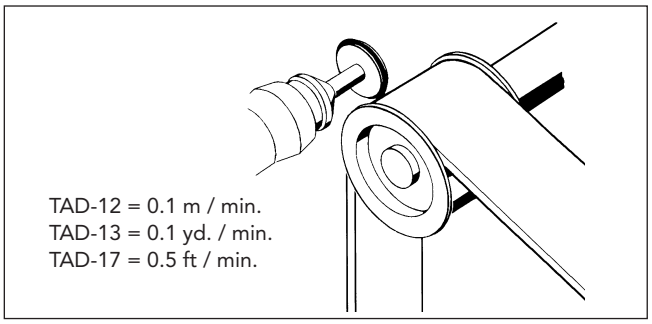
Contact measurement of rpm
The contact adapter TAD-10 with a rubber tipped contact center, TAD-11/15, is screwed onto the tachometer probe and then held against the center of a shaft end or a wheel.

Contact measurement of peripheral speed
The contact adapter TAD-10 with contact wheel is held against the circumference of a shaft, a belt, etc. The speed is read out in units, depending on which contact wheel is used:

Meters per minute – use TAD-12, divide result by 10
Yards per minute – use TAD-13, divide result by 10
Feet per minute – use TAD-17, divide result by 2.







Part numbers

TAD-18	Tachometer probe for Leonova, incl. cable
TAD-18TA	Tachometer probe for A30/T30, incl. cable
CAB-10	Spiral cable
TAD-10	Contact adapter
TAD-11	Contact center, rpm, short
TAD-15	Contact center, rpm, long
TAD-12	Contact wheel, meter/min.
TAD-13	Contact wheel, yards/min.
TAD-17	Contact wheel, feet/min.
TAD-14	Reflecting tape, pad of 5 sheets
TAD-16	Reflecting tape for thin shafts, 5 sheets

Technical specifications

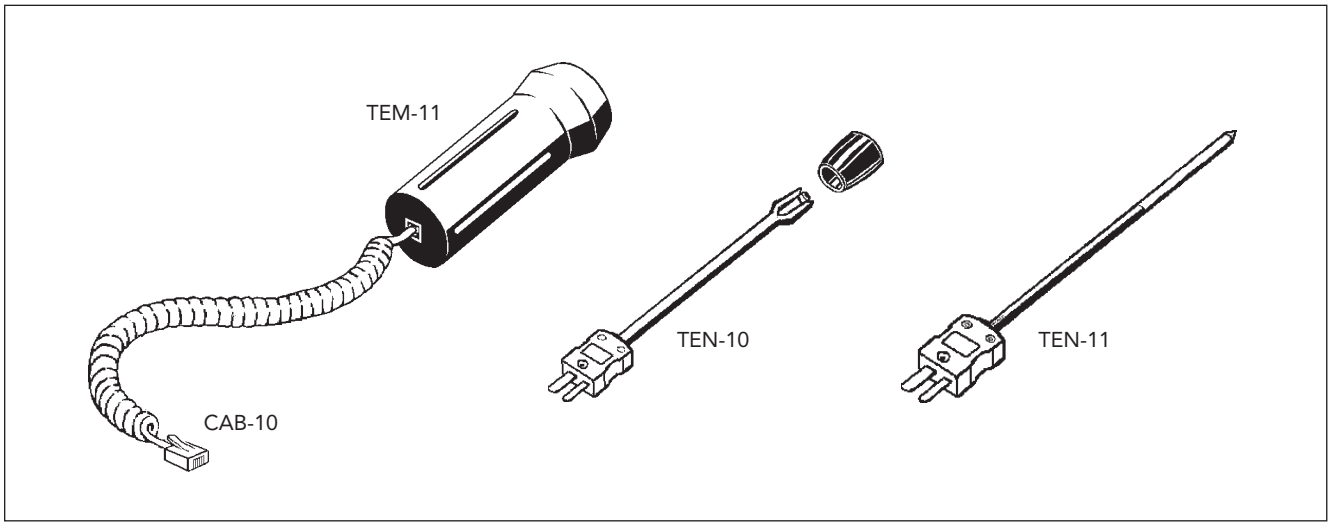
Measuring range:	max. 20 000 rpm optical
Measuring distance:	max. 0.6 m (2 ft.)
Dimensions, tachometer probe:	171 x 42 mm

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Temperature probe TEM-11



The temperature probe TEM-11 is used together with SPM's hand-held instruments, for temperature measurements in the range of –50 to +440 °C.

The probe TEM-11 is connected via the spiral cable CAB-10 to the EXT connector of the instrument. The TEMP menu appears automatically on the instrument when the temperature probe is connected. It is power supplied by the instrument.

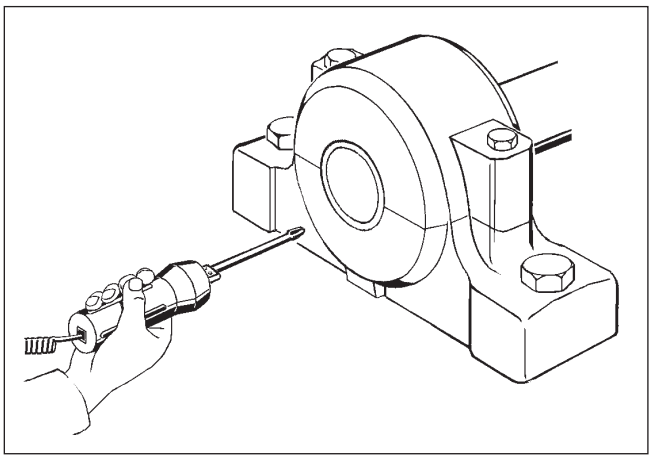
Two probe tips belongs to TEM-11:

- TEN-10 for measuring the surface temperature of solids
- TEN-11 for measuring the temperatures of liquids.

The probe tips fit into the socket at the front end of the probe. Probe and tips should be handled and stored with care. Keep the protective cap on the TEN-10 when the tip is not being used.

Artikelnummer

TEM-11	Temperature probe with cable
CAB-10	Spiral cable
TEN-10	Probe tip for solids
TEN-11	Probe tip for liquids



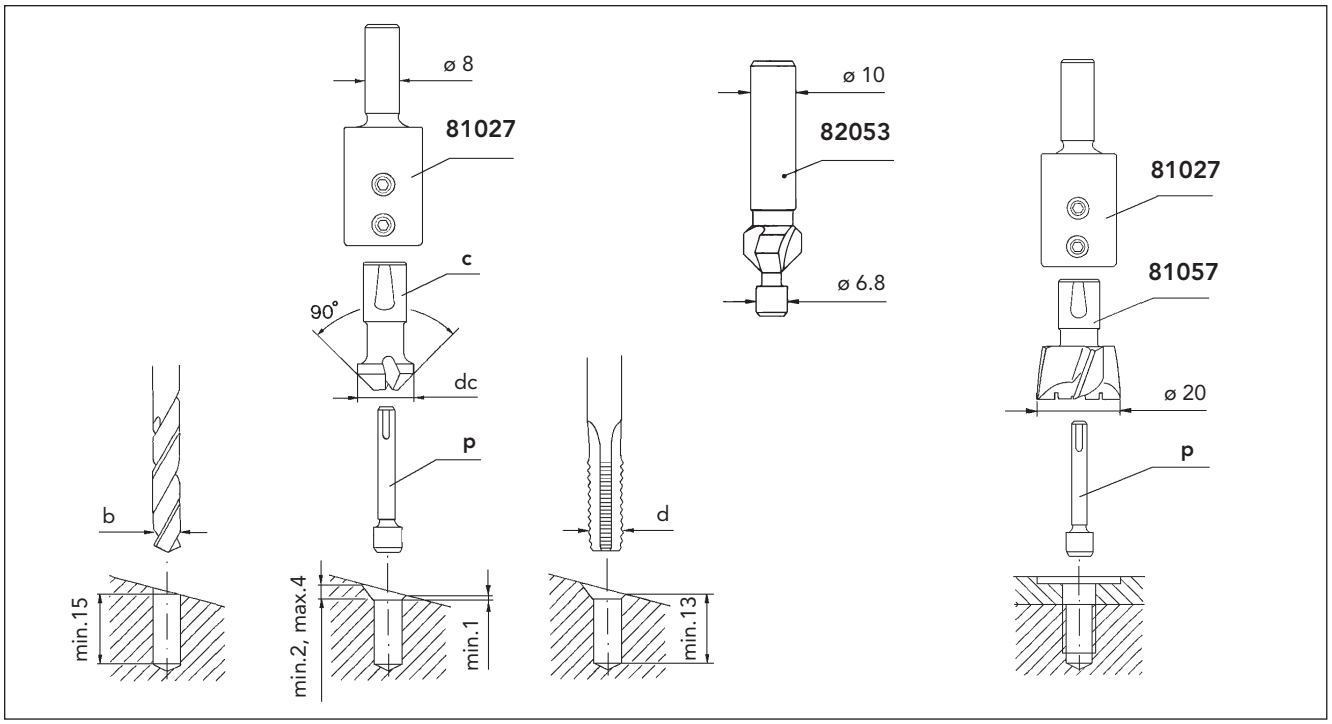
Tekniska data

Measuring range:	–50 to +440 °C
Maximum offset:	±5 °C
Meas. uncertainty:	±1 °C
Sensitivity:	10 mV / °C
Output range:	0 to 5 V DC
Power supply:	+5 V DC
Measuring time:	approx. 1 minute
Weight, TEM-11:	94 g
Dimensions,	
TEM-11:	ø 42 x 118 mm
TEN-10:	122 mm with cap
TEN-11:	159 mm

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Countersinking tools for adapters and transducers



Combination tools

The listed tools are used for correct countersinking of mounting holes for adapters and standard shock pulse transducers. The combination tool consists of a holder, a replaceable countersink and replaceable pilots. Ordering numbers are shown beside.

b (mm)	**p**	**c**	**dc** (mm)	**d**
5.5	81030	81028	ø12	M6/UNF 1/4"
6.9	81031	81028	ø12	M8
6.6	81032	81028	ø12	UNC 5/16"
8.6	81033	81028	ø12	M10
8.1	81034	81028	ø12	UNC 3/8"
10.3	81035	81029	ø15	M12
10.9	81036	81029	ø15	UNC 1/2"

81057 Counterbore

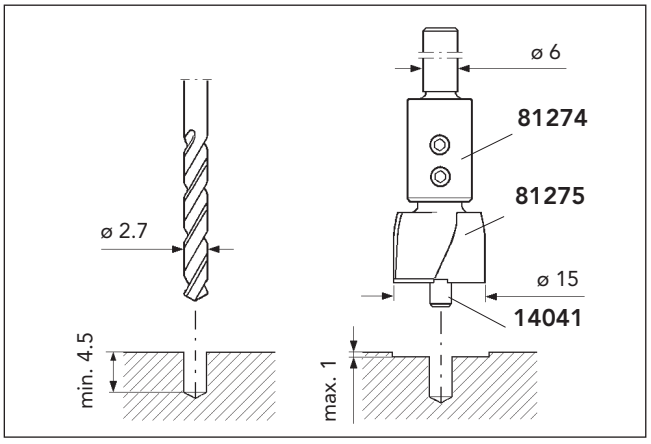
The counterbore is used for flat face milling of mounting holes for shock pulse transducers in bolt design and vibration transducers. The counterbore is mounted in holder 81027 together with a pilot according to the table beside.

82053 Countersink with fixed pilot

The countersink is intended for mounting hole M8.

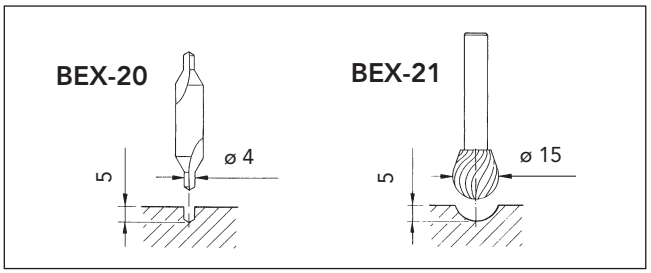
Counterbore for Glue-on Transducer 40010

14042 Counterbore, complete
81274 Holder for counterbore
81275 Counterbore, diameter 15 mm
14041 Pilot, diameter 2.7 mm



Tools for measuring point preparation

BEX-20 center drill and BEX-21 ball shaped rotary file are used to prepare measuring points for the probe transducer, and to faciliate drilling of mounting holes for adapters, studs, and transducers at an angle.



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SPM
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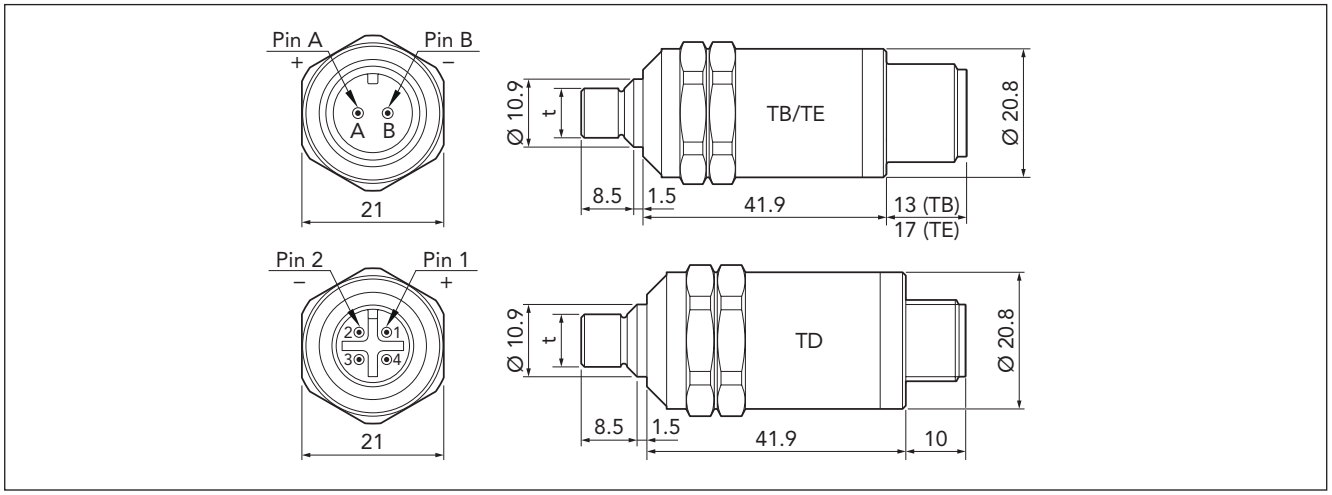
Vibration Transducers and Transmitters

DuoTech Accelerometers

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DuoTech accelerometer, SLC100 series



DuoTech is an accelerometer used for vibration or shock pulse measurements, or both in combination. The combination of the two most commonly used methods for monitoring mechanical condition enables lubrication and bearing monitoring as well as the detection of vibration-related problems.

The housing and base are made of stainless acid-proof steel suitable for aggressive environments. The accelerometer is internally isolated in a Faraday shield providing maximum protection from ground loops and RF interference.

DuoTech is installed in a countersunk mounting hole identical to holes normally used by shock pulse transducers.

Technical specifications

Transverse sensitivity:	max. 10%
Base strain sensitivity:	0.01 m/s²/µ strain
Frequency range, vibration:	2 Hz to 10 kHz (±3 dB)
Settling time:	3 sec.
Bias point:	10 to 13V (typical 12V)
Power supply:	24 V, 4 to 5 mA
Temperature range:	–40° to +125 °C
Sealing:	IP65, IP66/67 (or higher) with sealed connector
Casing:	stainless acid-proof steel, Sandvik Grade: 1802, EN: 1.4523
Isolation:	case isolated, >10 Mohm
Thread (t):	M6x1.0, M8x1.25, M10x1.5, or UNC 5/16"-18
Torque limit:	10 Nm
Weight:	approx. 75 g
Transducer line:	max. 100 m to instrument, cable capacitance 210pF/m

Part number	Nom. sensitivity, main axis*	Meas. range, vibration	Meas. range, shock pulse
SLC141	10 mV/g	6000 m/s² = 600 g	10 to 95 dB
SLC144	100 mV/g	600 m/s² = 60 g	–12 to 75 dB

* Individual value given on the calibration chart.

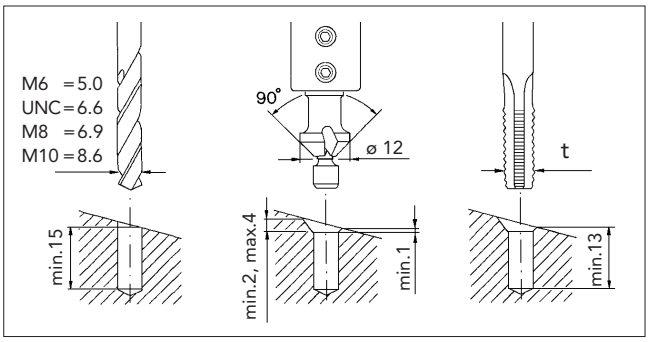
ARTICLE NO: SLC141 | TB | - XXX
A B C

A. Part number SLC144
B. Connection TB = 2-pin connector MIL-C-5015
C. Thread (t) M6, M8, M10, or UNC

ARTICLE NO: SLC144 | TX | - XXX
A B C

A. Part number SLC144
B. Connection TB = 2-pin connector MIL-C-5015
TD = 4-pin M12 male connector
TE = Extended 2-pin connector (17 mm)
C. Thread (t) M6, M8, M10, or UNC

SERIAL NO: XX | XX | XXX
Year | Week | Number



Installation tools

82053	Countersink with fixed pilot for M8x1.25
81027	Holder for countersink
81028	Countersink, angle 90°, 12 mm diameter
81030	Pilot for M6x1.0
81031	Pilot for M8 x1.25
81032	Pilot for UNC 5/16"-18
81033	Pilot for M10x1.5

To drill a mounting hole, use drill bits 5.0 (M6), 6.6 mm (UNC 5/16"), 6.9 mm (M8), or 8.6 (M10). Tighten and unscrew the accelerometer with a torque wrench and a long 21 mm socket.

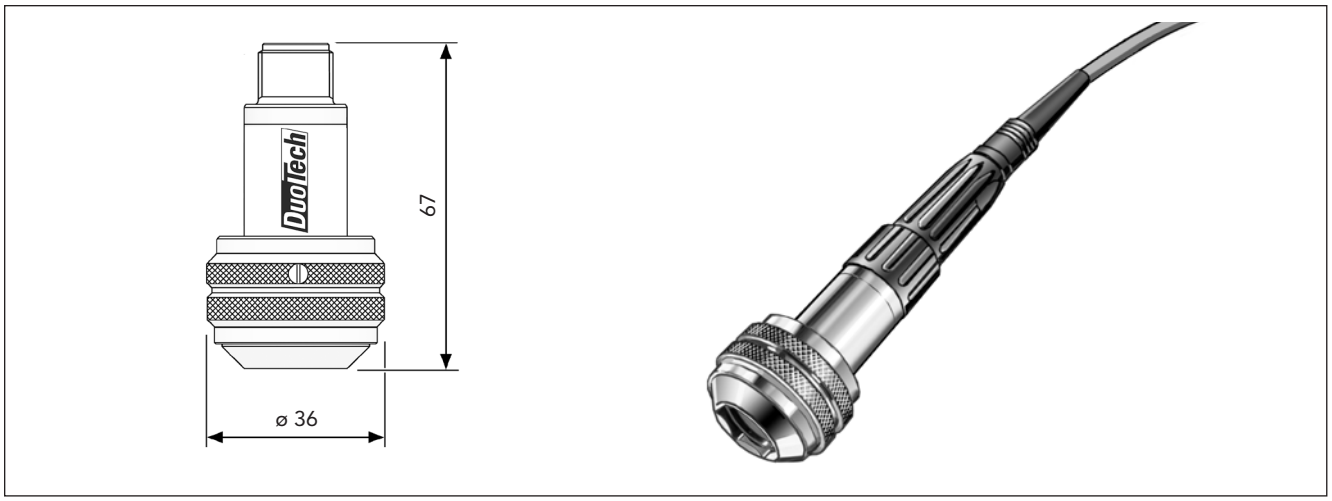
Accessories

15168	2-pin MIL-C-5015 connector, composite (TD-217)
16100	2-pin MIL-C-5015 connector, stainless steel (TD-314)
90381	Twisted pair cable, 2 wires with shield, high temperature (TD-394)
90389	Twisted pair cable, 2 wires with shield (TD-394)
90510	4-pin M12 female connector, straight (TD-540)
90511	4-pin M12 female connector, angled (TD-540)

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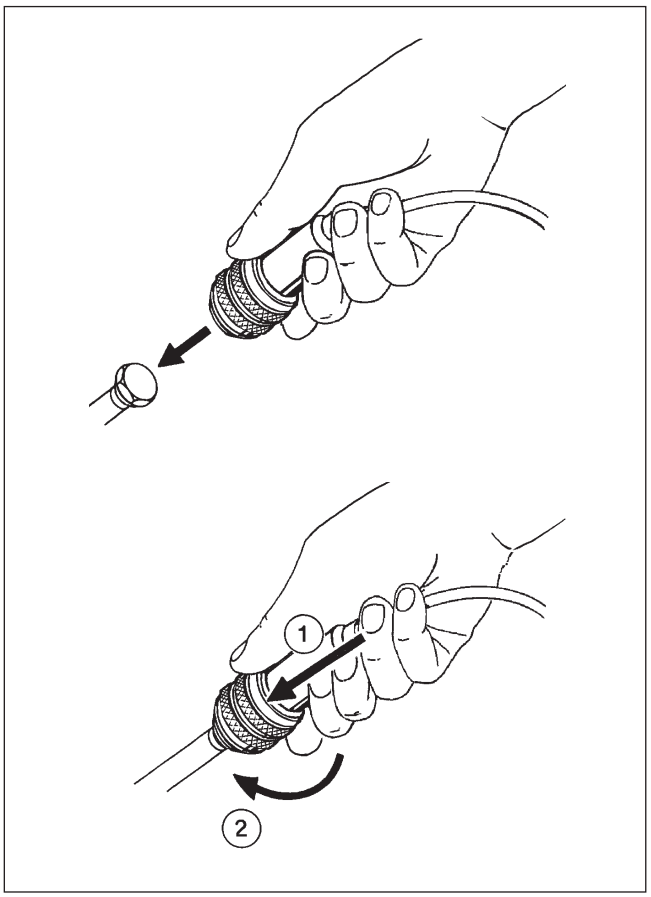
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DuoTech Accelerometer with Quick Connector TRC100



TRC100 is a DuoTech accelerometer with quick connector, used together with the handheld instrument Leonova Diamond and Emerald, for measurements on permanently installed adapters. The quick connector forms a bayonet connection together with the permanently installed adapter. The accelerometer is internally isolated in a Faraday shield providing maximum protection from ground loops and RF interference.

To attach the transducer to an adapter, push the transducer firmly onto the adapter and twist it clockwise. Twist counter clockwise to unfasten the transducer.



Technical specifications

Nom. sensitivity, main axis:	100 mV/g *
Measuring range, vibration:	600 m/s^2 = 60 g
Measuring range, shock pulse:	−12 to 75 dB
Transverse sensitivity:	max. 10%
Base strain sensitivity:	0.01 m/s^2/µ strain
Frequency range, vibration:	2 Hz to 5 kHz (±3 dB)
Settling time:	3 sec.
Bias point:	10 to 13V (typical 12V)
Power supply:	24 V, 4 to 5 mA
Design:	sealed IP66/67
Temperature range:	−40° to + 125° C
Material:	stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Sealings:	Viton (fluor rubber)
Connector:	2-pin MIL-C-5015
Cable length:	max. 100 m
Weight:	165 g

* Individual value given on the calibration chart.

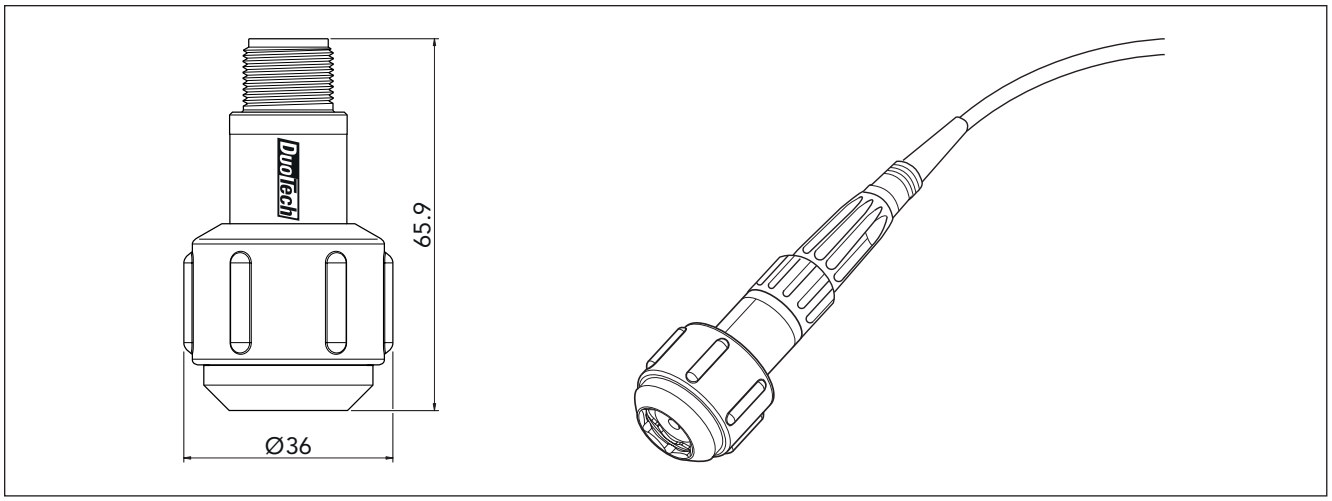
Part numbers

TRC100	DuoTech accelerometer with quick connector for SPM adapters
CAB110	Measuring cable, 8 pin-M12, 1.5 m, straight
CAB93	Measuring cable, 8 pin-2 pin, 1.5 m, straight
CAB82	Measuring cable, 8 pin-2 pin, 1.5 m, spiral
CAB83	Measuring cable, 8 pin-2 pin, 10 m
CAB83-L	Measuring cable, 8 pin-2 pin (L= length in meter)

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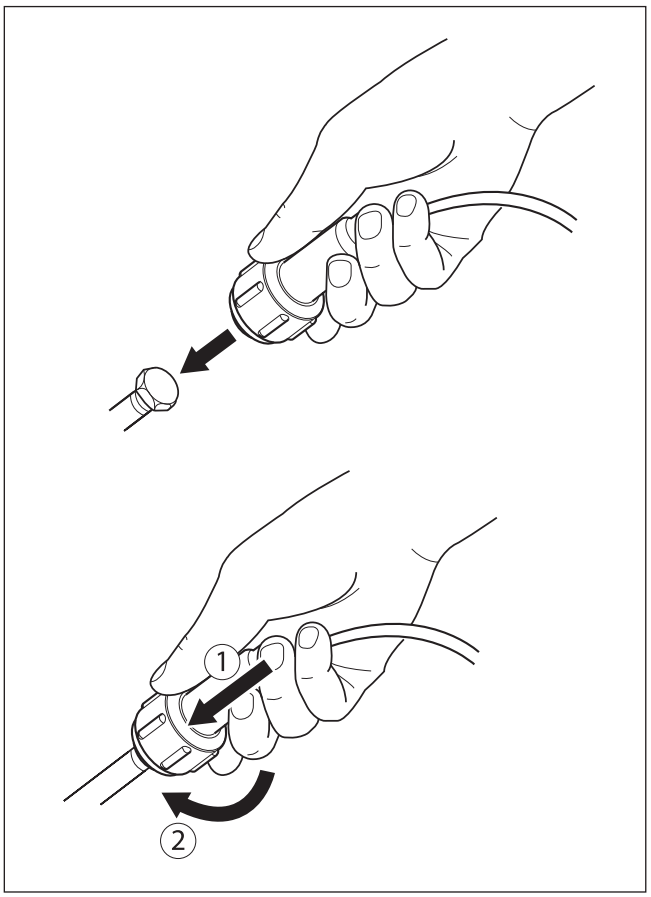
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DuoTech accelerometer with quick connector TRC150



TRC150 is a DuoTech accelerometer with quick connector, used together with the handheld instrument Leonova Diamond and Emerald, for measurements on permanently installed adapters. The quick connector forms a bayonet connection together with the permanently installed adapter. The accelerometer is internally isolated in a Faraday shield providing maximum protection from ground loops and RF interference.

To attach the transducer to an adapter, push the transducer firmly onto the adapter and twist it clockwise. Twist counter clockwise to unfasten the transducer.



Technical specifications

Nom. sensitivity, main axis:	100 mV/g*
Measuring range, vibration:	600 m/s² = 60 g
Measuring range, shock pulse:	−12 to 75 dB
Transverse sensitivity:	max. 10%
Base strain sensitivity:	0.01 m/s²/µ strain
Frequency range, vibration:	2 Hz to 3 kHz (±3 dB)
Settling time:	3 sec.
Bias point:	10 to 13 V (typical 12 V)
Power supply:	24 V, 4 to 5 mA
Design:	sealed IP66/67
Temperature range:	−40° to +125 °C
Material:	stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Material, sleeve:	Isothane 3085AU
Sealings:	Viton (fluor rubber)
Connector:	2-pin MIL-C-5015
Cable length:	max. 100 m
Weight:	165 g

* Individual value given on the calibration chart.

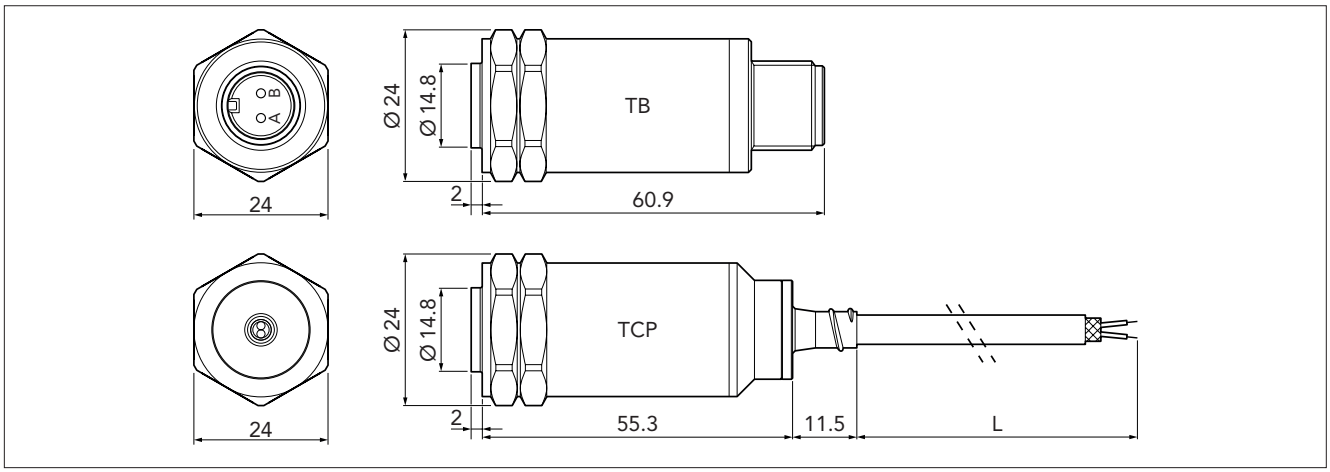
Part numbers

TRC150	DuoTech accelerometer with quick connector for SPM adapters
CAB93	Measuring cable, Lemo 8 pin-2 pin, 1.5 m, straight
CAB82	Measuring cable, Lemo 8 pin-2 pin, 1.5 m, spiral
CAB83	Measuring cable, Lemo 8 pin-2 pin, 10 m
CAB83-L	Measuring cable, Lemo 8 pin-2 pin (L = length in meter)

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4-20 mA vibration transmitters



The 4-20 mA vibration transmitters are accelerometers that provide a 4-20 mA output signal proportional to the true RMS value of vibration velocity. The transmitters can be connected to common process control systems (PLC, DCS). The electrical signal is isolated from the transmitter housing. The transmitters operate by using power from a standard 4-20 mA loop.

The transmitter is installed on a flat machine surface. For mechanical fastening, mounting studs (available as accessories) with thread size M6, M8, M10, or UNF 1/4" are used. The connection of the mounting studs is made through a tapped hole with an M8 thread on the transmitter.

Technical specifications

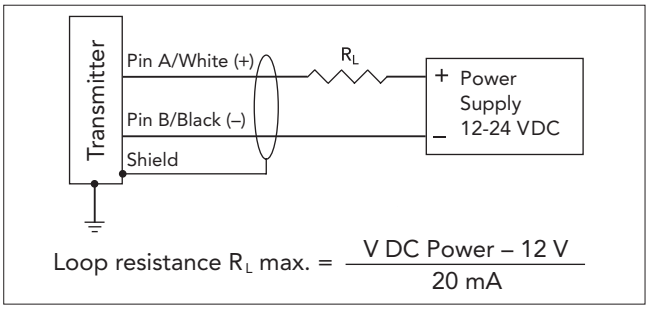
Output signal:	4 to 20 mA
Tolerance:	4 mA ±5%, 20 mA ±10%
Turn-on time:	< 60 seconds
Transverse sensitivity:	< 5%
Maximum acceleration:	15 g
Repeatability:	< 3%
Operating temperature:	–40° to +85 °C (–40° to +185 °F)
Power requirements:	12 to 24 V DC
Loop resistance:	R_L max. 600 Ω at 24 V DC
Casing:	stainless acid-proof steel, Sandvik 1802, EN:1.4523
Sealing:	IP66/67
Isolation:	case isolated, >10 Mohm
Cable type:	90389, shielded twisted pair. High temp. cable on request
Mounting thread:	M8, tapped hole
Torque limit:	10 Nm (7.4 lbf·ft)
Weight:	approx. 70 grams (2.5 oz) excl. cable

ARTICLE NO: SLD7XX | TXX - XX
A B C

A.	Part number	See table
B.	Connection	TB = 2-pin connector MIL-C-5015 TCP = Integral cable, adapter for protection tube
C.	Cable length (L)	3, 5, 10, or 20 m (integral)

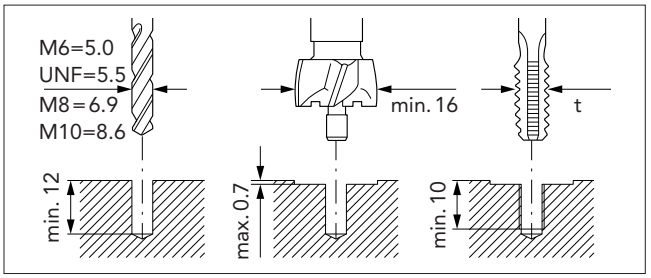
SERIAL NO: XX | XX | XXX
Year | Week | Number

Installation example



Loop resistance R_L max. = $\frac{\text{V DC Power} - 12\ \text{V}}{20\ \text{mA}}$

Part numbers	Measuring range	Frequency range
SLD722	0-12.5 mm/s, 0.5 ips	2-1000 Hz
SLD723	0-25 mm/s, 1 ips	2-1000 Hz
SLD724	0-50 mm/s, 2 ips	2-1000 Hz
SLD732	0-12.5 mm/s, 0.5 ips	10-1000 Hz
SLD733	0-25 mm/s, 1 ips	10-1000 Hz
SLD734	0-50 mm/s, 2 ips	10-1000 Hz



Installation tools

81027	Holder for counterbore
81057	Counterbore, diameter 20 mm
81030	Pilot for M6 and UNF 1/4"-28
81031	Pilot for M8
81033	Pilot for M10

To drill the installation hole, use drill bit 6.9 mm (M8), 8.6 mm (M10), or 5.5 mm (M6 and UNF 1/4"-28). Tighten the transmitter with a 24 mm torque wrench.

Accessories

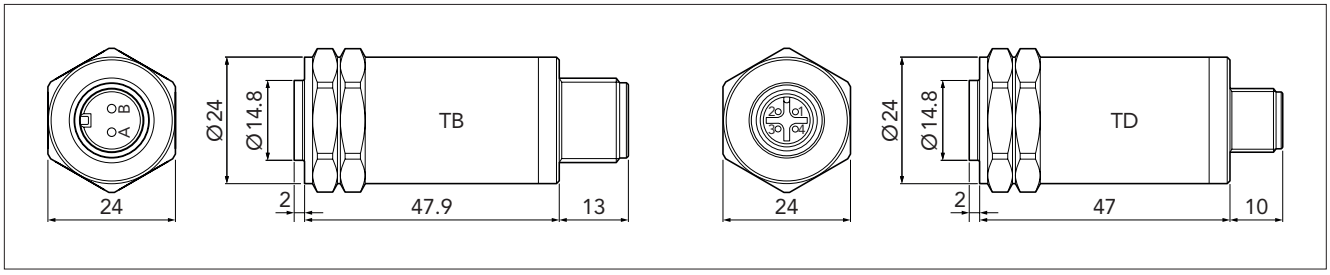
18177	Mounting stud M8-M6 (TD-287)
18178	Mounting stud M8-M10 (TD-287)
18179	Mounting stud M8-UNF 1/4"x28 (TD-287)
18180	Mounting stud M8-M8 (TD-287)

CE

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Vibration transducer, SLD144



The vibration transducer SLD144 is a piezo-electric accelerometer of compression type with built-in electronics, designed for vibration monitoring of industrial machinery. The electrical signal is isolated from the transducer housing.

The transducer is installed on a flat machine surface and connected via a twisted pair cable with a 2-pin or 4-pin connector. The connection of mounting studs (available as accessories) is made through a tapped hole with an M8 thread on the transducer. For vibration transducers with side entry, see TD-636.

In addition to acceleration measurement, temperature measurement is available as an option for SLD144. When used with the Intellinova Parallel EN online system (TD-562), the transducer can measure temperature in the –20° to +120 °C range. Temperature measurement is performed above 10 kHz, where it does not interfere with the acceleration signal.

Technical specifications

Transverse sensitivity:	max. 10 %
Base strain sensitivity:	0.01 m/s²/µ strain typical
Linear frequency range:	2 Hz to 10 kHz (±1 dB)
Max. peak acceleration:	600 m/s² = 60 g
Settling time:	3 sec
Operating temperature:	–40° to +125 °C (–40° to +257 °F)
Power requirements:	24 V, 2 to 5 mA
Casing:	stainless acid-proof steel, Sandvik 1802, EN:1.4523
Sealing:	IP66/67
Isolation:	case isolated, >10 Mohm
Cable length:	max. 100 m (328 ft)
Cable capacitance:	210 pF/m
Mounting thread:	M8, tapped hole
Torque limit:	10 Nm (7.4 lbf·ft)
Weight:	approx. 110 grams (4 oz)

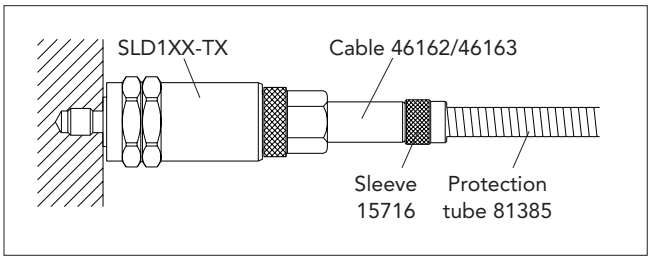
ARTICLE NO: SLD144 | TX | - | X
A B C

A.	Part number	SLD144
B.	Connection	TB = 2-pin connector MIL-C-5015 TD = 4-pin M12 connector
C.	Temperature	T = temperature measurement (optional)

SERIAL NO: X X | X X | X X X

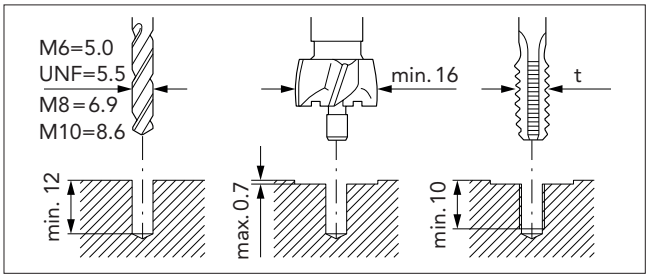
Year | Week | Number

Installation example



Part number	Frequency range (±1 dB)	Sensitivity *	Bias (typical)
SLD144	2–10 000 Hz	10 mV/m/s² = 100 mV/g	10–13 V (12 V)

* Individual value given on the calibration chart.



Installation tools

81027	Holder for counterbore
81057	Counterbore, diameter 20 mm
81030	Pilot for M6 and UNF 1/4"-28
81031	Pilot for M8
81033	Pilot for M10

To drill the installation hole, use drill bit 6.9 mm (M8), 8.6 mm (M10), or 5.5 mm (M6 and UNF 1/4"-28). Tighten the transducer with a 24 mm torque wrench.

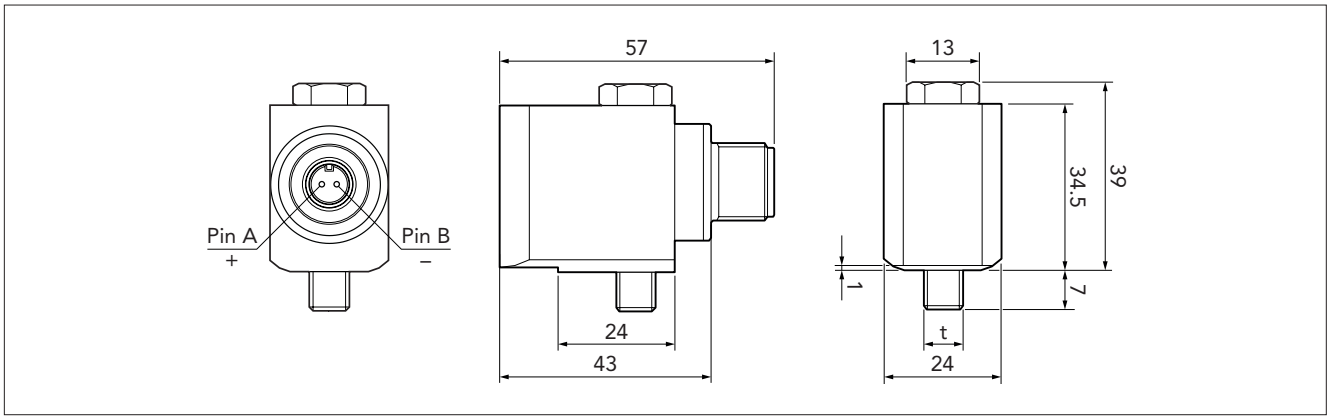
Accessories

18177	Mounting stud M8-M6 (TD-287)
18178	Mounting stud M8-M10 (TD-287)
18179	Mounting stud M8-UNF 1/4”x28 (TD-287)
18180	Mounting stud M8-M8 (TD-287)

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Vibration transducer, SLD144S



The vibration transducer SLD144S is a piezo-electric accelerometer of compression type with side entry and built-in electronics, designed for vibration monitoring of industrial machinery. The electrical signal is isolated from the transducer housing.

The transducer is installed on a flat machine surface and connected via a twisted pair cable with a 2-pin connector. The flat machine surface must be min. 30 mm in diameter (min. 16 mm in diameter when using mounting base 15757, 15802, or 17769). The transducer has a captured bolt for installation. For vibration transducers with top entry, see TD-635.

Technical specifications

Nominal sensitivity, main axis:	10 mV/m/s² * =100 mV/g
Transverse sensitivity:	max. 10%
Base strain sensitivity:	0.01 m/s²/μ strain typical
Linear frequency range:	2 Hz to 10 kHz (±1 dB)
Max. peak acceleration:	600 m/s² = 60 g
Settling time:	3 sec
Bias point:	10 to 13 V (typical 12 V)
Temperature range:	–40° to +125 °C (–40° to 257 °F)
Power requirements:	24 V, 2 to 5 mA
Isolation:	case isolated, > 10 Mohm
Casing:	stainless acid-proof steel Sandvik 1802, EN:1.4523
Sealing:	IP66/67
Thread (t):	M6x1.0, M8x1.25 or UNF 1/4"-28
Torque limit:	10 Nm (7.4 lbf·ft)
Weight:	200 grams (7 oz)
Connection:	2-pin connector, MIL-C-5015 style
Cable length:	max. 100 m (328 ft)
Cable capacitance:	210 pF/m

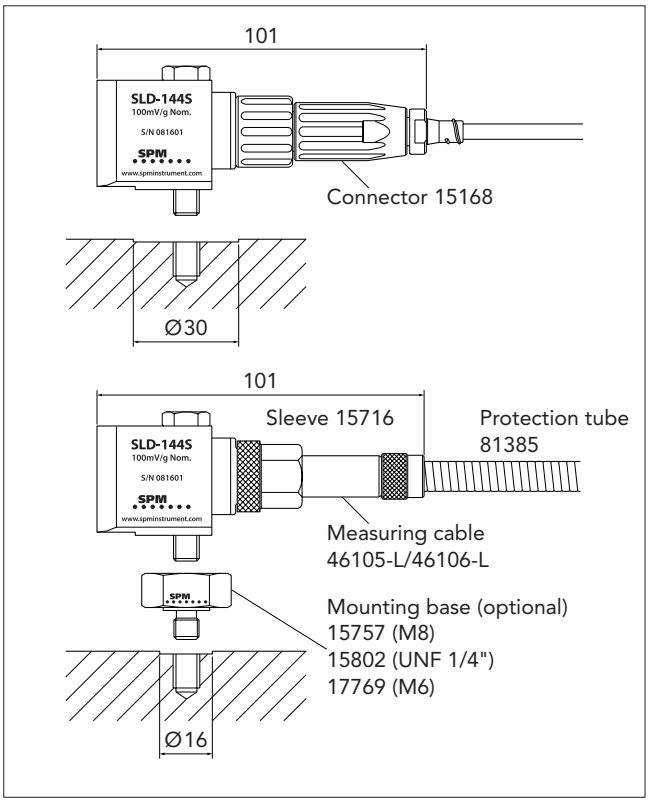
* Individual value given on the calibration chart.

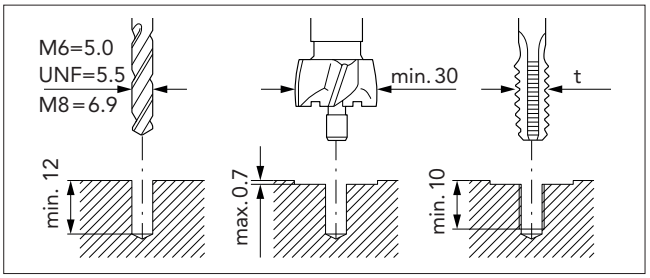
ARTICLE NO: SLD144S - XXX
A B

A. Part number SLD144S
B. Thread (t) M6, M8, or UNF

SERIAL NO: XX XX XXX
Year | Week | Number

Installation examples





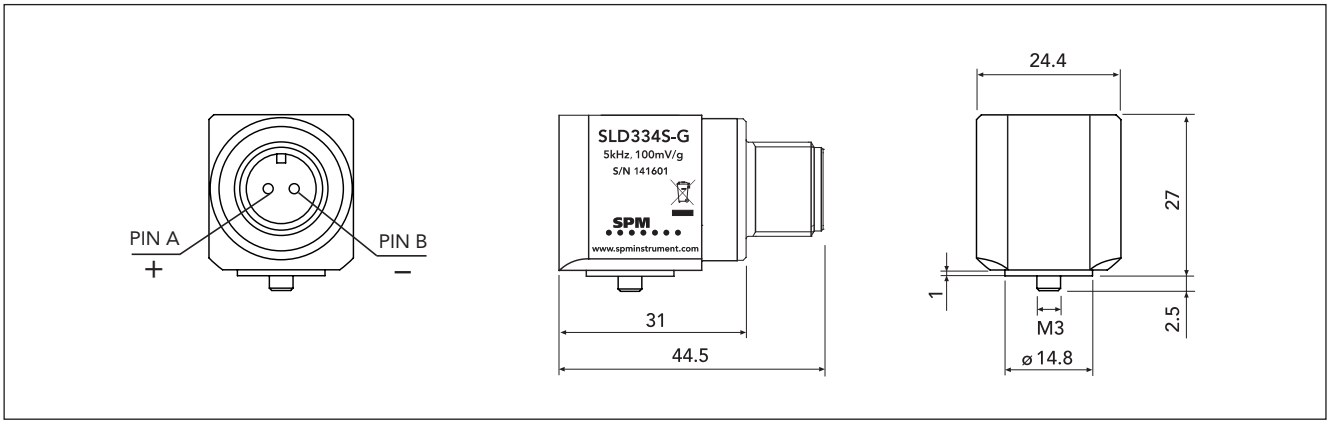
Installation tools

81393 Holder for counterbore
81394 Pilot for M6 and UNF 1/4"-28
81395 Pilot for M8
81396 Counterbore, diameter 30 mm

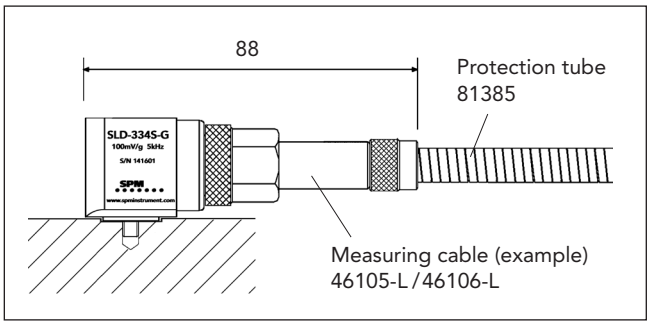
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Vibration transducer SLD334S-G



The glue-on vibration transducers SLD334S-G with side entry based on micro-electro-mechanical-systems (MEMS) technologies and can replace standard transducers on thinwalled bearing housings and on machines where the drilling of standard mounting holes would affect equipment warranties. It has a flat, circular base which is glued to the measuring point, and an M3 screw for unloading and fixing. The electrical signal is isolated from the transducer housing.

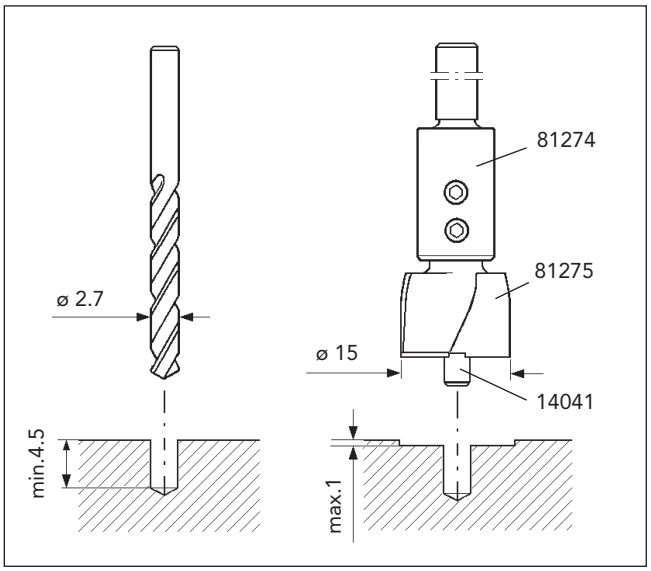


Mounting

The transducer is mounted against a smooth, flat surface on the machine. Use a 2.7 mm drill for the mounting hole and make it 4.5 mm deep. Always plane the surface with a counterbore, min. diameter 15 mm.

The recommended adhesives are 3M DP810, Loctite 638 or Loctite 480. Please read the instructions for use and follow them carefully. The screw is self-threading. Screw the transducer into the mounting hole by hand with modest torque. The torque should not be more than 1 Nm. Wait until the adhesive has hardened before connecting the cable.

The transducer is connected via a twisted pair cable with 2 pin connector. In moist environment, use the sealed connector with integrated measuring cable SPM 46162/46163 together with cable protection tube SPM 81385.



Technical specifications

Nominal sensitivity:	10 mV/m/s² = 100 mV/g*
Transverse sensitivity:	max. 5%
Typical base strain sensitivity:	0.01 m/s²/µ strain
Linear frequency range:	1 to 1000 Hz (±1 dB) 1 to 2000 Hz (±3 dB)
Max. peak acceleration:	10 g
Settling time:	3 sec
Bias point:	8-12 V (type 11 V)
Temperature range:	–20° to +85 °C (–4° to +185 °F)
Power requirements:	24 V/2 to 5 mA
Casing:	Stainless acid proof steel, Sandvik 1802, EN:14523
Sealing:	IP67 together with appropriate connector
Isolation:	Case isolated, > 1 Mohm
Recommended adhesive:	3M DP810, Loctite 638 or 480
Weight:	110 grams
Connector type:	Compatible with 2 pin MIL-C-5015 style
Cable length:	max. 100 m

* Individual value given on the calibration chart.

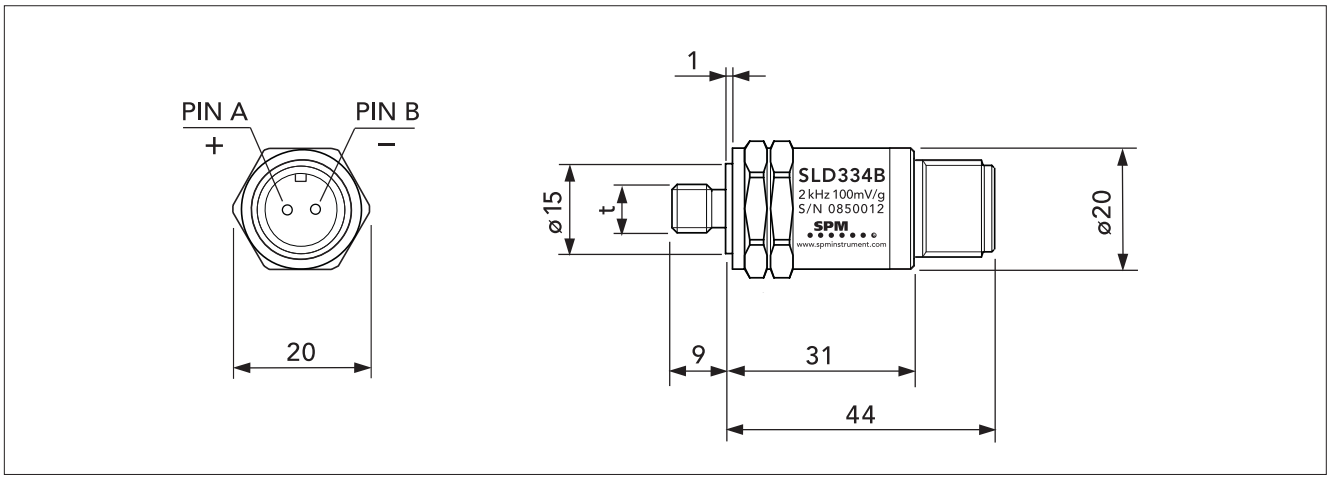
Mounting tools

14042	Counterbore, complete
81274	Holder for counterbore
81275	Counterbore, diameter 15 mm
14041	Pilot, diameter 2.7 mm
90472	Adhesive, 3M DP810 (50 ml)

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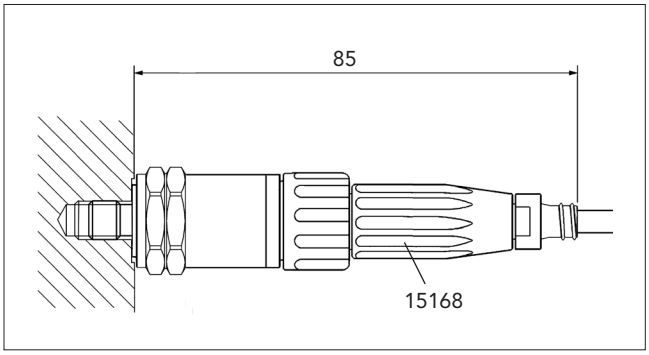
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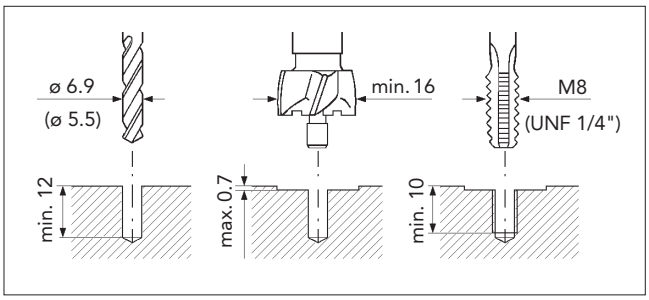
Vibration transducers, series SLD 300



The vibration transducers series SLD300 are small accelerometers based on micro-electro-mechanical-systems (MEMS) technologies, designed for vibration monitoring of industrial machinery. The electrical signal is isolated from the transducer housing.

The transducer is mounted against a smooth, flat surface min. 16 mm in diameter. The transducer is connected via a twisted pair cable with 2 pin connector. In moist environment, use the sealed connector with integrated measuring cable SPM 46162/46163 together with cable protection tube SPM 81385.





Technical specifications

Transverse sensitivity:	max. 5 %
Typical base strain sensitivity:	0.01 m/s²/µ strain
Linear frequency range:	1 to 1000 Hz (±1 dB) 1 to 2000 Hz (±3 dB)
Max. peak acceleration:	10 g
Settling time:	3 sec
Temperature range:	–20° to +85° C (–4° to +185° F)
Power requirements:	24 V / 2 to 5 mA
Casing:	Stainless acid proof steel Sandvik 1802, EN:14523
Sealing:	IP66/67 together with appropriate connector
Isolation:	Case isolated, > 1 Mohm
Thread (t):	M8x1.25 or UNF 1/4"-28
Torque limit:	10 Nm (7.4 lbf·ft)
Weight:	55 grams (2 oz)
Connector type:	Compatible with 2 pin MIL-C-5015 style
Cable length:	max. 100 m

Article number	Thread (t)	Nom. sensitivity *	Bias Point
SLD 322 B-M8	M8x1.25	4 mV/m/s² = 40 mV/g	6-9.5 V (typ 8 V)
SLD 322 B-UNF	UNF 1/4-28	4 mV/m/s² = 40 mV/g	6-9.5 V (typ 8 V)
SLD 334 B-M8	M8x1.25	10 mV/m/s² = 100 mV/g	9-13 V (typ 11 V)
SLD 334 B-UNF	UNF 1/4-28	10 mV/m/s² = 100 mV/g	9-13 V (typ 11 V)

* Individual value given on the calibration chart.

Mounting tools

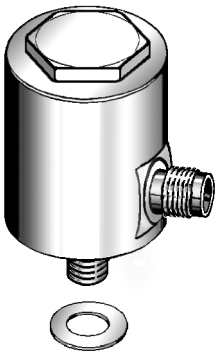
81027 Holder for counterbore
81057 Counterbore, diameter 20 mm
81030 Pilot for UNF 1/4"
81031 Pilot for M8

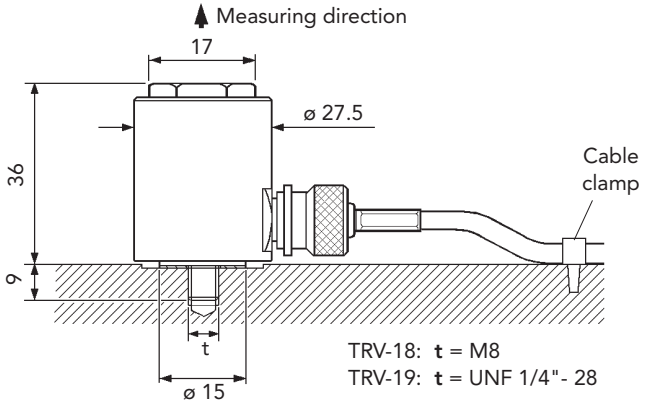
To drill the mounting hole, use drill bit 6.9 mm (M8) or 5.5 mm (UNF 1/4"). Torque the transducer with a 24 mm torque wrench.

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Vibration Transducer TRV-18/19

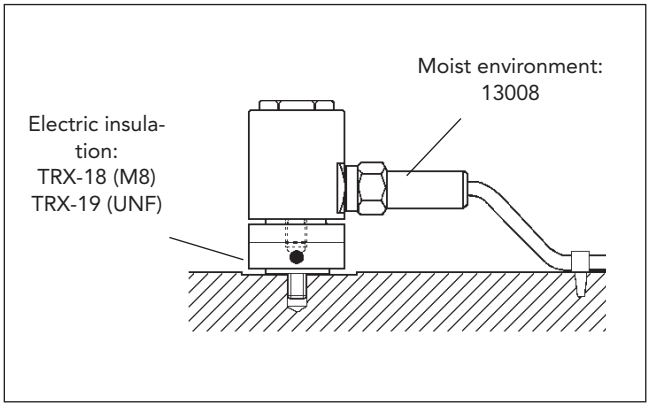


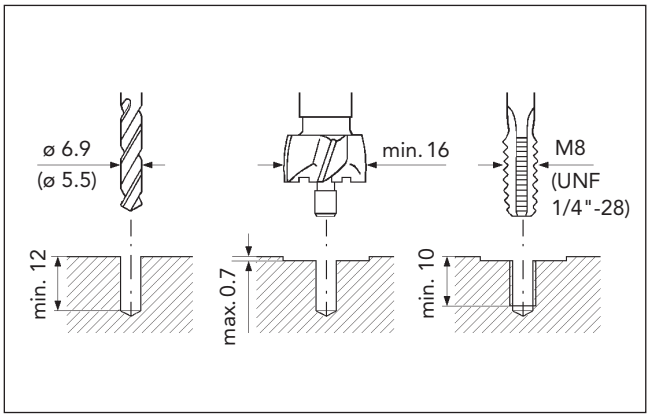


The transducers TRV-18 and TRV-19 are piezo-electric accelerometers of compression type with built-in preamplifier, designed for vibration monitoring of industrial machinery. They are used in permanent installations with the CMM System, Intellinova and MG-4. The cable length between transducer and measuring unit is max. 50m (165 ft).

The transducer is mounted against a smooth, flat surface on the machine. TRV-18 has thread size M8 and TRV-19 has UNF 1/4"-28. The transducers are delivered with three washers for adjusting the connector angle. Each washer turns the transducer 90°. The coaxial cable (90005-L or 90267-L) with TNC connector must be secured with a clamp close to the transducer.

In moist environments, use sealing TNC cable plugs 13008 to prevent cable corrosion. For electric insulation, use insulation foot TRX-18/TRX-19.





To drill the mounting hole, use drill bit 6.9 mm for M8 and 5.5 mm for UNF 1/4"-28. Torque and unscrew the transducer with a torque wrench and a 17 mm socket (81086).

Technical specifications

Nominal sensitivity, main axis:	1.2 mV/m/s² *
Transverse sensitivity:	max. 10%
Typical base strain sensitivity:	0.01 m/s²/μ strain
Linear frequency range:	3 to 1000 Hz
Max. peak acceleration:	600 m/s²
Temperature range:	−20 °C to +125 °C (−4 °F to +260 °F)
Typical temperature drift:	0.25%/°C
Housing, base:	stainless acid-proof steel, Sandvik Grade:1802, EN:1.4523
Design:	sealed
Connector tightness:	IP65 with TNC connector, IP67 with connector 13008
Weight:	135 g (5 oz)
Connector type:	TNC
Torque limit:	10 Nm (7.4 lbf/ft)
Power requirement:	12 to 24 V DC
Constant current:	2 to 5 mA
Settling time:	3 sec
Bias point:	5 to 11 V (typ 7 V)

* Individual value given on the calibration chart.

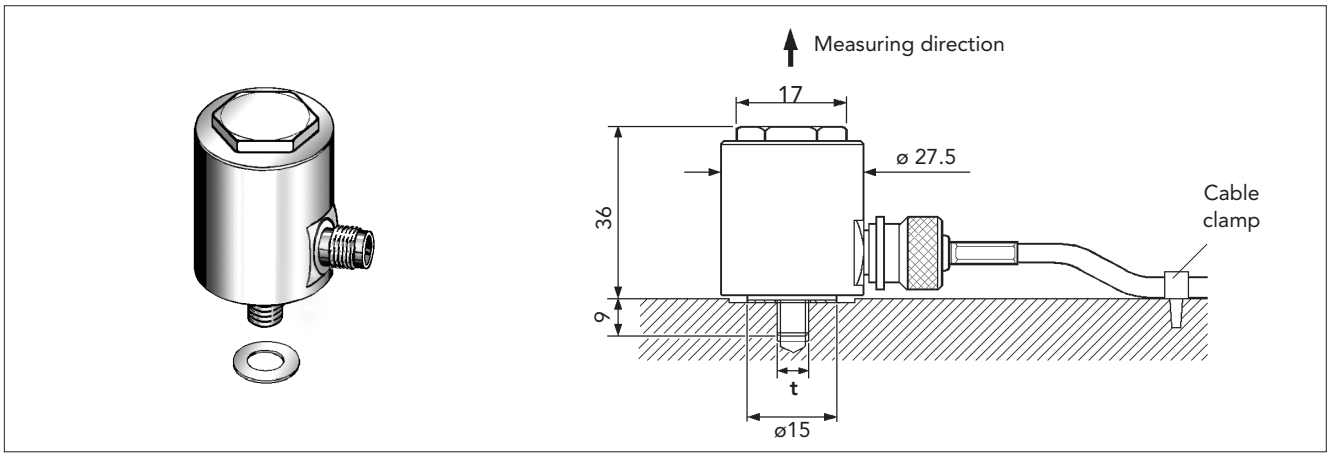
Mounting tools

81027	Holder for counterbore
81057	Counterbore, diameter 20 mm
81030	Pilot for UNF 1/4"-28 (TRV-19)
81031	Pilot for M8 (TRV-18)

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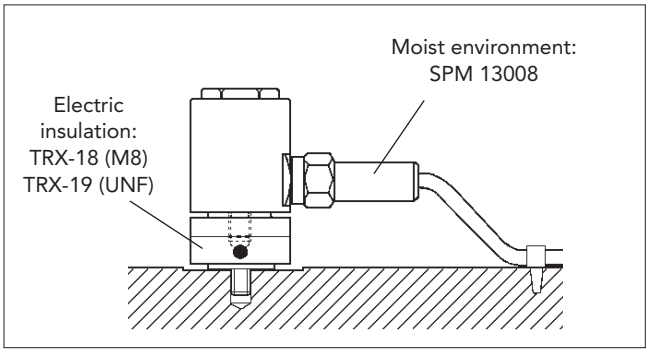
Vibration Transducer TRV-20/21

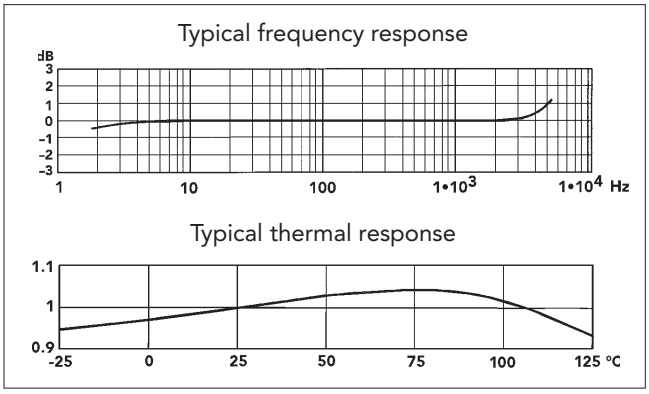


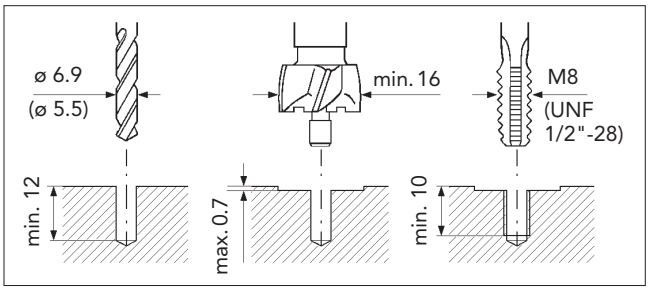
The transducers TRV-20 and TRV-21 are piezo-electric accelerometers of compression type with built-in preamplifier, designed for vibration monitoring of industrial machinery. The transducers are used in permanent installations with Intellinova, the CMS System (measuring unit VCM) and with the hand-held instrument Leonova. The cable length between the transducer and the measuring unit is max. 50 m (165 ft).

The transducer is mounted against a smooth, flat surface on the machine. TRV-20 has thread size M8 and TRV-21 has UNF 1/4"-28. The transducers are delivered with three washers for adjusting the connector angle. Each washer turns the transducer 90°. The coaxial cable (SPM 90005-L or 90267-L) with TNC connector must be secured with a clamp close to the transducer.

In moist environments, use sealing TNC cable plugs SPM 13008 to prevent cable corrosion. For electric insulation, use insulated installation foot TRX-18/19.







Technical data

Nominal sensitivity, main axis:	4.0 mV/m/s² *
Transverse sensitivity:	max. 10%
Typical base strain sensitivity:	0.01 m/s²/µ strain
Linear frequency range:	2 to 5000 Hz
Max. peak acceleration:	600 m/s²
Temperature range:	-20° C to +125° C (-4° F to +260° F)
Power requirements:	12–24 V, 2–5 mA
Casing:	Stainless acid proof steel, Sandvik Grade:1802,
EN:1.4523	
Design:	Sealed
Connector tightness	IP65 with TNC connector IP 67 with conn. SPM13008
Weight:	135 grams (5 oz)
Connector type:	TNC
Torque limit:	10 Nm (7.4 lbf·ft)
Bias point:	6 to 12 V (typ 8 V)

* Individual value given on the calibration chart.

Mounting tools

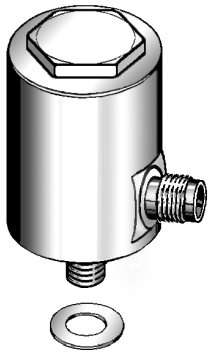
81027 Holder for counterbore
81057 Counterbore, diameter 20 mm
81030 Pilot for UNF 1/4" (TRV-21)
81031 Pilot for M8 (TRV-20)

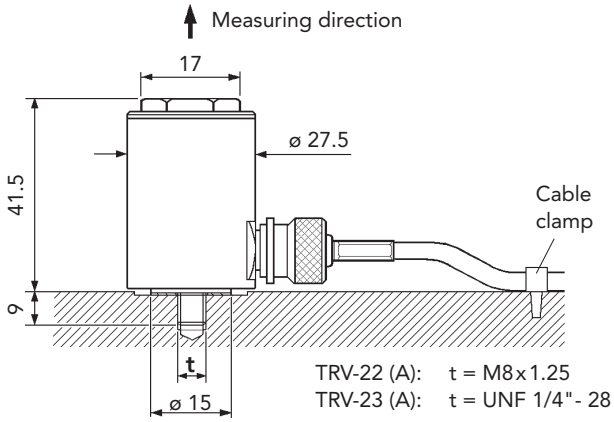
To drill the mounting hole, use drill bit 6.9 mm for M8 and 5.5 mm for UNF 1/4". Torque and unscrew the transducer with a torque wrench and a 17 mm socket (SPM 81086).

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Vibration Transducer TRV-22/23 (A)





The transducers TRV-22/23 (A) are piezo-electric accelerometers of compression type, designed for vibration monitoring of industrial machinery. They can be used together with handheld instruments or in permanent installations. Max. cable length between transducer and measuring unit is 10 m (33 ft).

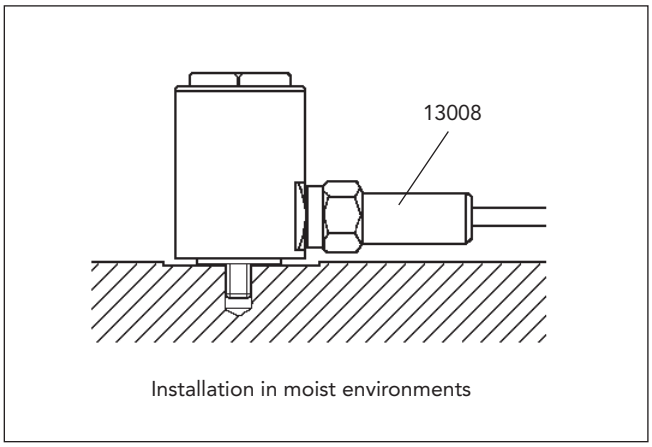
The transducer is mounted in a threaded hole on a smooth, flat surface on the machine. It is delivered with three washers for adjusting the connector angle. Each washer turns the transducer 90°. Fix low noise coaxial cable (90176-L or 90292-L) with TNC connector with a clamp close to the transducer.

For installations in moist environments, use sealing TNC cable plugs (13008) to prevent cable corrosion.

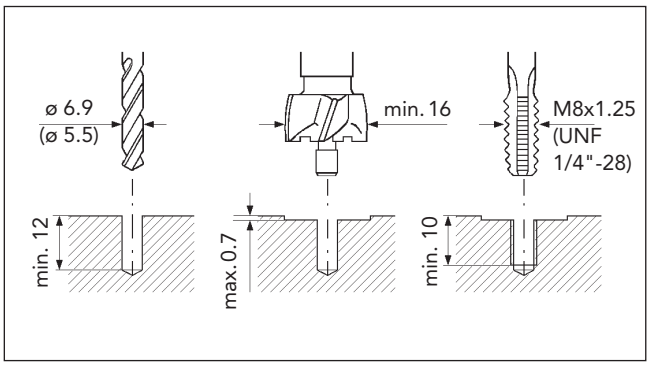
Technical specifications

Nominal sensitivity, main axis	
TRV-22/TRV-23:	10 pC/m/s² (7-12 pC/m/s²) *
TRV-22A/TRV23A:	12 pC/m/s² (11-13 pC/m/s²) *
Transverse sensitivity:	max. 10%
Typical base strain sensitivity:	0.01 m/s²/µ strain
Linear frequency range:	0 to 5000 Hz
Max. peak acceleration:	600 m/s²
Temperature range:	–30 °C to +150 °C (–22 °F to +302 °F)
Typical temperature drift:	0.25%/°C
Housing, base:	stainless acid-proof steel, Sandvik Grade:1802, EN:1.4523
Design:	sealed
Connector tightness:	IP65 with TNC connector IP67 with connector 13008
Weight:	171 g (6 oz)
Connector type:	TNC
Torque limit:	10 Nm (7.4 lbf/ft)

* Individual value given on the calibration chart.



Installation in moist environments



To drill the mounting hole, use drill bit 6.9 mm (M8x1.25) or 5.5 mm (UNF 1/4"-28). Torque and unscrew the transducer with a torque wrench and a 17 mm socket (81086).

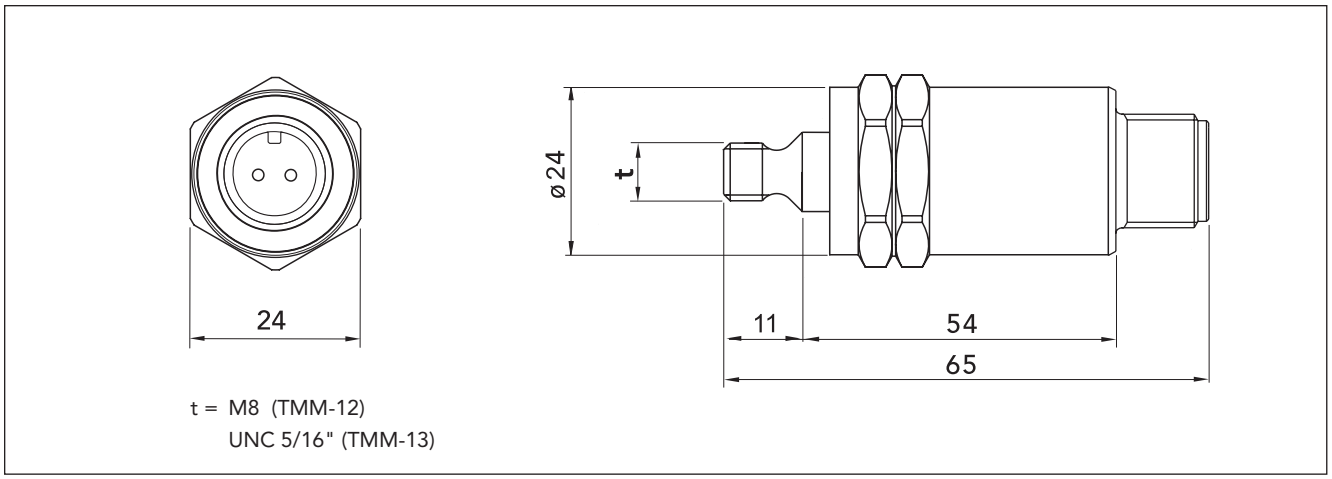
Part numbers

TRV-22	Vibration transducer, M8x1.25
TRV-23	Vibration transducer, UNF 1/4"-28
TRV-22A	Vibration transducer, M8x1.25
TRV-23A	Vibration transducer, UNF 1/4"-28
13008	Sealing TNC cable plug
81027	Holder for counterbore
81057	Counterbore, diam. 20 mm
81030	Pilot for UNF 1/4"
81031	Pilot for M8

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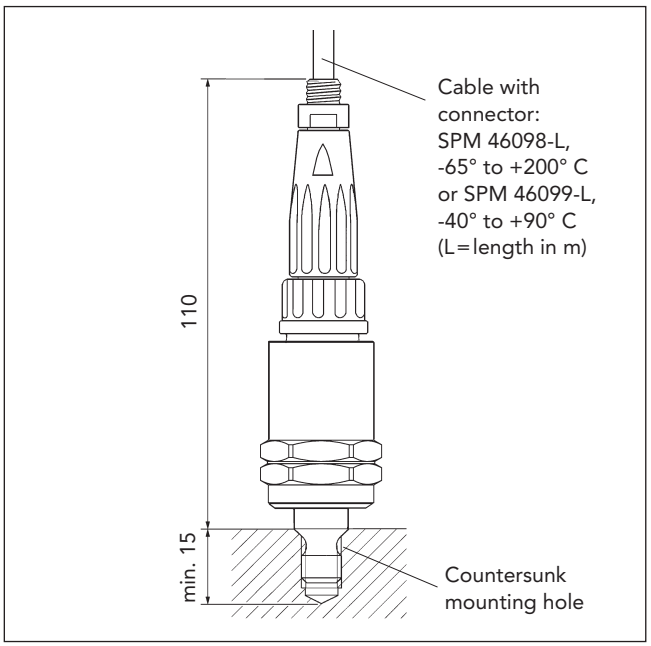
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4-20 mA Temperature Transmitter TMM-12 / 13

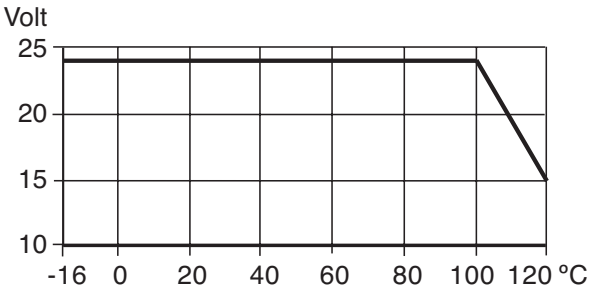


TMM-12 and TMM-13 are temperature transmitters with a measuring range from –16° to +120° C and an analog output of 4 to 20 mA. The transmitters are mounted in countersunk mounting holes. TMM-12 has thread size M8 and TMM-13 has thread size UNC 5/16". The transmitters are connected via twisted pair cable with 2 pin connector, compatible with 2 pin MIL-C-5015 style. They use a power supply of 12 to 24 V DC (see derating curve).

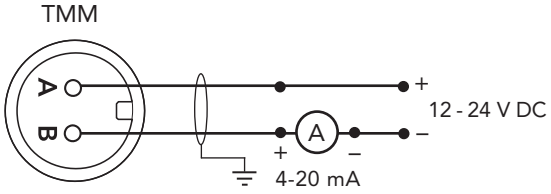
TMM-12 / 13 transmitters can be connected to the CMM System (DMM and VDM-14/15 measuring units), to Intellinova (Analog Monitoring Unit) or to CMS System (AMS unit) for continuous machine condition monitoring. They can also be connected to the analog inputs on a PLC or similar.



Derating curve for power supply



Electrical connection



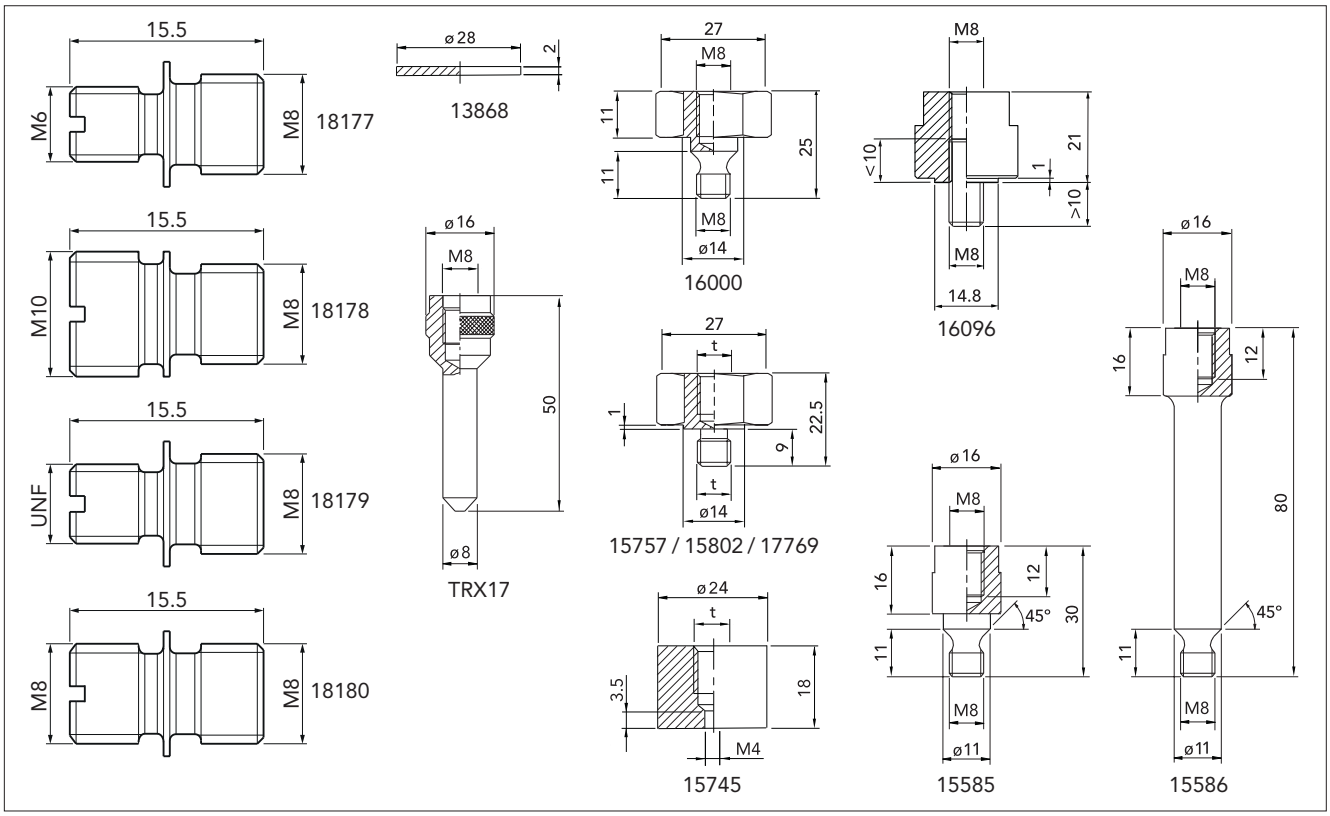
Technical specifications

Measuring range:	–16° to 120 °C (3° to 248° F)
Output:	4 to 20 mA
Inaccuracy:	typical 1° C, max. 3° C at 25° C
Linearity deviation:	2% +0.5 °C
Long time stability:	0.4 °C
Temperature range:	–30° to 125° C (–22° to 257° F)
Power supply:	12 to 24 V DC, see derating curve
Loop resistance$_{max}$:	50 (U-7) Ω for U=12 to 24 V DC e.g. 400 Ω at 15 V
Housing:	stainless acid proof steel, Sandvik Grade:1802, EN:1.4523, Viton sealing, IP67
Mounting hole:	M8x1.25 (TMM-12), UNC 5/16-18 (TMM-13), 90° countersunk
Torque:	max. 15 Nm
Connector type:	SPM 15168 or compatible with 2 pin MIL-C-5015 style

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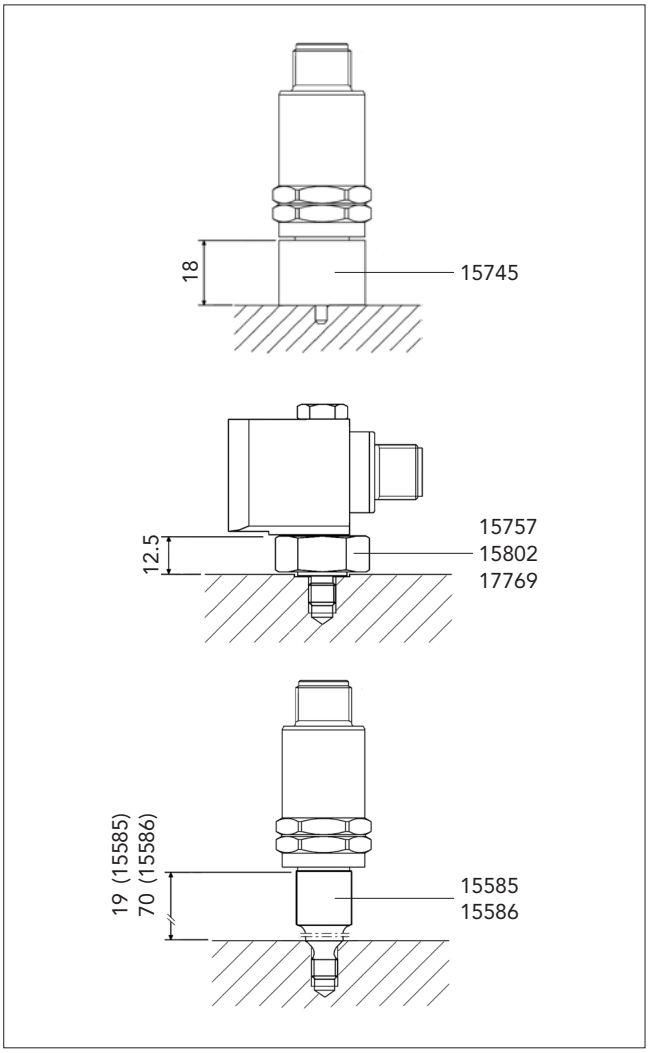
Accessories for vibration transducers and transmitters



Installation accessories for vibration transducers and vibration transmitters of type SLD:

TRX17 Hand-held probe tip, M8x1.25, in stainless steel SS2346. Not recommended for measurements above 1000 Hz
13868 Glue-on measuring pad, stainless steel EN4016
15757 Mounting base, M8x1.25, stainless steel AISI 316L
15802 Mounting base, UNF1/4-28, stainless steel AISI316L
17769 Mounting base, M6, stainless steel AISI316L
15745 Glue-on adapter, M8x1.25, stainless steel Sandvik 1802 (EN:1.4523), with an M4 for unloading and fixing
15868 Glue-on adapter, UNF1/4-28, stainless steel Sandvik 1802 (EN:1.4523), with an M4 for unloading and fixing
15585 Extension base, length 30 mm, M8x1.25, stainless steel SS2346
15586 Extension base, length 80 mm, M8x1.25, stainless steel SS2346
16000 Mounting base for countersunk mounting hole, M8x1.25, stainless steel AISI 316L
16096 Isolation foot for transducers M8x1.25, composite, with locking screw M8x1.25/length 20 mm
18177 Mounting stud M8-M6
18178 Mounting stud M8-M10
18179 Mounting stud M8-UNF 1/4"x28
18180 Mounting stud M8-M8

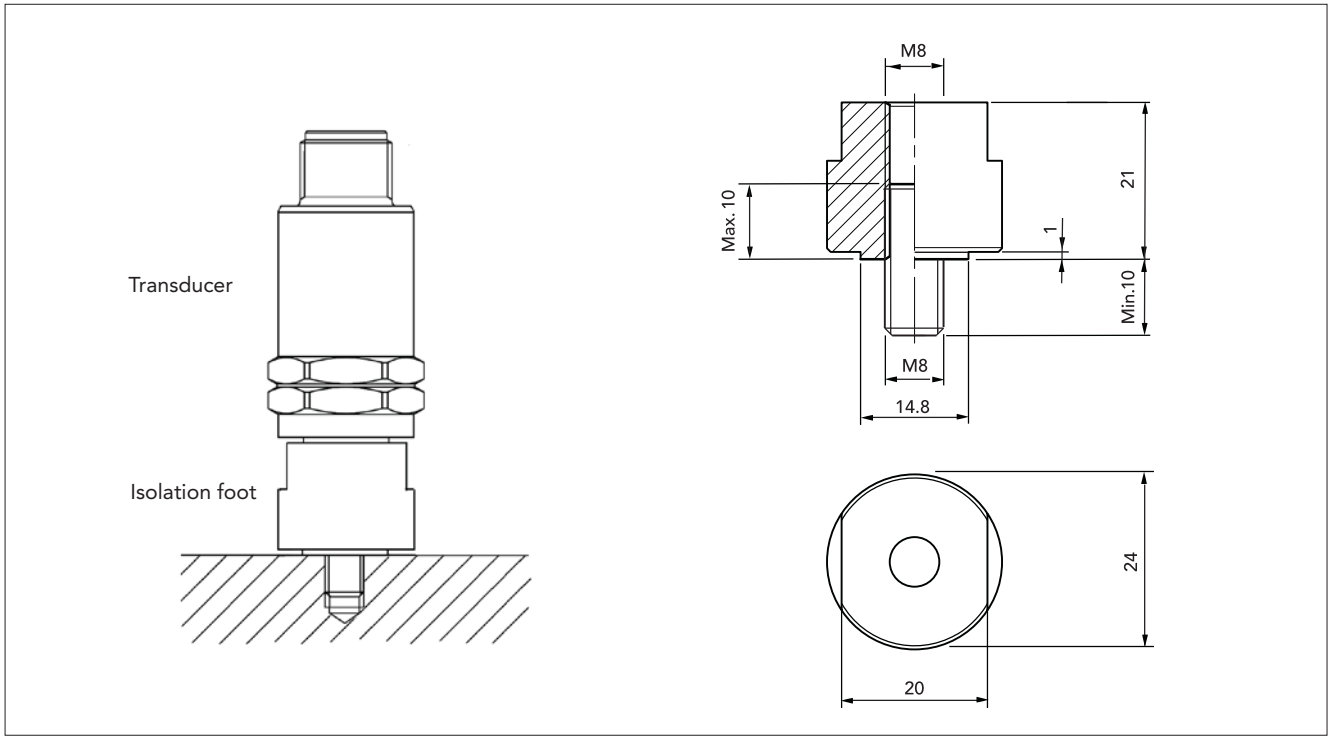
For magnetic mounting bases, see TD-548.



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Isolation Foot 16096 for Vibration Transducers



The isolation foot 16096 is most often used when the grounding condition influences a measurement and there is a need to open up the grounding of a transducer. The isolation foot is mounted on a smooth, flat and clean surface on the machine. The mounting hole should be threaded M8.

In addition to provide an electrical isolation it will also provide a thermal isolation of the transducer from the measuring surface, especially useful when the surface has high temperature changes. This can reduce any negative effects that the hot surface may have on the performance of the transducer.

The isolation foot will also act as a mechanical filter which means that it will change the sensitivity of the transducer for the higher frequencies. If accuracy is very important one should avoid using an isolation foot for 10 kHz measurement for this reason.

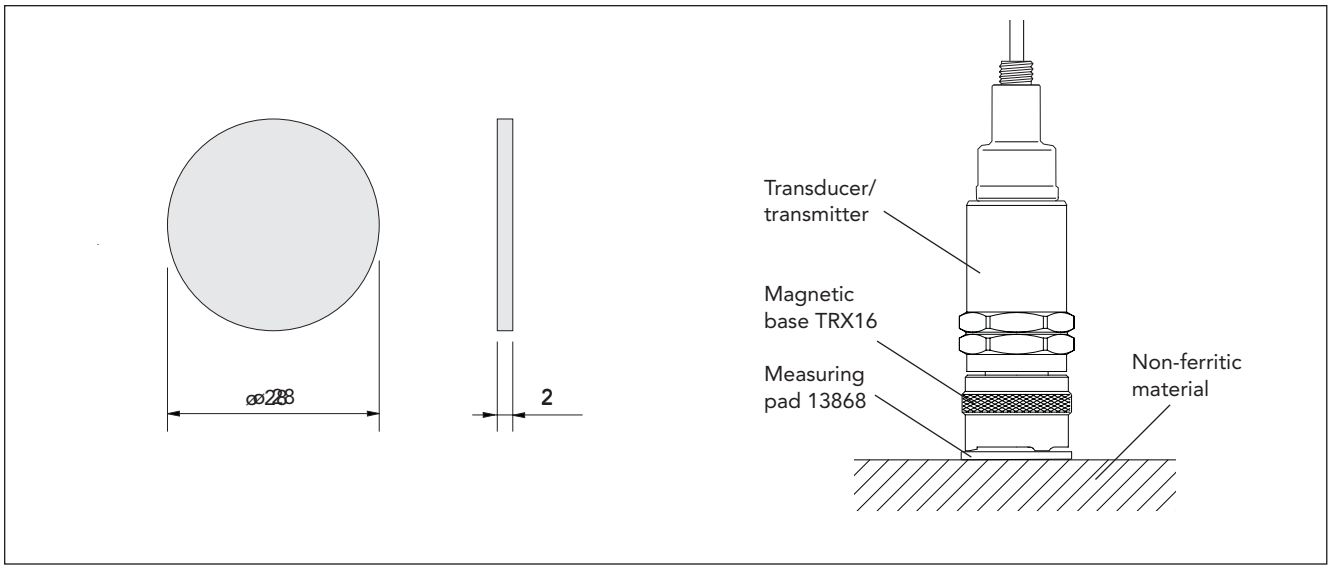
Technical specifications

Frequency range:	< 5 kHz
Operating temperature:	–40 to +125 °C (–40 to 257 °F)
Material:	Composite
Thread:	M8x1.25
Locking screw:	M8x1.25 length 20 mm
Torque limit, transducer:	10 Nm (7.4 lbf/ft)

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Glue-on Measuring Pad SPM 13868



The glue-on measuring pad 13868 is mounted on the measuring point when using transducers and other products with magnetic base on non-ferritic materials.

Mounting

Select a measuring point in accordance with the SPM rules. The surface has to be plane, clean and free from paint. If the surface is curved it should be planed with a counterbore, min. diameter 30 mm.

The recommended adhesives are 3M DP810, Loctite 638 or Loctite 480. Please read the instructions for use and follow them carefully. Wait until the adhesive has completely hardened before using the mounting pad.

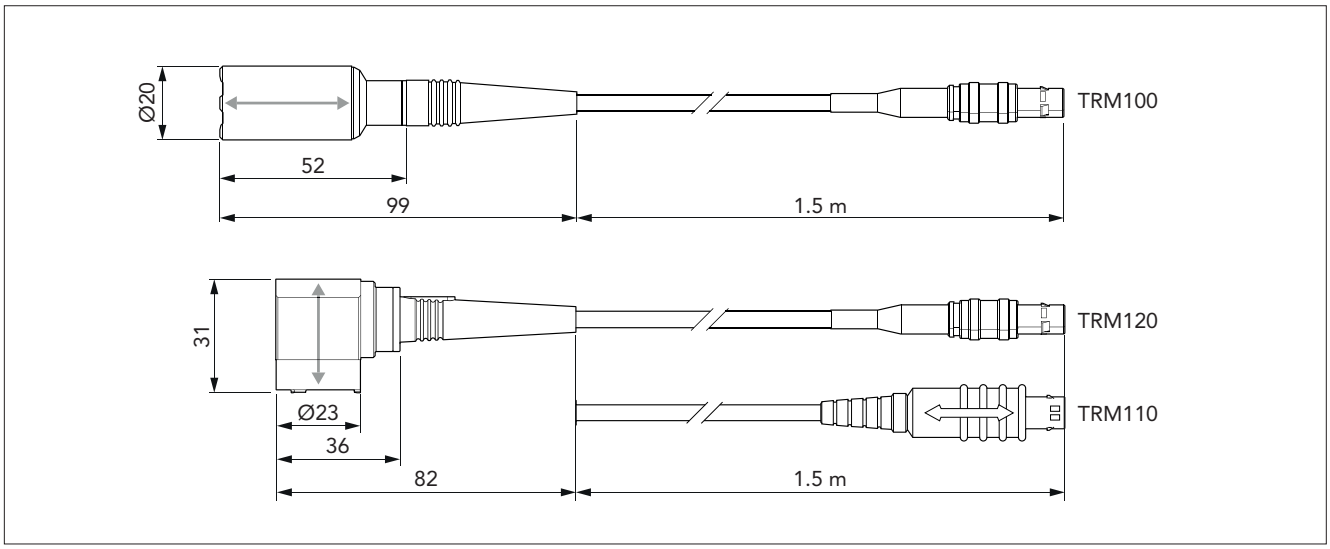
Technical specifications

Material:	stainless steel, ferritic, EN 1.4016
Dimensions:	diam. 28 x 2 mm
Adhesive:	3M DP810, Loctite 638, Loctite 480 or similar

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Vibration transducer TRM100/110/120



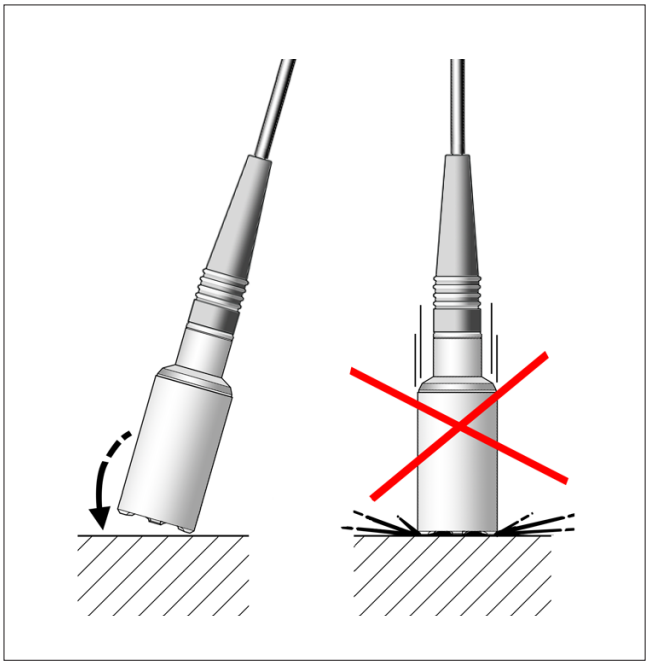
The vibration transducers are accelerometers based on micro-electro-mechanical-systems (MEMS) technologies, designed for vibration monitoring with the handheld instruments VibChecker (TRM100/120) and Leonova (TRM110).

The transducer has integral magnet for attachment to plain, clean metal parts with the main sensitivity axis pointing in the desired measuring direction. To get comparable results, measuring points should be clearly marked, so that the measurements can always be taken in the same spots.

Technical specifications

Nom. sensitivity, main axis:	10 mV/m/s² * =100 mV/g
Transverse sensitivity:	max. 5%
Linear frequency range:	1 to 1000 Hz (±1dB)
Max. peak acceleration:	10 g
Settling time:	3 sec
Bias point:	10 to 12V (typical 11V)
Temperature range:	–20° to +70 °C (–4° to +158 °F)
IEPE interface:	24 V / 2 to 5 mA
Casing:	Stainless acid proof steel
Sealing:	IP67
Isolation:	Case isolated, > 1 Mohm
Weight:	70 grams (2.5 oz)
Connector type, TRM100/120:	QLA
Connector type, TRM110:	Lemo Circular Push Pull

* Individual value given on the calibration chart.



Note! The magnetic transducer should be carefully mounted to the measuring point by "rocking" it into place.

Incorrect mounting of a transducer with integral magnet can cause very high g levels that may cause damage to the transducer.

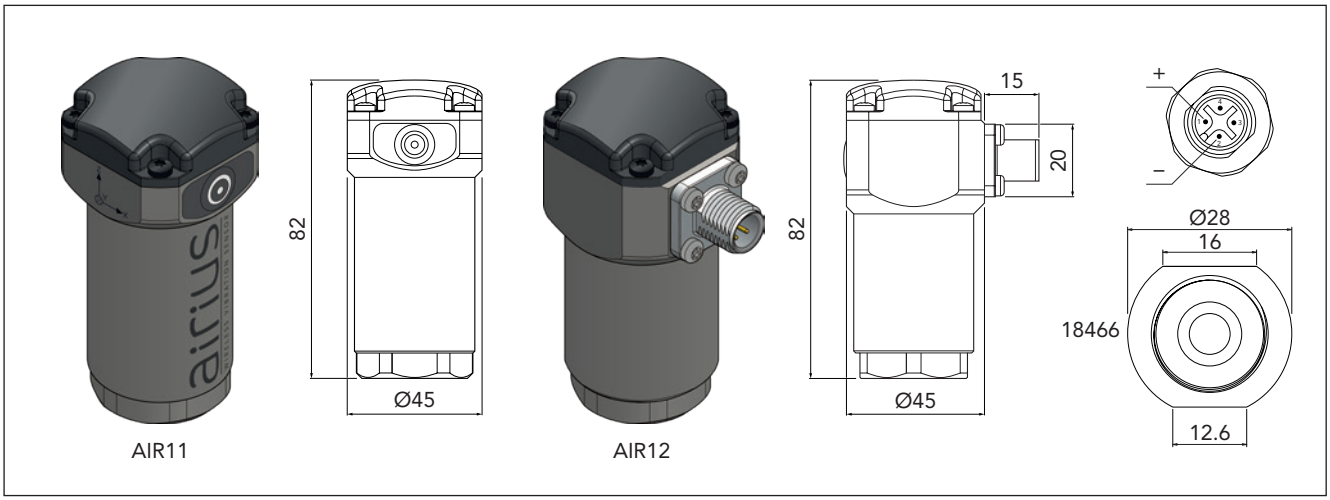
Part numbers

TRM100 Vibration transducer, straight, for VibChecker
TRM110 Vibration transducer, angled, for Leonova
TRM120 Vibration transducer, angled, for VibChecker

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Airius II Wi-Fi – Wireless vibration sensor



Airius is a wireless sensor that performs a user-defined number of vibration measurements per day in the 10-1000 Hz or the 2-5000 Hz frequency range. The MEMS (micro-electro-mechanical-systems) type sensor measures triaxial vibration and temperature.

The vibration sensor is optimal for use on standard production equipment, such as pumps and fans. Airius provides warning of vibration-related problems, such as imbalance, misalignment, impeller and fan blade issues, resonance, and cavitation, as well as gear and bearing faults. The sensor is ideal wherever wireless transmission of vibration data is practical or a matter of safety, as in inaccessible machines or machines placed in hostile or risky environments.

With favorable battery technology and careful design, the battery-powered sensor ensures four-year battery life at four measurements a day under ideal conditions. Aspects that affect battery life are the number of measurements per day, Wi-Fi signal quality, ambient temperature, and time in Bluetooth mode.

The externally powered sensor enables triggered measurements by being connected to one and the same network session instead of several short ones.

Airius is compatible with both Condmaster.NET, the cloud-based application providing easy access to measurement data through a user-friendly interface, and the analysis and diagnostic software Condmaster Ruby. For further information, see TD-583.

The SPM Connect app is used to configure the parameters required to connect to Condmaster Entity Server (CES) or SPM Cloud. The app allows you to search for Airius sensors via Bluetooth, verify server connection, and set up a connection to Wi-Fi and CES or SPM Cloud.

AIR12 has a 4-pin M12 male connector for external power supply. For connectors that fit, see TD-540 and TD-544.

Technical specifications

Material:	housing; stainless steel EN 1.4523, lid; polyamide
Weight:	approx. 300 g
Power supply:	non-rechargeable 3.0 VDC Lithium or 24 VDC ±10 %, 400 mA
Power rating, AIR12:	1.2 W
Readings:	RMS, peak, peak-to-peak, crest, kurt, skew, temperature
Measurement range, temperature:	–20° to +85 °C (–4° to +185 °F) (accuracy +/– 2 °C)
Spectrum lines:	400, 800, 1600, 3200 lines*
Operating temperature:	–20° to +85 °C (–4° to +185 °F)
Storage temperature:	–40° to +85 °C (–40° to +185 °F)
Maximum altitude:	2000 m
Condition evaluation:	ISO10816 Part 2, 3, 4 >600 rpm
Protection class:	IP69
Relative humidity:	0 to 100% (non-condensing)
Wi-Fi:	802.11 b/g/n, 2.4 GHz
Wi-Fi Security:	WPA/WPA2 PSK/WPA2 Enterprise (PEAP-MSCHAPv2 and TTLS-MSCHAPv2 without certificates)
Bluetooth:	v4.2 BLE

Part numbers

AIR11-01	Airius II Wi-Fi, battery-powered sensor 10-1000 Hz, 2/4/8 g
AIR11-10	Airius II Wi-Fi, battery-powered sensor 2-5000 Hz, 2/4/8/16 g
AIR12-01	Airius II Wi-Fi, externally powered sensor 10-1000 Hz, 2/4/8 g
AIR12-10	Airius II Wi-Fi, externally powered sensor 2-5000 Hz, 2/4/8/16 g

Accessories

18466	Installation foot, glue installation
18470	Installation kit (installation foot, M4 screw, M4 washer, M6 screw)
18471	Installation kit (installation foot, M8 screw)
18549	Power supply for testing AIR12 in indoor environment (incl. Europlug, angled 4-pin M12 female connector, and 1.8 m cable)

Spare parts

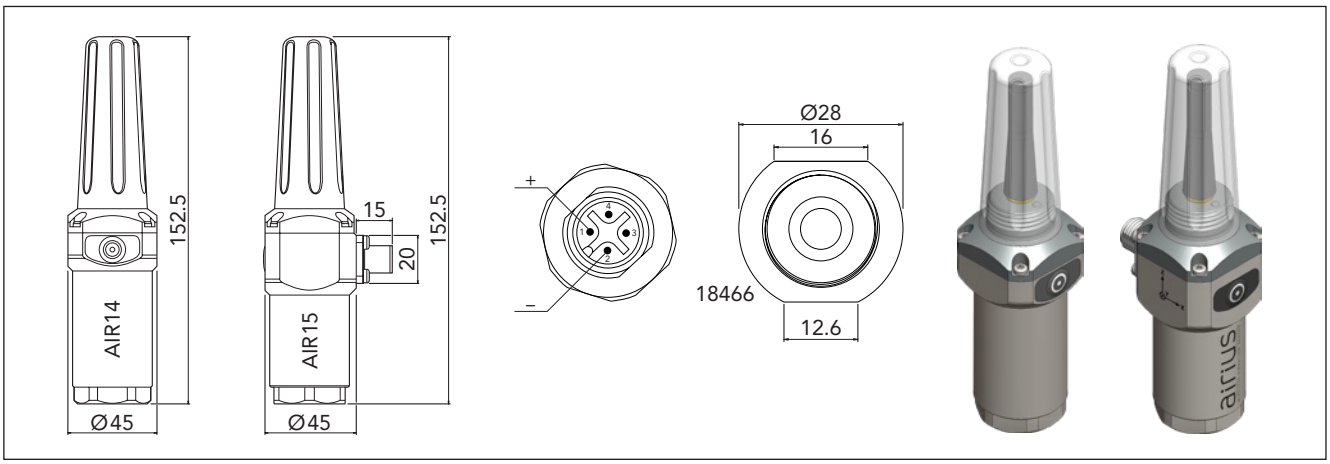
18716	Lid kit (lid, gasket, 4xM3 screws)
18779	Battery cell, AIR11

* 3200 lines are only available for AIR11-10 and AIR12-10.

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Airius II LTE-M – Wireless vibration sensor



Airius is a cellular data sensor that performs a user-defined number of vibration measurements per day in the 10-1000 Hz or the 2-5000 Hz frequency range. The MEMS (micro-electro-mechanical-systems) type sensor measures triaxial vibration and temperature.

The vibration sensor is optimal for use on standard production equipment, such as pumps and fans. Airius provides warning of vibration-related problems, such as imbalance, misalignment, impeller and fan blade issues, resonance, and cavitation, as well as gear and bearing faults.

With favorable battery technology and careful design, the battery-powered sensor ensures four-year battery life at two measurements a day under ideal conditions. Aspects that affect battery life are the number of measurements per day, LTE-M signal quality, ambient temperature, and time in Bluetooth mode.

The wireless transmission is via mobile data and LTE-M, a low energy protocol designed to meet high-coverage, low-cost, and low power-consumption requirements of IoT equipment. LTE-M is on track to support future 5G requirements.

The solution is available for the Nordic market. The Airius sensor has an eSIM card from the telecom operator Telia, locked to the physical sensor, and a communication protocol that only allows communication initiated from the users' own network via a secure server. The transfer from the sensor to the user is thus secure against intrusion.

Airius is compatible with both Condmaster.NET, the cloud-based application providing easy access to measurement data through a user-friendly interface, and the analysis and diagnostic software Condmaster Ruby. For further information, see TD-583.

AIR15 has a 4-pin M12 male connector for external power supply. For connectors that fit, see TD-540 and TD-544.

Technical specifications

Material, housing/lid:	stainless steel EN 1.4523
Weight:	approx. 300 g
Power supply,	
AIR14:	non-rechargeable 3.0 VDC Lithium
AIR15:	24 V DC ±10 %, 400 mA
Power rating, AIR15:	1.2 W
Power connector, AIR15:	4-pin M12 male connector
Readings:	RMS, peak, peak-to-peak, crest, kurt, skew, temperature
Measurement range, temperature:	–20° to +85 °C (–4° to +185 °F) (accuracy +/– 2 °C)
Spectrum lines:	400, 800, 1600, 3200 lines*
Operating temperature:	–20° to +85 °C (–4° to +185 °F)
Storage temperature:	–40° to +85 °C (–40° to +185 °F)
Maximum altitude:	2000 m
Condition evaluation:	ISO10816 Part 2, 3, 4 >600 rpm
Protection class:	IP69
Relative humidity:	0 to 100% (non-condensing)
LTE-M:	LTE Cat M1 (300 kb/s DL, 375 kb/s UL). Multi-region, including bands 1, 2, 3, 4, 5, 8, 12, 13, 18, 19, 20, 25, 26, 28
Nordic operator:	Telia Sverige AB
Bluetooth:	v4.2 BLE

Part numbers

AIR14-01	Airius II LTE-M, battery powered, incl. subscription with 3 years of data**, 10-1000 Hz, 2/4/8 g
AIR14-10	Airius II LTE-M, battery powered, incl. subscription with 3 years of data**, 2-5000 Hz, 2/4/8/16 g
AIR15-01	Airius II LTE-M, externally powered, incl. subscription with 3 years of data**, 10-1000 Hz, 2/4/8 g
AIR15-10	Airius II LTE-M, externally powered, incl. subscription with 3 years of data**, 2-5000 Hz, 2/4/8/16 g

Accessories

18466	Installation foot for glue installation
18470	Installation kit (installation foot, M4 screw, M4 washer, M6 screw)
18471	Installation kit (installation foot, M8 screw)
18549	Power supply for testing AIR15 in an indoor environment (incl. Europlug, angled 4-pin M12 female connector, and 1.8 m cable)
MOD1YB	1 year of additional data for AIR14**
MOD1YC	1 year of additional data for AIR15**
MOD3YB	3 years of additional data for AIR14**
MOD3YC	3 years of additional data for AIR15**

Spare parts

18661	Antenna lid, transparent
18779	Battery cell, Airius II
90700	Antenna

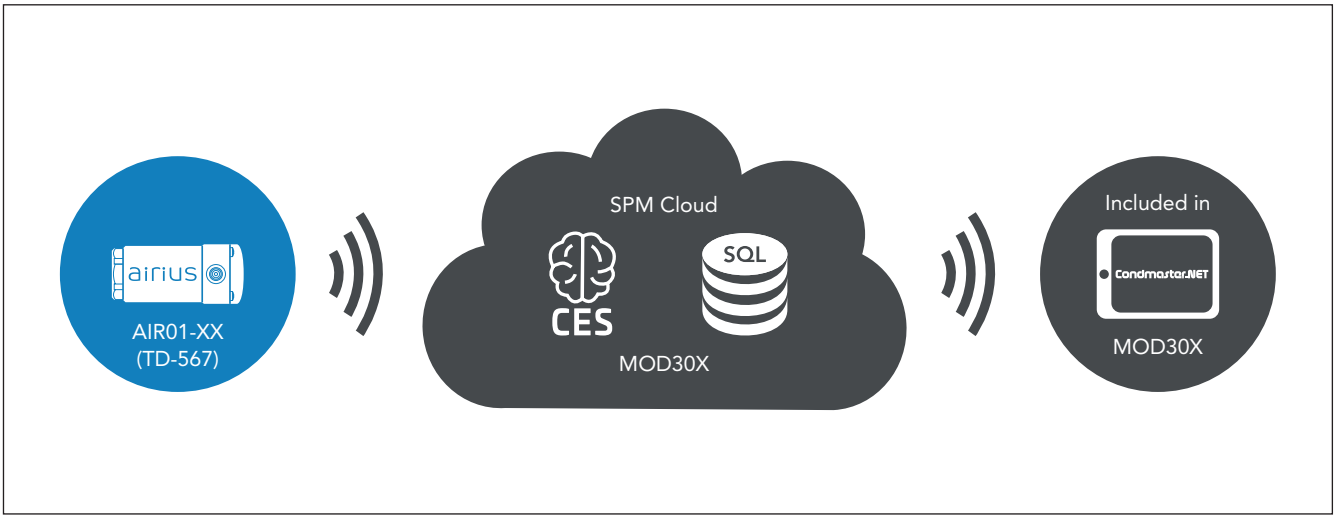
* 3200 lines are only available for AIR14-10 and AIR15-10.

** Amount of data based on 4 measurements per day for AIR14 and 24 measurements per day for AIR15.

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SPM Cloud solution – with Condmaster.NET and Airius



The SPM Cloud solution with monthly subscription enables access to measurement data from the Airius sensors. Stored in SPM Cloud, the smart data from CES (Condmaster Entity Server) can be viewed in Condmaster.NET from any device with Internet access – anytime, anywhere in the world.

The solution includes:

- SQL Server in SPM Cloud
- Condmaster.NET
- CES in SPM Cloud
- Airius (ordered separately; see TD-567)

SPM Cloud offers a secure SQL Server with very high availability. For each part number, the storage space specified is guaranteed to be sufficient for three years when performing four 3-channel measurements per Airius sensor and day. Additional data storage can easily be added through part number MOD310.

Condmaster.NET is an easy-to-use web application for evaluation of measurement results from the Airius sensors. Included in the SPM Cloud packages, Condmaster.NET provides access to measurement data via all devices, e.g., computers, tablets, and smartphones. Users log onto Condmaster.NET to view spectrums, time signals, trends, and alarms – all based on data residing in SPM Cloud.

The web application allows users to create components and measuring points as well as set up vibration and temperature measurements. The dashboard provides an overview of the current condition status of all measuring point, alarms, and any issues on component and measuring point level. There is no limit to the number of user accounts that can be created and used in Condmaster.NET.

CES is a high-performance backend communication program that controls and links the Airius sensors and Condmaster.NET, transmitting measuring assignments to the sensors and accepting the measuring results. Using a virtual digital signal processor (DSP), CES performs advanced signal processing algorithms, providing smart data to Condmaster.NET.



Airius® is a vibration sensor ideal for remote condition monitoring of standard production equipment such as pumps and fans. The maximum number of Airius sensors that can be included in a given SPM Cloud solution is specified in the part numbers below. The Airius sensors are ordered separately; see technical data sheet TD-567.

Part numbers

MOD300	SPM Cloud: up to 24 sensors, 10 GB data storage
MOD301	SPM Cloud: up to 49 sensors, 20 GB data storage
MOD302	SPM Cloud: up to 99 sensors, 40 GB data storage
MOD303	SPM Cloud: up to 199 sensors, 80 GB data storage
MOD304	SPM Cloud: up to 499 sensors, 200 GB data storage
MOD305	SPM Cloud: more than 499 sensors*

* Please contact SPM Instrument for information.

Options

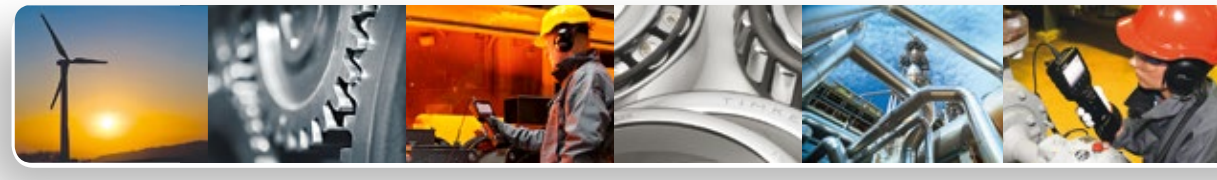
MOD310	10 GB extra data storage

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condition monitoring solutions

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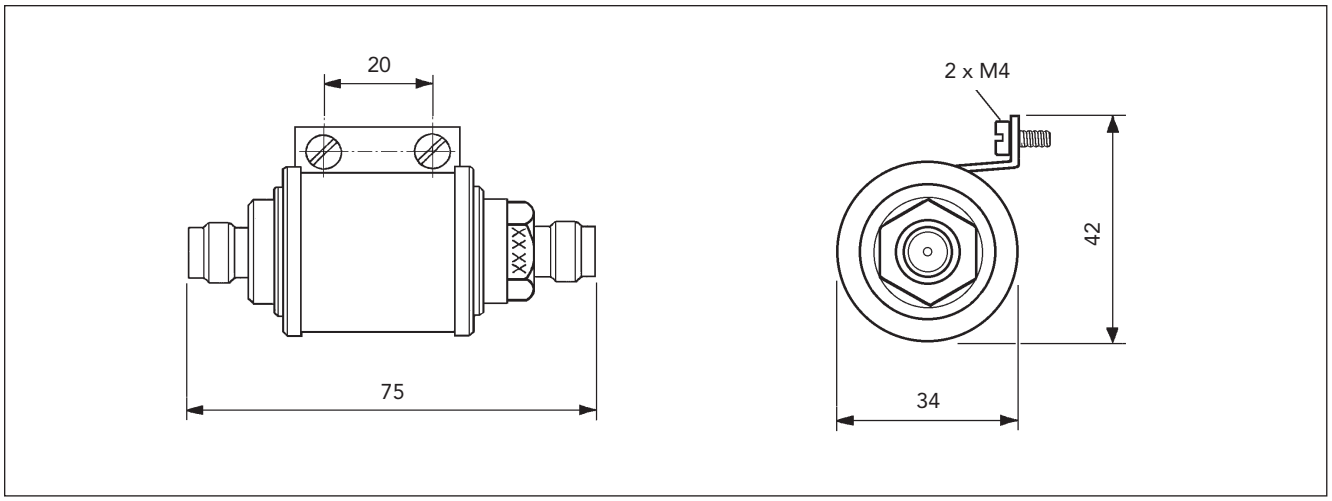


Accessories for Remote Monitoring

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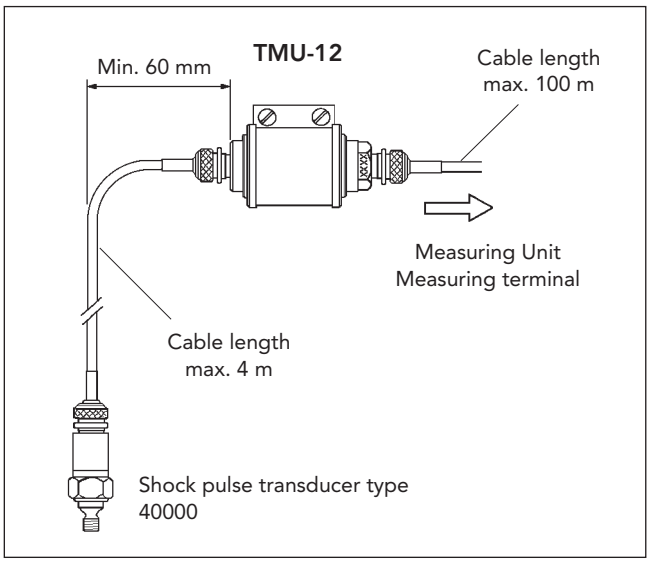
Transducer Matching Unit TMU 12

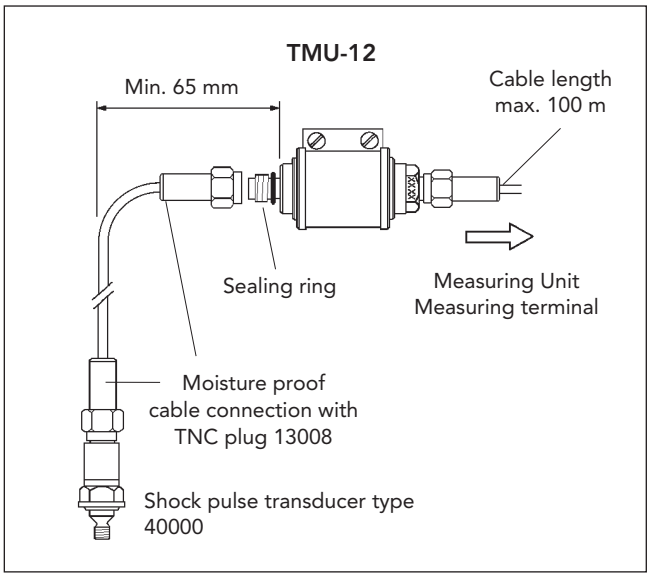


Transducer Matching Unit TMU-12 is an impedance converter for all permanently installed SPM bearing monitoring systems. It is placed between the shock pulse transducer type 40000 and the measuring unit or measuring terminal. The bracket on the TMU is fastened with two mounting screws to the machine or machine foundation. The round connector base faces towards the transducer.

The TMU is used to extend the length of the coaxial cable between transducer and measuring device from max. 4 m to max. 100 m. The distance between the TMU and the transducer is always max. 4 m.

TMU-12 is suitable for both chemically basic and acid environments. For installations in moist environments, it is necessary to use sealing TNC cable plugs 13008 to prevent cable corrosion.





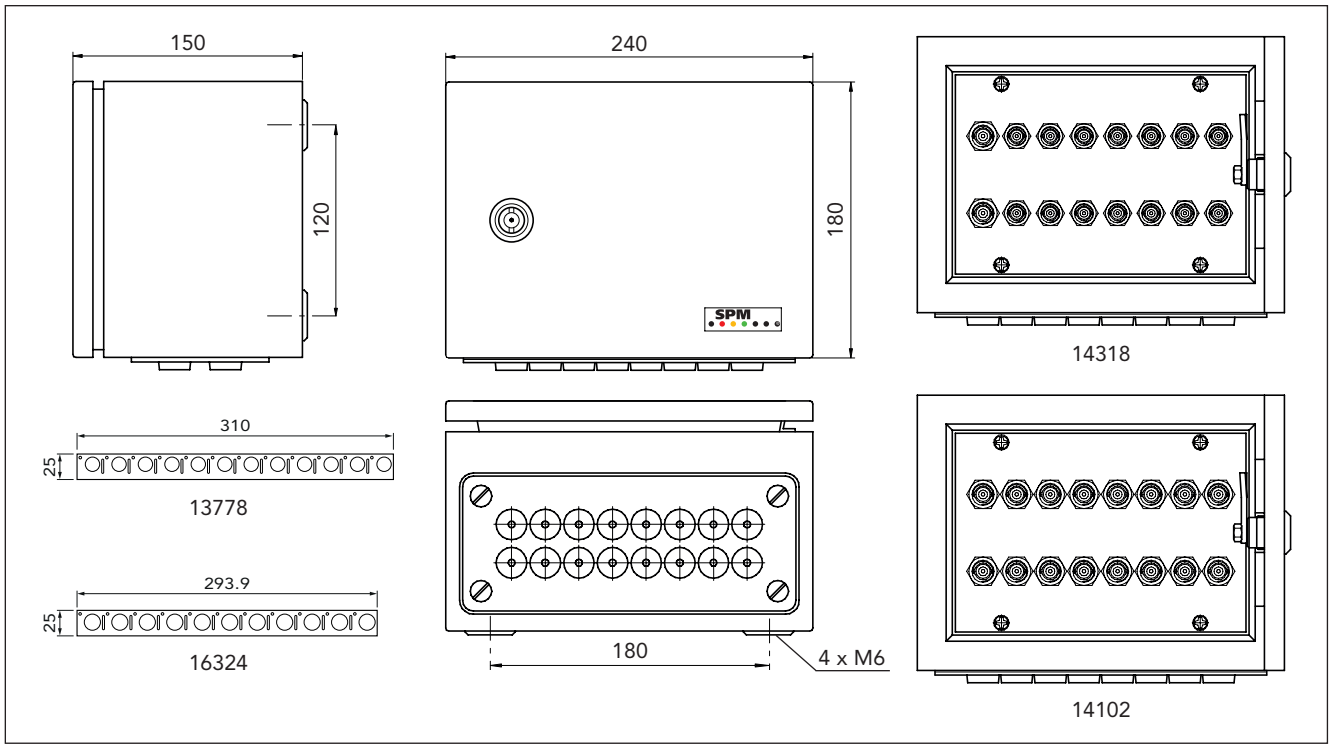
Technical specifications

Casing:	stainless acid-proof steel, Sandvik Grade:1802, EN:1.4523, and fluor rubber
Sealing:	IP65 with TNC connector, IP67 with sealed TNC connector (13008)
Temperature range:	–30° to +100 °C
Dimensions:	75 x ø42 mm
Weight:	140 grams
Connectors:	TNC jacks
Cable length:	max. 100 m
Fastening screws:	2 x M4, stainless acid-proof steel

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Terminal cabinets



14318 is a terminal cabinet that can receive up to 14 cables from shock pulse and vibration transducers, and maximum two cables with M12 connectors.

14102 is a terminal cabinet that can receive up to 16 cables with M12 connectors.

13778 and 16324 are terminal brackets with holes for connector type BNC/TNC/2-pin and M12 respectively.

The individual cable is inserted through the chloroprene seal in the bottom plate. Afterwards, terminal connectors are crimped, soldered or screwed on to the transducer cables.

Terminal connectors, terminal brackets and other accessories are ordered separately. For further information about the accessories, *see technical data sheet TD-480*.

Technical specifications

Dimensions:	240x180x150 mm
Mounting holes:	M6, spacing 180x120
Casing:	Stainless steel, SS142333
Door lock:	Removable key
Protection class:	IP66
Temperature range:	–30° to +80 °C
Cable inlets:	Chloroprene, IP67
Cable diameter:	5 to 7 mm

Terminal bracket 13778

Material:	PVC
Dimensions:	310x25x25x3 mm
Temperature range:	–20° to +70 °C

Terminal bracket 16324

Material:	PVC
Dimensions:	293.9x25x25x3 mm
Temperature range:	–20° to +70 °C

Part numbers

14102 Terminal cabinet, 16xM12
14318 Terminal cabinet, 2xM12, 14xBNC/TNC*

Options

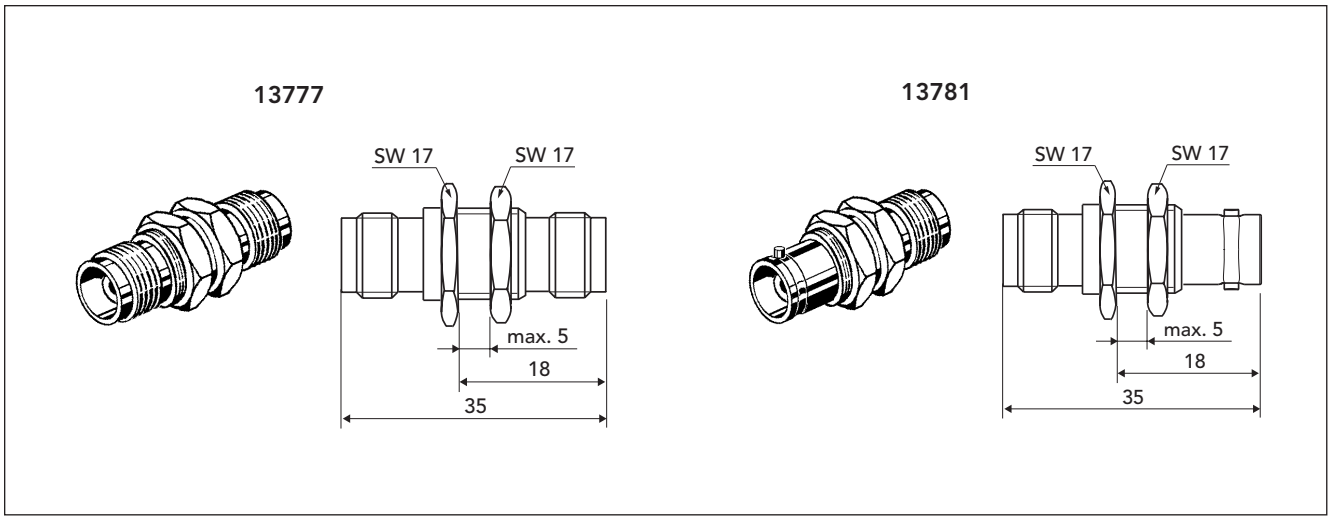
13778 Terminal bracket, BNC/TNC/2-pin
16324 Terminal bracket, M12

* IS version available (17834, TD-561)

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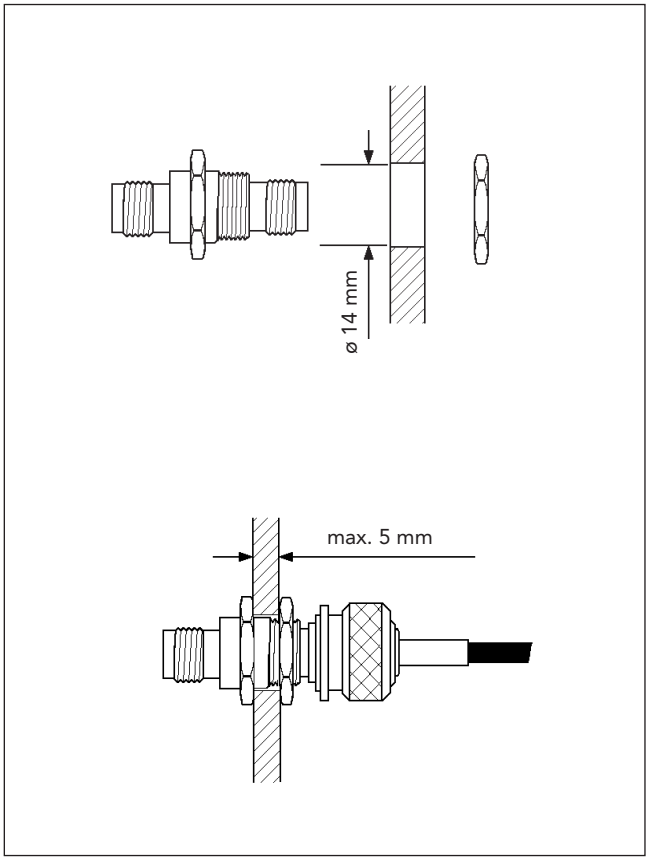
TNC/BNC Terminal Connectors for Sealed Installation



The terminal connectors 13777 (TNC-TNC) and 13781 (TNC-BNC) are mainly used as measuring terminals, connecting a hand-held shock pulse meter with a permanently installed shock pulse transducer. They are then normally mounted on the terminal bracket 13778.

The terminal connectors can also be used as bulkhead unions for walls with a thickness of up to 5 mm. A sealed connection is achieved by using sealed cable connector (13008).

The open end of the connectors should always be protected by dust caps, 93035 for TNC and 93061 for BNC.



Technical specifications

Thread:	TNC-TNC or TNC-BNC
Nut width:	17 mm
Mounting hole:	ø14 mm
Max. wall thickness:	5 mm
Material, connector body:	stainless acid-proof steel, Sandvik Grade:1802, EN:1.4523
Material, nuts:	nickel-plated brass
Design:	sealed
Temperature range:	−65 to +165 °C (−85 to +329 °F)
Connector tightness:	IP65, IP67 with appropriate connector

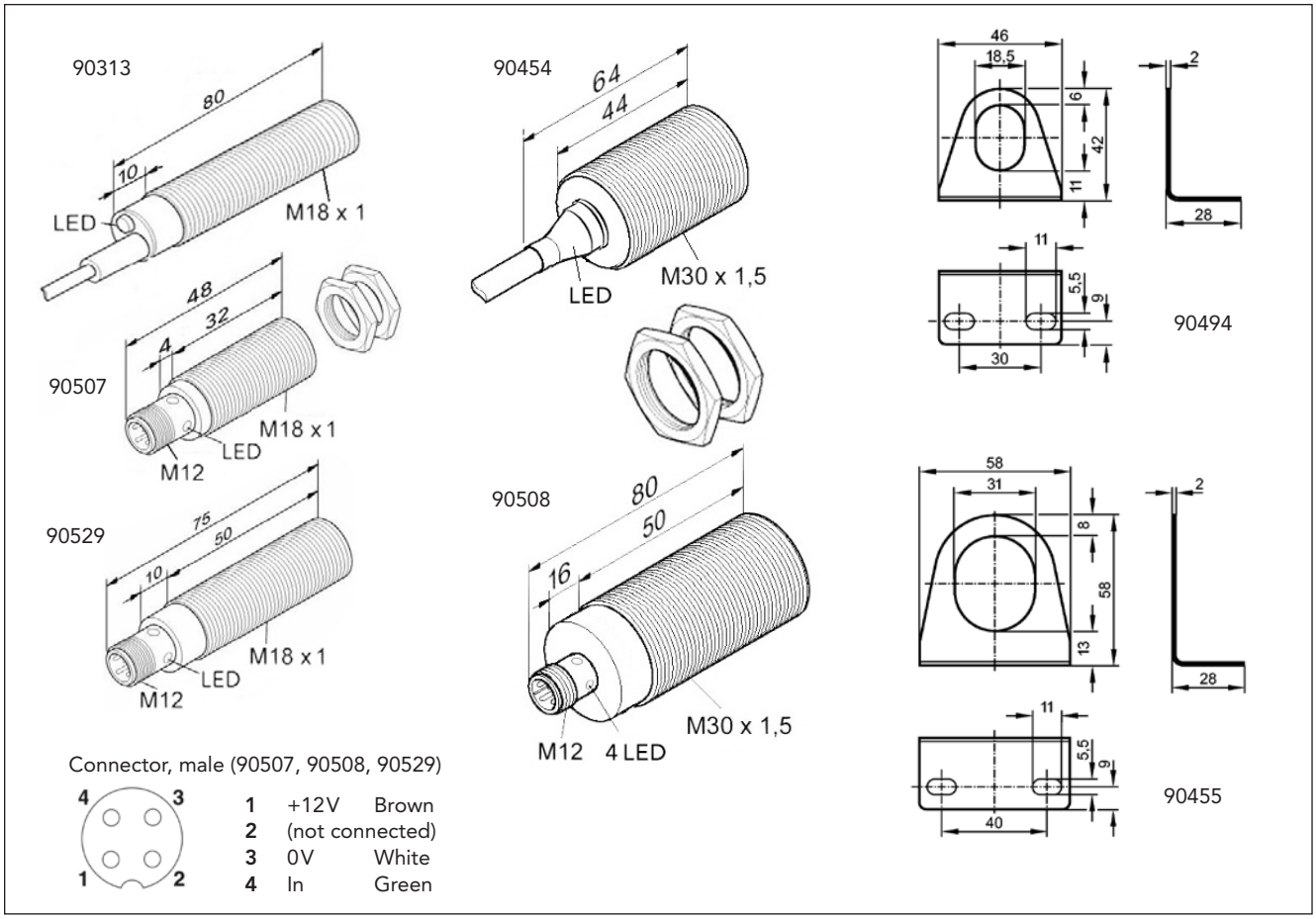
Part numbers

13777	Terminal connector, TNC-TNC
13781	Terminal connector, TNC-BNC
93035	Dust cup for TNC terminal connector
93061	Dust cup for BNC terminal connector

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Inductive Proximity Switches



The inductive proximity switches have integrated amplifiers and LED indicators for easy operation and adjustment. They are available with integrated cable 2m or with connector.

The angle brackets 90455 and 90456 are made of galvanized steel. Cables, connectors and accessories for inductive proximity switches are described on TD-384.

Technical specifications

Housing material:	nickel plated brass
Material active face:	PBT
Switching distance, Sn	
90313, 90507, 90529:	8 mm, shielded
90454:	15 mm, shielded
90508:	22 mm, shielded
Switching frequency	
90313, 90507, 90529:	500 Hz
90454:	250 Hz
90508:	300 Hz
Switching hysteresis:	<15% (Sr)
Operating temperature:	–25 °C to +70 °C
Protection category:	IP 67
Function control:	LED
Operating voltage:	10 to 30 V DC
Ripple:	< 10%
Voltage drop	
90507:	< 2.0 V
90313, 90508:	< 1.5 V
90454, 90529:	< 2.5 V
Max. load current:	max. 200 mA
Leakage current:	<0,01 mA
No load current:	< 15 mA
Output function:	NPN, N.O.
Connection:	plug M12 alt. integrated cable, PVC, 2 m 90313; 3 x 0.34 mm^2 90454; 3 x 0.5 mm^2

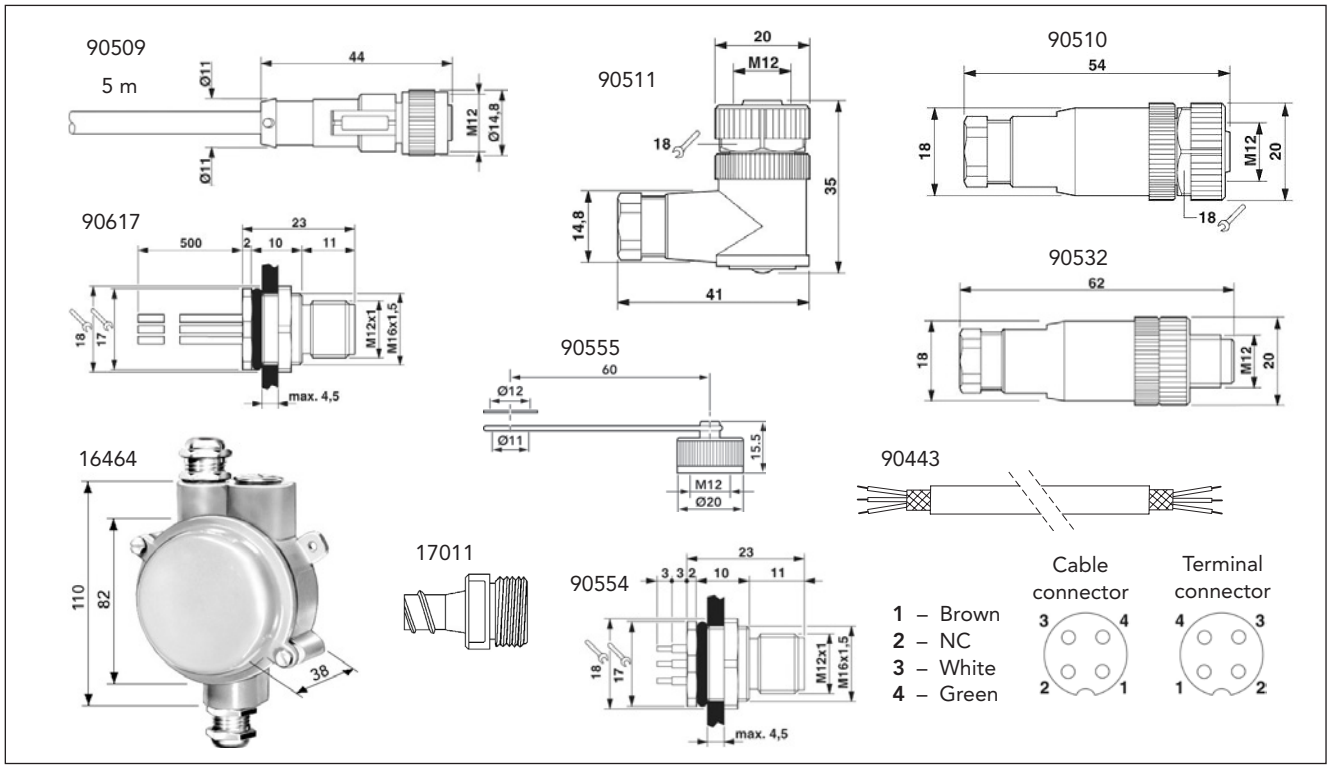
Part numbers

90313	Inductive Proximity Switch M18 with integrated cable 2m without connector
90454	Inductive Proximity Switch M30 with integrated cable 2m without connector
90507	Inductive Proximity Switch M18 with connector
90529	Inductive Proximity Switch M18 with connector
90508	Inductive Proximity Switch M30 with connector
90494	Angle bracket M18
90455	Angle bracket M30

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Accessories for inductive proximity switches



90509 is a PUR halogen-free sensor cable with a straight M12 connector intended for use with the inductive proximity switches 90507 and 90508.

Rated voltage:	250 V
Rated current at 40 °C:	4 A
Insulation resistance, connector:	≥ 100 MΩ
Conductors:	4 x 0.34 mm², AWG 22
Cable diameter:	4.7 mm
Insulation resistance, cable:	≥ 1 GΩ/km
Conductor resistance:	max. 58 Ω/km (at 20 °C)
Nom. voltage, conductor:	≤ 300 V
Length of cable:	5 m
Ambient temperature:	–25 to +80 °C
Degree of protection:	IP68

90510 (straight) and **90511** (angled) are 4-position female connectors for the inductive proximity switches 90507 and 90508. They are A-coded and have screw connection Pg7.

Rated current at 40°C:	4 A
Rated voltage:	250 V
Insulation resistance:	≥ 100 MΩ
Ambient temperature:	–40 to +85 °C
Degree of protection:	IP67
External cable diameter:	4 to 6 mm

90532 is a straight 4-position male connector with the same specifications as the connectors 90510 and 90511.

90554 is a 4-position terminal connector for rear/screw mounting with M16 thread, with straight solder connection.

90617 is a 4-position terminal connector for rear/screw mounting with M16 thread, with 0.5 m TPE litz wire, 4 x 0.34 mm².

90443 is a PUR cable with 3 conductors and shield. It has a wide temperature range and good resistance to mineral oils.

Ambient temperature:	–40 to +80 °C
Conductors:	0.25 mm², AWG 23
Rated voltage:	250 V
Test voltage:	1500 V
Diameter:	4.7 mm
Bend radius:	min. 71 mm

16464 is a junction box produced in gray alloy and has three cable inlets. It is supplied with terminal block with 4 mantle clamps, grounding screw and 3 cable inlets with thread Pg18.6 plus 2 cable inlets of type Pg11 and 1 blind plug.

Terminal wire range:	up to 3 x 2.5 mm²
Rated voltage:	500 V
Inner depth:	23 mm
Inner diameter:	76 mm
Degree of protection:	IP67
Cable diameter, Pg18.6:	8 to 12 mm
Cable diameter, Pg11:	3 to 8.5 mm

Part numbers

90509	Sensor cable, 5 m, with connector M12
90510	Connector M12 straight, female, IP67
90511	Connector M12 angled, female, IP67
90532	Connector M12 straight, male, IP67
90554	Terminal connector M12, IP67
90555	Sealing cap for 90554 made of plastic with fixing band with 12 mm fastening eye
90443	Cable PUR, –40 to +80 °C
90617	Terminal connector M12, IP67, with 0.5 m litz wire
16464	Junction box, IP67
17011	Protection tube end for 90510/90511/90532

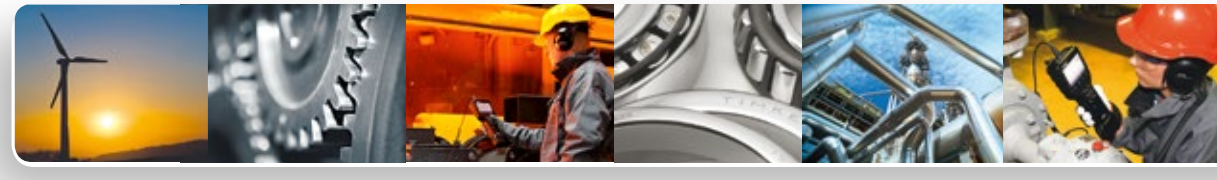
Inductive proximity switches are described in TD-383.

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SPM
condition monitoring solutions

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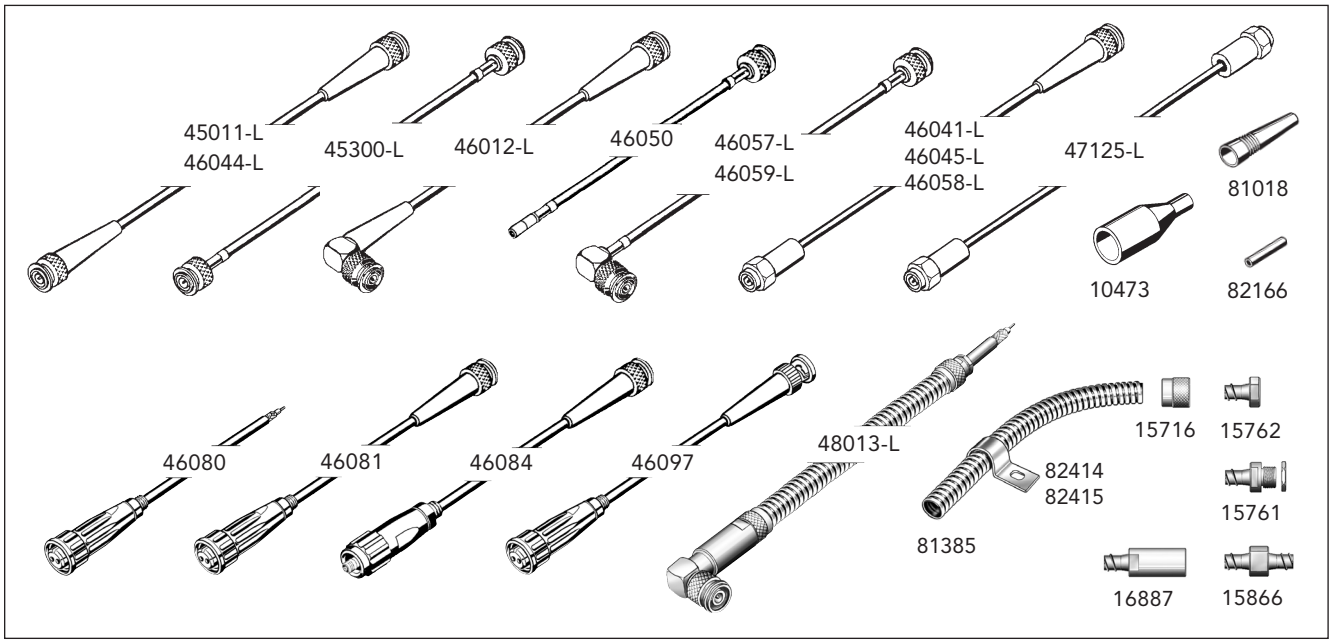


Cables, Connectors and Tools

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Coaxial cables and accessories



Coaxial cables for shock pulse transducers and vibration transducers with pre-amplifier

45011-L Cable with connectors, TNC-TNC, −25 to +70 °C
45300-L Cable with connectors, TNC-TNC, −55 to +150 °C
46012-L Cable with connectors, TNC-TNC, −25 to +70 °C
46041-L Cable with connectors, TNC-TNC, −55 to +150 °C
46050-L Cable with connectors, TNC-SMB, −25 to +70 °C
46057-L Cable with connectors, TNC-TNC, −55 to +150 °C
46058-L Cable with connectors, TNC-TNC, −25 to +70 °C
46080-L Cable with connector, 2 pin, −55 to +150 °C
46081-L Cable with connectors, 2 pin-TNC, −25 to +70 °C
46084-L Cable with connectors, TNC-SMB, −25 to +70 °C
46097-L Cable with connectors, 2 pin-BNC, −25 to +70 °C
47125-L Cable with TNC sealing connectors, −55 to +150 °C
48013-L Cable with TNC angle connector and protection tube, −55 to +150 °C

90005-L Coaxial cable without connectors, −25 to +70 °C
90267-L Coaxial cable without connectors, −55 to +150 °C
90420-L Coaxial cable without connectors, halogen free, −25 to +70 °C

Accessories

10473 Sealing cover for TNC/BNC connector
81018 PVC sleeve for TNC/BNC crimp connector
82166 Neoprene tube for cable 90267-L
81385-L Protection tube, outer diameter 9.3 mm, stainless acid proof steel
82414 Clips JR 9.5 mm, stainless steel
82415 Clips JR 9.5 mm, stainless acid proof steel
15716 Sleeve for protection tube, stainless steel
15761 Fitting for protection tube, stainless steel, thread for locknut M10 x 1
15762 End piece for protection tube, stainless steel
15866 Coupler for protection tube, stainless steel
16887 Protection tube end for angle connector 93077 and 93105

Coaxial cables for vibration transducers without pre-amplifier

46044-L Low noise cable with TNC connectors, −25 to +85 °C, L = max. 10 m
46045-L Low noise coaxial cable with one standard TNC and one sealing connector (SPM 13008), −25 to +85 °C, L = max. 10 m
46059-L Low noise cable with TNC connectors, −25 to +85 °C, L = max. 10 m

90176-L Low noise coaxial cable without connectors, −25 to +85 °C

Coaxial cable for vibration transducer TRV-01

46019-L Low noise cable with connectors, TNC-SMA, −25 to +85 °C, L = max. 10 m

Note:

When ordering cables and/or protection tubes, please state the desired length (L) in meters.

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Coaxial Cables – Specifications

Part number	90005
Cable model	Coax RG58
Colour	Black
Jacket material	PVC
Outer diameter	4.95 mm
Bending radius	25 mm static / 75 mm flexible use
Conductor material	Tinned copper
Conductors / diam.	19 / 0.18 Total diam. 0.92 mm
Conductor area	0,66 mm^2
Braid	Tinned copper over polyester foil
Impedance	50 ohm
Capacitance	101 pF/m
Temperature rating	–20 to +70 °C
Oil resistant	No
Recommended to	Normal installation cable for SPM and some TRV transducers

Part number	90176
Cable model	Coax
Colour	Black
Jacket material	PVC
Outer diameter	5 mm
Bending radius	25 mm static use, 75 mm flexible use
Conductor material	Copper
Conductors / diam.	1 / 0.5 mm
Conductor area	0.20 mm^2
Braid	Copper
Impedance	75 ohm
Capacitance	70.7 pF/m
Temperature rating	–25 to +85 °C
Oil resistant	No
Special remarks	Low noise
Recommended to	Special low noise cable for TRV-01/22/23/26/27 vibration transducers
EN compliance	IEC 60332-1/2/3 cat C, IEC 61034, IEC 60754-1/2

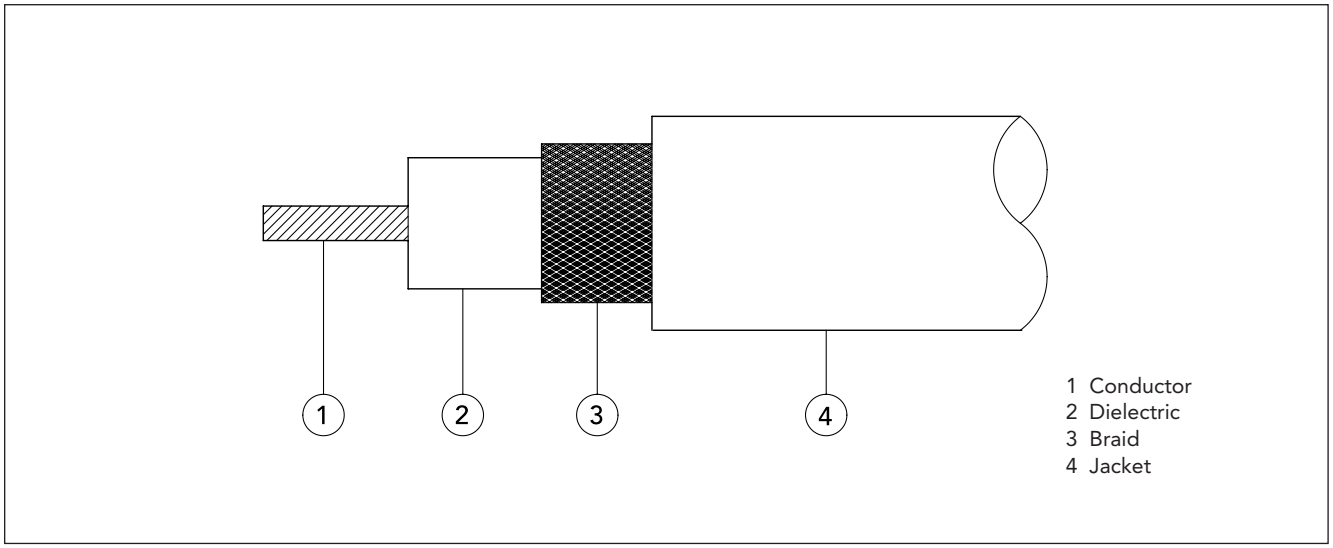
Part number	90267
Cable model	Coax RG58
Colour	Dark grey
Jacket material	FEP
Outer diameter	4 mm
Bending radius	20 mm static / 80 mm flexible use
Conductor material	Silver-plated copper
Conductors / diam.	19 / 0.18 Total diam. 0.92 mm
Conductor area	0.66 mm^2
Braid	Silver-plated copper
Impedance	50 ohm
Capacitance	Nom. 94 nF/km, max 105 nF/km
Temperature rating	–55 to +200 °C
Oil resistant	High
Special remarks	High chemical resistance
Recommended to	High temperature cable for SPM and some TRV transducers
EN compliance	IEC 60332-3-24

Part number	90420 (detailed specs, see TD-456)
Cable model	Coax RG58
Colour	Black
Jacket material	FRNC
Outer diameter	4.95 mm
Bending radius	25 mm static / 75 mm flexible use
Conductor material	Tinned copper
Conductors / diam.	19 / 0.18 Total diam. 0.92 mm
Conductor area	0.66 mm^2
Braid	Tinned copper
Impedance	50 ohm
Capacitance	approx. 101 pF/m
Temperature rating	–25 to +70 °C
Oil resistant	Limited
Special remarks	Halogen free, low smoke
Recommended to	Medium demand cable for SPM transducers
EN compliance	EN 60332-1

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Coaxial Cable 90420



Technical specifications

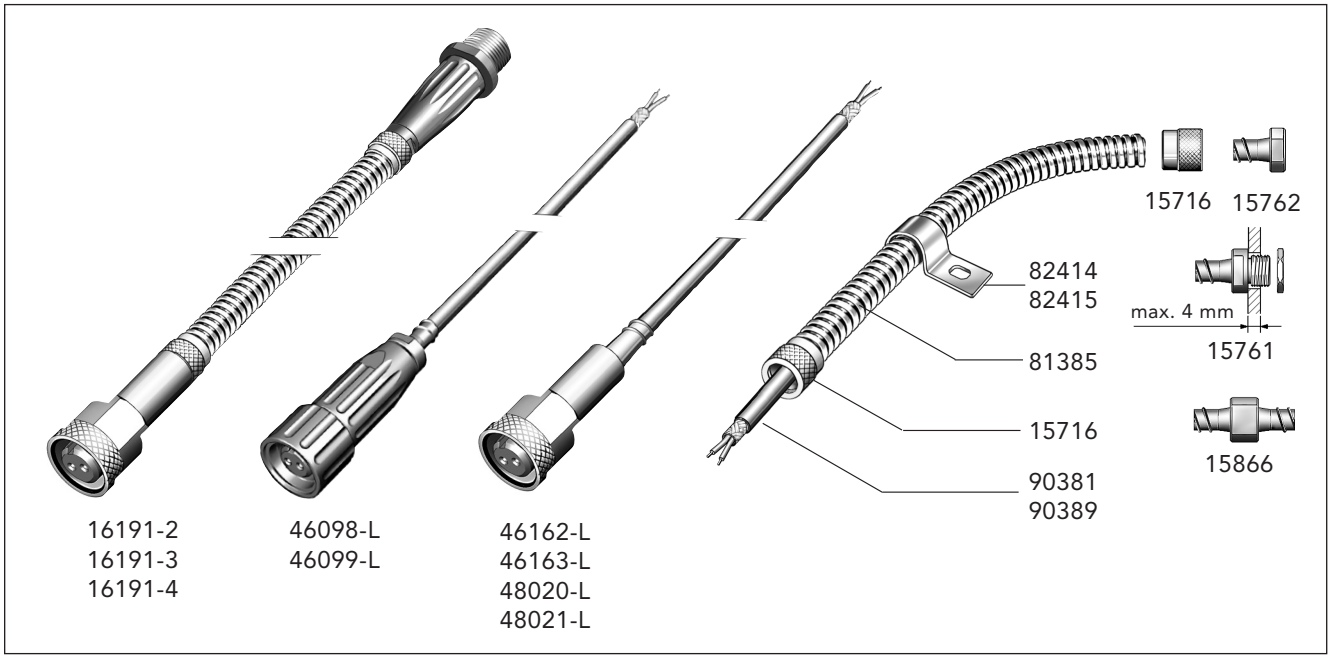
Cable model:	Coax RG58
Colour:	Black
Temperature rating:	–25 to +70 °C
Max. working voltage:	1400 volt
Loop resistance:	< 53 Ω/km
Outer diameter:	4.95 mm
Bending radius:	25 mm static/75 mm flexible use
Impedance:	50 ohm
Capacitance:	approx. 101 pF/m
Conductor material:	Tinned copper
Conductors / diam.:	19x0.18 = 0.92 mm
Conductor area:	0.66 mm^2
Dielectric:	PE, diameter 2,95 mm
Braid:	Tinned copper, coverage 92%
Jacket material:	FRNC

Oil resistant:	Resistant for testingoil "ASTM2" and gearbox oil "SAE20", limited resistant for diesel oil
Special remarks:	Halogen free, low smoke
EN compliance:	EN 60332-1
Attenuation:	
At	dB/100m
1 MHz	1,4
10 MHz	4,5
20 MHz	6,5
50 MHz	10,4
100 MHz	15,1
200 MHz	21,9
500 MHz	36,6
1000 MHz	54,8

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Twisted pair cables and accessories



16191-2 Protected transducer cable, length 2 m, twisted pair cable 90381 with 2-pin connectors (male-female) and protection tube

16191-3 Protected transducer cable, length 3 m, twisted pair cable 90381 with 2-pin connectors (male-female) and protection tube

16191-4 Protected transducer cable, length 4 m, twisted pair cable 90381 with 2-pin connectors (male-female) and protection tube

16191-L Protected transducer cable, twisted pair cable 90381 with 2-pin connectors (male-female) and protection tube

90381 High temp twisted pair cable, AWG 20, diam. 4.8 mm. See TD-394

90389 Twisted pair cable, AWG 20, diam. 4.8 mm. See TD-394

46098-L Twisted pair cable 90381 with 2-pin connector 15168

46099-L Twisted pair cable 90389 with 2-pin connector 15168

46162-L Twisted pair cable 90381 with 2-pin connector, stainless steel. See TD-301

46163-L Twisted pair cable 90389 with 2-pin connector, stainless steel. See TD-301

48020-L Twisted pair cable 90381 with 2-pin connector, fits transducer SLC144TE with 17 mm connector length, stainless steel. See TD-301

48021-L Twisted pair cable 90389 with 2-pin connector, fits transducer SLC144TE with 17 mm connector length, stainless steel. See TD-301

81385 Protection tube, outer diameter 9.3 mm, stainless acid proof steel

82414 Clips JR 9.5 mm, stainless steel

82415 Clips JR 9.5 mm, stainless acid proof steel

15716 Sleeve for protection tube, stainless steel, required to enable dismounting of the protection tube

15761 Fitting with locknut M10 x 1 for protection tube, stainless steel

15762 End piece for protection tube, stainless steel

15866 Coupler for protection tube, stainless steel

18366 Replacement kit: O-rings for 2-pin connectors

Note! When ordering cables and protection tubes, please state the desired length (L) in meters.

Technical specifications

Temperature range:

90381	–65 to +200 °C (–85 to +392 °F)
90389	–40 to +90 °C (–40 to +194 °F)
2-pin connector	–40 to +125 °C (–40 to +257 °F)

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Twisted Pair Cables – Specifications

Part number	90389
Cable model	TP 2 wire with shield
Colour	Yellow
Jacket material	HFS / PUR
Outer diameter	4.8 mm
Bending radius	25 mm static, 100 mm flexible
Conductor material	Tinned copper
Conductors/diam.	19 x 0.203 = 0.96 mm
Conductor area	AWG20 0.51 mm^2
Braid	Tinned copper between polyester foils
Temperature rating	–40 to +90 °C
Oil resistant	High
Special remarks	Halogen free, low smoke
Recommended to	Normal installation cable for VIB transducers
EN complience	IEC 60332-1, IEC60754-2, IEC60544, IEC60216

Part number	90220
Cable model	TP 2 + 2 wires with one shield
Colour	Grey
Jacket material	PVC
Outer diameter	6 mm
Bending radius	60 mm static use, 90 mm flexible use
Conductor material	Copper
Conductors/diam.	102 x 0.05 mm
Conductor area	AWG24 0.20 mm^2
Braid	Tinned copper
Temperature rating	–10 to +80 °C
Oil resistant	No
Recommended to	Signal cable, for CMS system and likewise

Part number	90381
Cable model	TP 2 wire with shield
Colour	Yellow
Jacket material	FPI205 / TEFZEL
Outer diameter	4.8 mm
Bending radius	25 mm static, 100 mm flexible
Conductor material	Silver-plated copper
Conductors/diam.	19 x 0.203 = 0.96 mm
Conductor area	AWG20 0.51 mm^2
Braid	Silver-plated copper
Temperature rating	–65 to +200 °C
Oil resistant	Medium
Special remarks	Low smoke, Flame retardent
Recommended to	High temperature cable for VIB transducers

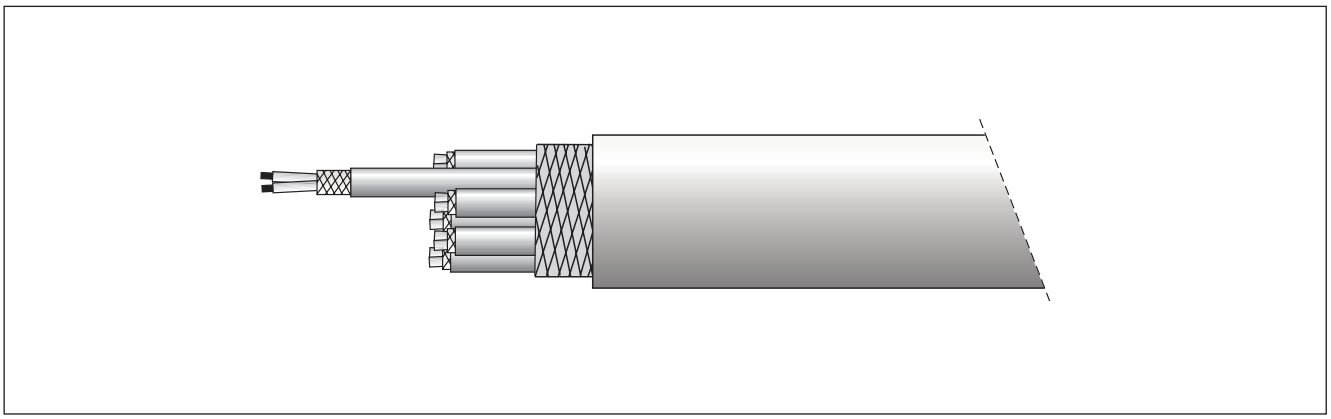
Part number	90386
Cable model	4 wires with shield
Colour	Black
Jacket material	PVC
Outer diameter	4.9 mm
Bending radius	25 mm static use, 100 mm flexible use
Conductor material	Tinned copper
Conductors/diam.	7 x 0.20 mm
Conductor area	AWG24 0.20 mm^2
Braid	Tinned copper
Temperature rating	–20 to +80 °C
Oil resistant	Medium
Recommended to	Signal cable, for DO/DI/AI + prox switches and likewise
EN complience	IEC 332-2

Part number	90443
Cable model	3 wires with shield
Colour	Grey
Jacket material	PUR
Outer diameter	4.7 mm
Bending radius	25 mm static, 75 mm flexible
Conductor material	Copper
Conductors/diam.	15 x 0.15 mm
Conductor area	AWG23 0.25 mm^2
Braid	Copper
Temperature rating	–40 to +80 °C
Oil resistant	High
Special remarks	Halogen free
Recommended to	Signal cable for prox switches etc.

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Multicore Cable



The multicore cable 90521-L with 10 twisted pairs are suitable for both shock pulse and vibration monitoring. The multicore cable can be used with the SPM Junction Boxes (TD-329). The multicore cable is overall shielded and all the pairs are individually shielded. They are resistant to UV radiation, water absorption and inert to almost all chemicals, solvents and fluxes. When ordering, please state desired cable length (L) in meters.

Technical specifications

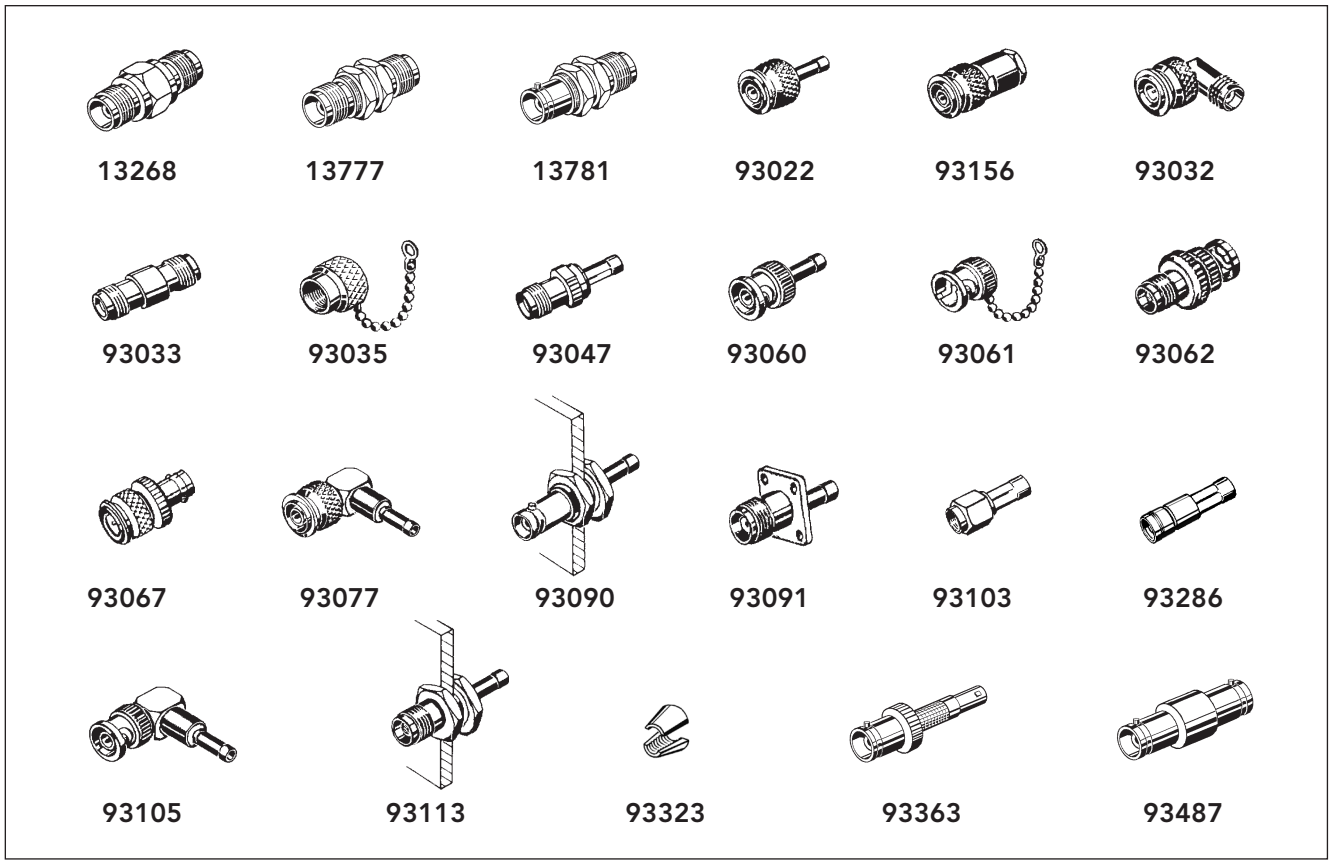
Part number 90521-L

Cable model, 90521-L:	Multi twisted pair, 10 pair
Recommended to:	Multi pair signal cable for vibration signal
Colour:	Grey
Jacket material:	Special PVC
Outer diameter, 90521-L:	18.4 mm
Bending radius, 90521-L:	111 mm static / 221 mm flexible use
Conductor material:	Copper
Conductor construction and diameter:	14 x 0.15
Conductor area:	AWG 23 0.25 mm^2
Braid:	Tinned copper over polyester foil
Temperature rating:	–40 to +80 °C (–40 to +176 °F)
Oil resistant:	High
Special remarks:	Flame retardent, self-extinguishing, cadmium and silicone free
EN complience:	IEC 60332-1, EN 60332-1/2
Nominal voltage:	500 V
Test voltage:	2000 V
Conductor resistance:	max 250 Ohm/km
Mutual capacitance:	Core/core 0.25 mm^2 = 152.5pF/m Core/screen 0.25 mm^2 = 263 pF/m

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Connectors and accessories for coaxial cables



The listed equipment is used for SPM coaxial cable installations for shock pulse and vibration monitoring. See SPM installation instructions and application descriptions for details. The connectors are made of copper/brass with SUCOPLATE® plating. They have PTFE/PFA insulators and silicone rubber gaskets. The temperature range is −65 to +165 °C (−85 to +329 °F).

TNC Connections

13777 TNC-TNC terminal connector (see TD-081)
13781 TNC-BNC terminal connector (see TD-081)
93022 TNC cable connector, plug, crimp (see TD-529)
93032 TNC_TNC angle adapter, plug-jack (see TD-533)
93033 TNC-TNC adapter, jack-jack (see TD-533)
93035 TNC dust cap for jack (see TD-532)
93047 TNC cable connector, jack, crimp (see TD-529)
93067 TNC-BNC adapter, plug-jack (see TD-533)
93077 TNC angle connector, crimp (see TD-529)
93091 TNC terminal connector, flange, crimp (TD-532)
93113 TNC terminal connector, crimp (see TD-532)
93149 Low noise contact pin, TNC/BNC, for low noise cable 90176 (see TD-529)
93156 TNC cable connector, screw-type with strain relief, solder/screw type (see TD-529)
93323 Clamping jaws for 93156 with high temp cable (see TD-529)

Sealed TNC Connections

13008 TNC cable plug, crimp (see TD-009)
15837 TNC cable plug, crimp (see TD-292)
15291 TNC cable plug, composite, crimp (see TD-257)
13268 TNC-TNC adapter, jack-jack, for sealed connection (see TD-025)

BNC Connections

93060 BNC cable connector, plug crimp (see TD-530)
93061 BNC dust cap (see TD-532)
93062 BNC-TNC adapter, plug-jack (see TD-533)
93090 BNC terminal connector, crimp (see TD-532)
93105 BNC angle connector, crimp (see TD-530)
93363 BNC-mini coax adapter, fits Bearing Checker (see TD-533)
93487 BNC-BNC adapter, jack-jack (see TD-533)

SMA Connections

93103 SMA cable connector, plug, crimp, fits TRV-01 (see TD-531)

SMB Connections

93286 SMB cable connector, crimp (see TD-531)

Sealed SMB Connections

14990 SMB cable plug, crimp (see TD-248)
15869 SMB cable plug, crimp (see TD-294)
15388 SMB cable plug, composite, crimp (see TD-258)

Connector for Coax Screw Terminal

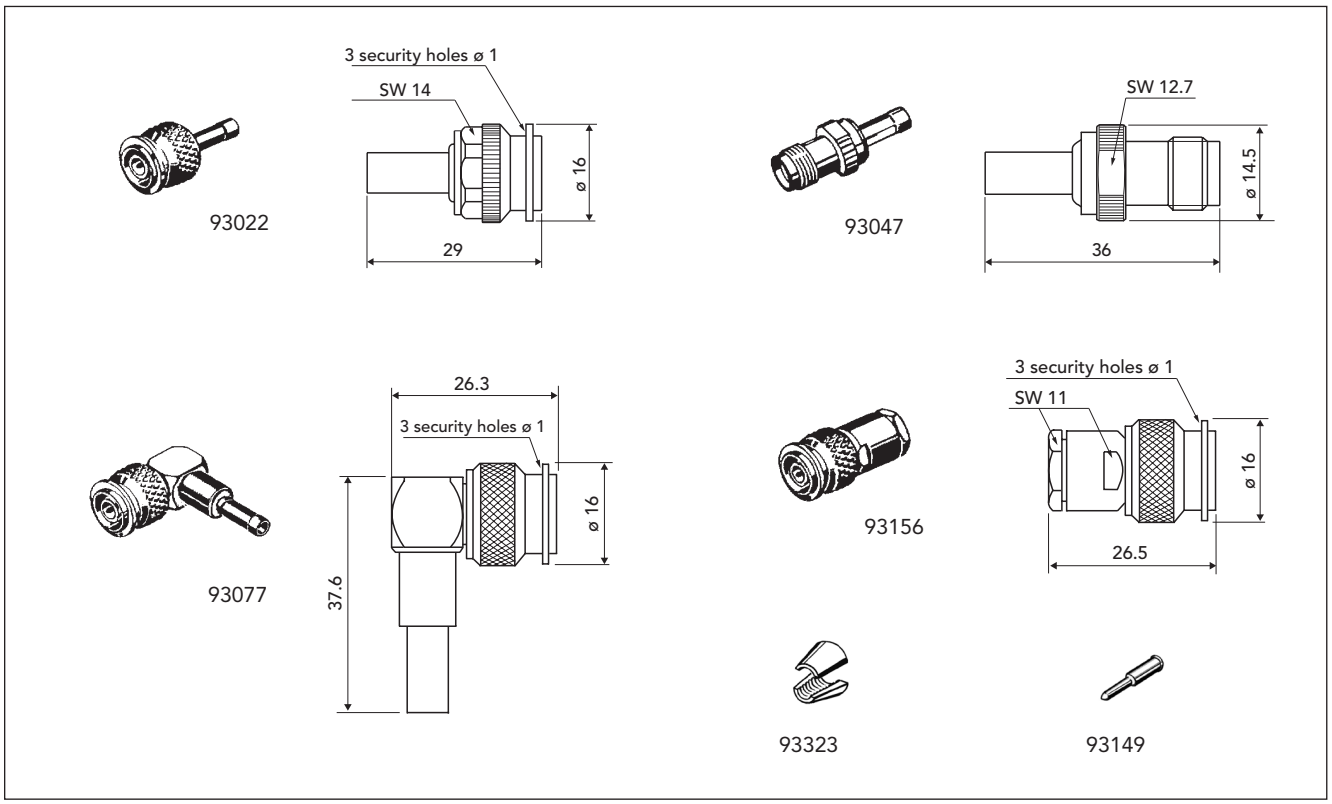
12775 Mounting kit for coax cable (fits Intellinova Compact, INB80/82, Junction Box 162XX)

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TNC cable connectors



TNC connectors are used for SPM Instruments coaxial cable installations for shock pulse and vibration monitoring. See SPM Instruments installation instructions and application descriptions for details. The connectors are made of copper/brass with SUCOPLATE® plating. They have PTFE/PFA insulators and silicone rubber gaskets. The temperature range is –65 to +165 °C (–85 to +329 °F).

Part numbers

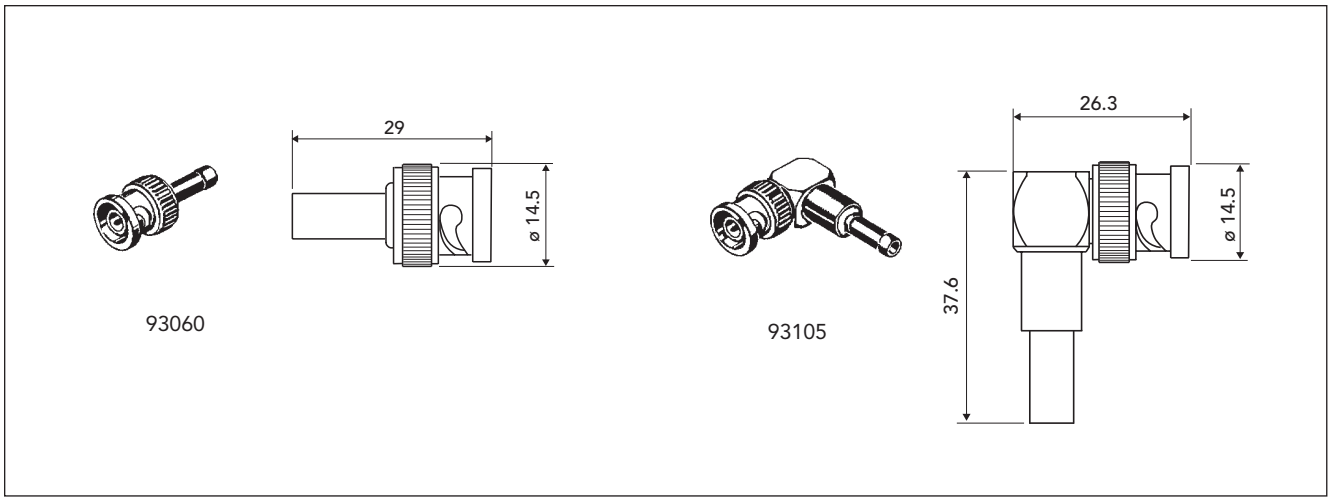
93022	TNC cable connector, plug, crimp
93047	TNC cable connector, jack, crimp
93077	TNC angle connector, plug, crimp
93156	TNC cable connector, screw-type with strain relief, solder/screw type
93323	Clamping jaws for 93156 with high temp cable
93149	Low noise contact pin, TNC/BNC, for low noise cable 90176
12775	Connector for SPM coax screw terminal (Intellinova Compact, INB80/82, Junction Box 162XX)

Sealed TNC cable connectors, see TD-296.
TNC terminal connectors, see TD-532.
TNC adapters, see TD-533.

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BNC cable connectors



BNC connectors are used for SPM Instruments coaxial cable installations for shock pulse and vibration monitoring. See SPM Instruments installation instructions and application descriptions for details. The connectors are made of copper/brass with SUCOPLATE® plating. They have PTFE/PFA insulators and silicone rubber gaskets. The temperature range is –65 to +165 °C (–85 to +329 °F).

Part numbers

93060	BNC cable connector, plug, crimp
93105	BNC angle connector, plug, crimp
12775	Connector for SPM coax screw terminal (Intellinova Compact, INB80/82, Junction Box 162XX)

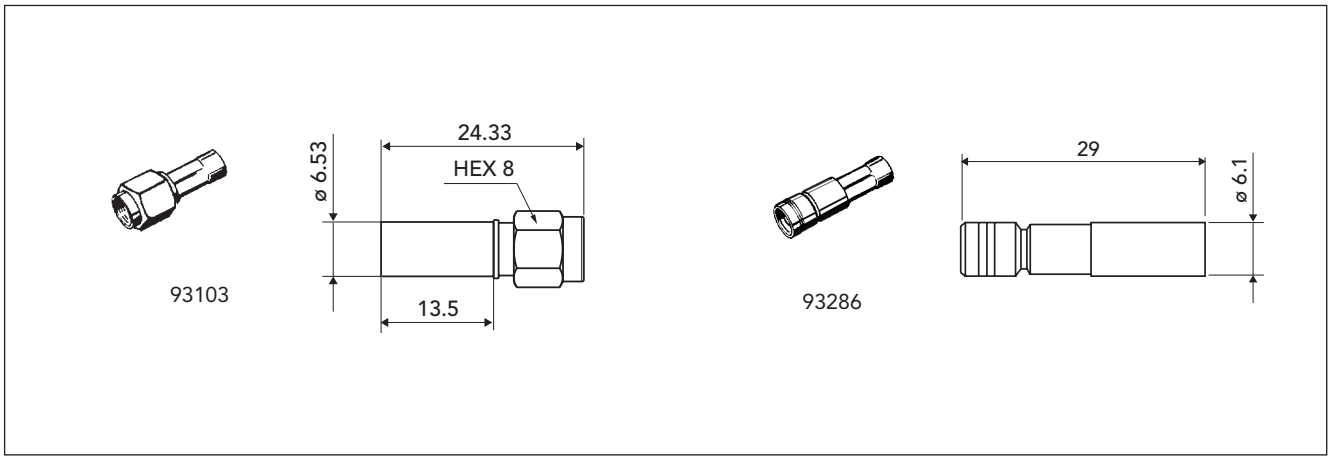
BNC Terminal connectors, see TD-532.

BNC Adapters, see TD-533.

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SMA/SMB cable connectors



The listed equipment is used for SPM Instruments coaxial cable installations for shock pulse and vibration monitoring. See SPM Instruments installation instructions and application descriptions for details. The connectors are made of copper/brass with SUCOPLATE® plating. They have PTFE/PFA insulators and silicone rubber gaskets. The temperature range is –65 to +165 °C (–85 to +329 °F).

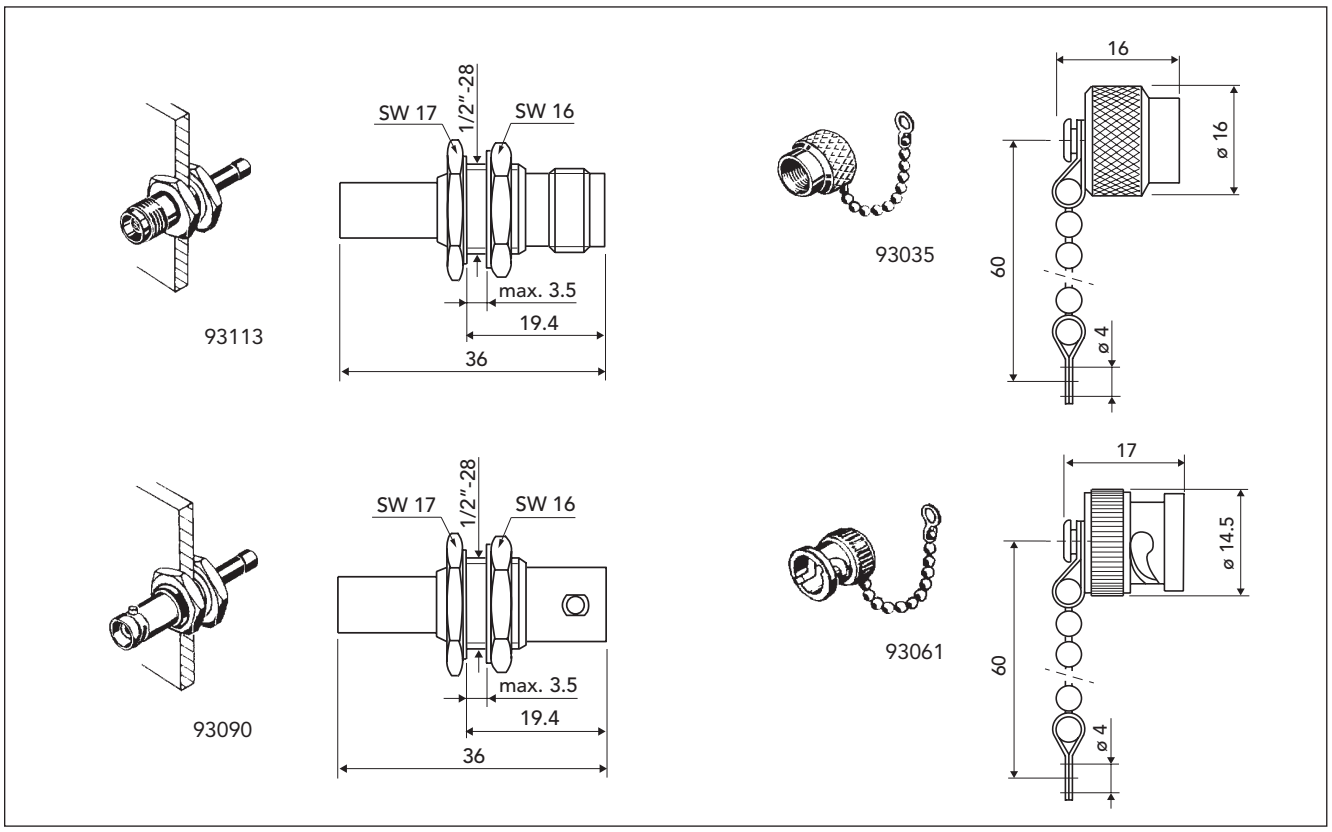
Part numbers

93103	SMA cable connector, plug, crimp (fits TRV-01)
93286	SMB cable connector, jack, crimp
14990	SMB cable plug, crimp (TD-248)
15869	SMB cable plug, crimp (TD-294)
15388	SMB cable plug, composite, crimp (TD-258)

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TNC/BNC terminal connectors



The terminal connectors are used for SPM Instruments coaxial cable installations for shock pulse and vibration monitoring, mainly used as measuring terminals, connecting a hand-held instrument with a permanently installed transducer. They are then normally mounted on the terminal bracket 13778 or in a terminal cabinet.

The terminal connectors 93090 and 93113 can also be used as bulkhead unions for walls with a thickness of up to 3.5 mm.

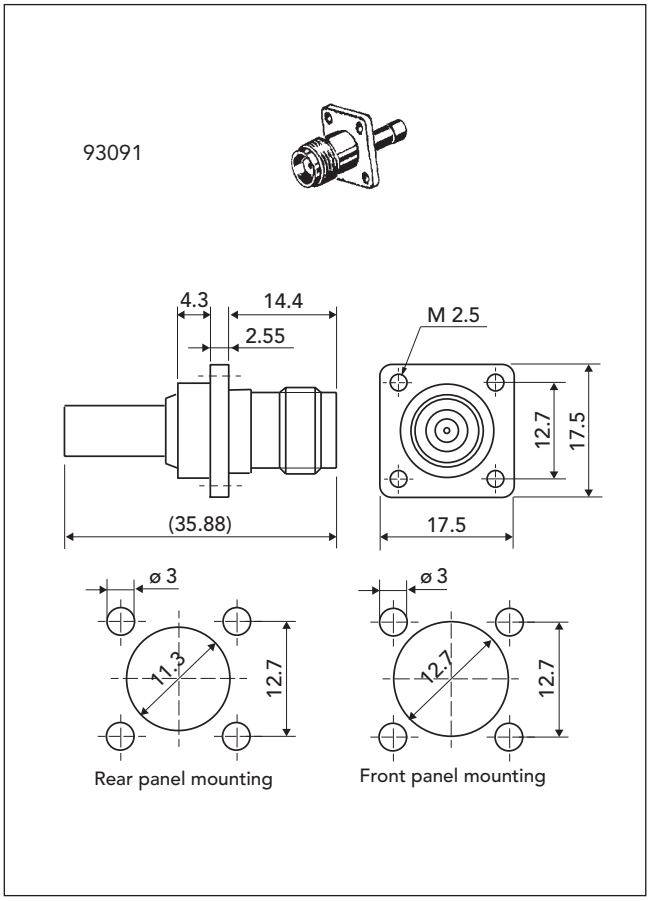
The open end of the connectors should always be protected by dust caps, 93035 for TNC and 93061 for BNC.

The connectors are made of copper/brass with SUCOPLATE® plating. They have PTFE/PFA insulators and silicone rubber gaskets. The temperature range is –65 to +165 °C (–85 to +329 °F).

Part numbers

93091	TNC terminal connector, flange, crimp
93113	TNC terminal connector, crimp
93035	TNC dust cap for jack
93090	BNC terminal connector, crimp
93061	BNC dust cup for jack

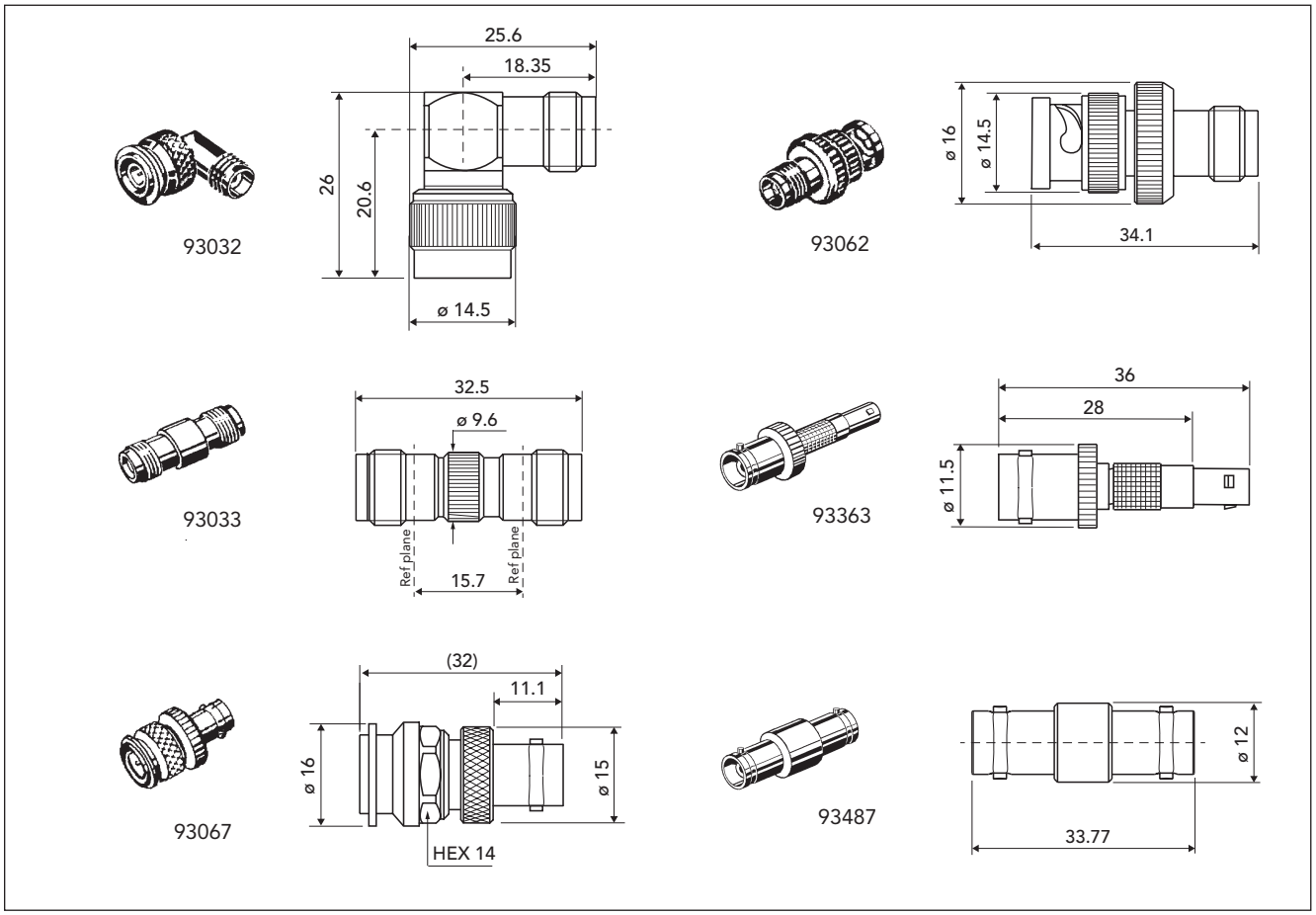
Sealed TNC/BNC terminal connectors, see TD-081.



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TNC/BNC adapters



TNC and BNC adapters can be used for joining two coaxial cables, to repair broken cables or to prolong cables during installation. See SPM Instrument installation instructions and application descriptions for details. The connectors are made of copper/brass with SUCOPLATE® plating. They have PTFE/PFA insulators and silicone rubber gaskets. The temperature range is –65 to +165 °C (–85 to +329 °F).

Part numbers

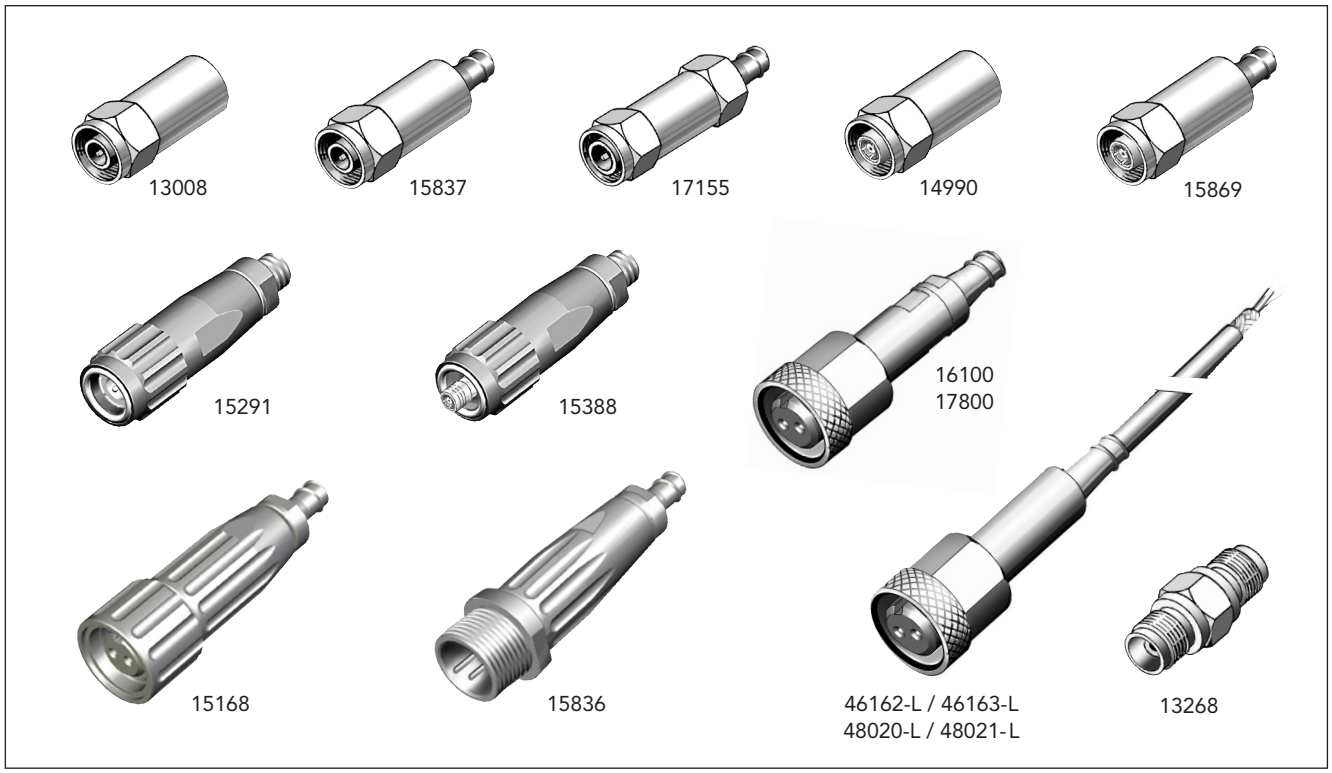
93032	TNC angle adapter, plug-jack
93033	TNC adapter, jack-jack
93067	TNC-BNC adapter, plug-jack
93062	BNC-TNC adapter, plug-jack
93363	BNC-mini coax adapter (fits BearingChecker)
93487	BNC-BNC adapter

TNC adapter 13268 for sealed installation, see TD-025.

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Sealed Connectors – Overview



The listed equipment is used for SPM cable installations for shock pulse and vibration monitoring. See specific data sheets (TD) for installation descriptions and technical specifications.

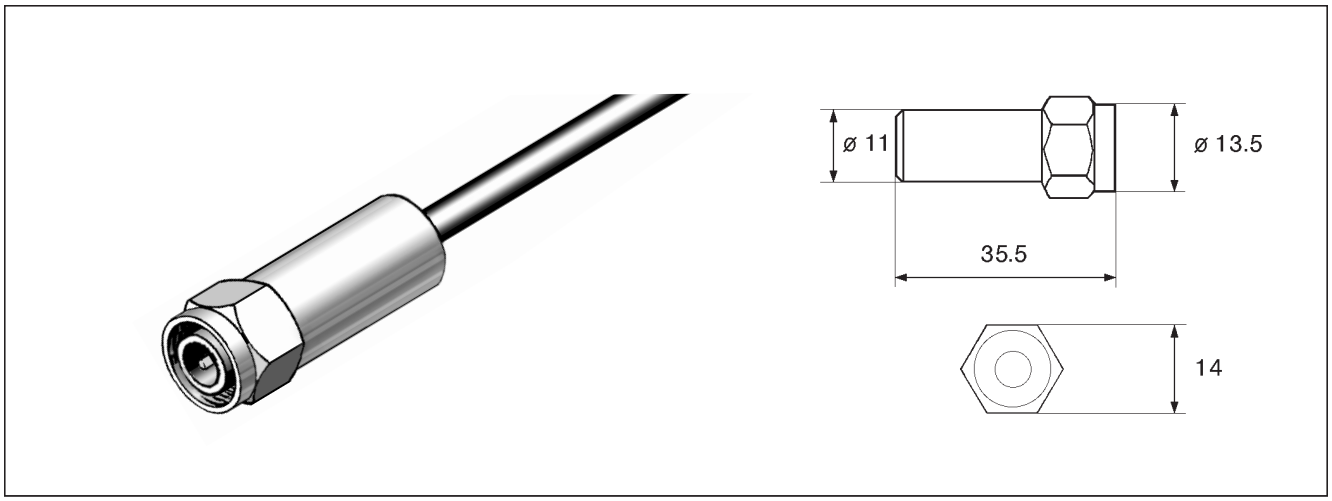
Article no.	Connector	Type	Protection	Material	Fitting for protection tube	TD sheet
13008	TNC	plug	IP67	stainless steel*	no	TD-009
15837	TNC	plug	IP67	stainless steel*	yes	TD-292
17155	TNC	plug	IP67	stainless steel*	yes	TD-462
15291	TNC	plug	IP67	composite	yes	TD-257
13268	TNC	jack-jack	IP67	stainless steel*	no	TD-025
14990	SMB	plug	IP67	stainless steel**	no	TD-248
15869	SMB	plug	IP67	stainless steel*	yes	TD-294
15388	SMB	plug	IP67	composite	yes	TD-258
16100	2-pin	jack	IP67	stainless steel*	yes	TD-314
17800	2-pin	jack, extended collet	IP67	stainless steel*	yes	TD-527
15168	2-pin	jack	IP67	composite	yes	TD-217
15836	2-pin	plug	IP67	composite	yes	TD-291
46162-L	2-pin	jack with integrated cable -65° to +200°C ***	IP67	stainless steel*	yes	TD-301
46163-L	2-pin	jack with integrated cable, -40° to +90°C ***	IP67	stainless steel*	yes	TD-301
48020-L	2-pin	jack with integrated cable and extended collet, -65° to +200°C ***	IP67	stainless steel*	yes	TD-301
48021-L	2-pin	jack with integrated cable and extended collet, -40° to +90°C ***	IP67	stainless steel*	yes	TD-301

* Sandvik 1802, EN:1.4523
** AISI 316L, EN:1.4404
*** When ordering connector with integrated cable, please state the desired cable length (L) in meters.

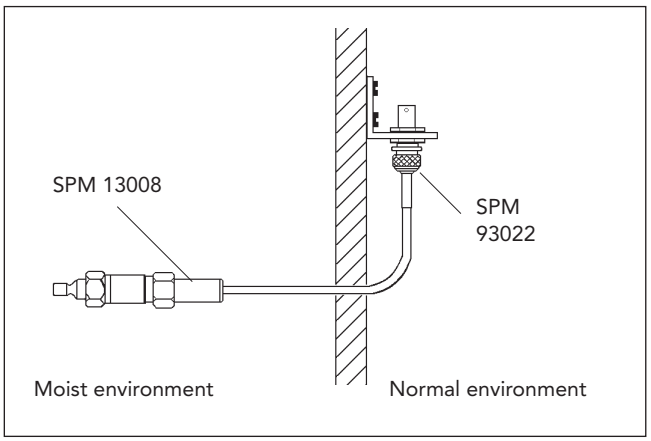
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TNC Cable Plug 13008



SPM 13008 is a special TNC cable plug for SPM installations in moist environments. It prevents moisture from entering the coaxial cable and causing loss of signal strength. The cable plug fits standard shock pulse transducers and other SPM measuring equipment with TNC jacks having a ø 14 mm connector base. It must be used wherever the TNC connection is exposed to water, steam, or high humidity.

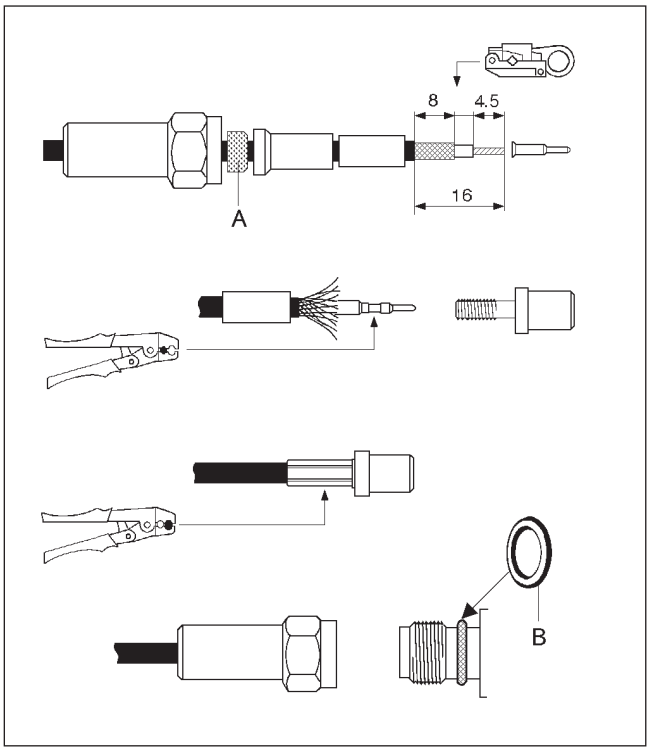


The cable seal, marked A below, seals the cable entry when the connector collet is tightened. The sealing ring marked B is placed over the receiving TNC jack and seals the other end of the connection.

Note: The connector package contains two cable seals (A) of different sizes, marked in different colours:

- green seal for cable diameter 4 mm
- black seal for cable diameter 5 mm.

Use the appropriate seal and discard the other. Lubricate the thread with oil or grease. Tighten the connector with a 14 mm open wrench.



The instruction for cable stripping is included in the package. SPM offers two tools for connector mounting:

81052 Cutting tool for stripping coaxial cables
81478 Crimping tool for fitting cable connectors.
81479 Die for TNC to crimping tool 81478.

To join two cables in moist environment, use the TNC adapter SPM 13268 (separate data sheet) together with two cable connectors SPM 13008.

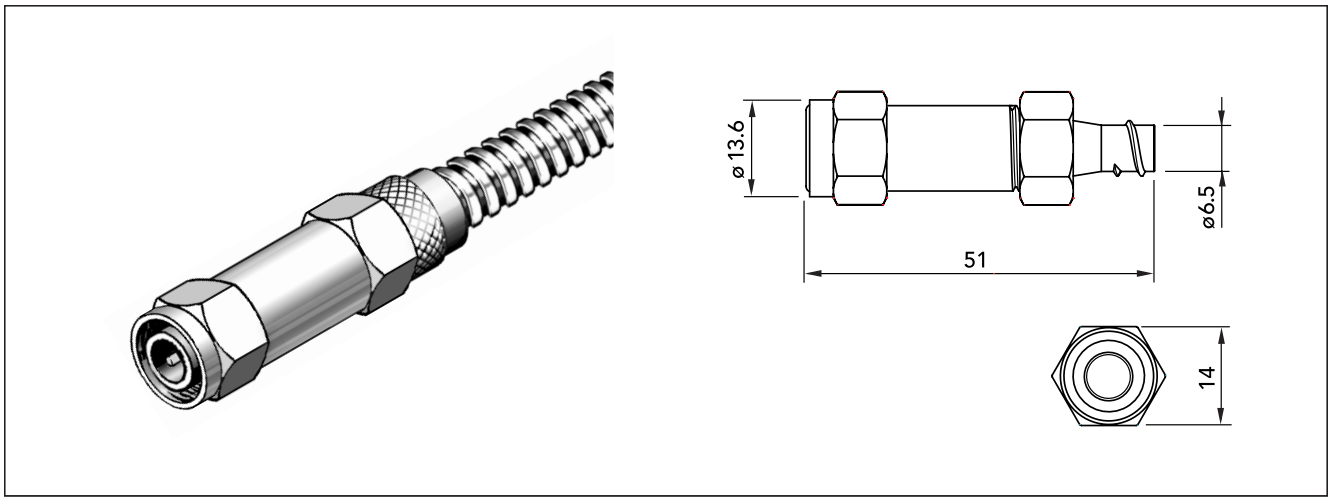
Technical data:

Material, connector body:	Stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Temperature range:	−40° to 150 °C (−40° to 302 °F)
Connector type:	TNC plug
Seals:	Viton (fluor rubber)
Connector tightness:	IP67
Torque:	Min. 7 Nm / Max. 9 Nm

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TNC Cable Plug 17155



SPM 17155 is a sealed TNC cable plug designed for use with cable protection tube (SPM 81385). The plug prevents moisture from entering the coaxial cable and causing loss of signal strength. It fits standard shock pulse transducers and other SPM measuring equipment with TNC jacks having a ø 14 mm connector base. It can be used wherever the TNC connection is exposed to water, steam, or high humidity.

The cable seal, marked A in the figure, seals the cable entry when the connector collet is tightened. The sealing ring marked B is placed over the receiving jack and seals the other end of the connection.

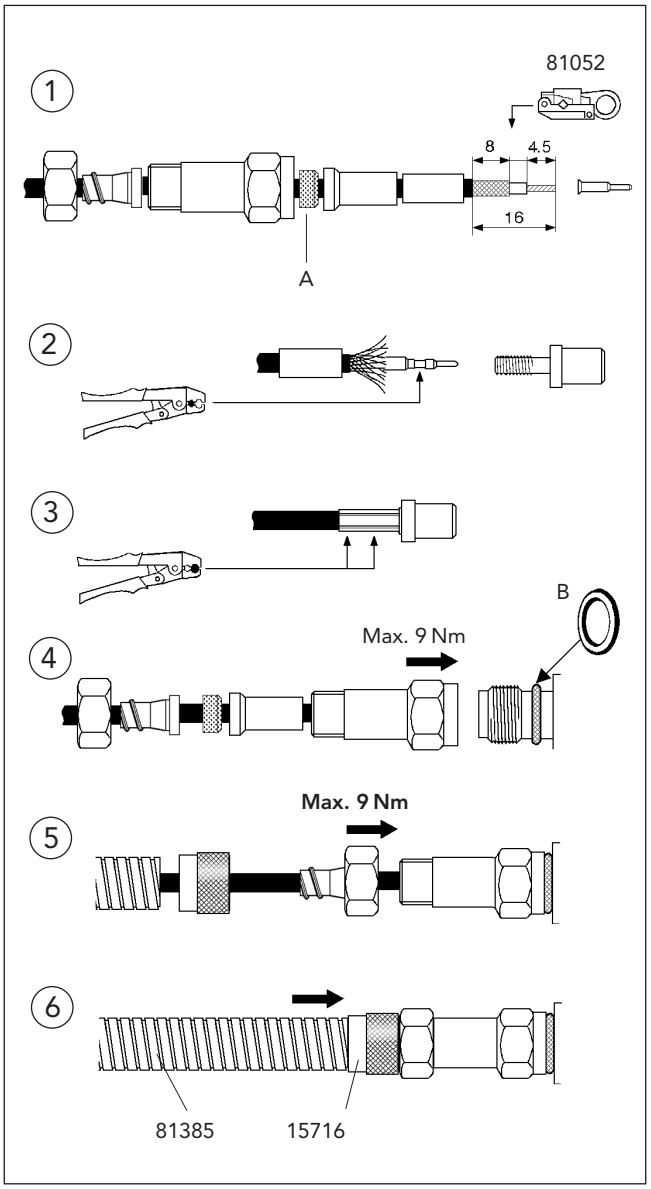
Note! The connector package contains two cable seals (A) of different sizes, marked in different colours:

- green seal for cable diameter 4 to 4.5 mm
- black seal for cable diameter 4.5 to 5.2 mm.

Use the appropriate seal and discard the other. Lubricate the thread with oil or grease. Tighten the connector and the end piece for the protection tube with a 14 mm open wrench.

The instruction for cable stripping is included in the package. SPM offers two tools for connector mounting:

81052 Cutting tool for stripping coaxial cables
81478 Crimping tool for fitting cable connectors.
81479 Die for TNC to crimping tool 81478.



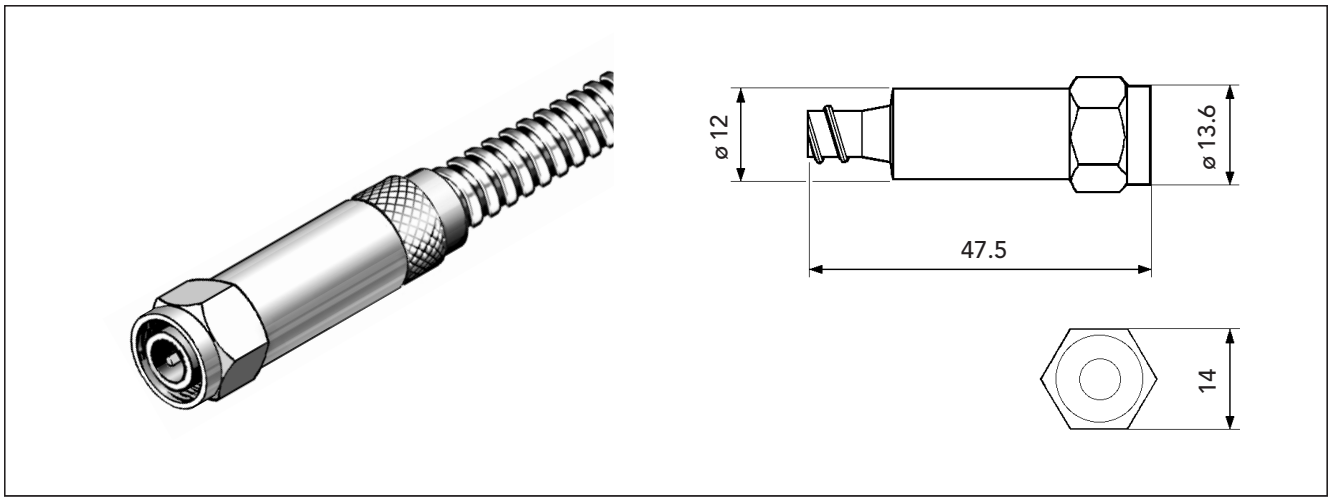
Technical specifications

Material, connector body:	Stainless acid proof steel Sandvik Grade:1802, EN:1.4523
Temperature range:	–40° to 150 °C (–40° to 302 °F)
Connector type:	TNC plug
Seals:	Viton (fluor rubber)
Protection category:	IP67
Torque:	Min. 7 Nm/Max. 9 Nm

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TNC Cable Plug 15837



SPM 15837 is a sealed TNC cable plug designed for use with cable protection tube (SPM 81385). The plug prevents moisture from entering the coaxial cable and causing loss of signal strength. It fits standard shock pulse transducers and other SPM measuring equipment with TNC jacks having a ø 14 mm connector base. It can be used wherever the TNC connection is exposed to water, steam, or high humidity.

The cable seal, marked A in the figure, seals the cable entry when the connector collet is tightened. The sealing ring marked B is placed over the receiving jack and seals the other end of the connection.

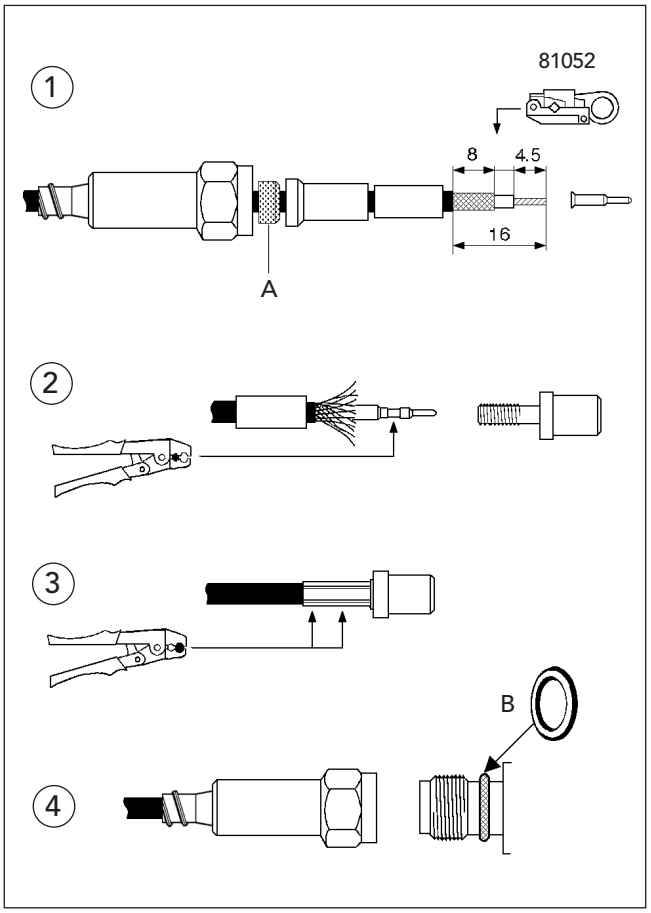
Note! The connector package contains two cable seals (A) of different sizes, marked in different colours:

- green seal for cable diameter 4 to 4.5 mm
- black seal for cable diameter 4.5 to 5.2 mm.

Use the appropriate seal and discard the other. Lubricate the thread with oil or grease. Tighten the connector with a 14 mm open wrench.

The instruction for cable stripping is included in the package. SPM offers two tools for connector mounting:

81052 Cutting tool for stripping coaxial cables
81478 Crimping tool for fitting cable connectors.
81479 Die for TNC to crimping tool 81478.



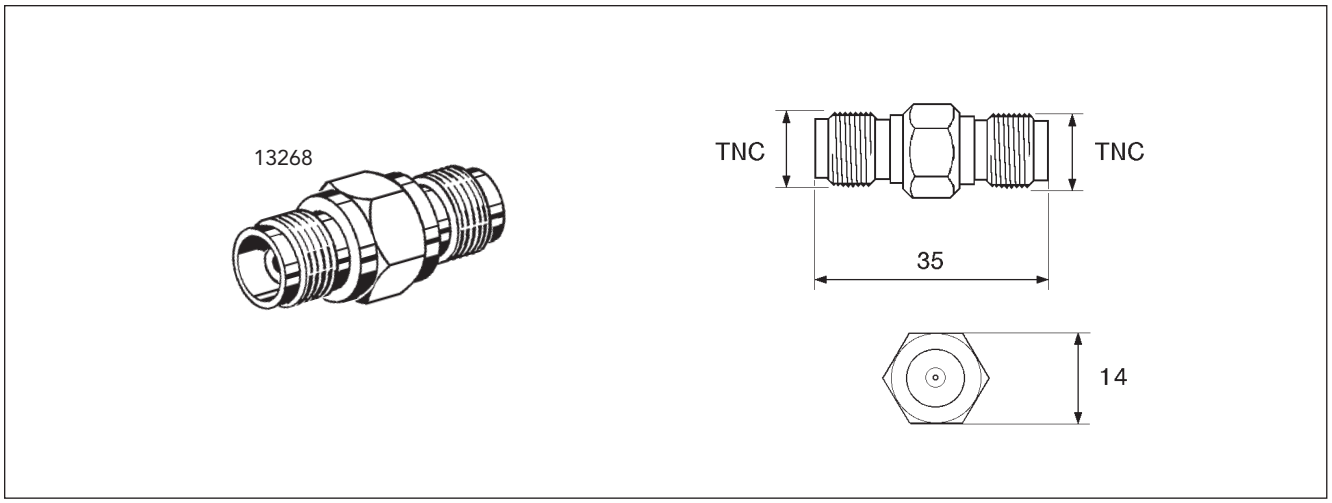
Technical specifications

Material, connector body:	Stainless acid proof steel Sandvik Grade:1802, EN:1.4523
Temperature range:	–40° to 150° C (–40° to 302° F)
Connector type:	TNC plug
Seals:	Viton (fluor rubber)
Connector tightness:	IP67
Torque:	Min. 7 Nm / Max. 9 Nm

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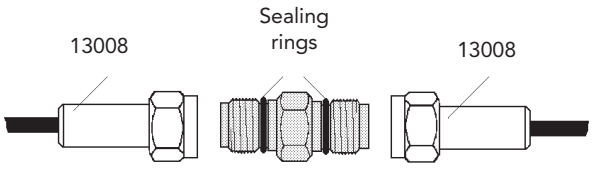
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TNC Adapter for Sealed Installation



13268 is a special TNC adapter (jack - jack) for joining two coaxial cables. It is used to repair broken cables or to prolong cables during installation.

In environments where the connection is exposed to water, steam, or high humidity, the cable plugs must be of sealed type (for example, 13008). This type of plug prevents moisture from entering the coaxial cable and causing loss of signal strength. The sealing rings are placed over the receiving TNC jacks of the adapter. The connection is tightened with two 14 mm open wrenches until the sealing rings are slightly flattened against the adapter body.



Cable joint in moist environmemt

Technical specifications

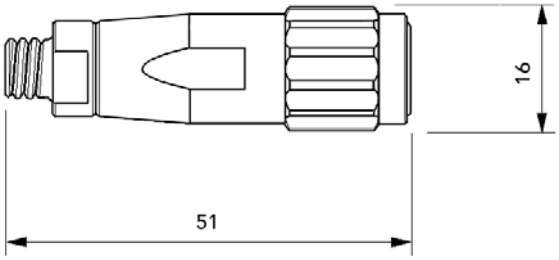
Material, adapter body:	stainless acid-proof steel, Sandvik Grade:1802, EN:1.4523
Design:	sealed
Temperature range:	−65 to +165 °C (−85 to +329 °F)
Connector tightness:	IP65, IP67 with appropriate connector
Connector type:	TNC jack

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TNC Cable Plug 15291





SPM 15291 is a TNC cable plug made of composite material and has sealings which prevent moisture from entering the cable causing loss of signal strength. The cable plug fits standard shock pulse transducers and other SPM measuring equipment with TNC jacks. It must be used wherever the TNC connection is exposed to water, steam, or high humidity.

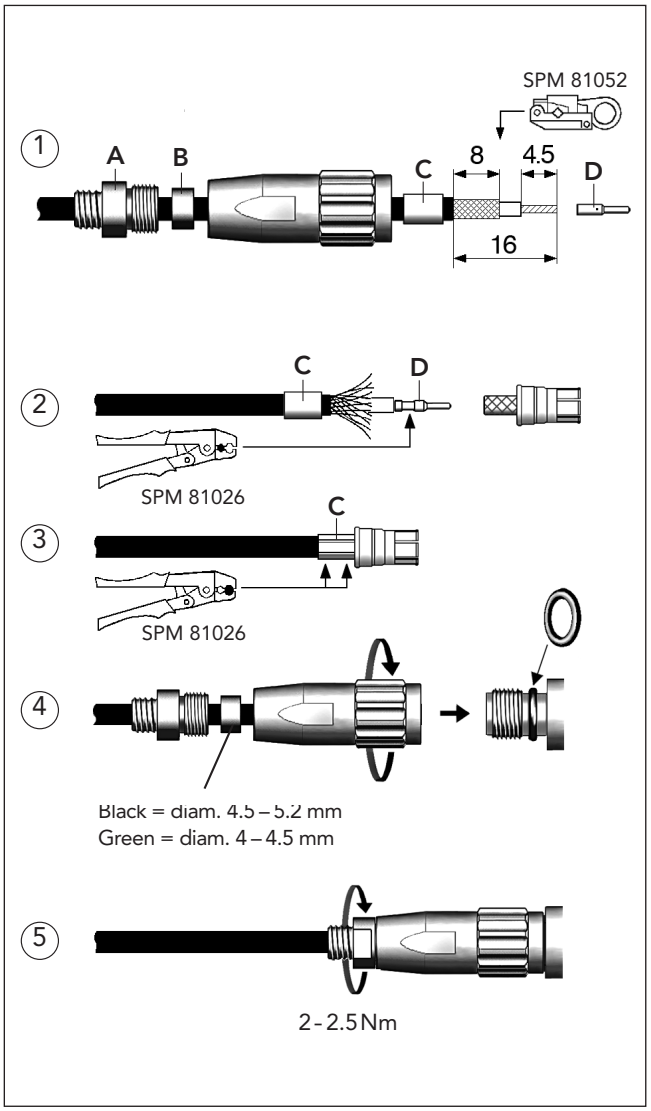
The end (A) of the connector is designed for use with cable protection tube. The connector can easily be mounted in the field by crimping/soldering.

The cable seal, marked B in the figure, seals the cable entry when the connector collet (A) is tightened. Note: The connector package contains two cable seals (B) of different sizes, marked in different colours.

- Green seal for cable diameter 4 to 4.5 mm
- Black seal for cable diameter 4.5 to 5.2 mm.

Use the appropriate seal and discard the other. Lubricate the thread with oil or grease. Tighten the collet (A) by hand or with a 10 mm open wrench, 2 to 2.5 Nm. The instruction for cable stripping is included in the package.

SPM offers two tools for connector mounting:
81052 Cutting tool for stripping coaxial cables
81026 Crimping tool for fitting cable connectors.



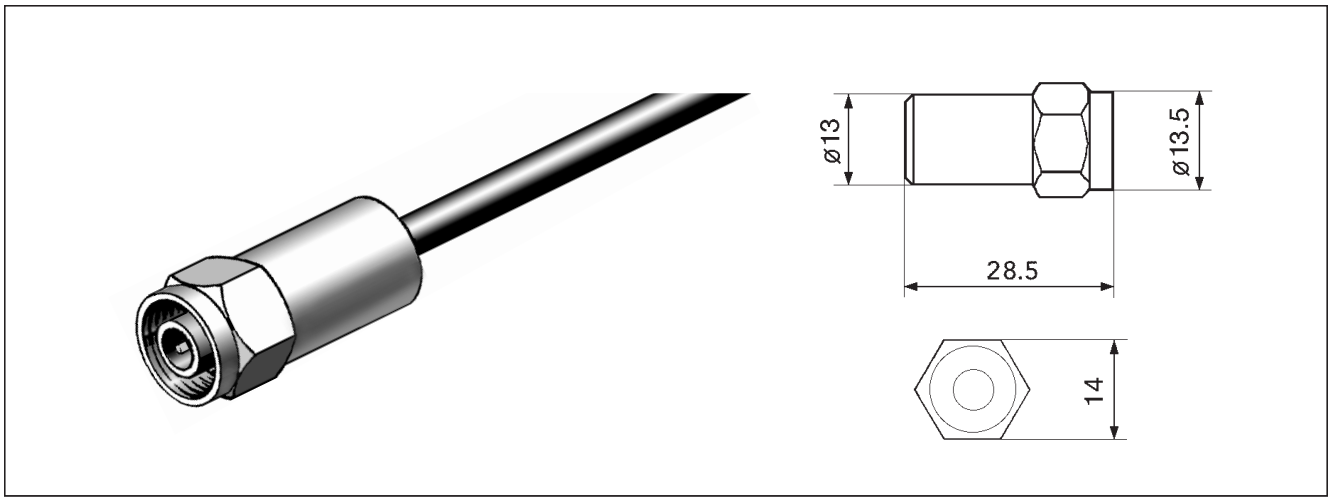
Technical specifications

Mounting:	Crimp/solder termination
Wire range/size:	Coaxial cable diam. 4–5.2 mm
Temperature range:	–40° C to +150° C (–40 ° F to 302° F)
Material, connector body:	Composite
Contact plating:	Gold
Seals:	Viton (fluor rubber), IP 67

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SMB Cable Plug 14990



The sealed SMB cable plug SPM 14990 fits SPM vibration transducers of type SLD with SMB connector.

The cable seal, marked B in the figure, seals the cable entry when the connector collet is tightened. The sealing ring marked G is placed over the receiving jack and seals the other end of the connection.

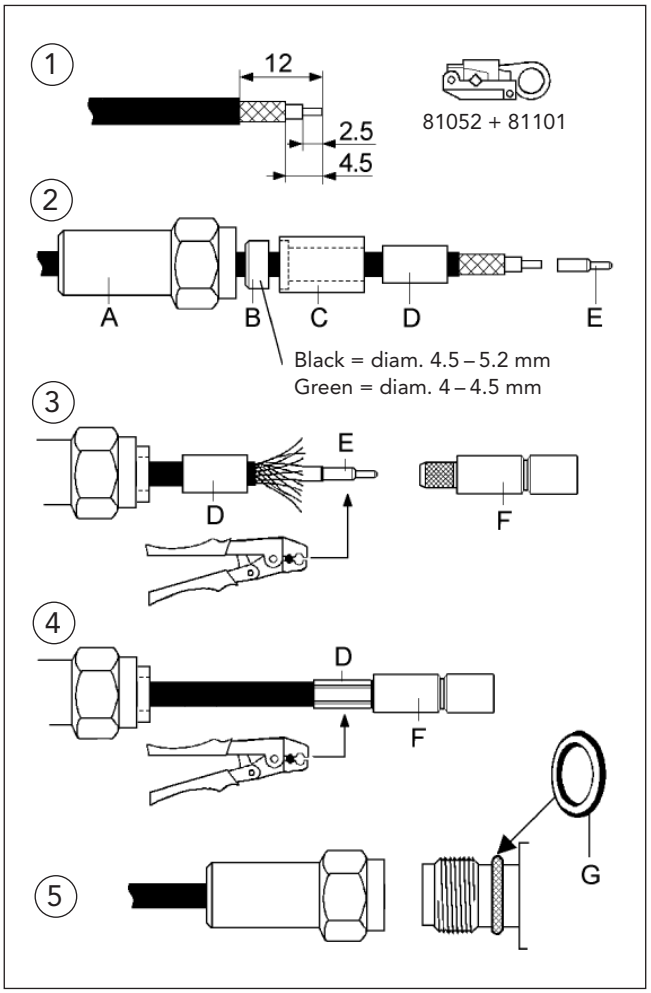
Note: The connector package contains two cable seals (B) of different sizes, marked in different colours:

- green seal for cable diameter 4 to 4.5 mm
- black seal for cable diameter 4.5 to 5.2 mm.

Use the appropriate seal and discard the other. Lubricate the thread with oil or grease. Tighten the connector with a 14 mm open wrench.

The instruction for cable stripping and crimping is included in the package. SPM offers tools for connector mounting:

81052	Cutting tool for stripping coaxial cables
81101	Insert for cutting tool 81052
81478	Crimping tool for fitting cable connectors
81479	Die for TNC to crimping tool 81478



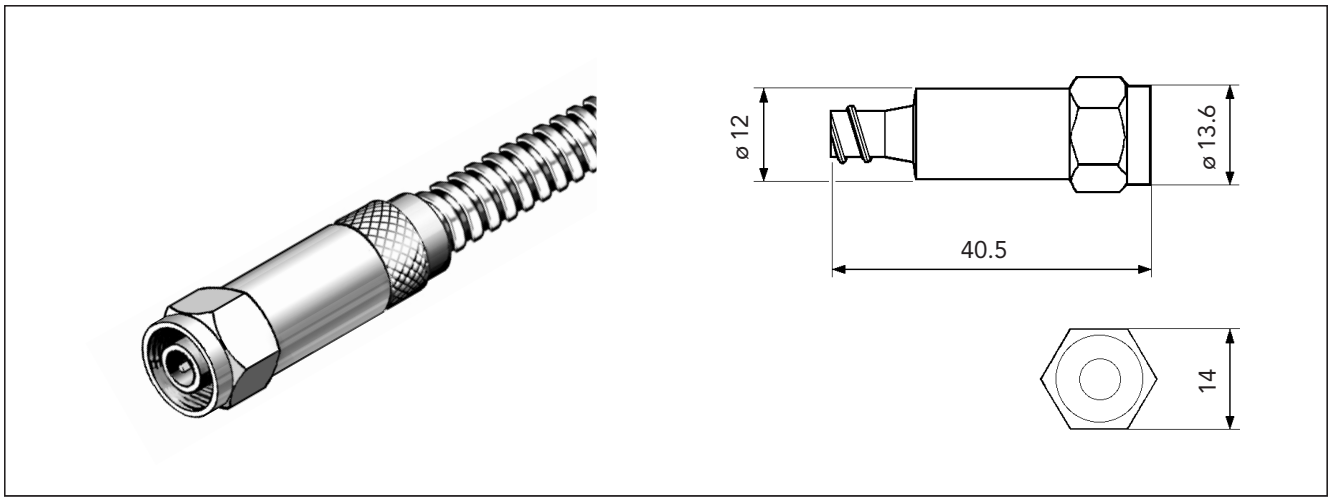
Technical specifications

Material, connector body:	Stainless acid proof steel, AISI 316L
Temperature range:	–40° to 150 °C (–40° to 302 °F)
Connector type:	SMB
Seals:	Viton (fluor rubber), IP67
Torque:	Min. 7 Nm / Max. 9 Nm

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SMB Cable Plug 15869



The sealed SMB cable plug SPM 15869 fits SPM vibration transducers of type SLD with SMB connector. The end of the cable plug is designed for use with cable protection tube (SPM 81385).

The cable seal, marked B in the figure, seals the cable entry when the connector collet is tightened. The sealing ring marked G is placed over the receiving jack and seals the other end of the connection.

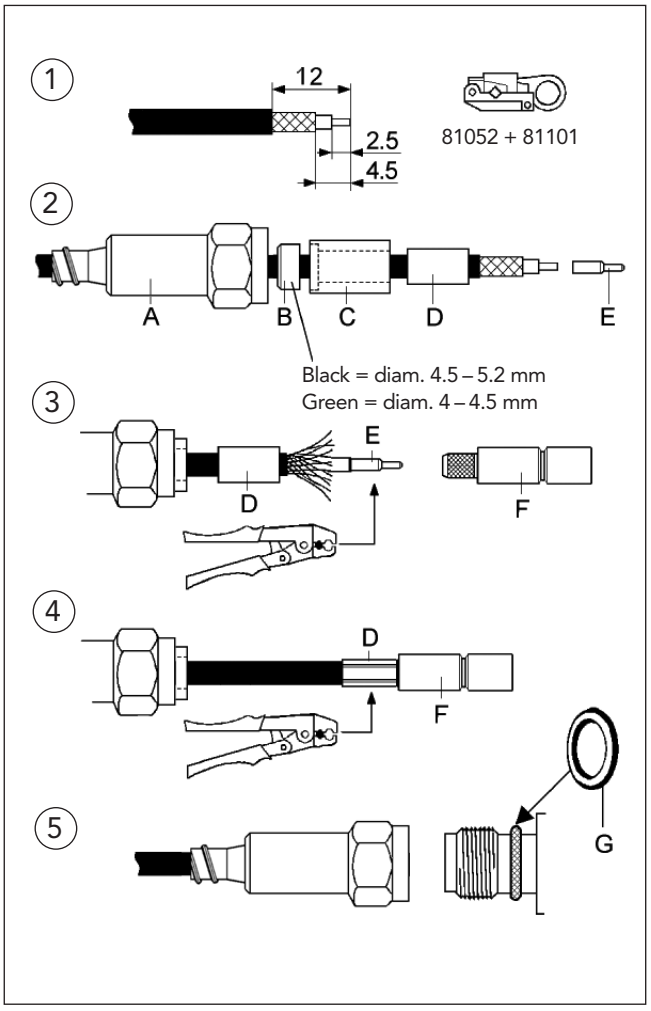
Note! The connector package contains two cable seals (B) of different sizes, marked in different colours:

- green seal for cable diameter 4 to 4.5 mm
- black seal for cable diameter 4.5 to 5.2 mm.

Use the appropriate seal and discard the other. Lubricate the thread with oil or grease. Tighten the connector with a 14 mm open wrench.

The instruction for cable stripping and crimping is included in the package. SPM offers tools for connector mounting:

81052 Cutting tool for stripping coaxial cables
81101 Insert for cutting tool 81052
81300 Crimping tool for fitting cable connectors.



Technical specifications

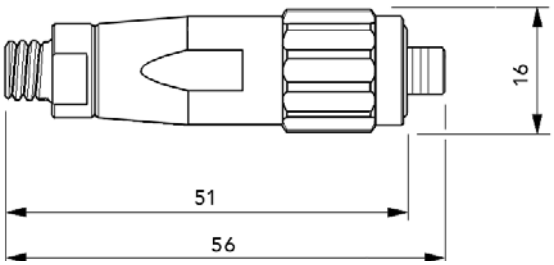
Material, connector body:	Stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Temperature range:	–40° to 150 °C (–40° to 302 °F)
Connector type:	SMB
Seals:	Viton (fluor rubber), IP67
Torque:	Min. 7 Nm / Max. 9 Nm

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SMB Cable Plug 15388





SPM 15388 is a SMB cable plug for connection of vibration transducers of type SLD with SMB connector. It is made of composite material and has sealings which prevent moisture from entering the cable causing loss of signal strength.

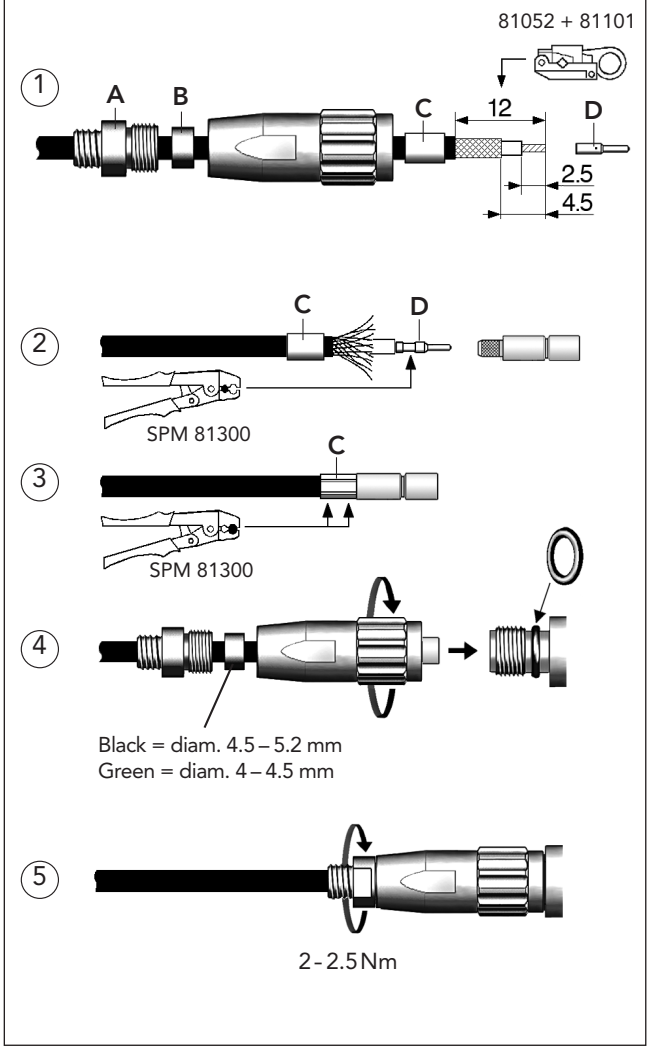
The end (A) of the connector is designed for use with cable protection tube. The connector can easily be mounted in the field by crimping/soldering.

The cable seal, marked B in the figure, seals the cable entry when the connector collet (A) is tightened. Note: The connector package contains two cable seals (B) of different sizes, marked in different colours.

- Green seal for cable diameter 4 to 4.5 mm
- Black seal for cable diameter 4.5 to 5.2 mm.

Use the appropriate seal and discard the other. Lubricate the thread with oil or grease. Tighten the collet (A) by hand or with a 10 mm open wrench, 2 to 2.5 Nm. The instruction for cable stripping is included in the package.

SPM offers two tools for connector mounting:
81052 Cutting tool for stripping coaxial cables
81101 Insert for cutting tool 81052
81300 Crimping tool for fitting cable connectors.



Technical specifications

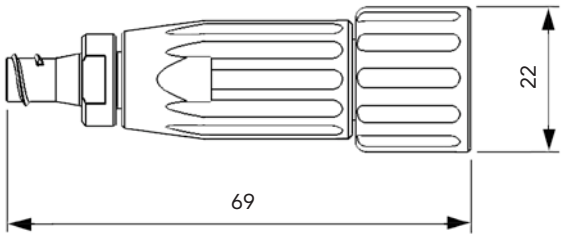
Mounting:	Crimp/solder termination
Wire range/size:	Coaxial cable diam. 4–5.2 mm
Temperature range:	–40 °C to +150 °C (–40 °F to 302 °F)
Material, connector body:	Composite
Contact plating:	Gold
Seals:	Viton (fluor rubber), IP 67

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2-pin cable jack 15168



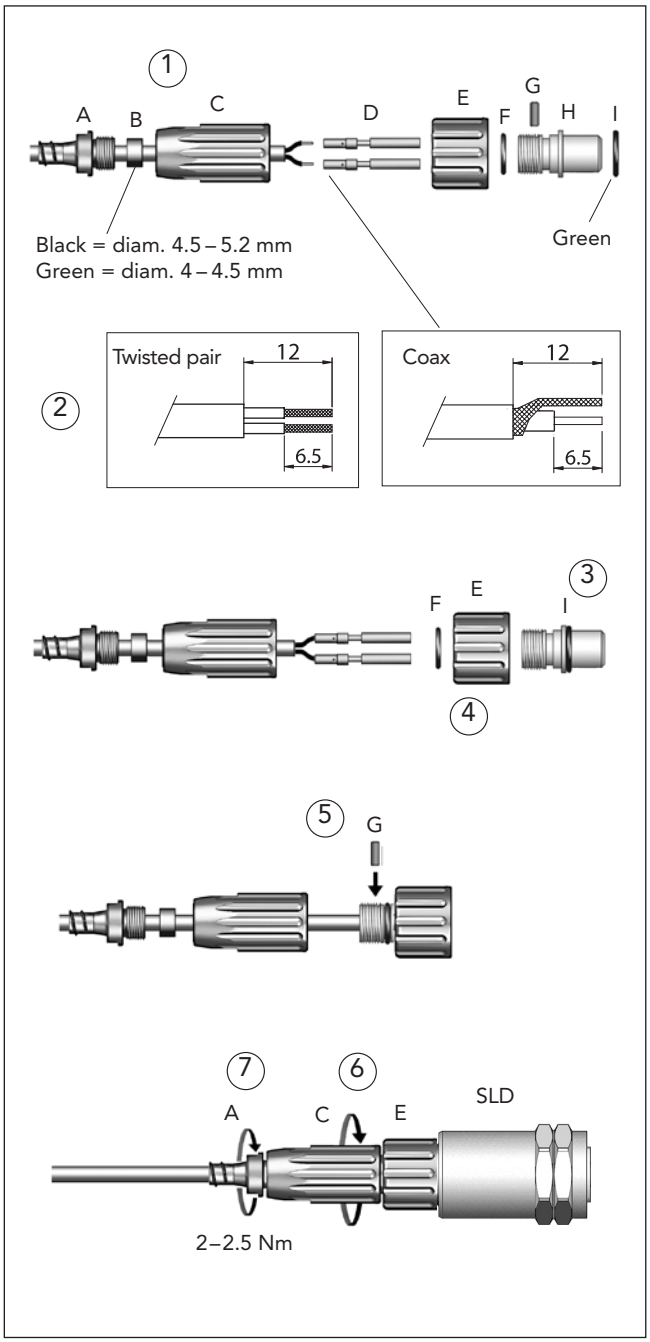


15168 is a 2-pin MIL style cable jack for connection of vibration transducers of type SLD to twisted pair cable or coaxial cable. The end (A) of the connector is designed for use with cable protection tube. The connector can easily be mounted in the field, either by crimping or soldering.

The cable seal, marked B in the figure, seals the cable entry when the connector collet (A) is tightened. Note: The connector package contains 3 sockets (D) and 2 cable seals (B) of different sizes, marked in different colours.

- Green seal for cable diameter 4 to 4.5 mm.
- Black seal for cable diameter 4.5 to 5.2 mm.

To mount the connector, slide the parts A, B and C over the cable. Cut and strip the cables as shown in the figure and crimp/solder the sockets (D). Use the socket 16-18 AWG for the shield when using coaxial cable. Mount the green sealing ring (I) on the contact body (H). Slide the nut (E) over the connector body and mount the sealing ring (F). Push the sockets (D) into the connector body and secure them by mounting the locking pin (G). Mount the connector on a transducer and tighten first part E and then part C by hand. Tighten the collet (A) with a suitable tool, 2 to 2.5 Nm.



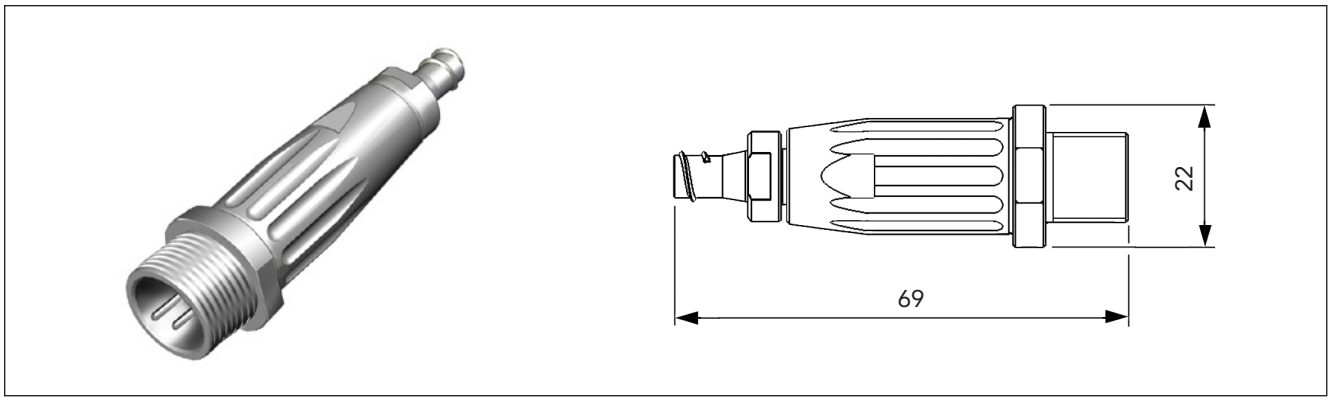
Technical specifications

Mounting:	Crimp/solder termination
Wire range/size:	0.30 - 0.60 mm²/22-20 AWG
	0.75 - 1.5 mm²/16-18 AWG
Temperature range:	–40 to +125 °C (–40 to 257 °F)
Material, connector body:	Composite
Contact plating:	Gold
Seals:	Viton (fluor rubber), IP 67

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2-pin cable plug 15836



15836 is a sealed 2-pin MIL style cable plug for twisted pair cable or coaxial cable and is used together with cable plug 15168 as cable joint. The end (A) of the connector is designed for use with cable protection tube (81385). The connector can easily be mounted in the field, either by crimping or soldering.

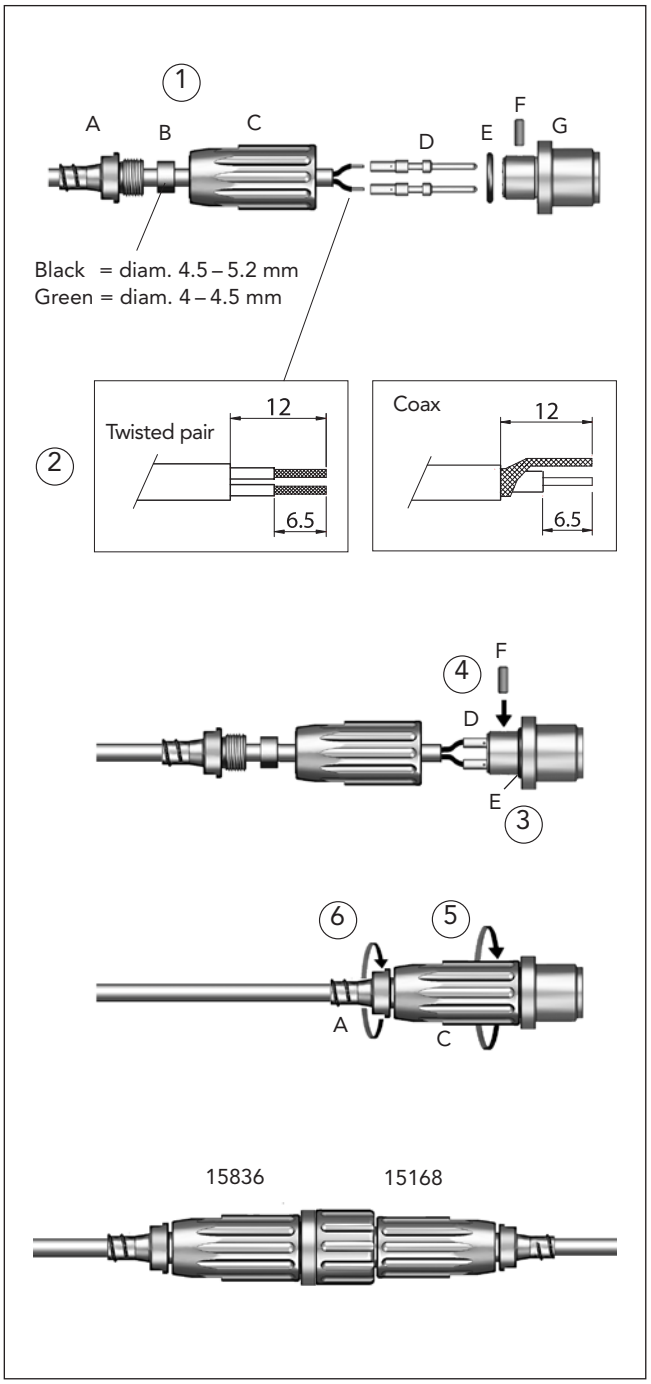
The cable seal, marked B in the figure, seals the cable entry when the connector collet (A) is tightened. Note: The connector package contains 3 contact pins (D) and 2 cable seals (B) of different sizes, marked in different colours.

- Green seal for cable diameter 4 to 4.5 mm
- Black seal for cable diameter 4.5 to 5.2 mm.

To mount the connector, slide the parts A, B and C over the cable. Mount the sealing ring (E) on the connector body (G). Cut and strip the cable as shown in the figure (2) and crimp/solder the cables into the contact pins (D). Use the contact pin 16-18 AWG for the shield when using coaxial cable. Push the connector pins (D) into the connector body and secure them by mounting the locking pin (F). Mount the sleeve (C) on the connector body and tighten by hand. Mount the collet (A) and tighten with a suitable tool, 2 to 2.5 Nm.

Technical specifications

Mounting:	Crimp/solder termination
Wire range/size:	0.30 - 0.60 mm²/22-20 AWG
	0.75 - 1.5 mm²/16-18 AWG
Temperature range:	–40 °C to +125 °C
	(–40 °F to 257 °F)
Material, connector body:	Composite
Contact plating:	Gold
Seals:	Viton (fluor rubber), IP 67

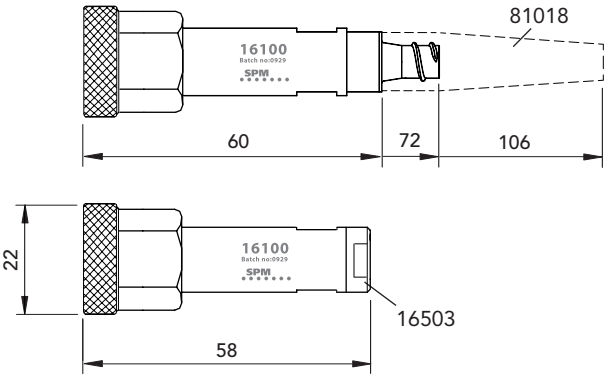


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2-pin Cable Jack 16100





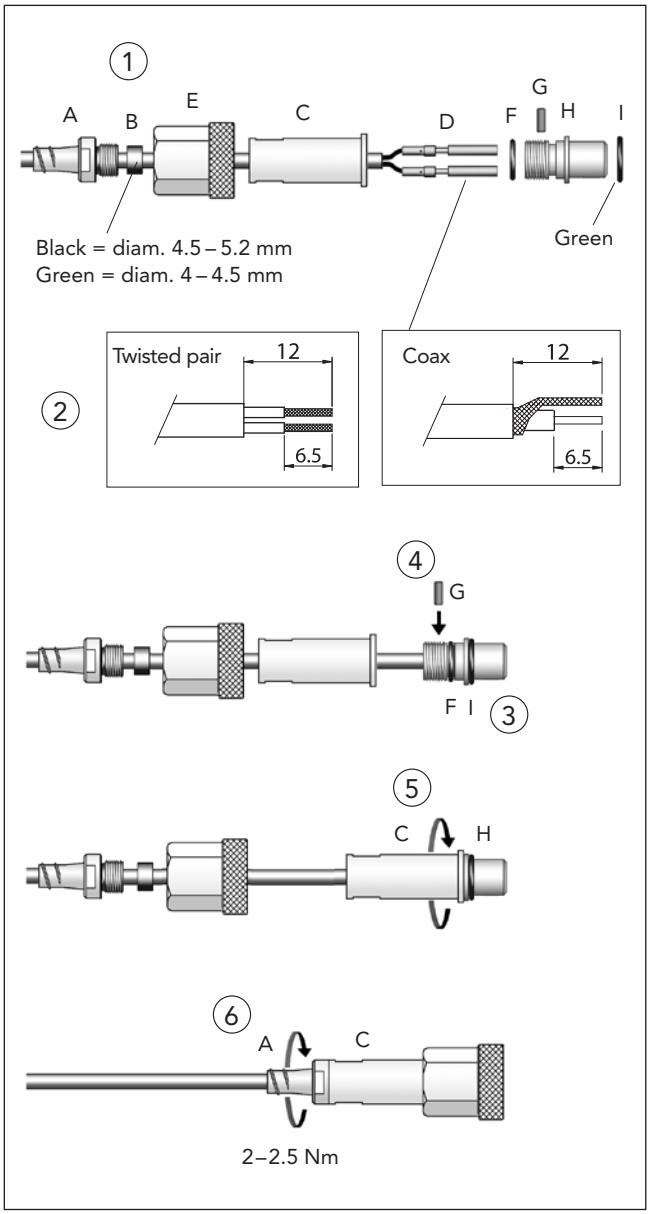
16100 is a 2-pin MIL style cable jack for twisted pair cable and is used together with vibration transducers of type SLD/SLC. The end (A) of the connector is designed for use with cable protection tube 81385 with sleeve 15716. The connector can easily be mounted in the field, either by crimping or soldering. The cable seal, marked B in the figure, seals the cable entry when the connector collet (A) is tightened.

If not used together with protection tube, use the PVC sleeve 81018 or the short end piece 16503 for fixed installation.

Note! The connector package contains 3 sockets (D) and 2 cable seals (B) of different sizes, marked in different colours.

- Green seal for cable diameter 4 to 4.5 mm
- Black seal for cable diameter 4.5 to 5.2 mm.

To mount the connector, slide the parts A, B, E and C over the cable. Cut and strip the cables as shown in the figures and crimp/solder the sockets (D). Use the socket 16-18 AWG for the shield when using coaxial cable. Mount the sealing rings F (black) and I (green) on the connector body (H). Push the sockets (D) into the connector body and secure them by mounting the locking pin (G). Mount the connector body (H) on the part C and tighten by hand. Tighten the end piece (A) with an 12 mm open spanner, 2 to 2.5 Nm.



Technical specifications

Type:	2 pin MIL style, female
Mounting:	Crimp/solder termination
Wire range/size:	0.30 - 0.60 mm^2 / 22-20 AWG 0.75 - 1.5 mm^2 / 16-18 AWG
Material:	Stainless acid proof steel Sandvik Grade:1802, EN:1.4523
Temperature range:	–40° to 125 °C (–40 to 257 °F)
Material, connector body:	Composite
Contact plating:	Gold
Seals:	Viton (fluor rubber), IP 67

Accessories

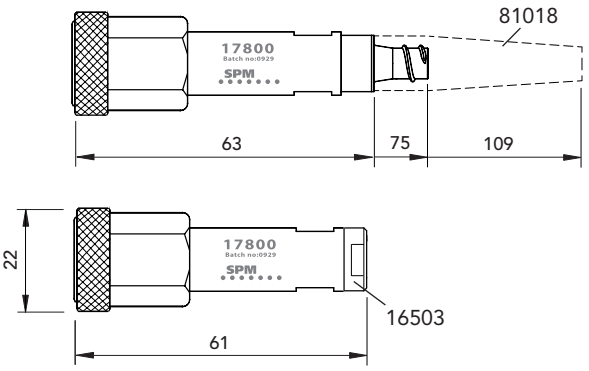
16503	Short end piece
81018	PVC sleeve

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2-pin extended cable jack 17800





17800 is a 2-pin MIL style cable jack with extended collet for twisted pair cable and is used together with vibration transducers of type SLC144TE with 17 mm connector length and transducers from other manufacturers.

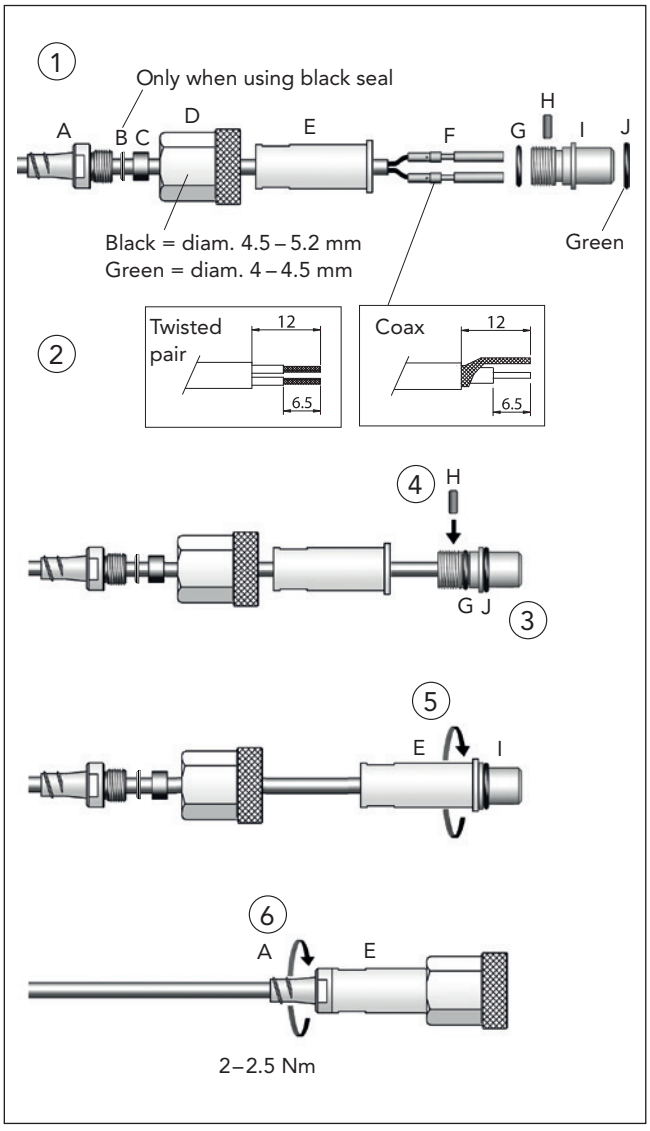
The end (A) of the connector is designed for use with cable protection tube 81385 with sleeve 15716. The connector can easily be mounted in the field, either by crimping or soldering. The cable seal, marked C in the figure, seals the cable entry when the connector collet (A) is tightened.

If not used together with protection tube, use the PVC sleeve 81018 or the short end piece 16503 for fixed installation.

The connector package contains three sockets (F) and two cable seals (C) of different sizes, marked in different colours.

- Green seal for cable diameter 4 to 4.5 mm
- Black seal for cable diameter 4.5 to 5.2 mm.

To mount the connector, slide the parts A, B (only when using black seal), C, D and E over the cable. Cut and strip the cables as shown in the figures and crimp/solder the sockets (F). Use the socket 16-18 AWG for the shield when using coaxial cable. Mount the sealing rings G (black) and J (green) on the connector body (I). Push the sockets (F) into the connector body and secure them by mounting the locking pin (H). Mount the connector body (I) on the part E and tighten by hand. Tighten the end piece (A) with an 12 mm open spanner, 2 to 2.5 Nm.



Technical specifications

Type:	2 pin MIL style, female
Mounting:	Crimp/solder termination
Wire range/size:	0.30 - 0.60 mm^2 / 22-20 AWG
	0.75 - 1.5 mm^2 / 16-18 AWG
Material:	Stainless acid proof steel
	Sandvik Grade:1802, EN:1.4523
Temperature range:	–40° to 125 °C (–40 to 257 °F)
Material, connector body:	Composite
Contact plating:	Gold
Seals:	Viton (fluor rubber), IP67

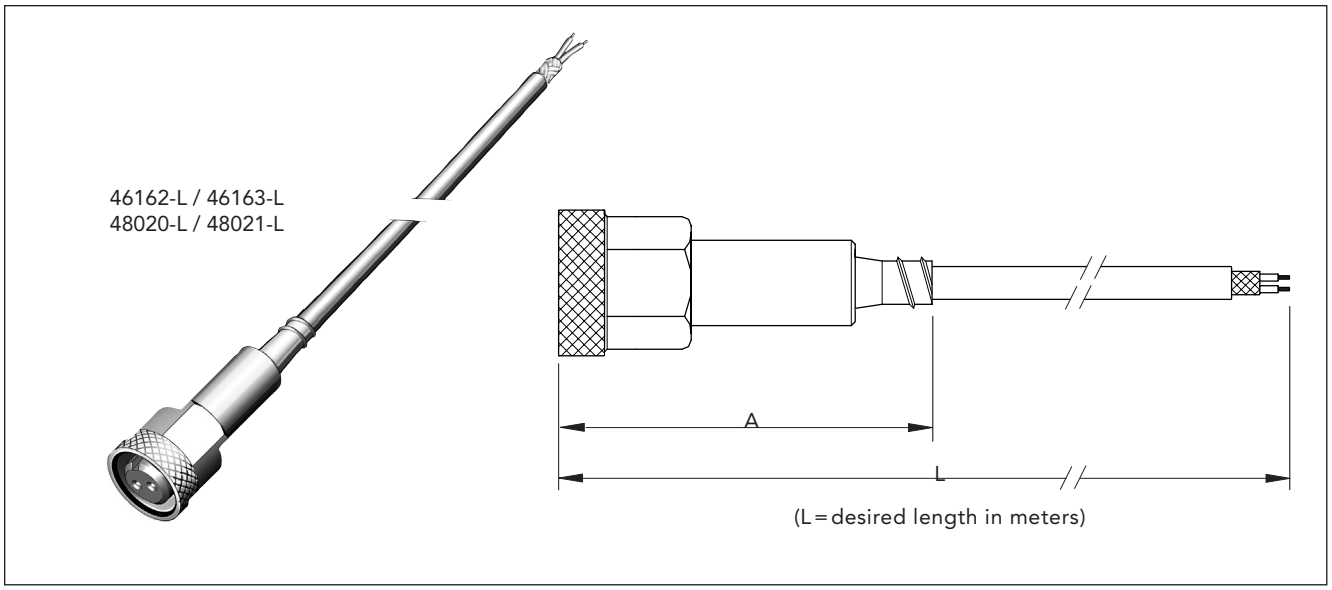
Accessories

16503	Short end piece
81018	PVC sleeve

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2-pin Cable Jack with Integrated Cable



46162-L and 46163-L are 2-pin MIL style cable jacks with integrated twisted pair cable for connection of vibration transducers of type SLD and SLC (13 mm connector length).

48020-L and 48021-L are similar but have an extended collet that fits transducers of type SLC144TE with 17 mm connector length and transducers from other manufacurers.

The cable jacks with integrated cable are specially designed for extreme environmental conditions and for applications with potentially explosive atmosphere. The end of the connector is designed for use with cable protection tube 81385 with sleeve 15716.

Part numbers

46162-L	2-pin cable jack with high temp. cable 90381
46163-L	2-pin cable jack with standard cable 90389
48020-L	2-pin cable jack with extended collet and high temp. cable, 90381
48021-L	2-pin cable jack with extended collet and standard cable 90389

Note! When ordering cables please state the desired cable length (L) in meters.

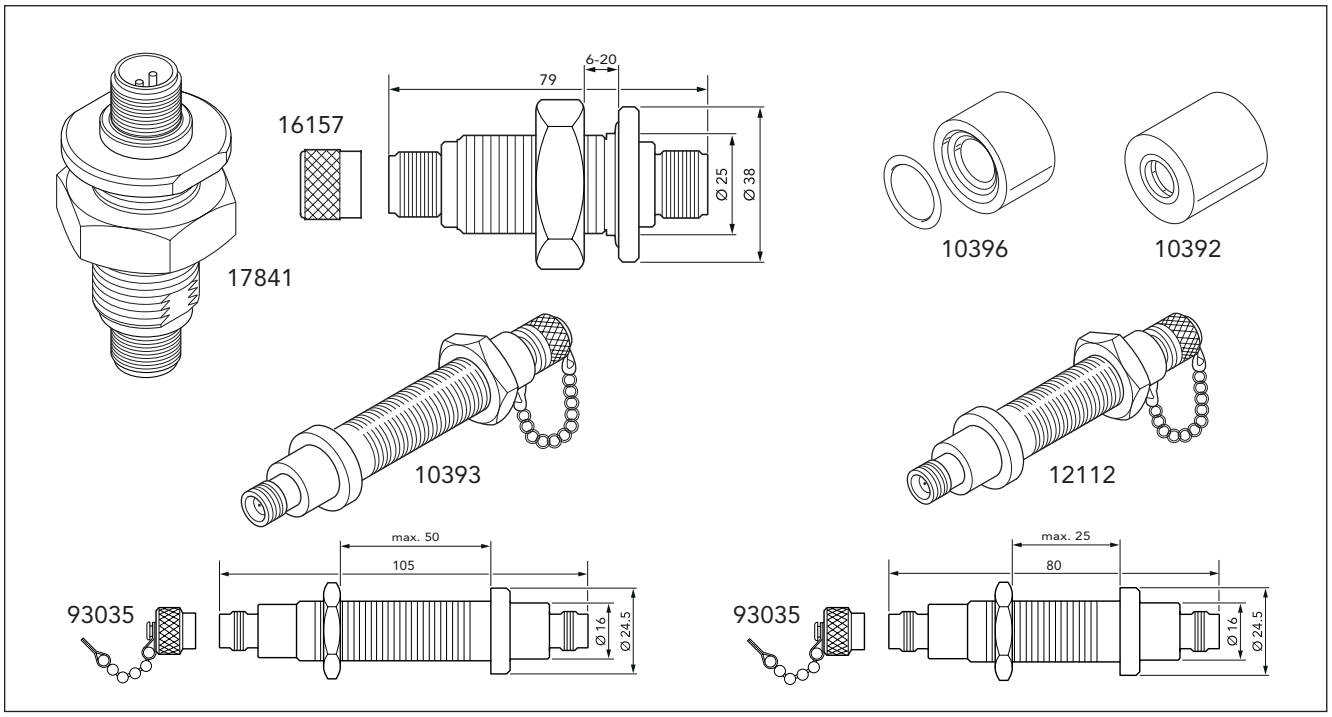
Technical specifications

Type:	2 pin MIL style, female
Material, body:	Stainless steel, Sandvik Grade:1802, EN:1.4523
Contact plating:	Gold
Seals:	Viton (fluor rubber), IP 67
Temperature range:	
90381	–65 to +200 °C (–85 to +392 °F)
90389	–40 to +90 °C (–40 to +194 °F)
Cable jack:	–40 to +125 °C (-40 to +257 °F)
Dimensions, cable jack:	
46162-L/46163-L	A = 56 x diam. 22 mm
48020-L/48021-L	A = 59 x diam. 22 mm

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Bulkhead unions



10393 and 12112 are bulkhead unions (measuring terminals) for thicker walls or partitions (max 25 mm and 50 mm respectively). They have TNC jacks on both sides and are supplied with sealing ring and a dust cap.

10396 is a sealing sleeve that can be used together with 10393 and 12112. It is supplied with a sealing ring.

10392 is a sealing sleeve that can only be used together with standard transducers. The transducer is pressed through the teflon sealing when tightening.

17841 is a 2-pin MIL style bulkhead union (measuring terminal) for walls or partitions with a thickness between 6 and 20 mm. The bulkhead union is used together with vibration transducers of type SLC/SLD. It is supplied with a sealing ring.

For information about terminal cabinets, *see technical data sheet TD-154*.

For information about terminal brackets, protection caps and other accessories, *see technical data sheet TD-480*.

Technical specifications

Bulkhead union 10393 and 12112

Material:	Nickel plated brass

Bulkhead union 17841

Material:	Stainless steel
Type:	2-pin, male (MIL-C-5015)
Conductor:	AWG28
Tightening torque:	> 20Nm
Protection:	IP67
Mounting hole:	Ø 25 mm (+0,5/−0)
Seals:	FPM 75 O-ring
Temperature range:	−40 to +100 °C

Sealing sleeve 10392 for transducer

Material:	Brass/Reinforced teflon

Sealing sleeve 10396 for bulkhead union

Material:	Brass/Nitrile

Part numbers

10393	Bulkhead union, max. wall thickness 50 mm
12112	Bulkhead union, max. wall thickness 25 mm
17841	Bulkhead union, wall thickness 6 to 20 mm

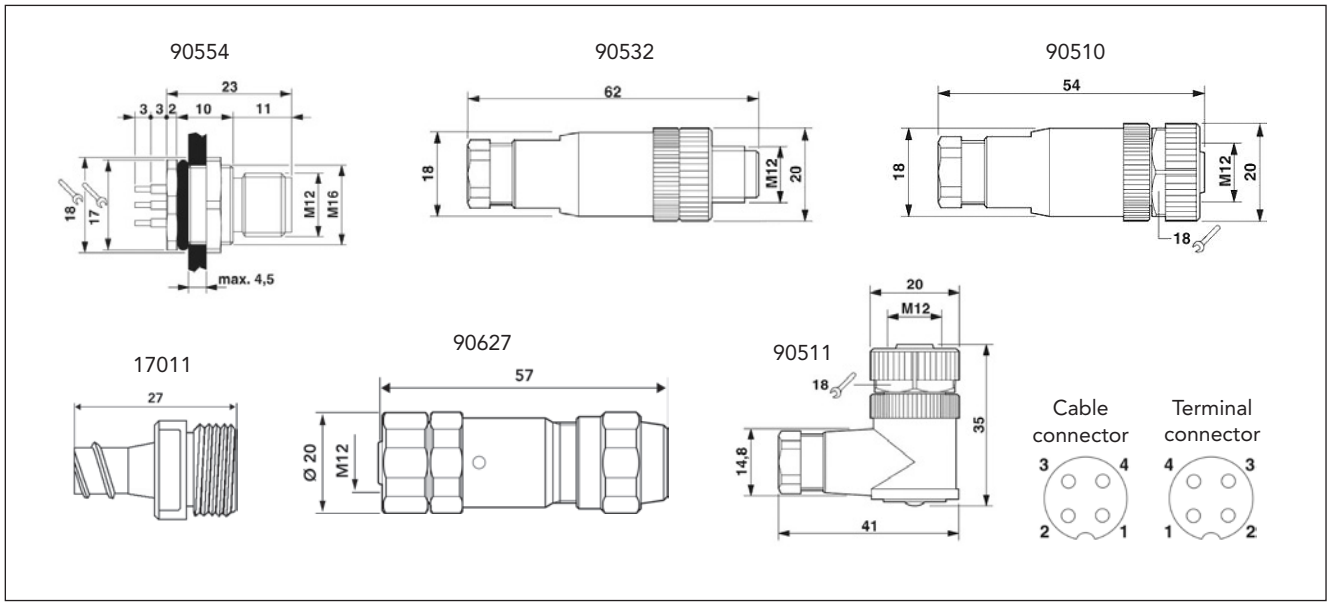
Options

10392	Sealing sleeve for transducer
10396	Sealing sleeve for bulkhead union
16157	Protection cap for 2-pin terminal connector
93035	Protection cap for TNC connector

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M12 cable connectors



90510 (straight) and 90511 (angled) are 4-position female connectors. They are A-coded and have screw connection Pg 7.

Rated current at 40°C:	4 A
Rated voltage:	250 V
Insulation resistance:	≥ 100 MΩ
Ambient temperature:	–40 to +85 °C
Degree of protection:	IP67
External cable diameter:	4 to 6 mm

90532 is a straight 4-position male connector with the same specifications as the connectors 90510 and 90511.

90554 is a 4-position terminal connector for rear/screw mounting with M16 thread, with straight solder connection.

90627 is a straight 4-position female connector with shell in stainless steel. It is A-coded and has screw connection.

Rated current at 40°C:	4 A
Rated voltage:	250 V
Conductors:	0.75 mm^2, AWG 18
Ambient temperature:	–40 to +85 °C
Degree of protection:	IP67
External cable diameter:	3 to 5.5 mm

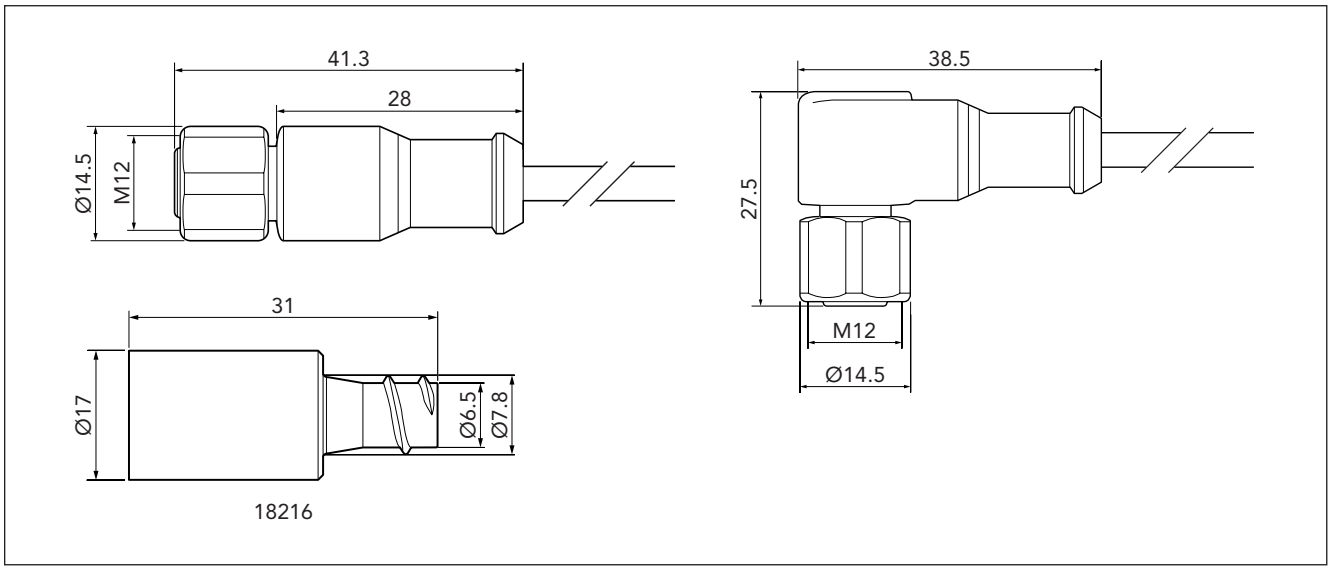
Part numbers

90510	Connector M12 straight, female, IP67
90511	Connector M12 angled, female, IP67
90532	Connector M12 straight, male, IP67
90554	Terminal connector M12, IP67
90627	Connector M12 straight, female, IP67, SS
17011	Protection tube end for 90510/90511/90532

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Pre-moulded M12 connectors



The pre-moulded female 4-pin cable connectors, with locking rings in stainless steel, are available as either straight or angled. The twisted pair cable 90381 or 90389 is available in three different cable lengths with connector in one end. See part numbers below.

18216 is a protection tube adapter for snap on to the pre-moulded cable connector.

For further information about 90381 and 90389, see TD-394.

Technical specifications

Rated current at 40°:	4 A
Rated voltage:	250 V
Conductors:	0.51mm²/AWG20
Ambient temperature:	–25° to +90 °C
Degree of protection:	IP68
Cable type:	Twisted pair
Material locking rings:	Stainless steel
Material housing:	PUR

Part numbers

49005	M12 connector, straight, cable 90389, 5 m
49010	M12 connector, straight, cable 90389, 10 m
49020	M12 connector, straight, cable 90389, 20 m
49105	M12 connector, angled, cable 90389, 5 m
49110	M12 connector, angled, cable 90389, 10 m
49120	M12 connector, angled, cable 90389, 20 m
49205	M12 connector, straight, cable 90381, 5 m
49210	M12 connector, straight, cable 90381, 10 m
49220	M12 connector, straight, cable 90381, 20 m
49305	M12 connector, angled, cable 90381, 5 m
49310	M12 connector, angled, cable 90381, 10 m
49320	M12 connector, angled, cable 90381, 20 m

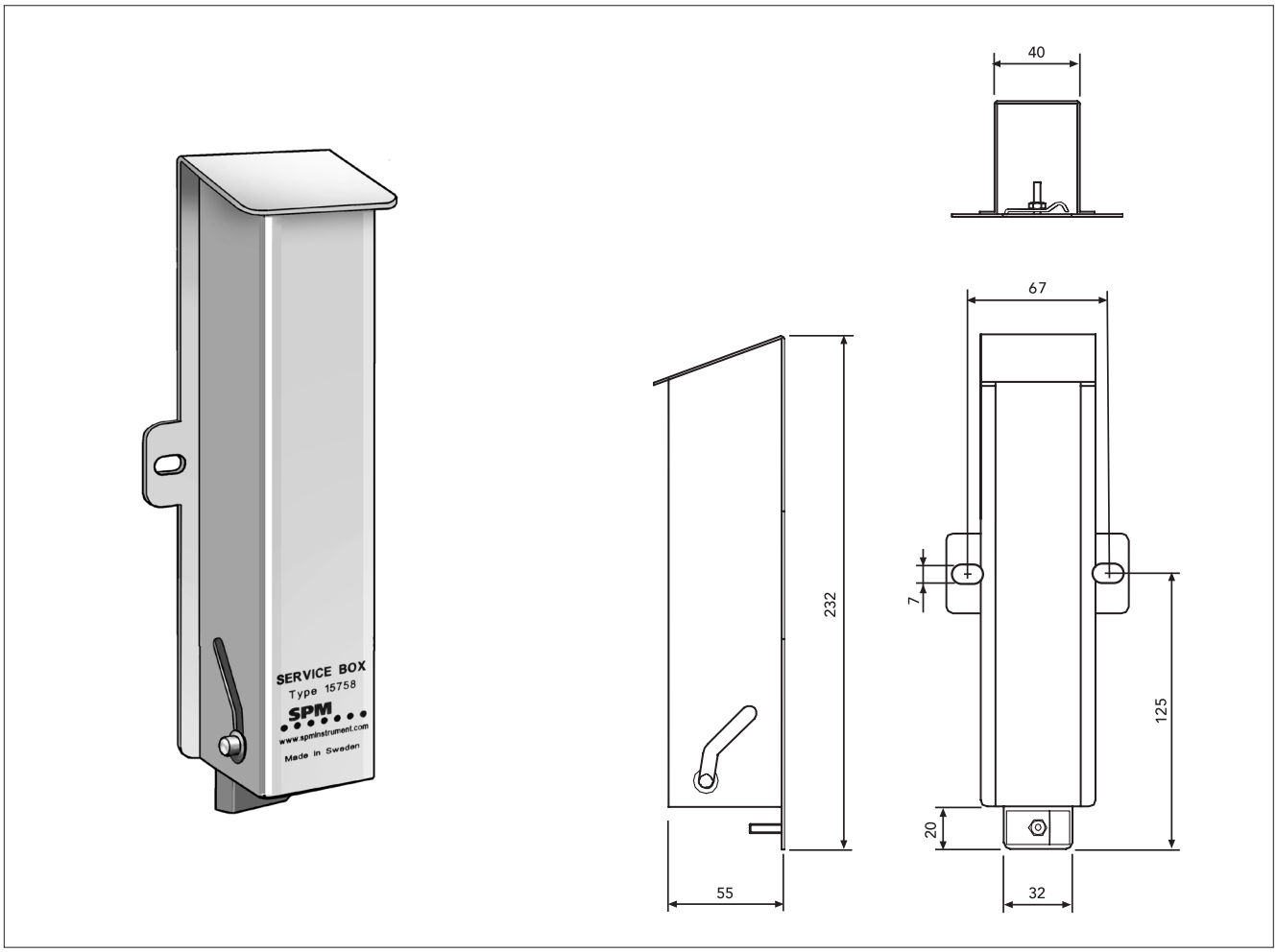
Accessories

15716	Sleeve for protection tube, stainless steel, required to enable dismounting of the protection tube
18216	Protection tube adapter
81385	Protection tube, outer diameter 9.3 mm, stainless acid proof steel

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Service Box 15758



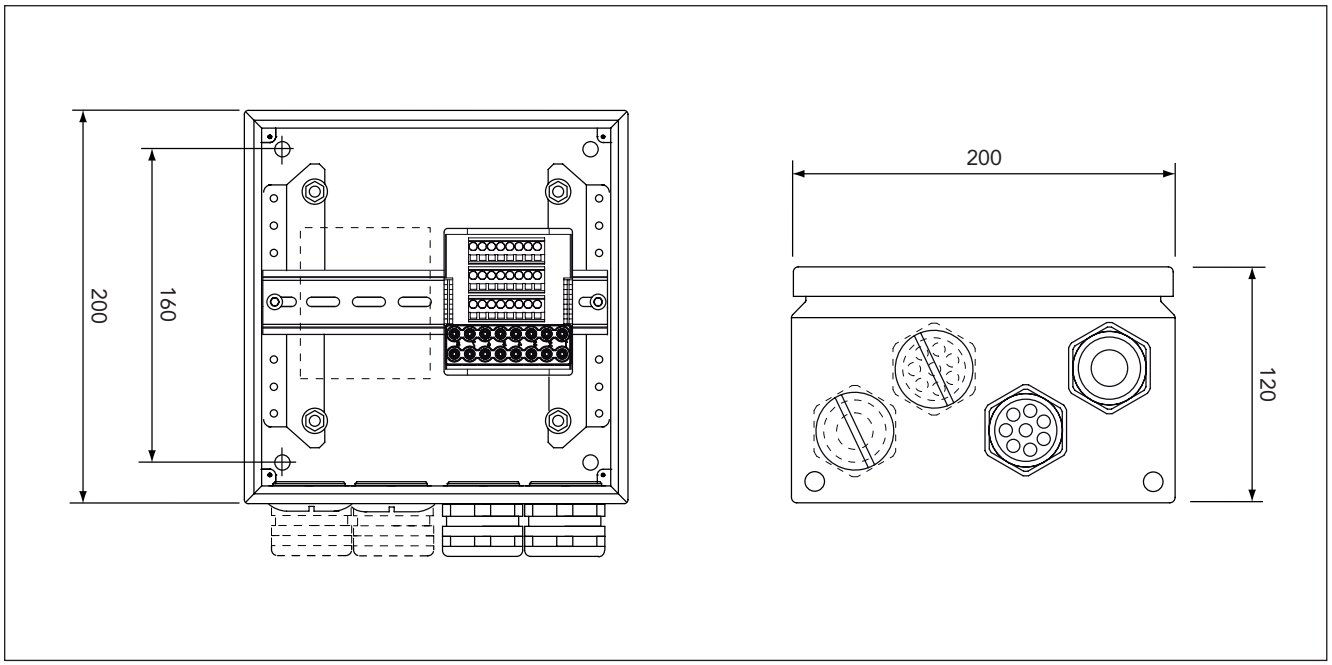
The Service Box 15758 is a protective cover for cable joint specially designed for extreme environmental conditions. It is made of stainless acid proof steel, AISI 316, and has an access opening in the bottom.

It is mounted in upright position with two mounting screws, diameter max. 7 mm. The cable clamp and the retaining pin will secure the cable joint inside the box.

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Junction Box



The junction box is intended for joining multiple measuring cables into a single multicore cable and is designed for quick installation. It is robust and sealed for use in harsh environments. The box allows easy inspection and troubleshooting if required.

The junction box is available with enclosures in stainless or powder-coated steel, for up to 16 coaxial or 8 twisted pair cables to be integrated into 1 or 2 multicore cables. One or two terminals for connections, depending on model, are provided in the the box mounted on a DIN rail. The cable inlets (PG29) are intended for up to eight measuring cables each. Cable entries not in use are simply sealed using the plugs provided.

Technical specifications

Design, enclosure:	stainless steel AISI 304/EN 1.4301/SS 2333 alt. powder-coated steel
Protection class:	IP66
Input terminals:	screw terminals for coaxial or push-in terminals for twisted pair cables, cable diam. 5 mm
Output terminals:	push-in terminals for multicore cables, cable diam. 16 to 26 mm
Cable inlets:	2 or 4 type PG29 with sealing inserts for up to 8 measuring cables or 1 multicore cable
Dimensions (w x h x d):	200 x 200 x 120 mm (7.9 x 7.9 x 4.7 inches)
Mounting holes, coated steel enclosure:	160 x 160 mm (6.3 x 6.3 inches) diameter 8.5 mm
Ambient temperature:	–10 to +80 °C

Part number	Material, enclosure	Measuring cables	Multicore cables
16203	Stainless steel	8 coaxial cables	1
16204	Stainless steel	16 coaxial cables	2
16205	Stainless steel	8 pair cables	1
16206	Stainless steel	16 pair cables	2
16207	Stainless steel	8 coaxial + 8 pair	2
16177	Coated steel	8 coaxial cables	1
16199	Coated steel	16 coaxial cables	2
16200	Coated steel	8 pair cables	1
16201	Coated steel	16 pair cables	2
16202	Coated steel	8 coaxial + 8 pair	2

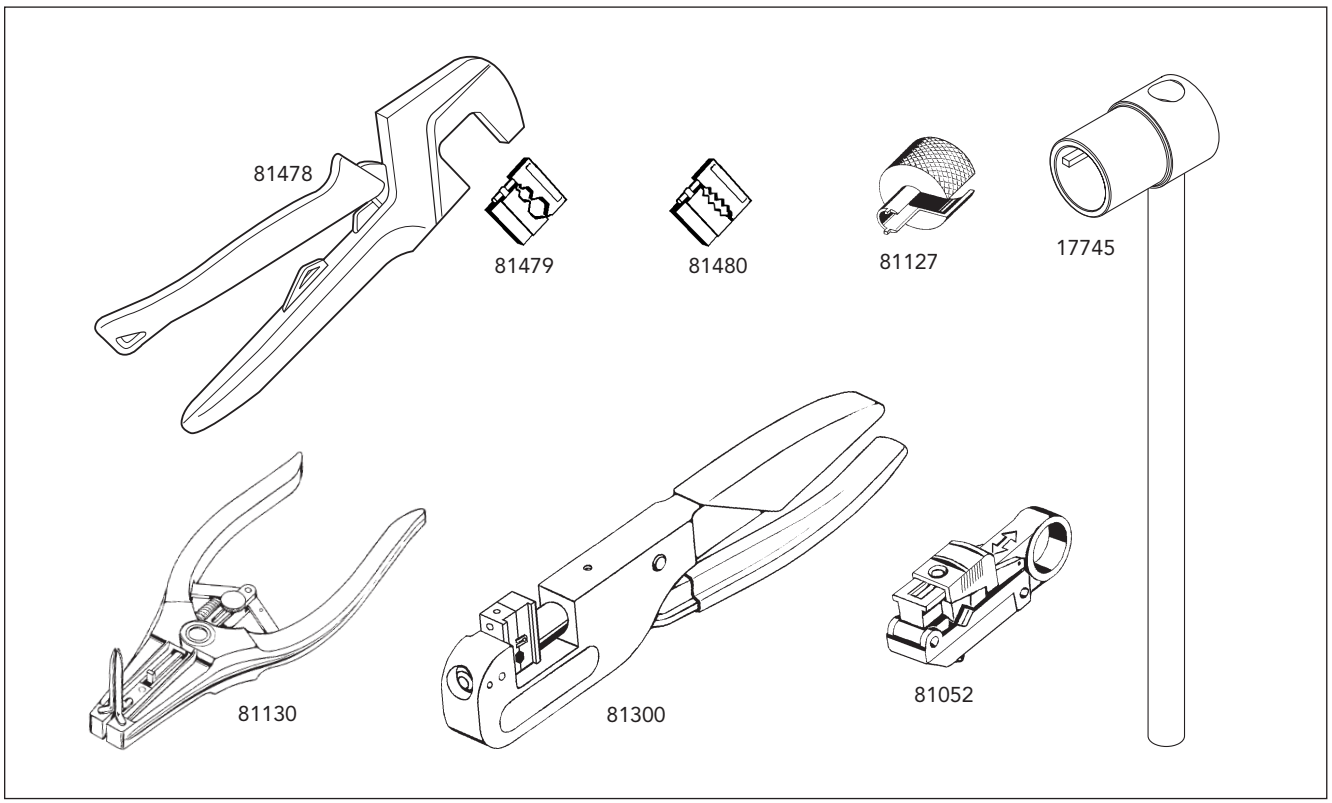
Accessories

12775	Connector for coaxial cable
90466-L	Multicore cable,10 pairs, halogen free, type LiHCH-PiMF 10 x 2 x 0.5, -40 to +125°C, L=desired length in meters (see TD-330)
81325	Mounting braces, 4 pcs
81473	Mounting braces, stainless steel, 4 pcs
IND19	Mounting magnets, 3 pcs

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Tools for fitting cables and connectors



The listed tools are used to prepare coaxial cables and to mount connectors for SPM installations, both for shock pulse and vibration monitoring.

Crimping tool 81300 is used for coaxial cables with SMB connectors.

81478 is a crimping tool with a replaceable die. Die for fitting TNC/BNC connectors has part number 81479 and die for fitting connector 15168 has part number 81480.

Cutting tool 81052 has a replaceable knife cassette. The standard cassette is used for coaxial cables with TNC/BNC connectors and the replacement cassette 81101 for coaxial cables SMB connectors.

Part numbers

17745	Counter support tool for 2-pin connectors
81052	Cutting tool for coaxial cables with TNC/BNC connectors
81101	Replacement cassette for cutting tool 81052, used for coaxial cables with SMB connectors
81127	Fitting tool for connectors with strain relief
81130	Expansion pliers for fitting neoprene tube 82166
81300	Crimping tool for fitting SMB connectors
81478	Crimping tool without die
81479	Die for crimping tool 81478, used for fitting TNC/BNC coaxial connectors
81480	Die for crimping tool 81478, used for fitting 2-pin connectors

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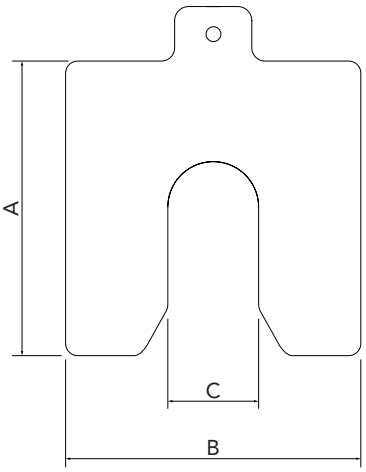


Precut Shims

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Precut shims





SCAT-XX

In the shaft alignment process, precut shims can be used to correct the exact vertical position of a movable machine so it will be in alignment with the stationary or reference machine.

Shims in packs of 10

Shims in stainless steel are available in six different dimensions and in ten different thicknesses, from 0.05 to 3.00 mm. Shims are supplied in packs of 10* in single thickness, according to the part number tables to the right.

Industrial cases with precut shims

Shims are also available packaged in convenient cases with a compartmentalised high density foam insert. The refillable cases are available with five different assortments, where every case of precut shims offers a combination of popular shim dimensions and thicknesses. The small cases have dimensions of 305x230x115 mm and the large cases have dimensions of 435x295x155 mm.

Part numbers, cases with solid shims

SCAT-91 Small case with 180 shims: 10 pcs of A-/B-/C-0.05/0.10/0.20/0.50/0.70/1.0

SCAT-01 Small case with 360 shims: 20 pcs of A-/B-/C-0.05/0.10/0.20/0.50/0.70/1.0

SCAT-92 Large case with 360 shims: 10 pcs of A-/B-/C-/D-0.05/0.10/0.20/0.40/0.50/0.70/0.80/1.0/2.0

SCAT-02 Large case with 680 shims: 20 pcs of A-/B-/C-/D-0.05/0.10/0.20/0.40/0.50/0.70/0.80/1.0 and 10 pcs of A-/B-/C-/D-2.0

SCAT-32 Large case with 340 shims: 20 pcs of C-/D-0.05/0.10/0.20/0.40/0.50/0.70/0.80/1.0 and 10 pcs of C-/D-2.0. Empty rows for A and B shims.

10 stainless steel shims, single thickness

Dimension			Part numbers Thickness (mm)				
A	B	C	0.05	0.10	0.20	0.40	0.50
55	50	15	A-005	A-010	A-020	A-040	A-050
75	70	23	B-005	B-010	B-020	B-040	B-050
90	80	32	C-005	C-010	C-020	C-040	C-050
125	105	44	D-005	D-010	D-020	D-040	D-050
200	200	55	F-005	F-010	F-020	F-040	F-050
200	200	85	G-005	G-010	G-020	G-040	G-050

10 stainless steel shims, single thickness*

Dimension			Part numbers Thickness (mm)				
A	B	C	0.70	0.80	1.00	2.00*	3.00*
55	50	15	A-070	A-080	A-100	A-200*	A-300*
75	70	23	B-070	B-080	B-100	B-200*	B-300*
90	80	32	C-070	C-080	C-100	C-200*	C-300*
125	105	44	D-070	D-080	D-100	D-200*	D-300*
200	200	55	F-070	F-080	F-100	F-200*	F-300*
200	200	85	G-070	G-080	G-100	G-200*	G-300*

* Shims come in packs of 10, except for the thicknesses 2 mm (5 pcs) and 3 mm (2 pcs).

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9



Instruments Approved for Potential Explosive Atmosphere

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Leonova Diamond® IS


DIA500IS


16863


CAS28Ex


CAS27Ex

Leonova Diamond IS is a three-channel handheld machine condition analyzer approved for use in potentially explosive environments. The following functions are always included for unlimited use:

- Data logging with Condmaster® Ruby.
- ISO 2372 vibration monitoring.
- Speed and temperature measurements.
- Automatic recording, up to 50 hours.
- Stethoscope function.
- Recording of vocal comments.

The main Leonova functions are user-selected, see TD-360. With synchronous measurement, enveloping, true zoom, and up to a 25600 line spectrum over DC up to 40 kHz, Leonova Diamond IS has full vibration analysis capacity. The evaluation tables of the ISO 10816 standards for broadband measurement of vibration velocity, acceleration, and displacement are also incorporated. For single and dual plane rotor balancing, an easy-to-use graphical guide calculates balancing weights and their position.

Part numbers

DIA500IS	Leonova Diamond IS, incl. wrist strap. Must be combined with selectable basic platform function (DIA510/520/530/550), see TD-360

Required accessories, non-hazardous environments

16999	USB-isolator incl. communication cables
CHA01IS	Battery charger incl. AC adapter, Euro plug
CHA02IS	Battery charger incl. AC adapter, UK plug
CHA03IS	Battery charger incl. AC adapter, US plug
CHA04IS	Battery charger incl. AC adapter, AU plug

Accessories approved, hazardous environments

DIA162	Extra memory, 4 GB
DIA163	Extra memory, 8 GB
16850	Optional battery pack
BATT02-Ex	Optional battery pack
CAS27Ex	Carrying case, plastic, foam insert, 420x340x120 mm
CAS28Ex	Carrying case, soft, modular insert, 370x200x270 mm

Optional accessories, non-hazardous environments

CAS26	Carrying case, soft, modular insert, 390x230x260 mm
CAS35	Carrying case/trolley case with two wheels, plastic with foam insert, 560x350x230 mm
81469	Silica gel (moisture absorbent) spare for CAS35
81468	Code lock, TSA approved, for CAS35

Parts of the Leonova system are specified on the technical data sheets (TD) listed below:

Instrument specifications	TD-358
User-selected functions	TD-360
Shock pulse method SPM HD frequency and time domain analysis	TD-361
SPM Shock pulse method dBm/dBc	TD-406
SPM Shock pulse method LR/HR	TD-362
SPM Spectrum®	TD-407
Vibration monitoring ISO 2372	TD-408
Vibration monitoring ISO 10816 with spectrum	TD-363
Vibration monitoring ISO 20283-5	TD-484
3-channel simultaneous vibration monitoring	TD-364
Vibration Advanced	TD-459
FFT spectrum with symptoms	TD-460
HD ENV	TD-511
Vibration Expert	TD-365
EVAM evaluated vibration analysis	TD-401
HD ENV	TD-511
Run up/Coast down and Bump test	TD-402
HD Order tracking	TD-403
Frequency Response Function, FRF	TD-402
HD Analysis	TD-514
Vibration Expert	TD-365
SPM HD Expert	TD-361
Orbit analysis/Shaft centerline plot	TD-368
Balancing, single and dual plane	TD-369
Recording function	TD-409
Leonova Service Program	TD-379
Accessories	TD-378
Tachometer/Temperature probe	TD-448
Carrying cases, Ex	TD-497

Spare parts

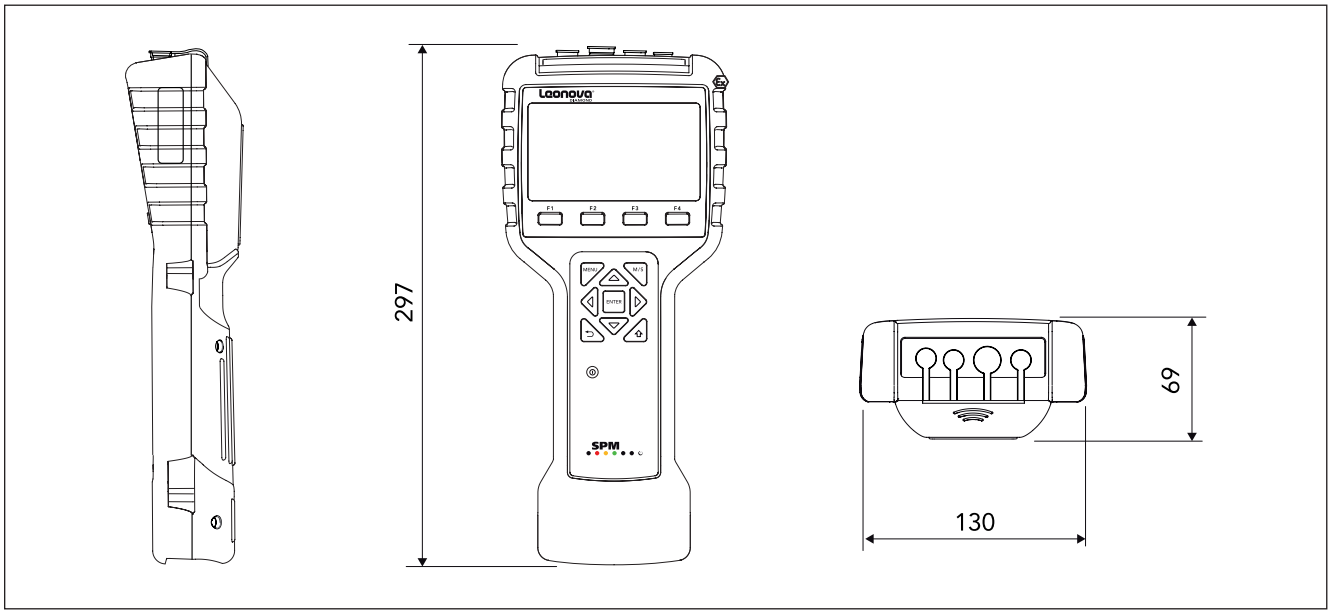
16645	Protection foil for display
14661	Wrist strap
90362	AC adapter, Euro plug, 100-240 V AC
90380	AC adapter, UK plug, 100-240 V AC
90379	AC adapter, US plug, 100-240 V AC
90528	AC adapter, AU plug, 100-240 V AC
16863	Battery charger IS
PRO52	Leonova Service Program
72000	User guide, Leonova Diamond IS
CAB94IS	Communication cable, USB-mini USB, 1 m
CAB104IS	Communication cable, USB-USB, 1 m
17102	Battery pack removal tool

Patents: www.spminstrument.com/patents

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Leonova Diamond® IS – Instrument specifications



Technical specifications

Approvals:	CE, ATEX, IECEx
Marking:	I M1 Ex ia I Ma T_a: -10°C to +50°C II 1G Ex ia IIC T4 Ga T_a: -20°C to +50°C
Housing:	ABS/PC/TPE, IP65
Dimensions:	297x130x69 mm
Weight:	1005 g
Keypad:	sealed, snap action
Display:	TFT colour, 480x272 pixels, 4.3 inch widescreen, adjustable backlight
Main processor:	400 MHz ARM
Memory:	256 MB RAM, 512 MB Flash, SD card 1 GB expandable up to 8 GB
Operating system:	Microsoft Windows® CE
DSP processor:	375 MHz floating point
Communication:	USB 2.0
Power supply:	rechargeable battery pack
Battery power:	for min. 12 h normal use (20 °C)
Charging temperature:	0 to 45 °C
General features:	language selection, battery status indication, transducer line test, metric or imperial units

Output/input

Headphones/ microphone:	3.5 mm stereo plug
Communication:	mini USB, via USB-isolator

Stethoscope

Transducer types:	shock pulse and vibration transducer
Settings:	filter, volume and gain

Vibration monitoring

Vibration channels:	3 simultaneous
Dynamic range:	< 120 dB, 24 bit A/D converter
Frequency range:	0 (DC) to 40 kHz
Resolution:	max. 25 600 lines
Vibration transducer input:	< 24 Vpp. Transducer supply of 2.5 mA for IEPE (ICP) type can be set On/Off
Transducer types:	SLD200 series or any transducer (acc., disp., vel.) with voltage output
Measuring techniqes:	ISO 2372, ISO 10816, HD ENV, EVAM Evaluated Vibration Analysis, Orbit, 3 channels simultaneously, balancing

Bearing monitoring

Measuring range:	SPM HD: –30 to 110 dBsv (44011 transducer) dBm/dBc: –9 to 99 dBsv LR/HR: –19 to 99 dBsv
Resolution:	0.2 dB/HD, 1 dB dBm/dBc and LR/HR
Transducer types:	SPM 44011, probe transducer TRA78IS and transducer with quick connector TRA79IS, Duo-Tech SLC2xx, TRC2xx

RPM input

Measuring range:	1 to 150 000 PPM
Resolution:	1 pulse
Accuracy:	± (1 pulse + 0.01% of reading)
Transducer types:	SPM TTP10IS

AUX input

Interface:	according to NAMUR standard IEC60947-5-6
Rated supply voltage:	8.2 V
Operating Frequency:	up to 40 kHz
Switching time:	< 10 µs
Switching position:	1.6 mA
Switching current difference:	0.3 mA
Functional cable length:	max. 100 m, shielded if > 3m

Temperature measurement

Transducer type:	TTP10IS Tachometer/Temp. probe

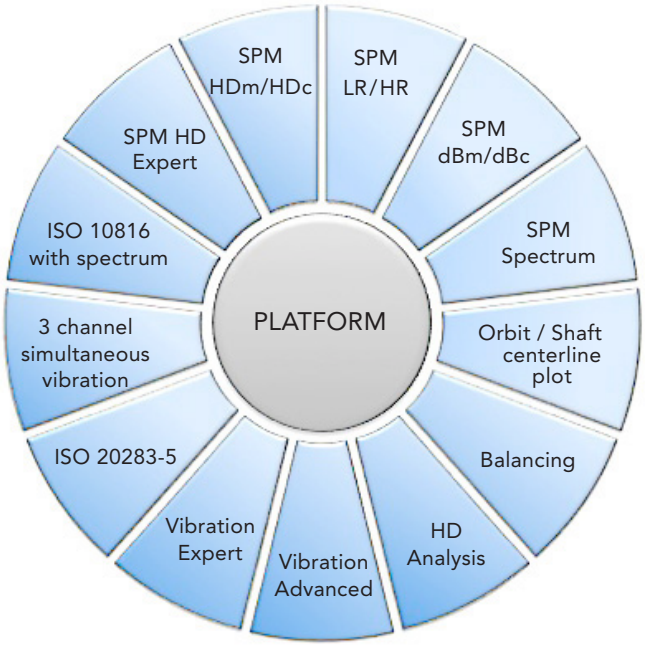
Patents

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Leonova Diamond® IS – User-selected functions



PLATFORM — **Module in Ruby**
unlimited use

- Balancing, SPM HDm/HDc and/or LR/HR
- RMS vibration, ISO 2372
- Speed measurement
- Temperature measurement
- Stethoscope function
- Automatic recording, up to 50 hours
- Time signal recording
- Check points, free text
- Recording of vocal comments
- Supports 2 channel simultaneous vibration measurements — MOD136
- Supports up to 12.800 lines, 20 kHz — MOD139

To obtain the optimal performance range and instrument price, Leonova users can select any or all of the condition diagnosis and maintenance functions below, under two alternative conditions of sale. The choice is between unlimited and limited use (Function & Use).

When use is limited, the price for the function itself is much lower. Instead, the user prepays a tankful of 'credits'.

Choose your basic platform (compulsory)

DIA510 Leonova Diamond IS, HDm/HDc
DIA520 Leonova Diamond IS, Balancing
DIA530 Leonova Diamond IS, LR/HR
DIA550 Leonova Diamond IS, HDm/HDc + LR/HR

Functions for Unlimited Use — Module in Ruby

DIA195 SPM HD Expert, time and frequency domain analysis — MOD195
DIA197 Shock pulse method HDm/HDc — (Platform)
DIA130 Shock pulse method dBm/dBc — MOD130
DIA131 Shock pulse method LR/HR — MOD131
DIA132 SPM Spectrum, — MOD132
12.800 lines, 20 kHz — MOD139
DIA133 Vibration ISO 10816 with spectrum — MOD133
DIA198 Vibration ISO 20283-5 — MOD198
DIA138 Orbit analysis/Shaft centerline plot — MOD138
DIA192 3 channel simultaneous vibration — MOD192
DIA193 Vibration Expert — MOD193
HD ENV
EVAM evaluated vibration analysis
25.600 lines/40 KHz
HD Order Tracking
Time signal, Post trigger
Run up/coast down,
Bump test and FRF
DIA194 Vibration Advanced — MOD135+MOD139
HD ENV
FFT spectrum with symptoms
12.800 lines/20 kHz, Time signal,
HD Order Tracking, Post trigger
DIA140 HD Analysis — MOD140
Vibration Expert
SPM HD Expert
DIA109 Balancing, single and dual plane

Leonova automatically deducts credits from the tank when its 'Measure' key is pressed. Thus, the user's operating costs depend on the number of measurements taken. Credit tanks are refilled, and/or new functions added, by loading a coded file ordered via the local distributor.

Unlimited and limited functions can be combined at will. Platform functions are always for unlimited use.

Functions for Limited Use (Function & Use)

DIA295 SPM HD Expert, time and freq. domain analysis (3)
DIA297 Shock pulse method HDm/HDc (2)
DIA230 Shock pulse method dBm/dBc (1)
DIA231 Shock pulse method LR/HR (2)
DIA232 SPM Spectrum (2)
DIA233 Vibration ISO 10816 with spectrum (1)
DIA298 Vibration ISO 20283-5 (1)
DIA238 Orbit analysis (5), Shaft centerline plot (5)
DIA292 3 channel simultaneous vibration (6)
DIA293 Vibration Expert
incl. HD Order Tracking, Time signal and
25.600 lines/40 KHz (no credit consumption)
HD ENV (3)
EVAM evaluated vibration analysis (2)
Post trigger (25)
Run up / coast down (50)
Bump test (25)
Frequency Response Function, FRF (25)
DIA294 Vibration Advanced
incl. HD Order Tracking, Time signal and
12.800 lines/20 kHz (no credit consumption)
HD ENV (3)
FFT spectrum with symptoms (2)
Post trigger (25)
DIA240 HD Analysis
Vibration Expert (3–50)
SPM HD Expert (3)
DIA209 Balancing, single and dual plane
Single plane (4 runs: 16 / 2 runs: 42)
Dual plane (80)

Credit consumption is stated within brackets.
DIA290 Credits for limited functions
DIA291 Credits for limited functions, refill

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Leonova Emerald® IS


EME600IS


16863


CAS28Ex


CAS27Ex

Leonova Emerald® IS is a handheld machine condition analyzer approved for use in potentially explosive environments. The following functions are always included for unlimited use:

- Data logging with Condmaster® Ruby.
- Shock pulse method SPM HDm/HDc and/or LR/HR.
- ISO 2372 vibration monitoring.
- 1 channel vibration monitoring.
- Speed and temperature measurements.
- Automatic recording, up to 50 hours.
- Stethoscope function.
- Recording of vocal comments.

The main Leonova functions are user-selected, see TD-376. With synchronous measurement, enveloping, true zoom, and up to a 12 800 line spectrum over DC up to 20 kHz, Leonova Emerald® has full vibration analysis capacity. SPM has also incorporated the evaluation tables of the new ISO 10816 standards for broadband measurement of vibration velocity, acceleration, and displacement. For single-rotor balancing, an easy-to-use graphical guide calculates balancing weights and their position.

Part numbers

EME600IS	Leonova Emerald IS, incl. wrist strap. EME600IS must be combined with selectable basic platform (EME610/EME630/EME650), see TD-376

Required accessories, non-hazardous environments

16999	USB-isolator incl. communication cables
CHA01IS	Battery charger incl. AC adapter, Euro-plug
CHA02IS	Battery charger incl. AC adapter, UK-plug
CHA03IS	Battery charger incl. AC adapter, US-plug
CHA04IS	Battery charger incl. AC adapter, AU-plug

Accessories approve, hazardous environments

16850	Optional battery pack
BATT02-Ex	Optional battery pack
CAS27Ex	Carrying case, plastic, foam insert, 420x340x120 mm
CAS28Ex	Carrying case, soft, modular insert, 370x200x270 mm

Optional accessories, non-hazardous environments

81468	Code lock, TSA approved, for CAS35
81469	Silica gel (moisture absorbent) for CAS35
CAS26	Carrying case, soft, modular insert 390x230x260 mm
CAS35	Carrying case/trolley case with two wheels, plastic with foam insert, 560x350x230 mm

Parts of the Leonova system are specified on the technical data sheets (TD) listed below:

Instrument specifications	TD-374
User-selected functions	TD-376
Shock pulse method SPM HD frequency & time domain analysis	TD-435
SPM Shock pulse method dBm/dBc	TD-440
SPM Shock pulse method LR/HR	TD-436
SPM Spectrum®	TD-441
Vibration monitoring ISO 2372	TD-446
Vibration monitoring ISO 10816 with spectrum	TD-442
Vibration Premium	TD-366
HD ENV	TD-512
FFT with symptoms	TD-367
HD Order tracking	TD-439
Vibration Supreme	TD-445
HD ENV	TD-512
EVAM Evaluated Vibration	TD-438
HD Order tracking	TD-439
HD Analysis	TD-515
Vibration Supreme	TD-445
Shock pulse method SPM HD	TD-435
Balancing, single plane	TD-443
Recording function	TD-444
Leonova Service Program	TD-437
Accessories	TD-378
Tachometer/Temperature probe	TD-448
Carrying cases, Ex	TD-497

Spare parts

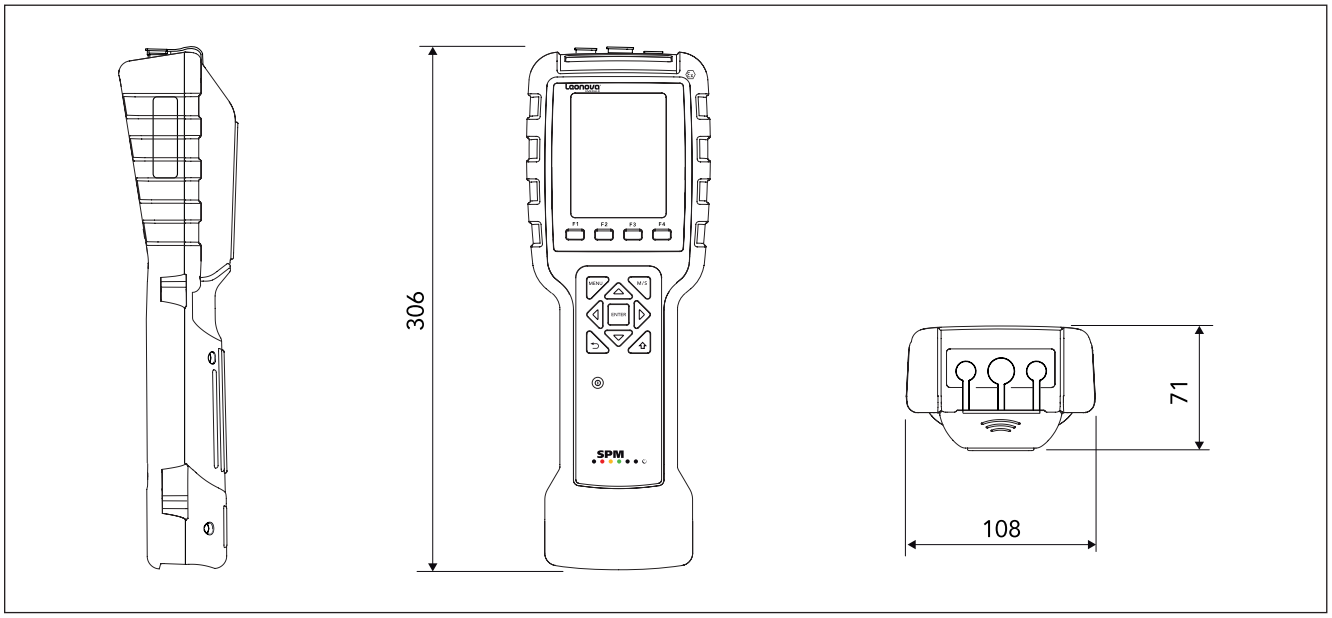
16686	Protection foil display
14661	Wrist strap
90362	AC adapter, Euro-plug, 100-240 V AC
90380	AC adapter, UK-plug, 100-240 V AC
90379	AC adapter, US-plug, 100-240 V AC
90528	AC adapter, Australia plug, 100-240 V AC
16863	Battery charger IS
PRO52	Leonova Service Program
71998	User guide, Leonova Emerald IS
CAB94IS	Communication cable, USB-mini USB, 1 m
CAB104IS	Communication cable, USB-USB, 1 m
17102	Battery pack removal tool

Patents: www.spminstrument.com/patents

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Leonova Emerald® IS – Instrument specifications



Technical specifications

Approvals:	CE, ATEX, IECEx
Marking:	I M1 Ex ia I Ma T_a: -10°C to +50°C II 1G Ex ia IIC T4 Ga T_a: -20°C to +50°C
Housing:	ABS/PC/TPE, IP65
Dimensions:	306x108x71 mm
Weight:	960 g
Keypad:	sealed, snap action
Display:	TFT colour, 240x320 pixels, 3.5 inch, adjustable backlight
Main processor:	400 MHz ARM
Memory:	256 MB RAM, 512 MB Flash, SD card 1 GB
Operating system:	Microsoft Windows® CE
DSP processor:	375 MHz floating point
Communication:	USB 2.0
Power supply:	rechargeable battery pack
Battery power:	for min. 14 h normal use (20 °C)
Charging temperature:	0 to 45 °C (32 to 113 °F)
General features:	language selection, battery status indication, transducer line test, metric or imperial units

Output/input

Headphones/ microphone:	3.5 mm stereo plug
Communication:	mini-USB, via USB-isolator

Stethoscope

Transducer types:	shock pulse and vibration transducer
Settings:	filter, volume and gain

Vibration monitoring

Vibration channels:	1
Dynamic range:	< 120 dB, 24 bit A/D converter
Frequency range:	0 (DC) to 20 kHz
Resolution:	max. 12 800 lines
Vibration transducer input:	< 24 Vpp. Transducer supply of 2.5 mA for IEPE (ICP) type can be set On/Off
Transducer types:	SLD2XX series or any transducers (acc, disp., vel.) with voltage output
Measuring techniqes:	ISO 2372, ISO 10816, HD ENV, FFT with symptoms, EVAM Evaluated Vibration Analysis, balancing

Bearing monitoring

Measuring range:	SPM HD: –30 to 110 dBsv (44011 transducer) dBm/dBc: –9 to 99 dBsv LR/HR: –19 to 99 dBsv
Resolution:	0.2 dB / HD, 1 dB / dBm/dBc and LR/HR
Transducer types:	SPM 44011, probe transducer TRA78IS and transducer with quick connector TRA79IS, Duo-Tech SLC2xx, TRC2xx

RPM input

Measuring range:	1 to 150 000 PPM
Resolution:	1 pulse
Accuracy:	± (1 pulse + 0.01% of reading)
Transducer types:	SPM TTP10IS

Temperature measurement

Transducer type:	TTP10IS Tachometer/Temp. probe

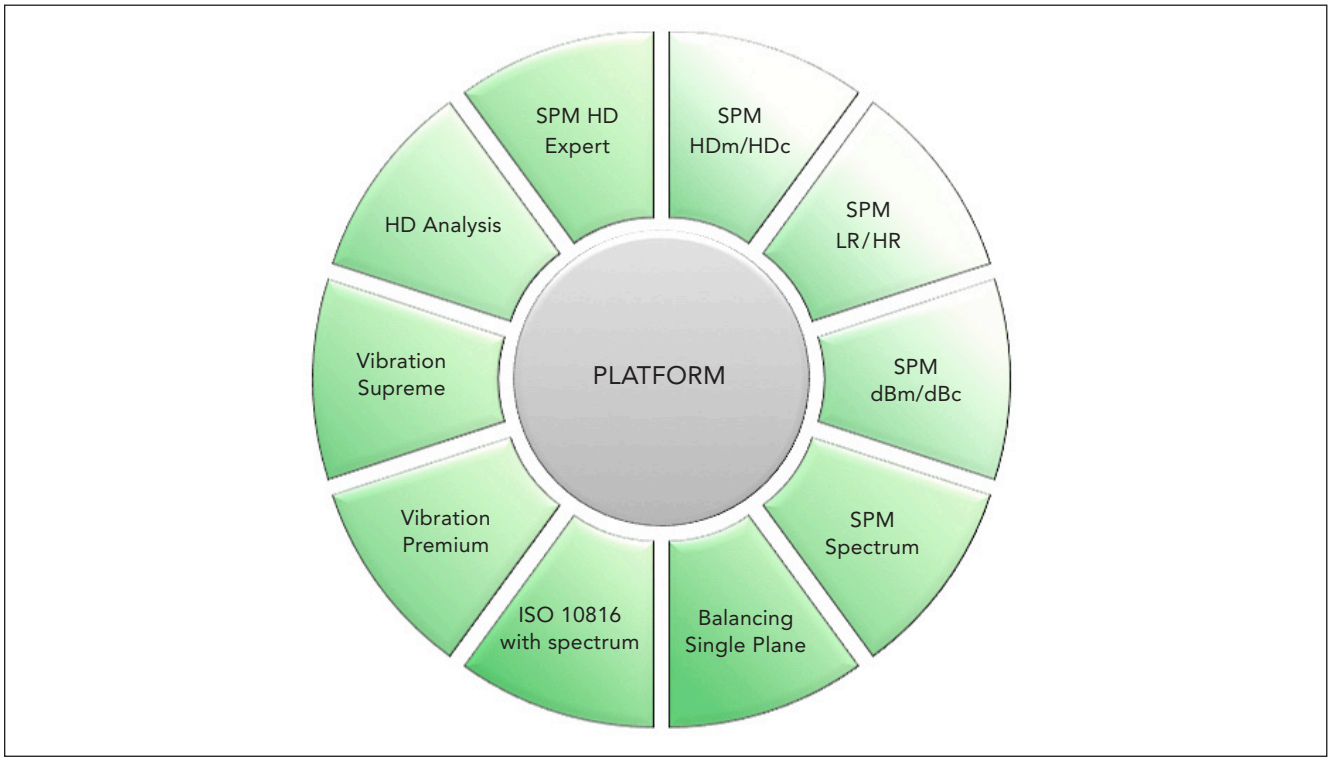
Patents

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Leonova Emerald® IS – User selected functions



To obtain the optimal performance range and instrument price for their purpose, Leonova users can select any or all of the condition diagnosis and maintenance functions below. Platforms are selectable.

Choose your basic platform (compulsory)

EME610	Leonova Emerald IS, HDm/HDc
EME630	Leonova Emerald IS, LR/HR
EME650	Leonova Emerald IS, HDm/HDc + LR/HR

Platform functions

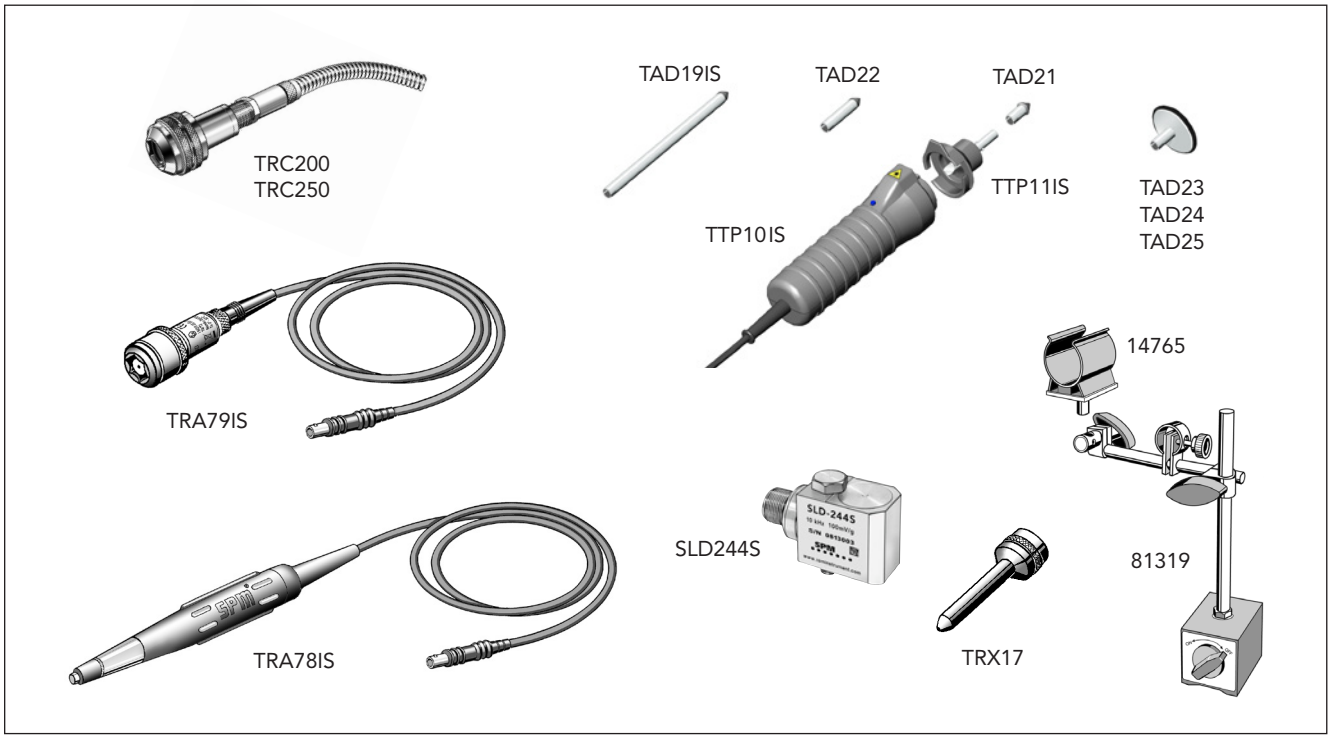
- SPM HDm/HDc + LR/HR
- RMS vibration, ISO 2372
- Speed measurement
- Temperature measurement
- Stethoscope function
- Recording
- Manual recording, free quantity
- Check points, free text
- Recording of vocal comments
- Supports up to 6400 lines, 10 kHz

Optional functions		Module in Ruby
EME195	SPM HD Expert, freq. and domain analysis	MOD195
EME130	Shock pulse method dBm/dBc	MOD130
EME131	Shock pulse method LR/HR	MOD131
EME132	SPM Spectrum	MOD132
EME133	Vibration ISO 10816 with spectrum	MOD133
EME134	Vibration Premium HD ENV FFT spectrum with symptoms 6400 lines, 10 kHz HD Order tracking Time signal Post trigger	MOD135
EME193	Vibration Supreme HD ENV EVAM evaluated vibration analysis 12800 lines, 20 kHz + all functions in EME134	MOD197
EME140	HD Analysis Vibration Supreme SPM HD Expert	MOD140
EME109	Balancing, single plane	

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Leonova Diamond®/Emerald® IS – Accessories



Part numbers

Shock pulse monitoring

CAB80IS	Measuring cable, mini coax - BNC slip on, 1.5 m
CAB81IS	Measuring cable, mini coax - BNC 1.5 m
CAB101IS	Measuring cable, mini coax - TNC, 1.5 m
TRA78IS	Shock pulse transducer with probe (TD-432)
TRA79IS	Shock pulse transducer with quick connector for measuring adapters (TD-433)

Vibration monitoring

SLD2XX	Vibration transducers (TD-215, TD-300)
TRC200	DuoTech accelerometer excl. cable (TD-520)
TRC250	DuoTech accelerometer excl. cable (TD-560)
TRX17	Probe for vibration transducer, M8
CAB82IS	Measuring cable, 6 pin - 2 pin 1.5 m, spiral
CAB83IS	Measuring cable, 6 pin - 2 pin 10 m
CAB83IS-L	Measuring cable, 6 pin - 2 pin (L = length in meter)
CAB88IS	3 channel vibration split cable, 6 pin, 0.25 m (Diamond IS)
CAB89IS	2 channel vibration split cable, 6 pin, 0.25 m (Diamond IS)
CAB97IS	Measuring cable, 6 pin - BNC, 1.5 m, spiral
CAB123IS-X-Y-L	1-3 channels generic cable. Customized options.

For vibration transducers, see TD-637 and TD-638.
For magnetic mounting bases, see TD-548.

Speed and temperature monitoring

TTP10IS	Tachometer and temperature Probe (TD-448)
TAD21	Contact center, rpm, short (30 mm)
TAD22	Contact center, rpm, long (60 mm)
TAD19IS	Contact center, rpm, extra long (170 mm)
TAD23	Contact wheel m/min
TAD24	Contact wheel yd./min
TAD25	Contact wheel ft./min
TAD16	Reflecting tape, 5 sheets
CAB92IS	Cable for NAMUR sensor, 1.5 m, spiral, 5 pin - M12

Balancing

81319	Magnetic base
14765	Holder for tachometer probe TTP10IS

Headset

EAR16IS	Headset with headband (TD-447)
EAR17IS	Headset with helmet brackets (TD-447)
EAR18IS	Headset with neckband (TD-447)
EAS11	Hygiene set for headset and headphones

Others

16999	USB-isolator incl. communication cables

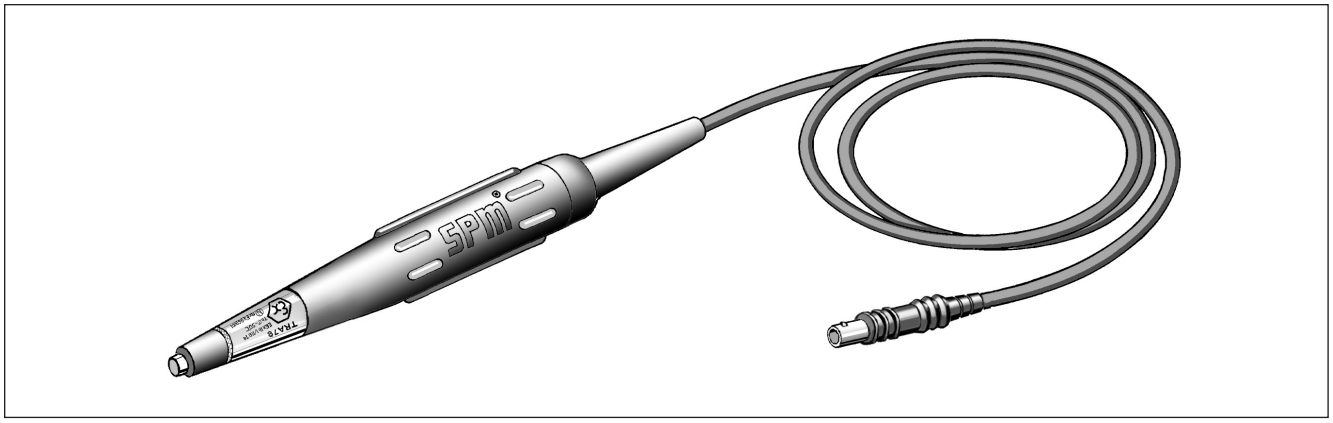
Spare parts

13108	Sleeve for probe tip (TRA78IS)
TTP11IS	Contact adapter for TTP10IS
CAB79IS	Cable for TRA78IS, 1.2 m
CAB103IS	Cable for TRA79IS, 1.5 m
CAB94IS	Communication cable, USB - mini USB, 1 m
CAB104IS	Communication cable, USB - USB, 1 m
16632	Adapter 6.3/3.5 mm phones plug for headset

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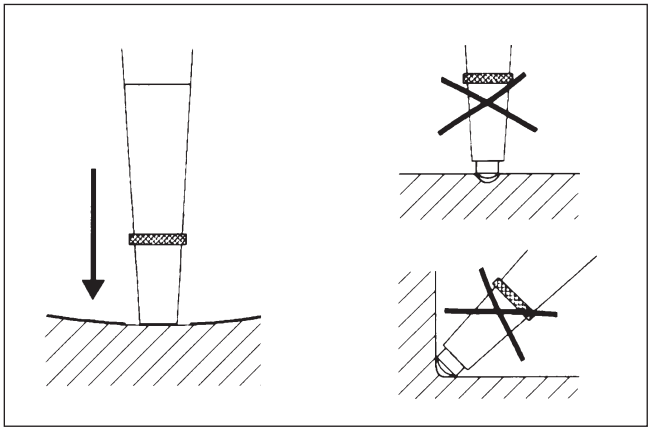
Shock pulse transducer with probe, TRA78IS

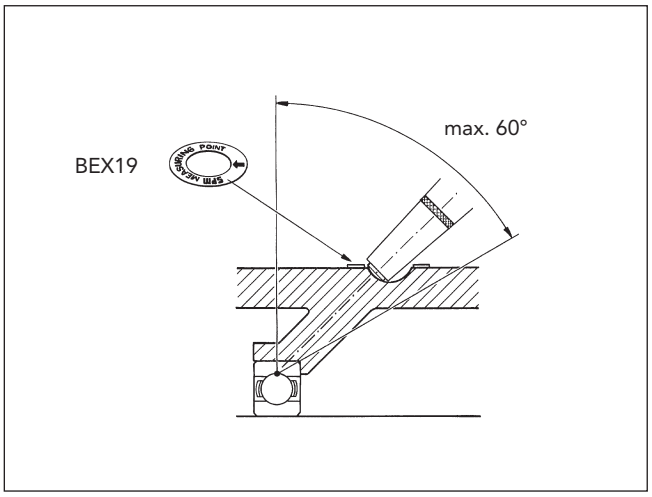


TRA78IS is a hand-held probe transducer permitted for use together with SPM's handheld Ex instruments in applications with potentially explosive atmosphere. The probe is directionally sensitive and must be held aligned against the bearing and not deviate from this direction by more than ±5°. The probe tip is spring loaded and moves within a sleeve made of chloroprene rubber (neoprene) and tolerates 110 °C (230 °F).

Measuring points for the probe should be located directly on the bearing housing and the signal path should be in a direct line to the contact area. The strongest shock pulses are emitted from the loaded region of the rolling interface in the bearing. The loaded region for radial load covers a sector of ±45° from the load direction, for axial load the region is 360°. Measuring points should be clearly marked, for instance with the SPM marker BEX19.

To maintain a steady pressure on the tip, press the probe tip against the measuring point until the rubber sleeve is in contact with the surface. Avoid pressing the probe tip against cavaties and fillets which are smaller than the probe tip.





Safety

The cable must be fitted to the transducer to maintain an ingress protection of minimum IP65.

No maintenance is required. Exchange of cable or probe tip sleeve are the only repair actions allowed.

Technical specifications

Approvals:	CE, ATEX, IECEx
Marking:	I M1 Ex ia I Ma II 1G Ex ia IIC T4 Ga U_i: 28 V, I_i: 120 mA, P_i: 300 mW, C_i: 2 nF
Ambient temperature, T_a:	–20 °C to +50 °C
Measuring range:	max. 100 dB_{SV}
Enclosure:	stainless steel, TPE (rubber alike) grip
Sealing:	IP65
Dimensions:	260x25 mm
Weight:	275 g (incl. cable)
Coaxial cable:	total length 1.5 m, PVC
Electrical connector:	mini Coax

List of complying standards

EX – General requirements:	IEC 60079-0:2011, EN 60079-0:2012
EX – Intrinsic safety:	IEC 60079-11:2011, EN 60079-11:2012
EX – Ga Equipment:	IEC 60079-26:2006, EN 60079-26:2007

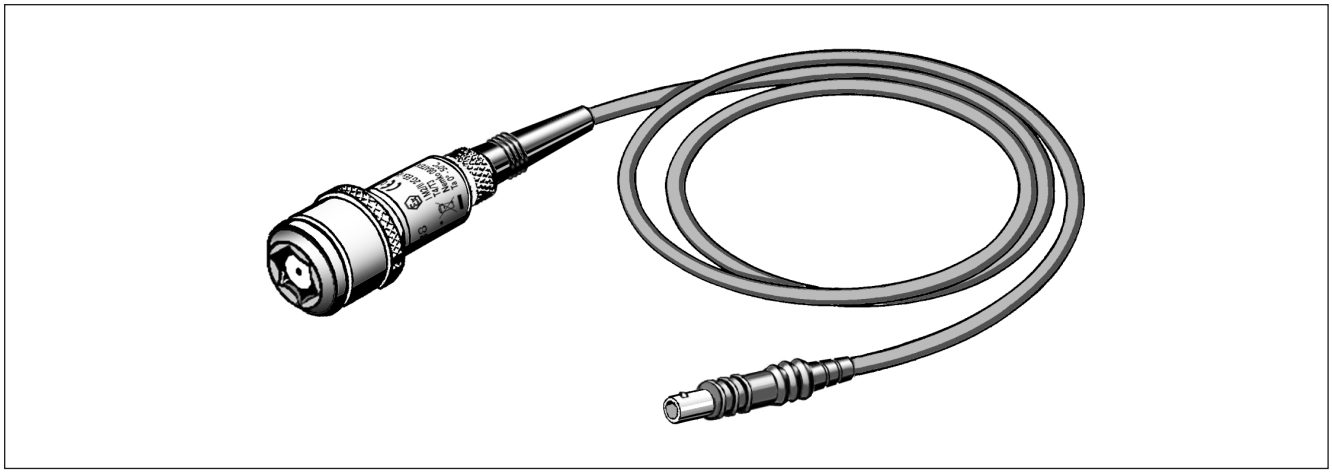
Spare parts

13108 Sleeve for probe tip
CAB79IS Coaxial cable for TRA78IS

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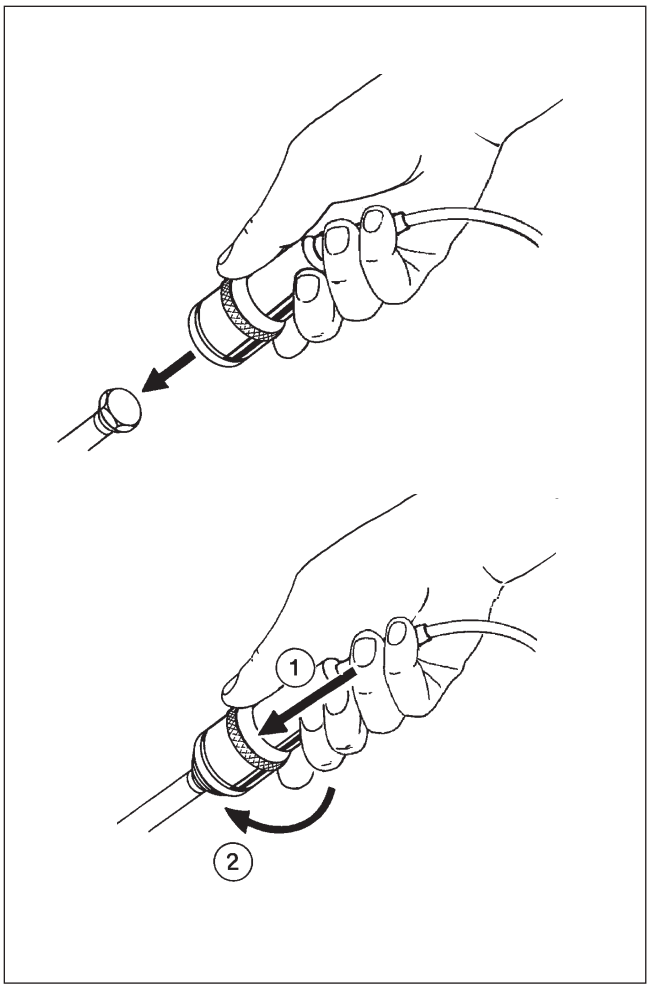
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Shock pulse transducer with quick connector, TRA79IS



TRA79IS is a shock pulse transducer with quick connector for measurements on permanently installed adapters. The transducer is used together with SPM's handheld Ex approved instruments and is specially designed for applications with potentially explosive atmosphere. The transducer is connected to the instrument via a 1.5 m (5 feet) coaxial cable.

The transducer has bayonet catch. To attach TRA79IS to an adapter, push the transducer firmly onto the adapter and twist it clockwise. Twist counter clockwise to unfasten the transducer.



Safety

The cable must be fitted to the transducer to maintain an ingress protection of minimum IP65.

No maintenance is required. Exchange of cable is the only repair action allowed.

Technical specifications

Approvals:	CE, ATEX, IECEx
Marking:	I M1 Ex ia I Ma II 1G Ex ia IIC T4 Ga U_i: 28 V, I_i: 120 mA, P_i: 300 mW, C_i: 2 nF
Ambient temperature, T_a:	–20 °C to +50 °C
Measuring range:	max. 100 dB_{SV}
Enclosure:	stainless steel
Sealing:	IP65
Dimensions:	66x28 mm
Weight:	200 g (incl. cable)
Coaxial cable:	length 1.5 m, PVC
Electrical connector:	mini Coax

List of complying standards

EX – General requirements:	IEC 60079-0:2011, EN 60079-0:2012
EX – Intrinsic safety:	IEC 60079-11:2011, EN 60079-11:2012
EX – Ga Equipment:	IEC 60079-26:2006, EN 60079-26:2007

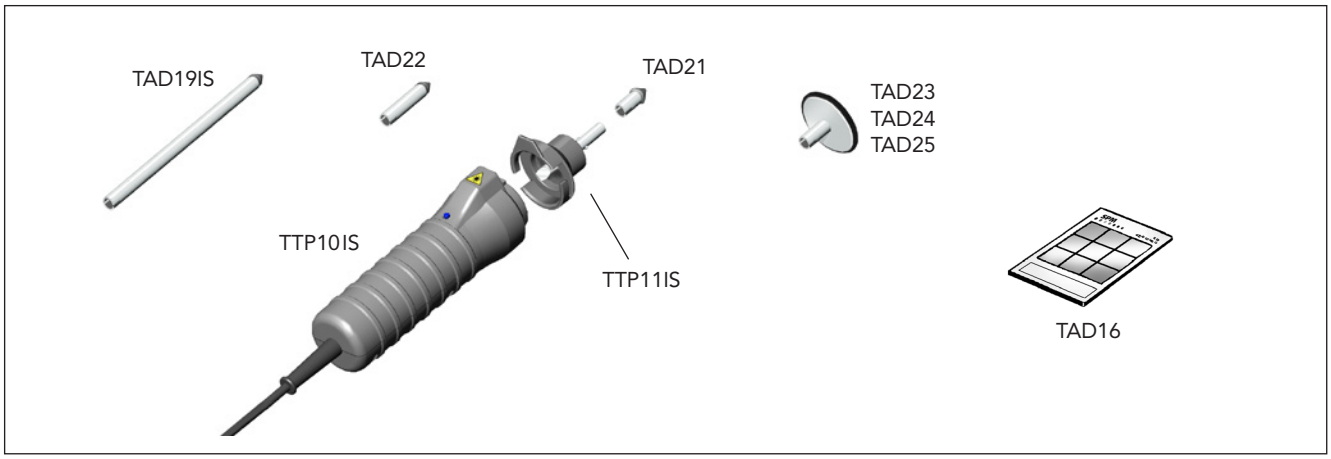
Spare parts

CAB103IS Coaxial cable for TRA79IS

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Tachometer and temperature probe, TTP10IS



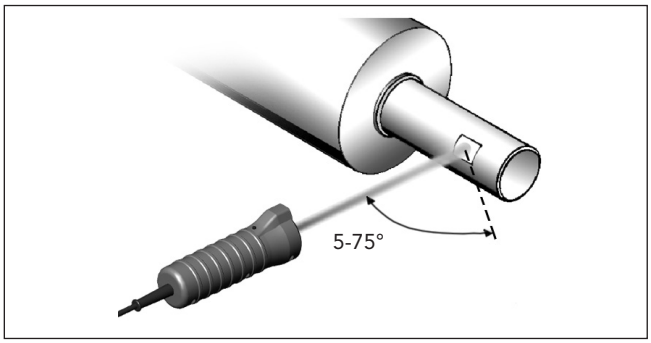
The tachometer and temperature probe TTP10IS is used together with Leonova Diamond® and Emerald® instruments for optical or contact measurement of the rate of rotation and for contact measurement of peripheral speed. It also has a built-in temperature sensor.

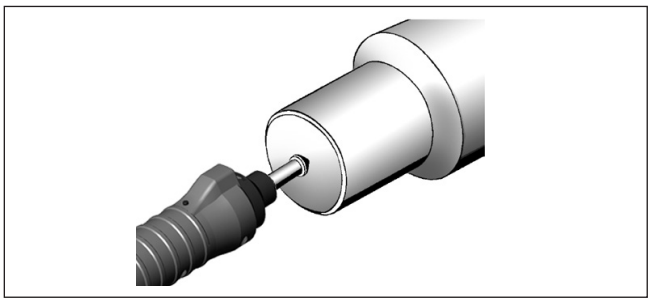
Optical measurement of the rate of rotation
A light beam is directed against a reflecting tape on the rotating object, from a distance of 30-500 mm and from an angle of 5-75°.

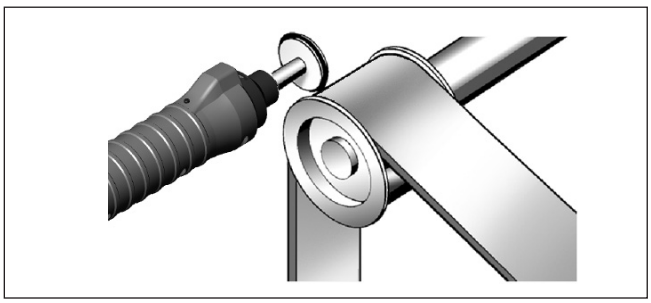
Contact measurement of rpm
The contact adapter TTP11IS with a rubber tipped contact center, TAD-21/22/19IS, is attached onto the probe and then held against the center of a shaft end or a wheel.

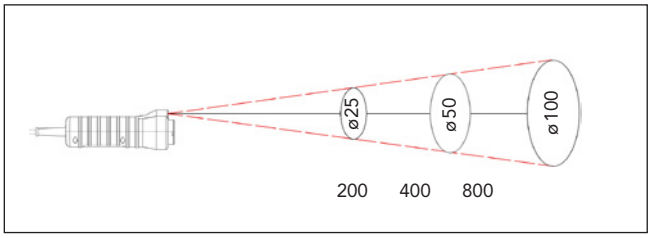
Contact measurement of peripheral speed
The contact adapter TTP11IS with contact wheel is held against the circumference of a shaft, a belt, etc. The speed is read out in units, depending on which contact wheel is used: TAD-23/24/25.

Temperature measurement
The tachometer and temperature probe TTP10IS is also used together with Leonova Diamond/Emerald for temperature measurements with a thermopile element in the range –20 to +300 °C.









Technical specifications

Approvals:	CE, ATEX, IECEx
Measuring range, rpm:	max. 100 000 (pulses) optical
Measuring distance, rpm:	30 to 500 mm
Indicator, rpm:	blue LED
Measuring range, temp.:	–20 to +300 °C
Measuring accuracy, temp.:	± 2,5 °C *
D:S, temp:	8:1
Operating temperature:	0 to +40 °C
Weight:	210 g
Dimensions:	137x50 mm, 179 incl. TTP11IS

* If RF emission is present at 625 MHz to 655 MHz, the accuracy is possibly reduced to ±2.5°C – 10% of full scale

Part numbers

TTP10IS	Tachometer and temperature probe, incl. TTP11IS
TAD21	Contact center, rpm, short, 30 mm
TAD22	Contact center, rpm, long, 60 mm
TAD19IS	Contact center, rpm, extra long, 170 mm
TAD23	Contact wheel m/min.
TAD24	Contact wheel yd./min
TAD25	Contact wheel ft./min
TAD16	Reflecting tape for thin shafts, 5 sheets

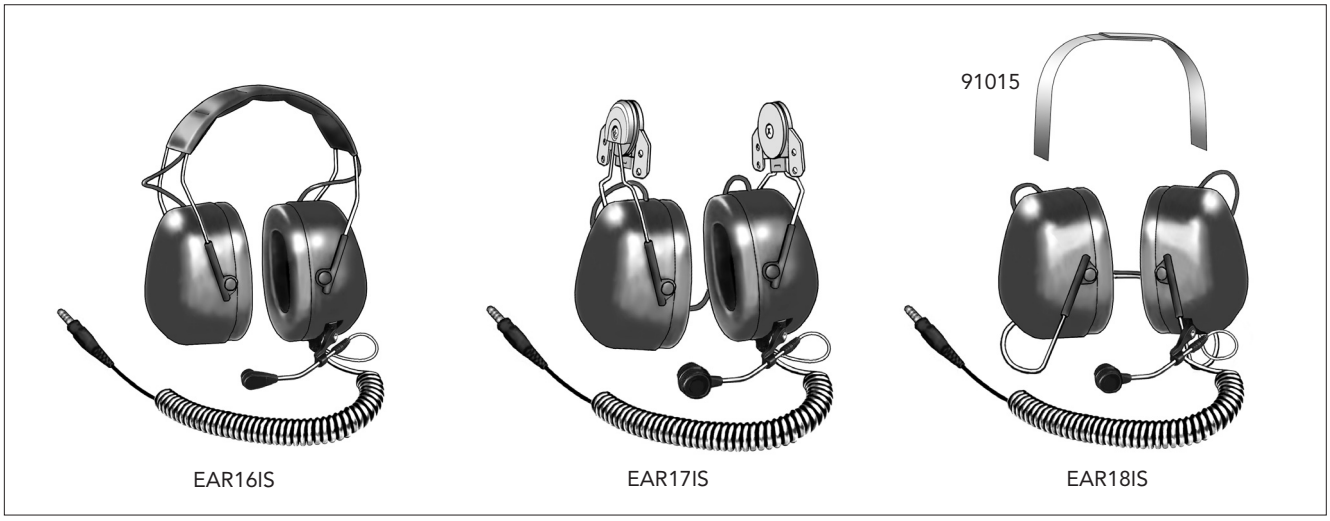
Spare parts

TTP11IS	Contact adapter

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Headset with microphone IS



EAR16/17/18IS are specially selected headsets for Leonova Diamond/Emerald, providing excellent sound reproduction even in noisy environments. The headphones are equipped with microphone for voice recording of comments to the measuring points. In order to use EAR16/17/18 with Leonova Diamond/Emerald, the required phones plug adapter (16332) is included.

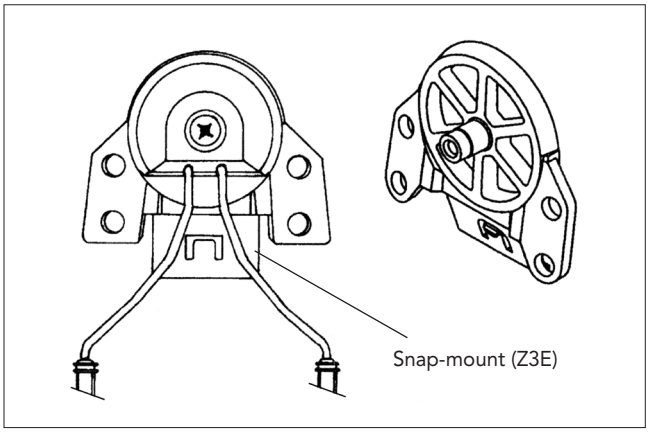
- Individually sprung headband wires of stainless sprung steel provide an even distribution of pressure around the ears. Steel headband wires retain their resilience better than plastic through a wide temperature range.
- Low, two-point fasteners and easy height adjustment with no protruding parts.
- Soft, wide foam and fluid-filled sealing rings with built-in pressure-equalizing channels provide low pressure, effective sealing and ideal comfort.
- Connection cord, 0.75 to 1.4 m, of soft spiral polyurethane with a 6.3 mm stereo plug.
- Frequency range 125-8000 Hz

The headsets are tested and approved in accordance with PPE directive 89/686/EEC and EMC directive 89/336/EEC to meet the demands for CE labelling.

Headset with headband, EAR16IS
The headset EAR16IS is a headset with two parallel connected earphones and a microphone. It has a collapsible headband for convenient storage when you are not using the headset.

Headset for helmet, EAR17IS
The headset with microphone EAR17IS is a headset with two parallel connected earphones and a microphone. The headset fits most safety helmets available in the market today. The headphones have standard snap-mounts (Z3E) and are adapted to a specific helmet by simple manipulation.

Headset with neckband, EAR18IS
The headset EAR18IS is a headset with two parallel connected earphones and a microphone. It has a neckband for use with or without helmet. A soft headband with velcro is optional.



To mount the headphone, snap the helmet attachment into the slot on the helmet. Note! The cups can be set in three positions: working position, ventilation position and parking position. When in use, the cups must be placed in working position. Press the wires inward until you hear a click on both sides. Make sure that the cup and the headband wire in working position are not pressing on the helmet lining or the edge of your hard hat so that leakage can occur. Parking position should not be used if the cups are damp inside after an intense period of use.

Marking
II 2G Ex ib IIC T4 -20°C ≤ Ta ≤ +50°C *
IECEx NEM 09.0005X

Part numbers
EAR16IS	Headset with headband
EAR17IS	Headset with helmet brackets
EAR18IS	Headset with neckband
EAS11	Hygiene set (consists of two sets of attenuating cushions and snap-in sealing rings.)
91015	Headband with velcro for EAR18IS

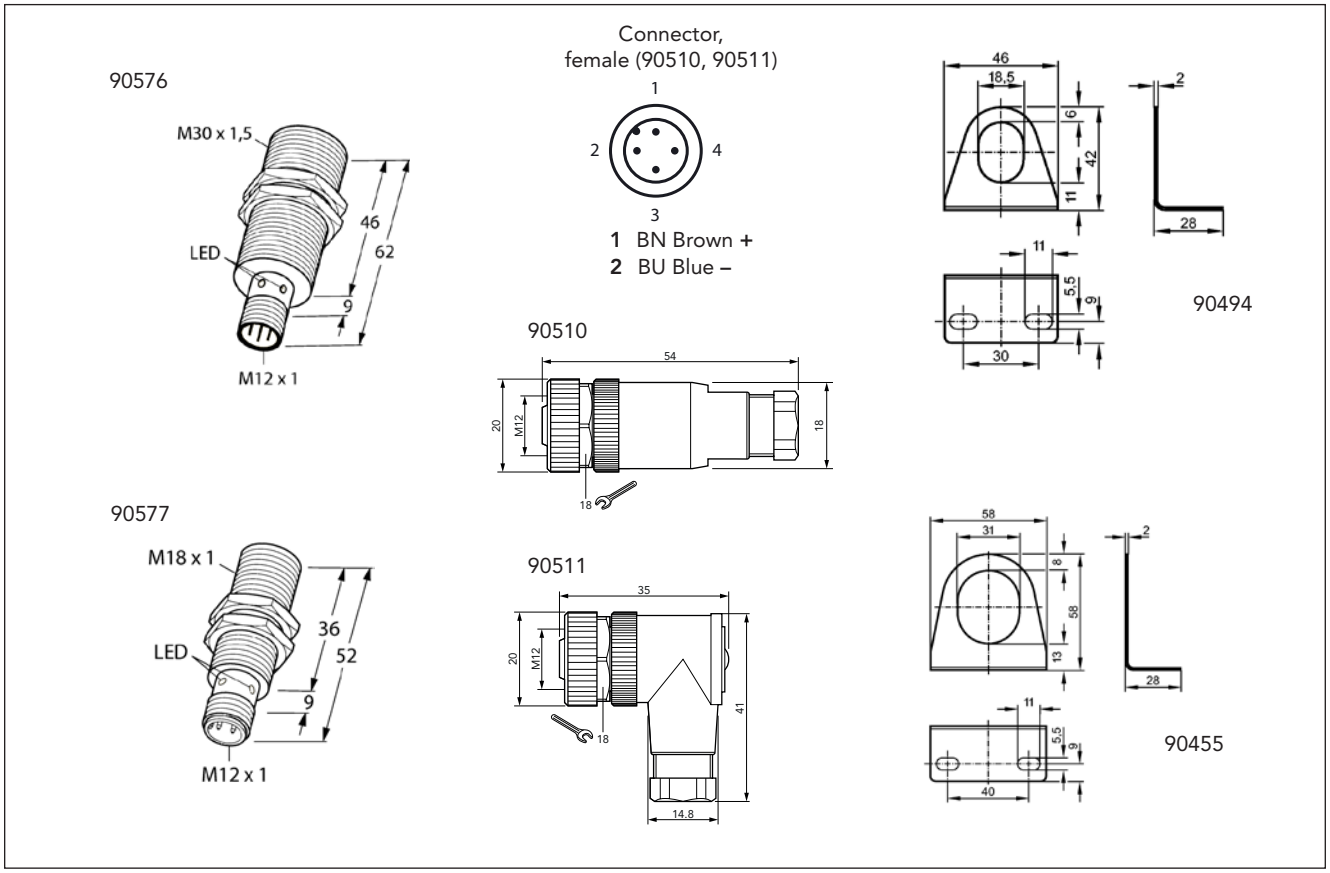
Spare part
16632	Adapter 6,3/3,5 mm phones plug

* Headsets are not allowed to be used in zone 0.

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Inductive Proximity Switches, NAMUR



The inductive proximity switches of NAMUR standard have LED indicators for easy operation and adjustment. The angle brackets 90455 and 90494 are made of galvanized steel.

Technical specifications

Ex marking:	II 1G Ex ia IIC T6 Ga II 1D Ex ia IIIC T115°C
Standards:	
NAMUR	DIN EN 60947-5-6
Housing material:	metal, CuZn, chrome-plated
Material active face:	plastic, PBT
Rated operating distance, Sn:	
90576	10 mm
90577	5 mm
Switching frequency:	
90576	0.5 kHz
90577	1 kHz
Hysteresis:	1... 10%
Ambient temperature:	
90576	–25 °C to +70 °C
90577	–25 °C to +70 °C
Max. tightening torque housing nut:	
90576	75 Nm
90577	25 Nm
Shock resistance:	30g
Protection category:	IP 67
Switching state:	LED, yellow
Voltage:	Nom. 8.2 VDC
Actuated current consumption:	≤ 1.2 mA
Non-actuated current consumption:	≥ 2.1 mA
Connection:	male M12X1

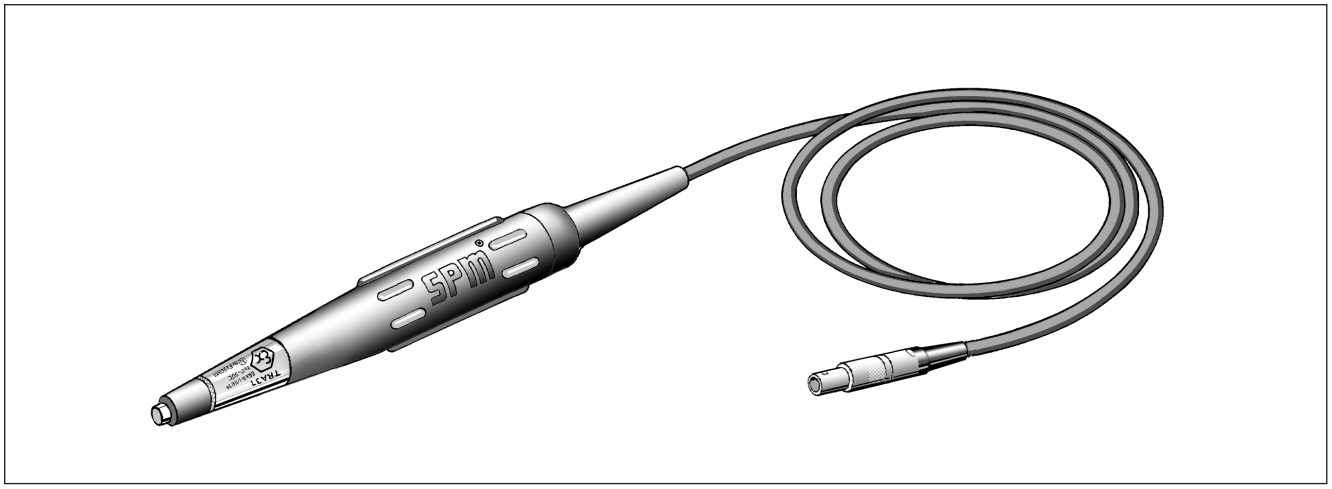
Part numbers

90576	Inductive Proximity Switch M30
90577	Inductive Proximity Switch M18
93516	M12 connector with 2 meter cable, straight, (female)
93517	M12 connector with 2 meter cable, angled, (female)
90510	M12 connector, straight (female)
90511	M12 connector, angled (female)
90494	Angle bracket M18
90455	Angle bracket M30

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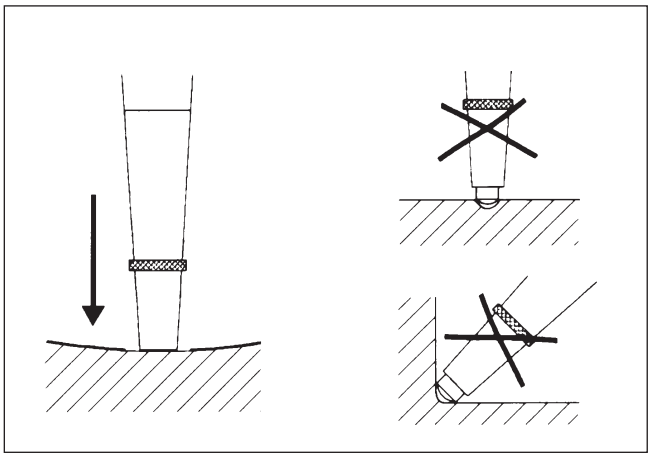
Shock Pulse Transducer with Probe TRA-37

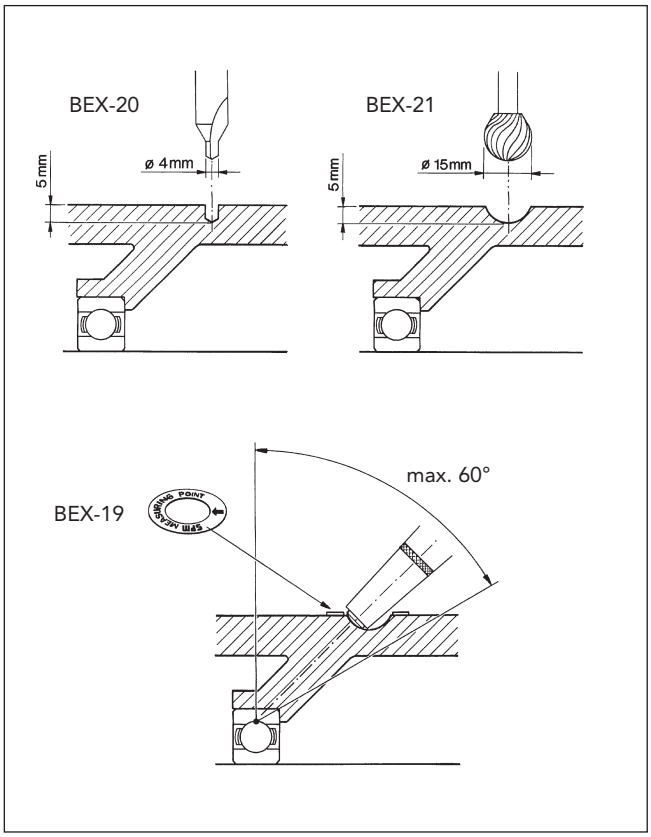


TRA-37 is a hand-held probe transducer permitted for use together with BearingChecker Ex in applications with potentially explosive atmosphere. The probe is directionally sensitive and must be held aligned against the bearing and not deviate from this direction by more than ±5°. The probe tip is spring loaded and moves within a sleeve made of chloroprene rubber (neoprene) and tolerates 110 °C (230 °F).

Measuring points for the probe should be located directly on the bearing housing and the signal path should be in a direct line to the contact area. The strongest shock pulses are emitted from the loaded region of the rolling interface in the bearing. The loaded region for radial load covers a sector of ±45° from the load direction, for axial load the region is 360°. Measuring points should be clearly marked, for instance with the SPM marker BEX-19.

To maintain a steady pressure on the tip, press the probe tip against the measuring point until the rubber sleeve is in contact with the surface. Avoid pressing the probe tip against cavaties and fillets which are smaller than the probe tip.





Technical specifications

Certificate of conformity:	NEMKO08ATEX1374
Ex certification:	I M2/II 2G Ex ib I/IIB T4
CE number:	CE 0470
Ta:	0 to +50 °C (32 to 120 °F)
Coaxial cable:	PVC, length 1.5 m (5 ft)
Connector:	mini coax
Dimensions:	260 x 25 mm (10.2 x 1 in)
Weight:	275 g (9.7 oz)

Part numbers

TRA-37	Shock pulse transducer, probe assembly
BEX-19	Measuring point marker
BEX-20	Center drill
BEX-21	Rotary file

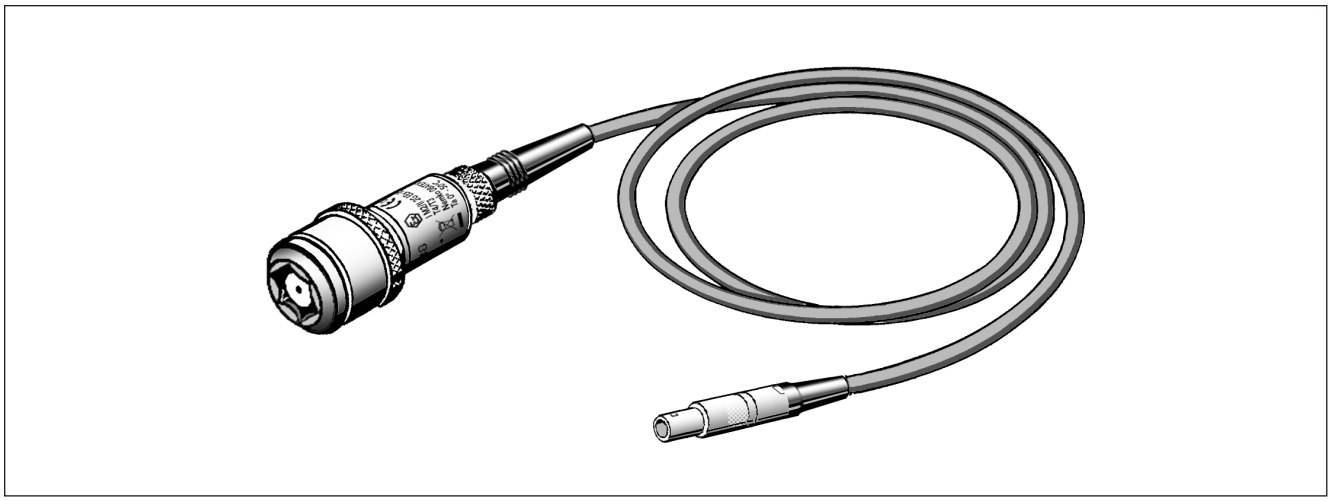
Spare part

13108	Sleeve for probe tip

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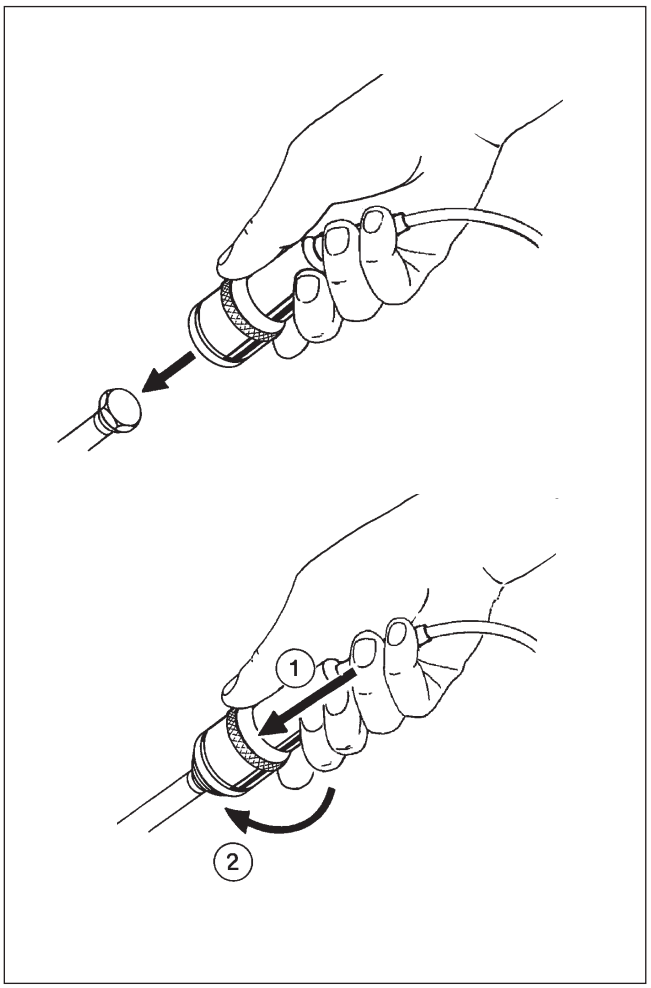
Shock pulse transducer with quick connector TRA-38



TRA-38 is a shock pulse transducer with quick connector for measurements on permanently installed adapters. The transducer is used together with the handheld instrument BearingChecker Ex and is specially designed for applications with potentially explosive atmosphere. It is provided with a transducer matching unit (TMU). The transducer is connected to BearingChecker Ex via a 1.5 m (5 feet) coaxial cable.

The transducer has bayonet catch. To attach the TRA-38 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

Twist counter clockwise to unfasten the transducer.



Technical specifications

Certificate of conformity:	NEMKO08ATEX1374
Ex certification:	IM2/II 2G Ex ib I/IIB T4
CE number:	CE 0470
Ta:	0 to +50 °C (32 to 120 °F)
Measuring range:	max. 80 dBsv
Design:	sealed
Material, spanner:	blacknited steel
Material, handle:	stainless steel
Coaxial cable:	PVC, length 1.5 m (5 ft)
Connector:	mini coax
Dimensions, transducer:	66 x 28 mm
Weight:	approx. 200 g

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Carrying Cases Ex



CAS27 Ex



CAS28 Ex

The carrying cases CAS27 Ex and CAS28 Ex, made of conductive material, are especially designed for transporting measuring instruments in explosive environment. They reliably prevent electrostatic charge and divert already existing charges. CAS27 Ex is made of hard conductive plastic and has a foam inlay set suitable for Leonova Dimond IS / Emerald IS with accessories. CAS28 Ex is a soft case with easily customizable modular insert and is provided with shoulder belt.

Technical specifications CAS27 Ex

Material:	PRE-ELEC® PP 1375 carbon black filled conductive thermoplastic compound based on polypropylene
Insert:	die-cut foam
Surface resistance:	$<10^4$ Ω IEC 61340-2-3
Dimensions:	42 x 34 x 12 cm (16.5 x 13.4 x 4.7 in)
Inside dimensions:	41 x 27 x 11 cm (16.1 x 10.7 x 4.4 in)
Weight:	1.2 kg (2.7 lbs)

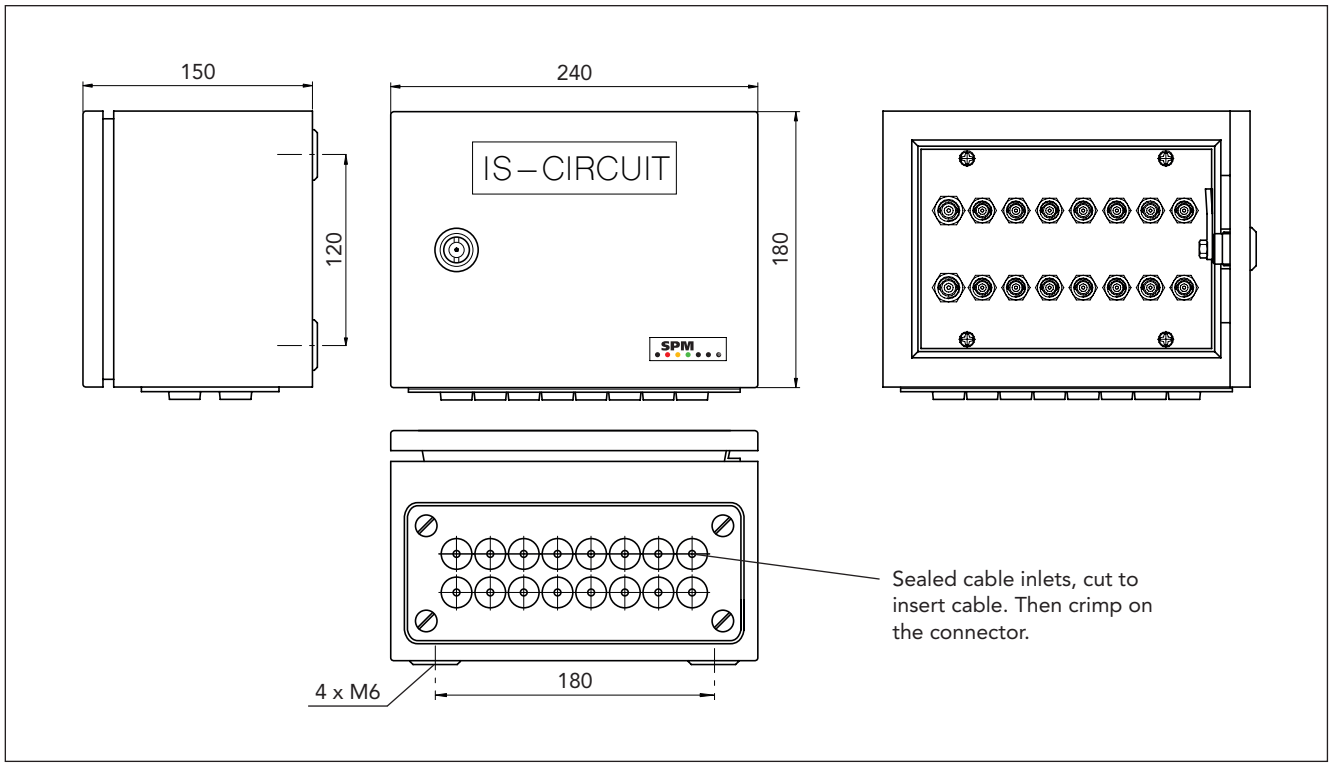
Technical specifications CAS28 Ex

Material:	electrically conductive skai®, approx. 90% PVC-compound approx 10% CO/PES-knitted fabric weight 630 ±50 gr/m2 thickness 1.1 ±0.2 mm
Insert:	modular
Dimensions:	37 x 20 x 27 cm (14.5 x 7.9 x 10.6 in)
Weight:	1.2 kg (2.7 lbs)

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Terminal cabinet IS 17834



The terminal cabinet 17834 can recieve up to 14 cables from shock pulse and vibration transducers, and up to two cables with M12 connectors. The individual cable is inserted through the chloroprene seal in the bottom plate. Afterwards, terminal connectors are crimped on to the transducer cables. The terminal connectors and accessories are ordered separately, *see technical data sheet TD-480*.

Safety

The following conditions relate to safe installation and use of equipment:

- The junction box is part of an intrinsic safety installation as "simple apparatus" defined in EN 60079-14:2008 and IEC 60079-14:2013.
- The junction box is permanently marked with "IS-Circuit".

Technical specifications

Dimensions:	240x180x150 mm
Mounting holes:	M6, spacing 180x120
Casing:	Stainless steel, SS142333
Door lock:	Removable key
Protection class:	IP66
Temperature range:	–30° to +80 °C
Temperature class:	T6 and T85 °C
Protection level:	Ex Ga and Ex Da (Zone 0, 1, 2 and 20, 21, 22)
Cable inlets:	Chloroprene, IP67
Cable diameter:	5 to 7 mm

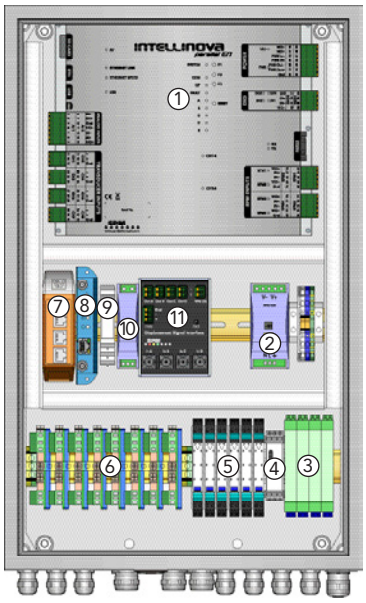
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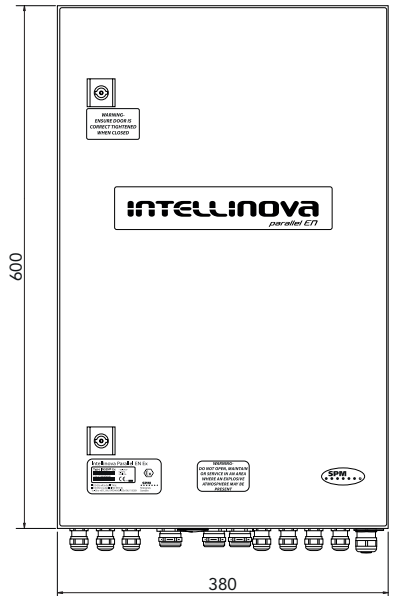
17834 Terminal cabinet, IS version

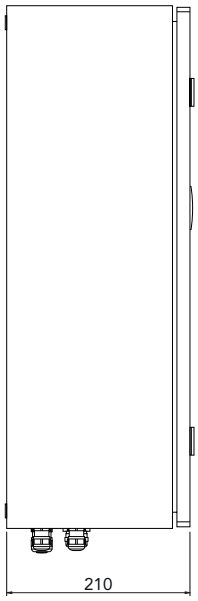
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Intellinova® Parallel EN Ex – System INSEN8 Ex







1. System unit INCEN8
2. Power supply
3. Barrier, RPM
4. Key phasor interface
5. Barrier, digital input/output
6. VIB transducer Ex interface
7. Ethernet switch
8. Ethernet unit
9. Relay for external alarm
10. Power supply unit 12 V DC*
11. Displacement signal interface

*Only needed if INO17 is installed.

INSEN8 Ex is an advanced online system, intended for use in potentially explosive environments, for continuous monitoring of machine condition. The system is comprised of system unit INCEN8, Ex cabinet, internal cabling and terminals for power supply. Power supply (IND34 Ex or IND35 Ex) and DIN rails are included in INSEN8 Ex. Desirable cable inlets must be specified to complete the order. In order to obtain a complete Ex system, Ex interfaces must be used.

The system is ATEX and IECEx certified to be installed in Gas-explosion-endangered area and Dust-explosion-endangered area. Ex interfaces for transducers located in Ex gas Zones 0, 1 or 2, or Ex dust Zones 20, 21, 22 are ordered separately. IND8 Ex is an industrial enclosure designed for encapsulation of INCEN8. The cabinet, intended for wall mounting, is certified as Ex "restricting breathing" for use in zone 2 and "dust ignition protection by enclosure" for use in zone 22.

By collecting data from parallel condition measurement on eight channels for bearing condition and vibration measurement, and four RPM channels, the system allows complex measurement applications. Two digital inputs and two digital outputs can be used for connection to PLC or via external relays to machine stop, warning lamp or measurement assignments, etc. The system also has two analog inputs.

The system communicates with Condmaster Ruby via standard Ethernet in a LAN network. The Group Measurement function enables measurement assignments to trigger multiple system units. In Condmaster, the Live View is used for monitoring the state of all connected devices.

INCEN8 is equipped with parallel measuring logic, alarm, storing and analysis logic. Technical specifications for the system unit, see technical data sheet TD-565.

Technical specifications

Approvals:	CE, ATEX, IECEx
Design, enclosure:	stainless steel, IP66
Power supply:	IND35 Ex: 100-240VAC, 34W, 50-60 Hz IND34 Ex: 24VDC Nom., 34W
Cable channels:	4 pcs, plastic
Dimensions:	380x600x210 mm (15x23.6x8.3 in)
Weight:	approx. 20 kg (44 lbs)

Marking

II 3 (1) G Ex nR [ia Ga] IIC T4 Gc
II 3 (1) D Ex tc [ia Da] IIIC IP66, T85°C Dc
100-240Vac 47-63Hz 34W alt. 24Vdc Nom Ta: −20 to +60°C

Part numbers

INSEN8 Ex	Intellinova Parallel EN Ex system (INCEN8+Ex cabinet+cable inlets+power supply)
INCEN8	System unit
IND8Ex304	Ex cabinet in stainless steel
IND8Ex316	Ex cabinet in stainless acid proof steel
IND34 Ex	Power supply, 24 V DC
IND35 Ex	Power supply unit, 100-240 V AC
IND36 Ex	Cable inlets, plastic
IND37 Ex	Cable inlets, metal
IND38 Ex	Cable inlets, customized

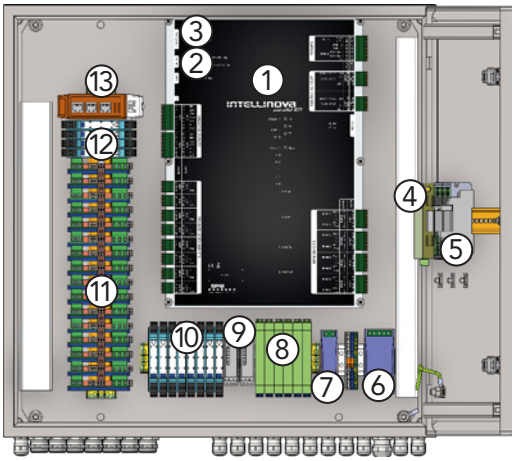
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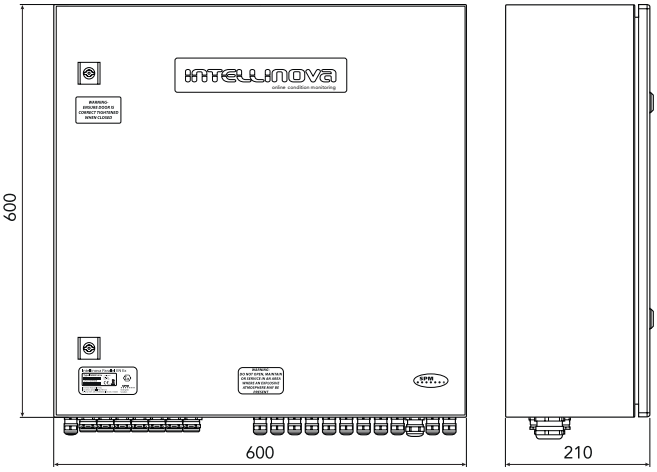
IND21	Wi-Fi Ethernet modem, incl. antenna with 5m cable
IND22	Ethernet switch with RJ45 communication
IND23	Ethernet switch with fiber-optical communication
IND28	Signal relay
INO17	Key phasor interface (TD-299)
INO33	Displacement signal interface (TD-549)
IND09Ex	Ex interface for VIB transducers, max. 8 (TD-495)
IND26	Ex interface for analog input AI, max. 2
IND27	Ex interface for RPM according to NAMUR (TD-502)
IND29	Ex interface for digital input DI, max. 2
IND30	Ex interface for digital output DO, max. 2

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Intellinova® Parallel EN Ex – System INSEN16 Ex





1. System unit INCEN16
2. Network connection, RJ45
3. Input for SD memory card
4. Ethernet unit
5. Displacement signal interface
6. Power supply 24 V DC
7. Power supply unit 12 V DC*
8. Barrier, RPM
9. Key phasor interface
10. Barrier, digital input/output
11. VIB transducer Ex interface
12. Barrier, analog input
13. Ethernet switch

*Only needed if INO17 is installed.

INSEN16 Ex is an advanced online system, intended for use in potentially explosive environments, for continuous monitoring of machine condition. The system is comprised of system unit INCEN16, Ex cabinet, internal cabling and terminals for power supply. Power supply (IND34 Ex or IND35 Ex) and DIN rail are included in INSEN16 Ex. Desirable cable inlets must be specified to complete the order. In order to obtain a complete Ex system, Ex interfaces must be used.

The system is ATEX and IECEx certified to be installed in Gas-explosion-endangered area and Dust-explosion-endangered area. Ex interfaces for transducers located in Ex gas Zones 0, 1 or 2, or Ex dust Zones 20, 21, 22 are ordered separately. IND16 Ex is an industrial enclosure designed for encapsulation of INCEN16. The cabinet, intended for wall mounting, is certified as Ex "restricting breathing" for use in zone 2 and "dust ignition protection by enclosure" for use in zone 22.

By collecting data from parallel condition measurement on sixteen channels for bearing condition and vibration measurement, and eight RPM channels, the system allows complex measurement applications. Four digital inputs and four digital outputs can be used for connection to PLC or via external relays to machine stop, warning lamp or measurement assignments, etc. The system also has four analog inputs.

The system communicates with Condmaster Ruby via standard Ethernet in a LAN network. The Group Measurement function enables measurement assignments to trigger multiple system units. In Condmaster, the Live View is used for monitoring the state of all connected devices.

INCEN16 is equipped with parallel measuring logic, alarm, storing and analysis logic. The unit has status LED indicators and USB connection for setup of the system. Technical specifications for the system unit, *see technical data sheet TD-543*.

Technical specifications

Approvals:	CE, ATEX, IECEx
Design, enclosure:	stainless steel, IP66
Power supply:	100-240VAC/24VDC, 34W, 50-60 Hz
Cable channels:	2 pcs, plastic
Dimensions:	600x600x210 mm (23.6x23.6x8.3 in)
Weight:	approx. 31 kg (68.4 lbs)

Part numbers

INSEN16 Ex	Intellinova Parallel EN Ex system (INCEN16 + Ex cabinet + cable inlets+power supply)
INCEN16	System unit
IND16 Ex 304	Ex cabinet in stainless steel
IND16 Ex 316	Ex cabinet in stainless acid proof steel
IND24 Ex	Cable inlets, plastic
IND25 Ex	Cable inlets, metal
IND33 Ex	Cable inlets, customized
IND34 Ex	Power supply, 24 V DC
IND35 Ex	Power supply unit, 100-240 V AC

Marking

II 3 (1) G Ex nR [ia Ga] IIC T4 Gc
II 3 (1) D Ex tc [ia Da] IIIC IP66, T85°C Dc
100-240Vac 47-63Hz 34W alt. 24Vdc Nom Ta: −20 to +60°C

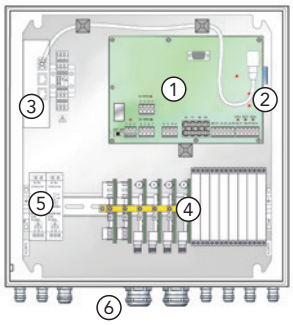
Options

IND21	Wi-Fi Ethernet modem, incl. antenna with 5m cable
IND22	Ethernet switch with RJ45 communication
IND23	Ethernet switch with fiber-optical communication
IND28	Signal relay, max. 4
INO17	Key phasor interface (TD-299)
INO33	Displacement signal interface, max. 4 (TD-549)
IND09 Ex	Ex interface for vibration transducer, max. 16 (TD-495)
IND26	Ex interface for analog input AI, max. 4
IND27	Ex interface for RPM according to NAMUR (TD-502)
IND29	Ex interface for digital input DI, max. 4
IND30	Ex interface for digital output DO, max. 4

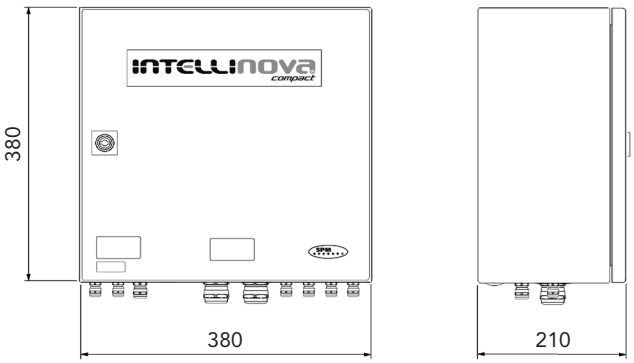
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Intellinova® Compact – System Unit INS06 Ex



1. Circuit board
2. SD memory card
3. Ethernet switch (option)
4. Input/output Ex interface
5. Power supply unit
6. Cable inlets



The system unit INS06 Ex in the Intellinova Compact series is a small and advanced measuring unit for continuous monitoring of machine condition. The system is ATEX and IECEx certified to be installed in Gas-explosion-endangered area and Dust-explosion-endangered area. Cable inlets are included in INS06 Ex. Power supply unit and Ex interfaces for transducers located in Ex gas Zones 0, 1 or 2, or Ex dust Zones 20, 21, 22 are ordered separately. The enclosure, intended for wall mounting, is certified as Ex "restricting breathing" for use in zone 2 and "dust ignition protection by enclosure" for use in zone 22.

INS06 Ex measures bearing condition on four channels, vibration on two channels and analog signals on three channels. Two RPM sensors can be connected and linked to measuring assignments set up in Condmaster® Ruby. The unit has three digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc.

If Digital Output or Analog Input is connected to equipment located in Ex hazardous zone 0/20 or 1/21, Intellinova® System units need to be ordered as special. The actual type of equipment intended to be used must be specified at time of ordering the system unit. This so suitable Ex interfaces can be installed.

The unit is equipped with multiplexing measuring logic, alarm, storing and analysis logic. It is connected via standard Ethernet in a LAN network. The circuit board is equipped with status LED indicators and an SD memory card used for data buffering and setup of the system unit.

Technical specifications

Design, enclosure:	stainless steel, IP66
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps
Power supply unit:	100 to 240 VAC, output 12 VDC, 1.5 A or 10 to 36 VDC, 25 W
Ambient temperature:	−20 to +60 °C (−4 to 140 °F)
Storage temperature:	−20 to +80 °C (−4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	380 x 380 x 210 mm (15 x 15 x 8.3 in)
Weight:	approx. 11 kg (24 lbs)
ATEX, IECEx marking:	II 3 (1) G Ex nR [ia Ga] IIC T4 Gc II 3 (1) D Ex tc [ia Da] IIIC IP66,T85 °C Dc 100-240Vac 47-63Hz 36W/10-36Vdc 25W Ta: −20 to +60 °C

Bearing Monitoring

Measuring methods:	SPM HD, LR/HR HD
Measuring channels:	4, multiplexing
Measuring range:	−20 to 80 dBsv (SPM HD) −19 to 80 dBsv (LR/HR)
Amplitude scale unit:	HDm/HDc, LR/HR, Time Signal HD, SPM Spectrum HD
Transducer line test:	TLT test
Input connectors:	for coaxial cables with TNC connectors
Transducer type:	SPM 44000 Ex series with isolation foot, only for use with coaxial cables

Vibration Monitoring

Measuring methods:	ISO 2372, ISO10816, FFT with symptoms, EVAM vibration analysis, HD ENV
Measuring channels:	2, multiplexing
Frequency range:	DC to 40 kHz
Measuring range:	≥60 g peak-peak (using 100 mV/g transducer)
Resolution:	0.0015m/s² RMS (using 100 mV/g transducer)
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Transducer type:	SLD200 series, SLC244 DuoTech or IEPE (ICP®) type transducers with a nominal bias output voltage of 10 to 14 VDC

Digital Inputs DI/RPM

Digital/RPM inputs:	2 channels, multiplexing
RPM transducer type:	proximity switches, supply NAMUR
RPM measuring range:	0.1 to 120 000 rpm (when 1 pulse/rev.)

Digital Outputs DO

Digital outputs:	3, open collector, user configurable

Analog Inputs AI

Input channels:	3
Measurement range:	0 to 20 mA
Resolution:	0.01 mA (12 bit)
Meas. accuracy:	±(1% +0.1 mA)
Input resistance:	current 100 Ω

Options *(need to be specified when system is ordered)*

IND01 Ex	Wi-Fi Ethernet unit incl. antenna with 5 m cable
IND02 Ex	Ethernet switch with RJ45 communication
IND03 Ex	Ethernet switch with fiber-optic and RJ45 communication
IND09 Ex	Ex interface for vibration transducer, max. 2
IND10 Ex	Ex interface for shock pulse transducer, max. 4
IND04 Ex	Ex interface for first channel DI/RPM according to NAMUR incl. power supply 24VDC
IND05 Ex	Ex interface for additional channel DI/RPM according to NAMUR
*	Ex interface for digital input DI/RPM - not NAMUR
*	Ex interface for analog input AI, max. 3
*	Ex interface for digital output DO, max. 3
IND31 Ex	Power supply unit, 24 VDC, 25W
IND32 Ex	Power supply unit, 230 VAC, 47-63 Hz, 36W

* Special option. Please contact SPM Instrument for information.

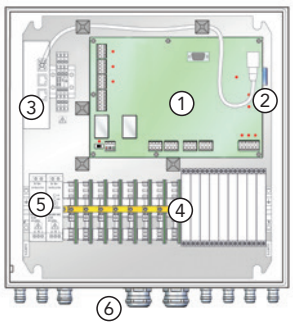
Accessories

IND14	Relay for external alarm, 2 poles (TD-386)
81524	Mounting braces for wall mounting, 4 pcs.

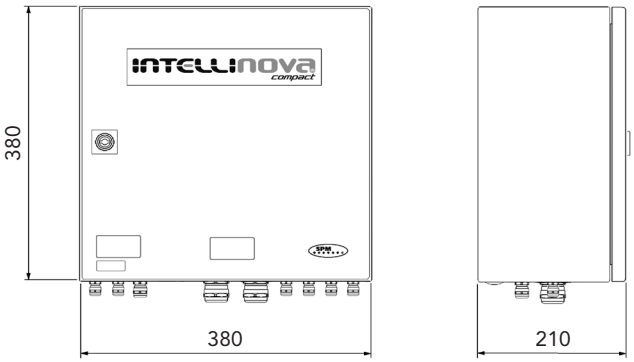
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Intellinova® Compact – System Unit INS08V Ex



1. Circuit board
2. SD memory card
3. Ethernet switch (option)
4. Input/output Ex interface
5. Power supply unit
6. Cable inlets



The system unit INS08V Ex in the Intellinova Compact series is a small and advanced measuring unit for continuous monitoring of machine condition. The system is ATEX and IECEx certified to be installed in Gas-explosion-endangered area and Dust-explosion-endangered area. Cable inlets are included in INS08V Ex. Power supply unit and Ex interfaces for transducers located in Ex gas Zones 0, 1 or 2, or Ex dust Zones 20, 21, 22 are ordered separately. The enclosure, intended for wall mounting, is certified as Ex "restricting breathing" for use in zone 2 and "dust ignition protection by enclosure" for use in zone 22.

INS08V Ex measures vibration on eight channels and analog signals on three channels. Up to three RPM sensors can be connected and linked to measuring assignments set up in Condmaster. The unit has three digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc.

If Digital Output or Analog Input is connected to equipment located in Ex hazardous zone 0/20 or 1/21, Intellinova® System units need to be ordered as special. The actual type of equipment intended to be used must be specified at time of ordering the system unit. This so suitable Ex interfaces can be installed.

The unit is equipped with multiplexing measuring logic, alarm, storing and analysis logic. It is connected via standard Ethernet in a LAN network. The circuit board is equipped with status LED indicators and an SD memory card used for data buffering and setup of the system unit.

Technical specifications

Design, enclosure:	stainless steel, IP66
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps
Power supply unit:	100 to 240 VAC, Output 12 VDC, 1.5 A or 10 to 36 VDC, 25 W
Ambient temperature:	–20 to +60 °C (–4 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	380 x 380 x 210 mm (15 x 15 x 8.3 in)
Weight:	approx. 11,7 kg (26 lbs)
ATEX, IECEx marking:	II 3 (1) G Ex nR [ia Ga] IIC T4 Gc II 3 (1) D Ex tc [ia Da] IIIC IP66,T85°C Dc 100-240Vac 47-63Hz 36W / 10-36Vdc 25W Ta: –20 to +60 °C

Vibration Monitoring

Measuring methods:	ISO 2372, ISO10816, FFT with symptoms, EVAM vibration analysis, HD ENV
Measuring channels:	8, multiplexing
Frequency range:	DC to 40 kHz
Measuring range:	≥ 60 g peak-peak (using 100 mV/g transducer)
Resolution:	0.0015m/s² RMS (using 100 mV/g transducer)
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Transducer type:	SLD200 series, SLC244 DuoTech or IEPE (ICP®) type transducers with a nominal bias output voltage of 10 to 14 VDC

Digital Inputs DI/RPM

Digital / RPM inputs:	3 channels, multiplexing
RPM transducer type:	proximity switches, supply NAMUR
RPM measuring range:	0.1 to 120 000 rpm (when 1 pulse/rev.)

Digital Outputs DO

Digital outputs:	3, open collector, user configurable

Analog Inputs AI

Input channels:	3
Measurement range:	0 to 20 mA
Resolution:	0.01 mA (12 bit)
Meas. accuracy:	±(1% +0.1 mA)
Input resistance:	current 100 Ω

Options *(need to be specified when system is ordered)*

IND01 Ex	Wi-Fi Ethernet unit incl. antenna with 5 m cable
IND02 Ex	Ethernet switch with RJ45 communication
IND03 Ex	Ethernet switch with fiber-optic and RJ45 communication
IND09 Ex	Ex interface for vibration transducer, max. 8
IND04 Ex	Ex interface for first channel DI/RPM according to NAMUR inkl. powersupply 24 VDC
IND05 Ex	Ex interface for additional channel(s) DI/RPM according to NAMUR
IND07 Ex	Ex interface set for 3 channels DI/RPM according NAMUR
*	Ex interface for digital input DI/RPM - not NAMUR
*	Ex interface for analog input AI, max. 3
*	Ex interface for digital output DO, max. 3
IND31EX	Power supply unit, 24 VDC, 25W
IND32EX	Power supply unit, 230 VAC, 47-63 Hz, 36W

* Special option. Please contact SPM Instrument for information.

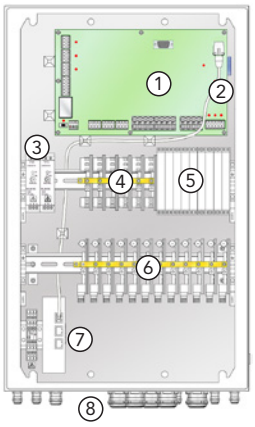
Accessories

IND14	Relay for external alarm, 2 poles (TD-386)
81524	Mounting braces for wall mounting, 4 pcs.

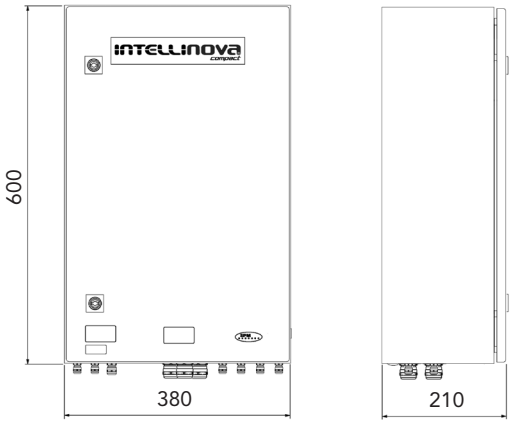
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Intellinova® Compact – System Unit INS18 Ex



1. Circuit board
2. SD memory card
3. Power supply unit
4. VIB transducer Ex interface
5. DI/AI/DO Ex interface
6. SPM transducer Ex interface
7. Ethernet switch (option)
8. Cable inlets



The system unit INS18 Ex in the Intellinova Compact series is a small and advanced measuring unit for continuous monitoring of machine condition. The system is ATEX and IECEx certified to be installed in Gas-explosion-endangered area and Dust-explosion-endangered area. Cable inlets are included in INS18 Ex. Power supply unit and Ex interfaces for transducers located in Ex gas Zones 0, 1 or 2, or Ex dust Zones 20, 21, 22 are ordered separately. The enclosure, intended for wall mounting, is certified as Ex "restricting breathing" for use in zone 2 and "dust ignition protection by enclosure" for use in zone 22.

INS18 Ex measures bearing condition on twelve channels, vibration on six channels and analog signals on three channels. Up to three RPM sensors can be connected and linked to measuring assignments set up in Condmaster® Ruby. The unit has three digital outputs for connection to PLC or via external relays to machine stop, external warning lamp, etc.

If Digital Output or Analog Input is connected to equipment located in Ex hazardous zone 0/20 or 1/21, Intellinova® System units need to be ordered as special. The actual type of equipment intended to be used must be specified at time of ordering the system unit. This so suitable Ex interfaces can be installed.

The unit is equipped with multiplexing measuring logic, alarm, storing and analysis logic. It is connected via standard Ethernet in a LAN network. The circuit board is equipped with status LED indicators and an SD memory card used for data buffering and setup of the system unit.

Technical specifications

Design, enclosure:	stainless steel, IP66
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10 Mbps
Power supply unit:	100 to 240 VAC, Output 12VDC, 1.5 A or 10 to 36 VDC, 25 W
Ambient temperature:	–20 to +60 °C (–4 to 140 °F)
Storage temperature:	–20 to +80 °C (–4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Dimensions (w x h x d):	380 x 600 x 210 mm (15 x 23.6 x 8.3 in)
Weight:	approx. 15 kg (33 lbs)
ATEX, IECEx marking:	II 3 (1) G Ex nR [ia Ga] IIC T4 Gc II 3 (1) D Ex tc [ia Da] IIIC IP66,T85°C Dc 100-240Vac 47-63Hz 36W/10-36Vdc 25W Ta: –20 to +60 °C

Bearing Monitoring

Measuring methods:	SPM HD, LR/HR HD
Measuring channels:	12, multiplexing
Measuring range:	–20 to 80 dBsv (SPM HD) –19 to 80 dBsv (LR/HR)
Amplitude scale unit:	HDm/HDc, LR/HR, Time Signal HD, SPM Spectrum HD
Transducer line test:	TLT test
Input connectors:	for coaxial cables with TNC connectors
Transducer type:	SPM 44000 Ex series with isolation foot, only for use with coaxial cables

Vibration Monitoring

Measuring methods:	ISO 2372, ISO10816, FFT with symptoms, EVAM vibration analysis, HD ENV
Measuring channels:	6, multiplexing
Frequency range:	DC to 40 kHz
Measuring range:	≥60 g peak-peak (using 100 mV/g transducer)
Resolution:	0.0015m/s² RMS (using 100 mV/g transducer)
Measurem. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Transducer type:	SLD200 series, SLC244 DuoTech or IEPE (ICP®) type transducers with a nominal bias output voltage of 10 to 14 VDC

Digital Inputs DI/RPM

Digital/RPM inputs:	3 channels, multiplexing
RPM transducer type:	proximity switches, supply NAMUR
RPM measuring range:	0.1 to 120 000 rpm (when 1 pulse/rev.)

Digital Outputs DO

Digital outputs:	3, open collector, user configurable

Analog Inputs AI

Input channels:	3
Measurement range:	0 to 20 mA
Resolution:	0.01 mA (12 bit)
Meas. accuracy:	±(1% +0.1 mA)
Input resistance:	current 100 Ω

Options *(need to be specified when system is ordered)*

IND21 Ex	Wi-Fi Ethernet unit incl. antenna with 5 m cable
IND22 Ex	Ethernet switch with RJ45 communication
IND23 Ex	Ethernet switch with fiber-optic and RJ45 communication
IND09 Ex	Ex interface for vibration transducer, max. 6
IND10 Ex	Ex interface for shock pulse transducer, max. 12
IND04 Ex	Ex interface set for 1 channel DI/RPM according NAMUR
IND05 Ex	Ex interface set for 2 channels DI/RPM according NAMUR
IND07 Ex	Ex interface set for 3 channels DI/RPM according NAMUR
*	Ex interface for digital input DI/RPM - not NAMUR
*	Ex interface for analog input AI, max. 3
*	Ex interface for digital output DO, max. 3
IND31 Ex	Power supply unit, 24 VDC, 25W
IND32 Ex	Power supply unit, 230 VAC, 47-63 Hz, 36W

* Special option. Please contact SPM Instrument for information.

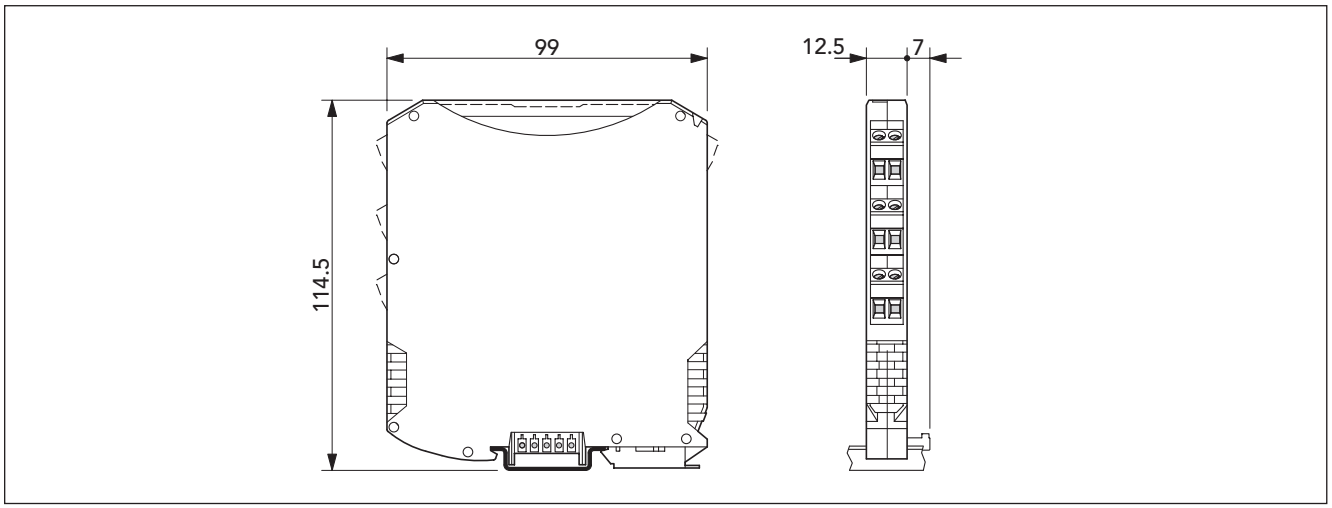
Accessories

IND14	Relay for external alarm, 2 poles (TD-386)
81524	Mounting braces for wall mounting, 4 pcs.

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Intellinova® – Ex Interface for DI/RPM



The Ex interface for DI/RPM is an Ex i NAMUR isolating amplifier for operating proximity sensors and switches in Ex areas. It has input for NAMUR proximity sensors (EN 60947-5-6), floating contacts or contacts with resistance circuit, [Ex ia] IIC and LED indicators for supply voltage, switching state, and malfunction according to NAMUR NE 44. Direction of operation can be selected (operating or closed circuit current behavior).

The Ex interface is available for both Intellinova Compact Ex and Intellinova Parallel EN Ex. See part numbers below.

Technical specifications

Dimensions (w x h x d):	12.5x99x114.5 mm
Ambient temperature:	–20 °C to +60 °C
Storage temperature:	–40 °C to +80 °C
Maximum altitude:	≤ 2000 m
Permissible humidity:	10 % to 95 % (non-condensing)
Noise immunity:	EN 61000-6-2
Degree of protection:	IP20
ATEX/IECEx marking:	II (1) G [Ex ia Ga] IIC II (1) D [Ex ia Da] IIIC II 3 G Ex nA IIC T4 Gc X [Ex ia Ga] IIC [Ex ia Da] IIIC Ex nA IIC T4 Gc

Input data

Non-load voltage:	~ 8 V DC
Switching points:	(attenuated) < 1.2 mA (blocking) (unattenuated) > 2.1 mA (conductive)

Output data

Switching output:	2 transistor outputs, passive
Max. switching voltage:	30 V DC
Min. contact current:	5 mA (short-circuit resistant)

Power supply

Nom. supply voltage:	24 V DC
Supply voltage range:	19.2 V DC to 30 V DC (24 V DC (–20% to +25%))
Max. current consumpt.:	< 28 mA (24 V DC)
Power consumption:	≤ 800 mW

General

No. of channels:	1
Status display:	green LED (supply voltage) yellow LED (switching state) red LED (line errors)
Inflammability class:	according to UL 94 V0
Pollution degree:	2
Surge voltage:	category II
Housing material:	PA 66-FR

Input/output

Electrical isolation:	375 V (Peak value in accordance with EN 60079-11)
Designation:	Input/output/supply, DIN rail connector
Electrical isolation:	300 Vrms (Rated insulation voltage (surge voltage category II; pollution degree 2, safe isolation as per EN 61010-1)) 2.5 kV (50 Hz, 1 min., test voltage)

Input/supply, DIN rail connector

Electrical isolation:	375 V (Peak value in accordance with EN 60079-11)
Designation:	Output 1/output 2
Electrical isolation:	50 Vrms (Rated insulation voltage (surge voltage category II; pollution degree 2, basic insulation as per EN 61010-1))

Safety data

Max. internal inductance Li:	negligible
Max. internal capacitance Ci:	1.1 nF
Max. output voltage Uo:	9.6 V
Max. output current Io:	10 mA
Max. output power Po:	25 mW
Group IIC	
Max. external inductivity Lo:	300 mH
Max. external capacity Co:	3.6 µF
Group IIB/IIIC	
Max. external inductivity Lo:	1000 mH
Max. external capacity Co:	26 µF
Safety max. voltage Um:	253 V AC (125 V DC)

EMC data

Standards/regulations: EN 61000-4-3, EN 61000-4-4, EN 61000-4-6

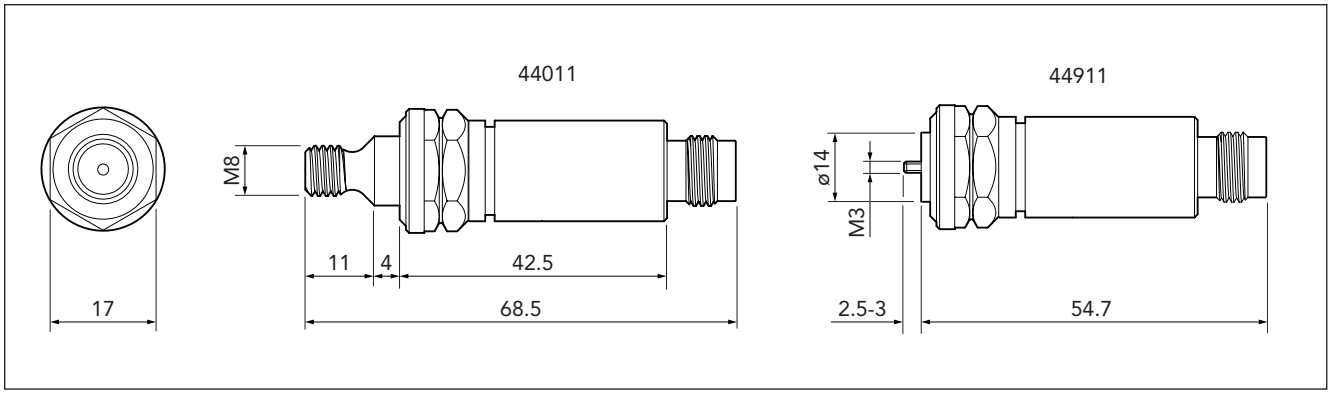
Part numbers

IND04Ex	Ex interface for 1 channel DI/RPM according to NAMUR, incl. power supply unit and internal wiring for Intellinova Compact Ex
IND05Ex	Ex interface for 2 channels DI/RPM according to NAMUR, incl. power supply unit and internal wiring for Intellinova Compact Ex
IND07Ex	Ex interface for 3 channels DI/RPM according to NAMUR, incl. power supply unit and internal wiring for Intellinova Compact Ex
IND27	Ex interface for RPM according to NAMUR, incl. internal wiring for Intellinova Parallel EN Ex

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Shock pulse transducers, Ex



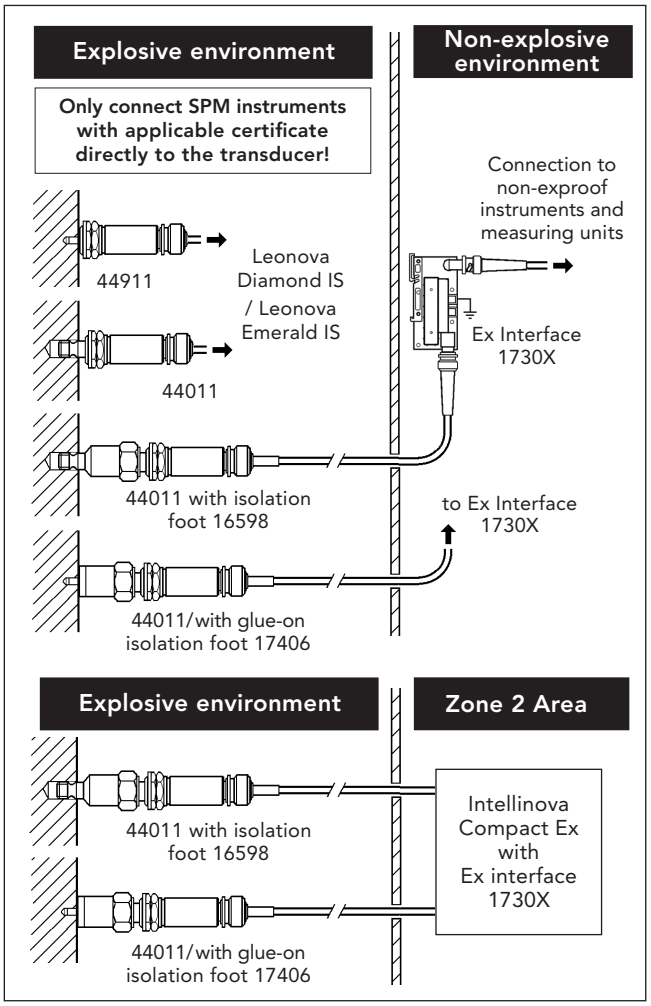
The 44000-family of transducers for potentially explosive atmospheres is approved for use in mining, explosive gases and dust.

The transducer is connected to a measuring SPM instrument for bearing condition monitoring. Measuring instruments in hazardous areas must be suitable certified. Instruments outside hazardous areas must be connected via a suitable and certified barrier.

Transducer 44911 has a flat base that is glued to the measuring point, and an M3 screw for unloading and fixing. The recommended adhesives are 3M DP810, Loctite 638 or Loctite 480.

The transducer connector must be fitted with either a mating cable plug or a protection plug to maintain the ingress protection of minimum IP54.

The isolation foot, 16598/17406, must not be exposed to the flow of non-conductive media and hazardous electrostatic charging must be avoided when used in group IIC zone 0, or used in group IIIA/B/C atmosphere.



Technical specifications

Certificate number:	Sira 13ATEX2197X IECEx SIR 13.0074X
Ex certification:	I M1 Ex ia I Ma II 1G Ex ia IIC T4 Ga II 1D Ex ia IIIC T 135 °C Da T_a: –40 °C to +120 °C U_i: 28 V, I_i: 120 mA, P_i: 300 mW, C_i: 2 nF
Measuring range:	max. 100 dB_{SV}
Environment:	–40 to +120 °C, max. 1 MPa (10 bar)
Enclosure:	stainless acid-proof steel
Protection:	IP67 (depends on TNC plug)
Electrical connector:	TNC
Mounting torque:	max. 15 Nm
Weight:	44011: 65 g; 44911: 55 g

Part numbers

44011	Shock pulse transducer, Ex, M8x1.25
44911	Glue-on shock pulse transducer, Ex

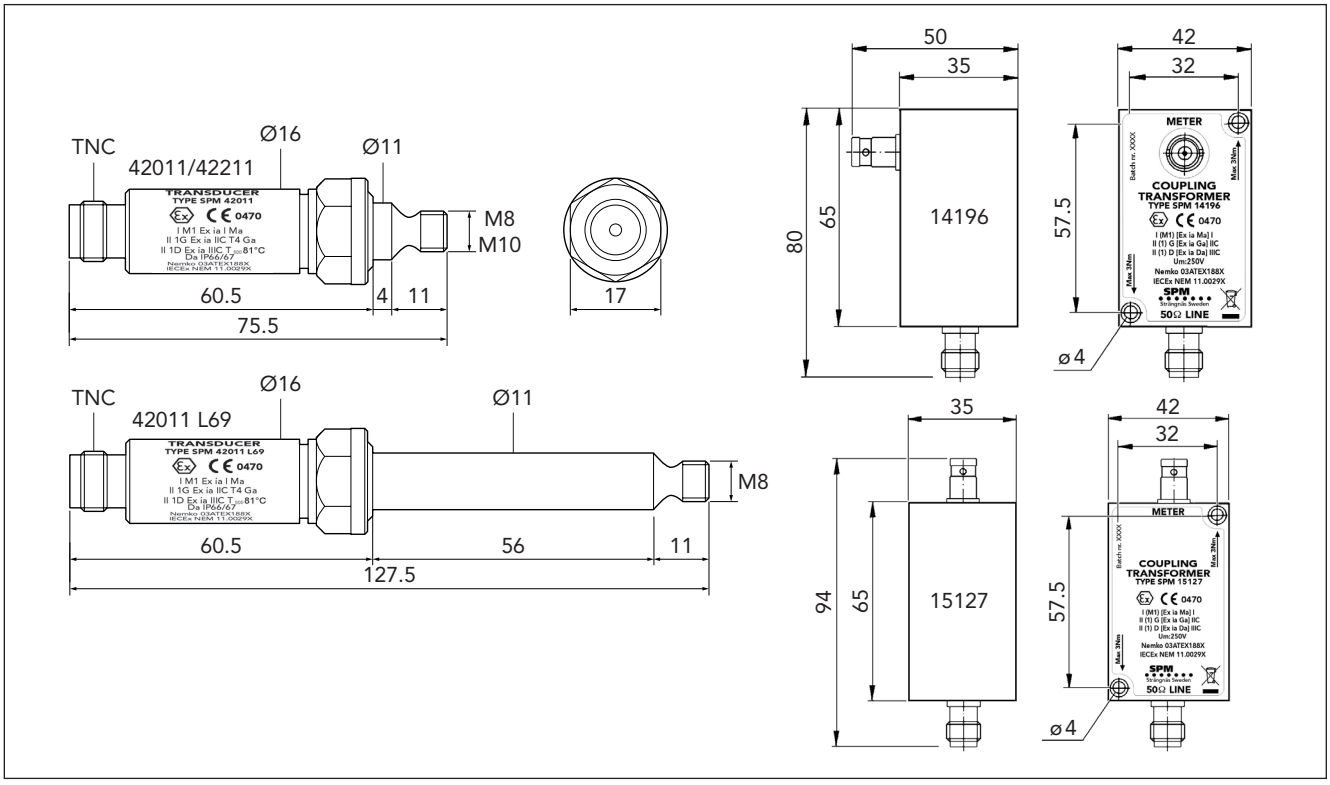
Approved accessories

13008	TNC plug, crimp, IP67, stainless steel
15837	TNC plug, crimp, IP67, stainless steel, conduit hold
16598	Isolation foot, M8/M8, –25/+125 °C
17155	TNC cable plug, crimp, IP67, stainless steel, conduit removeable hold
17406	Glue-on isolation foot, M8, –25/+125 °C
90005	RG58 Coaxial cable, –25/+70 °C, 101 pF/m
90267	RG400 Coaxial cable, –55/+200 °C, 105 pF/m
90472	Adhesive, 3M DP810 (50ml)
93022	TNC plug, crimp, IP65, straight
93035	TNC dust cap, IP67
93077	TNC plug, crimp, IP65, right angle

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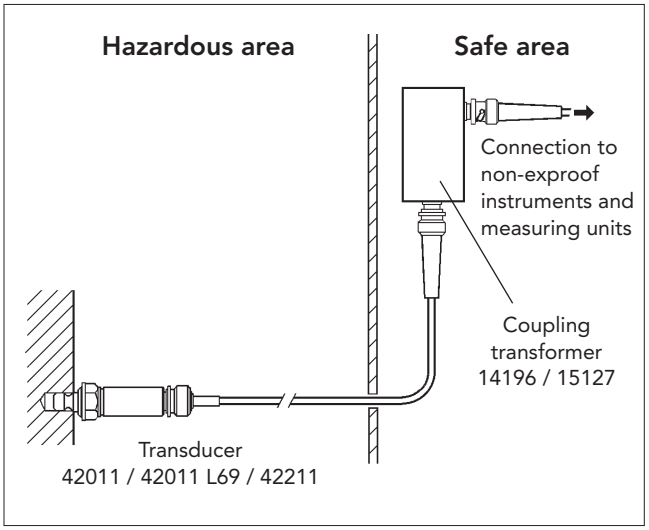
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Shock pulse transducers and coupling transformers, Ex



Shock pulse transducers 42011, 42011 L69, and 42211 must be used together with coupling transformer 14196 or 15127 when connected to external measuring units.

The coupling transformer connects the transducer to measuring instrument. The transformer provides galvanic isolation and a diode safety barrier between the transducer and the instrument. The coupling transformer itself shall be installed in safe area.



Technical specifications, shock pulse transducers

Approvals:	CE, ATEX, IECEx
Measuring range:	max. 80dBSV
Environment:	–20 °C to +80 °C max. 0.7 MPa (7 bar)
Enclosure:	stainless acid-proof steel IP66/67 (depends on TNC plug)
Electrical connector:	TNC
Mounting:	15 Nm (torque) 42011/42011 L69 (M8), 42211 (M10)
Weight:	70 g (42011, 42211) 130 g (42011 L69)

Technical specifications, coupling transformers

Approvals:	CE, ATEX, IECEx
Environment:	–20 °C to +55 °C
Enclosure:	plastic, epoxy sealed
Electrical connector:	TNC – 50Ω LINE (to transducer in hazardous area), BNC – METER (to instrument in safe area)
Mounting:	max. 3 Nm (torque of fastening screws) 14196 (right angle), 15127 (straight)
Weight:	160 g

Part numbers

14196	Coupling transformer, front connection
15127	Coupling transformer, top connection
42011	Shock pulse transducer, M8, length 75.5 mm
42011 L69	Shock pulse transducer, M8, length 127.5 mm
42211	Shock pulse transducer, M10, length 75.5 mm

Approved accessories

93035	TNC dust cap, IP67
13008	TNC cable plug, crimp, IP67, stainless steel
15837	TNC cable plug, crimp, IP67, stainless steel, conduit hold
90267	Coaxial cable, 105 pF/m
93022	TNC cable plug, crimp, IP65, straight
93077	TNC cable plug, crimp, IP65, right angle
17155	TNC cable plug, crimp, IP67, stainless steel, conduit removeable hold

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Glue-on Transducer and transformer for potentially explosive atmosphere

Shock Pulse Transducer

Transducer 42911 must be used together with Coupling Transformer 14196 or 15127 when connected to external measuring units. It is also certified for use together with the portable instruments type A30/T30 with certificate Nemko 03ATEX185. The code of the portable instruments is Ex ib I/IIB T4 which also will be the code of the transducer, when used together. The transducer is installed inside the area with potentially explosive atmosphere in the same way as standard SPM transducers but is glued to the measuring point.

Coupling Transformer

Coupling Transformer 14196 and 15127 connects the transducer to the measuring instrument. The transformer provide galvanic isolation and a diode safety barrier between the transducer and the instrument. The transformer itself shall be installed in unclassified area.

Safety

This equipment must only be installed, used and maintained by competent personnel. Such personnel shall have undergone training, which included instruction on the various types of protection and installation practices, the relevant rules and regulations, and on the general principles of area classification. Appropriate refresher training shall be given on a regular basis (See EN 60079-17).

Specific Conditions of Use

Connection from Coupling Transformers to Shock Pulse Transducers must be evaluated in the end-installation whereof the allowed limits for use of cable must not be exceeded. The following limits applies:

Ratio L/R 506 µH/Ω. Co: 29 nF for IIC or Co: 288 nF for IIB or 888 nF for IIA.

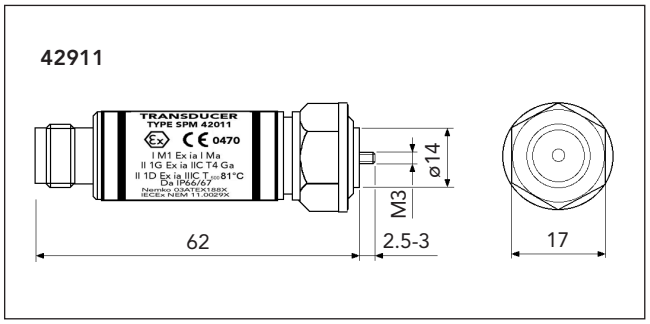
The intrinsically safe plug (50Ω LINE) of the Coupling Transformer shall be isolated from metal parts which may be earth connected and shall withstand a voltage test of 500 V AC for one minute.

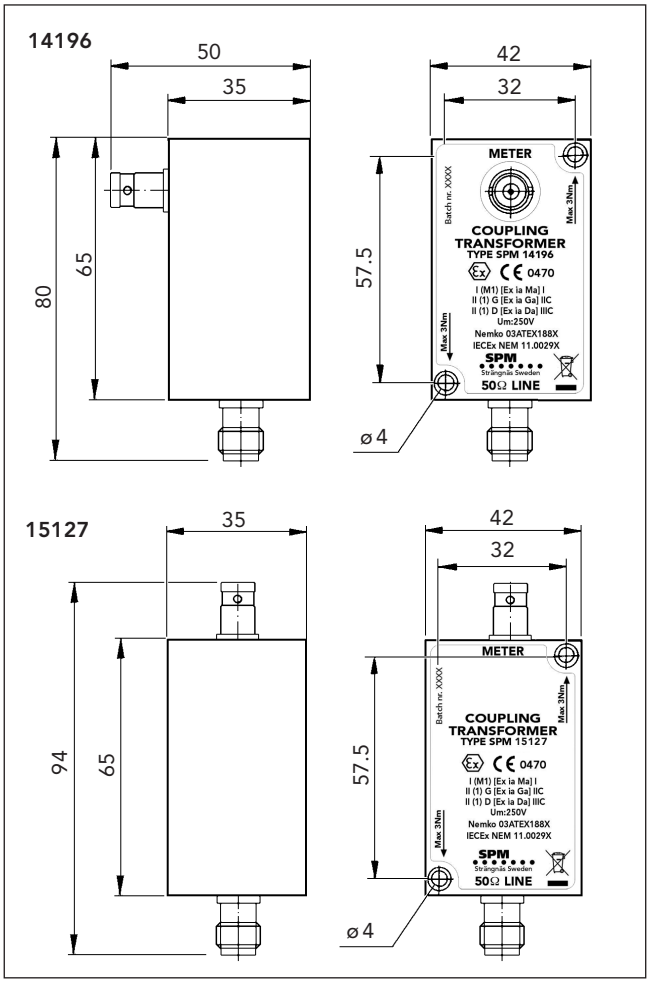
Technical Data, Glue-on Transducer 42911

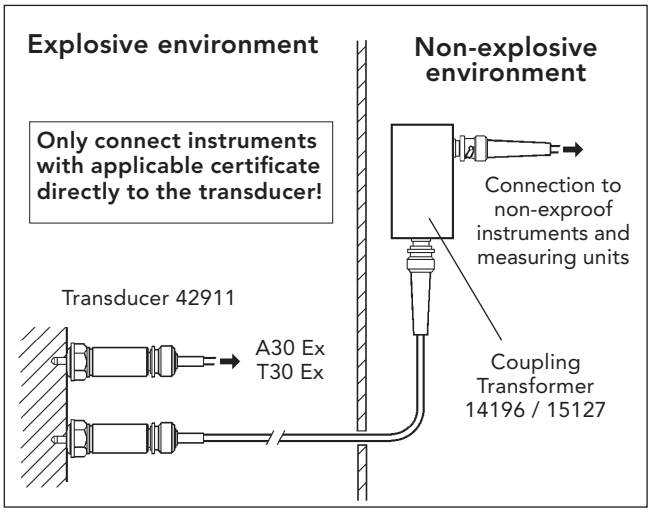
Certificate of conformity:	NEMKO 03 ATEX 188X, IECEx NEM 11.0029X
Ex certification:	I M1 Ex ia I Ma II 1G Ex ia IIC T4 Ga II 1D Ex ia IIIC T_{500} 81°C Da IP66/67
CE number:	0470
Measuring range:	Max. 80 dB_{SV}
Temperature range:	–20 °C to +80 °C
External overpressure:	Max. 0.7 MPa (7 bar)
Design:	Sealed, stainless acid proof steel
Connector tightness:	IP 67 (depends on TNC plug)
Connector type:	TNC
Mounting:	Glue-on using adhesive (3M DP810, Loctite 638, Loctite 480 or similar)

Technical Data, Transformer 14196 / 15127

Certificate of conformity:	NEMKO 03 ATEX 188X, IECEx NEM 11.0029X
Ex certification:	I (M1) [Ex ia Ma] I II (1)G [Ex ia Ga] IIC II (1)D [Ex ia Da] IIIC
CE number:	0470
Safety data:	Um: 250V, Uo: 2V, Io: 140mA, Co: 31nF, L/R: 506 µH/Ω Um: 250 V
Temperature range:	–20 °C to +55 °C
Design:	Plastic, epoxy resin, sealed
Connector type:	TNC to transducer (50Ω LINE), BNC to instrument (METER)
Torque, fastening screws:	Max. 3 Nm



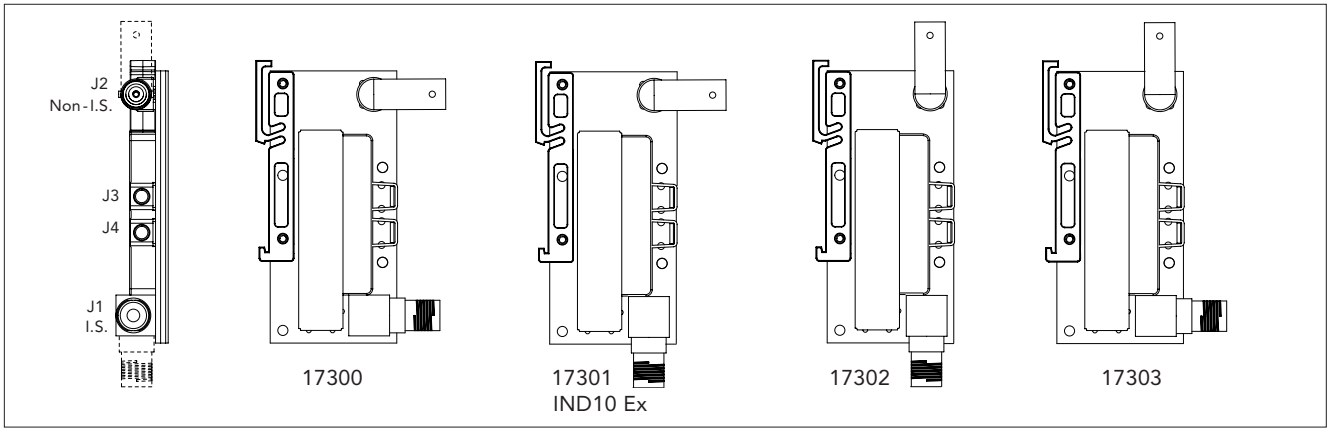




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Shock Pulse Transducer Ex Interface



The Shock Pulse Transducer Ex interfaces series SPM 1730X are interfaces for the 44X11-family of transducers for explosive atmosphere. The transducer interface enables connection of an unspecified non-hazardous area measuring instrument to an intrinsically safe transducer located in explosive areas. Any suitable shock pulse transducer with matching IS parameters can be used together with the transducer interface.

The transducer interface has extremely low capacitance and are carefully shielded to obtain maximum performance also in disturbed (EMC) environments.

Screw holes or a DIN-rail clip make mounting easy and flexible. Connectors are available for front or top/bottom cabling. A front mounted earth rail enables easy mounting of multiple interfaces. The transducer interface can be installed in the non-hazardous area or in zone 2 (in a suitable enclosure).

Safety

This interface must only be installed, used and maintained by competent personnel. Such personnel shall have undergone training, which included instruction on the various types of protection and installation practices, the relevant rules and regulations, and on the general principles of area classification. Appropriate refresher training shall be given on a regular basis (See EN 60079-17).

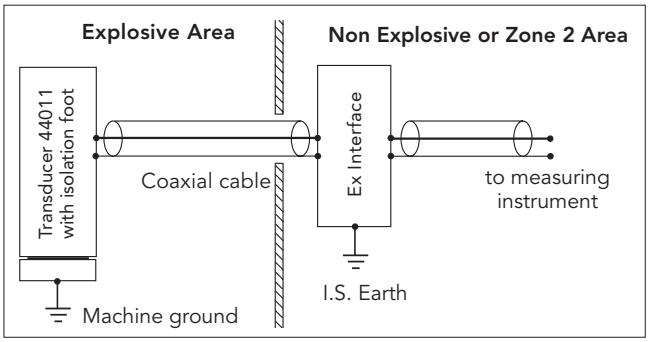
The installation, use and maintenance of this interface must comply with the appropriate European, national and local regulations, which may include reference to the IEC standards IEC60079-14, IEC60079-17 and IEC60079-19. In addition, particular industries or end users may have specific requirements relating to the safety (or health) and these requirements should also be met. Instructions and specifications issued by the manufacturer must be followed.

The SPM Transducer Ex Interface must be installed in a minimum IP20 enclosure. The interface must not be used in a chemical environment that is known to damage plastics or electric components.

Transducers isolated from Earth are only allowed to be connected to the SPM Transducer Ex Interface. Transducers without internal isolation (e.g. SPM 44011) must be installed with additional external isolation to Earth.

Marking

I (M1) [Ex ia Ma] I
II (1) GD [Ex ia Ga] IIC [Ex ia Da] IIIC
II 3(1) G Ex nA [ia Ga] IIC T4 Gc
T_a: −40 °C to +70 °C
CML 14ATEX2077X
CML 14ATEX4078X, IECEx CML 14.0031X



Electrical IS parameters

U_O = 23.1V, I_O = 51.6mA. P_O = 298mW, C_i = 0nF, L_i = 0mH

Technical specifications

Approvals:	CE, ATEX, IECEx
Mounting:	on DIN rail or M3 screw mounting
Connectors:	input; TNC, front or bottom output; BNC, front or top
Enclosure:	IP54
Ambient temperature, operating and storage:	−40 to +70 °C
Dimensions:	approx. 90 x 61 x 16 mm
Weight:	approx. 100 grams

Part numbers

17300	SPM Transducer Ex Interface, front/front connectors
17301	SPM Ex Interface, front/bottom connectors
17302	SPM Ex Interface, top / bottom connectors
17303	SPM Ex Interface, top / front connectors
IND10 Ex	SPM Transducer Ex Interface 17301 incl. wiring for Intellinova Compact Ex

Approved accessories

17474	I.S. Earth bar

Screw mounting:

83271	Spacer M3 x 14
82367	Screw MRTX M3 x 10
82027	Washer BRB 3.2 x 6 x 0.5

Cable lug:

93542	M4, 2 – 5 mm² (10-14 AWG), non-insulated
93543	M4, 3 – 5 mm² (10-12 AWG), insulated (yel)
93544	M4, 1 – 2.5 mm² (14-16 AWG), non-insulated
93545	M4, 1.5 – 2.5 mm² (14-16 AWG), insulated (blu)

I.S. Earth cable:

90601	4 mm² (grn/yel, 500VAC, 700VDC, 0.1mm, −40/+90°C)
90602	1.5 mm² (grn/yel, 500VAC, 700VDC, 0.1mm, −40/+90°C)

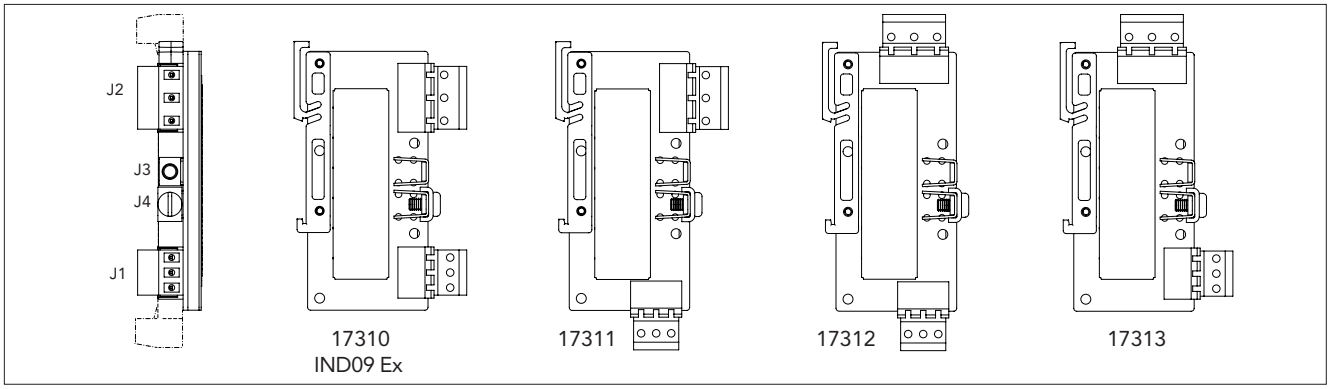
Spare parts

83267	Saddle type pressure plate (for J3, J4)
83269	Screw M4x8 (for J3, J4)
83270	Washer for 83269

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Vibration Transducer Ex Interface



The Ex interfaces series SPM 1731X are interfaces (Associated Apparatus) for vibration transducers (I.S. Equipment). The transducer interface enables connection of an unspecified non-hazardous area measuring instrument to an intrinsically safe transducer located in explosive areas. Any suitable vibration transducer with matching IS parameters can be used together with the transducer interface.

The transducer interface has extremely low capacitance and are carefully shielded to obtain maximum performance also in disturbed (EMC) environments.

Screw holes or a DIN-rail clip make mounting easy and flexible. Connectors are available for front or top/bottom cabling. A front mounted earth rail enables easy mounting of multiple interfaces. The transducer interface can be installed in the non-hazardous area or in zone 2 (in a suitable enclosure).

Safety

This interface must only be installed, used and maintained by competent personnel. Such personnel shall have undergone training, which included instruction on the various types of protection and installation practices, the relevant rules and regulations, and on the general principles of area classification. Appropriate refresher training shall be given on a regular basis (See EN 60079-17).

The installation, use and maintenance of this interface must comply with the appropriate European, national and local regulations, which may include reference to the IEC standards IEC60079-14, IEC60079-17 and IEC60079-19. In addition, particular industries or end users may have specific requirements relating to the safety (or health) and these requirements should also be met. Instructions and specifications issued by the manufacturer must be followed.

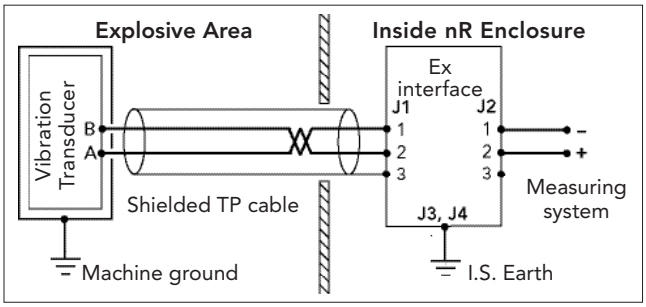
The VIB Transducer Ex Interface should normally be connected to isolated transducers only. However, transducers not isolated from earth can be connected if a bonding conductor is used between the transducer and the Interface IS Earth. Earth bonding should receive careful consideration by a competent person and particular care should be taken where the requirements of EPL Ga (zone 0) have to be met. Please consult the transducer installation instructions, certificates, IEC60079-14 and relevant regulations (local or national) for further details. The interface must not be used in a chemical environment that is known to damage plastics or electric components.

Marking

I (M1) [Ex ia Ma] I
II (1) GD [Ex ia Ga] IIC, [Ex ia Da] IIIC
II 3(1) G Ex nA [ia Ga] IIC T4 Gc
CML14ATEX2077X, CML14ATEX4078X
IECEx CML 14.0031X
Ta: –40°C to +70°C

Electrical IS parameters

U_O = 26.3V, I_O = 92.3mA. P_O = 607mW, C_i = 0 nF, L_i = 0 mH



Technical specifications

Approvals:	CE, ATEX, IECEx
Mounting:	on DIN rail or M3 screw mounting
Connectors:	screw terminals, front or top/bottom
Enclosure:	IP54
Ambient temperature, operating and storage:	–40 to +70 °C
Dimensions:	approx. 90 x 58 x 19 mm
Weight:	90 grams

Part numbers

17310	VIB Transducer Ex interface, front/front connectors
17311	VIB Transducer Ex interface, front/bottom connectors
17312	VIB Transducer Ex interface, top/bottom connectors
17313	VIB Transducer Ex interface, top/front connectors
IND09 Ex	VIB Transducer Ex Interface 17310 incl. wiring for Intellinova Compact Ex or Intellinova Parallel EN Ex

Approved accessories

17474	I.S. Earth bar
Screw mounting:	
83271	Spacer M3 x 14
82367	Screw MRTX M3 x 10
82027	Washer BRB 3.2 x 6 x 0.5
Cable lug:	
93542	M4, 2 – 5 mm^2 (10-14 AWG), non-insulated
93543	M4, 3 – 5 mm^2 (10-12 AWG), insulated (yel)
93544	M4, 1 – 2.5 mm^2 (14-16 AWG), non-insulated
93545	M4, 1.5 – 2.5 mm^2 (14-16 AWG), insulated (blu)
I.S. Earth cable:	
90601	4 mm^2 (grn/yel, 500VAC, 700VDC, 0.1mm, –40/+90°C)
90602	1.5 mm^2 (grn/yel, 500VAC, 700VDC, 0.1mm, –40/+90°C)

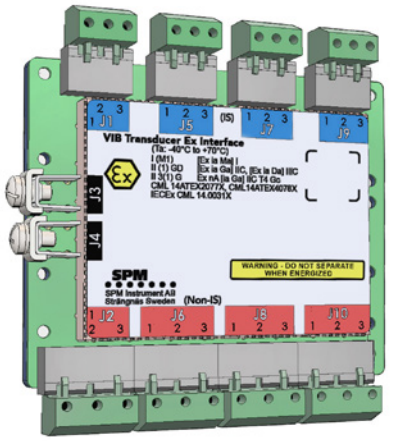
Spare parts

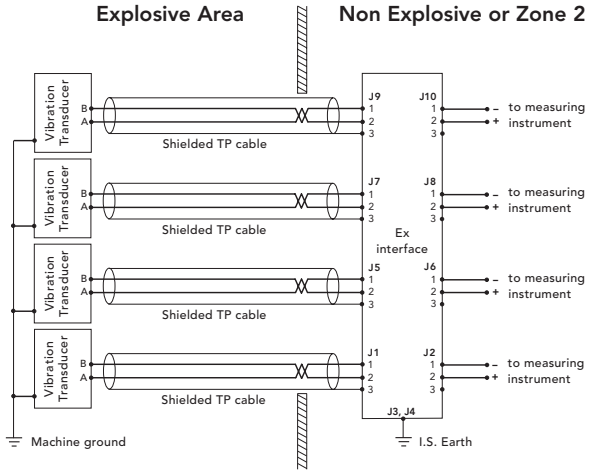
93548	Pluggable screw terminal, 3 pos. 5 mm (for J1)
93547	Pluggable screw terminal, 3 pos. 7.62 mm (for J2)
83267	Saddle type pressure plate (for J3, J4)
83269	Screw M4 x 8 (for J3, J4)
83270	Washer for 83269

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Vibration Transducer Ex Interface 17640





The SPM 17640 is a four channel interface (Associated Apparatus) for SPM vibration Ex transducers (I.S. Equipment). The transducer interface enables connection of a non-hazardous area measuring instrument to intrinsically safe transducers located in explosive areas. Any suitable vibration transducer with matching IS parameters can be used together with the transducer interface.

The transducer interface has extremely low capacitance and are carefully shielded to obtain maximum performance also in disturbed (EMC) environments.

Screw holes or a DIN-rail clip make mounting easy and flexible. A front mounted earth rail enables easy mounting of multiple interfaces. The transducer interface can be installed in the non-hazardous area or in zone 2 (in a suitable enclosure).

Safety

This interface must only be installed, used and maintained by competent personnel. Such personnel shall have undergone training, which included instruction on the various types of protection and installation practices, the relevant rules and regulations, and on the general principles of area classification. Appropriate refresher training shall be given on a regular basis (See EN 60079-17).

The installation, use and maintenance of this interface must comply with the appropriate European, national and local regulations, which may include reference to the IEC standards IEC60079-14, IEC60079-17 and IEC60079-19. In addition, particular industries or end users may have specific requirements relating to the safety (or health) and these requirements should also be met. Instructions and specifications issued by the manufacturer must be followed.

The VIB Transducer Ex Interface should normally be connected to isolated transducers only. However, transducers not isolated from earth can be connected if a bonding conductor is used between the transducer and the Interface IS Earth. Earth bonding should receive careful consideration by a competent person and particular care should be taken where the requirements of EPL Ga (zone 0) have to be met. Please consult the transducer installation instructions, certificates, IEC60079-14 and relevant regulations (local or national) for further details. The interface must not be used in a chemical environment that is known to damage plastics or electric components.

Marking

I (M1) [Ex ia Ma] I
II(1) GD [Ex ia Ga] IIC [Ex ia Da] IIIC
II 3(1) G Ex nA [ia Ga] IIC T4 Gc
T_a: −40 °C to +70 °C
CML 14ATEX2077X, CML 14ATEX4078X
IECEx CML 14.0031X

Electrical IS parameters

U_O = 26.3 V, I_O = 92.3 mA, P_O = 607 mW, C_i = 0 nF, L_i = 0 mH

Technical specifications

Approvals:	CE, ATEX, IECEx
Environment:	−40° to +70° C
Enclosure:	IP54
Mounting:	On DIN rail or M3 screw mounting
Connectors:	
J1, J5, J7, J9	Pluggable M3 screw terminal, 5 mm pitch, 0.34 – 2.5 mm² wre (12-24 AWG), I.S.
J2, J6, J8, J10	Pluggable M3 screw terminal, 7.62 mm pitch, 0.34 – 2.5 mm² wire (12-24 AWG), Non-I.S.
J3, J4	M4 screw, I.S. Earth
Weight:	270 g

Approved Accessories

17474 I.S. Earth bar
Cable lug:
93542 M4, 2 – 5 mm² (10-14 AWG), non-insulated
93543 M4, 3 – 5 mm² (10-12 AWG), insulated (yel)
93544 M4, 1 – 2.5 mm² (14-16 AWG), non-insulated
93545 M4, 1.5 – 2.5 mm² (14-16 AWG),insulated (blu)
I.S. Earth cable:
90601 4 mm² (grn/yel, 500VAC, 700VDC, 0.1mm, -40/+90°C)
90602 1.5 mm² (grn/yel, 500VAC, 700VDC, 0.1mm, -40/+90°C)
Mounting set:
17816 Mounting set, including spacers, washers, nuts and screws for mounting and stacking

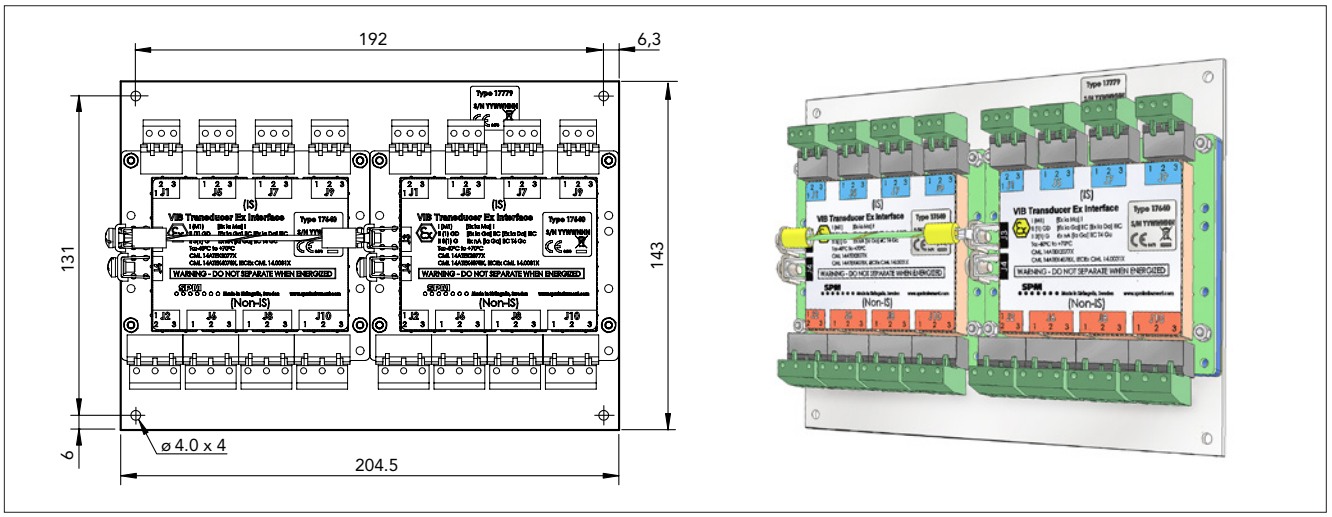
Spare Parts

93548 Pluggable screw terminal, 3 pos. 5 mm (for J1, J5, J7, J9)
93547 Pluggable screw terminal, 3 pos. 7.62 mm (for J2, J6, J8, J10)
83267 Saddle type pressure plate (for J3, J4)
83269 Screw M4x8 (for J3, J4)
83270 Washer for 83269

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Vibration Transducer Ex Interface 17779



The SPM 17779 is an interface for SPM vibration Ex transducers. It consist of two 17640 interfaces making an installation of total eight channels, with possibilities to replace Ex interface 15226. The transducer interface enables connection of non-hazardous area measuring instruments to intrinsically safe transducers located in explosive areas. Any suitable vibration transducer with matching IS parameters can be used together with the transducer interface.

The transducer interface has extremely low capacitance and are carefully shielded to obtain maximum performance also in disturbed (EMC) environments. Individual shielding of each channel minimizes cross coupling between channels.

The mounting plate has the same dimensions and screw hole placements as the old interface, 15226. So it can easily replace the old interface using the same mounting equipment.

Differences with Ex Interface 15226

Compared to the Ex interface 15226, this new interface has a lower *Uo* at 26.3 V compared to 27.15 V for 15226. SPM 17779 has improved EMC performance and its lower internal capacitance will cause less influence to signal quality.

Safety

This interface must only be installed, used and maintained by competent personnel. Such personnel shall have undergone training, which included instruction on the various types of protection and installation practices, the relevant rules and regulations, and on the general principles of area classification. Appropriate refresher training shall be given on a regular basis (See EN 60079-17).

The installation, use and maintenance of this interface must comply with the appropriate European, national and local regulations, which may include reference to the IEC standards IEC60079-14, IEC60079-17 and IEC60079-19. In addition, particular industries or end users may have specific requirements relating to the safety (or health) and these requirements should also be met. Instructions and specifications issued by the manufacturer must be followed.

The VIB Transducer Ex Interface should normally be connected to isolated transducers only. However, transducers not isolated from earth can be connected if a bonding conductor is used between the transducer and the Interface IS Earth. Earth bonding should receive careful consideration by a competent person and particular care should be taken where the requirements of EPL Ga (zone 0) have to be met. Please consult the transducer installation instructions, certificates, IEC60079-14 and relevant regulations (local or national) for further details.

Marking

I (M1) [Ex ia Ma] I
II(1) GD [Ex ia Ga] IIC [Ex ia Da] IIIC
II 3(1) G Ex nA [ia Ga] IIC T4 Gc
T_a: -40 °C to +70 °C

Electrical IS parameters

U_O = 26.3 V, I_O = 92.3 mA, P_O = 607 mW, C_i = 0 nF, L_i = 0 mH

Technical specifications

Approvals:	CE, ATEX, IECEx
Environment:	–40° to +70 ° C
Enclosure:	IP54
Channels:	8
Weight:	1020 g
Dimensions:	211 x 143 x 24.5 mm

Approved Accessories

Cable lug:

93542	M4, 2 – 5 mm² (10-14 AWG), non-insulated
93543	M4, 3 – 5 mm² (10-12 AWG), insulated (yel)
93544	M4, 1 – 2.5 mm² (14-16 AWG), non-insulated
93545	M4, 1.5 – 2.5 mm² (14-16 AWG),insulated (blu)

I.S. Earth cable:

90601	4 mm² (grn/yel, 500VAC, 700VDC, 0.1mm, -40/+90°C)
90602	1.5 mm² (grn/yel, 500VAC, 700VDC, 0.1mm, -40/+90°C)

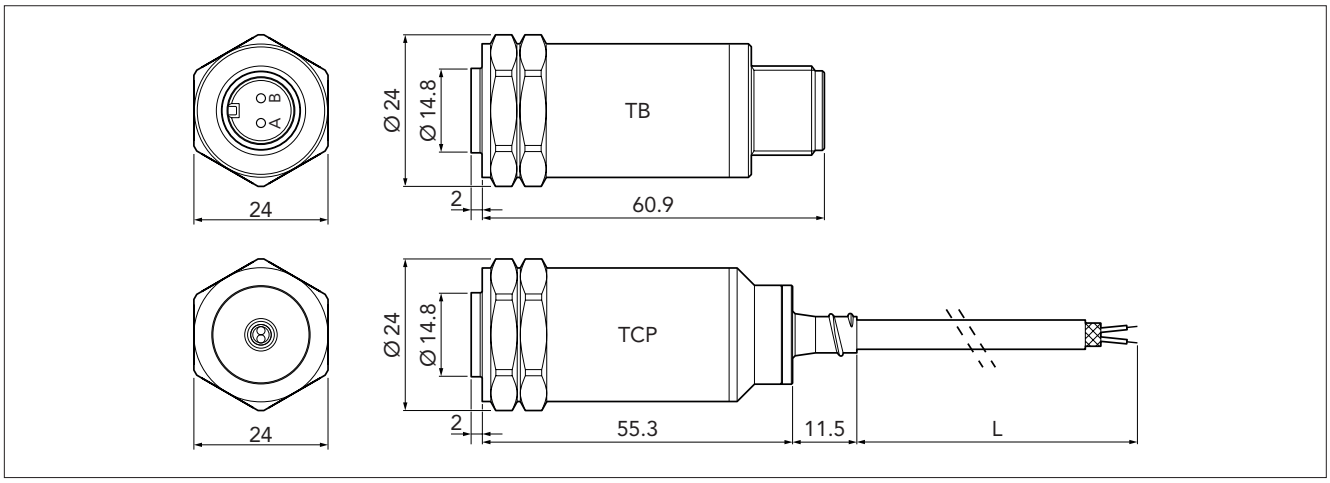
Spare Parts

93548	Pluggable screw terminal, 3 pos. 5 mm (for J1, J5, J7, J9)
93547	Pluggable screw terminal, 3 pos. 7.62 mm (for J2, J6, J8, J10)
83267	Saddle type pressure plate (for J3, J4)
83269	Screw M4x8 (for J3, J4)
83270	Washer for 83269

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4-20 mA vibration transmitters, Ex



Vibration transmitters in the SLD800 series are accelerometers that measure vibration and generate a 4-20 mA signal proportional to the velocity of the vibration in the specified frequency and measuring range. The transmitter can be connected to suitable certified instruments inside an area with a potentially explosive atmosphere. Connection to non-certified equipment must be made through a suitable and certified Ex barrier (e.g. SPM 83234, MTL7787+).

The housing and base are made of stainless acid-proof steel, suitable for aggressive environments. For mechanical fastening, mounting studs (available as accessories) with thread size M6, M8, M10, or UNF 1/4" are used. The connection of the mounting studs is made through a tapped hole with an M8 thread on the transmitter. The electrical interface uses a 2-pin connector (MIL-C-5015) or an integrated 2-wire cable with shield.

Marking

I M1 Ex ia I Ma
II 1 G Ex ia IIB T4 Ga
II 1 D Ex ia IIIC T99 °C Da
T_a –40 to +85 °C
U_i: 28 V I_i: 93 mA P_i: 0.66 W
C_i: 603 nF L_i: 10 µH

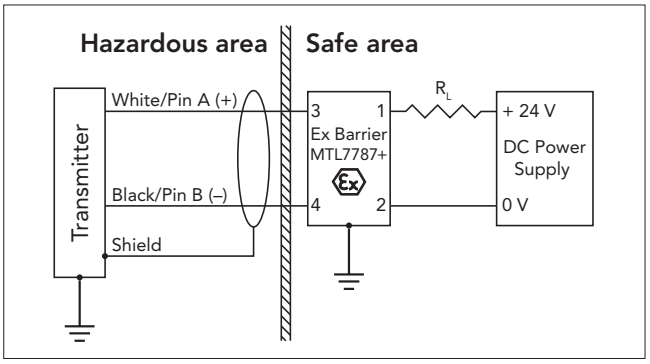
Part number	Measuring range	Frequency range
SLD822	0-12.5 mm/s, 0.5 ips	2-1000 Hz
SLD823	0-25 mm/s, 1 ips	2-1000 Hz
SLD824	0-50 mm/s, 2 ips	2-1000 Hz
SLD832	0-12.5 mm/s, 0.5 ips	10-1000 Hz
SLD833	0-25 mm/s, 1 ips	10-1000 Hz
SLD834	0-50 mm/s, 2 ips	10-1000 Hz

ARTICLE NO: SLD8XX | TXX - XX
A B C

A. Part number — See table
B. Connection — TB = 2-pin connector MIL-C-5015; TCP = Integral cable, adapter for protection tube
C. Cable length (L) — 3, 5, 10, or 20 m (integral)

SERIAL NO: XX | XX | XXX
Year | Week | Number

Installation example



Technical specifications

Approvals:	CE, ATEX, IECEx
Output signal:	4 to 20 mA
Tolerance:	4 mA ±5%, 20 mA ±10%
Turn-on time:	< 60 s
Transverse sensitivity:	< 5 %
Repeatability:	< 3 %
Operating temp.:	–40° to +85 °C (–40° to +185 °F)
Power requirements:	24 V DC
Loop resistance:	R_L max. 300 Ω at 24 V DC
Casing:	stainless acid-proof steel
Sealing:	IP66/67
Isolation:	case isolated, >10 Mohm
Mounting thread:	M8, tapped hole
Torque limit:	10 Nm (7.4 lbf·ft)
Weight:	approx. 70 grams (2.5 oz) excl. cable

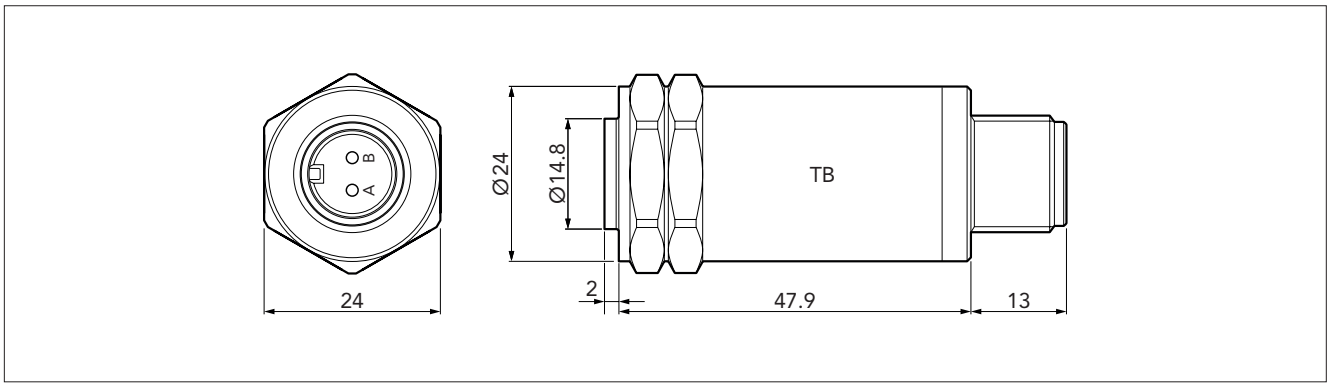
Accessories

16100	2-pin connector MIL-C-5015, stainless steel (TD-314)
18177	Mounting stud M8-M6 (TD-287)
18178	Mounting stud M8-M10 (TD-287)
18179	Mounting stud M8-UNF 1/4"x28 (TD-287)
18180	Mounting stud M8-M8 (TD-287)
81385	Protection tube, Ø 9.3 mm
83234	Ex barrier, MTL7787+
90389	2-wire cable with shield (TD-394)

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Vibration transducer, SLD244



The vibration transducer SLD244 is a piezo-electric accelerometer of compression type with built-in electronics, designed for vibration monitoring of industrial machinery. The transducer can be connected to IS instruments with matching IS parameters inside an area with a potentially explosive atmosphere. Connection to non-certified equipment must be made through a suitable and certified Ex barrier (e.g. SPM 17310).

The housing and base are made of stainless acid-proof steel, suitable for aggressive environments. The transducer is installed on a flat machine surface and connected via a twisted pair cable with a 2-pin connector. For mechanical fastening, mounting studs (available as accessories) with thread size M6, M8, M10, or UNF 1/4" are used. The connection of the mounting studs is made through a tapped hole with an M8 thread on the transducer. The electrical interface uses a 2-pin connector (MIL-C-5015). For vibration sensors with side entry in Ex version, see TD-638.

In addition to acceleration measurement, temperature measurement is available as an option for SLD244. When used with the Intellinova Parallel EN online system (TD-562), the transducer can measure temperature in the –20° to +120 °C range. Temperature measurement is performed above 10 kHz, where it does not interfere with the acceleration signal.

Marking

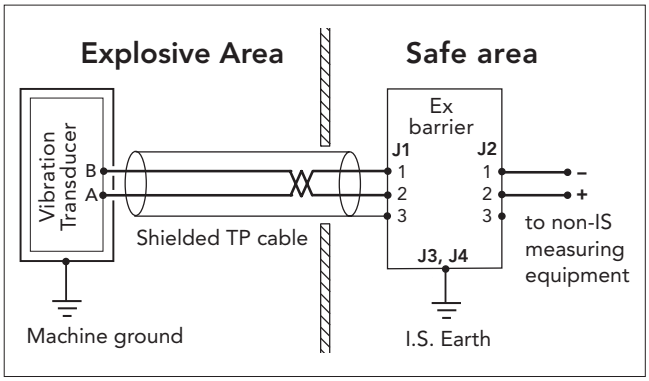
Ex ia I Ma (−40 °C <= Ta <= +125 °C)
Ex ia IIC T4 Ga (−40 °C <= Ta <= +115 °C)
I M1 Ex ia IIC T3 Ga (−40 °C <= Ta <= +125 °C)
II 1G Ex ia IIIC T135°C Da (−40 °C <= Ta <= +115 °C)
II 1D Ex ia IIIC T145°C Da (−40 °C <= Ta <= +125 °C)
U_i: 28 V I_i: 93 mA P_i: 0.66 W C_i: 58 nF L_i: 10 µH

ARTICLE NO: SLD244 | TB | - | X
A B C

A.	Part number	SLD244
B.	Connection	TB = 2-pin connector MIL-C-5015
C.	Temperature	T = temperature measurement (optional)

SERIAL NO: X X | X X | X X X
Year | Week | Number

Installation example



Technical specifications

Approvals:	CE, ATEX, IECEx
Nom. sensitivity, main axis:	10 mV/m/s² * = 100 mV/g
Transverse sensitivity:	max. 10%
Base strain sensitivity:	0.01 m/s²/µ strain typical
Linear frequency range:	2 Hz to 10 kHz
Max. peak acceleration:	600 m/s²
Settling time:	6 sec
Bias voltage:	11 to 13 V (typical 12 V)
Power requirements:	12 to 24 V, 2 to 5 mA
Isolation:	case isolated, >10 Mohm
Operating temp. T3:	−40° to +125 °C (−40° to +257 °F)
Operating temp. T4:	−40° to +115 °C (−40° to +239 °F)
Measuring range, temp.:	−20° to +120 °C (−4° to +248 °F) (accuracy +/− 4 °C)
Casing:	stainless acid-proof steel
Sealing:	IP66/67
Connection:	2-pin connector, MIL-C-5015
Mounting thread:	M8, tapped hole
Torque limit:	10 Nm (7.4 lbf·ft)
Weight:	115 grams (4 oz)

* Individual value given on the calibration chart.

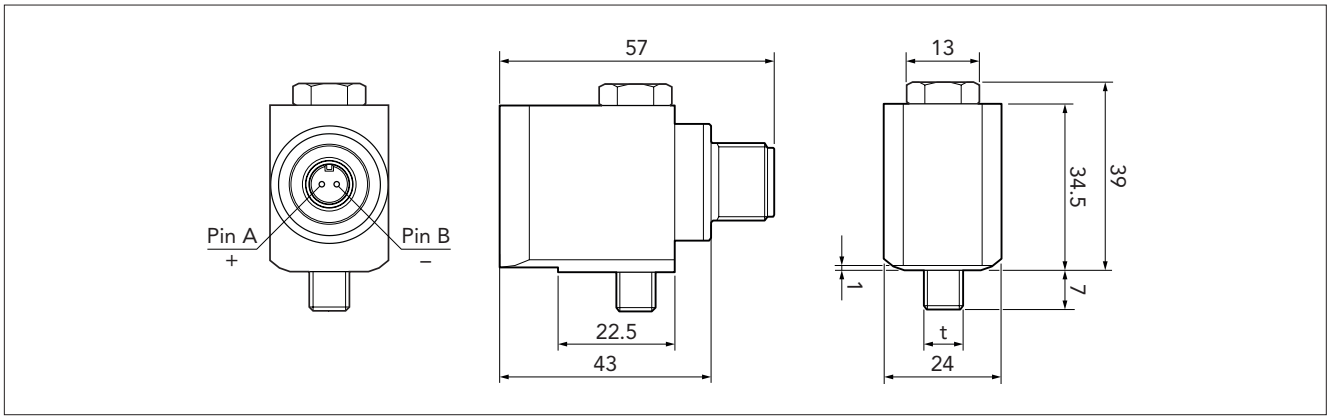
Accessories

15168	2-pin connector MIL-C-5015, composite (TD-217)
16100	2-pin connector MIL-C-5015, stainless steel (TD-314)
1731X	Ex barrier (TD-495)
18177	Mounting stud M8-M6 (TD-287)
18178	Mounting stud M8-M10 (TD-287)
18179	Mounting stud M8-UNF 1/4"x28 (TD-287)
18180	Mounting stud M8-M8 (TD-287)
90389	2-wire cable with shield (TD-394)

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Vibration transducer, SLD244S



The vibration transducer SLD244S is a piezo-electric accelerometer of compression type with side entry and built-in electronics, designed for vibration monitoring of industrial machinery. The electrical signal is isolated from the transducer housing.

SLD244S can be connected to IS instruments with matching IS parameters inside an area with a potentially explosive atmosphere. Connection to non-certified equipment must be made through a suitable and certified Ex barrier (e.g. SPM 17310). For vibration sensors with top entry in Ex version, see TD-637.

The housing and base are made of stainless acid-proof steel, suitable for aggressive environments. The transducer is installed on a flat machine surface and connected via a twisted pair cable with a 2-pin connector (MIL-C- 5015). Mechanical fastening standard thread size is M8. The transducer has a captured bolt for installation.

Marking

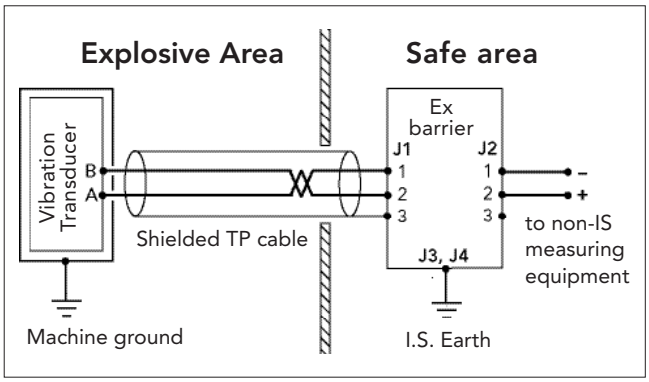
I M1 Ex ia I Ma
II 1 G Ex ia IIC T4 Ga
II 1 D Ex ia IIIC T114 °C Da
Ta –40 to +100 °C
U_i: 28 V I_i: 93 mA P_i: 0.66 W
C_i: 54 nF L_i: 5 µH

ARTICLE NO: SLD244S - M8
A B

A. Part number SLD244S
B. Thread (t) M8

SERIAL NO: X X X X X X
Year Week Number

Installation example



Technical specifications

Approvals:	CE, ATEX, IECEx
Nominal sensitivity, main axis:	10 mV/m/s² * =100 mV/g
Transverse sensitivity:	max. 10%
Base strain sensitivity:	0.01 m/s²/µ strain typical
Linear frequency range:	2 Hz to 10 kHz (±1 dB)
Max. peak acceleration:	600 m/s² = 60 g
Settling time:	6 sec
Bias point:	10 to 13 V (typical 12V)
Power requirements:	24 V, 2 to 5 mA
Isolation:	case isolated, > 10 Mohm
Operating temperature:	–40° to +90 °C (–40° to 194 °F)
Casing:	stainless acid-proof steel
Sealing:	IP66/67
Connection:	2-pin connector, MIL-C-5015
Thread (t):	M8x1.25
Torque limit:	10 Nm (7.4 lbf·ft)
Weight:	200 grams (7 oz)

* Individual value given on the calibration chart.

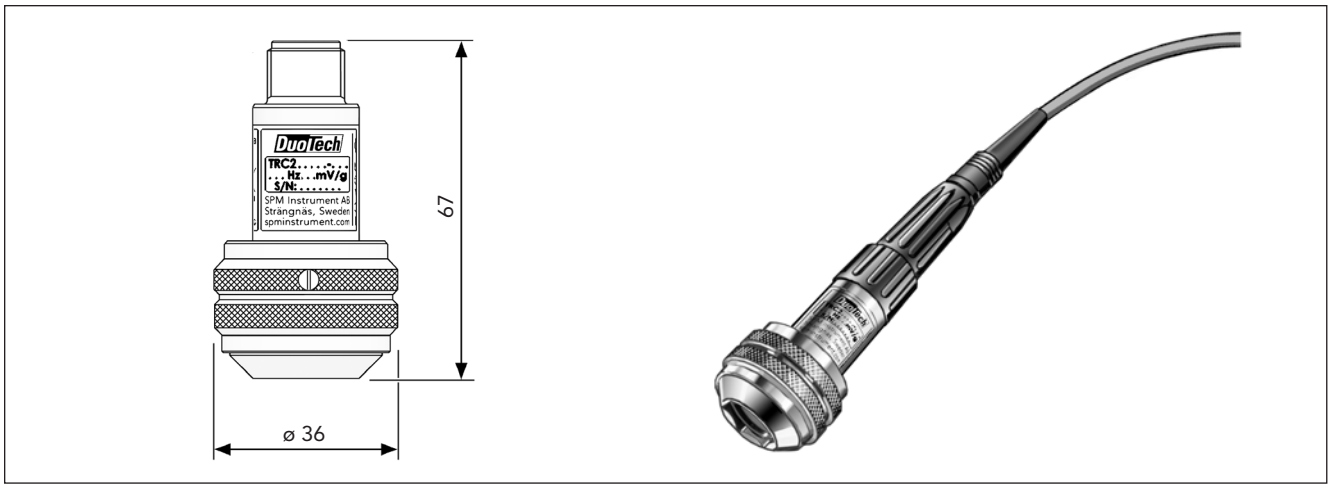
Accessories

15168	2-pin connector MIL-C-5015, composite (TD-217)
16100	2-pin connector MIL-C-5015, stainless steel (TD-314)
1731X	Ex barrier (TD-495)
90389	2-wire cable with shield (TD-394)

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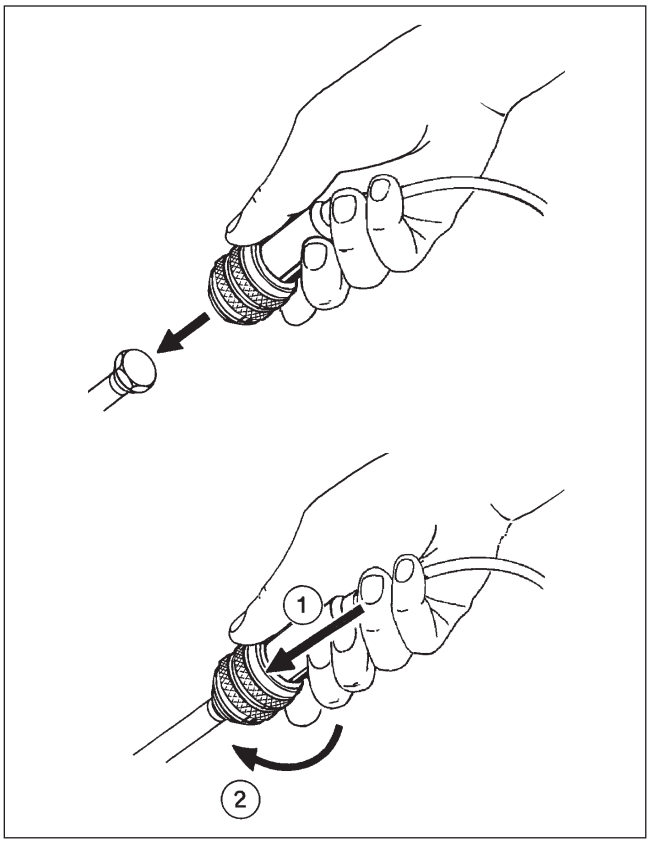
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DuoTech accelerometer with Quick Connector TRC200



TRC200 is a DuoTech accelerometer with quick connector, used together with the handheld instrument Leonova Diamond IS and Emerald IS, for measurements on permanently installed adapters inside the area with potentially explosive atmosphere. The quick connector forms a screw connection together with the permanently installed adapter. The accelerometer is internally isolated in a Faraday shield providing maximum protection from ground loops and RF interference.

To attach the transducer to an adapter, push the transducer firmly onto the adapter and twist it clockwise. Twist counter clockwise to unfasten the transducer.



Marking

I M1/II 1G/II 1D
CML 15ATEX2003X
IECEx CML15.0043X
Ex ia IIC T4 Ga (-40°C ≤ Ta ≤ +115°C)
Ex ia IIC T3 Ga (-40°C ≤ Ta ≤ +125°C)
Ex ia IIIC T135°C Da (-40°C ≤ Ta ≤ +115°C)
Ex ia IIIC T145°C Da (-40°C ≤ Ta ≤ +125°C)

Electrical IS parameters

U_i = 28V, I_i = 93mA, P_i = 0.66W, C_i = 58nF, L_i = 10µH

Technical Data

Approvals:	CE, ATEX, IECEx
Environment:	−40° to +115/125 °C
Nom. sensitivity, main axis:	100 mV/g *
Measuring range, vibration:	600 m/s² = 60 g
Measuring range, shock pulse:	−12 to 75 dB
Transverse sensitivity:	max. 10%
Base strain sensitivity:	0.01 m/s²/µstrain
Frequency range, vibration:	2 Hz to 5 kHz (±3dB)
Settling time:	3 sec.
IEPE bias point:	10 to 13 V (typical 12 V)
IEPE power:	19 to 24 V, 2 to 5 mA
Isolation:	500V withstand (enclosure to IEPE), > 10 MΩ
Electrical connector:	2 pin MIL-C-5015
Mechanical fastening:	quick screw connector
Enclosure:	IP66/67, Stainless acid-proof steel, Sandvik Grade: 1802, EN: 1.4523
Weight:	165g

* Individual value given on the calibration chart.

Part Numbers

TRC200	DuoTech accelerometer with quick connector for SPM adapters
CAB82 IS	Measuring cable, 8 pin–2 pin, 1.5m spiral
CAB83 IS	Measuring cable, 8 pin–2 pin, 10m
CAB83 IS-L	Measuring cable, 8 pin–2 pin (L= length in meter)

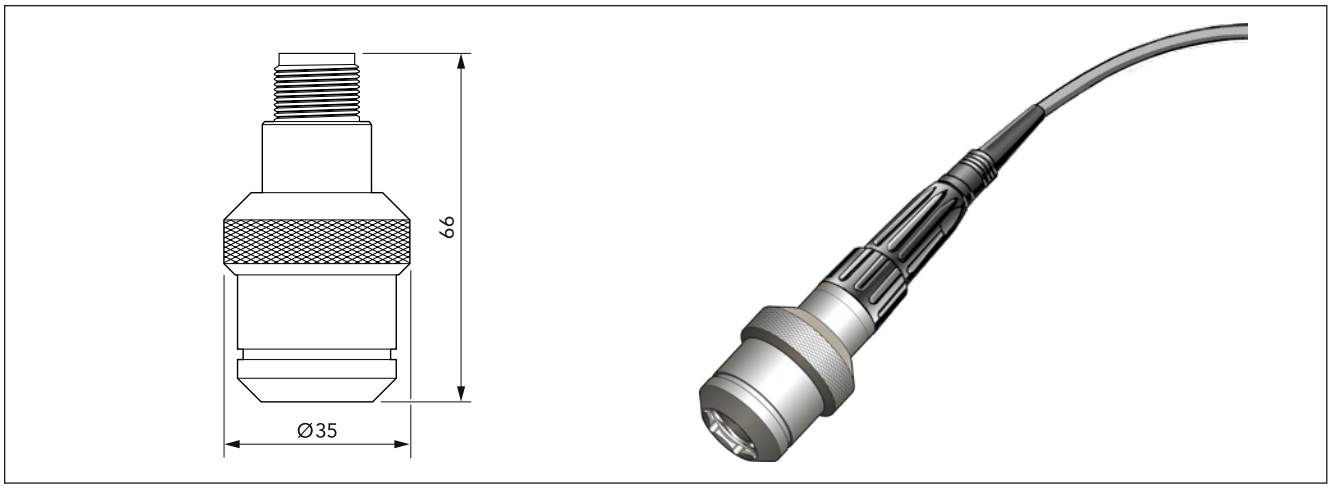
SERIAL NO: X X | X X | X X X

Year | Week | Number

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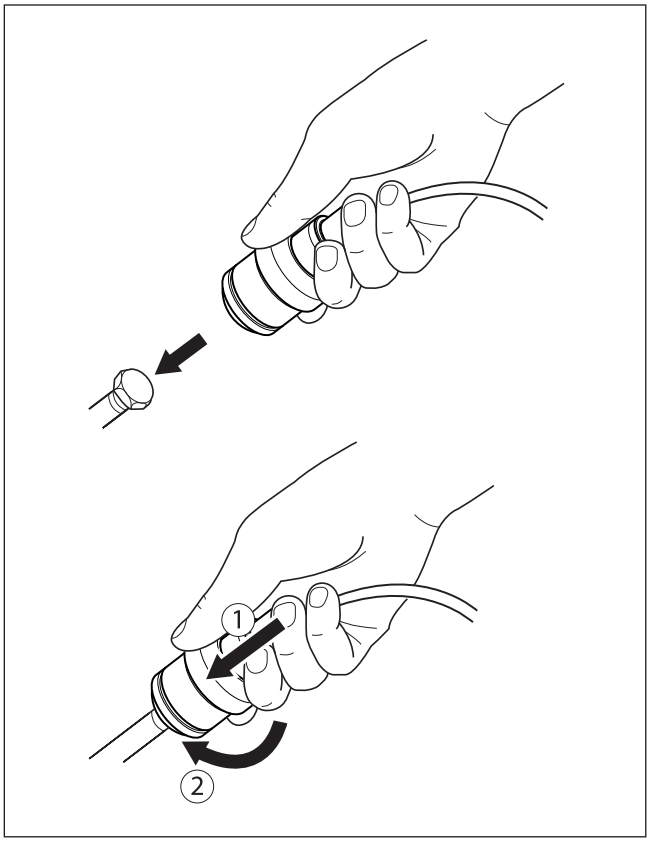
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DuoTech accelerometer with quick connector, TRC250



TRC250 is a DuoTech accelerometer with quick connector, used together with the handheld instrument Leonova Diamond IS and Emerald IS, for measurements on permanently installed adapters inside the area with potentially explosive atmosphere. The quick connector forms a bayonet connection together with the permanently installed adapter. The accelerometer is internally isolated in a Faraday shield providing maximum protection from ground loops and RF interference.

To attach the transducer to an adapter, push the transducer firmly onto the adapter and twist it clockwise. Twist counter clockwise to unfasten the transducer.



Marking

I M1/II 1G/II 1D
CML 15ATEX2003X
IECEx CML15.0043X
Ex ia IIC T4 Ga (-40°C ≤ Ta ≤ +115°C)
Ex ia IIC T3 Ga (-40°C ≤ Ta ≤ +125°C)
Ex ia IIIC T135°C Da (-40°C ≤ Ta ≤ +115°C)
Ex ia IIIC T145°C Da (-40°C ≤ Ta ≤ +125°C)

Electrical IS parameters

U_i = 28V, I_i = 93mA, P_i = 0.66W, C_i = 58nF, L_i = 10µH

Technical specifications

Approvals:	CE, ATEX, IECEx
Environment:	−40° to +115/125 °C
Nom. sensitivity, main axis:	100 mV/g *
Measuring range, vibration:	600 m/s² = 60 g
Measuring range, shock pulse:	−12 to 75 dB
Transverse sensitivity:	max. 10%
Base strain sensitivity:	0.01 m/s²/µstrain
Frequency range, vibration:	2 Hz to 5 kHz (±3dB)
Settling time:	3 sec.
IEPE bias point:	10 to 13 V (typical 12 V)
IEPE power:	19 to 24 V, 2 to 5 mA
Isolation:	500V withstand (enclosure to IEPE), > 10 MΩ
Electrical connector:	2 pin MIL-C-5015
Mechanical fastening:	quick bayonet connector
Enclosure:	IP66/67, Stainless acid-proof steel, Sandvik Grade: 1802, EN: 1.4523
Weight:	230 g

* Individual value given on the calibration chart.

Part numbers

TRC250	DuoTech accelerometer with quick connector for SPM adapters
CAB82 IS	Measuring cable, 8 pin–2 pin, 1.5m spiral
CAB83 IS	Measuring cable, 8 pin–2 pin, 10m
CAB83 IS-L	Measuring cable, 8 pin–2 pin (L=length in meter)

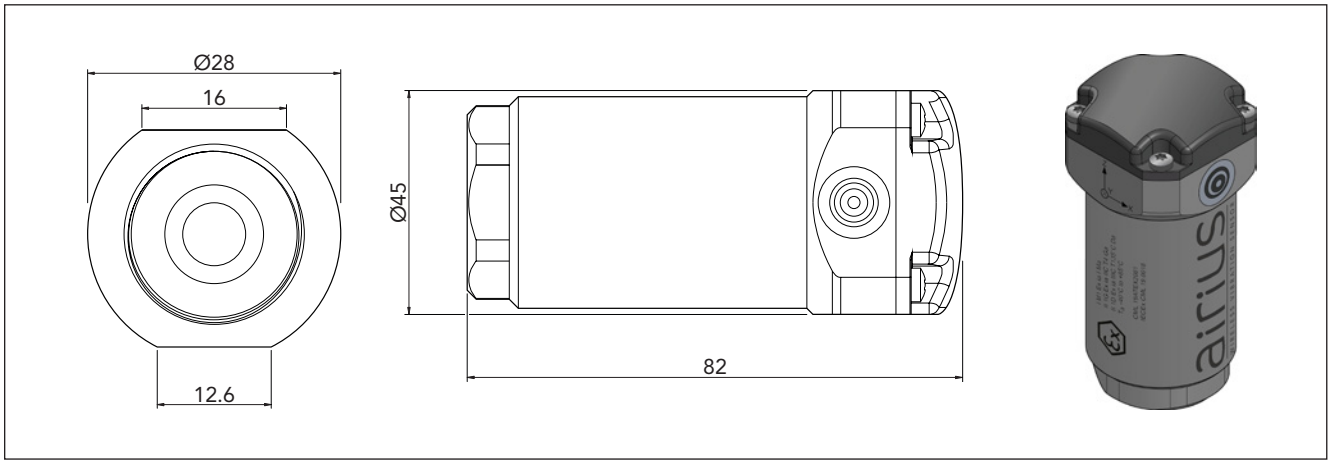
SERIAL NO: XX XX XXX

Year | Week | Number

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Airius – Wireless vibration sensor, Ex



Airius is a wireless, battery-powered sensor designed for vibration monitoring of industrial machines in areas with potentially explosive atmosphere. It performs a user-defined number of vibration measurements per day in the 10-1000 Hz or the 2-1000/10-5000 Hz frequency range. The MEMS (micro-electro-mechanical-systems) type sensor with digital output measures triaxial vibration and temperature.

The vibration sensor is optimal for use on standard production equipment, such as pumps and fans. Airius provides warning of vibration-related problems, such as imbalance, misalignment, impeller and fan blade issues, resonance, and cavitation, as well as gear and bearing faults. The sensor is ideal wherever wireless transmission of vibration data is practical or a matter of safety, as in inaccessible machines or machines placed in hostile or risky environments.

The favorable choice of battery technology, along with the careful design, ensure four-year battery life at four measurements a day under ideal conditions.

Airius is compatible with both Condmaster.NET, the cloud-based application providing easy access to measurement data through a user-friendly interface, and the analysis and diagnostic software Condmaster Ruby.

The SPM Connect app, downloadable for mobile devices, is used to configure the parameters required to connect to Condmaster Entity Server (CES) or SPM Cloud. Only certified mobile devices are allowed to be used in Ex-hazardous areas. The app allows you to

- search for Airius vibration sensors via Bluetooth
- verify server connection
- set up connection to Wi-Fi and CES/SPM Cloud.

Marking

I M1 Ex ia I Ma
II 1G Ex ia IIC T4 Ga
II 1D Ex ia IIIC T135 °C Da
Ta –40 °C to +85 °C
CML 19ATEX2081
IECEx CML 19.0018

Technical specifications

Approvals/Certificates:	ATEX, IECEX, CE, FCC, Canadian RSS, China MIIT, Japan MIC, Korean CRM, Taiwan NCC, Wi-Fi Alliance, Bluetooth SIG
Enclosure:	stainless steel body, acid proof; plastic lid, ESD protected
Weight:	220 g
Power supply:	replaceable lithium battery, SPM 18425 only
Readings:	RMS, peak, peak-to-peak, crest, kurt, skew, temperature
Condition evaluation:	ISO10816 Part 2, 3, 4 >600 rpm
Temp. measurement:	
Range	–40° to +85 °C (–40° to +185 °F)
Resolution	0.1 °C
Accuracy	+/– 2 °C
Ambient temperature:	
Operational	–20° to +85 °C (–4° to +185 °F)
Ex safety	–40° to +85 °C (–40° to +185 °F)
Storage	–40° to +85 °C (–40° to +185 °F)
Protection class:	IP69
Relative humidity:	0 to 100% (non-condensing)
Wi-Fi:	802.11 b/g/n, 2.4 GHz
Wi-Fi Security:	WPA/WPA2 PSK/WPA2 Enterprise (PEAP-MSCHAPv2 and TTLS-MSCHAPv2 without certificates)
Bluetooth:	v4.2 BLE
Antenna:	Internal PCB antenna only, 3.7 dBi
Installation:	Installation foot, glue (Loctite 326 and activator 7649) or screw (M4, M6, M8, 1/4" UNF)

Part numbers

AIR01-01-EX	Airius Ex sensor, 2/4/8 g, 16 bits, 10-1000 Hz, 800/1600 lines
AIR01-10-EX	Airius Ex sensor, 2/4/8/16 g, 16 bits 10-5000 Hz, 800/1600 lines or Airius Ex sensor, 10/20/40 g, 20 bits 2-1000 Hz, 800/1600 lines

Accessories

18470	Installation kit (installation foot, M4 screw, M4 washer, M6 screw)
18471	Installation kit (installation foot, M8 screw)
18466	Installation foot, glue installation

Spare parts

18524	Ex lid kit (lid with gasket, 4xM3 screws)
18425	Ex battery assembly

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Technical data are subject to change without notice.
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