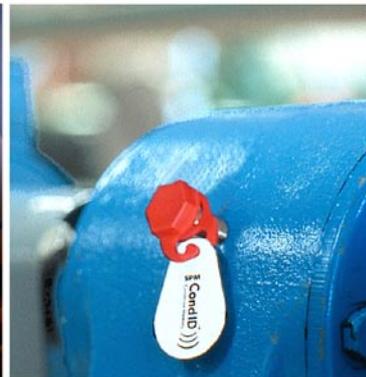
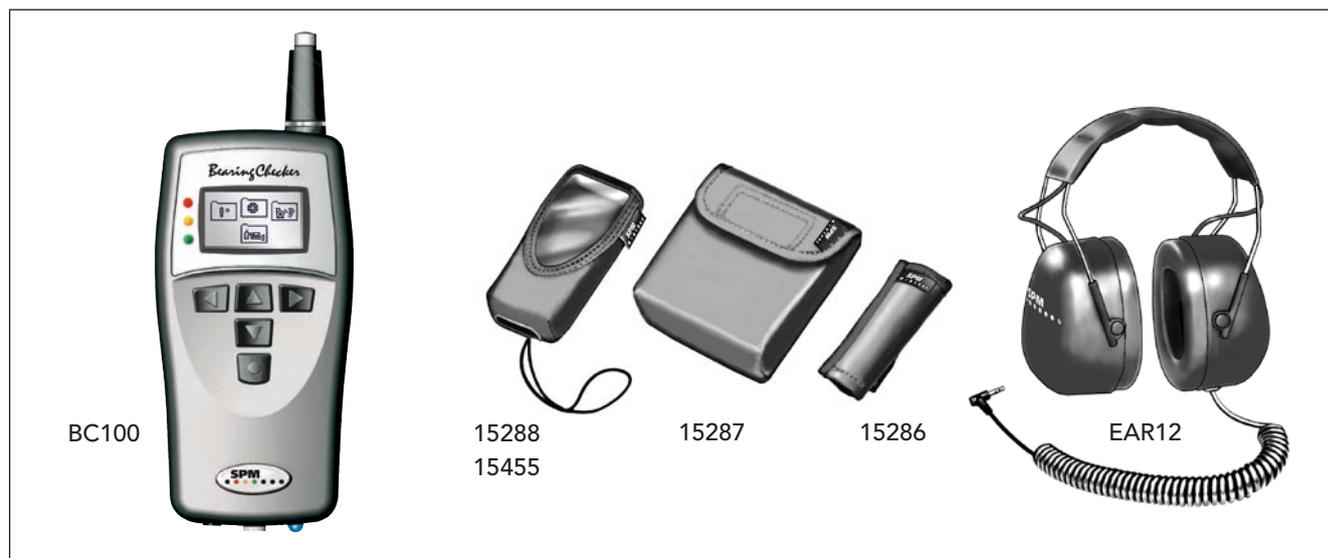


Product Catalogue

2009-05



Bearing Checker



Bearing Checker 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.

Bearing Checker measures shock pulses with a built-in probe and machine surface temperature with an infrared sensor. The instrument can also be used as an electronic stethoscope for detecting machine sound irregularities.

Technical data

Material, casing:	ABS/PC
Size:	158 x 62 x 30 mm (6.2 x 2.4 x 1.2 in)
Weight:	185 g (6.5 ounces) including batteries
Keypad:	Sealed membrane (silicone rubber)
Display:	Graphic monochrome, 64 x 128 pixels, LED backlight
Bearing condition indication:	Green, yellow and red light diodes
Measurement indication:	Blue light diode
Power supply:	2 x 1.5 V AA batteries, alkaline or rechargeable
Battery life:	> 20 hours of normal use
Operating temperature:	0 °C to +50 °C (32 °F to 122 °F)
Input connector:	Lemo coaxial, for external shock pulse transducers (probe or quick connector)
Output connector:	3.5 mm stereo mini plug for headphones
General functions:	Battery status display, transducer line test, metric or Imperial units of measurement, language independent menus with symbols, storage of up to 10 measurement values

Shock pulse measurement

Measurement technique:	dBm/dBc, measuring range -9 to 90 dBsv, ± 3 dBsv
Transducer type:	Built-in probe transducer

Temperature measurement

Temperature range:	-10 to +185 °C (14 to +365 °F)
Resolution:	1 °C (1 °F)
Transducer type:	Thermopile Sensor TPS 334/3161, built-in contact free IR-sensor

Stethoscope

Earphone mode:	8 level amplification
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Article numbers

BC100 Bearing Checker, excl. batteries and accessories

Accessories

EAR12	Headphones with eardefenders
TRA73	External transducer with probe
TRA74	Transducer with quick connector for adapters
CAB52	Measuring cable, 1.5 m, Lemo - BNC slip-on
15286	Belt holder for external probe transducer
15287	Belt case for accessories
15288	Protective cover with wrist strap
15455	Protective cover with belt clip
93363	Cable adapter, Lemo - BNC
93062	Cable adapter, BNC - TNC, plug-jack



Leonova™ Infinity – Platform



Leonova™ Infinity is a hand-held machine condition analyser with colour touch screen, operating under Windows CE. Following functions are always included for unlimited use:

- Data logging with Condmaster®Nova
- ISO 2372 vibration monitoring
- Speed measurement
- Temperature measurement
- Analog signals, current and voltage
- Reading from and writing to Condid® memory tags
- Manual recording, free quantity
- Check points, free text

The main Leonova functions are user selected, see TD-212. With synchronous measurement, enveloping, true zoom and up to a 12 800 line spectrum over 0.5 Hz up to 40 kHz, Leonova™ Infinity has full vibration analysis capacity. SPM has also incorporated the evaluation tables of the new ISO 10816 standards for broad-band measurement of vibration velocity, acceleration and displacement. For single and dual plane rotor balancing, an easy to use graphical guide calculates balancing weights and their position. For shaft alignment, Leonova Infinity uses advanced laser technique with easy targeting, modulated line laser beam and automatic precision calculation of shaft positions.

Ordering numbers

LEO801	Leonova Infinity, Grey, incl. wrist strap and stylus
LEO802	Leonova Infinity, Blue, incl. wrist strap and stylus
90362	Charger 9.3 V/1.33 A, 100-240 V AC, Euro-plug
90379	Charger 9.3 V/1.33 A, 100-240 V AC, US-plug
90380	Charger 9.3 V/1.33 A, 100-240 V AC, UK-plug
CAB46	Communication cable, USB
CAB47	Communication cable RS232, 9 pin
14715	Belt clip
15310	Protective cover
CAS16	Carrying case, plastic with foam insert

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

Instrument specifications	TD-211
Selection of instrument functions	TD-212
SPM Shock pulse measurement, dBm/dBc	TD-213
SPM Shock pulse measurement, LR/HR	TD-214
SPM Spectrum™	TD-218
ISO 2372 vibration monitoring	TD-225
ISO 10816 vibration monitoring with spectrum	TD-219
FFT with symptoms	TD-220
EVAM® Evaluated vibration analysis	TD-221
2 channel simultaneous vibration monitoring	TD-222
Run up/Coast down and Bump test	TD-223
Orbit analysis	TD-224
Balancing	TD-226
Shaft alignment	TD-227
Long-time recording	TD-228
Order tracking	TD-306
Services	TD-229
Protective cover	TD-246
Transducers and measuring cables	TD-247
LineLazer ^{II} detector units	TD-267

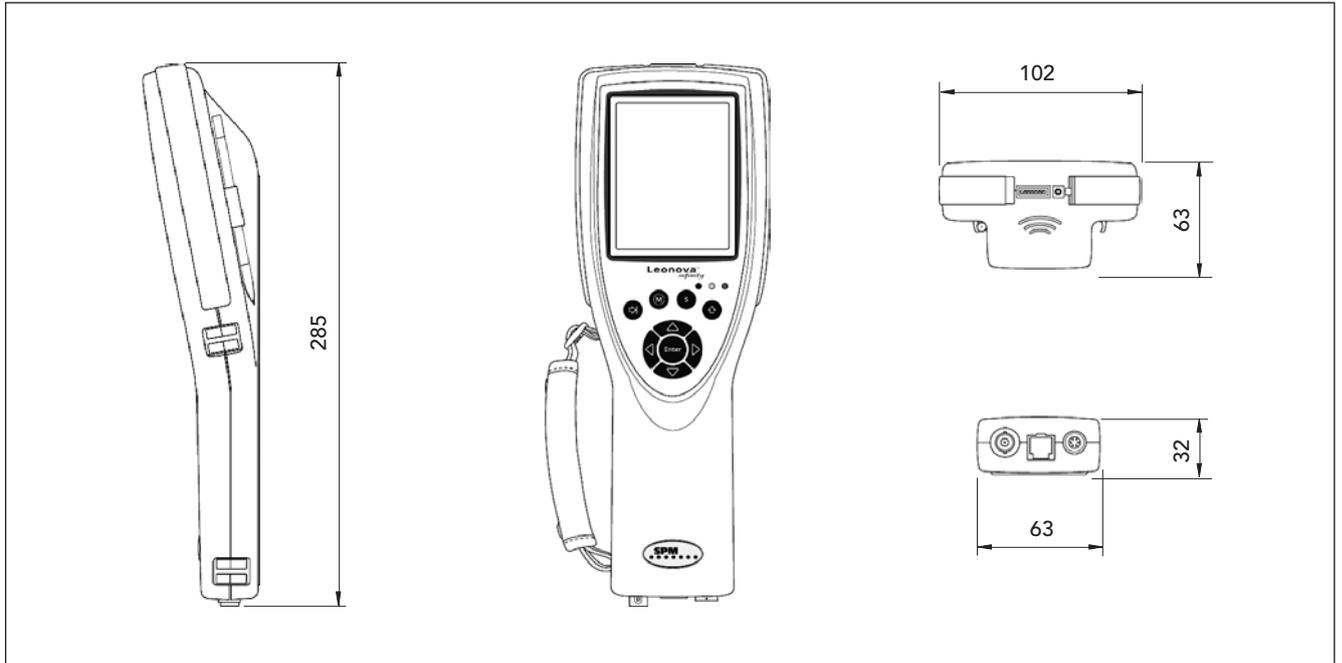
Spare parts

15178	Stylus for touch screen
14661	Wrist strap
PRO49	Leonova Service Program
71789	Instruction "Getting started"
71792	Leonova Infinity User guide

Patent No.: US7313484, US7167814, US7200519, US7054761, US7324919
EPO1474664, DE60304328.3, FR1474664, GB1474664, NL1474664, SE03731865.6



Leonova™ Infinity – Instrument Specifications



Leonova Infinity is a multi-function, hand-held data logger. The instrument is operated via keypad and touchscreen. Basic data for the measurement set-up can be input manually or downloaded from Condmaster®Nova.

Leonova Infinity is always programmed for an unlimited use

of the measuring functions listed below (Platform). Other diagnostic and analytic functions, for shock pulse measurement, vibration measurement, orbit analysis, rotor balancing and shaft alignment, are user selected. For technical information and specifications, see respective data sheets listed on TD-212.

Technical data, instrument (Platform)

Housing:	ABS/PC, Santoprene, IP54
Dimensions:	285 x 102 x 63 mm (11.2" x 4" x 2.5")
Weight:	580 g (20 oz.)
Keypad:	sealed, snap action
Display:	touch screen, TFT colour, 240 x 320 pixels, 54 x 72 mm (2.1 x 2.8 inch), adjustable backlight
Main processor:	400 MHz Intel® XScale®
Memory:	64 MB RAM, 32 MB Flash expandable up to 4 GB
Operating system:	Microsoft Windows® CE.net
Communication:	RS232 and USB
Dynamic range:	16 bit A/D converter, automatic gain settings
Condition indication:	green, yellow and red LEDs
Power supply:	rechargeable Lithium-Ion batteries
Battery power:	for minimum 8 hours normal use
Operating temperature:	0 to 50 °C (32 to 120 °F)
Charging temperature:	0 to 45 °C (32 to 113 °F)
General features:	language selection, battery charge display, transducer line test, metric or imperial units
Meas. point identification:	RF transponder for communication with CondID™ tags, read/write distance max. 50 mm (2 inch)

Vibration severity (ISO 2372)

Measurement quantity:	vibration velocity, RMS, range 10 – 1000 Hz
Evaluation table selection:	menu guided, ISO 2372
Vibration transducer input:	< 18 Vpp. Transducer supply of 4 mA for IEPE* (ICP) type can be set On/Off
Transducer types:	Any transducers (disp., vel. or acc.) with voltage output
Vibration channels:	2, simultaneous measuring

Speed measurement

Measuring range:	10 to 60 000 rpm
Resolution:	1 rpm
Accuracy:	± (1 rev. + 0.1% of reading)
Transducer type:	TAD-18, TTL-pulses

Temperature measurement

Measuring range:	-50 to +440 °C (-58 to 824 °F)
Resolution:	1 °C (1 °F)
Transducer type:	TEM-11 with TEN-10 (surface tem- perature) and TEN-11 (liquids)

Analog signals

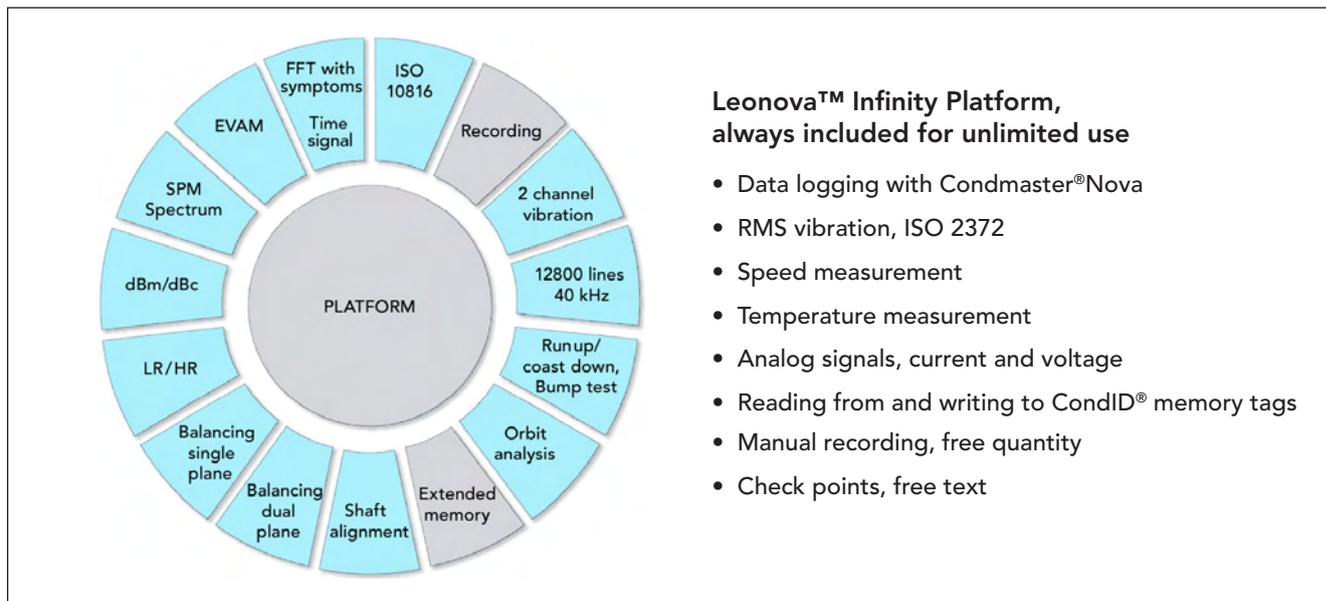
Measurement range:	0 to 1 V DC, 0 to 10 V DC, 0 to 20 mA, 4 to 20 mA
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* Integral Electronic PiezoElectric

Patent No.: US7313484, US7167814, US7200519, US7054761, US7324919
EPO1474664, DE60304328.3, FR1474664, GB1474664, NL1474664, SE03731865.6



Leonova™ Infinity – User selected functions



Leonova™ Infinity Platform, always included for unlimited use

- Data logging with Condmaster®Nova
- RMS vibration, ISO 2372
- Speed measurement
- Temperature measurement
- Analog signals, current and voltage
- Reading from and writing to CondID® memory tags
- Manual recording, free quantity
- Check points, free text

To obtain the optimal performance range and instrument price for their purpose, Leonova users can select any or all of the 16 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.

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

Functions for Unlimited Use

LEO130	Shock pulse method dBm/dBc
LEO131	Shock pulse method LR/HR
LEO132	SPM Spectrum
LEO133	ISO 10816 vibration monitoring with spectrum
LEO134	FFT with symptoms
LEO135	EVAM evaluated vibration analysis, time signal
LEO136	2 channel simultaneous vibration monitoring
LEO137	Run up / coast down & bump test
LEO138	Orbit analysis
LEO151	Shock pulse method dBm/dBc and LR/HR
LEO152	Balancing, single plane
LEO153	Balancing, dual plane
LEO154	Balancing, single and dual plane
LEO155	Shaft alignment

Functions for Limited Use (Function & Use)

LEO230	Shock pulse method dBm/dBc (1)
LEO231	Shock pulse method LR/HR (2)
LEO232	SPM Spectrum (2)
LEO233	ISO 10816 vibration monitoring with spectrum (1)
LEO234	FFT with symptoms (2)
LEO235	EVAM evaluated vibration analysis, time signal (2)
LEO236	2 channel simultaneous vibration monitoring (4)
LEO237	Run up / coast down (50) and Bump test (25)
LEO238	Orbit analysis (5)
LEO251	Shock pulse method dBm/dBc and LR/HR
LEO252	Balancing, single plane (4 runs 16, 2 runs 42)
LEO253	Balancing, dual plane (80)
LEO254	Balancing, single and dual plane
LEO255	Shaft alignment (30)

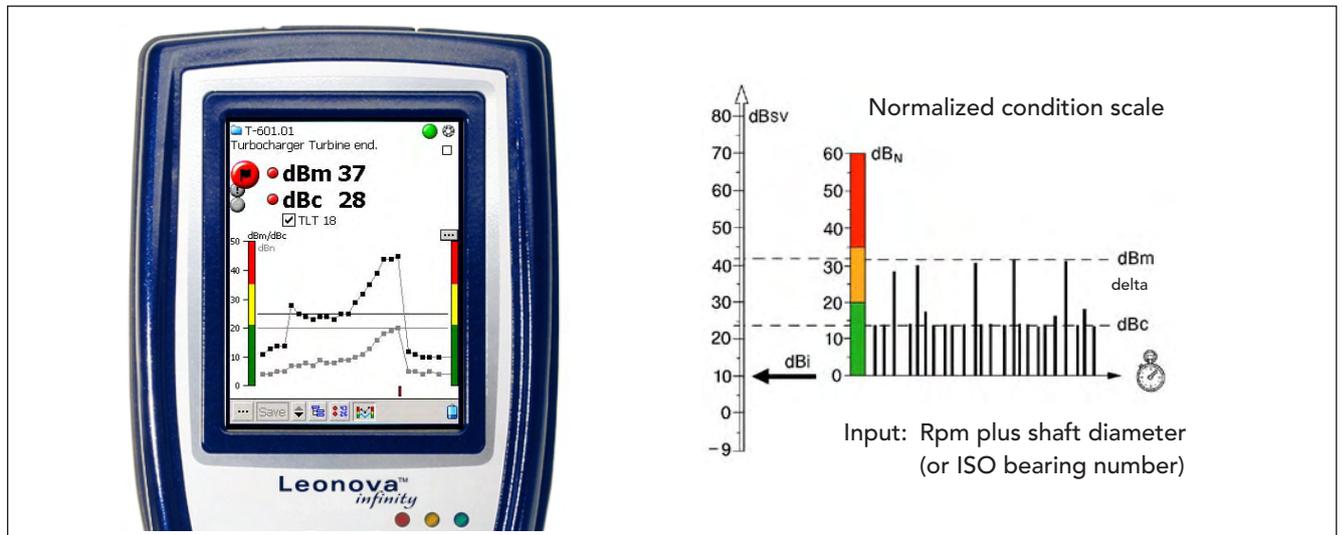
Credit consumption is stated within brackets.

Options

LEO139	12 800 lines, 40 kHz
LEO160	Recording function
LEO161	Extended memory, 512 MB
LEO162	Extended memory, 1 GB
LEO163	Extended memory, 4 GB
LEO164	Time signal, option to FFT with symptoms



Leonova™ Infinity – Shock pulse measurement, dBm/dBc



For over 30 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 2 seconds). 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 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.

Technical data

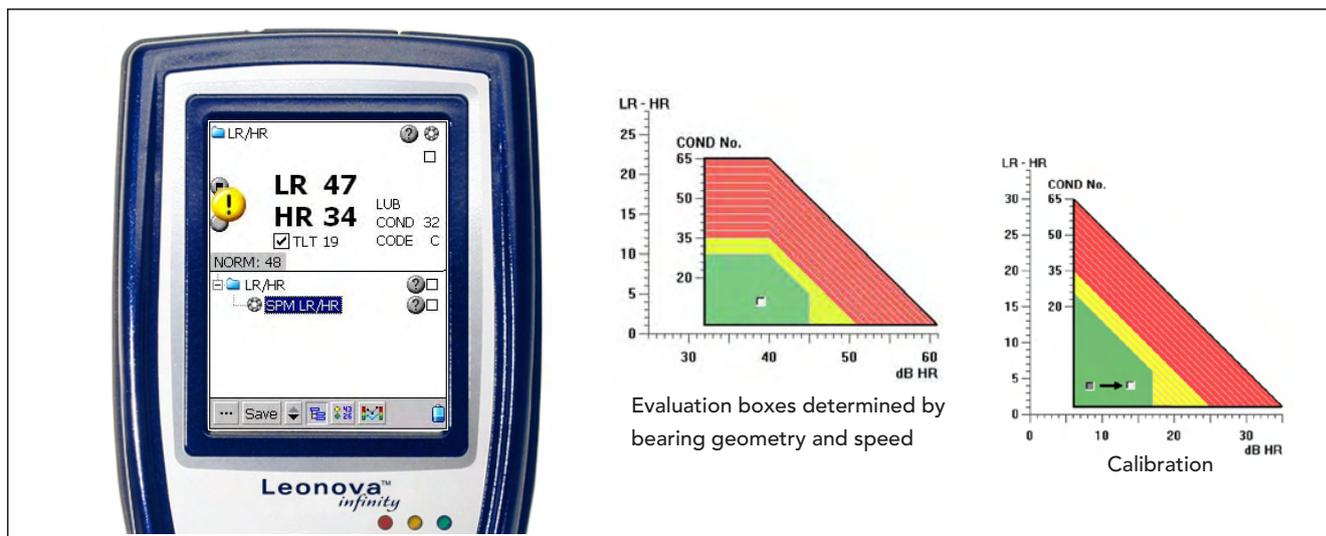
Measuring range:	-9 to 99 dBsv
Resolution:	1 dBsv
Accuracy:	± 1 dBsv
Transducer types:	SPM 40000/42000, probe transducer and quick connector transducer for adapters
Input data:	Rpm, shaft diameter (or ISO bearing number)
Output:	Maximum value dBm, evaluated green - yellow -red, carpet value dBc, peak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

Ordering numbers

LEO130	Shock pulse method dBm/dBc, unlimited use
LEO230	Shock pulse method dBm/dBc, limited use



Leonova™ Infinity – Shock pulse measurement, LR/HR



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 the dBm/dBc method (TD-213). 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).

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 calculates the normal shock level for a good bearing and compensates for an abnormally low signal before returning the evaluation results.

Technical data

Measuring range: -19 to 99 dBsv

Resolution: 1 dBsv

Accuracy: ± 1 dBsv

Transducer types: SPM 40000/42000, 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.

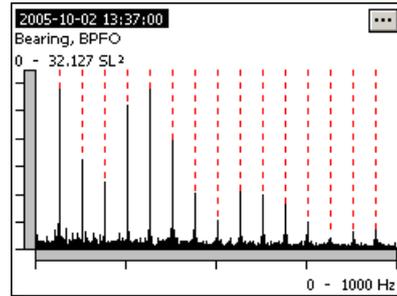
Ordering numbers

LEO131 Shock pulse method LR/HR, unlimited use

LEO231 Shock pulse method LR/HR, limited use



Leonova™ Infinity – SPM Spectrum



Pattern recognition:

Bearing with rotating inner race and a damaged outer race. BPFO = ball pass frequency outer race and its multiples dominate the shock pulse 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 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.

Leonova 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 HR 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 the 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 data

Frequency range:	0 to 100, 200, 500, 1000, 2000, 5000, 10000, 20 000 Hz
Number of spectrum lines:	400, 800, 1600, 3200, 6400
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)
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.
Transducer type:	Shock pulse transducers with probe and quick connector, SPM 40000/42000

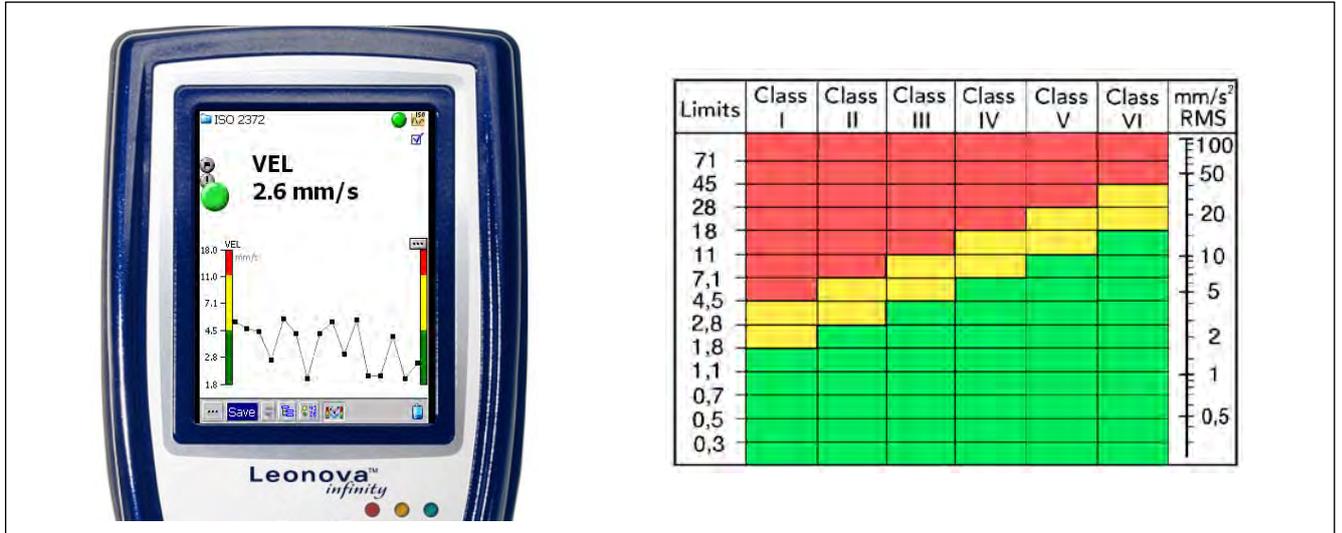
As an option, the frequency range can be extended to 40000 Hz, the number of spectrum lines to 12800.

Ordering numbers

LEO132	SPM Spectrum, unlimited use
LEO232	SPM Spectrum, limited use
LEO139	12 800 lines, 40 kHz, option



Leonova™ Infinity – Vibration ISO 2372



Broad band 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 219.

Technical data

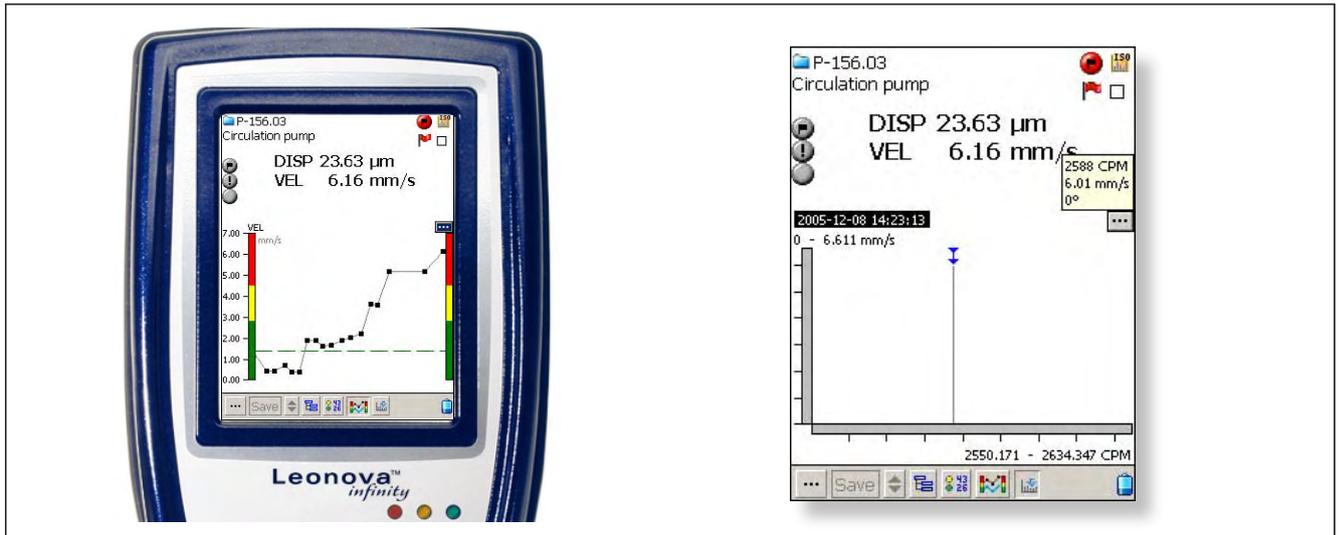
Measurement quantities: Velocity, RMS value in mm/s over 10 to 1000Hz

Transducer type: Vibration transducer SLD144 or IEPE* (ICP®) type transducers with voltage output

* Integral Electronic PiezoElectric



Leonova™ Infinity – Vibration ISO 10816 with spectrum



Broad band 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 (see TD-225). ISO 10816 is an option with ordering numbers LEO133 (unlimited use) and LEO233 (limited use).

Features of ISO 10816 are:

- Measurements are made in three direction (horizontal, vertical, axial).
- Machine condition is generally diagnosed on the basis of broad band 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 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 also provides a 1600 line spectrum.

Technical data

Measurement quantities: Velocity, acceleration, and displacement, RMS values over 2 or 10 Hz to 1000 Hz, peak, peak-to-peak

Spectrum: Linear, 1600 lines, Hanning window.

Spectrum unit: Velocity, mm/s or inch/s

Transducer type: Vibration transducer SLD 144 or IEPE* (ICP®) type transducers with voltage output

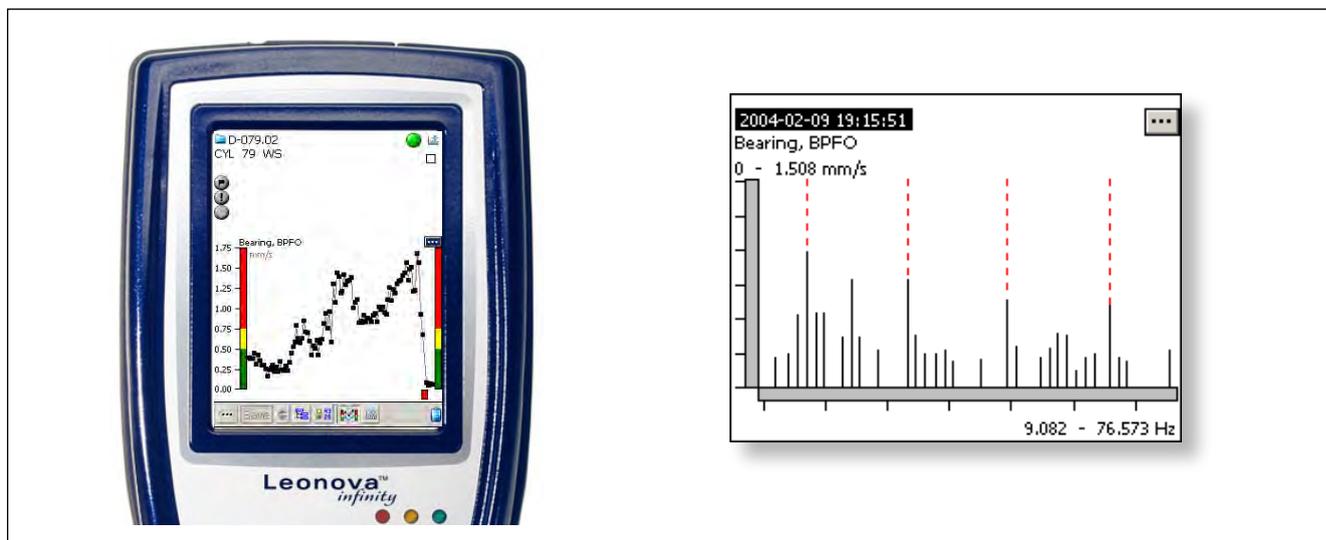
* Integral Electronic PiezoElectric

Ordering numbers

LEO133 Vibration ISO 10816 with spectrum, unlimited use
LEO233 Vibration ISO 10816 with spectrum, limited use



Leonova™ Infinity – FFT spectrum with symptoms



FFT Spectrum with Symptoms is a vibration analysis function offered with Leonova, for either limited or unlimited use. It is a reduced form of EVAM (Evaluated Vibration Analysis Method), lacking the statistical evaluation by means of criteria and possibility to display and save time signal (option).

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 pre-set 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 data

Frequency limit, lower:	0.5, 2, 10 or 100 Hz
Frequency limit, upper:	100, 200, 500, 1000, 2000, 5000, 10000 Hz
Envelope high pass filters:	100, 200, 500, 1000, 2000, 5000, 10000 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
Saving options:	peaks only, full spectrum
Spectrum types displayed:	linear, power, PSD
Zoom:	true FFT zoom, visual zoom
Transducer types:	Vibration transducer SLD144 or IEPE (ICP®) type transducers with voltage output

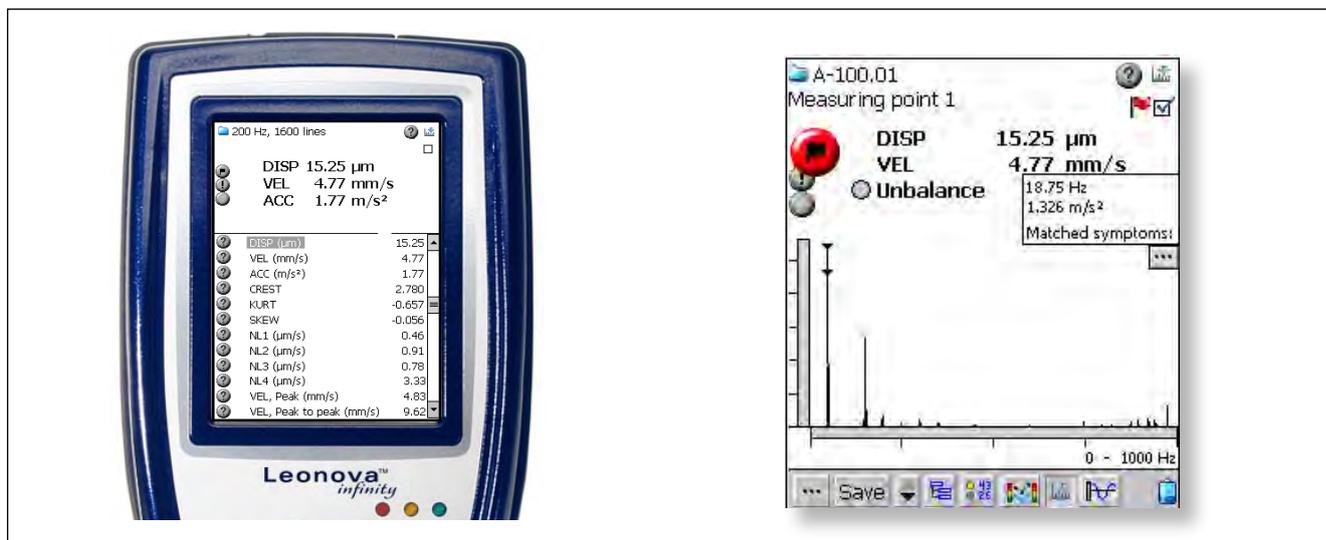
As options, the frequency range can be extended to 40000Hz/12800 spectrum lines and possibility to save time signal.

Ordering numbers

LEO134	FFT with symptoms, unlimited use
LEO234	FFT with symptoms, limited use
LEO139	12 800 lines, 40 kHz, option
LEO164	Time signal, option to FFT with symptoms



Leonova™ Infinity – EVAM evaluated vibration analysis



EVAM stands for Evaluated Vibration Analysis Method. With Leonova, the EVAM method is offered as an analysing function with either limited or unlimited use.

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 pre-set 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 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, for some an input is needed, 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 that compares new parameter values with the statistical mean value and displays a dimensionless condition value against a green - yellow - red scale.

Technical data

Frequency limit, lower:	0.5, 2, 10 or 100 Hz
Frequency limit, upper:	100, 200, 500, 1000, 2000, 5000, 10000, 20000 Hz
Envelope high pass filters:	100, 200, 500, 1000, 2000, 5000, 10000 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
Saving options:	peaks only, full spectrum, time signal
Spectrum types displayed:	linear, power, PSD
Zoom:	true FFT zoom, visual zoom
Transducer types:	Vibration transducer SLD144 or IEPE (ICP®) type transducers with voltage output

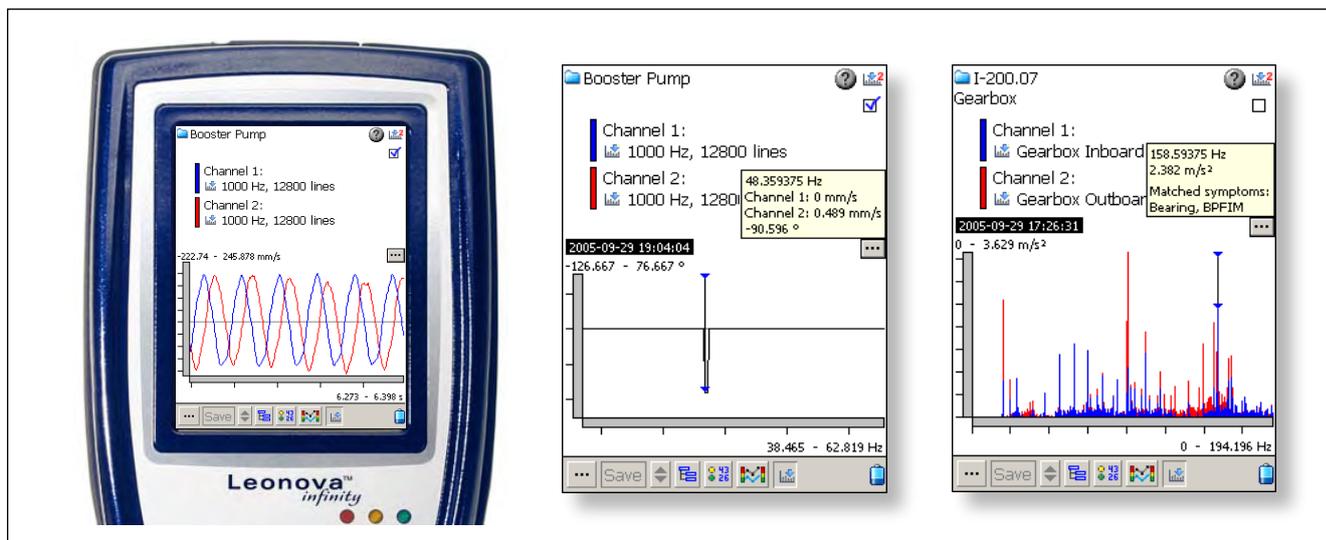
As an option, the frequency range can be extended to 40000 Hz, the number of spectrum lines to 12800.

Ordering numbers

LEO135	EVAM evaluated vibration analysis, unlimited use
LEO235	EVAM evaluated vibration analysis, limited use
LEO139	12 800 lines, 40 kHz, option



Leonova™ Infinity – 2 channel simultaneous vibration monitoring



Two channel simultaneous vibration monitoring is a Leonova Infinity function for limited (LEO236) or unlimited (LEO136) use. It requires that either the measuring technique 'FFT with symptoms' or 'EVAM' is active. The function 'FFT with symptoms' requires the option 'Time signal' (LEO164) for possibility to display and save time signal.

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.

Measurement requires the set-up of two vibration assignments with identical parameters. The 2 channel measuring cable CAB51 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.

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

- Spectrum
- Phase spectrum
- Time signal (option to FFT with symptoms)

In the spectrum and the time signal, the channels are overlaid red and blue.

Technical data

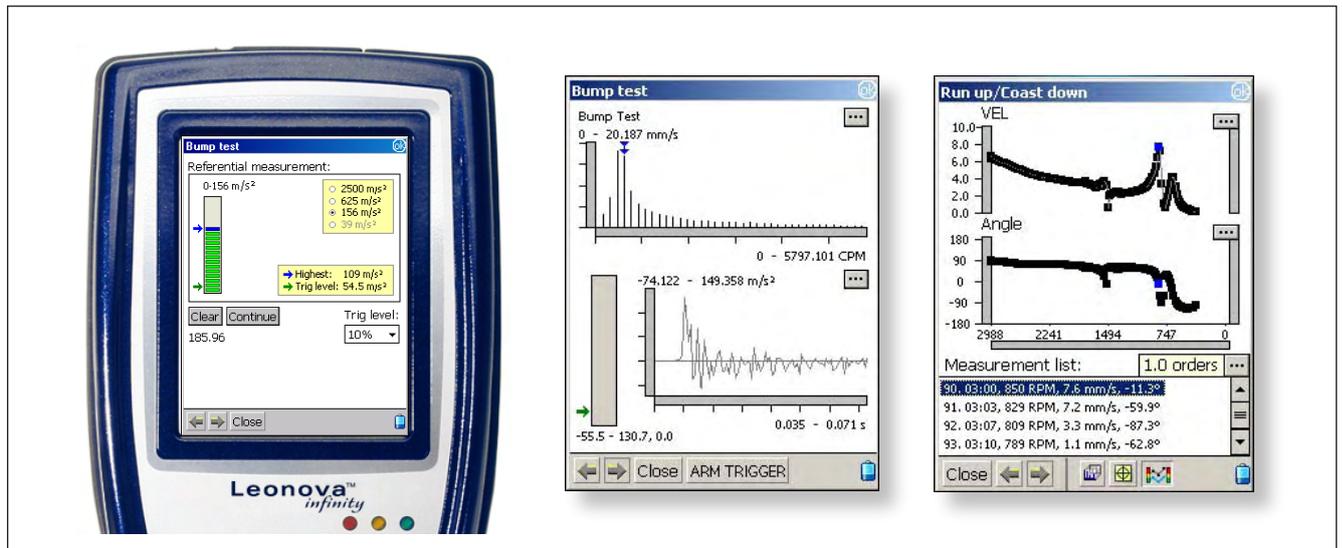
Frequency limit, lower:	0.5, 2, 10 or 100 Hz
Frequency limit, upper:	100, 200, 500, 1000, 2000, 5000, 10 000, 20 000 Hz
Envelope high pass filters:	100, 200, 500, 1000, 2000, 5000, 10 000 Hz
Measurement windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400
Saving options for spectrum:	peaks only, full spectrum, time signal
Spectrum types displayed:	linear, power, PSD
Zoom:	true FFT zoom, visual zoom
Transducer types:	Vibration transducer SLD144 or IEPE (ICP®) type transducers with voltage output

As an option, the frequency range can be extended to 40 kHz, the number of spectrum lines to 12800.

Ordering numbers

LEO136	2 channel vibration monitoring, unlimited use
LEO236	2 channel vibration monitoring, limited use
LEO139	12 800 lines, 40 kHz, option
LEO164	Time signal, option to FFT with symptoms
CAB 51	2 channel measuring cable, Lemo

Leonova™ Infinity – Run up/coast down and Bump test



Run up / coast down measurements and Bump test are two vibration analysis functions offered with Leonova Infinity, for either limited or unlimited use. 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. Both 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 Infinity 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-triggering 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-triggering time).

Technical data

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:	2 Hz
Frequency limit, upper:	100, 200, 500, 1000, 2000, 5000, 10000, 20000, 40 000 Hz
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
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

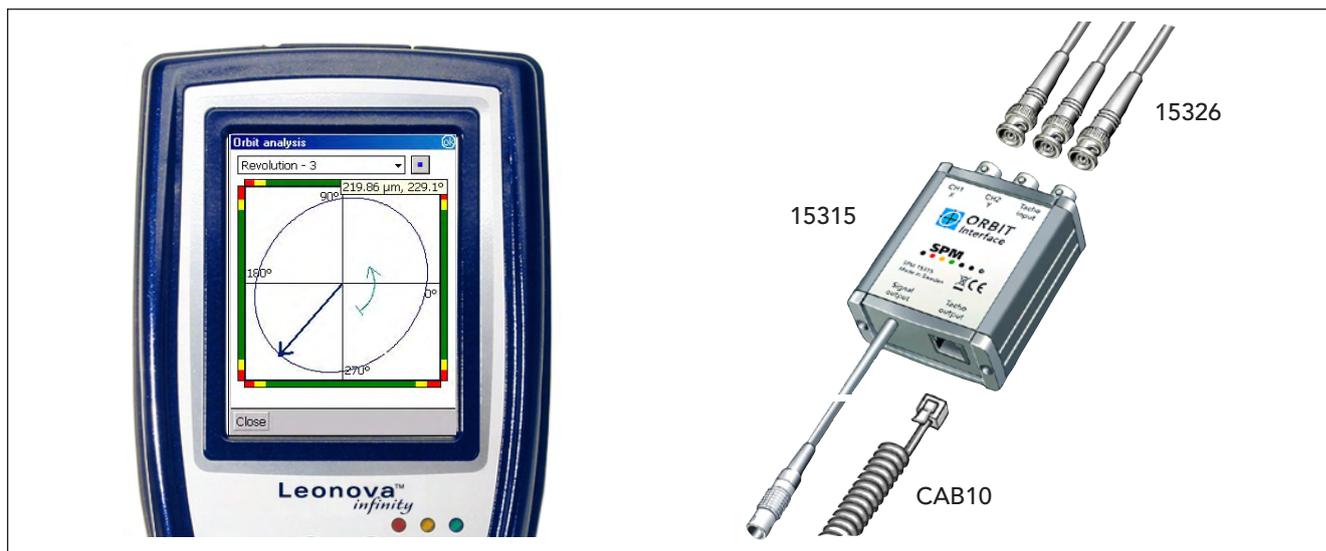
* Integral Electronic PiezoElectric

Ordering numbers

LEO137	Run up/coast down and Bump test, unlimited use
LEO237	Run up/coast down and Bump test, limited use



Leonova™ Infinity – Orbit analysis



Orbit analysis is a vibration measurement function offered with Leonova infinity, for either unlimited (LEO138) or limited use (LEO238). 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.

The measurements are normally made on the buffered outputs of a machine protection system via the Orbit Interface 15315. The interface is connected to the vibration and the tachometer inputs on Leonova. Signal inputs, channel X, channel Y and tachometer are connected via BNC connectors.

Measurements can also be made with e. g. accelerometers to get a two dimensional graph of machine movement. 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.

During measurement, the result window shows displacement in the x and y direction per revolution. When the 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 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 via tap and hold on the orbit graph.

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

Technical data

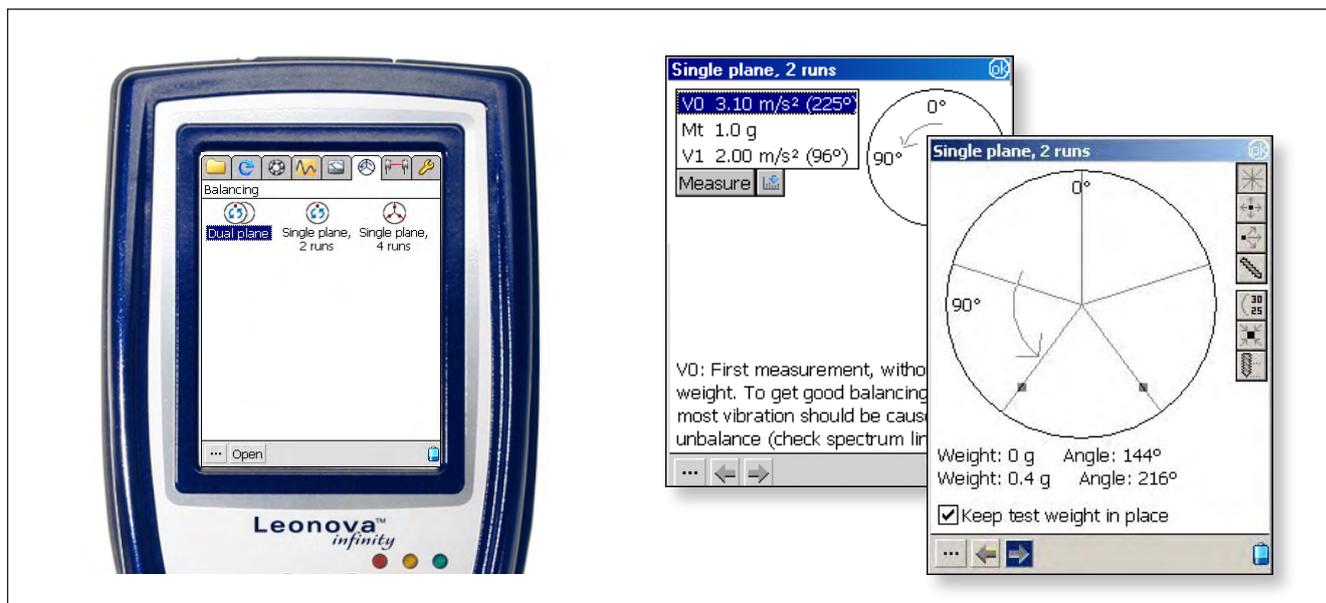
Orders:	1 to 5, default 1
Filter types:	None, band pass, low pass
Signal unit:	DISP, VEL, ACC
Trig threshold:	Automatic
Measuring time:	1 to 25 revolutions
RPM range:	15 to 20 480 rpm
Transducer types:	Buffered outputs from API670 approved protection systems via Orbit Interface 15315, alternative vibration transducers SLD144 or IEPE (ICP®) type transducers with voltage output

Ordering numbers

LEO138	Orbit analysis, unlimited use
LEO238	Orbit analysis, limited use
15315	Orbit Interface with belt clip
15326	Set of measuring cables, 3 x BNC - BNC
CAB10	Tachometer cable, spiral



Leonova™ Infinity – Balancing



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

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, two 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.

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.

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 min. 4.

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.

Ordering numbers

LEO152	Balancing, single plane, unlimited use
LEO252	Balancing, single plane, limited use
LEO153	Balancing, dual plane, unlimited use
LEO253	Balancing, dual plane, limited use
LEO154	Balancing, single and dual plane, unlimited use
LEO254	Balancing, single and dual plane, limited use



Leonova™ – Shaft Alignment



Shaft Alignment is an optional Leonova™ function for quick and easy shaft alignment, with 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 Accessory Set contains detector/transmitter units, brackets, chains, rods, cables and a measuring tape, all in a carrying case. This set fits a multitude of applications, e.g. compressors, gearboxes, generators, and pumps.

The detector units have position detectors (PSD) with a large reception area, which makes fine tuning unnecessary. Compensation values for thermal growth can be input. Integrated 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.

The Leonova instrument is the control and display unit. 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 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
- Softfoot measurement
- Compensation for thermal growth
- Feet lock function
- Shaft alignment log

Ordering numbers, Leonova™ Infinity

- LEO155 Shaft alignment, unlimited use
- LEO255 Shaft alignment, limited use

Ordering numbers, Leonova™

- LEO220 Shaft alignment, unlimited use, upgrade
- LEO420 Shaft alignment, limited use, upgrade

LineLazer Accessory Set LLA300

- LLB30 1 pc. LineLazer detector, lower beam (TD-267)
- LLB31 1 pc. LineLazer detector, upper beam (TD-267)
- 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
- LLB15 2 pcs. Shaft bracket for chain
- CAB50 1 pc. Communication cable between LineLazer and Leonova Infinity, length 3 m
- CAB75 1 pc. Charger cable, length 1.5 m
- MAA70 1 pc. Measuring tape
- TOL21 1 pc. Torquing tool for chains and rods
- CAS19 1 pc. Carrying case, plastic with foam insert

Battery charger

- 90362 Charger, 100-240 V AC, 50-60 Hz, Euro-plug
- 90379 Charger, 100-240 V AC, 50-60 Hz, US-plug
- 90380 Charger, 100-240 V AC, 50-60 Hz, UK-plug

Options

Magnetic brackets, offset brackets 50 mm and offset brackets 100 mm on request.

Spare parts

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



Leonova™ Infinity – Recording function



Recording is an optional Leonova function with unlimited use. It allows the user to measure simultaneously with up to three different transducers and record measuring results for as long as the battery charge will last. Thus, 'Recording' is an analysis tool that can show the interaction of various condition parameters over time.

Leonova has three separate input connectors, for

- shock pulse measurement
- speed or temperature measurement
- vibration or analogue measurement.

Thus, shock pulse recording can be combined with either of the alternatives given by the other two input.

The recording function for a single quantity, e. g. temperature, can be reached and set up from the default file saved under the respective technique window. To record different quantities at the same time, one needs a measuring point file where all the different techniques are activated.

In the example shown above the measuring point is configured for the techniques SPM dBm/dBc with spectrum (which automatically asks for a speed measurement), for ISO 2372 vibration measurement and for EVAM vibration measurement.

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 (A) and selecting techniques in any order. A technique can be used more than once in the sequence.

Recording is started with the 'Measure' key and can be terminated with the 'Cancel' key (B).

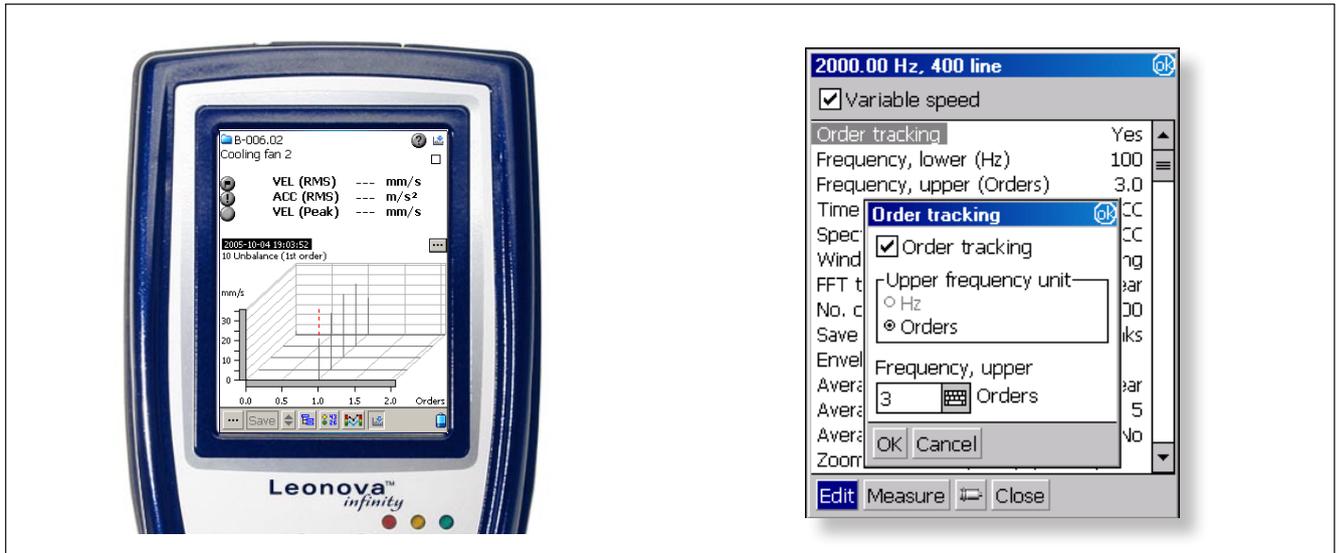
Leonova displays the number of measurements taken and powers down when all are recorded. The batch is then saved by the user and can be transferred to Condmaster.

Ordering number

LEO160 Recording function, unlimited use



Leonova™ Infinity – Order tracking



Order tracking is an optional Leonova function primarily used for vibration 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 minimise 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 between the measurements.

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.

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. Setup of order tracking assignments in Condmaster require the optional software module, MOD188 Order tracking.

Ordering number

LEO165 Order tracking, unlimited use



Leonova™ Infinity – Services



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

- print and save balancing and alignment reports.
- load credits and/or functions from the file 'Leonova.txt'
- upgrade a Leonova version from the file 'P70.EXE'
- display and print a credit log containing all events in connection with measurements 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.

A safety copy of the Leonova measurement file can be used to export one or more measuring points and, for example, send them to SPM for technical advice.

The file 'Leonova.txt' can contain measuring credits and/or Leonova function 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.

Ordering number

PRO49 Leonova Service Program

The credits required for a measuring round and the tank status are displayed by 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
Shock pulse method dBm/dBc	1
Shock pulse method LR/HR	2
SPM Spectrum	2
Vibration ISO 10816 with spectrum	1
EVAM evaluated vibration analysis /time signal	2
FFT with symptom	2
2 channel simultaneous vibration measurement	4
Orbit analysis	5
Run up/Coast down	50
Bump test	25
Balancing, 1 plane 4 runs	16
Balancing, 1 plane 2 runs	42
Balancing, 2 plane	80
Shaft alignment	30



Leonova™ Infinity – Protective cover 15310



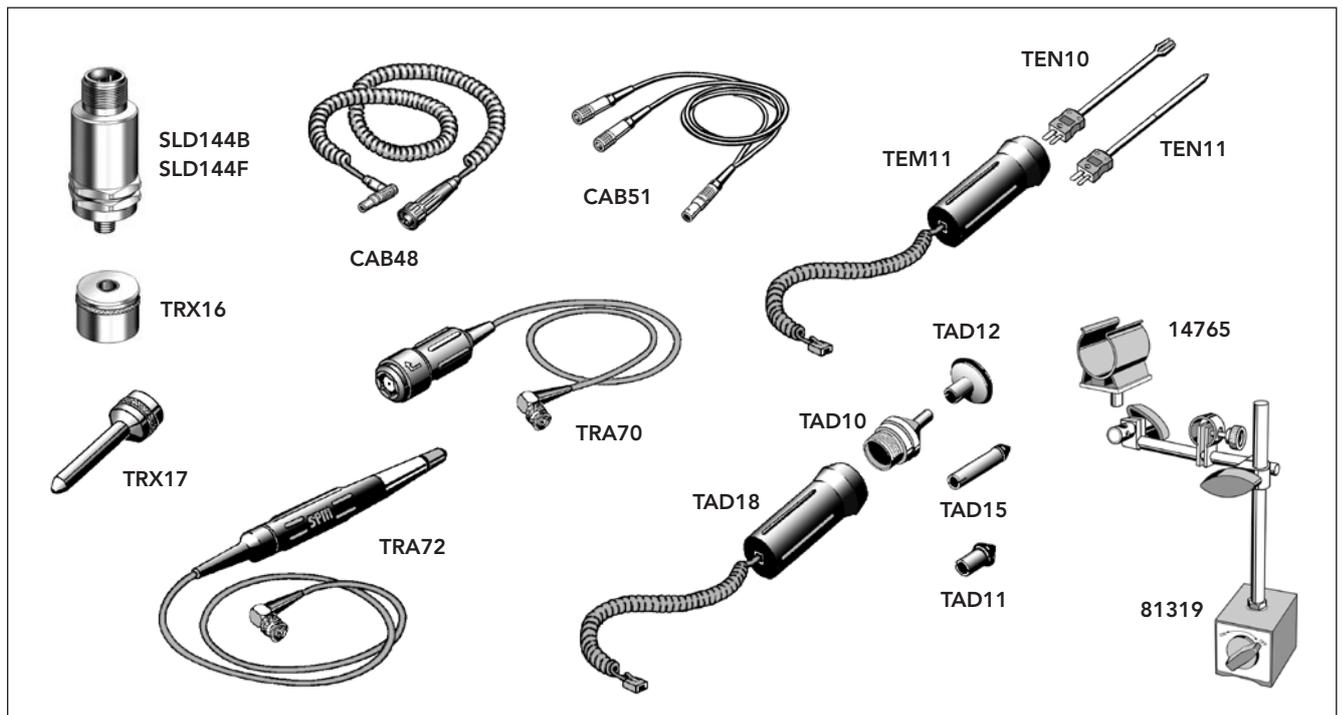
Protective cover 15310 is an optional accessory for the hand-held machine condition analyser Leonova™ Infinity. The cover, made of foamed polyester fabric, protects the instrument against shocks, splashes and dirt (IP64). The transparent plastic window makes Leonova easy to operate via the keypad and can be opened to facilitate the use of the touch screen. The cover is provided with holders for wrist strap and stylus.

Technical specifications

Material:	Polyester fabric with foam lining and window of soft transparent PVC foil
Fastenings, seals:	Velcro tape, polyamide
Weight:	95 g



Leonova™ Infinity – Transducers and measuring cables



Transducers and measuring cables for Leonova™ Infinity are selected in accordance with the individual instrument's range of measuring functions. The ordering numbers are listed below.

For shock pulse monitoring, only use original SPM shock pulse transducers. For vibration monitoring, any vibration transducer with voltage output can be used.

Shock pulse monitoring

- TRA70 Shock pulse transducer with quick connector for measuring adapters
- TRA72 Shock pulse transducer with probe
- CAB36 Measuring cable, BNC slip-on, 1.5 m
- EAR10 Earphone in ear defenders, headset, with cable
- EAR11 Earphone in ear defenders, for helmet, with cable

Vibration monitoring

- SLD144B Vibration transducer M8 (2-10 000 Hz)
- SLD144F Vibration transducer UNF 1/4"-28 (2-10 000 Hz)
- TRX16 Magnetic foot for vibration transducer M8
- TRX17 Probe for vibration transducer M8
- CAB38 Measuring cable, spiral, Lemo-TNC
- CAB39 Measuring cable, spiral, angle Lemo-TNC
- CAB48 Measuring cable, spiral, angle Lemo-2 pin
- CAB48-L Measuring cable, Lemo-2 pin (L=length in m)
- CAB51 2 channel measuring cable, Lemo-Lemo
- CAB41 Communication cable for 'iLearn'

Temperature monitoring

- TEN10 Temperature probe tip, surface
- TEN11 Temperature probe tip, liquid
- TEM11 Temperature probe with cable

Current and voltage monitoring

- CAB42 Cable for analog signals

Speed monitoring

- TAD10 Contact adapter for tachometer probe
- TAD11 Contact centre, rpm, short
- TAD15 Contact centre, rpm, long
- TAD12 Contact wheel, meter/min.
- TAD13 Contact wheel, yards/min.
- TAD17 Contact wheel, feet/min.
- TAD14 Reflecting tape, pad of 5 sheets
- TAD16 Reflecting tape for thin shafts, 5 sheets
- TAD18 Tachometer probe with cable

Balancing

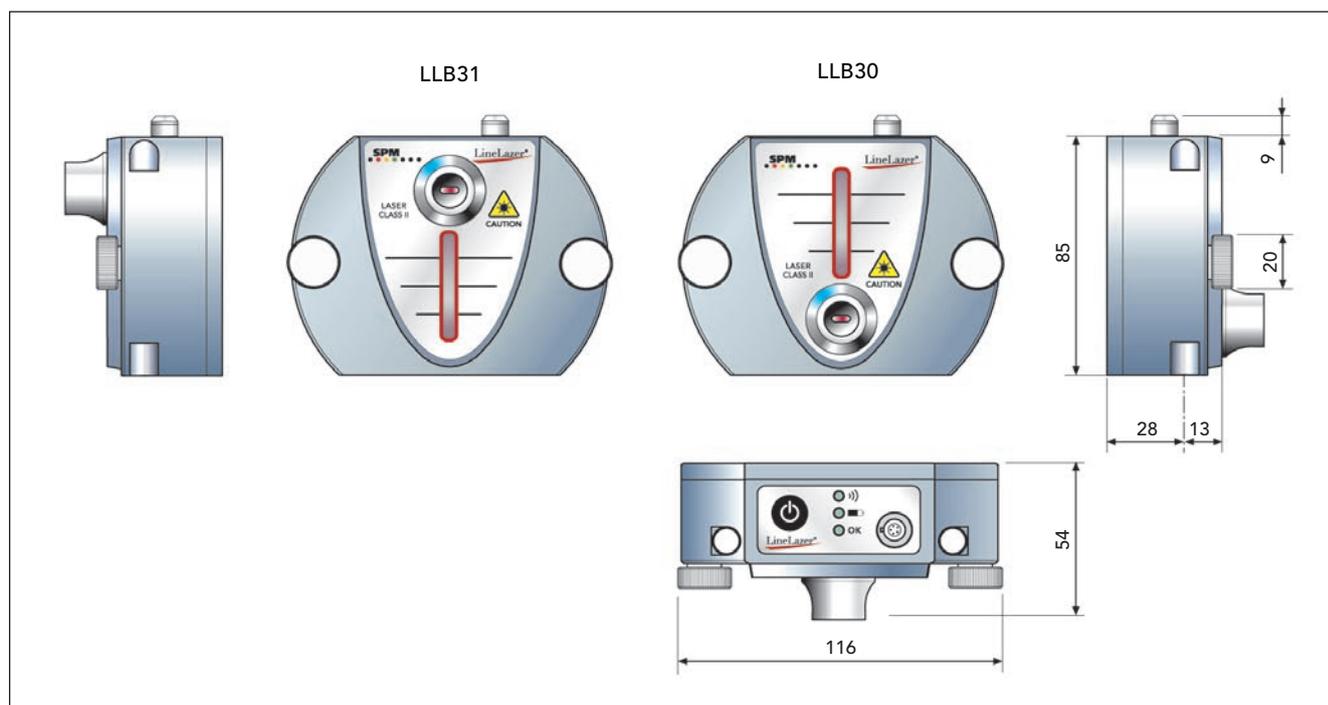
- CAB43 Cable for TAD18, length 5 m
- 81319 Magnetic base
- 14765 Holder for tachometer probe TAD18

Spare parts

- 13108 Sleeve for probe tip (TRA-72)
- CAB37 Cable for TRA-72, 1.5 m (5 ft)
- CAB10 Spiral cable for TAD-18, TMM-11



Leonova™ Infinity – LineLazer™ detector units



LineLazer™ LLB30 and LLB31 are two detector/transmitter units for shaft alignment with the multi-function datalogger Leonova™. The detectors are identical with exception of the position of laser diode and sensor.

Using a horizontally spread laser beam in combination with a 37 mm vertical sensor (PSD) makes fine tuning unnecessary. The laser beam is modulated and thus easily and automatically distinguished from interfering light sources. The laser beam is not mirrored, both units are true detectors/transmitters. The communication between them is wireless, only one of the units is cable connected to Leonova.

The detector units have integrated double axis precision inclinometers which 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.

The control panel on the detector has a power off switch and LED indicators to show correct aim, battery status, and communication mode. The batteries are recharged with the standard Leonova Infinity chargers SPM 90362 (EU), 90379 (US) or 90380 (UK).

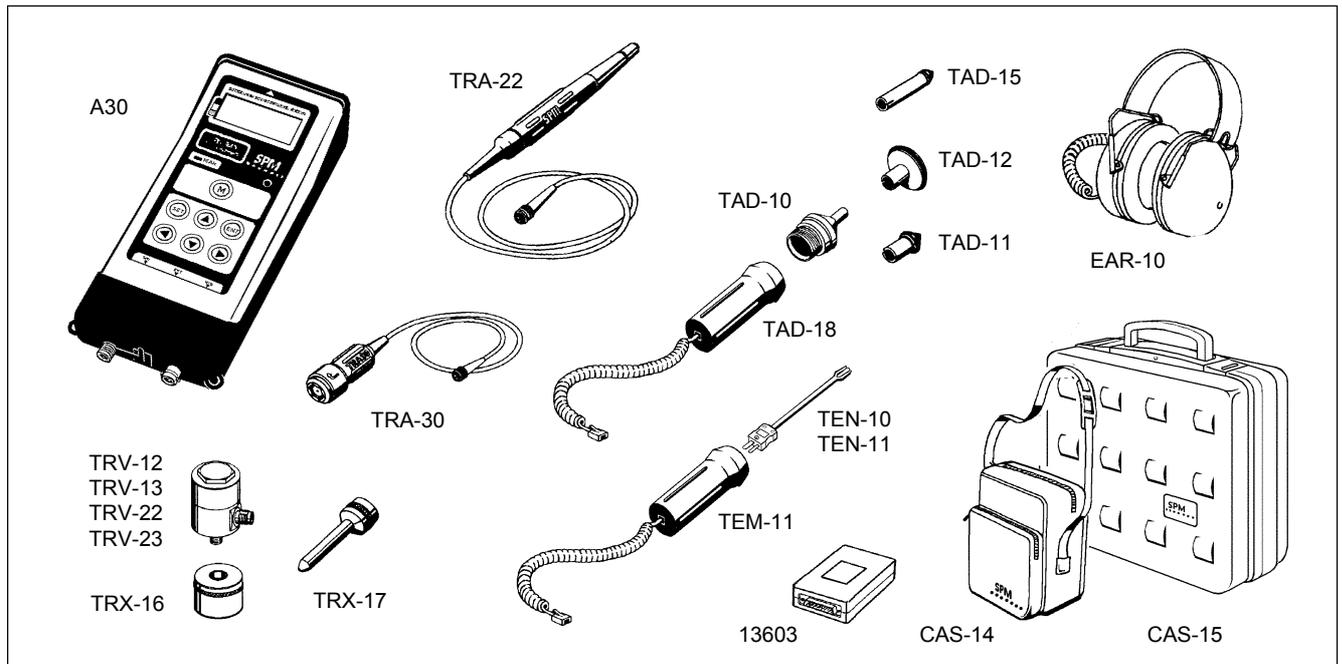
Technical specifications

Laser type:	line laser, visible red light
Laser power :	<1 mW
Laser safety class:	Class 2
Laser wavelength:	635 to 657 nm
Laser modulation:	200 kHz
Sensor resolution :	1 µm
Sensor linearity :	< 2% deviation
Sensor size :	37 x 1 mm (1.5 x 0.03 in)
Operating range :	50 to 3000 mm (2 to 120 in)
Inclinometer resolution :	0.5°
Batteries:	NiMH rechargeable
Operating time :	> 16 hours normal use
Operating temperature:	0 to +50 °C (32 to 122 °F)
Storage temperature:	-25 to +55 °C (14 to 140 °F), non condensing
Keyboard:	sealed membrane
Control indicators:	LED, red/green
Connector type:	LEMO 5 pins, for communication with Leonova and battery charger
Housing:	aluminium, blue anodized
Protection:	IP65
Dimensions:	116 x 94 x 54 mm (4.6 x 3.7 x 2.1 in)
Weight:	450 g

Patent No.: US7301616, SE 0400586-4



Machine Condition Analyzer A30



Part Numbers

A30-1	Machine Condition Analyzer A30 Basic
A30-2	Machine Condition Analyzer A30 Logger
A30-3	Machine Condition Analyzer A30 Expert
13603	Communication module
CAB-31	Computer cable, male 25 pins- female 25 pins
CAB-32	Computer cable, male 25 pins- female 9 pins
CAS-14	Carrying case
CAS-15	Carrying case with foam insert
EMD-13	Carrying strap
FUP-02	Follow-up form for A30, pad of 25 (mm)
FUP-04	Follow-up form for A30, pad of 25 (inch)

Shock pulse monitoring

TRA-20	Quick conn. transducer for measuring stud
TRA-22	Shock pulse transducer, probe assembly
TRA-30	Shock pulse transd. with quick connector
EAR-10	Earphone in eardefenders, headset, incl. cable
EAR-11	Earphone in eardefenders, for helmet, incl. cable
CAB-07	Cable for remote monitoring, 1.5 m (6 ft)

Vibration monitoring

TRV-12	Vibration transducer M8 (0-1000 Hz)
TRV-13	Vibration transducer UNF 1/4"-28 (0-1000 Hz)
TRV-22	Vibration transducer M8 (0-5000 Hz)
TRV-23	Vibration transducer UNF 1/4"-28 (0-5000 Hz)
TRX-16	Magnetic foot for vibration transducer
TRX-17	Probe for vibration measurement
VIC-19	Cable for vibration transducer, 1.5 m

Speed monitoring

TAD-10	Contact adapter for tachometer probe
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
TAD-18	Tachometer probe with cable

Temperature monitoring

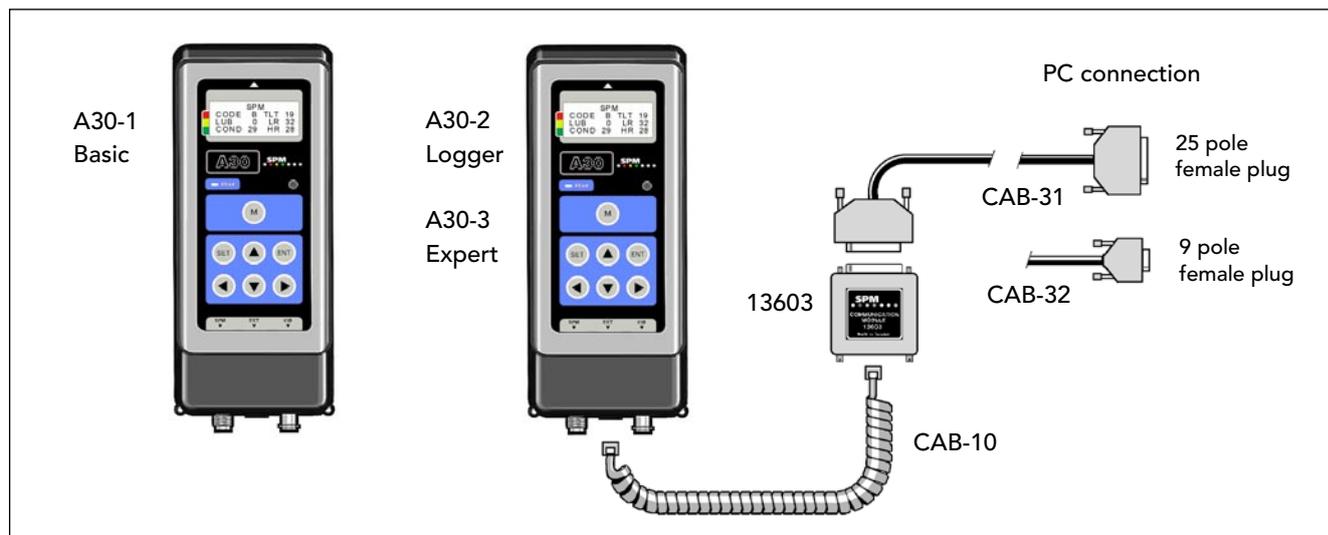
TEN-10	Temperature probe tip, surface
TEN-11	Temperature probe tip, liquid
TEM-11	Temperature probe with cable

Spare parts

13108	Sleeve for probe tip (TRA-22)
CAB-02	Cable for TRA-20, 1.5 m (5 ft)
CAB-06	Cable for TRA-22, 1.5 m (5 ft)
CAB-10	Spiral cable for TAD-18, TEM-11
CAB-30	Cable for TRA-30
90022	Battery 1.5 V, alkaline, AA-cell



Machine Condition Analyzer A30



A30 is a machine condition analyzer designed for a reliable preventive maintenance of industrial machines. A30 is available in three versions. With "Basic", measuring results are recorded manually. "Logger" is a data logger and works together with SPM software Condmaster®. "Expert" has all the logger features. In addition, it uses the EVAM® method for vibration analysis. A "Basic" version can be upgraded to "Logger" and "Expert".

Measuring techniques and other features	Analyzer A30		
	Basic	Logger	Expert
Shock pulse, LR/HR	●	●	●
Vibration severity, ISO 10816	●	●	●
Temperature measurement	●	●	●
Speed, contact and optical	●	●	●
Continuous reading	●	●	●
Data logging with Condmaster®		●	●
Measuring point identification with CondID®		●	●
Alternative measuring systems		●	●
Selectable comments		●	●
Display of check points		●	●
Long time recording		●	●
Vibration spectrum			●
Evaluated vibration analysis (EVAM)			●

Instrument specifications

General features:	language selection, battery test, continuous reading, transducer line test, automatic idle / power off
Temperature range:	0 to 50 °C (32 to 120 °F)
Power supply:	6 x 1.5V LR6 alkaline cells
Battery life:	power down 1 year, or 5000 typical measurements, or continuous recording 50 hours
Size:	255 x 105 x 60 mm (10 x 4.2 x 2.4 in)
Weight:	0.85 kg (1.9 lb.)
Casing / protective cover:	ABS / polyurethane
Keypad:	sealed membrane
Display:	LCD, 4x16 characters, LED backlight, adjustable, automatic on/off
Memory:	typical 500, max. 999 meas. points
Backup, memory/clock:	approx. 24 hours
Meas. point identification:	read and write to CondID®
Reading distance:	max. 50 mm

Shock pulse (SPM® LR/HR)

Measuring range:	-19 to 99 dBsv
Resolution:	1 dBsv
Accuracy:	± 1 dBsv

Vibration severity (ISO 10816)

Measuring range:	0.5 to 49.9 mm/s RMS (0.02 to 2.0 in/s RMS)
Resolution:	0.1 mm/s (0.01 in/s)
Accuracy:	± (0.2 mm/s + 2% of reading)
Frequency range:	3 to 1000 Hz

Speed measurement

Measuring range:	10 to 19 999 rpm optical
Measuring distance:	max. 0.6 m (2 ft.)
Resolution:	1 rpm
Accuracy:	± (1 rev. + 0.1% of reading)

Temperature measurement

Measuring range:	-50 to +440 °C (-58 to 824 °F)
Resolution:	1 °C (1 °F)

Alternative measuring systems

No. per meas.point:	2
Additional information:	date / time and comments

Long time recording

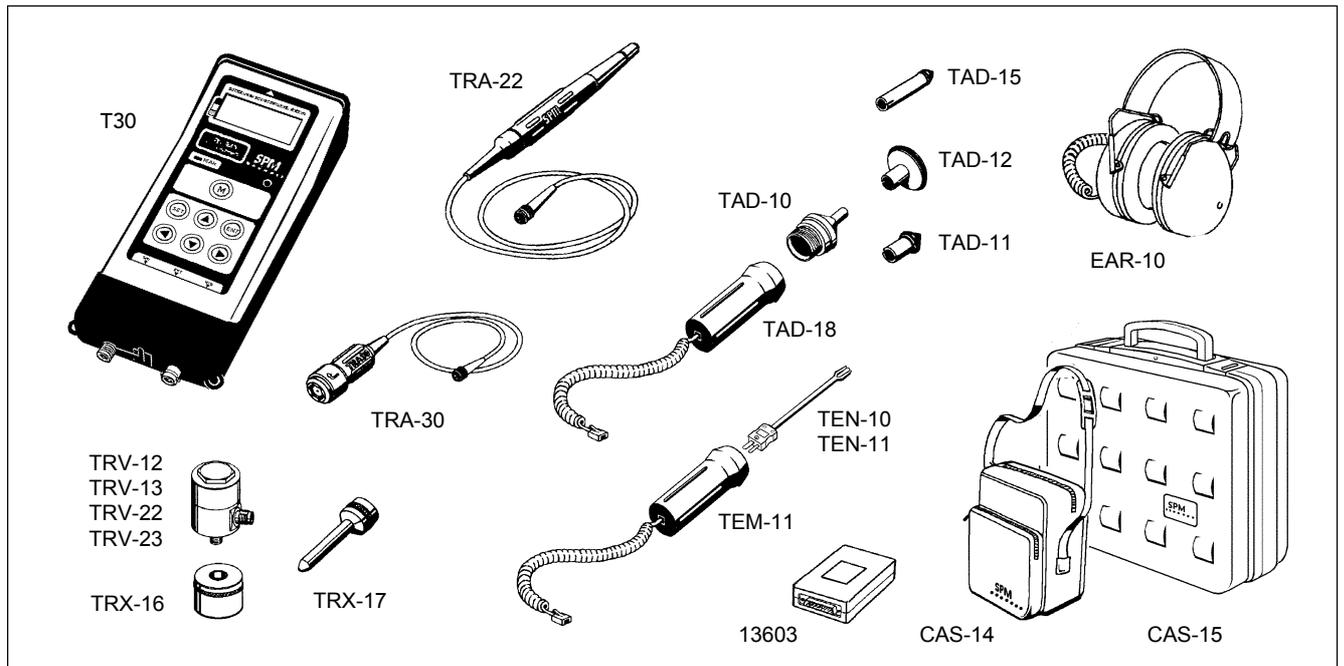
Measuring parameters:	SPM, VIB, temperature/speed
Measuring interval:	adjustable 0 to 60 minutes

Vibration analysis (EVAM®)

Window:	Hanning
Number of samples:	1024 / 2048
FFT result:	400 / 800 spectrum lines
Range, resolution at 400 / 800 lines:	3 to 200 Hz, 0.5 / 0.25 Hz 3 to 500 Hz, 1.25 / 0.625 Hz 3 to 1000 Hz, 2.5 / 1.25 Hz 3 to 2000 Hz, 5.0 / 2.5 Hz 3 to 5000 Hz, 12.5 / 6.25 Hz
Lines displayed:	15 highest, toggle Hz / cpm
Lines saved:	1 to 200 highest



Machine Condition Tester T30



Part Numbers

T30-1	Machine Condition Tester T30 Basic
T30-2	Machine Condition Tester T30 Logger
T30-3	Machine Condition Tester T30 Expert
13603	Communication module
CAB-31	Computer cable, male 25 pins- female 25 pins
CAB-32	Computer cable, male 25 pins- female 9 pins
CAS-14	Carrying case
CAS-15	Carrying case with foam insert
EMD-13	Carrying strap
FUP-01	Follow-up form for T30, pad of 25 (mm)
FUP-03	Follow-up form for T30, pad of 25 (inch)

Shock pulse monitoring

TRA-20	Quick conn. transducer for measuring stud
TRA-22	Shock pulse transducer, probe assembly
TRA-30	Shock pulse transd. with quick connector
EAR-10	Earphone in eardefenders, headset, incl.cable
EAR-11	Earphone in eardefenders, for helmet, incl. cable
CAB-07	Cable for remote monitoring, 1.5 m (6 ft)

Vibration monitoring

TRV-12	Vibration transducer M8 (0-1000 Hz)
TRV-13	Vibration transducer UNF 1/4"-28 (0-1000 Hz)
TRV-22	Vibration transducer M8 (0-5000 Hz)
TRV-23	Vibration transducer UNF 1/4"-28 (0-5000 Hz)
TRX-16	Magnetic foot for vibration transducer
TRX-17	Probe for vibration measurement
VIC-19	Cable for vibration transducer, 1.5 m

Speed monitoring

TAD-10	Contact adapter for tachometer probe
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
TAD-18	Tachometer probe with cable

Temperature monitoring

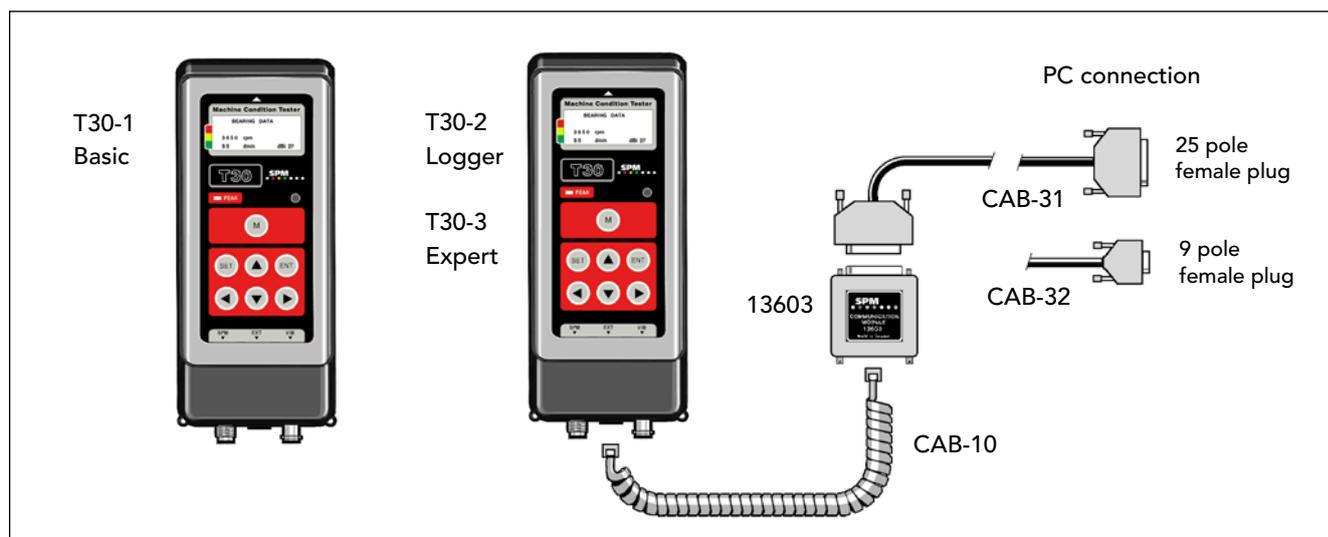
TEN-10	Temperature probe tip, surface
TEN-11	Temperature probe tip, liquid
TEM-11	Temperature probe with cable

Spare parts

13108	Sleeve for probe tip (TRA-22)
CAB-02	Cable for TRA-20, 1.5 m (5 ft)
CAB-06	Cable for TRA-22, 1.5 m (5 ft)
CAB-10	Spiral cable for TAD-18, TMM-11
CAB-30	Cable for TRA-30
90022	Battery 1.5 V, alkaline, AA-cell



Machine Condition Tester T30



T30 is a machine condition tester designed for a reliable preventive maintenance of industrial machines. T30 is available in three versions. With "Basic", measuring results are recorded manually. "Logger" is a data logger and works together with SPM software Condmaster®. "Expert" has all the logger features. In addition, it uses the EVAM® method for vibration analysis. A "Basic" version can be upgraded to "Logger" and "Expert".

Measuring techniques and other features	Tester T30		
	Basic	Logger	Expert
Shock pulse, dBm/dBc	●	●	●
Vibration severity, ISO 10816	●	●	●
Temperature measurement	●	●	●
Speed, contact and optical	●	●	●
Continuous reading	●	●	●
Data logging with Condmaster®		●	●
Measuring point identification with CondID®		●	●
Alternative measuring systems		●	●
Selectable comments		●	●
Display of check points		●	●
Long time recording		●	●
Vibration spectrum			●
Evaluated vibration analysis (EVAM)			●

Instrument specifications

General features:	language selection, battery test, continuous reading, transducer line test, automatic idle / power off
Temperature range:	0 to +50 °C (32 to 120 °F)
Power supply:	6 x 1.5V LR6 alkaline cells
Battery life:	power down 1 year, or 5000 typical measurements, or continuous recording 50 hours
Size:	255x105x60 mm (10 x 4.2 x 2.4 in)
Weight:	0.85 kg (1.9 lb)
Casing / protective cover:	ABS / polyurethane
Keypad:	sealed membrane
Display:	LCD, 4x16 characters, LED backlight, adjustable, automatic on/off
Memory:	typical 500, max. 999 meas. points
Backup, memory/clock:	approx. 24 hours
Meas. point identification:	read and write to CondID®
Reading distance:	max. 50 mm

Shock pulse (SPM® dBm/dBc)

Measuring range:	-9 to 99 dBsv
Resolution:	1 dBsv
Accuracy:	± 1 dBsv

Vibration severity (ISO 10816)

Measuring range:	0.5 to 49.9 mm/s RMS (0.02 to 2.0 in/s RMS)
Resolution:	0.1 mm/s (0.01 in/s)
Accuracy:	± (0.2 mm/s + 2% of reading)
Frequency range:	3 to 1000 Hz

Speed measurement

Measuring range:	10 to 19 999 rpm optical
Measuring distance:	max. 0.6 m (2 ft.)
Resolution:	1 rpm
Accuracy:	± (1 rev. + 0.1% of reading)

Temperature measurement

Measuring range:	-50 to +440 °C (-58 to +824 °F)
Resolution:	1 °C (1 °F)

Alternative measuring systems

No. per meas.point:	2
Additional information:	date / time and comments

Long time recording

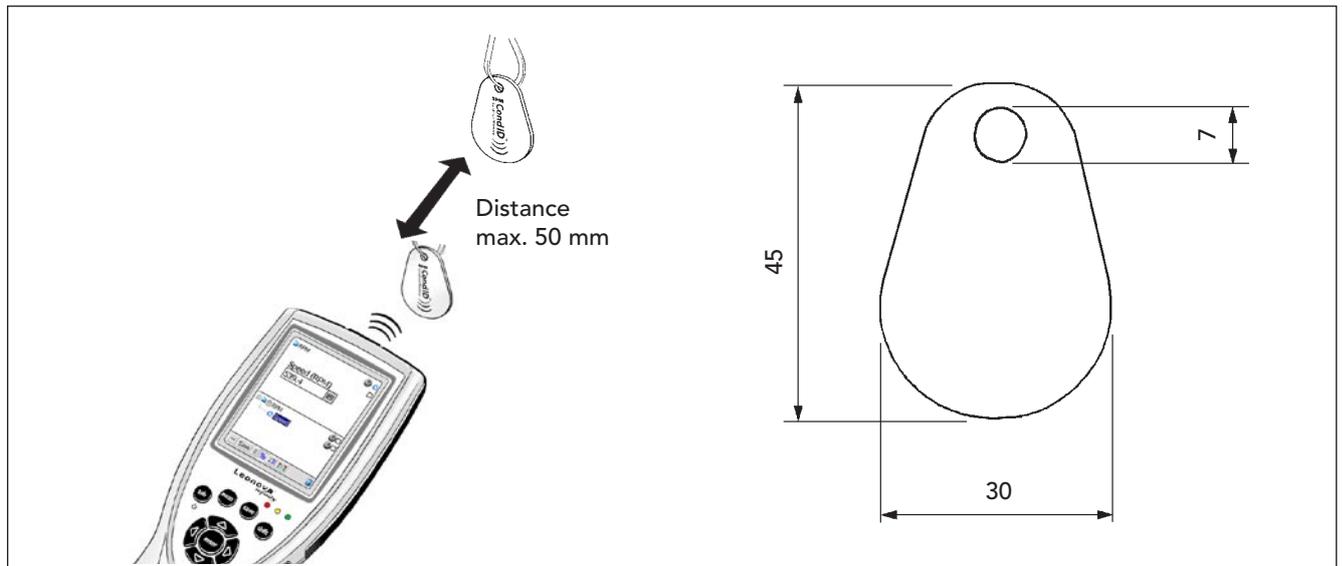
Measuring parameters:	SPM, VIB, temperature/speed
Measuring interval:	adjustable 0 to 60 minutes

Vibration analysis (EVAM®)

Window:	Hanning
Number of samples:	1024 / 2048
FFT result:	400 / 800 spectrum lines
Range, resolution at 400 / 800 lines:	3 to 200 Hz, 0.5 / 0.25 Hz 3 to 500 Hz, 1.25 / 0.625 Hz 3 to 1000 Hz, 2.5 / 1.25 Hz 3 to 2000 Hz, 5.0 / 2.5 Hz 3 to 5000 Hz, 12.5 / 6.25 Hz
Lines displayed:	15 highest, toggle Hz / cpm
Lines saved:	1 to 200 highest



CondID[®], Condition Memory



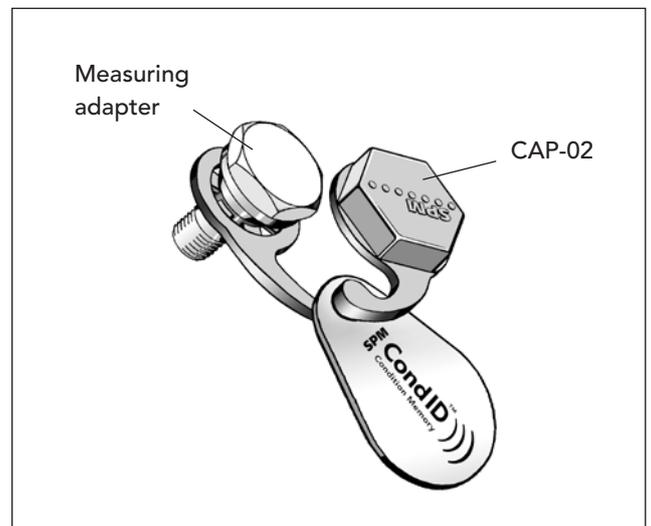
CondID[®] is a contact free memory tag used for measuring point recognition and condition memory, used with Leonova and the "Logger" and "Expert" versions of Tester T30 and Analyzer A30. It is hung on the adapter cap or strapped in a suitable place on the machine. It should not be mounted flat against 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.



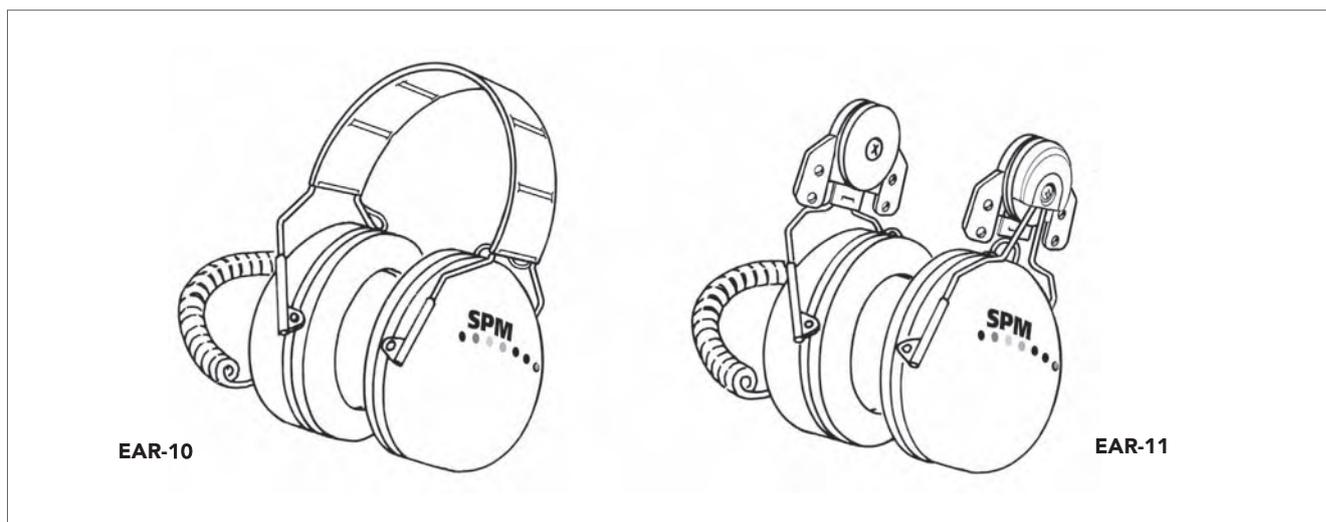
Specifications:

Memory:	116 bytes
Supported techniques:	dBm/dBc, LR/HR, ISO2372, ISO10816, EVAM/FFT, RPM, user defined 1 & 2 and checkpoints
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

EU patent no. 0909430, US patent no. 6499349, 6725723.



Earphones in eardefenders EAR-10 / EAR-11



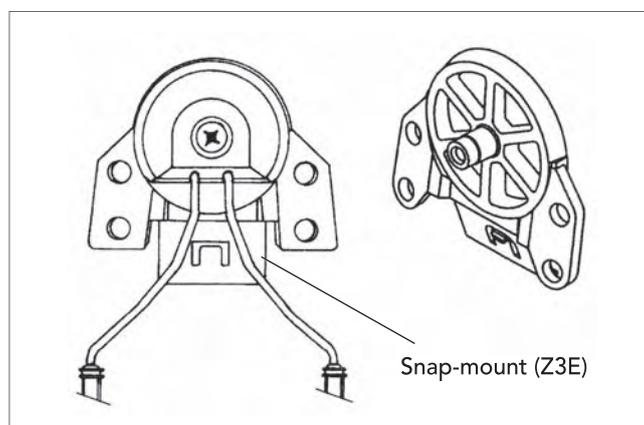
EAR-10 and EAR-11 are specially selected earphones, providing excellent sound reproduction even in noisy environments.

- 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, 0.75 to 1.4 m, of soft spiral polyurethane with a modular telephone connector.

The earphones with eardefenders are tested and approved in accordance with PPE directive 89/1686/EEC and EMC directive 89/336/EEC to meet the demands for CE labelling.

Headset, EAR-10

The headset EAR-10 is a mono telephone set with two parallel connected earphones. It has a collapsible headband for convenient storage when you are not using the earphones with eardefenders.



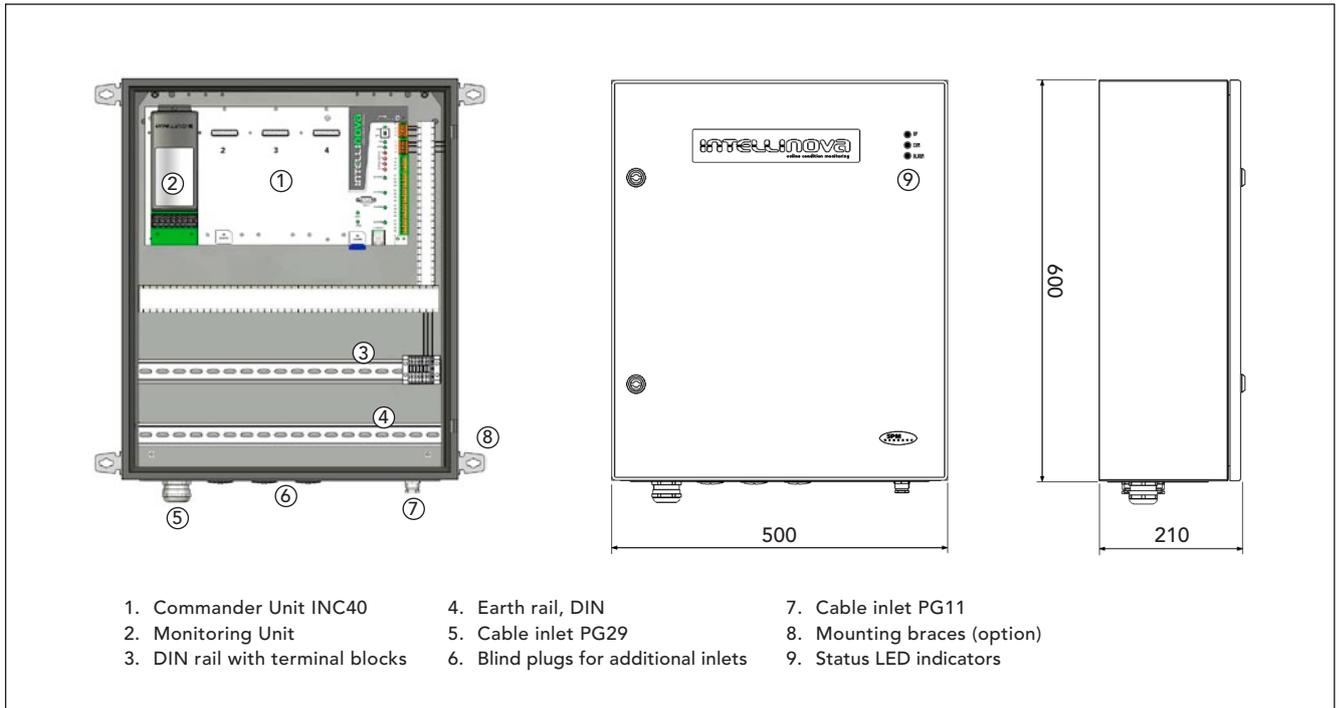
Earphones for helmet, EAR-11

Earphones EAR-11 fit most safety helmets available in the market today. The earphones 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.



Intellinova® – System Unit INS10



The Intellinova System Unit INS10 is comprised of an industrial enclosure, a Commander Unit, 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 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 and status indicators on the lid. Power supply unit, accessories for DIN rails, internal cabling and cable inlets 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. Cable inlets and accessories for DIN rails are described on TD-289.

Technical specifications, INS10

Design, enclosure:	enamelled steel, IP66
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)
Cable inlets:	1 PG29 for 8 measuring cables 2 PG11 for power supply and network connection
Terminals:	7 terminal blocks for connection of power supply
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. 21 kg (46 lbs)

Monitoring Units

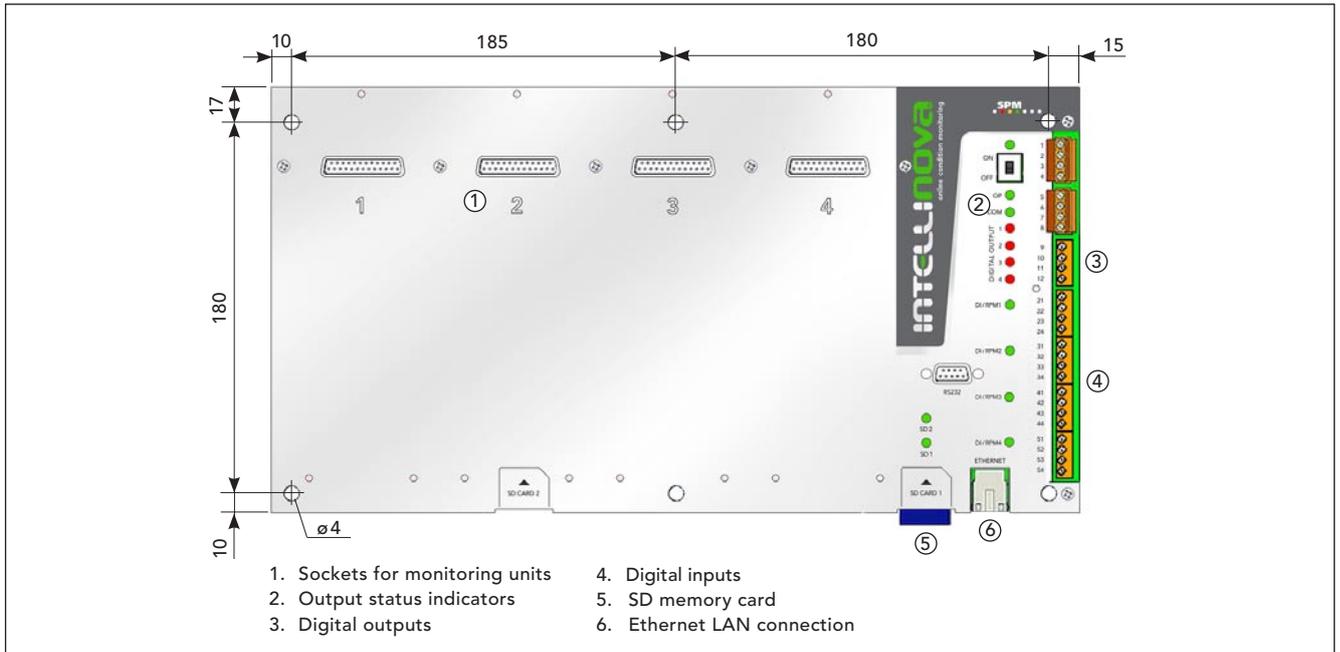
INB80	Bearing Monitoring Unit for SPM transducers of type 40000 (TD-272)
INB82	Bearing Monitoring Unit for SPM transducers of type 42000 (TD-272)
INV80A	Vibration Monitoring Unit, screw terminals (TD-273)
INAI10	Analog Monitoring Unit (TD-274)
INAO80	Analog Output Unit (TD-275)

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
81325	Mounting braces, 4 pcs



Intellinova® – Commander Unit INC40



The Intellinova Commander Unit INC40 is a flexible and modular platform which controls and communicates with the monitoring units for continuous monitoring 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.

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®Nova.

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®Nova running under Windows. Condmaster also handles portable SPM dataloggers and existing SPM online systems. SQL Server is used as database handler.

Technical data

Monitoring units:	sockets for 4 monitoring units
Digital/RPM inputs:	4 channels
RPM transducer type:	proximity switches, supply 12 V DC
RPM measuring range:	10 – 120 000 rpm
Digital output:	2 status and 4 user configurable
Memory:	SD card, 2 GB
LAN interface:	Ethernet TCP/IP, 10/100 Mbps
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

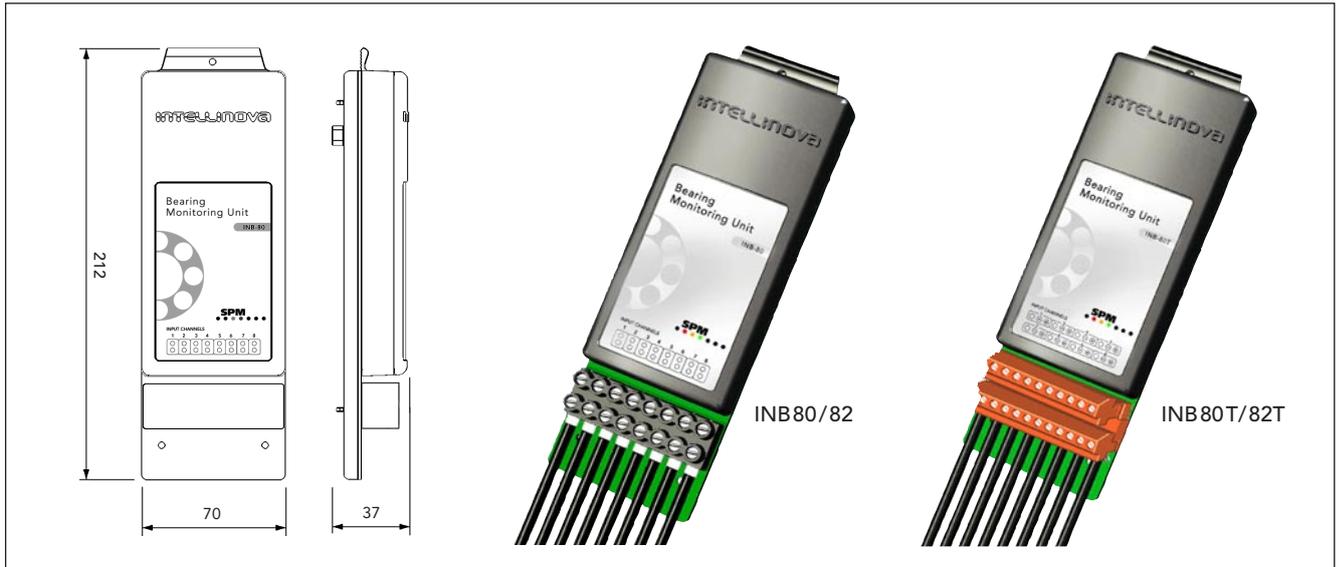
INC40	Commander Unit incl. mounting screws with spacers and 2 screw terminals for power supply and status indicators
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Accessories

93384	Screw terminal, 4 pins, for connection of digital inputs/RPM and digital outputs
90419	SD memory card, 2 GB



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. 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®Nova.

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 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.

Technical data

Measuring methods:	dBm/dBc, LR/HR, SPM Spectrum
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, 10000, 20 000, 40 000 Hz
Number of spectrum lines:	400, 800, 1600, 3200, 6400, 12800
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)
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 INB80/82, for pair cables on INB80T/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
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 (INB80/82)



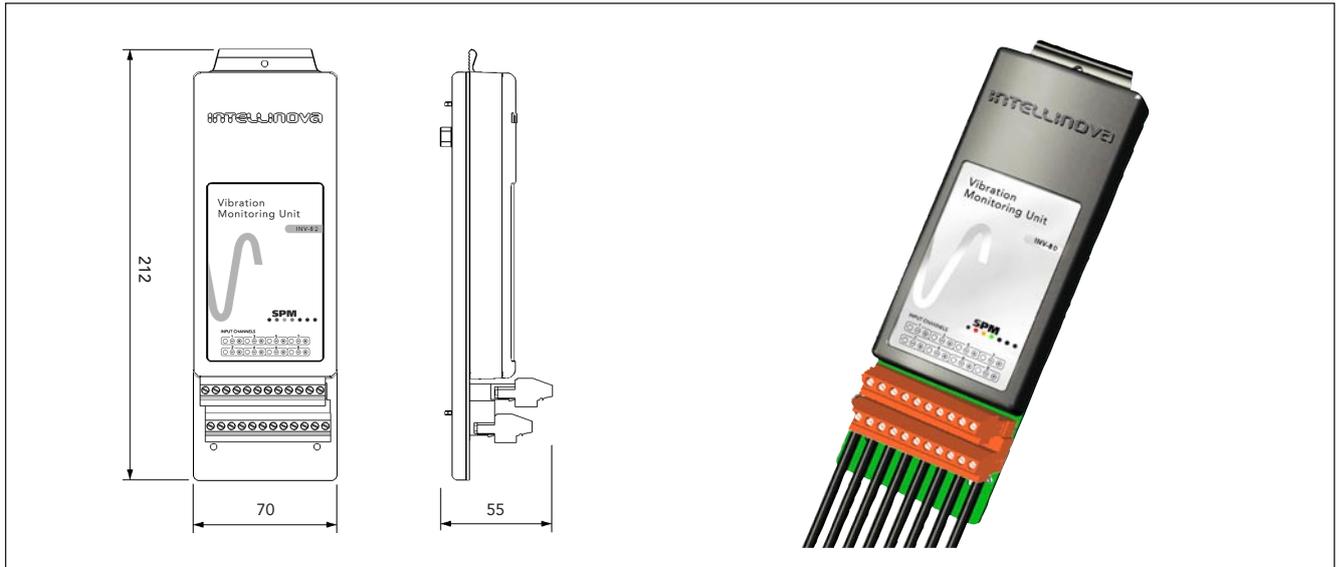
SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden

Tel +46 152 22500 • Fax +46 152 15075 • info@spminstrument.se • www.spminstrument.com



Technical data are subject to change without notice. ISO 9001 certified. © Copyright SPM 2009-01. TD-272 B

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®Nova.

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 FFT with symptoms and EVAM (Evaluated Vibration Analysis Method). 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.

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.

Two channel simultaneous vibration monitoring requires that either the measuring technique 'FFT with symptoms' or 'EVAM' is active in Condmaster Nova. 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.

Technical data

Measuring methods:	ISO 2372, ISO10816, FFT with symptom, 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
Dimensions:	212 x 70 x 37 mm
Weight:	approx. 200 g

Vibration analysis

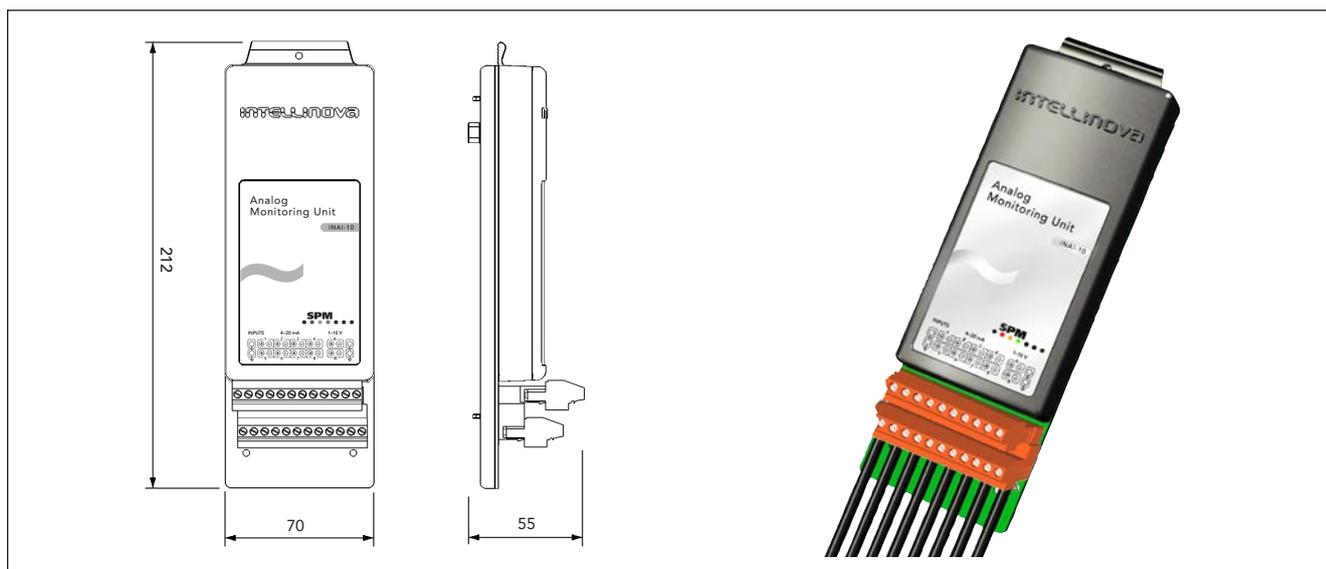
Freq. limit, lower:	0.5, 2, 10 or 100 Hz
Freq. limit, upper:	100, 200, 500, 1000, 2000, 5000, 10000, 20000, 40000 Hz
Envelope HP filters:	100, 200, 500, 1000, 2000, 5000, 10000 Hz
Measur. windows:	Rectangle, Hanning, Hamming, Flat Top
Averages:	time synch, FFT linear, FFT exponential, FFT peak-hold
Spectrum lines:	400, 800, 1600, 3200, 6400, 12800
Transducer types:	Vibration transducer SLD144 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



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 25 mA on eight channels and 1 to 10 V DC on two channels.

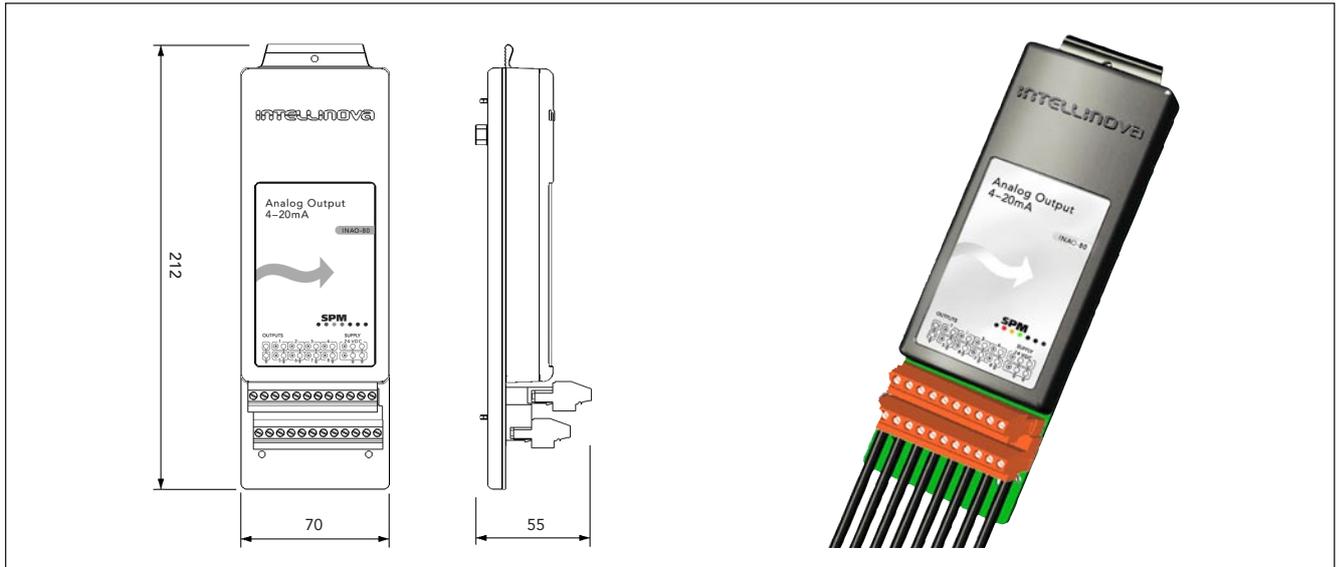
The unit is simply plugged into the socket in the Intellinova Commander Unit. Measuring units, range, quantities, alarm limits etc. are set up in Condmaster®Nova.

Technical data

Current inputs:	8 channels, multiplexing
Voltage inputs:	2 channels, multiplexing
Input resistance:	current 100 Ω , voltage 86 k Ω
Measuring time:	approx. 1 sec. per channel
Measurement range:	0 to 25 mA, 0 to 10 V DC
Resolution:	0.01 mA, 0.01V
Meas. uncertainty:	\pm (1% +0.1 mA)
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 37 mm
Weight:	approx. 200 g



Intellinova® – Analog Output Unit INAO80



The Analog Output Unit INAO80 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.

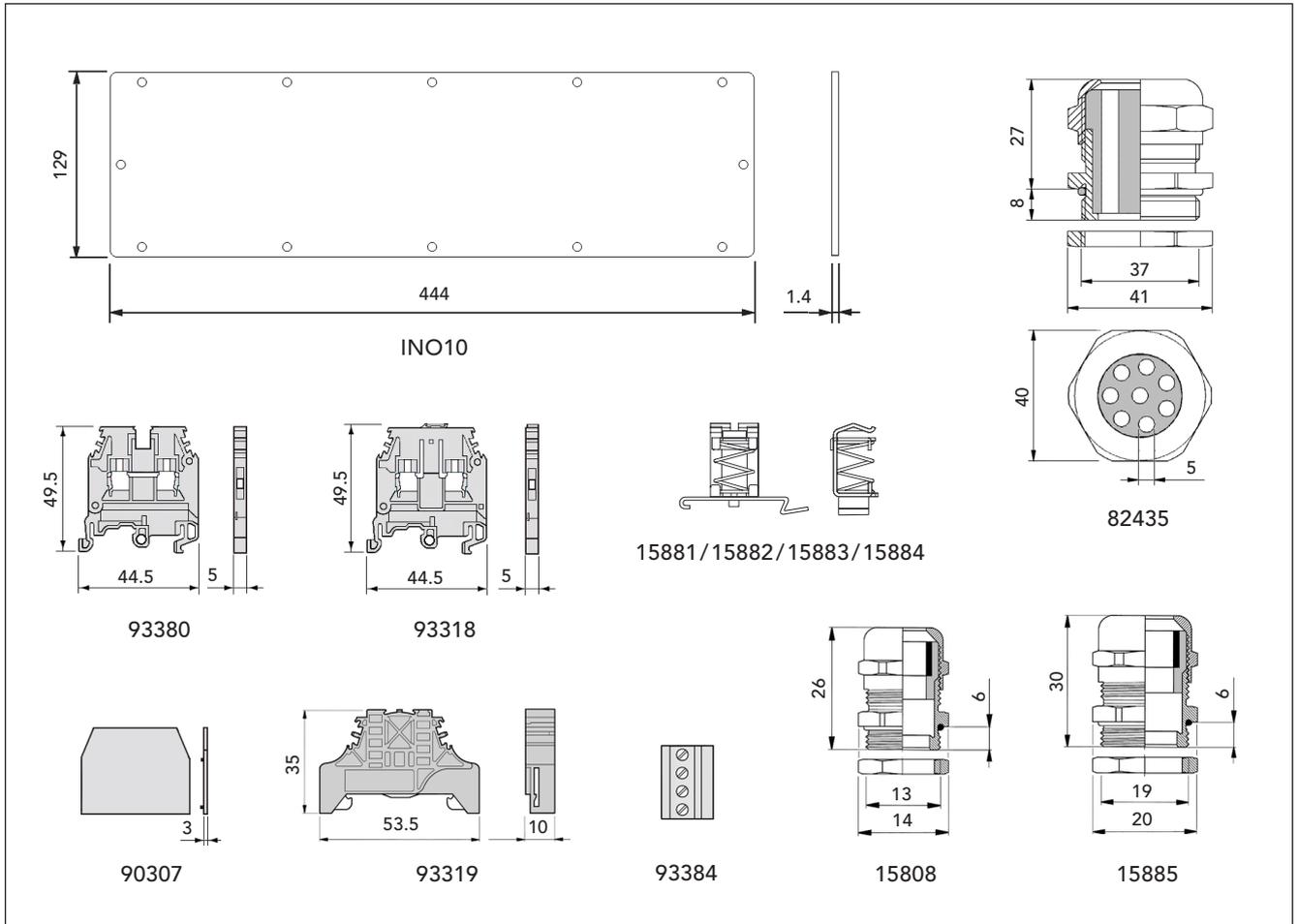
The unit converts the measuring values from the monitoring units to analog signals 4 – 20 mA for connection to PLC, DCS or other control systems.

Technical data

Analog outputs:	8
Output:	4 to 20 mA
Power supply:	18 to 36 V DC, nom. 24 V DC
Output 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 37 mm
Weight:	approx. 200 g



Intellinova® – Accessories for System Unit INS10

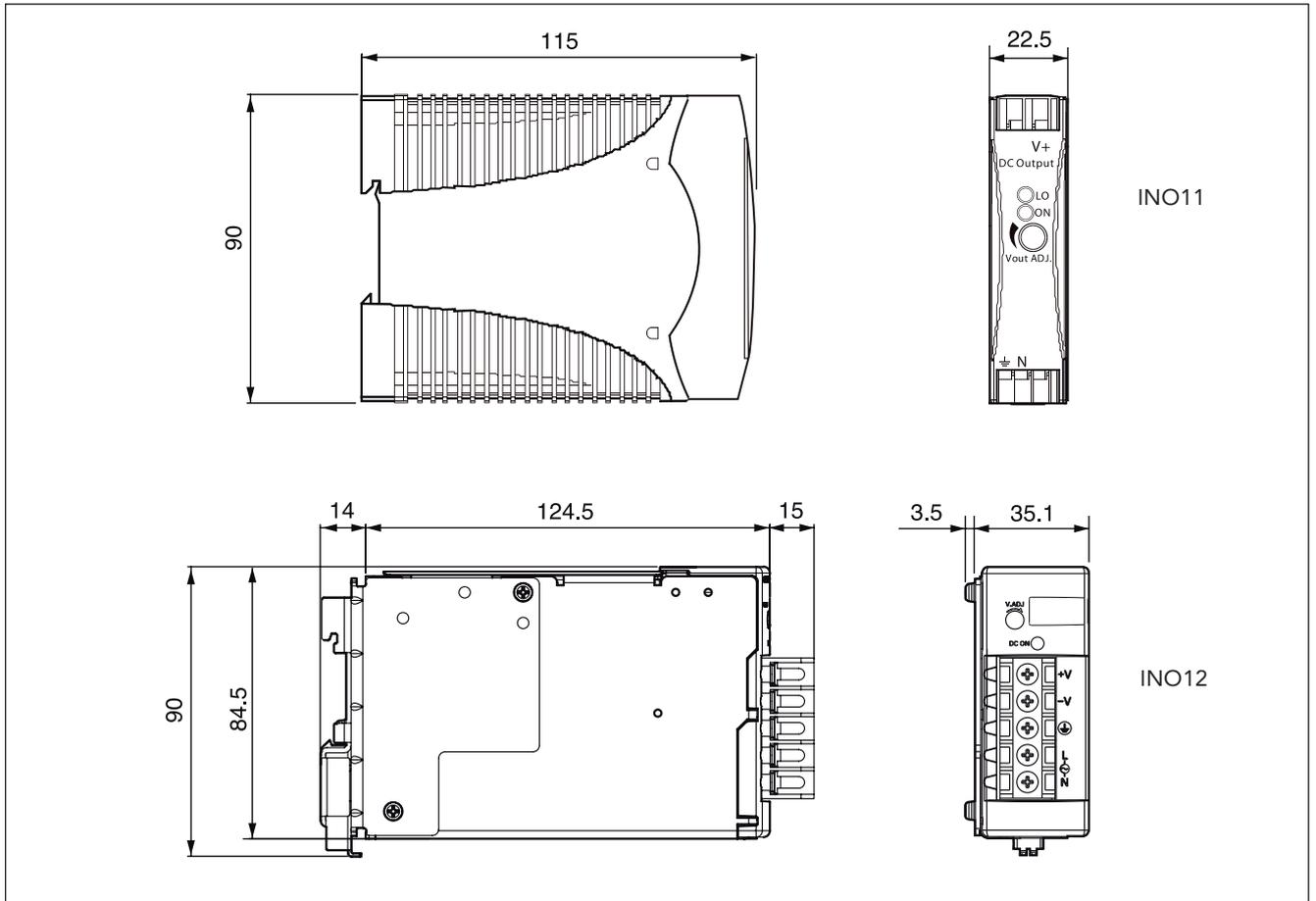


Part numbers

INO10	Blind flange for Intellinova enclosure	82435	Cable inlet, Pg 29, for 8 measuring cables diam. 5 mm, IP65, brass/nickel-plated, PVC sealing
15881	Clamping yoke for earth rail, DIN, cable 3-8 mm	93380	Terminal block for DIN rail, nom. area 2.5 mm ²
15882	Clamping yoke for earth rail, DIN, cable 4-13,5 mm	93318	Switch block for DIN rail, nom. area 2.5 mm ²
15883	Clamping yoke for earth rail, DIN, cable 10-20 mm	90307	End section for switch and terminal block
15884	Clamping yoke for earth rail, DIN, cable 15-32 mm	93319	End stop for DIN rail
15808	Cable inlet, Pg7, for cable 3-6.5 mm, IP68, brass/nickel-plated, Neoprene sealing	93384	Screw terminal, 4 pins, for digital in- and outputs on Commander Unit
15885	Cable inlet, Pg 11, for cable 5-10 mm, IP68, brass/nickel-plated, Neoprene sealing		



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

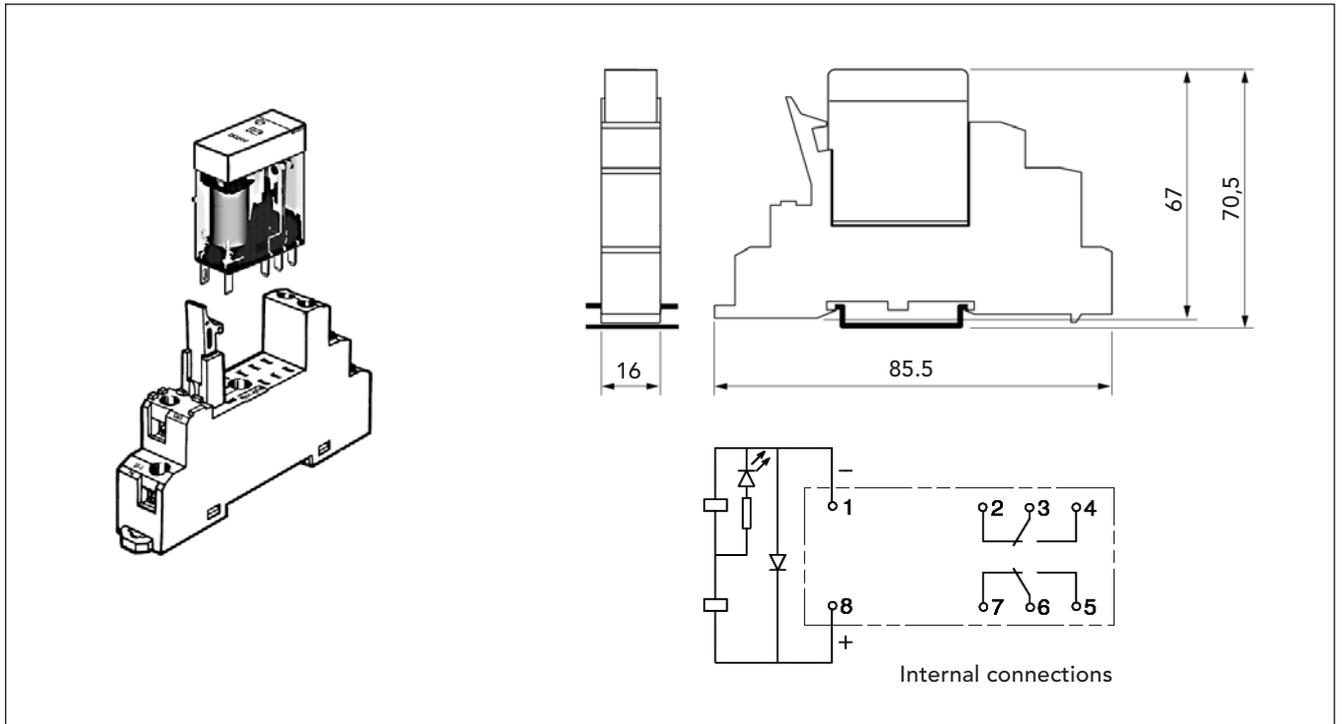
Rated input voltage:	100 to 240 V AC (85 to 265 VAC)
Frequency:	50/60 Hz
Power rating:	18 W
Rated output voltage:	+ 24 V DC
Voltage adjustment range:	-10% to +20%
Output current:	750 mA
Protection:	input fuse, over load, over voltage, output short circuit
Ambient temperature:	-10 to +50 °C
Storage temperature:	-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:	50/60 Hz
Power rating:	50 W
Rated output voltage:	+ 24 V DC
Voltage adjustment range:	-20% to +20%
Rated output current:	2.2 A
Protection:	input fuse, over load, over voltage
Ambient temperature:	-10 to +70 °C
Storage temperature:	-25 to +65 °C (with no icing or condensation)
Relative humidity:	30% to 85% RH
Dimensions (w x h x d):	38.6 x 90 x 153 mm
Approved standards:	UL: UL508 (Listing), UL60950-1, UL1604 (Class I/Division 2, Listing). CSA: cUL: C22.2 No.14, No.213 (Class I/Division 2), cUR: No. 60950-1. EN: EN50178, EN60950-1. SELV (EN60950-1). According to VDE0160/P100 SEMI-F47 (200 VAC input)



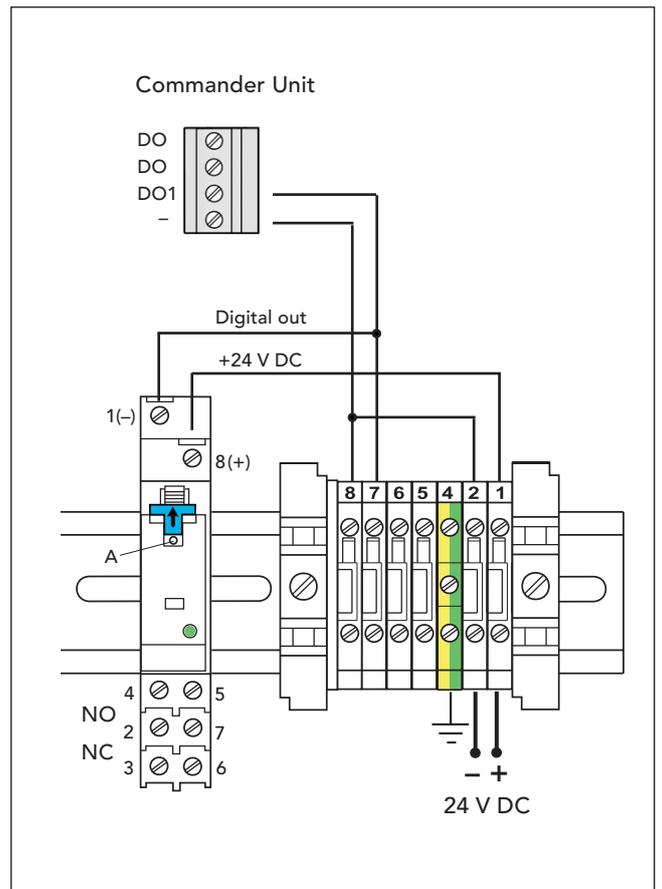
Intellinova® – Relay INO16



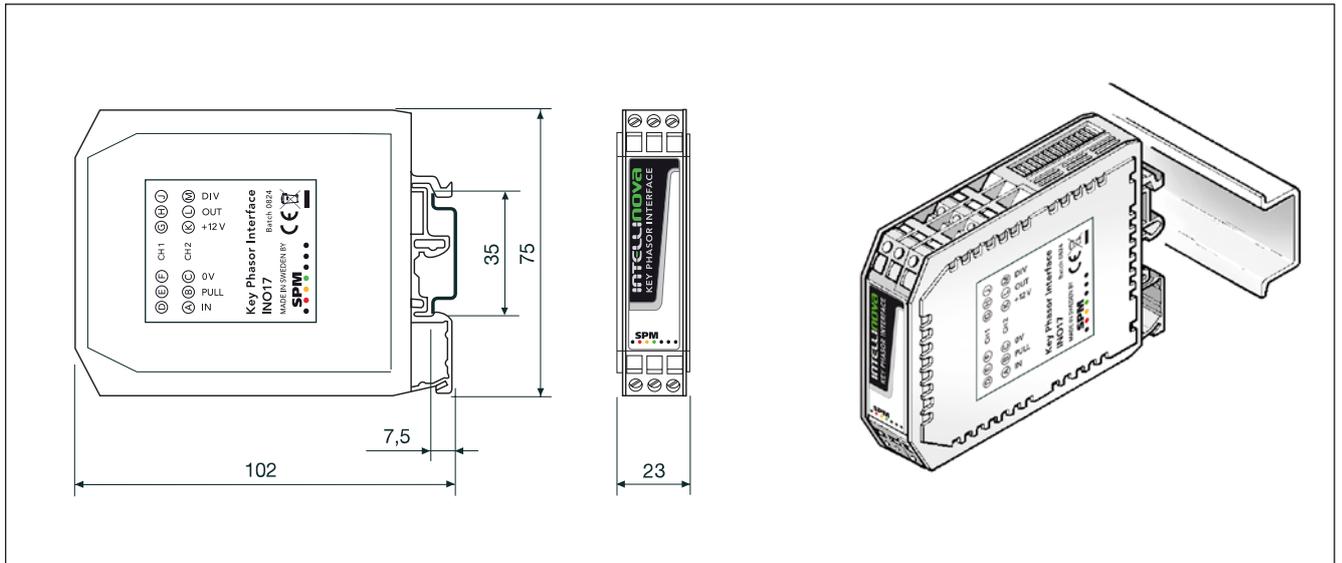
INO16 is a slim relay of plug-in type mounted in a socket for DIN rail mounting. It has a LED indicator showing mechanical operation and a test button (A). The relay is delivered complete with socket and internal cabling for Intellinova System Unit.

Technical specifications, INO16

Poles:	2
Rated coil voltage:	24 VDC
Rated coil current:	21.6 mA
Power consumption:	0.53 W
Load:	resistive load ($\cos\phi = 1$), inductive load ($\cos\phi = 0.4$; L/R=7 ms)
Rated load:	resistive; 5 A/250 VAC, 5 A/30 VDC inductive; 2 A/250 VAC, 3 A/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:	85.5 x 67 x 16 mm
Mounting:	DIN rail
Approved standards:	UL508 (File No. E41643), IEC/VDE (EN61810), CSA 22.2 No.0, No.14 (File No. LR311928), LR



Intellinova® – Key Phasor Interface INO17



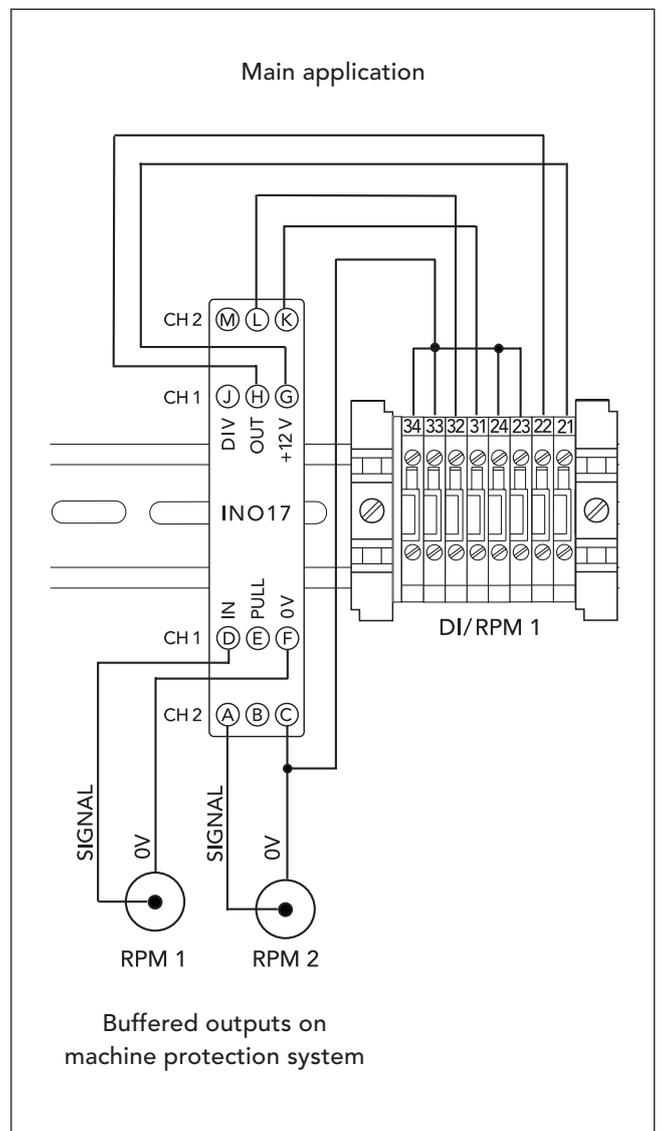
INO17 is a tachometer sensor interface ideal for connecting the Intellinova online system to buffered outputs of a machine protection system. It has two input channels with common 12V power supply from Intellinova. The interface has three main functions:

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.

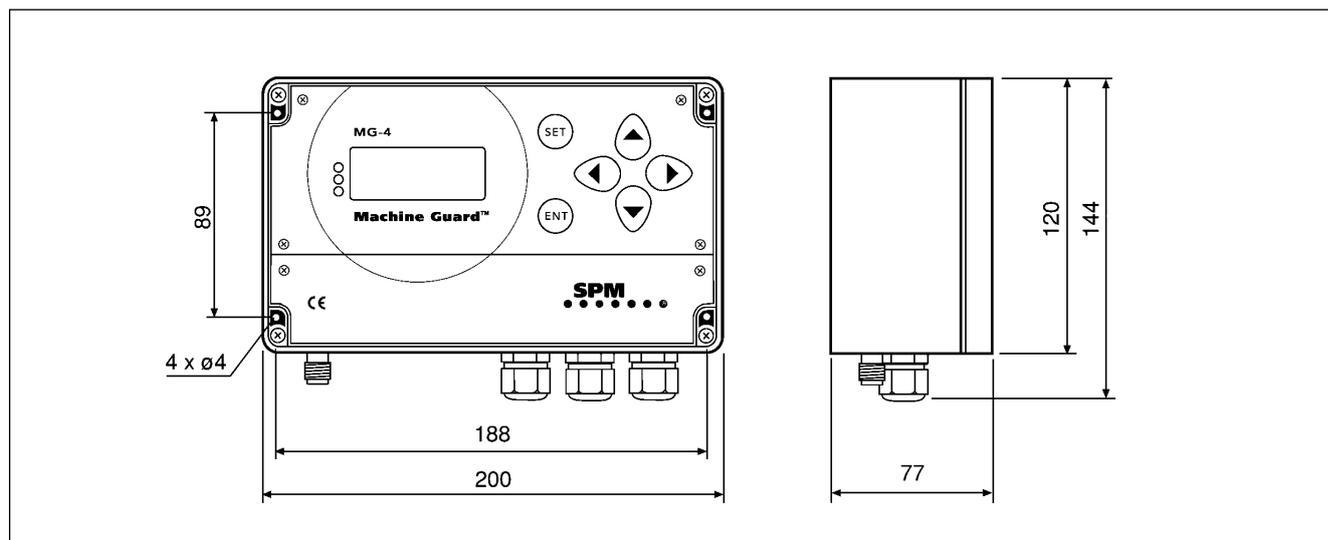
INO17 is intended for DIN rail mounting and is delivered with internal cabling for connection to the terminal blocks for digital input (option) in the Intellinova System Unit.

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 (no condensation)
Amb. humidity:	10% to 90% (operating)
Dimensions:	102 x 23 x 75 mm
Mounting:	DIN rail 35 mm



Machine Guard MG4-1



Machine Guard MG4-1 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 MG4-1 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.

MG4-1 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.

The following options are selected on ordering the unit:

Power supply:

- 230 Vac, 115 Vac or 15 to 30 Vac/Vdc

Vibration channel:

- Lower frequency range 3, 10 or 100 Hz
- Upper frequency range 1000 or 2000 Hz
- Modification for vibration transducers without pre-amplifier (TRV-01, TRV-12/13)

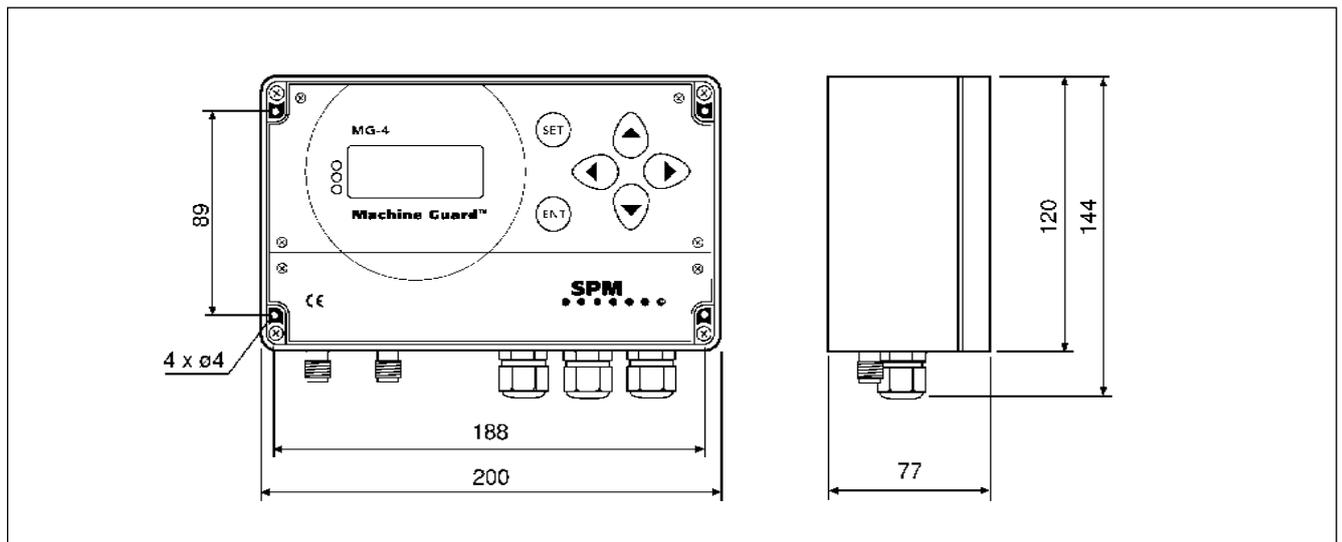
As an option the MG4 can be equipped with a RS-485 port for sending data via a LAN network. MG4 units equipped for network have no analog outputs.

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
Input connector:	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, lower limit:	3, 10, or 100 Hz
Frequency, upper limit:	1000 or 2000 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:	SLD122 or TRV-18/19/20/21 with isolated installation foot TRX-18/19



Machine Guard MG4-2



Machine Guard MG4-2 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 MG4-2 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.

MG4-2 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.

The following options are selected on ordering the unit:

Power supply:

- 230 Vac, 115 Vac or 15 to 30 Vac/Vdc

Vibration channel:

- Lower frequency range 3, 10 or 100 Hz
- Upper frequency range 1000 or 2000 Hz
- Modification for vibration transducers without pre-amplifier (TRV-01, TRV-12/13)

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

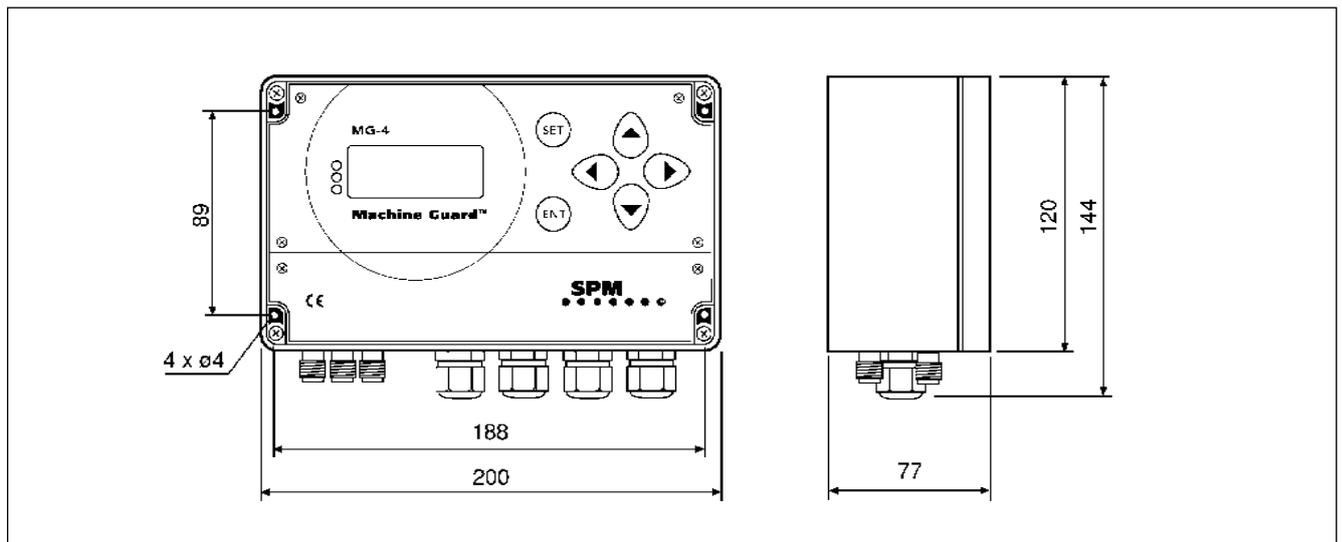
Vibration channels:	2, multiplexing
Analog outputs (2):	4-20 mA, selective range, no galvanic separation
Main relay (1):	250 Vac, 5 A, 1250 VA
Secondary relays (4):	125 Vac, 1 A, 60 VA, 150 Vdc, 1 A, 30 W
Power supply:	230 Vac, 115 Vac or 15 to 30 Vac/Vdc
Power consumption:	max. 6 VA
Temperature range:	0° to 50° C (32° to 122° F)
Casing:	Polycarbonate/PVC, IP65
Input connectors:	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, lower limit:	3, 10, or 100 Hz
Frequency, upper limit:	1000 or 2000 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:	SLD122 or TRV-18/19/20/21 with isolated installation foot TRX-18/19



Machine Guard MG4-12



Machine Guard MG4-12 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 MG4-12 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.

MG4-12 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.

The following options are selected on ordering the unit:

Power supply:

- 230 Vac, 115 Vac or 15 to 30 Vac/Vdc

Vibration channel:

- Lower frequency range 3, 10 or 100 Hz
- Upper frequency range 1000 or 2000 Hz
- Modification for vibration transducers without pre-amplifier (TRV-01, TRV-12/13)

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 to 30 Vac/Vdc
Power consumption:	max. 6 VA
Temperature range:	0° to 50° C (32° to 122° F)
Casing:	Polycarbonate/PVC, IP65
Input connectors:	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:	1140 grams

Vibration channel (VIB)

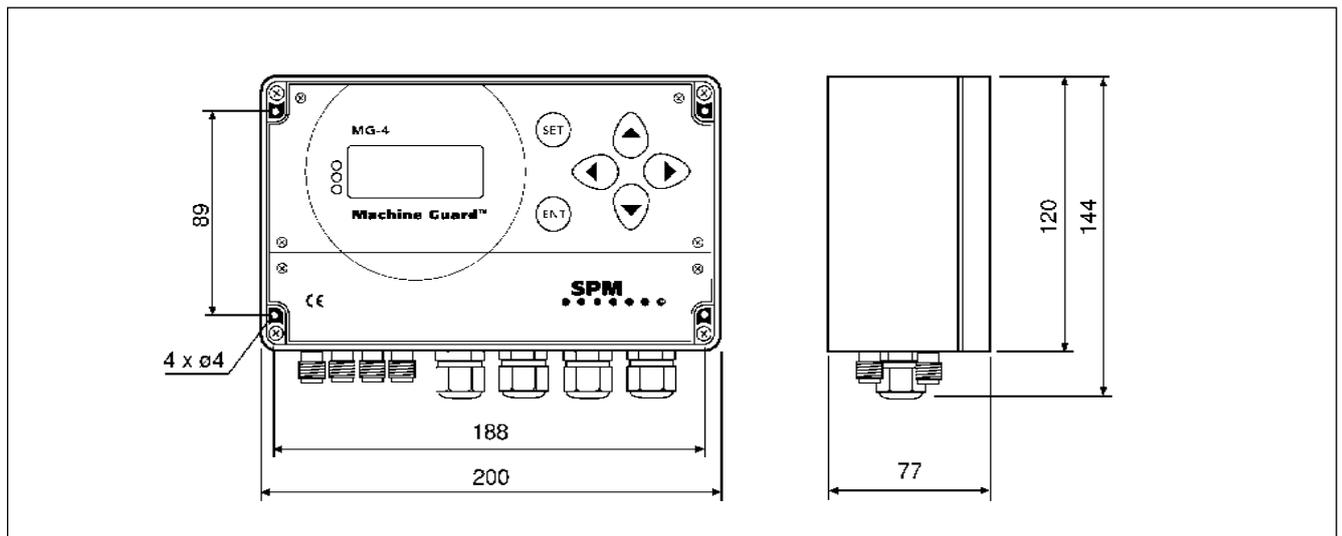
Measuring range:	0.5 to 49.9 mm/s RMS (0 to 1.9 inch/s RMS)
Resolution:	0.1 mm/s (0.01 inch/s)
Frequency, lower limit:	3, 10, or 100 Hz
Frequency, upper limit:	1000 or 2000 Hz
Measuring time:	Programmable 1 to 15 s
Alarm limits:	2, programmable
Alarm delay:	0 to 600 seconds, steps of 2 s
Fault indication:	Transducer line test for short and open circuit
Transducer type:	SLD122 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



Machine Guard MG4-22



Machine Guard MG4-22 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 MG4-22 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.

MG4-22 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.

The following options are selected on ordering the unit:

Power supply:

- 230 Vac, 115 Vac or 15 to 30 Vac/Vdc

Vibration channel:

- Lower frequency range 3, 10 or 100 Hz
- Upper frequency range 1000 or 2000 Hz
- Modification for vibration transducers without pre-amplifier (TRV-01, TRV-12/13)

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 to 30 Vac/Vdc
Power consumption:	max. 6 VA
Temperature range:	0° to 50° C (32° to 122° F)
Casing:	Polycarbonate/PVC, IP65
Input connectors:	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:	1150 grams

Vibration channel (VIB)

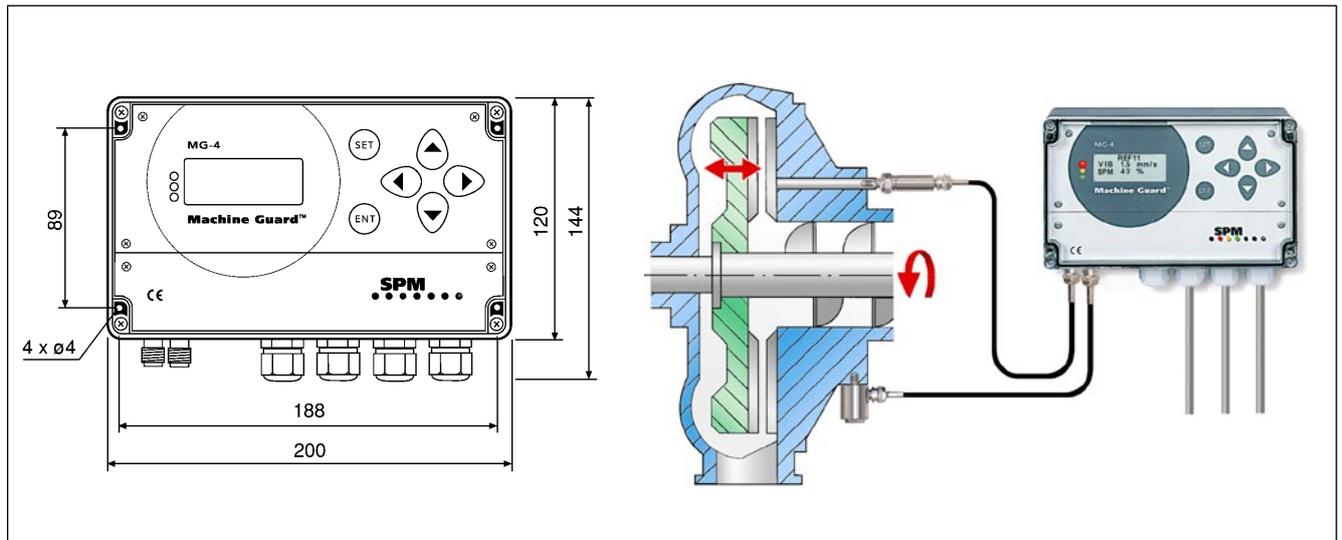
Measuring range:	0.5 to 49.9 mm/s RMS (0 to 1.9 inch/s RMS)
Resolution:	0.1 mm/s (0.01 inch/s)
Frequency, lower limit:	3, 10, or 100 Hz
Frequency, upper limit:	1000 or 2000 Hz
Measuring time:	Programmable 1 to 15 s
Alarm limits:	2, programmable
Alarm delay:	0 to 600 seconds, steps of 2 s
Fault indication:	Transducer line test for short and open circuit
Transducer type:	SLD122 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



Machine Guard MG4-REF11



Machine Guard MG4-REF11 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 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 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
Input connectors:	TNC, 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)

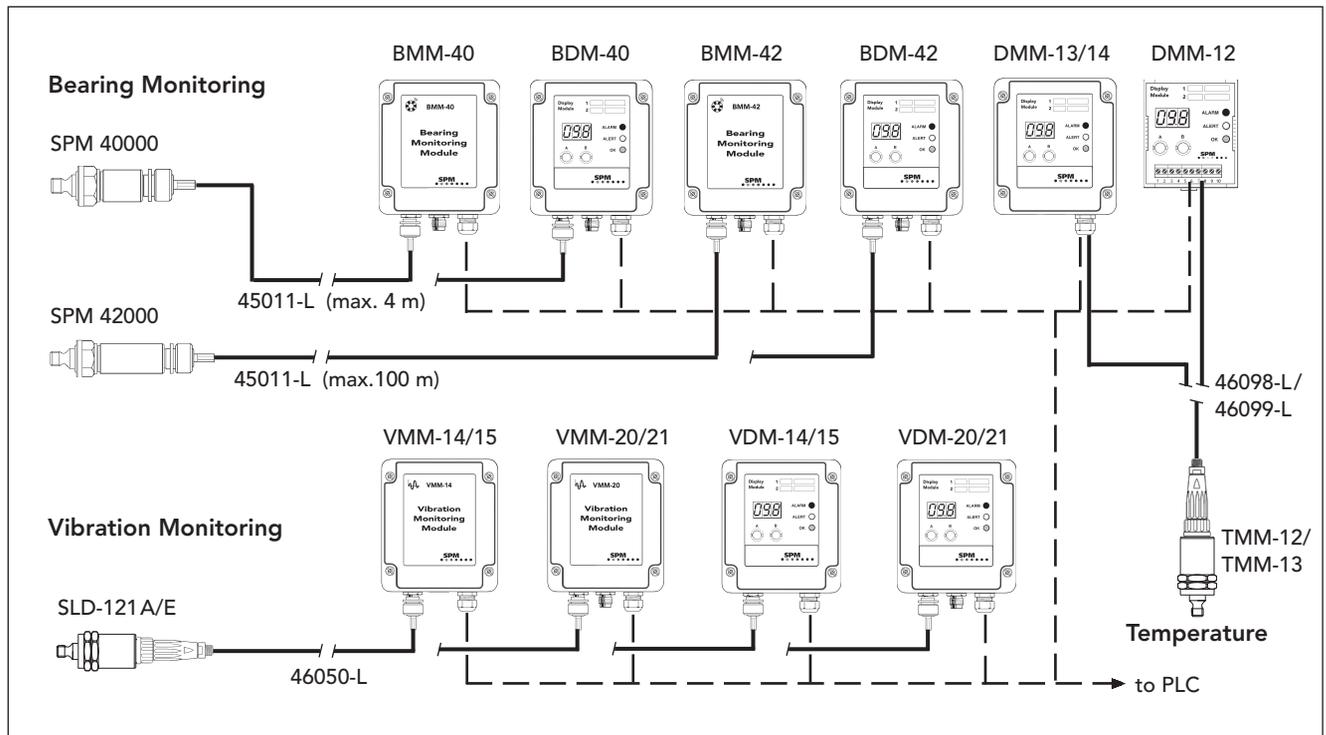
Measuring range:	0.5 to 49.9 mm/s RMS (0 to 1.9 inch/s RMS)
Resolution:	0.1 mm/s (0.01 inch/s)
Frequency range:	10 to 1000 Hz
Measuring time:	Programmable 1 to 15 sec
Alarm limits:	2, programmable, A1 (max) and A2 (min)
Alarm delay:	0 to 600 seconds, steps of 2 s
Fault indication:	Transducer line test for short and open circuit
Transducer type:	SLD122 or TRV-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



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

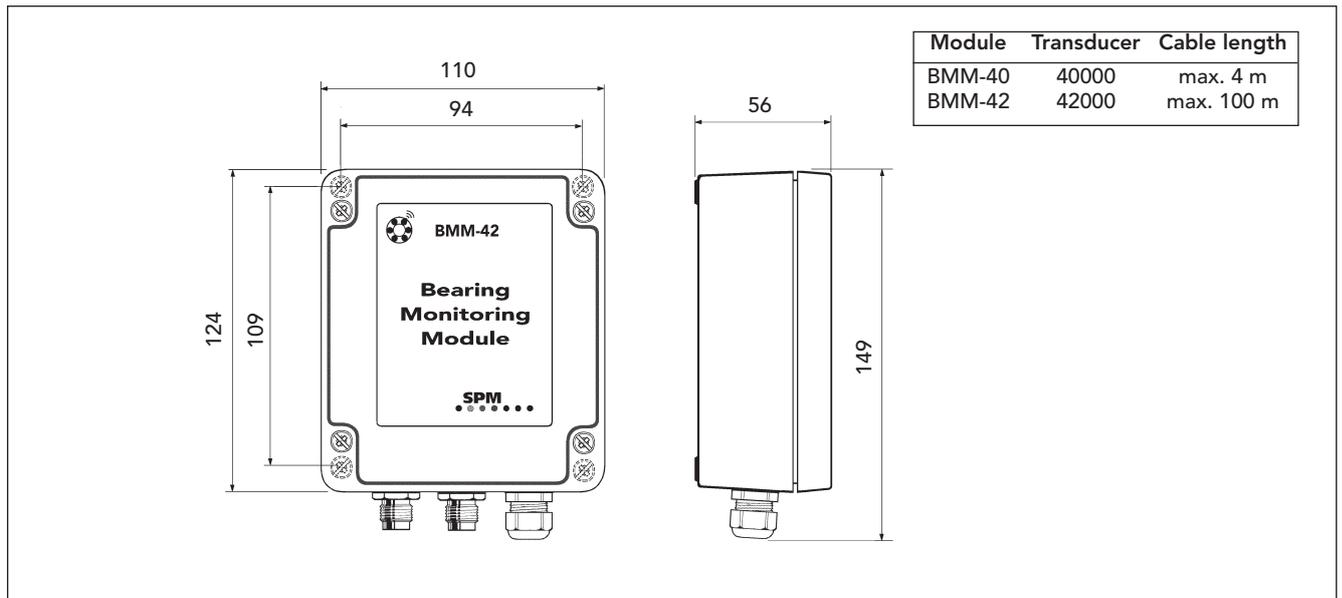
- SLD121A Vibration transducer, M8
- SLD121E Vibration transducer, UNF 1/4"
- TRV-18 Vibration transducer, M8
- TRV-19 Vibration transducer, UNF 1/4"
- TRX-18 Insulation foot for vibration transducer TRV-18
- TRX-19 Insulation foot for vibration transducer TRV-19
- 40000 Shock Pulse Transducer
- 42000 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, UNC5/16"
- 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



CMM System - Bearing Monitoring Module BMM



Bearing Monitoring Modules BMM 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, to a PLC or to a computer controlled monitoring system (e.g. SPM's CMS System).

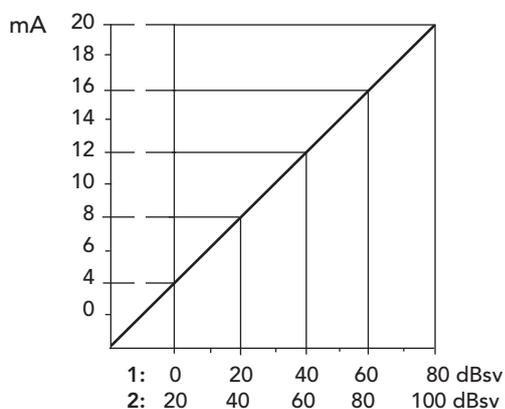
There are two versions:

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 24VDC. 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

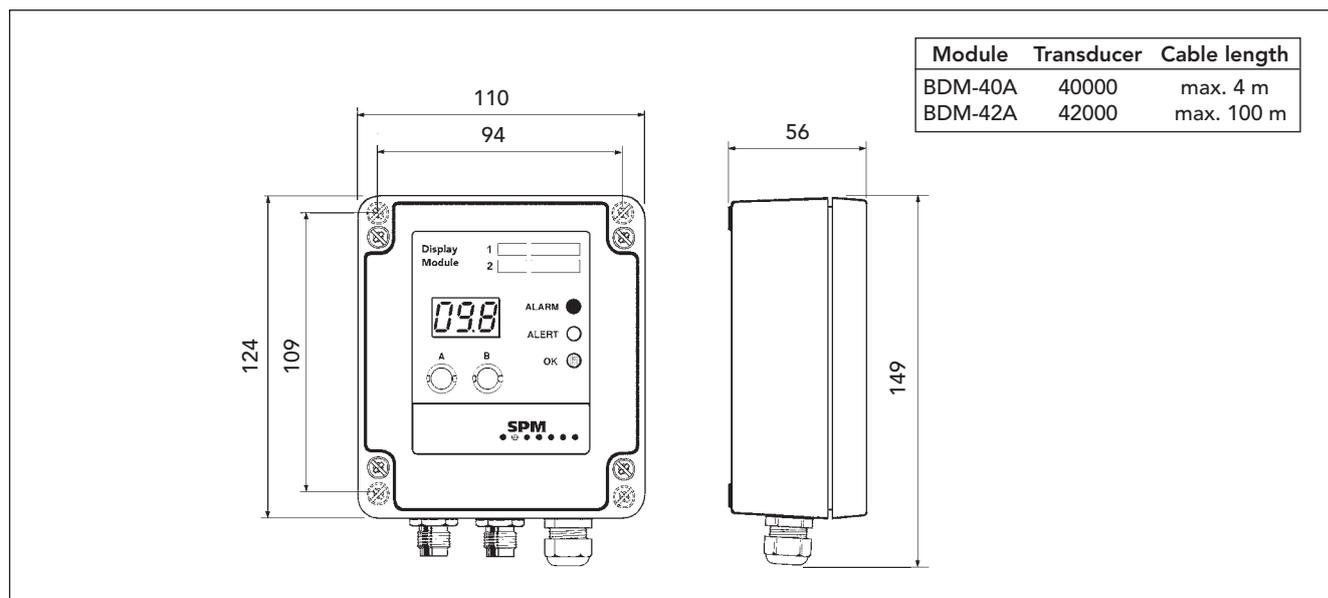


Technical data

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 (6.25 dB/mA, 0.16 mA/dB)
Measuring time:	approx. 1 second per channel
Transducer type:	SPM 40000 (BMM-40), SPM 42000 (BMM-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 ($\pm 10\%$, tested according to EN 50082-2)
Supply current:	max. 0.1 A
Cable inlet:	IP65 at \varnothing 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, \varnothing 4 mm, spacing 109x94mm
Weight:	300 g



CMM System - Bearing Display Module BDM



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 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 data

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: SPM 40000 (BDM-40A),
SPM 42000 (BDM-42A)

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 ($\pm 10\%$, tested accord-
ing to EN 50082-2)

Supply current: max 0.15 A

Cable inlet: IP 65 at $\varnothing 5.5$ 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, $\varnothing 4$ 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

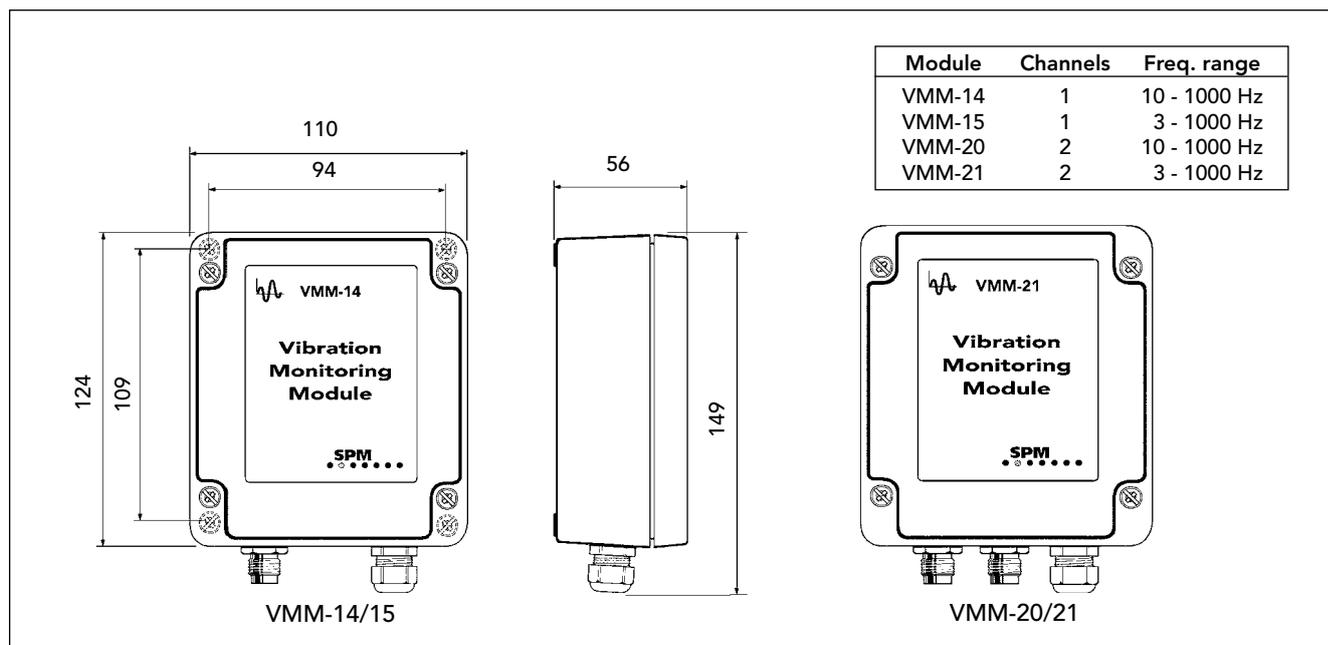
Condition display: green, yellow, and red LED

Alarm limits: 2 per input channel, set with push-
buttons

Push-buttons: 2, for display control, alarm limit and
alarm delay setting



CMM System - Vibration Monitoring Module VMM



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 \varnothing 4 mm and supplied with 12 to 24 V DC. The cable inlet is tight for cable diameters 5.5 to 10 mm.

Technical data

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: \leq 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 (\pm 10%, according to EN 50082-2)

Supply current: max 0.1 A

Cable inlet: IP 65 at \varnothing 5.5 to 10 mm

Input connectors: silver plated brass, 10 to 15 μ

Housing: polycarbonate, IP65

Temperature range: 0° to 55° C

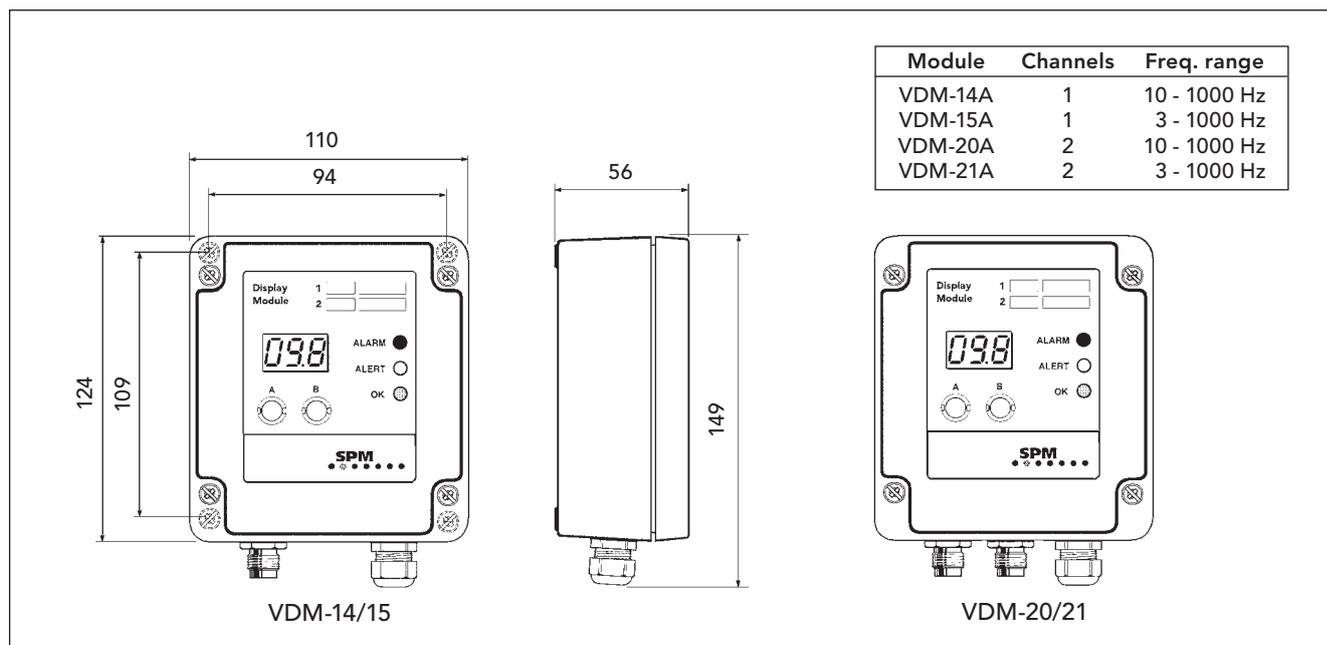
Dimensions: 110 x 149 x 56 mm

Mounting screws: 4 screws, \varnothing 4mm, spacing 109x94 mm

Weight: 300 g



CMM System - Vibration Display Module VDM



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.

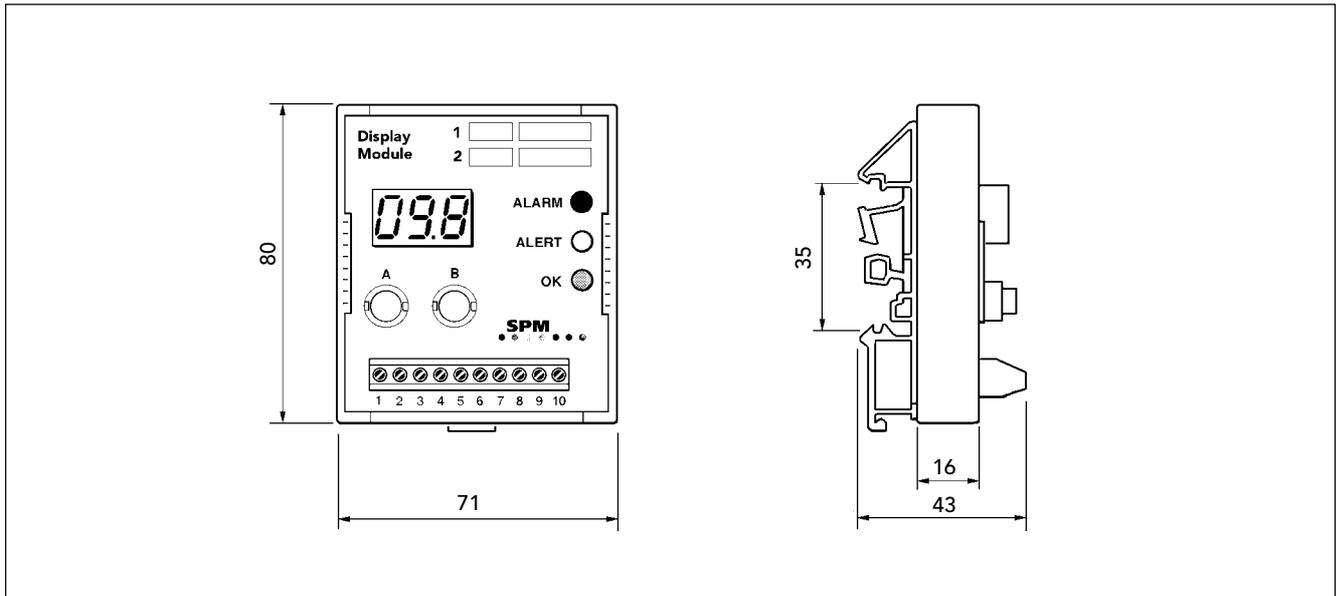
The display circuit acts as a programmable ampere meter with two channels. Using two push-buttons, one can select preprogrammed measuring units and ranges from a list and set two alarm levels (with alarm delay) for each channel. These are connected to the condition display (green - yellow - red) and 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:	1,6mA = 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 1000Hz (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



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).

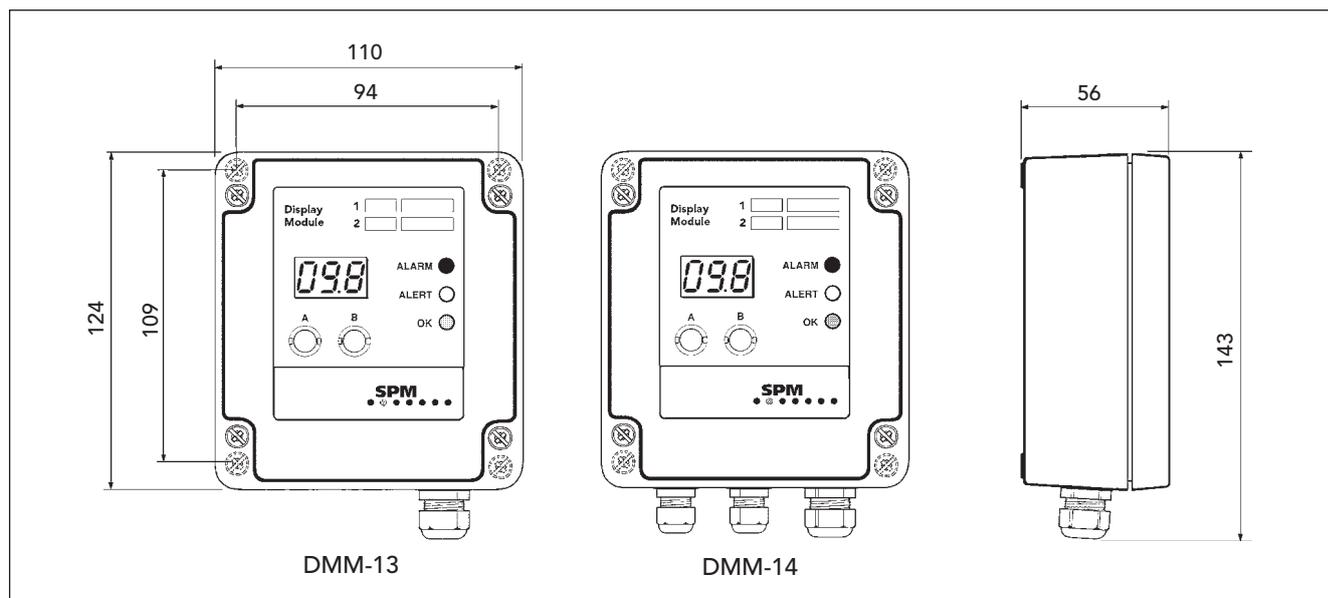
The measured value is displayed with three digits. In two channel mode the status LED's and the display alternates between the two channels and shows the channel number followed by the measured value on this channel.

Technical 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 ($\pm 10\%$, 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 Y to 55 Y C
Dimensions:	80 x 71 x 43 mm
Mounting:	clip on to 35 mm DIN rail
Weight:	100 g



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).

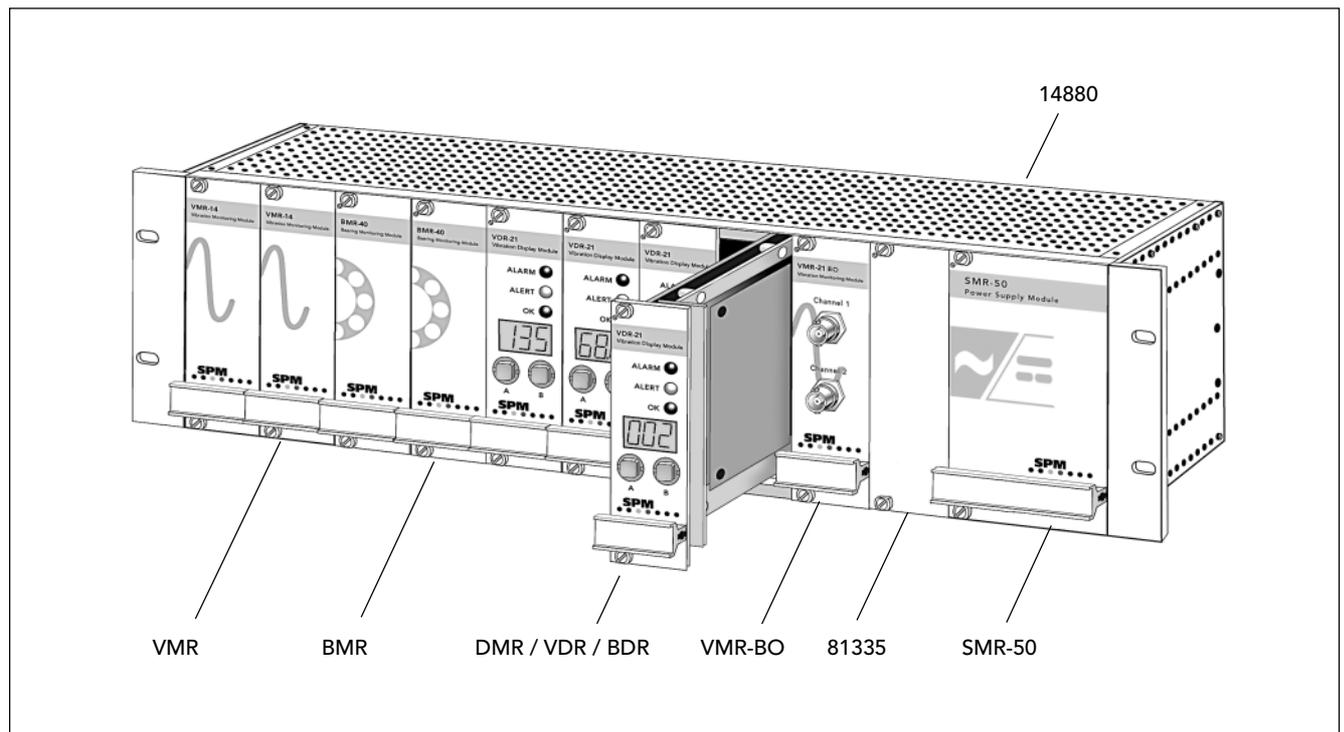
The measured value is displayed with three digits. In two channel mode the status LED's and the display alternates between the two channels and shows the channel number followed by the measured value on this channel.

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 ($\pm 10\%$, tested according to EN50082-2)
Supply current:	max. 0.1 A
Vibration exposure:	max. 5 mm/s RMS
Cable inlets:	Pg11, IP65 at $\varnothing 5.5$ to 10 mm Pg7, IP65 at $\varnothing 3$ 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, $\varnothing 4$ mm, spacing 109x94 mm
Weight:	320 g



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)
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Accessories

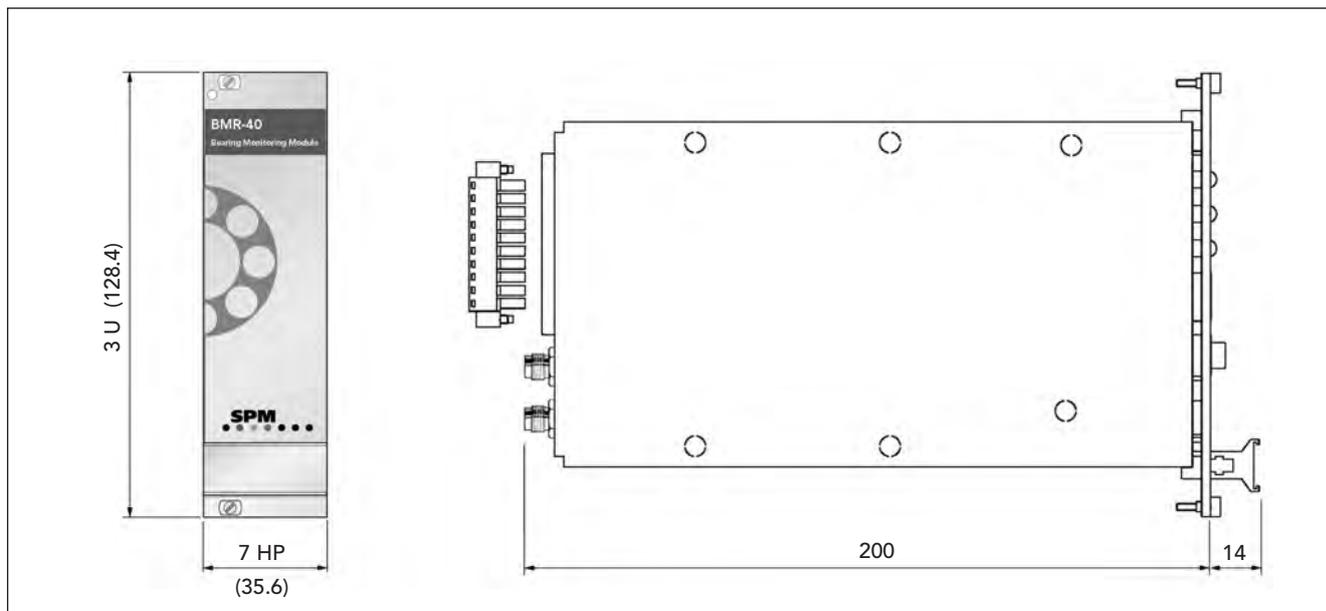
14880	19" subrack, 3U high, compl. with cover plates
SMR-50	Power supply module, 115/230 V AC / 24 V DC
81335	Blank panel, 3U x 7HP

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



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).

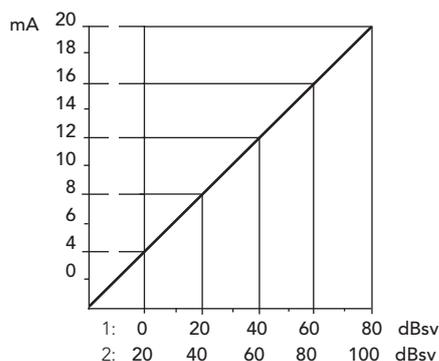
There are two versions:

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 24VDC. 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

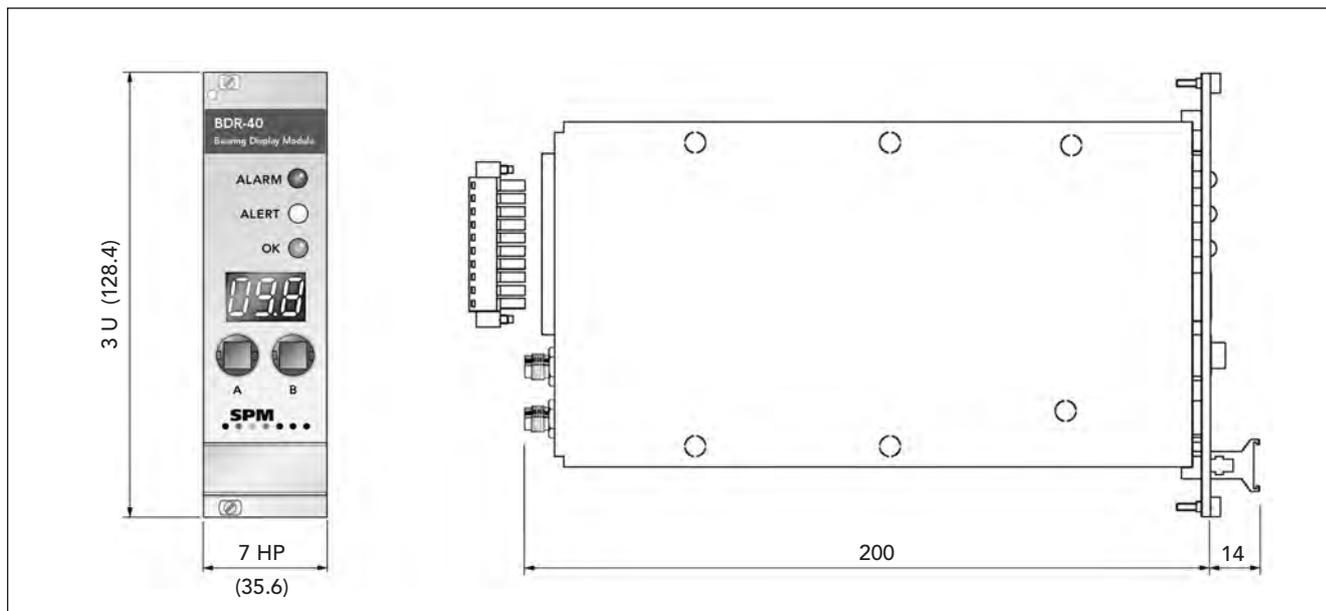


Technical data

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 \leq 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 ($\pm 10\%$, 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



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 24VDC. 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.

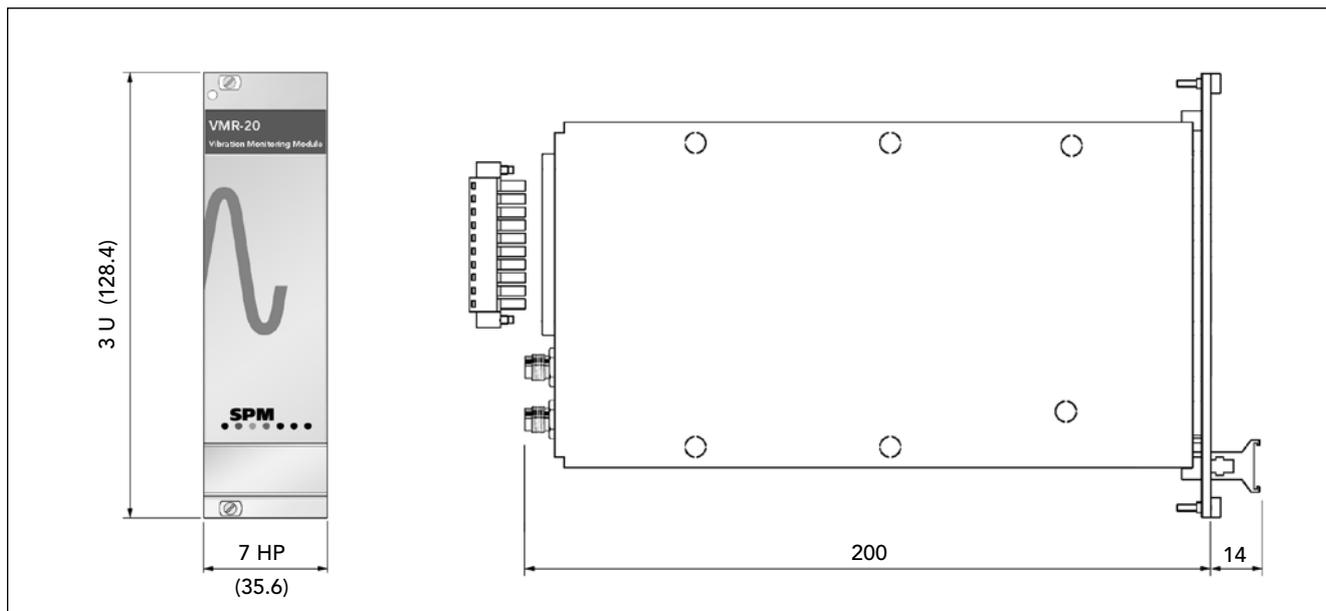
The relays can be controlled by either display channel. In one channel mode, both relays are slaved to a single display channel and provide relay switching at two levels (ALERT and ALARM). In two channel mode, each display channel uses one relay which switches at the ALARM level.

Technical data

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 \leq 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 ($\pm 10\%$, 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



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.

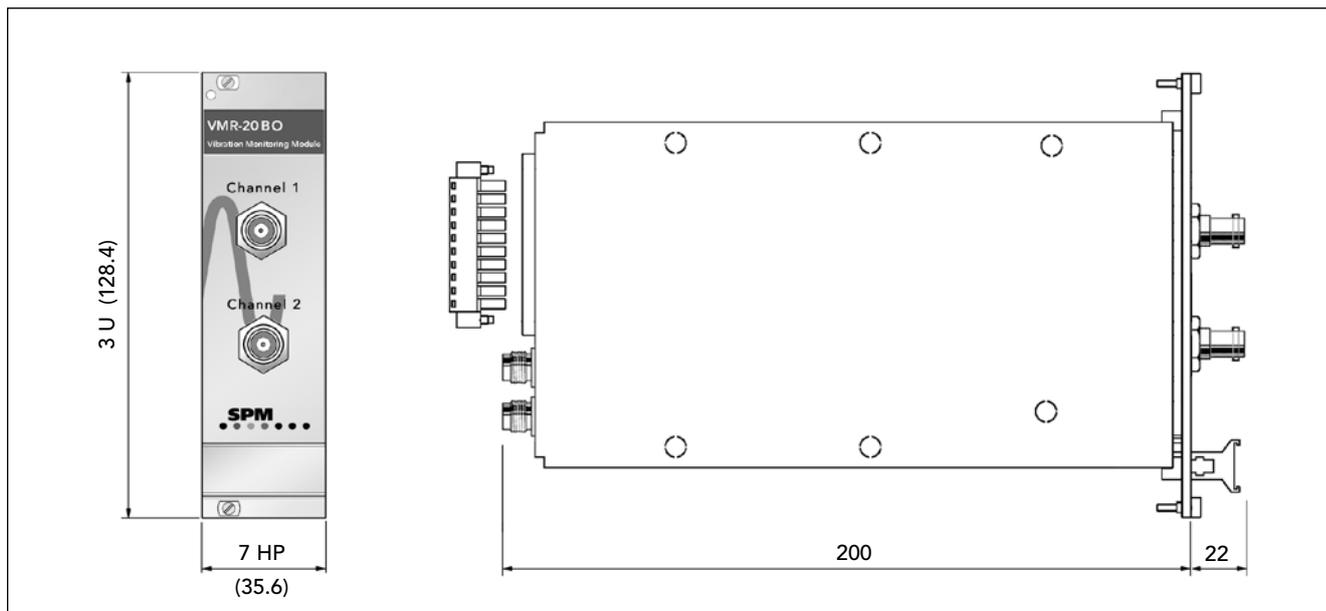
The vibration transducer is connected via coaxial cable with TNC connector. The modules are mounted in standard 19" rack and supplied with 12 to 24 V DC.

Technical data

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 mm ² , 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)



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.

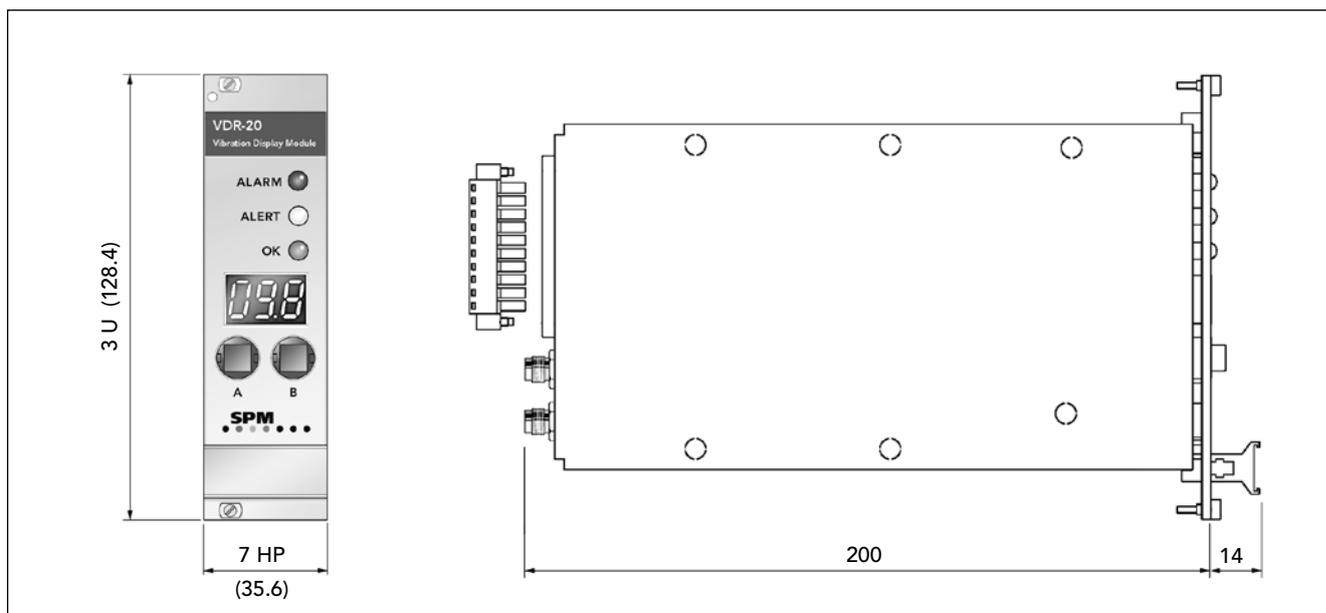
The portable instrument SPM Leonova (or similar) can be connected to the bypass outputs on the front panel via a coaxial cable with BNC connectors.

Technical data

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 mm ² , 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)



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.

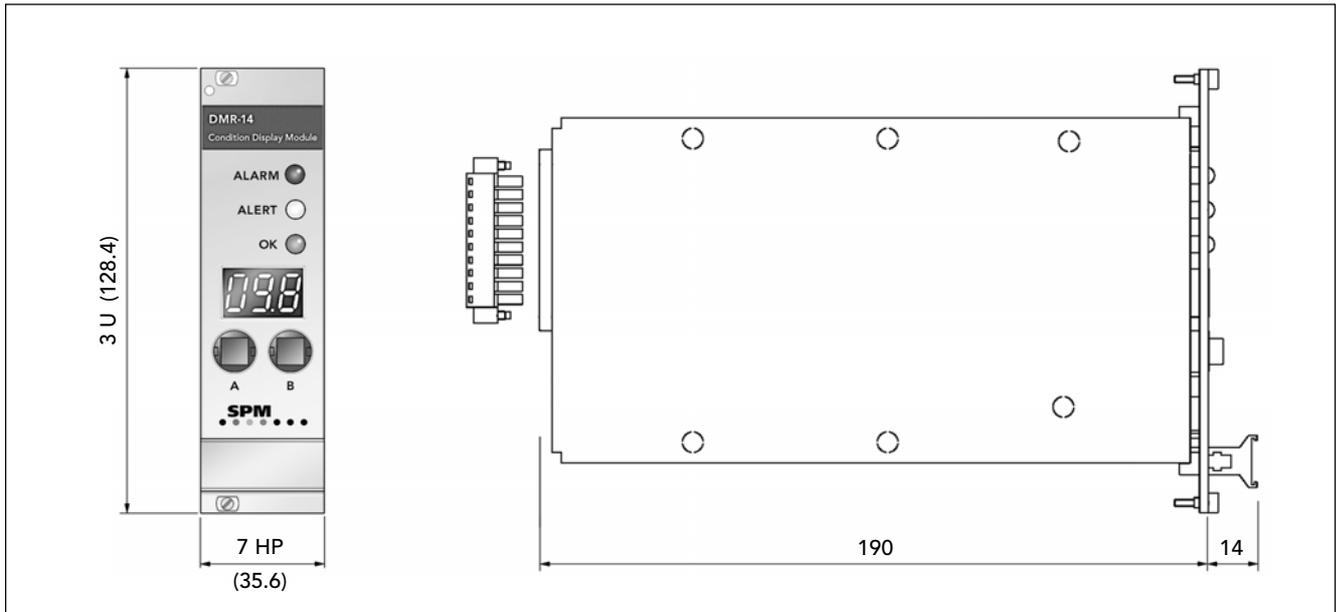
The display circuit acts as a programmable ampere meter with two channels. Using two push-buttons, one can select preprogrammed measuring units and ranges from a list and set two alarm levels (with alarm delay) for each channel. These are connected to the condition display (green - yellow - red) and 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:	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:	1,6mA = 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 1000Hz (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



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).

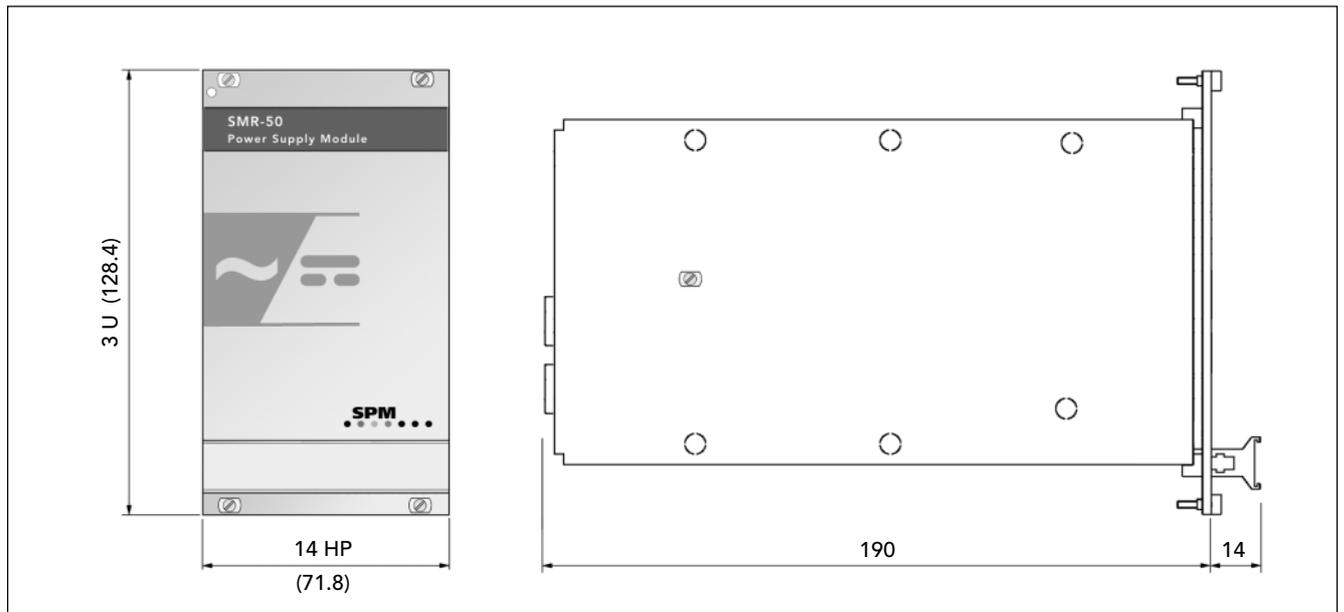
The measured value is displayed with three digits. In two channel mode the status LED's and the display alternate between the two channels and show the channel number followed by the measured value on this channel.

Technical data

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 push-buttons
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 mm ² , connector plug included
Mounting:	19" rack
Dimensions:	3 U x 7 HP x 204 mm, DIN 41494
Weight:	200 g



CMM System - Power Supply Module SMR-50



SMR-50 is a 35W switching power supply module with output for up to ten CMM modules. It has built in EMI filter and short circuit/overload protection with foldback limiting.

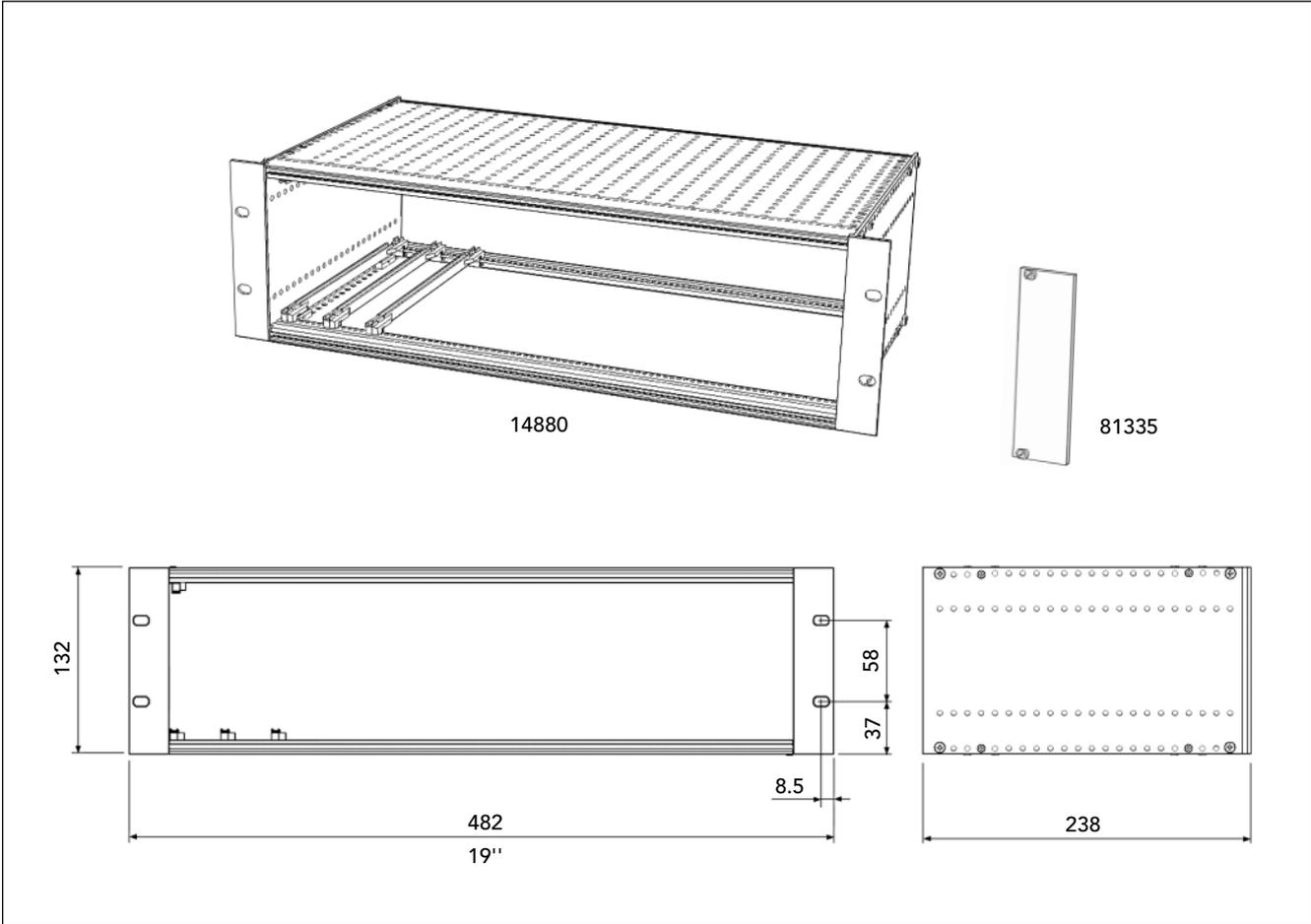
The power supply module is mounted in a standard 19 inch rack (SPM 14880). It is supplied with 115 V AC or 230 V AC selected by a switch on the circuit board.

Technical data

Input voltage:	85 to 132 VAC, 0.8 A or 170 to 264 VAC, 0.45 A selected by switch
Input frequency:	47 to 63 Hz
Output:	24 V ($\pm 10\%$ ADJ), 1.5 A
Ripple:	< 2% (p-p)
Working temperature:	0 to 50°C at 100%, -10°C at 80%, 60°C at 60%
Storage temperature:	-25 to 65°C
Operation humidity:	25 to 85% RH
EMI Standards:	IEC-100-3-2, 3, FCC class B
EMC Standards:	EN61000-4-2, 3, 4, 5
Approvals:	CE/CSA:219967-1426940
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



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.

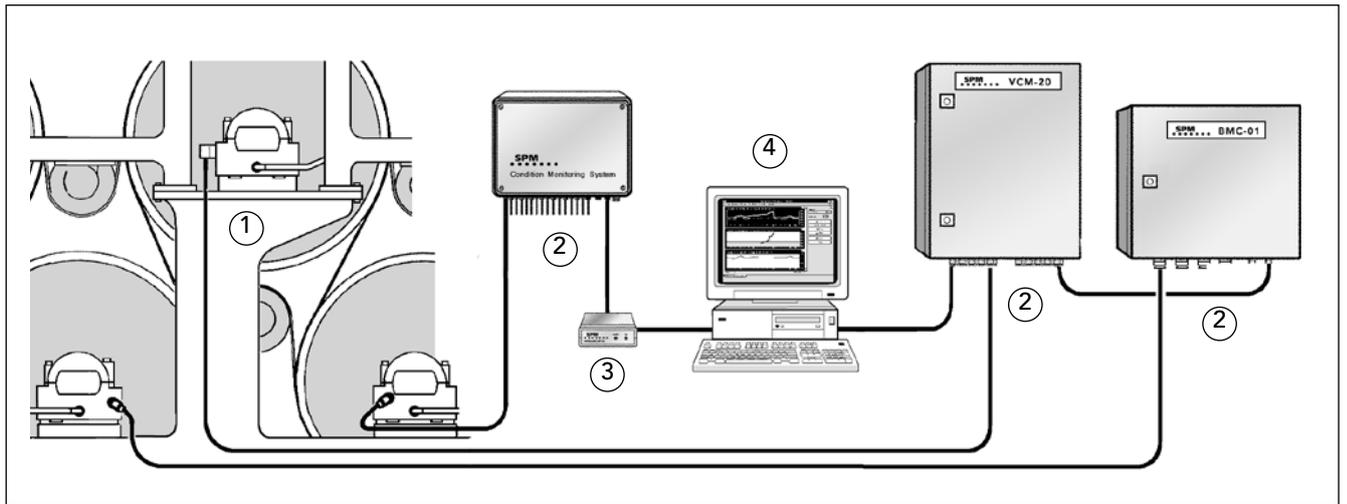
Empty spaces can be filled up with blank front panels, SPM 81335 (3U x 7HP). The subrack is delivered complete with bottom plate, vented top plate and twelve module slots for mounting of CMM rack modules.

Technical data

Material: anodised aluminium
 Dimensions: 482 x 132 x 238 mm
 Weight: 1600 g



CMS: System Components



The CMS System

The CMS System is a permanently installed, continuous machine condition monitoring system. It can be handled by the SPM software Condmaster®, a PC program which controls the system and collects, stores, and evaluates the measuring results.

A CMS system comprises: 1) Transducer line, 2) Measuring units, 3) System unit, and 4) Computer with Condmaster®. The parts are specified on a number of data sheets (TD) referred to below.

1. Transducer line

A. Bearing monitoring line:

A shock pulse transducer (several alternatives) and a transducer matching unit (TMU) are connected by coaxial cable to the measuring unit:

Standard transducer 40000 (40100) + TMU-12	TD-004
Transducer 42000 (42100) with built-in TMU	TD-005
Isolated transducer 11223-L + TMU 12	TD-006
Ex-proof transducer 42011 (42111), transformer	TD-116
Coaxial cables and connectors	TD-018
Transducer matching unit TMU-12	TD-055

B. Vibration monitoring and analysis:

Vibration transducer TRV-10/11 (VMS)	TD-063
Vibration transducer TRV-20/21 (VCM)	TD-124
Vibration transducer SLD144 B/F (VCM)	TD-203
Vibration transducer SLD244 B/F, Ex (VCM)	TD-215
Coaxial cables and connectors	TD-018
Twisted pair cables for SLD transducers	TD-259
Connector 15168 for SLD transducers	TD-217

C. Temperature monitoring:

Temperature transducer TMM-10	TD-107
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2. Measuring units

There are 4 types of measuring units, BMS (bearing monitoring), VMS (vibration severity monitoring), VCM (vibration analysis with the EVAM® method) and BMC (bearing monitoring with SPM Spectrum™). The BMS and VMS units can be equipped with additional boards for monitoring of speed (RPM board) or analogue signals (AMS board).

A. Bearing monitoring:

Measuring unit BMS with 16 bearing channels	TD-40
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B. Vibration monitoring:

Measuring unit VMS for 8 vib. channels	TD-42
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C. RPM monitoring:

RPM board 13490 with 4 channels	TD-41
Analogue RPM board 13854 for VMS/BMS	TD-87

D. Monitoring of analogue signals:

Analogue board 13863 (AMS measuring unit) with 16 analogue channels	TD-84
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E. Evaluated vibration analysis:

Measuring unit VCM for 8 alt. 24 vib. channels	TD-123
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F. Bearing monitoring with SPM Spectrum™

Cabinet BMC (connected to the host unit VCM) with 7 to 56 bearing channels	TD-174
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3. System unit

The system unit SYS-10 is the interface between the measuring units and the PC.

System unit SYS-10	TD-45
Computer cables and connectors	TD-44

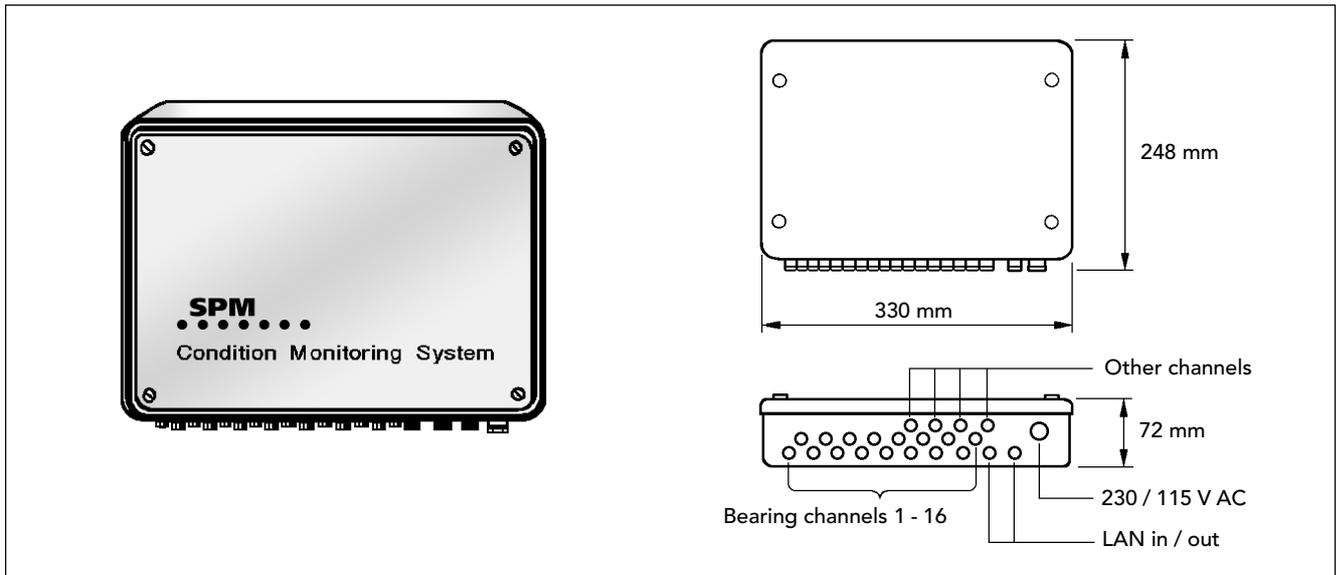
4. Computer with Condmaster®Nova

The system software Condmaster®Nova requires a PC for Windows environment.

SPM Condmaster®Nova	TD-230 – TD245
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CMS System: Measuring Unit BMS



Bearing monitoring

Measuring unit BMS is a part of the CMS System for continuous bearing monitoring. A CMS System can contain up to 250 measuring units. The BMS unit accommodates up to 16 bearing monitoring channels and is operated under software control (SPM Condmaster®).

Each bearing monitoring channel is activated for a programmed interval (5 to 42 minutes). Readings are taken in a programmed sequence, which can comprise 50 channel numbers in any combination. The measuring unit stores up to 960 readings, i.e. min. 80 hours of readings. These are transferred to the PC for evaluation and display by Condmaster®.

The measuring unit is designed for wall mounting and has a stainless steel housing with neoprene gaskets. It is connected to 230 or 115 V AC (nominal voltage $\pm 10\%$, even load, no excessive spikes).

Via data cables, the measuring units are connected in series, forming one or two local area networks (LAN) connected to the system unit. The shielded data cable must be installed in a suitable electrical environment.

A BMS measuring unit can be equipped with extra circuit boards for measuring speed or analogue signals. They are specified on other data sheets, see under Ordering numbers.

Technical data

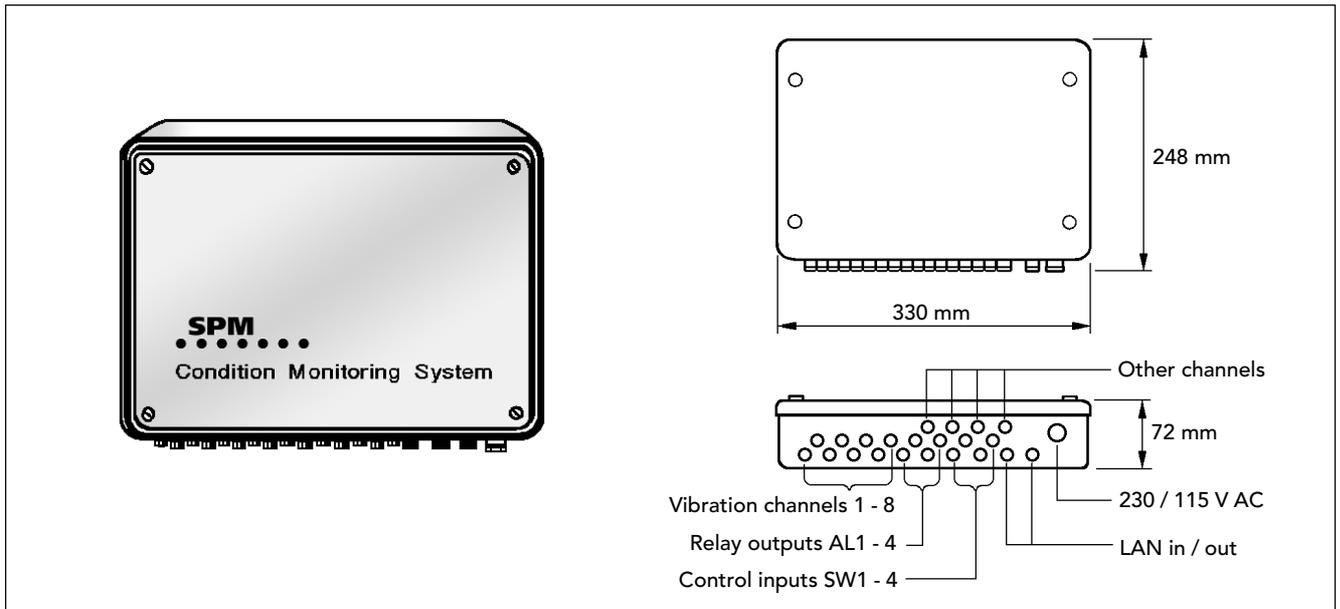
Measuring range:	LR / HR, -19 to 99 dB _{SV}
Inputs / outputs:	16 bearing monitoring channels, LAN in / out
Storage capacity:	960 readings
Dimensions:	330 x 248 x 72 mm
Weight:	4.5 kg
Housing:	Stainless steel, neoprene gaskets, IP 65
Cable inlets:	Nickel plated brass
Temperature:	0Y to 55Y C (32Y to 130Y F)
Mains supply :	230 or 115 V AC $\pm 10\%$, 10 VA
Data cable:	Shielded, 4 conductors twisted in pairs, area 0.22 mm ² each. Max. cable length between measuring units 1000 m

Ordering numbers

BMS-20	Measuring unit with 16 bearing channels
BMS-21	BMS unit with RPM board, see TD-41
BMS-23	BMS unit with AMS board, see TD-84
90220-L	Data cable, temperature -20Y to +70Y C, L = length in meters



CMS System: Measuring Unit VMS



Vibration monitoring

Measuring unit VMS is a part of the CMS System for continuous vibration monitoring. A CMS System can contain up to 250 measuring units. The VMS unit accommodates up to 8 vibration monitoring channels. The units are operated under software control (SPM Condmaster®). Each unit has 4 relay outputs for e.g. activating machine stop and 4 inputs for controlling the relay outputs.

The VMS unit measures vibration severity according to ISO 2372 (velocity in mm/s RMS, 10 to 1000 Hz). Each vibration channel is activated for a programmed measuring time (2–255 s). Readings are taken in a programmed sequence. The VMS unit stores up to 1000 readings per channel. These are transferred to the PC for evaluation and display by Condmaster®.

The measuring unit is designed for wall mounting and has a stainless steel housing with neoprene gaskets. It is connected to a main power of 230 V or 115 V AC (nominal voltage $\pm 10\%$, even load, no excessive spikes).

Via data cables, the measuring units are connected in series, forming one or two local area networks (LAN) connected to the system unit. The shielded data cable must be installed in a suitable electrical environment.

A VMS measuring unit can be equipped with extra circuit boards for measuring speed and analogue signals. They are specified on other data sheets, see under Ordering numbers.

Technical data

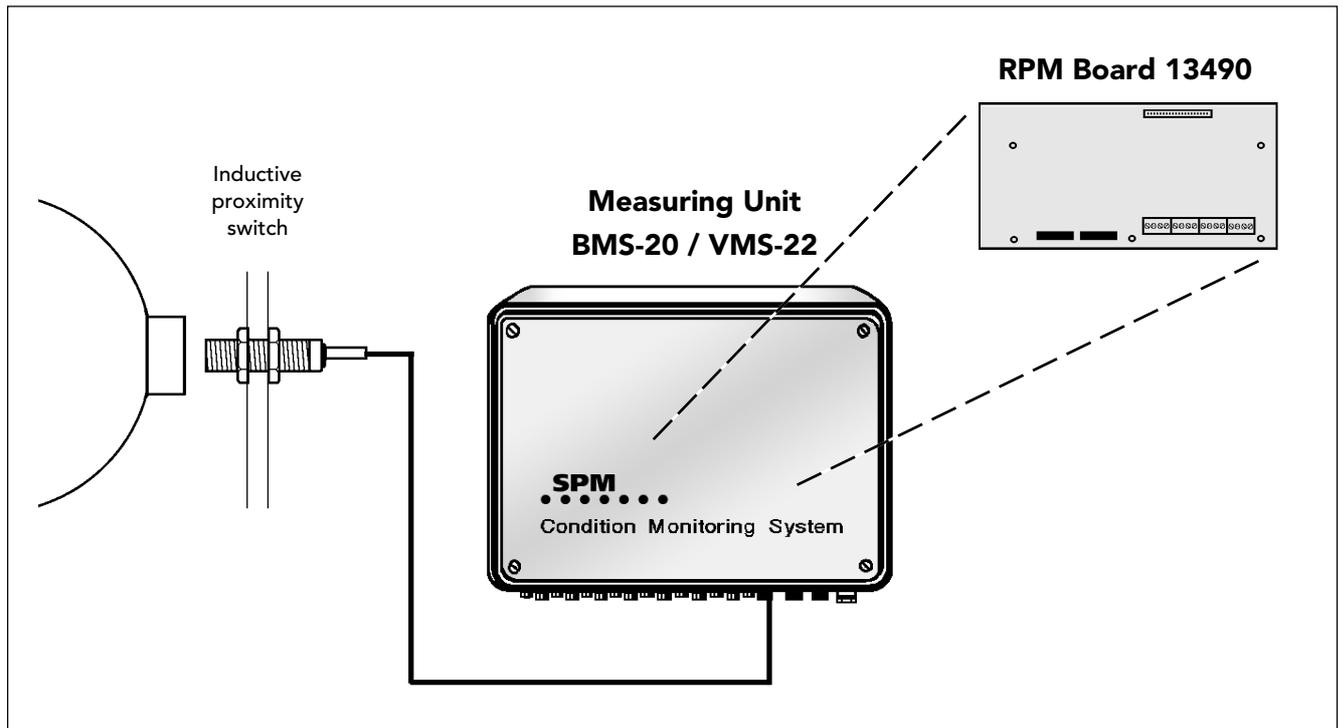
Measuring range:	0 to 100 mm/s RMS
Inputs / outputs:	8 vibration monitoring channels, LAN in / out, 4 control inputs and 4 relay outputs
Storage capacity:	1000 readings / channel
Dimensions:	330 x 248 x 72 mm
Weight:	4.5 kg
Housing:	Stainless steel, neoprene gaskets, IP 65
Cable inlets:	Nickel plated brass
Temperature:	0°C to 55°C
Mains supply :	230 or 115 V AC $\pm 10\%$, 10 VA
Relay:	Max. 50 V DC, 10 W alt. Max. 35 V AC, 10 VA
Data cable:	Shielded, 4 conductors twisted in pairs, area 0.22 mm ² each. Max. cable length between units 1000 m

Ordering numbers

VMS-22	VMS measuring unit, 8 vibration channels
VMS-23	VMS unit with RPM board 13490, see TD-41
VMS-24	VMS unit with AMS board, see TD-84
90220-L	Data cable, temperature -20°C to +70°C, L = length in meter



CMS: Speed Monitoring



Automatic speed measurement

Speed measurement in connection with a CMS System is used on machines with variable operating speeds, such as paper machines. The speed data allows for an automatic adjustment of shock pulse evaluation and alarm limits.

Rotational speed (r.p.m.) is measured by mounting an inductive proximity switch close to a rotating machine part, and connecting it to RPM board 13490 in the measuring unit. The RPM board is factory mounted in measuring unit BMS-21 and VMS-23. It can be installed in an existing BMS-20 unit with EPROM version 2.0 or higher, or in an existing VMS-22 unit.

The RPM board has four speed channels and measures the r.p.m. once per minute. The operating program checks the speed data every 25 seconds.

The r.p.m. can be stored in the system unit, to be used by any measuring unit in the CMS System (global speed, max. 8 per system). The r.p.m. can also be used for the monitoring channels in the measuring unit which contains the RPM board (local speed). Speed channel addresses are set in the operating program SPM Condmaster®.

The proximity switch is not normally supplied by SPM. It can be of PNP or NPN type, input voltage 15 V. It can send from one pulse to max. 15 pulses per revolution. The number of pulses/revolution is set by a DIL switch for each active speed channel.

Technical data, ordering numbers

Measuring unit BMS-20 with RPM board 13490 installed has ordering number BMS-21. VMS-22 with installed RPM board has ordering number VMS-23.

RPM board 13490, installation set

13490	RPM Board (1)
12832	Spacer screw (5)
82204	Cable inlet, nickel plated brass (4)
81166	O-ring (4)

Please note: for BMS-20 without prepared inlet holes for RPM channels, order separately:

82127	Cable inlet, grey GAP (4)
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RPM board 13490, data

Dimensions:	w x d x h = 218 x 95 x 15 mm
Channels:	4, with 4 screw connectors each
Temperature:	0Y to 55YC
Range:	1 to 20 000 r.p.m.
Measuring time:	1 minute
Power supply:	from the host board
Output voltage:	15 V DC to proximity switch
Input pulses:	1 – 15 pulses / revolution

Inductive proximity switch

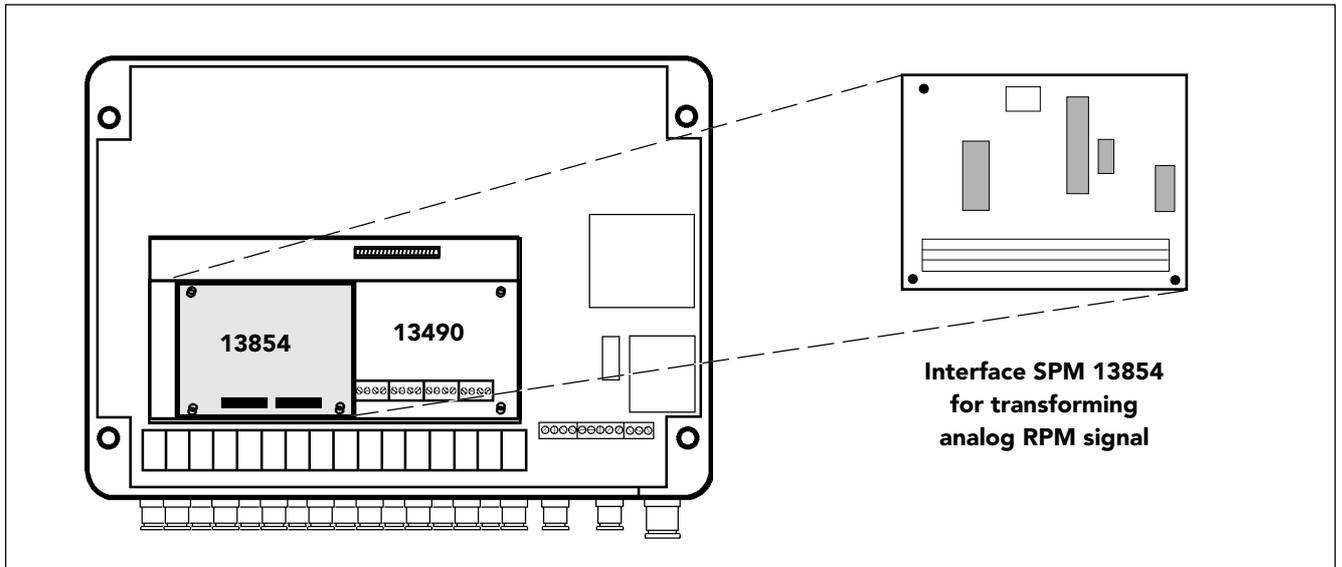
Type: PNP or NPN (ex. Telemecanique XS1/XS2)

Cable, proximity switch to RPM board

PVC type, 3 conductors, area 0,34 mm² each. Cable length up to 100 m.



CMS: Analogue RPM interface SPM 13854



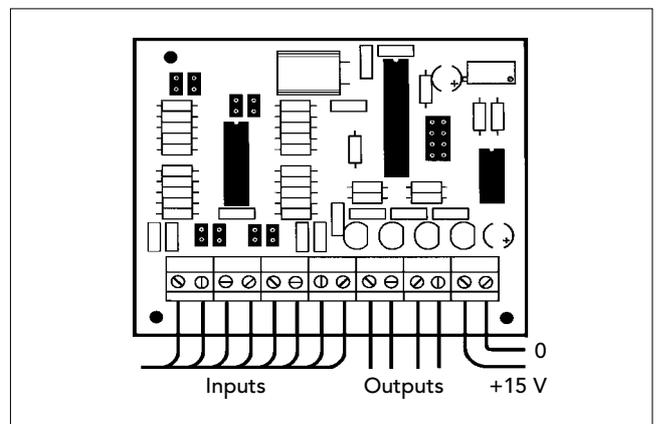
The analogue RPM interface is a circuit board that is mounted on the digital RPM board, SPM no 13490. The interface converts input analogue RPM signals, in mA or V, from the input channels to digital measuring pulses suited for the SPM CMS system.

Each input signal is read per minute. The input signals are converted to max. 3825 pulses per minute and channel. The actual number of pulses is proportional to the input signal in comparison with the set measuring range. The RPM signal is then adjusted in the CONDMASTER program so that 3825 pulses corresponds to the maximum possible RPM value provided by the analogue input signal. The output signals consist of pulse trains proportional to the analogue RPM values.

The input signals are connected to the interface input terminals. The input signals are interchangeable by means of jumpers between the following measuring ranges:

- | | |
|-----------|-----------|
| 0 - 1 V | 0,2 - 1 V |
| 0 - 10 V | 2 - 10 V |
| 0 - 20 mA | 4 - 20 mA |

The outputs are connected to the RPM board through cables from the output terminals. Power supply and earth are connected to their corresponding terminals on the RPM board. 3 spacer screws lock the interface to the RPM board.



Technical data:

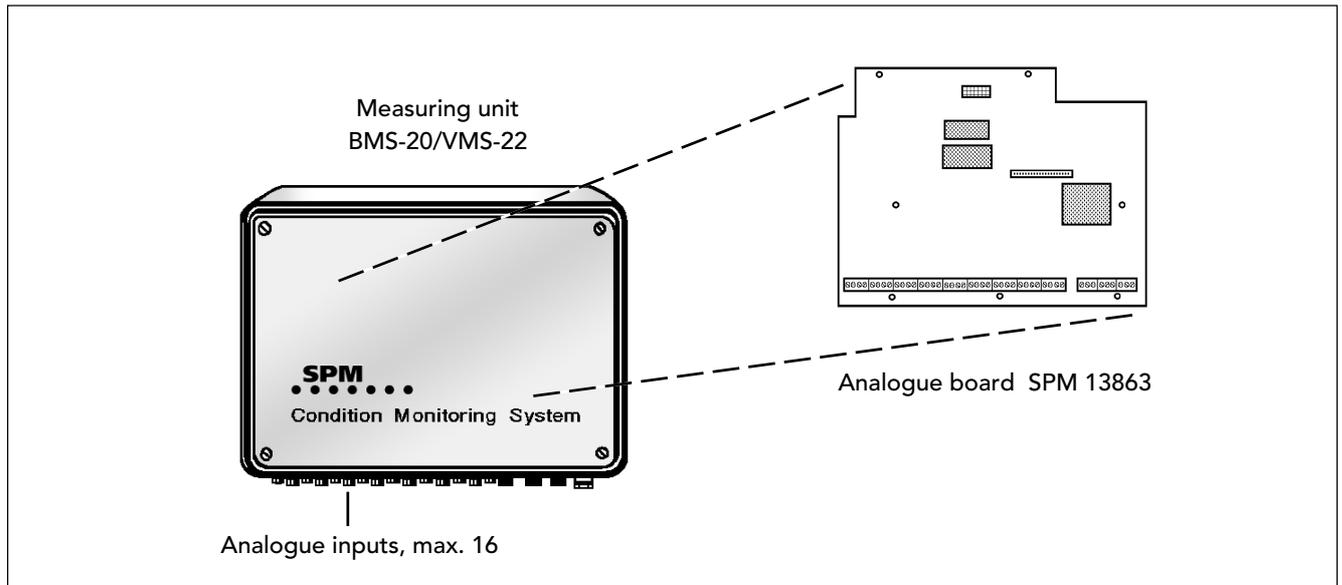
- Dimensions: 83.5 x 69 x 15 mm
- Temperature: 0 - 55°C (32°F to 130°F)
- Power supply: 15 V ± 1 V DC via the RPM board
- No. of inputs: 4
- No. of outputs: 4
- Tolerance: ± 5 % of the input signal

Ordering numbers

- Mounting kit **SPM 13854** consists of:
- | | |
|-----------------------------|-------|
| Circuit board 13852 | 1 |
| Jumper 93154 | 8 |
| Spacer screw 82329 | 3 |
| Screw MRX 3 x 5 | 3 |
| Cable MKUX, 90114 | 0.7 m |
| Mounting instruction, 71489 | 1 |



CMS: Analogue measuring



Measuring of analogue values

The task of the analogue measuring unit of the CMS system is to read measuring values from max. 16 input analogue channels. It is an independent unit, with exception of power supply, consisting of a circuit board which is mounted on top of the BMS or VMS board by means of a special installation set. The board is power supplied through the tag-strip of the BMS or VMS board. No power supply unit exists. Control program is SPM Condmaster® Pro.

Inputs

Only one of the input channels can be open at a time. Measuring times, measuring sequence and active channels are selected from the control program.

Filing data

During the set measuring time all active channels are scanned and measured max. number in increasing order followed by the next scanning a. s. o. The measuring takes approx. one second per channel. The max., min. or average measured value on each channel is saved.

Alarm limits

Each channel has min. and max. value respectively as alarm limit to be set from the control program. Alarm is released if these limits are passed. The relay of the SYS unit can then also be activated. The alarms can be tracked and analyzed from Condmaster® Pro.

Communications

The contact with the computer proceeds through the multiple serial transmission of the CMS system in one or two local area networks (LAN). Its shielded communication cable should be installed in a suitable electric environment.

Technical data and ordering numbers

Measurement unit BMS-20 with the analogue board SPM 13863 mounted has ordering number BMS-23. VMS-22 with analogue board installed has ordering number VMS-24.

Analogue board kit SPM 13864

13863	Analogue board (1)
12832	Spacer screws (7)
81166	O-ring (4)
82204	Cable inlet, nickel plated brass (4)
82221	Spacer screws (2)
82226	Screw M3 x 5 (7)
93174	Jumper (16)
71496	Mounting instruction
71497	Installation instruction (el)

NOTE! You can separately order cable inlets for the BMS-20 without pre-mounted analogue board :

82127	Cable inlet, grey GAP (4)
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Analogue board SPM 13863, data

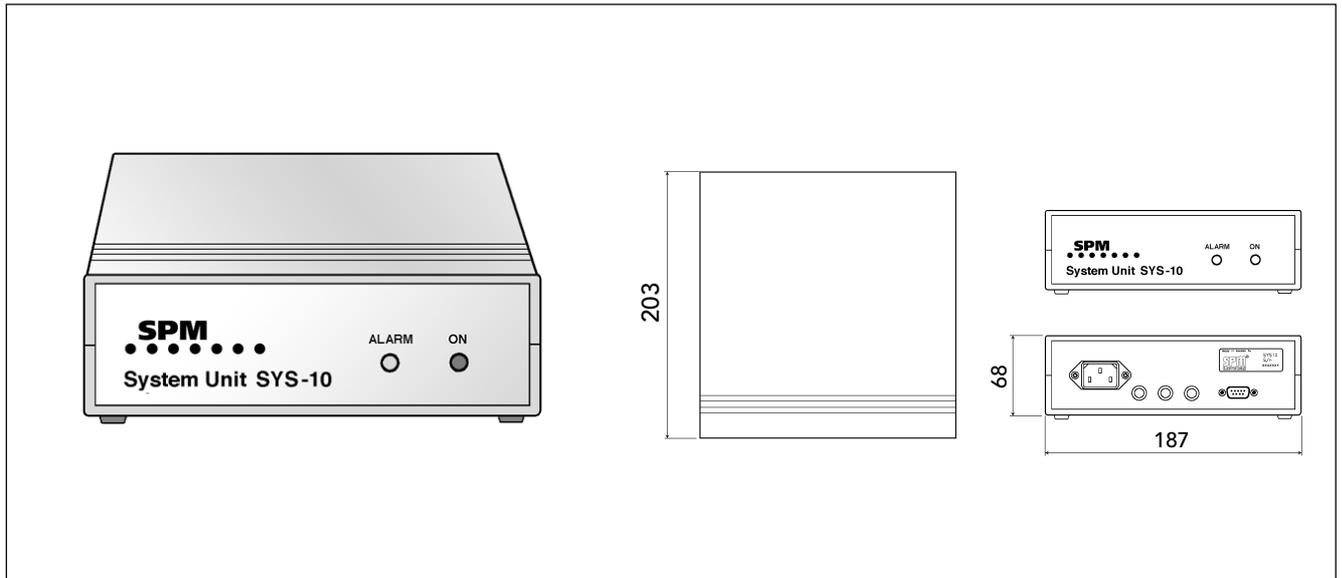
Dimensions:	w x d x h = 236 x 133 x 32 mm
Channels:	16 galvanically separated analogue inputs with 2 screw connectors each
Temp. range:	0°C - 55°C
Measuring range:	0 - 20 mA and 4 - 20 mA 0 - 1 V and 0 - 10 V
Measuring time for active channel:	1 - 42.5 min.

Parameters controlled from Condmaster® Pro

- Y Selection of active channels
- Y Tot. meas. time f. active channels (1 min. to 42.5 min.)
- Y Selection of values to be saved
- Y Setting of alarm limits (if used)
- Y Setting the real time watch.
- Y Setting of the measurement on and off



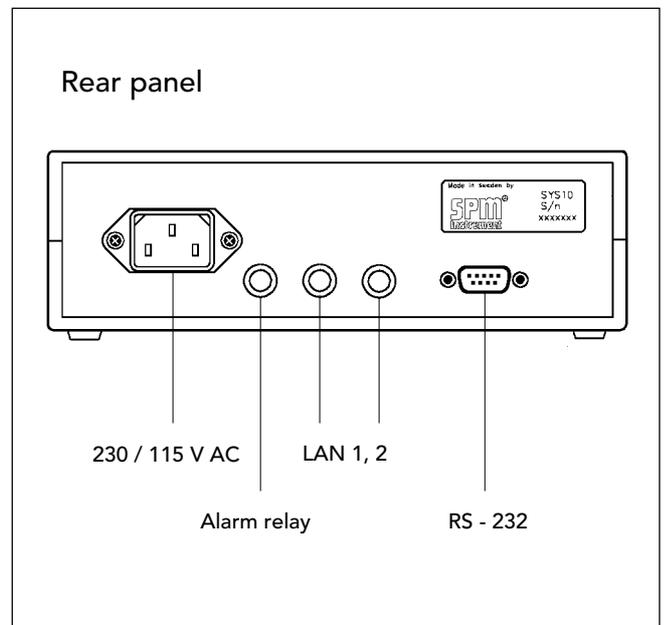
CMS: System Unit SYS-10



The system unit SYS-10 is the interface between the measuring units and the computer. It can accommodate up to 250 measuring units, connected in one or two local area networks (LAN).

The system unit is placed close to the computer equipment (max. cable length 10 m). Via a 9 pin RS-232 serial port, the system unit is connected to a modem or, normally, directly to the PC. The transmission rate is set by internal switches, 7 settings from 300 to 19 200 bits/second (baud rate).

On delivery, the unit is set for 230 V AC. An internal connector can be modified to set the unit for 115 V AC. A mains power cable is included. Power ON is indicated by a green light on the front panel, system alarm by a red light. An external warning circuit, triggered by a system alarm or loss of power, can be connected via a relay output. The relay (10 VA, 50 V, 0.5 A) is normally closed.



Technical data

Input:	2 LAN channels, max. 250 units
Output:	9 pin RS-232 serial port
Power supply:	230 or 115 V AC, 5 VA
Relay:	Max. 10 VA, 50 V, 0.5 A
Transmission rate:	300, 600, 1200, 2400, 4800, 9600, 19200 bps
Casing:	ABS, black
Temperature:	0°C to + 55°C (32°F to 130°F)
Dimensions:	187 x 203 x 68 mm (7.5 x 8.1 x 2.7 in)
Weight:	0.9 kg (32 oz)



CMS: Computer Cables

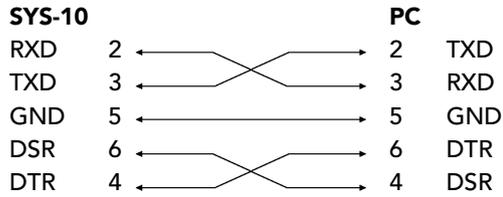
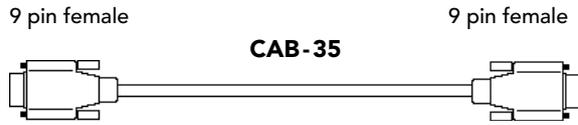


Fig. 1 Computer Cable CAB-35

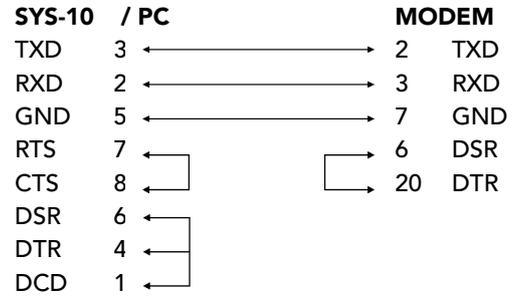


Fig. 2 Computer Cable CAB-18

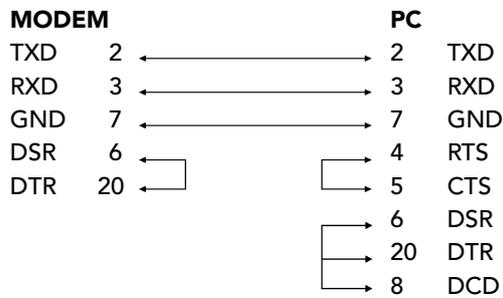
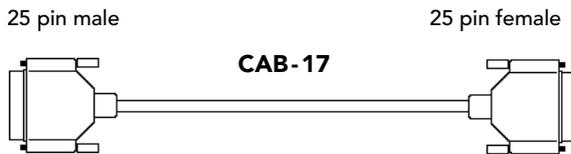


Fig. 3 Computer Cable CAB-17

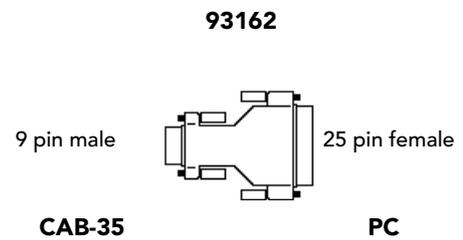
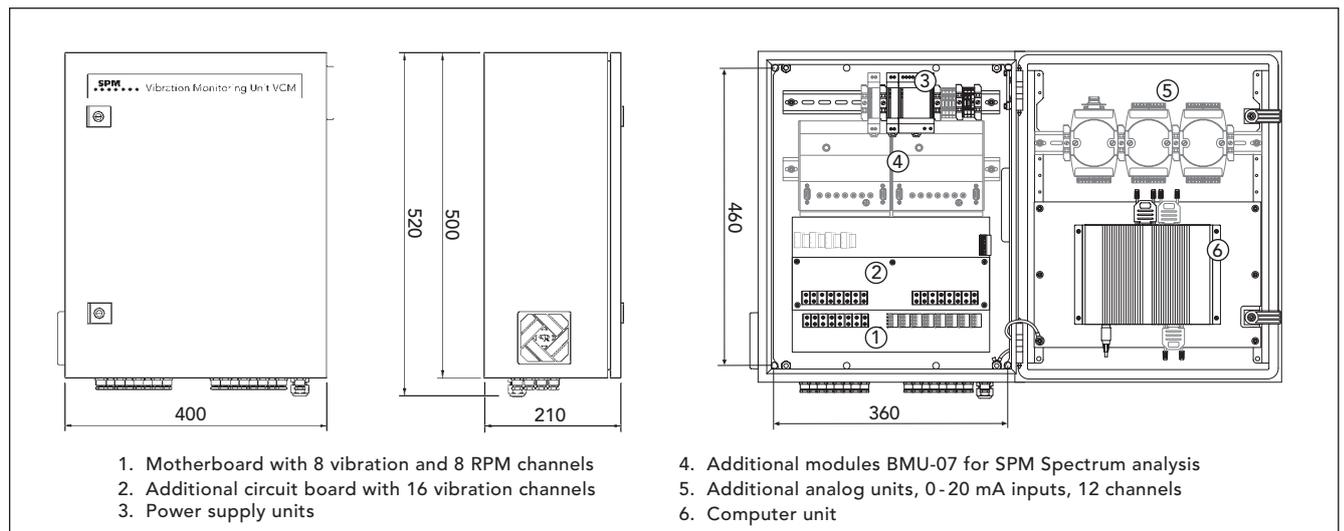


Fig. 4 Cable adapter SPM 93162



Measuring Unit VCM20 for EVAM[®] Vibration Analysis



1. Motherboard with 8 vibration and 8 RPM channels
2. Additional circuit board with 16 vibration channels
3. Power supply units

4. Additional modules BMU-07 for SPM Spectrum analysis
5. Additional analog units, 0-20 mA inputs, 12 channels
6. Computer unit

VCM20 is a continuous measuring unit for vibration analysis according to the EVAM[®] method. The unit is equipped with computer unit and multiplexing measuring logic. The software DAQ, installed on the computer, controls the measuring operations, data processing and storage.

VCM20 has 8 channels for vibration measurements and 8 channels for RPM measurements. The vibration channels can be used for SPM Spectrum when connected to the Bearing Monitoring Unit BMU-07. An additional circuit board, SPM 14393 or 14552, with 16 vibration channels can be mounted on top of the motherboard. As vibration transducers, VCM20 accepts ICP type accelerometers with voltage output. RPM transducers are proximity switches, NPN or PNP.

Via Ethernet, VCM20 is connected to a computer with the software Condmaster[®] and DBL under Windows. The measuring assignments are set up in Condmaster[®]. The communication program DBL transmits measuring assignments to and reads the result file from the VCM20 unit.

Technical data

Processor:	AMD Geode 500 MHz
Memory:	256 MB RAM
Storage:	1 GB Compact Flash
Ethernet:	2 x 10/100 Mbit (RJ45)
Interface for:	Monitor (VGA), mouse (PS/2), keyboard (PS/2)
Operating system:	Windows XP Embedded
RPM channels:	8
Vibration channels:	8, or 24 with additional board
Sampling methods:	Asynchronous, synchronous with programmable time averaging
Frequency ranges FFT:	0 to 100, 200, 500, 1000, 2000, 5000, 10000, 20000 Hz
Envelope frequencies:	100, 200, 500, 1000, 2000, 5000, 10000 Hz
Measurement windows:	Rectangle, Hanning, Hamming, Blackman, Exact Blackman, Kaiser-Bessel, Flat 4, Parzen, Welsh
Resolution, lines:	200, 400, 800, 1600, 3200, 6400
Antialiasing filter:	> 80 dB/octave
Vibration transducer:	SLD144 or ICP type accelerometers with voltage output

Transducer supply:	4 mA, +24 V DC
Transducer input:	Max. 12 V peak-peak (e.g. 600 m/s ² peak for sensitivity 10 mV/m/s ²)
Transducer line test:	Short and open circuit (transducers type SLD and TRV-20/21)
RPM transducer:	Proximity switch, PNP or NPN, supply 12 V DC from VCM20
RPM measuring range:	10 – 60000 rpm
Analog input:	12 channels, 0 to 20 mA (option)
SPM Spectrum channels:	7 or 14 with BMU-07 units (option)
Power supply:	115 / 230 V AC
Operating temperature:	0 to +40 °C (32 to 104 °F)
Storage temperature:	-20 to +80 °C (-4 to 176 °F)
Relative humidity:	10% to 90% (non-condensing)
Housing:	Enamelled steel, IP 52
Cable inlets:	Nickel plated brass
Dimensions (w x h x d):	400 x 520 x 210 mm
Weight:	approx. 20 kg

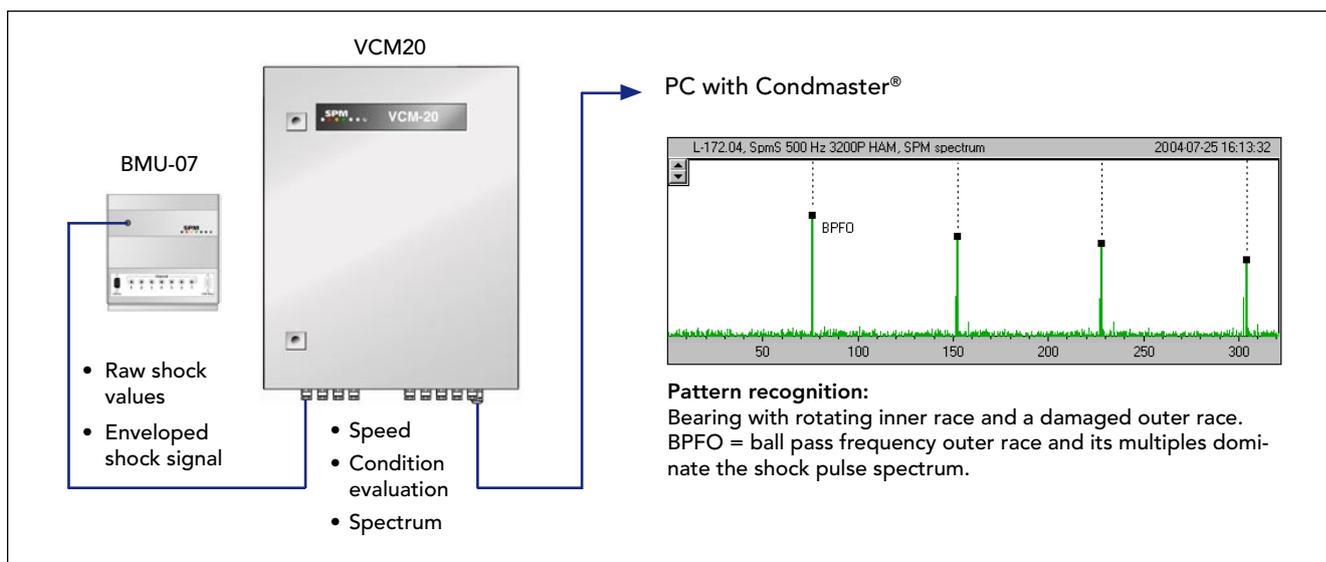
Ordering number

VCM20-XXWXXS

Vibration channels, 8 or 24 (24 with additional circuit board)	XX
Additional analog modules NuDAM W = 12 channels, 4-20 mA inputs	W
Transducer inputs on motherboard A = terminal strip for coaxial cables B = screw terminals C = SMB connectors	X
Transducer inputs on additional circuit board A = terminal strip for coaxial cables B = screw terminals	X
Bearing monitoring units, BMU-07 S = 1 unit, incl. power supply unit T = 2 units, incl. power supply unit	S
14393 Additional circuit board, 16 vibration channels with terminal strip for coaxial cables	
14552 Additional circuit board, 16 vibration channels with screw terminals	
14927 Additional analog units, 12 channels 0-20 mA current inputs	



SPM Spectrum on-line



The purpose of 'SPM Spectrum' is to verify the source of high shock pulse readings. In addition to high magnitudes, 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 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.

Signal to on-line system

The on-line measuring unit VCM20 measures vibration and has spectrum analysis capacity. This measuring unit can receive processed signals from up to 168 shock pulse measuring points, make the spectrum analysis and convey the data to the monitoring software Condmaster®.

To achieve this, up to 24 Bearing Measuring Units BMU-07, each with 7 SPM channels, are slaved to the VCM20-24C. These units measure the shock magnitude by a standard shock pulse measurement with the dBm/dBc or the LR/HR method. The raw values are transmitted to VCM20, together with the enveloped shock signal.

In the VCM20, this signal is subjected to a Fast Fourier Transform (FFT). The resulting spectrum is used for pattern recognition only. Spectrum line amplitudes are influenced by too many factors to be reliable condition indicators, so all condition evaluation is based on the dBm/dBc or LR/HR values.

Spectrum types

One unit for amplitude in an SPM spectrum is S_D (Shock Distribution unit), and 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. One can select linear or power spectra with up to 6400 lines, with frequency ranges from 0 – 100 Hz to 0 – 20 000 Hz.

Pattern recognition

Finding a line or line pattern in a spectrum is a purely mathematical procedure where the rpm is one factor and the specified bearing frequency is the other. SPM has automated the process so anybody can use it fast.

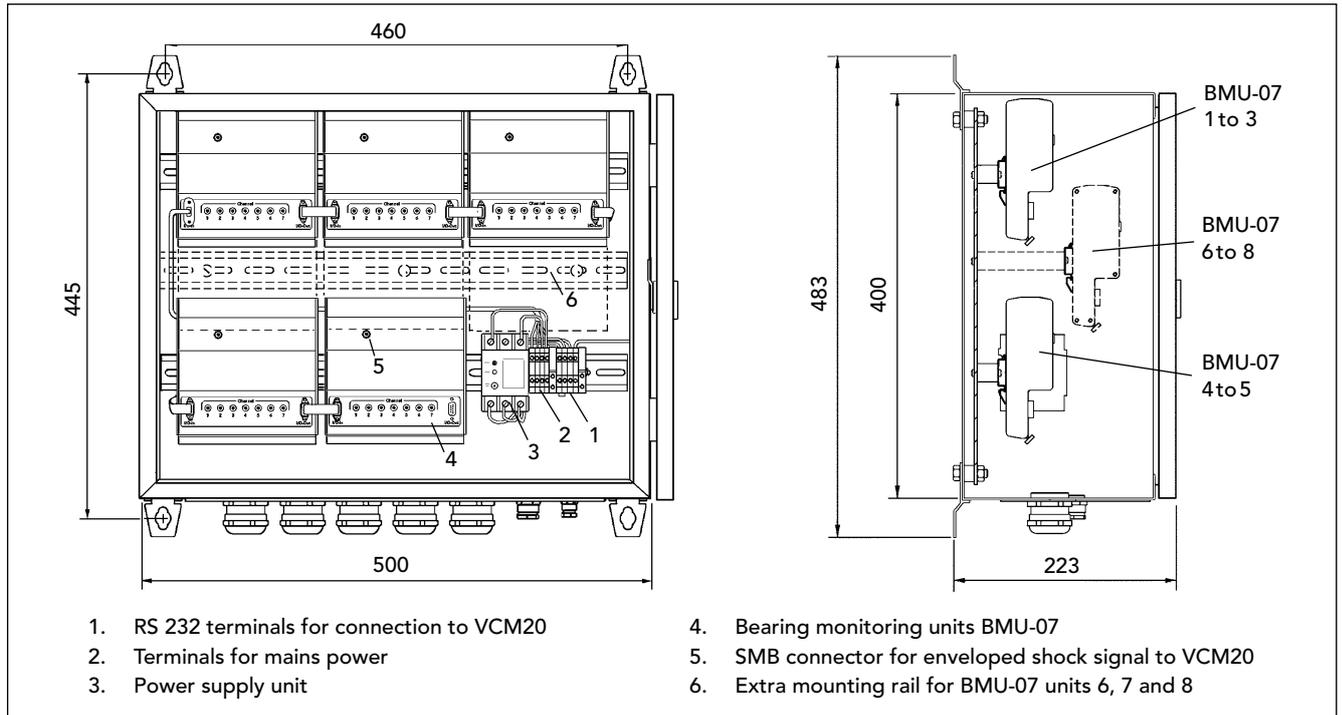
The rpm is measured by VCM20. The factors defining the bearing frequencies are automatically obtained from the bearing catalogue in Condmaster® by stating the ISO standard bearing number. The frequency patterns of bearings are also preset in Condmaster®. Linking the symptom group 'Bearing' to the measuring point will allow the user to highlight the following bearing patterns by clicking on their name:

BPFO	Ball pass frequency over the outer race
BPFOM	Ball pass frequency outer race, rpm modulated
BPFI	Ball pass frequency over the inner race
BPFIM	Ball pass frequency inner race, rpm modulated
BSF	Double ball spin frequency
BSFM	Double ball spin frequency, rpm modulated
FTF	Fundamental train frequency.

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.



Bearing Monitoring Cabinet BMC01-X



The Bearing Monitoring Cabinet BMC01-X accommodates up to eight BMU-07 with up to 7 bearing monitoring channels each. It is mounted next to the host unit VCM20-8C or VCM20-24C. The connecting cables have a length of 2 m.

BMC01-X (X = the number of BMU-07 it contains when ordered) is delivered fully equipped and wired. Its power supply unit transforms 100–240 V AC to 5 V DC supply current for the BMU units.

The positions of the BMU units are fixed, starting with BMU 1 in the upper left hand corner. This position is connected via the RS 232 terminal to the VCM20 unit. The envelope signal cable from BMU 1 is connected to measuring channel 1 in the VCM20. The 7 bearing measuring channels under BMU 1 are automatically recognized as sub-channels 1 through 7 under VCM channel 1. Via software setting, each can be linked to one of the rpm channels of the VCM20.

The following BMU units are connected in series to BMU 1, using the short I2C cable SPM 46065 for all but BMU 4 and BMU 6, which requires SPM 46066. The connection to the VCM20 is as for BMU 1, using VCM channels 2 to 8. Each BMU unit requires a cable inlet SPM 82370 with rubber sealing SPM 81317, plus an envelope signal cable SPM 46064.

BMU 6 to 8 are mounted on an upper rail, SPM 14820 with spacer set SPM 14856, ordered with BMU 6. Please note that accessories are ordered separately only when BMC01 is later equipped with more BMU units.

The system can be expanded to max. 3 cabinets (type BMC01-XB) by using the bus expander kit SPM 15070.

Technical data

Bearing Monitoring Units:	1 to 8 BMU-07 (max. 56 channels)
Interfaces:	serial I2C between BMU-07 units, RS232 to VCM20
Power supply unit:	input 100 – 240 V AC, 0.45 A, 50/60 Hz, output 5VDC, 1.5 A
Operating temperature:	-10 to 60 °C
Housing:	enamelled steel, IP 65
Cable inlets:	nickel plated brass
Dimensions (w x h x d):	500 x 483 x 223 mm

Software requirements

Condmaster®:	from version 4.0
VCM20 software:	from version 2.04

Hardware requirements

VCM20-8C/VCM20-24C:	circuit board no. 14389-003, 14389-013 or higher with firmware version 1.03 or higher.
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Ordering numbers

BMC01-X Bearing Monitoring Cabinet, X=1 to 8 BMU-07, fully equipped and wired.

Accessories for extra BMU-07

46064	Envelope signal cable to VCM, 2 m, coaxial, SMB
46065	I2C cable for serial connection of BMU-07, short for units in positions 2, 3, 5, 7, 8
46066	I2C cable for serial connection of BMU-07, long for units in positions 4, 6
82370	Cable inlet PG29
81317	Rubber sealing for cable inlet 82370

Extra mounting rail for BMU unit in position 6:

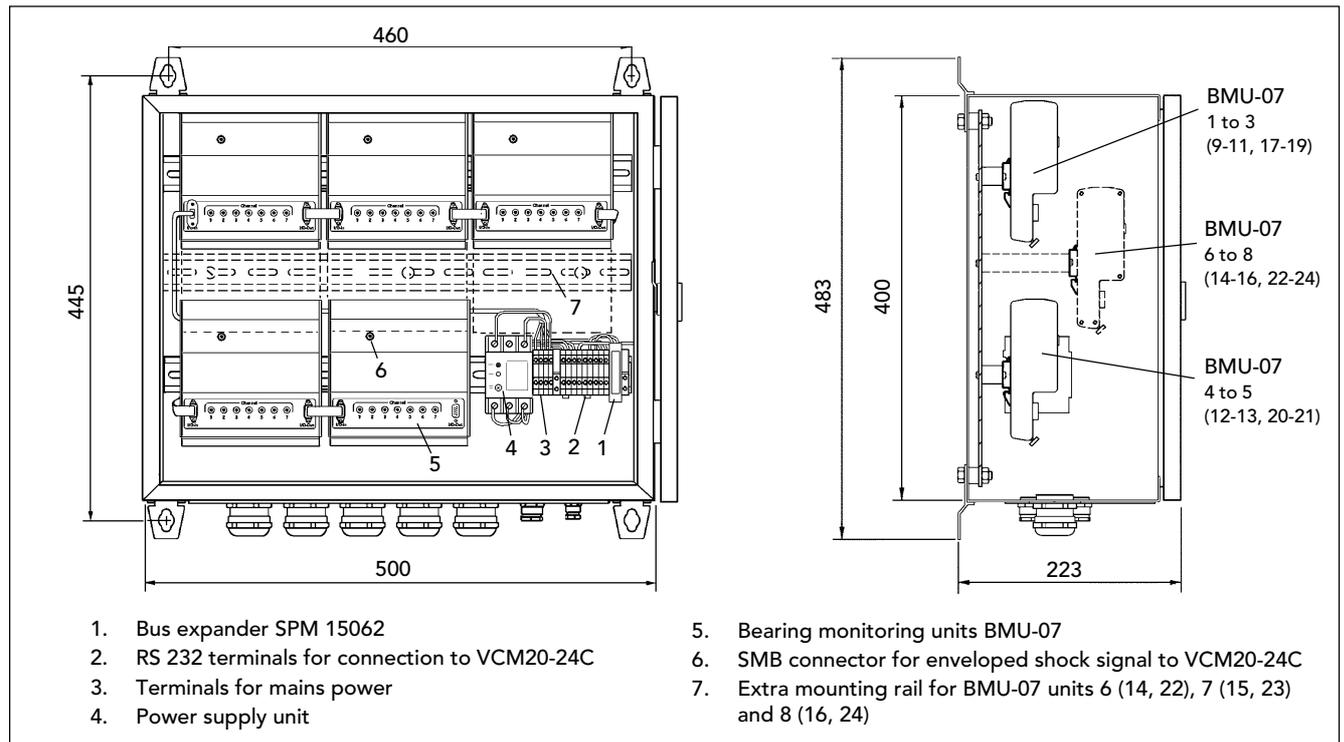
14820	Mounting rail, DIN 450 mm
14856	Spacers for mounting rail, set of 3 incl. screws

Bus expander kit for BMC01-X:

15070	The kit includes Bus Expander 15062, screw terminals (4), cable inlet and internal cables, for connection of an additional cabinet of type BMC01-XB to BMC01-X.
90297-L	Twisted 3-pair cable with shield (L = length in meters)



Bearing Monitoring Cabinet BMC01-XB



The Bearing Monitoring Cabinet BMC01-XB with bus expander accommodates up to eight BMU-07 with up to 7 bearing monitoring channels each. It is mounted next to the host unit VCM20-24C. The connecting cables have a length of 2 m.

BMC01-XB (X = the number of BMU-07 it contains when ordered) is delivered fully equipped and wired. Its power supply unit transforms 100 – 240 V AC to 5 V DC supply current for the BMU units.

The positions of the BMU units are fixed, starting with BMU 1 in the upper left hand corner. This position is connected via the RS 232 terminal to the VCM20-24C. The envelope signal cable from BMU 1 is connected to measuring channel 1 in the VCM20-24C. The 7 bearing measuring channels under BMU 1 are automatically recognized as sub-channels 1 through 7 under VCM channel 1. Via software setting, each can be linked to one of the rpm channels of the VCM20-24C.

The following BMU units are connected in series to BMU 1, using the short I2C cable SPM 46065 for all but BMU 4 and BMU 6, which requires SPM 46066. The connection to the VCM20-24C is as for BMU 1, using VCM channels 2 to 8. Each BMU unit requires a cable inlet SPM 82370 with rubber sealing SPM 81317, plus an envelope signal cable SPM 46064.

BMU 6 to 8 (14 to 16, 22 to 24) are mounted on an upper rail, SPM 14820 with spacer set SPM 14856, ordered with BMU 6. Please note that accessories are ordered separately only when BMC01 is later equipped with more BMU units.

Technical data

Bearing Monitoring Units:	1 to 8 BMU-07 (max. 56 channels)
Interfaces:	serial I2C between BMU-07 units, RS232 to VCM20-24C
Bus expander:	for connection of an additional BMC01-XB (max. 3 BMC01-XB / 168 channels)
Power supply unit:	input 100 – 240 V AC, 0.45 A, 50/60 Hz, output 5 V DC, 1.5 A
Operating temperature:	-10 to 60 °C
Housing:	enamelated steel, IP 65
Cable inlets:	nickel plated brass
Dimensions (w x h x d):	500 x 483 x 223 mm

Software requirements

Condmaster®Pro:	from version 4.0
VCM20 software:	from version 2.04

Hardware requirements

VCM20-24C:	circuit board no. 14389-003, 14389-013 or higher with firmware version 1.03 or higher.
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Ordering numbers

BMC01-XB	Bearing Monitoring Cabinet with bus expander, X=1 to 8 BMU-07, fully equipped and wired.
90297-L	Twisted 3-pair cable with shield (L = length in meters)

Accessories for extra BMU-07

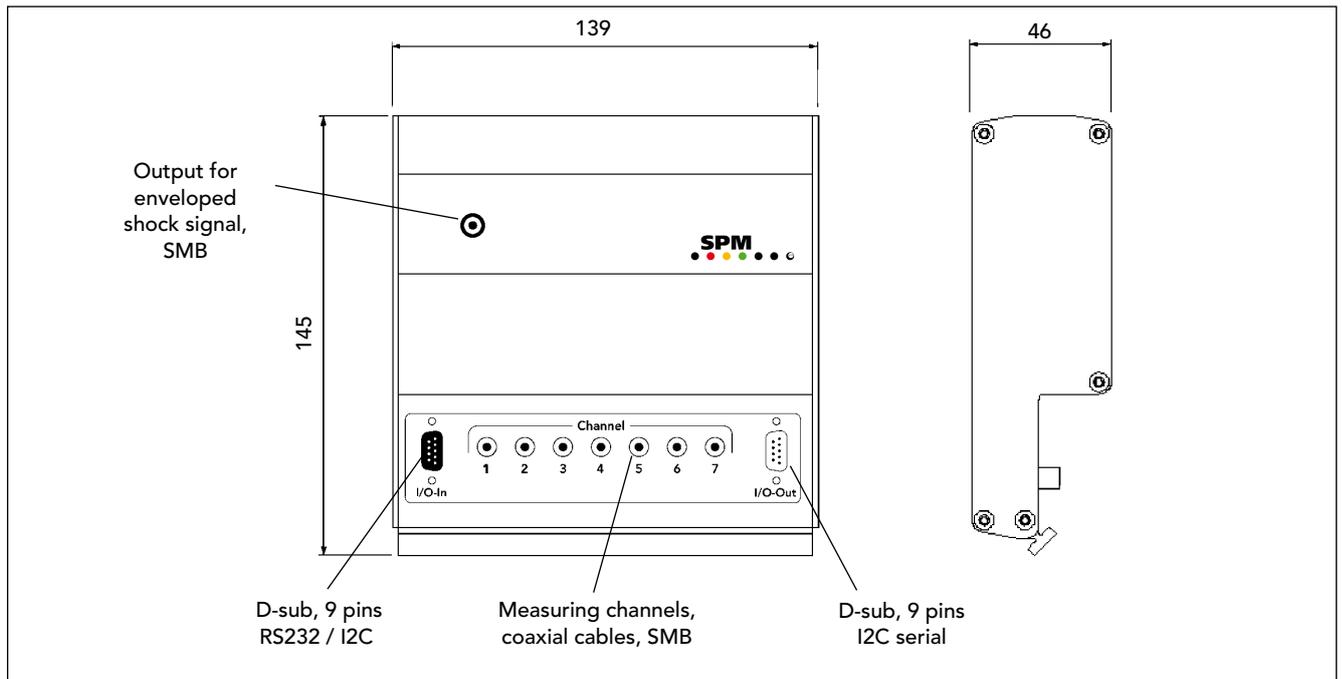
46064	Envelope signal cable to VCM, 2 m, coaxial, SMB
46065	I2C cable for serial connection of BMU-07, short for units in positions 2, 3, 5, 7, 8
46066	I2C cable for serial connection of BMU-07, long for units in positions 4, 6
82370	Cable inlet PG29
81317	Rubber sealing for cable inlet 82370

Extra mounting rail for BMU unit in position 6 (14, 22)

14820	Mounting rail, DIN 450 mm
14856	Spacers for mounting rail, set of 3 incl. screws



Bearing Monitoring Unit BMU-07



The Bearing Monitoring Unit BMU-07 is part of the CMS System for on-line machine condition monitoring. It has 7 multiplexing channels for shock pulse measurements on rolling element bearings, connected to SPM shock pulse transducers of type 42000 (cable length max. 100 m).

BMU-07 is slaved, in groups of up to 8 units, to the Measuring Unit VCM20 which transfers measuring instructions and measurements between the controlling software Condmaster® and the BMU-07.

BMU-07 measures shock pulses magnitude in dBsv (decibel shock value) according to the selected SPM method (dBm/dBc or LR/HR), plus the TLT value showing the transducer line quality. In addition, the BMU-07 transmits the enveloped shock pulse signal to the VCM20 unit for FFT analysis.

Communication with VCM20

The BMU-07 measures on request from the VCM20 unit and transmits data via an RS 232 interface (measuring instructions, shock and TLT values) and a coaxial cable (enveloped shock pulse signal for FFT analysis). When several BMU-07 units are used, the RS 232 interface are connected in series via I2C cables, with a common RS 232 interface to the VCM20.

Bearing condition evaluation

BMU supplies unnormalized values for shock magnitude and the enveloped shock pulse signal. The VCM20 unit measures the bearing speed, calculates the SPM Spectrum, and evaluates the bearing's operating condition.

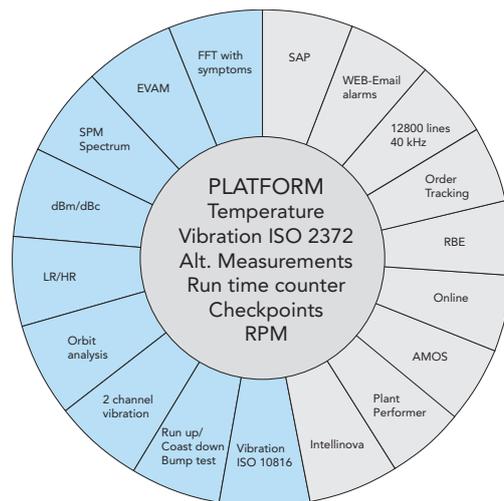
Measurement conditions are set up in Condmaster®. These include shock pulse method, spectrum type, symptoms for bearing fault recognition and alarm limits. The VCM20 settings control measuring sequence, measuring intervals and data recall times from the hardware to the condition monitoring program.

Technical data

Measuring methods:	Shock pulse measurement, dBm/dBc or LR/HR, and SPM Spectrum
Measuring range:	-9 to 99 dBsv (dBm/dBc) -19 to 99 dBsv (LR/HR)
Resolution:	1 dBsv
Measuring channels:	7
Transducer type:	SPM type 42000
Transducer input:	SMB connector, coaxial cable length max. 100 m
Shock signal output:	SMB connector, coaxial cable length max. 2.5 m
Fault indication:	Transducer line test of measuring circuit quality
Interface:	Serial communication I2C between BMU-07 units, RS 232 to VCM20
Power supply:	5 V DC \pm 10%
Temperature range:	-10° to 60° C
Dimensions:	139 x 145 x 46 mm



Condmaster® Nova - Platform



Condmaster®Nova is a comprehensive condition monitoring and predictive maintenance program. Module built, it can be tailored, in performance and price, to your selected hardware.

Condmaster®Nova communicates with all SPM handheld data logging instruments and online systems for continuous condition monitoring.

Condmaster®Nova is available for single users and for networks (Windows compatible). It works under Windows XP, Vista and uses SQL Server 2000 as database handler, included on the installation disks.

The Condmaster®Nova platform includes the measuring techniques

- ISO2372 vibration measurement
- 2 user defined measurements, with special input window for temperature (data input as analogue voltage or current, or manual)
- Checkpoint (free text describing maintenance activity). It also has a runtime counter for the operating hours of a machine.
- Contact free identification tags, CondID®, can be loaded with basic data and the latest measuring results.

Further modules (see TD-231 through TD-245, TD-278, TD-280 and TD-281) can be added as needed, for either limited or unlimited use.

The basic menu guided program functions are:

- Measuring point definition, using a customer defined numbering system and including input data for all active measuring techniques.
- Graphical overview, showing the measuring points'

location as a hierarchical structure, from plant down to machine level. The measuring point status is shown as a green - yellow - red dot.

- Creation of measuring rounds and communication with the measuring instrument (data logging, time planning).
- Display and print out of all measuring results as graphics and lists.
- Creation of alarm messages and lists, statistics and reports.

Minimum hardware requirements, Windows XP:

- PC with 233 MHz Intel Pentium/Celeron processor (>300 MHz recommended), 64 MB RAM (>128 MB recommended) and 1,5 GB available hard disk space
- Colour display adapter min. SVGA, 600 x 800 pixels

Minimum hardware requirements, Windows Vista:

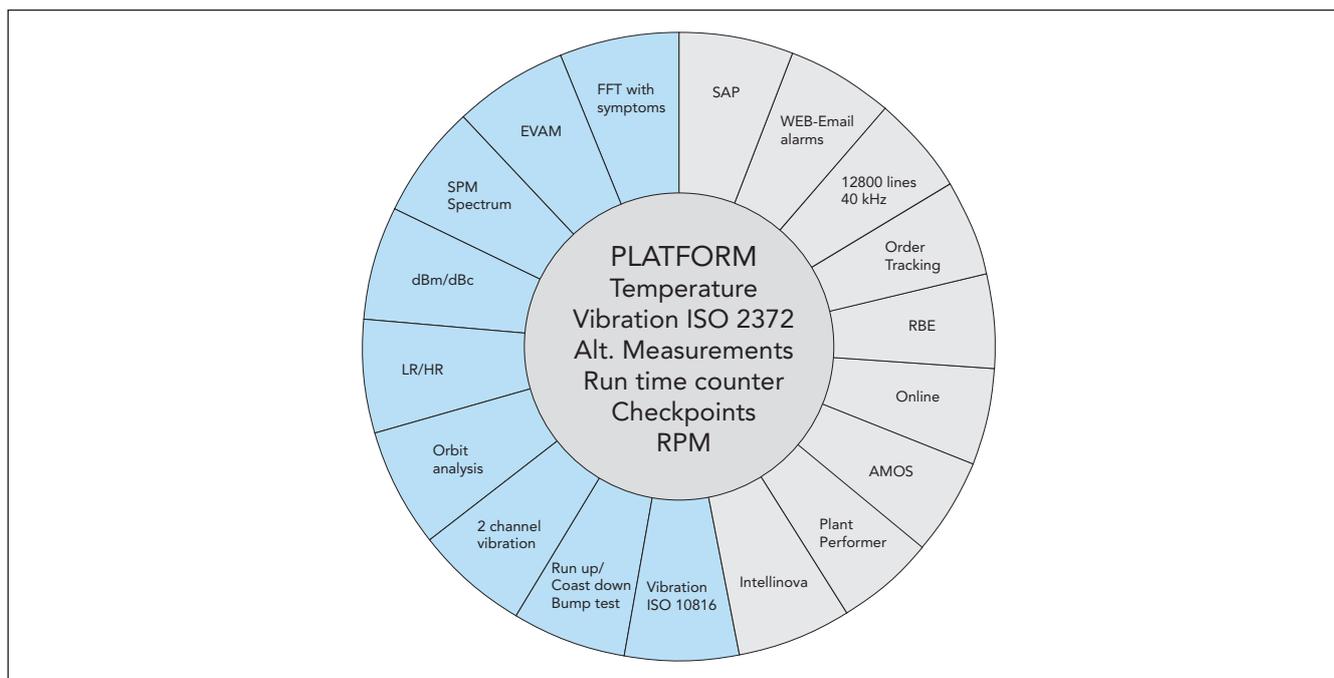
- 1 GHz 32-bit (x86) or 64-bit (x64) processor
- 1 GB of RAM memory
- 40 GB hard drive with at least 15 GB of available space
- Support for DirectX 9 graphics with:
 - WDDM Driver
 - 128 MB of graphics memory (minimum)
 - Pixel Shader 2.0 in hardware
 - 32 bits per pixel

Ordering number

PRO118 Condmaster®Nova, Platform



Condmaster® Nova - Modules



Condmaster®Nova is modular. It can be tailored, in performance and price, to your selected hardware and technical requirements.

The Condmaster®Nova platform includes the measuring techniques Vib ISO 2372, two user defined measurements (data input as analogue voltage or current, or manual), and Checkpoint (free text describing maintenance activity), all for unlimited use. It also has a runtime counter for the operating hours of a machine.

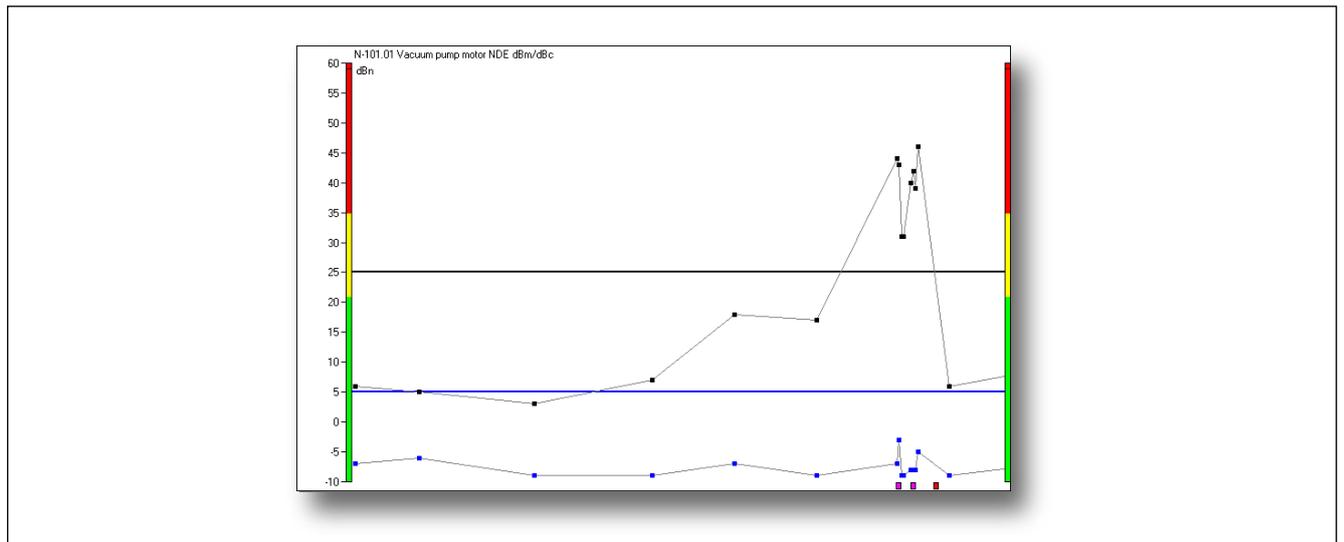
All additions to the platform functions are ordered from the list below, for either unlimited or limited use. Modules can be bought at any time as update files.

Limited use (for Leonova instruments only) implies that credits are deducted each time the function is used in the measuring instrument. For online system Intellinova, limited use is time based. Part of your investment can thus be turned into operating costs by buying "measuring credits" instead of paying for an unlimited program.

TD sheet No.	Module	Art no. Unlimited use / Art no. Limited use	Goes with instruments/system									
			T2001	A2010	T30	A30	Leonova	Leonova Infinity	VCM	CMS	Intellinova	
TD-230	Platform	PRO118 / - - -	x	x	x	x	x	x	x	x	x	x
TD-232	dBm/dBc	MOD130 / MOD230	x		x		x	x	+ BMU			x
TD-233	LR/HR and Lubmaster	MOD131 / MOD231		x		x	x	x	+ BMU	x		x
TD-234	SPM Spectrum	MOD132 / MOD232					x	x	+ BMU			x
TD-235	Vibration ISO 10816	MOD133 / MOD233					x	x				x
TD-236	FFT with symptoms	MOD134 / MOD234			T30-3	A30-3	x	x	x			x
TD-237	EVAM and time signal	MOD135 / MOD235			T30-3	A30-3	x	x	x			x
TD-238	2 channel simult. vibration	MOD136 / MOD236						x				x
TD-239	Run up/coast down, bump test	MOD137 / MOD237						x				
TD-240	Orbit analysis	MOD138 / MOD238						x				x
TD-241	12800 lines, 40 kHz	MOD139 / - - -						x				x
TD-242	Online, CMS	MOD182 / - - -								x	x	
TD-243	Web and e-mail alarms	MOD183 / - - -	x	x	x	x	x	x	x	x	x	x
TD-244	SAP link	MOD184 / - - -	x	x	x	x	x	x	x	x	x	x
TD-245	Rule Based Evaluation, RBE	MOD181 / - - -	x	x	x	x	x	x	x	x	x	x
TD-278	AMOS link	MOD185 / - - -	x	x	x	x	x	x	x	x	x	x
TD-280	Plant Performer	MOD186 / - - -	x	x	x	x	x	x	x	x	x	x
TD-281	Intellinova	MOD187 / - - -										x
TD-305	Order Tracking	MOD188 / - - -							x			



Condmaster® Nova - dBm /dBc



For over 35 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 2 seconds). 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

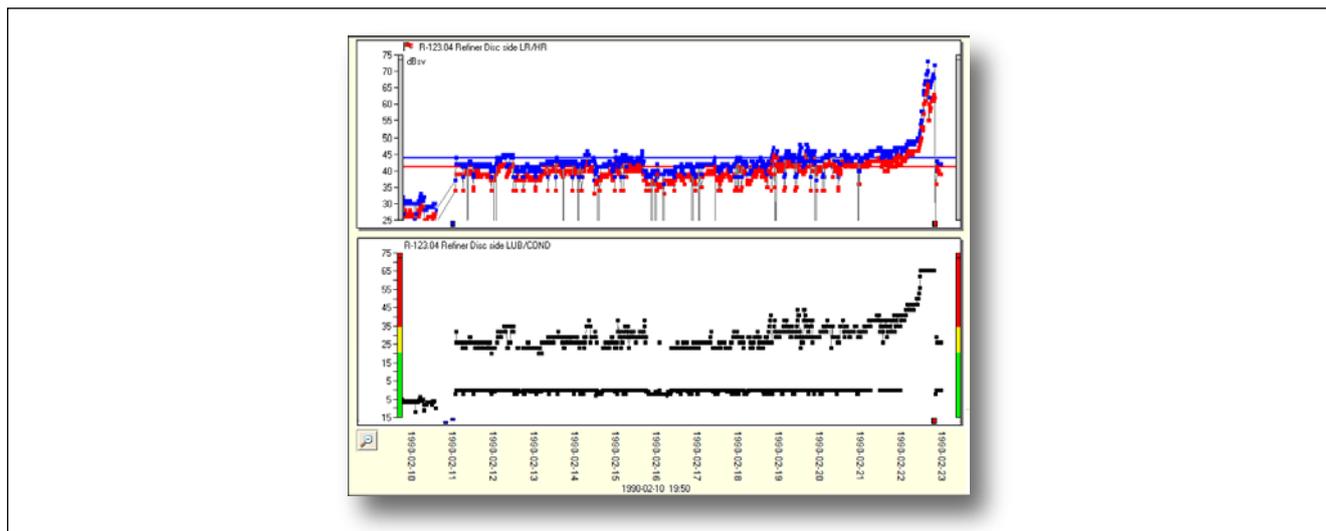
The initial value and the range of the three condition zones (green - yellow - red) was empirically established by testing bearings under variable operating conditions. The maximum value places the bearing into the condition zone. The height of the carpet value and delta (dBm minus dBc) indicated lubrication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

Ordering numbers

- MOD130 dBm/dBc, unlimited use
- MOD230 dBm/dBc, limited use



Condmaster® Nova - 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 the dBm/dBc method (TD-232). 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 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 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

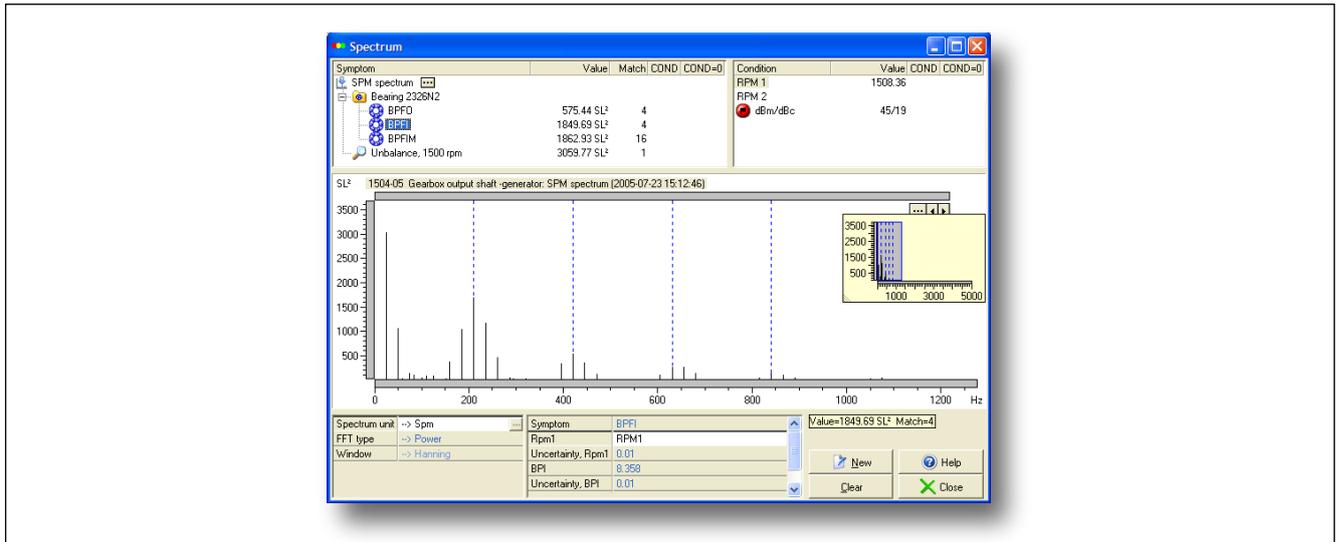
The accuracy of the LR/HR method is increased by a calibration factor (COMP no.) used in case of bearings with minimal load or poor quality measuring points (in both cases the signal strength is below normal). On the basis of the bearing's catalogue data and the lubricant properties, Leonova calculates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

Ordering numbers

- MOD131 LR/HR, unlimited use
- MOD231 LR/HR, limited use



Condmaster® Nova - 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 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.

Leonova 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 HR 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 the 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.

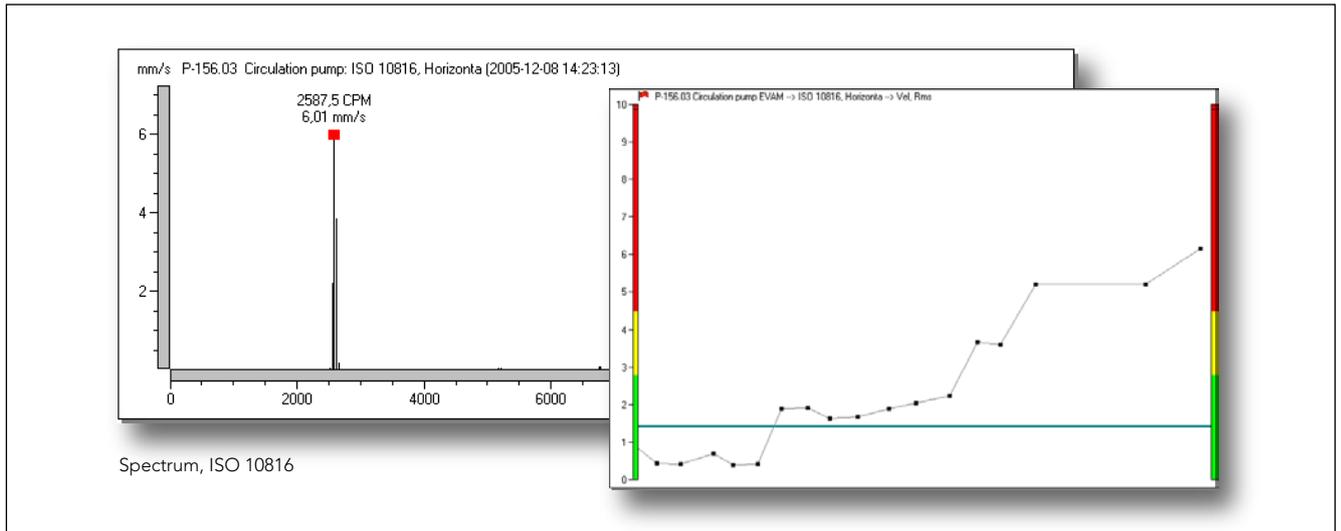
Ordering numbers

MOD132 SPM Spectrum, unlimited use

MOD232 SPM Spectrum, limited use



Condmaster® Nova - ISO Standard vibration monitoring



Broad band 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.

With Condmaster, ISO 2372 measurement is a platform function, always included for unlimited use (see TD-230).

ISO 10816 is an option with ordering numbers MOD133 (unlimited use) and MOD233 (limited use).

Features of ISO 10816 are:

- Measurements are made in three direction (horizontal, vertical, axial).
- Machine condition is generally diagnosed on the basis of broad band 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, 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, Condmaster also provides a 1600 line **spectrum**.

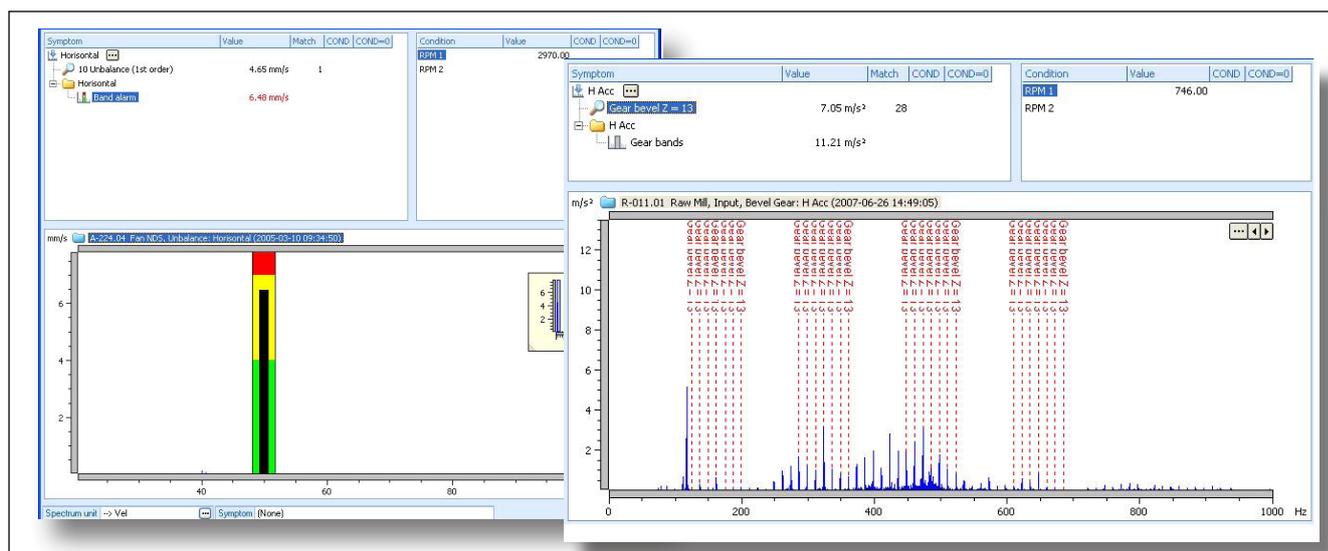
Ordering numbers

MOD133 VIB ISO 10816 and spectrum, unlimited use

MOD233 VIB ISO 10816 and spectrum, limited use



Condmaster® Nova - FFT with symptoms



FFT Spectrum with Symptoms is a vibration analysis function offered with Leonova and Intellinova, for either limited or unlimited use. It is a reduced form of EVAM (Evaluated Vibration Analysis Method), lacking the statistical evaluation by means of criteria (described in TD sheet TD-237).

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 the help of pre-set fault symptoms.
- Trending of symptom values. Alarm 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 surveillance of an individual machine. Alternatives include:

- FFT
- enveloping
- time synchronous averaging
- band alarms and averaging of measurement results for improved alarm reliability. Random high readings caused by resonance or other sources of disturbance are filtered out, minimizing the number of false alarms.

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 available in 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.

Phase measurement

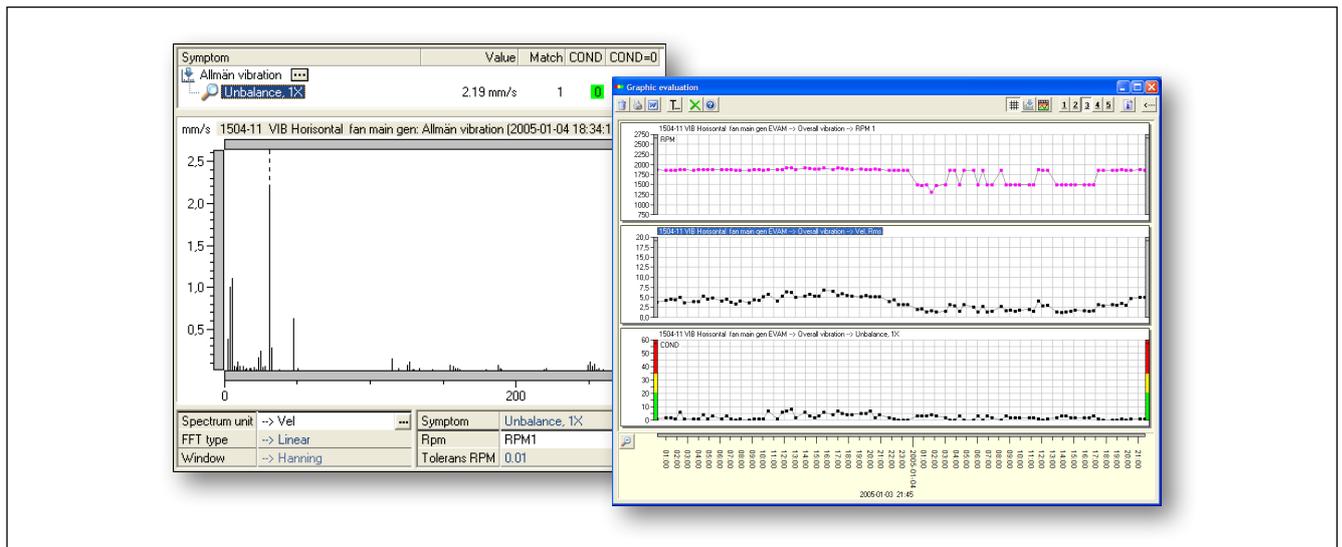
A phase is a time delay expressed in degrees of rotation. Leonova Infinity or Intellinova calculates the time delay between the passage of the tachometer pulse and the peak of the frequency component of interest from the vibration transducer at the speed of rotation. The value presented is a relative angle, not an absolute, because there is no compensation for phase lag in the transducer or the electronic circuits.

Ordering numbers

- MOD134 FFT with symptoms, unlimited use
- MOD234 FFT with symptoms, limited use



Condmaster® Nova - EVAM and Time Signal



EVAM stands for Evaluated Vibration Analysis Method. With Leonova and Intellinova, the EVAM method is offered as an analysing function with either limited or unlimited use.

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 pre-set 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
- time synchronous averaging
- band alarms and averaging of measurement results for improved alarm reliability.

Random high readings caused by resonance or other sources of disturbance are filtered out, minimizing the number of false alarms.

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 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, for some an input is needed, 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 that compares new parameter values with the statistical mean value and displays a dimensionless condition value against a green - yellow - red scale.

Phase measurement

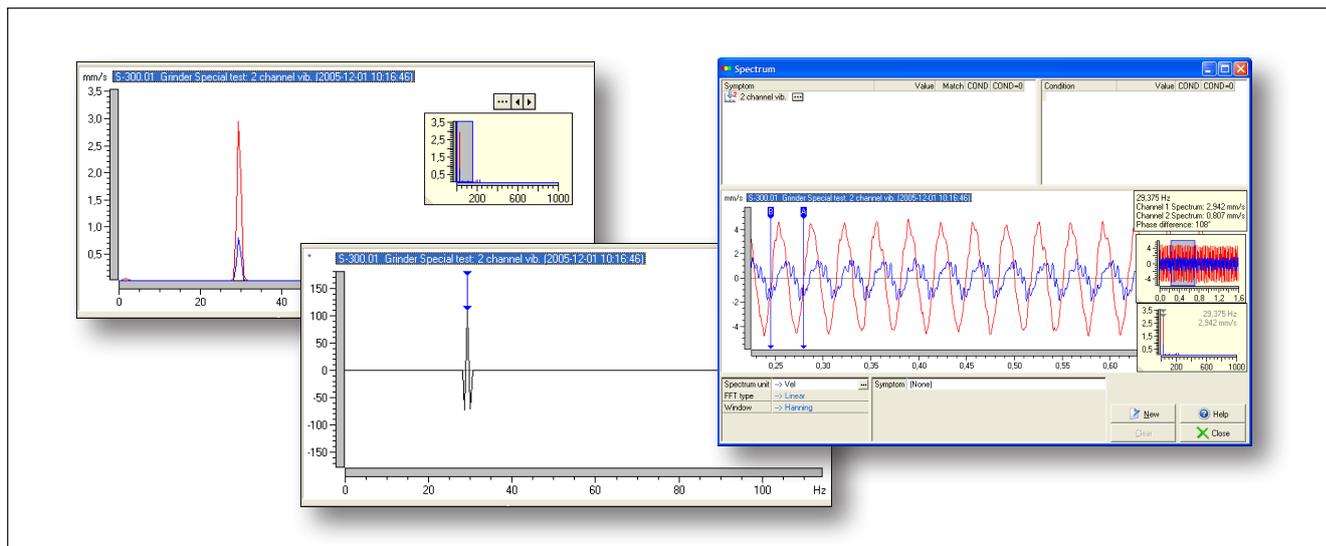
A phase is a time delay expressed in degrees of rotation. Leonova Infinity or Intellinova calculates the time delay between the passage of the tachometer pulse and the peak of the frequency component of interest from the vibration transducer at the speed of rotation. The value presented is a relative angle, not an absolute, because there is no compensation for phase lag in the transducer or the electronic circuits.

Ordering numbers

- MOD135 EVAM + Time Signal, unlimited use
- MOD235 EVAM + Time Signal, limited use



Condmaster® Nova - Two-channel simultaneous vibration



Two channel simultaneous vibration monitoring is a Condmaster®Nova function for limited (MOD236) or unlimited (MOD136) use. It requires that either the measuring technique 'FFT with symptoms' or 'EVAM' is active.

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.

Measurement requires the set-up of two vibration assignments with identical parameters. The two-channel measuring cable CAB51 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 online system Intellinova, two-channel measurement is set up using one even-numbered and one odd-numbered channel.

Condmaster®Nova displays the RMS values for DISP, VEL and ACC for both channels. Three graphs are available for each measurement:

- Spectrum
- Phase spectrum
- Time signal

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 Infinity 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.

In the spectrum and the time signal, the channels are overlaid red and blue.

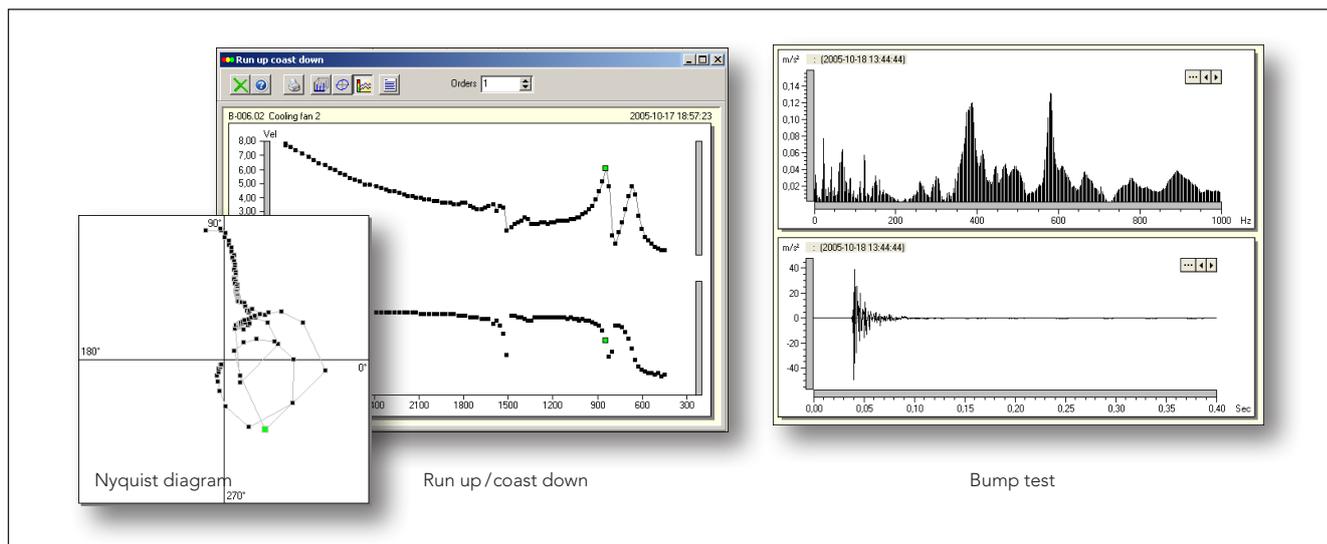
Ordering numbers

MOD136 Two-channel simultaneous vibration, unlimited use

MOD236 Two-channel simultaneous vibration, limited use



Condmaster® Nova - Run up/Coast down and Bump test



Run up / coast down measurements and Bump test are two vibration analysis functions offered with Leonova Infinity, for either limited or unlimited use. Run up / coast down is also available with online system Intellinova.

Run up / coast down

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 display 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.

A **waterfall diagram** can be viewed after the measurement is done. For each individual measurement, a spectrum can be called up.

A **Nyquist diagram** shows the phase angle and amplitude. A phase is a time delay expressed in degrees of rotation. Leonova Infinity 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.

Finally, the user can call up a **Bode diagram** 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 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-triggering 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-triggering time).

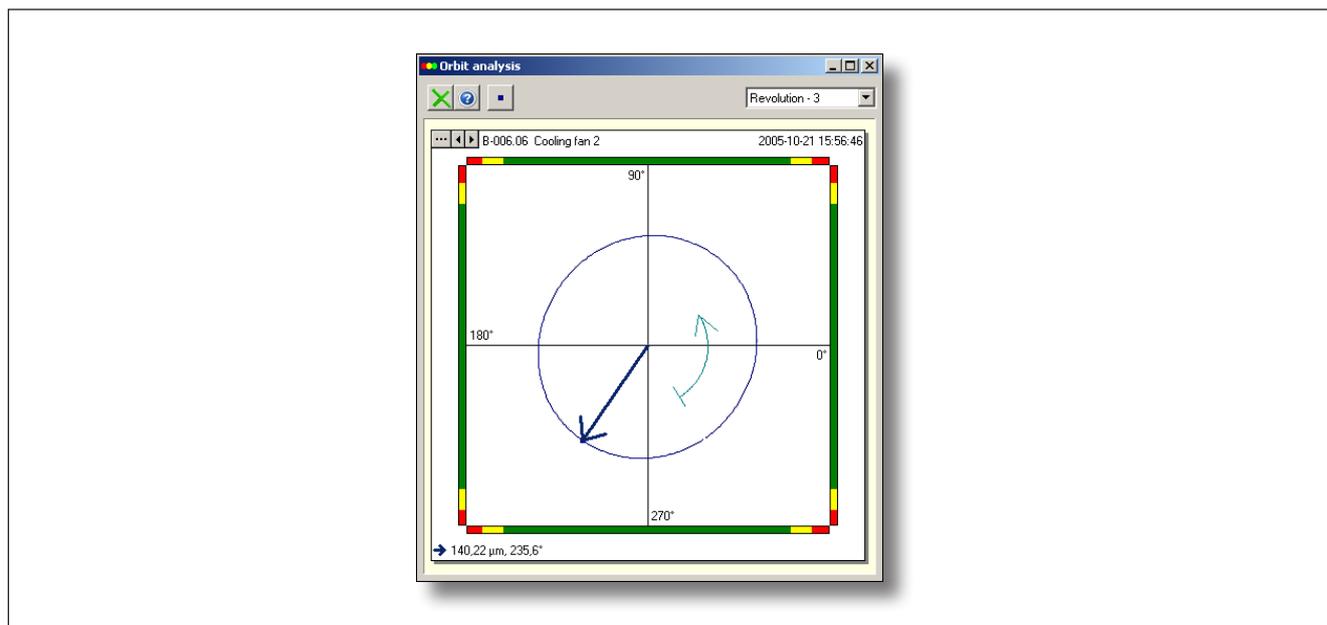
The spectrum can be stored as reference spectrum for any measuring assignment.

Ordering numbers

- MOD137 Run up/Coast down and Bump test, unlimited use
- MOD237 Run up/Coast down and Bump test, limited use



Condmaster® Nova - Orbit Analysis



Orbit analysis is a vibration measurement function offered with Condmaster® Nova, for either limited (MOD138) or unlimited use (MOD238). 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.

The measurements are normally made with Leonova Infinity or Intellinova on the buffered outputs of a machine protection system via the Orbit Interface 15315. Measurements can also be made with e. g. accelerometers to get a two dimensional graph of machine movement. 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 with the mouse in the orbit graph.

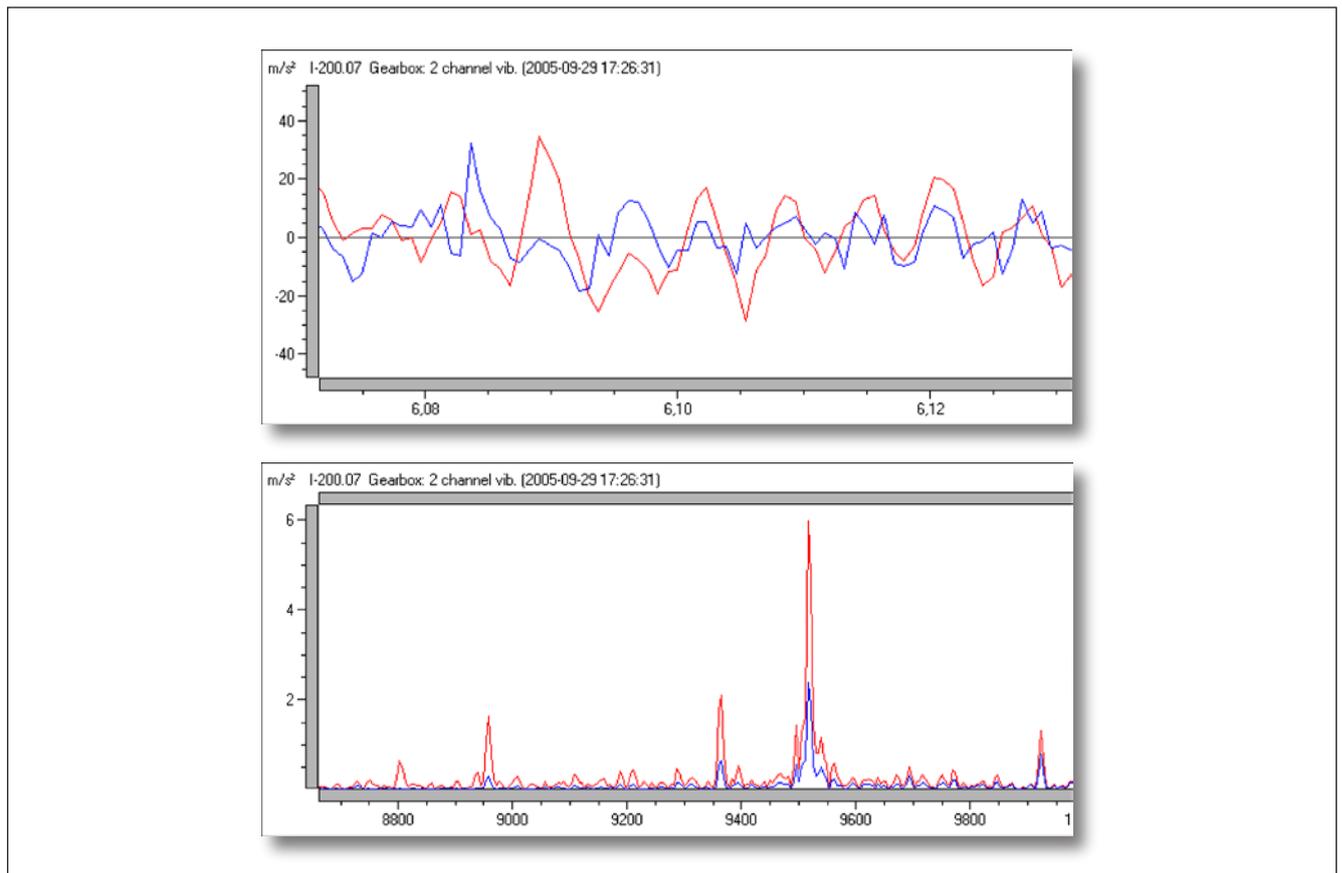
When the orbit assignment is set up in Condmaster® Nova, alarm limits can be set on the X and Y axis, resulting in an evaluated measurement (green - yellow- red scale).

Ordering numbers

- MOD138 Orbit analysis, unlimited use
- MOD238 Orbit analysis, limited use



Condmaster® Nova - 12 800 lines, 40 kHz



When higher resolution and frequency range are required, this module can be added to the system, e.g. for monitoring high speed gear boxes in turbines. The lower frequency limit is then 0.5, 2, 10 or 100 Hz. The upper limit is 40 000 Hz. The number of spectrum lines are extended to max. 12 800.

Ordering number

MOD139 12800 lines, 40 kHz, unlimited use



Condmaster® Nova - Intellinova®



The Intellinova module in Condmaster®Nova enables the software to communicate with all Commander Units, equipped with a user selected combination of measuring units for bearing and/or vibration monitoring. Units for analog in/out are also available.

The core of the Intellinova system is Condmaster®Nova, which receives the measuring results from all SPM condition monitoring devices for evaluation and presentation.

The Intellinova module offers advanced measurement, filtering and alarm 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 alarms.

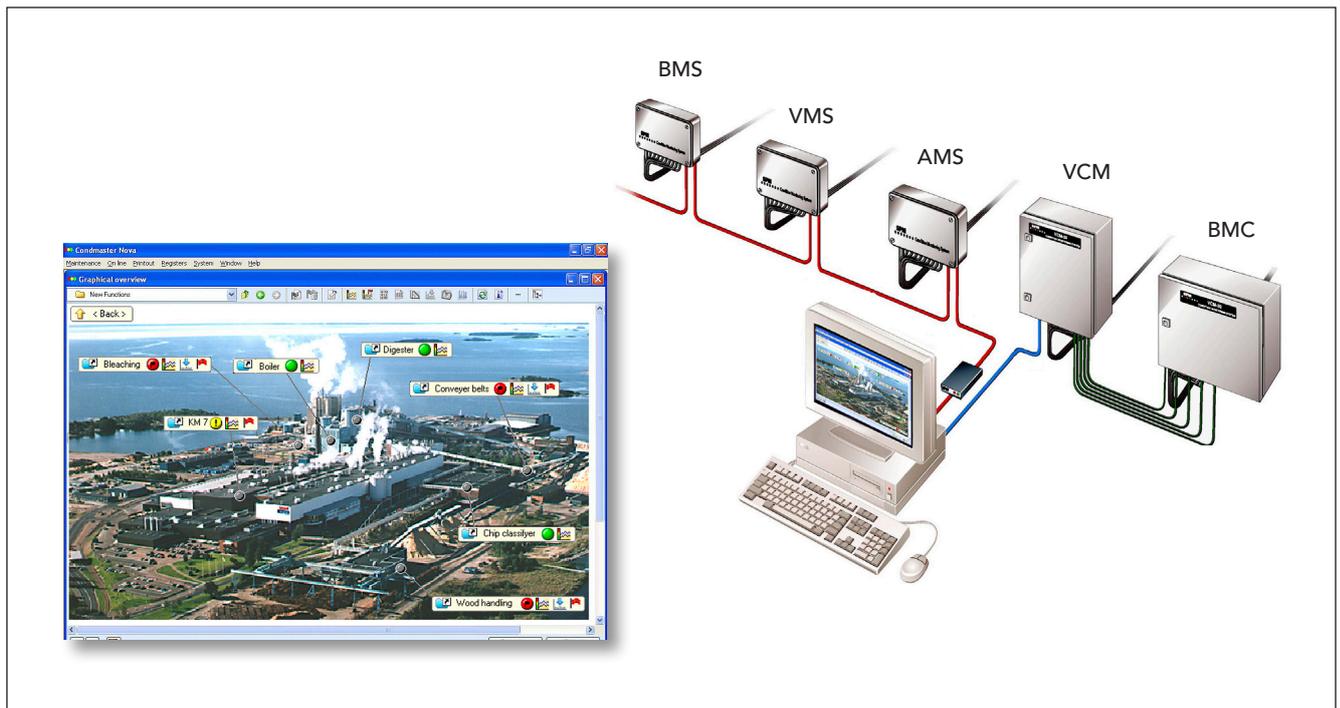
Based on extensive empirical data, international standards and machine statistics, the evaluation result is an easy to understand colour code, highlighting potential trouble spots. By calibrating and adjusting limit values, you can tune the automatic evaluation process with great precision and get an immediate, reliable diagnosis.

Ordering number

MOD187 Condmaster®Nova Intellinova



Condmaster® Nova - Online, CMS



The Condmaster®Nova Online module enables the software to communicate with all measuring units within the online condition monitoring system CMS:

- BMS units for bearing monitoring
- AMS boards to monitor voltage or current lines carrying analog signals
- VMS units for vibration severity monitoring
- VCM for vibration analysis with spectrum (EVAM) and BMC for SPM Spectrum

The core of the CMS system is Condmaster®Nova, which receives the measuring results from all SPM condition monitoring devices for evaluation and presentation.

Based on extensive empirical data, international standards and machine statistics, the evaluation result is an easy to understand colour code, highlighting potential trouble spots. By calibrating and adjusting limit values, you can tune the automatic evaluation process with great precision and get an immediate, reliable diagnosis.

Ordering number

MOD182 Condmaster®Nova Online, CMS



Condmaster® Nova - WEB and e-mail alarms

The image displays a Microsoft Internet Explorer browser window showing the CondmasterWEB interface. The main window is titled 'Graphical overview' and shows data for 'F-200.04 Fan, N'. It includes a table with the following data:

Date	1998-02-27
Time	15:59:00
dBm/dBc	7/1
Speed	1039 rpm
ISO 2372 Vertical	3.16 mm/s

Below the table is a bar chart titled 'VIBV, 500Hz - 1998-02-27 16:00:00' showing various vibration metrics. To the right of the main window are four smaller windows:

- Graphics:** Two line graphs showing vibration levels over time for 'A-200.04 Fan N (V A1 A2 C) LR/HR' and 'A-200.04 Fan N (V A1 A2 C) LUB/COND'.
- Complete results:** A window titled 'Measuring result details' showing parameters like CODE = A, LUB = 4, LFR = 37, HR = 32, ISO 2372 Horizontal = 1.3, ISO 2372 Axial = 0.6, Pressure, cool water = 10.5, and Temperature = 10.5.
- Alarm list:** A table listing alarms with columns for Date/Time, Alarm type, and Name.

Date/Time	Alarm type	Number	Name
1992-02-06 10:12:00	COND	A-200.04	Fan N (V A1 A2 C)
1990-06-09 13:33:00	CODE	A-200.04	Fan N (V A1 A2 C)
1990-06-09 13:33:00	LUB	A-200.04	Fan N (V A1 A2 C)
1990-06-09 13:33:00	LR/HR	A-200.04	Fan N (V A1 A2 C)
1991-04-04 07:38:00	FAGB Out of balance	A-200.04	Fan N (V A1 A2 C)
- Shock pulse and vibration spectra:** A window titled 'Spectrum' showing a frequency spectrum plot.

CondmasterWEB and e-mail alarms (MOD183) is an optional module in SPM's comprehensive maintenance program Condmaster®Nova.

With CondmasterWEB, users can reach their Condmaster program as a 'read only' version from any PC running Microsoft Internet Explorer 6 or higher. Thus, one can easily give access to Condmaster data by simply sending the name of the server on which CondmasterWEB is running to the party concerned.

CondmasterWEB will open in the Graphical Overview. By clicking on folders and icons, the user can quickly and easily get condition information in real time. Measuring results, alarm lists, graphics and spectra with zoom abilities are displayed in the same way as in the corresponding window of the 'real' Condmaster. Measuring point setups can be seen but not edited.

CondmasterWEB installs as a service on the server computer, which can be any PC with Windows NT or higher. A Web address is needed.

CondmasterWEB can be accessed from any PC via LAN or via Internet, normally through port 5790 (default).

Here are examples of addressing CondmasterWEB after logging on to the web with Microsoft Explorer.

A. CondmasterWEB is running on an external computer (= server) anywhere in the world or in the local network: [http://\(servername\):5790/](http://(servername):5790/)

B. CondmasterWEB is running on your own computer: <http://localhost:5790/>

E-mail Alarm sends selected alarms on selected components/measuring points via e-mail to stated addresses, according to a user defined weekly schedule. The e-mails can be rerouted to cellphones with SMS capability via messaging services.

As a general setup, the name of the company's mail server is input under 'Settings'. Each alarm mail assignment has a name and one or more recipients (e-mail addresses).

Measuring points and alarm types are selected from lists. In a week calendar, the user marks from - to periods. Alarms occurring during the marked periods will be sent by e-mail to all stated addresses. Users can also mark vacation periods on a year calendar, during which the mail service is suspended.

Alarm via cellphone requires the services of a company that redirects e-mail to cellphones. The user must make his own arrangement with the company providing the service.

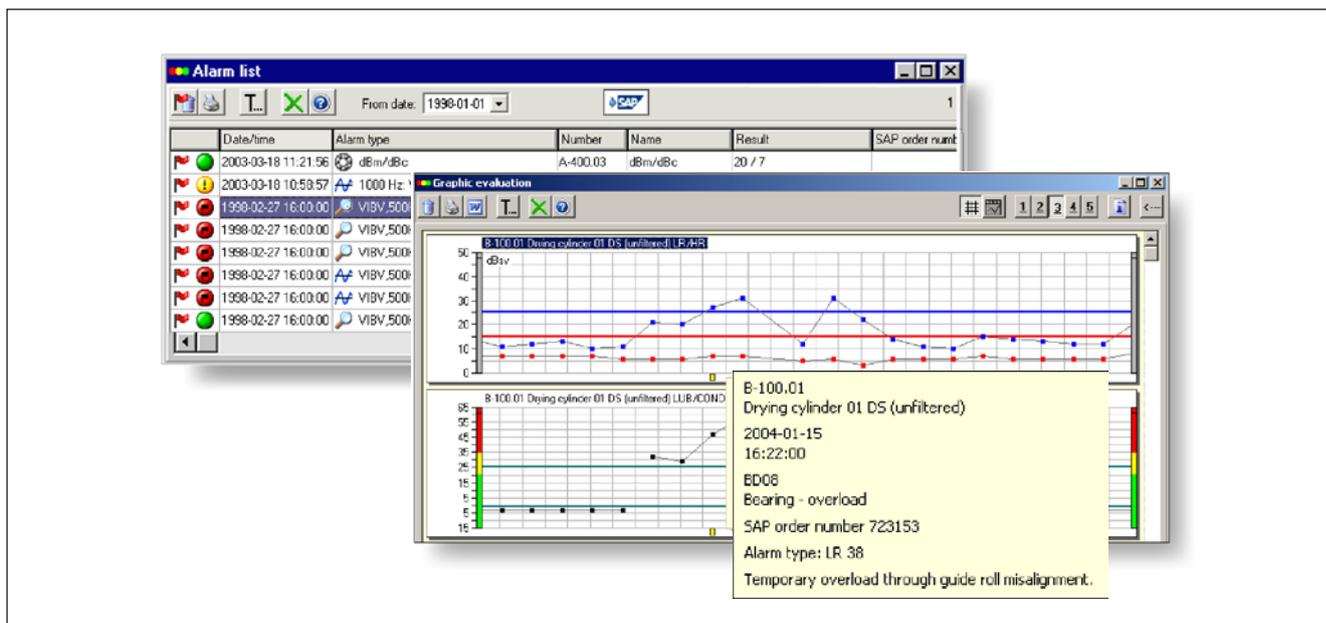
Option modules and installation instructions are included on the Condmaster®Nova disc.

Ordering number

MOD183 CondmasterWEB and e-mail alarms



Condmaster® Nova - SAP link



SAP link (MOD184) is an optional module in Condmaster® Nova.

The module provides a direct link to SAP software. Pressing the SAP button on the Condmaster alarm list sends the marked alarm message to the SAP software. Returned is a SAP work order number that locks the alarm, until a second message from SAP deletes the alarm 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 button when he decides that an alarm merits an SAP work order. The SAP 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 operator can add free text. On receiving the comment, Condmaster deletes the alarm. 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 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.

Z_Condmaster is the function that has to be implemented in SAP software. Condmaster calls Z-Condmaster in SAP and sends the measuring point and alarm 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 data base.

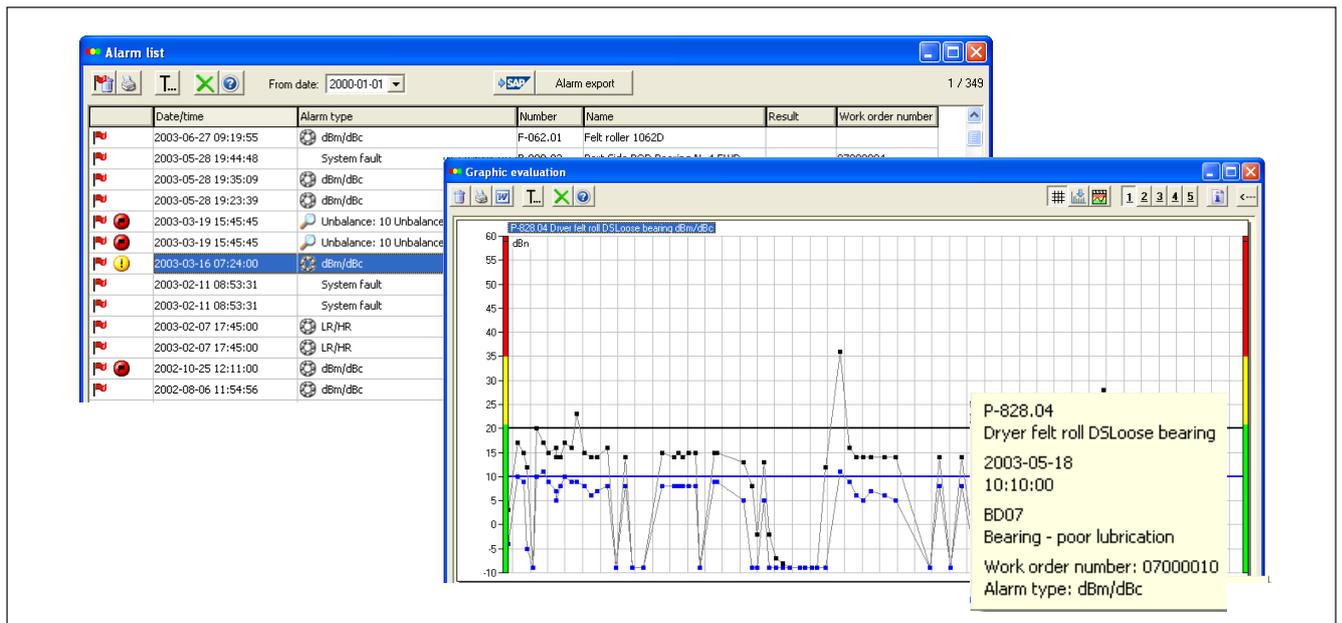
Option modules and installation instructions are included on the Condmaster®Nova disc.

Ordering number

MOD184 SAP link



Condmaster® Nova - AMOS link



The AMOS link (MOD185) is an optional module in Condmaster® Nova.

The module provides a link to AMOS software. Clicking the **Alarm export** button on the Condmaster alarm list sends the marked alarm message to the AMOS software. Returned is an AMOS work order number that locks the alarm, until a second message from AMOS deletes the alarm and sets a comment on the Condmaster measuring point, stating what has been done.

The operation requires no extra data input. The Condmaster operator simply presses the **Alarm export** button when he decides that an alarm merits an AMOS work order. The 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 AMOS operator can add free text. On receiving the comment, Condmaster deletes the alarm. 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 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.

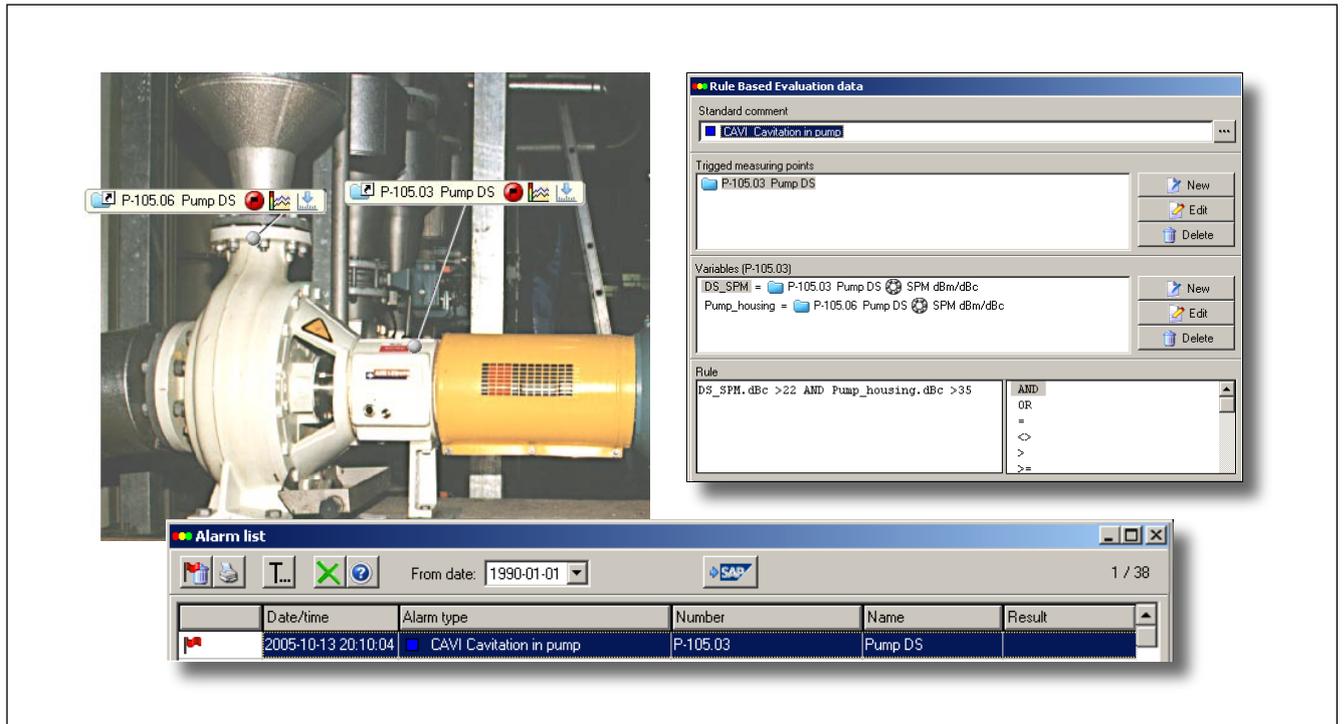
Option modules and installation instructions are included on the Condmaster®Nova disc.

Ordering number

MOD185 AMOS link



Condmaster® Nova - Rule Based Evaluation, RBE



RBE, Rule Based Evaluation (MOD181) is an optional module in Condmaster® Nova. The purpose of RBE is to give the user guidance on what to do when certain alarm conditions are met. RBE is an excellent tool in Product Integrated Maintenance (PIM).

RBE items are made up of standard comments and user defined texts to set up alarm parameters for triggered measuring points. Photographs can be attached to illustrate.

Each RBE item consists of a standard comment, one or more triggered measuring points, one or more variables and a rule specifying under what conditions the alarm is to be

triggered. Measuring points can be added and deleted as required. When the conditions of a specific alarm are met, the alarm is triggered, suggesting appropriate measures.

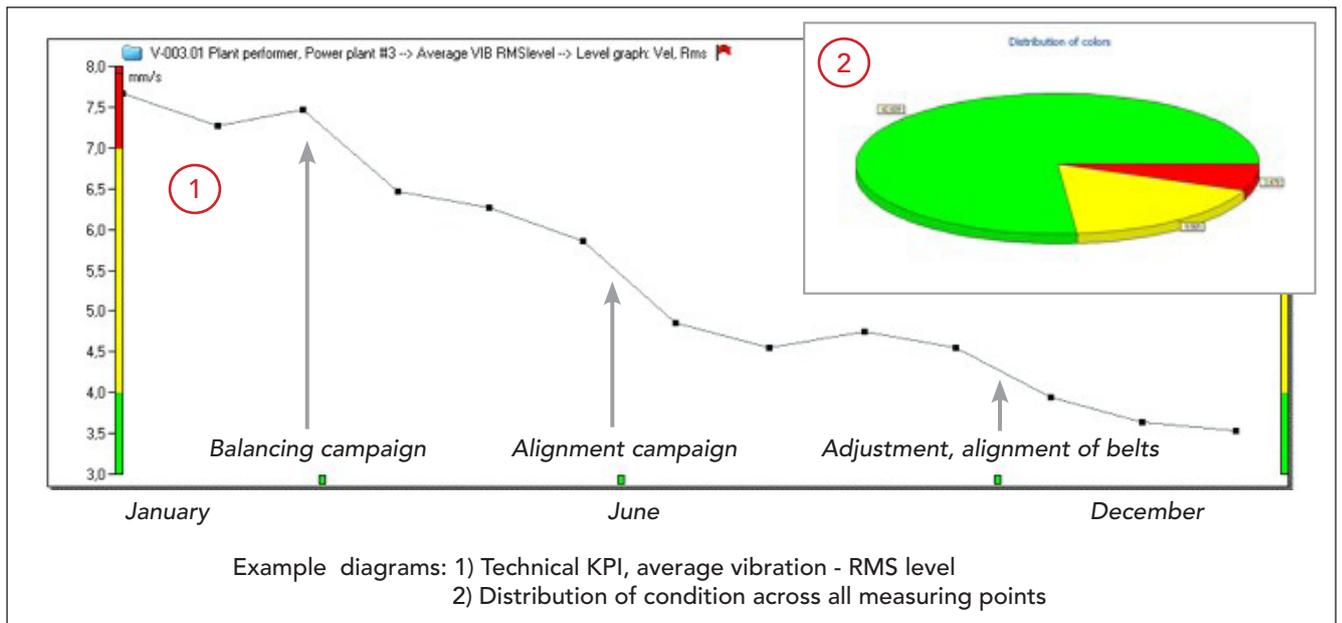
If for instance there are high readings on a pump housing the reason is most likely cavitation. If this condition arises, the RBE function could be set up to rectify the problem. Suggested actions might be to open valves, change speed or other relevant measures to correct the faulty condition.

Ordering number

MOD181 Rule Based Evaluation, RBE



Condmaster® Nova - Plant Performer™



Plant Performer™ is a statistics module in Condmaster, enabling strategic analysis of the economical and technical impact of maintenance. Statistical assignments are user defined and may include database or machine condition statistics and technical Key Performance Indicators, presented in easily understood pie, bar chart or 3D diagrams.

The concept of machine types, to which measuring points are connected, is central in the statistical module. When corrective measures have been taken, the user enters information in a **Corrective maintenance** comment, which is then used to generate *economical statistics*. Calculation intervals can be specified, and the resulting two or three dimensional graph can be exported to Word or Excel, printed or copied to clipboard.

Machine types are also the base for *machine condition statistics*.

Technical *KPIs* (Key Performance Indicators) are set up on the measuring point level. KPIs are quantifiable metrics used to facilitate defining and measuring progress towards

the goals of the maintenance organization. For instance, the overall vibration level for a department, or an entire plant, calculated on a regular time interval.

The contents of the database, such as the number of measuring points or rounds, can be viewed using the *database statistics* function.

Statistical examples include:

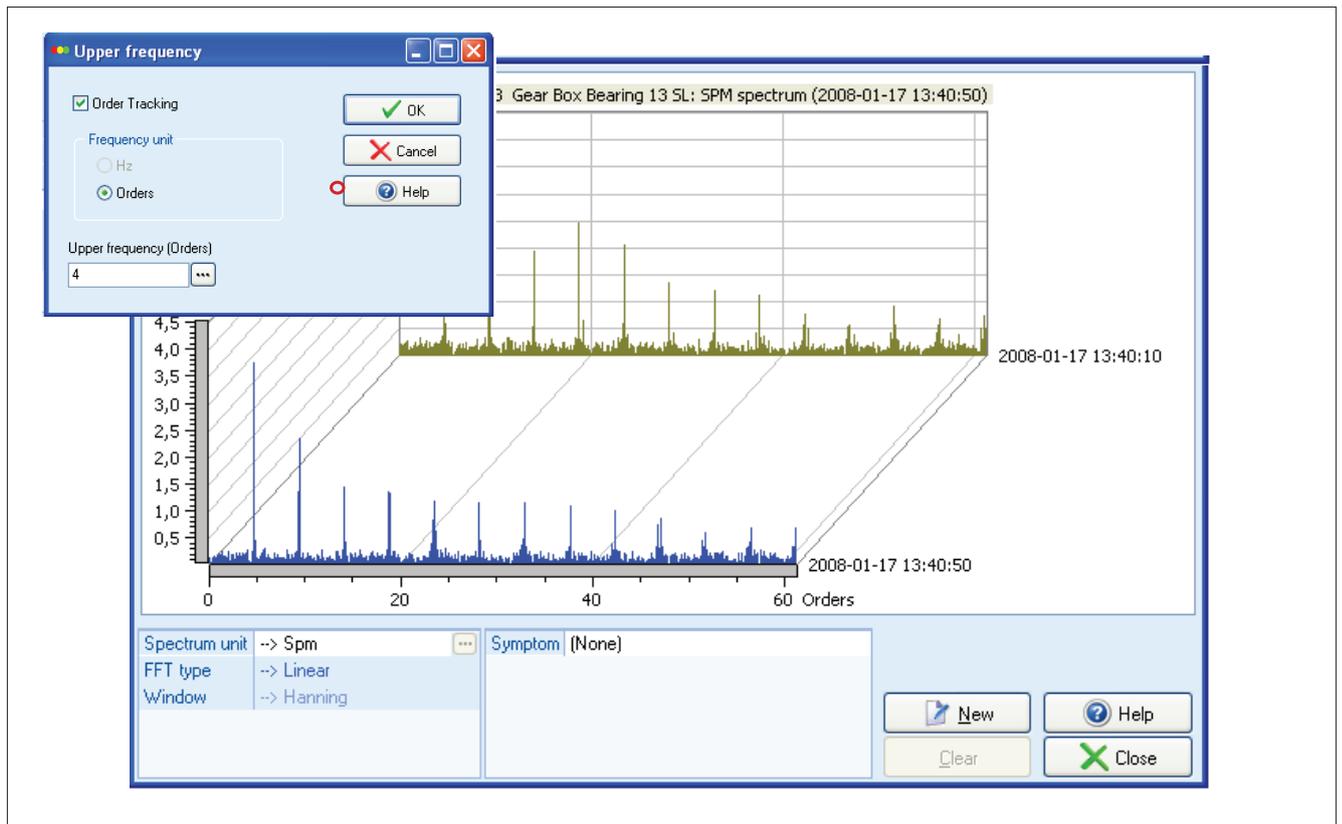
- Total Loss of Contribution
- Overall vibration level for a department / for all fans / for entire plant etc.
- Operating condition (green – yellow - red) for all electrical motors
- Number of fans in alarm condition
- Alarms per machine type

Ordering number

MOD186 Plant Performer



Condmaster® Nova - Order tracking



Order tracking is an optional Condmaster function used with Leonova Infinity for vibration analysis on variable speed applications. It is an ideal technique for analysing vibration problems that are related to the rotational speed of various machine components.

The method uses multiples of running speed (orders), rather than absolute frequency (Hz) to determine the upper frequency range. A tachometer pulse from the machine is required to determine the sampling frequency.

The purpose of order tracking is to retain the line resolution (number of lines per order) even when rotational speed varies between measurements. The reference axis of the resulting spectrum is scaled in orders, i.e. multiples

of the rotational frequency. When expressed in orders, two or more spectra from the same machine can be more easily compared because the rotational speed (1x) and its multiples (harmonics) will always appear in the same spectrum position (orders), even when rotational speed varies. The results can also be displayed in a waterfall diagram.

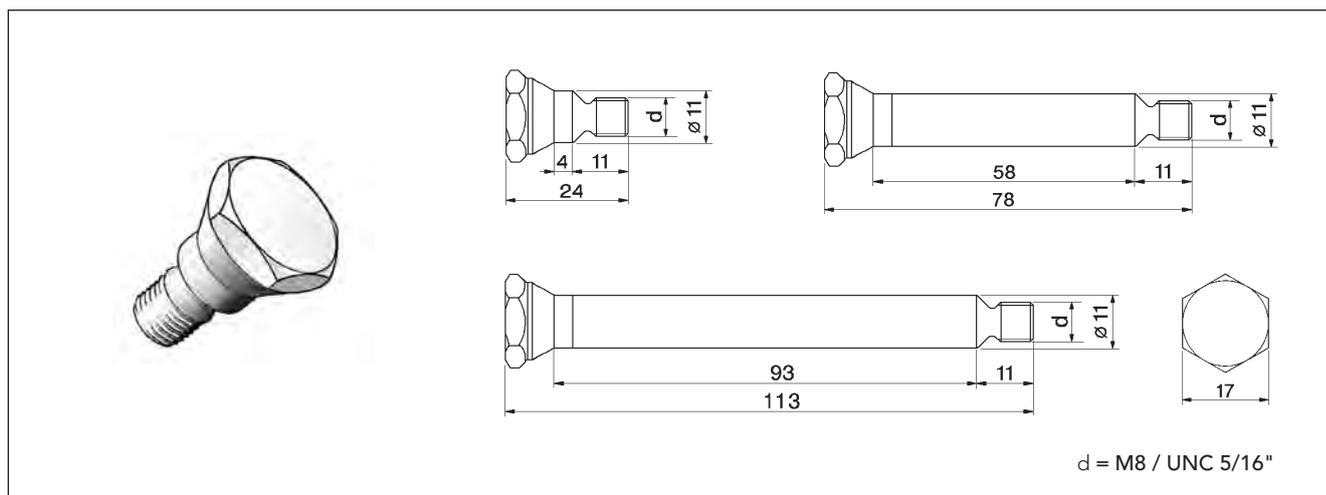
The primary advantage of order tracking is that the selected order range will always cover the symptoms of interest, regardless of running speed.

Ordering number

MOD188 Order tracking, unlimited use



Standard Adapters



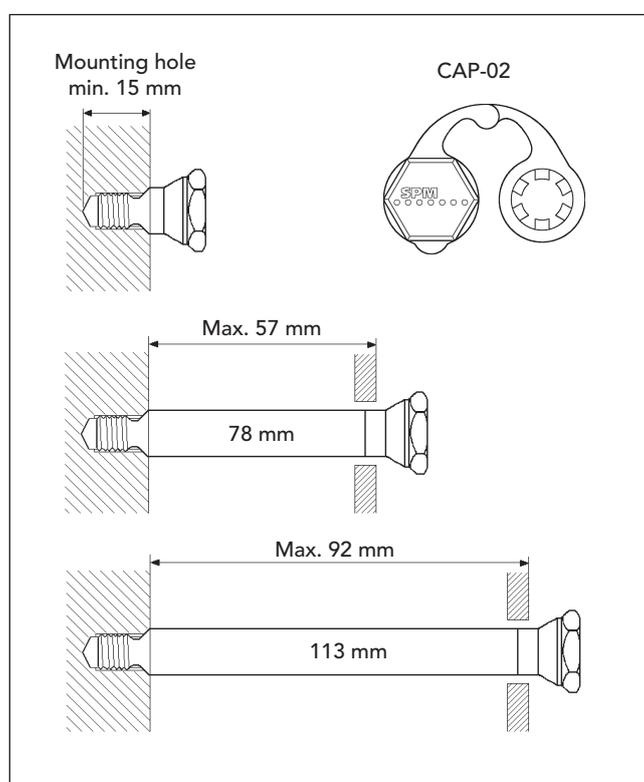
Adapters are solid bolts which are mounted in countersunk and threaded holes in the bearing housings. They form the connecting points for a transducer with quick connector, TRA-30 and equivalent.

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, 24 mm
32100	Zinc-plated, M8, 78 mm
32200	Zinc-plated, M8, 113 mm
33000	Zinc-plated, UNC 5/16", 24 mm
33200	Zinc-plated, UNC 5/16", 113 mm
32010	Stainless steel, M8, 24 mm
32110	Stainless steel, M8, 78 mm
32210	Stainless steel, M8, 113 mm
33010	Stainless steel, UNC 5/16", 24 mm
CAP-02	Dust cap for adapters



Technical data

Material, stainless steel	SS 2346 (AISI 303)
Material, zinc-plated	12 μ m Zn
Torque	15 Nm

To drill the mounting hole, use drill bits:

6.9 mm	for M8
6.6 mm	for UNC 5/16"

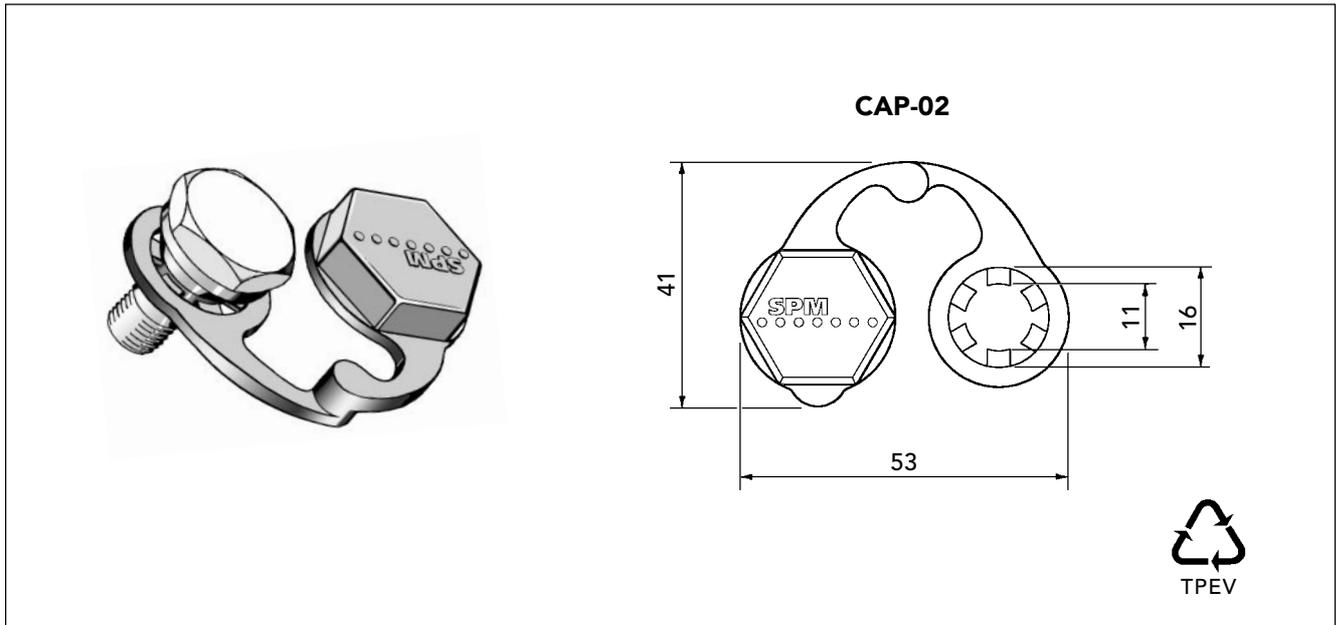
Mounting tools

82053	Countersink with fixed pilot for M8
81027	Holder for countersink
81028	Countersink, angle 90°, \varnothing 12 mm
81031	Pilot for M8
81032	Pilot for UNC 5/16"

Torque the adapter with a torque wrench and a 17 mm socket (SPM 81086).



Adapter Cap



The adapter cap CAP-02, made of red santoprene, protects the contact surface of adapters from dirt, paint, and damage.

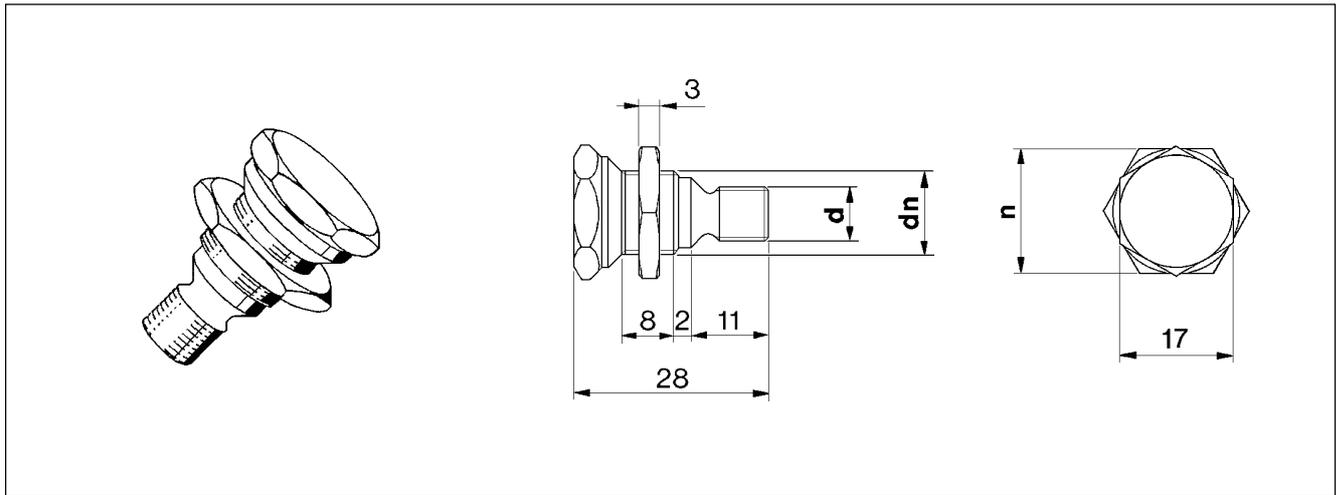
A clean and undamaged adapter surface is essential for the correct transmission of shock pulses from the bearing to the measuring instrument. CAP-02 fits all types of SPM adapters.

Technical data

Material:	Santoprene (TPEV)
Temperature range:	-60 to 135 °C
Weight:	2.5 g



Adapters with lock nut

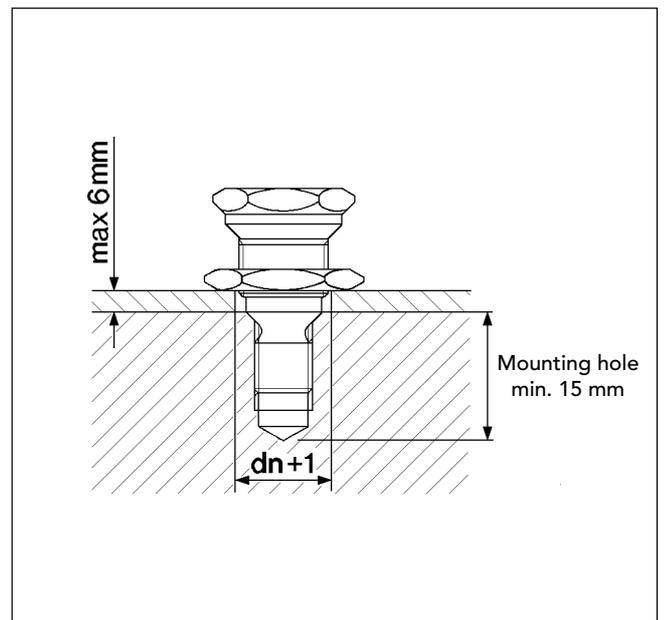


Adapters with lock nut are solid bolts of stainless steel. They are intended to replace existing mounting bolts or screws for protective covers, etc., with a thickness up to 6 mm. Adapters with lock nut are mounted in countersunk and threaded holes in the bearing housings. They form connecting points 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	dn = 12	n = 19
34511	d = M10	dn = 14	n = 19
36511	d = M12	dn = 16	n = 22



Technical data

Material	Stainless steel, SS 2346 (AISI 303)
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

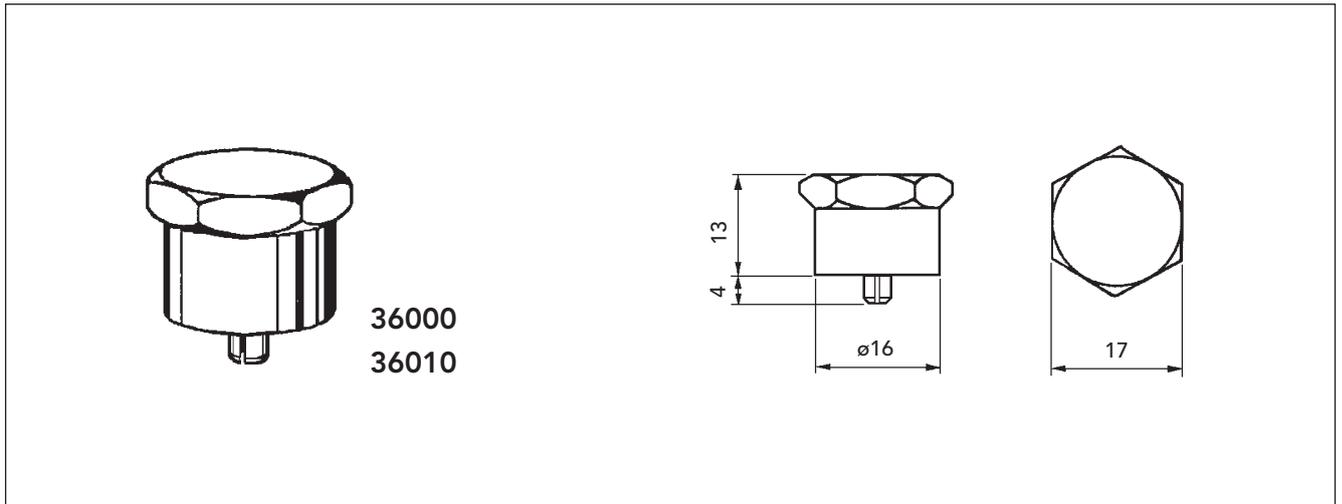
82053	Countersink with fixed pilot for M8
81027	Holder for countersink
81028	Countersink, angle 90°, ø 12 (M6-M10)
81029	Countersink, angle 90°, ø 15 (M12)
81031	Pilot for M8
81033	Pilot for M10
81035	Pilot for M12
81086	Socket, 17 mm

To drill the mounting hole, use drill bits:

6.9 mm	for M8
8.6 mm	for M10
10.3 mm	for M12



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

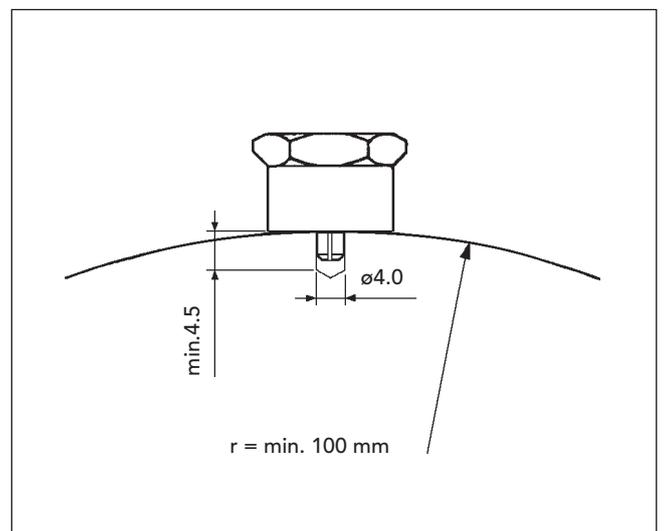
Select a measuring point in accordance with the SPM rules.

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 data

Material, stainless steel:	SS 2346 (AISI 303)
Material, zink-plated:	SS 1914, 15 mm Zn
Seat surface:	16 mm
Tubular pin:	Spring steel, for hole 4.0 mm
Weight:	22 g
Adhesive:	3M DP810, Loctite 638, Loctite 480 or similar

Ordering numbers

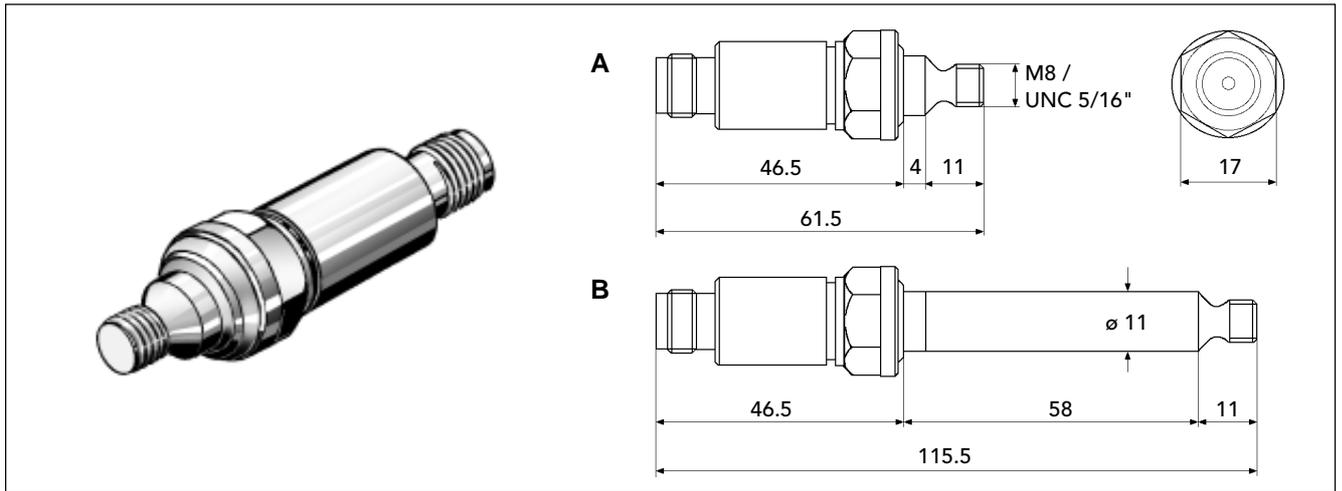
36000	Glue-on adapter, zink-plated
36010	Glue-on adapter, stainless steel

Mounting tools

TOM-11	Counterbore, 16 mm
81274	Holder for counterbore
14602	Pilot, 4 mm



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 with a measuring terminal or measuring device. Max. cable length is 4 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. Standard length (A) is 61.5 mm. A long transducer (B), length 115.5 mm, is used to reach bearing housings beneath protective covers.

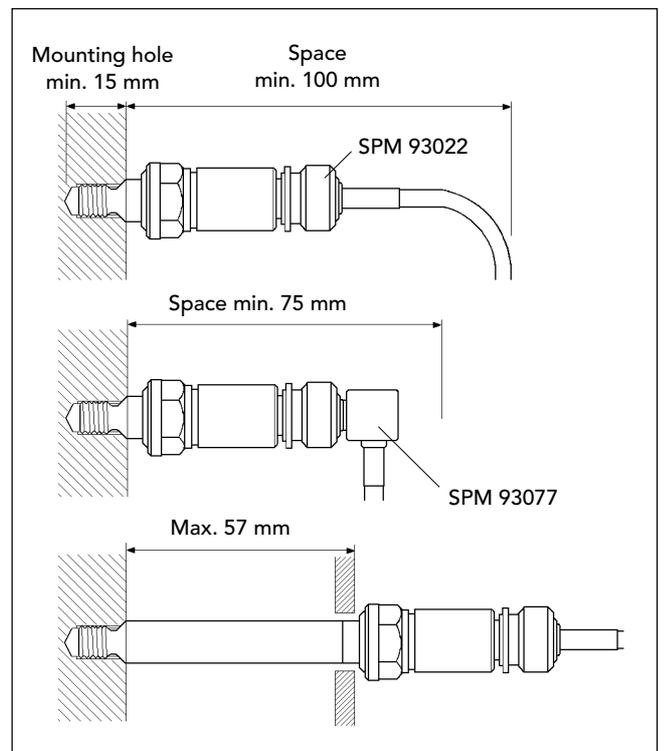
The transducer is normally connected with a TNC plug, SPM 93022. A TNC angle plug, SPM 93077, can be used in narrow spaces. To prevent cable corrosion in moist environments, the coaxial cable must be connected with a sealing TNC plug, SPM 13008.

Ordering numbers

40000	Standard shock pulse transducer, M8
40100	Standard shock pulse transducer, UNC 5/16"
40001	Standard shock pulse transducer, M8, extended
40101	Standard shock pulse transducer, UNC 5/16", extended

Technical data

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 conn. SPM13008
Temperature range	-30°C to +150°C
External overpressure	Max. 1 MPa (10 bar)
Torque	15 Nm, max. 20 Nm
Connector	TNC jack



Mounting tools

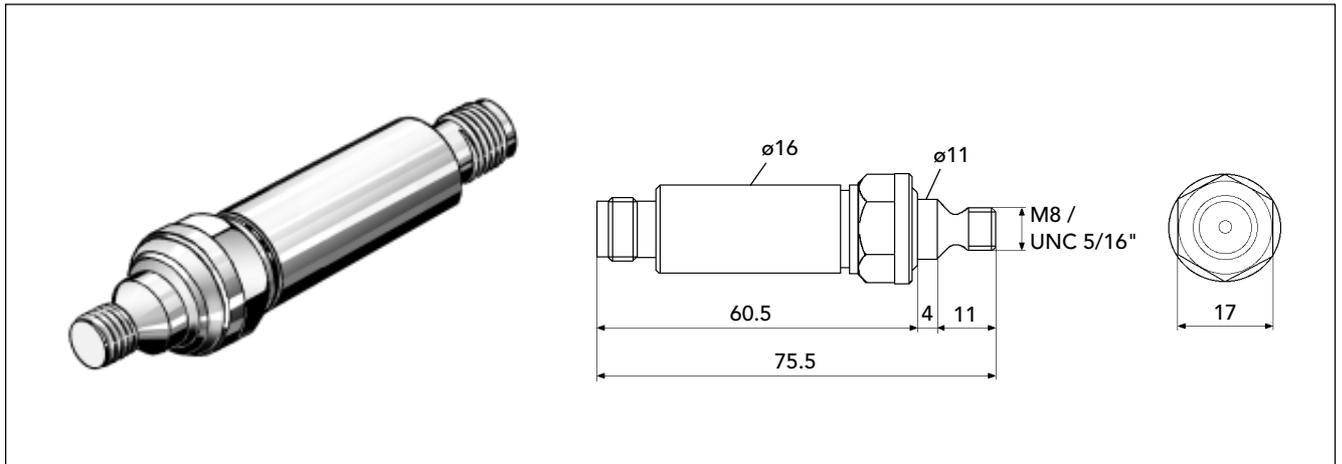
82053	Countersink with fixed pilot for M8
81027	Holder for countersink
81028	Countersink, angle 90°, 12 mm dia.
81031	Pilot for M8
81032	Pilot for UNC 5/16"

To drill the mounting hole, use drill bits 6.9 mm for M8, 6.6 mm for UNC5/16".

Torque and unscrew the transducer with a torque wrench and a long 17 mm socket (SPM 81086).



Shock Pulse Transducer with TMU

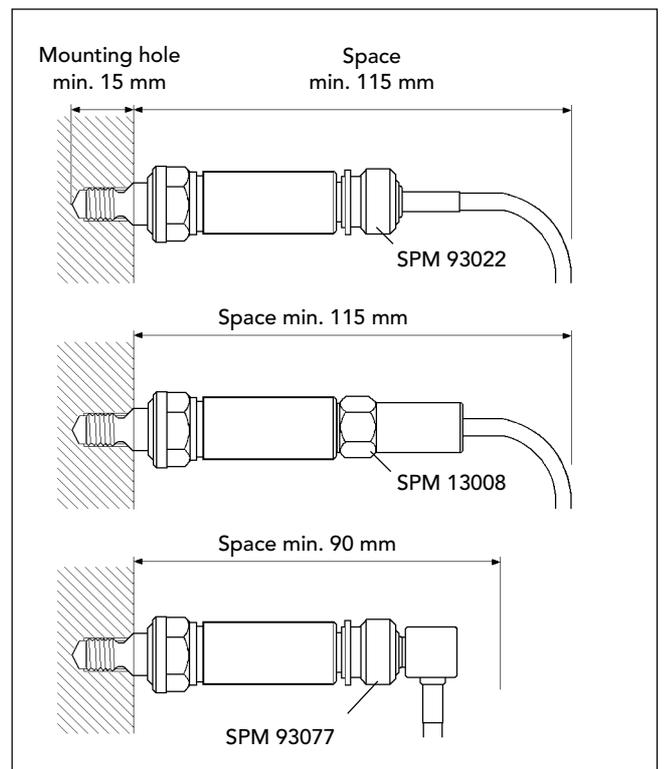


The shock pulse transducer with TMU is used in permanent SPM installations for bearing monitoring, in cases where the cable length between transducer and measuring unit exceeds 4 m. This allows a cable length of max. 100 m. The transducer with TMU is installed in a countersunk mounting hole on the bearing housing, in the same way as a standard transducer.

A shock pulse transducer with TMU (TMU = Transducer Matching Unit) 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 with a measuring terminal or measuring device.

Transducer housing and base are made of stainless, acid proof steel, suitable for aggressive environments. Thread size is M8, with UNC 5/16" as an alternative.

The transducer is normally connected with a TNC plug, SPM 93022. In moist environments, the coaxial cable must be connected with a sealing TNC plug, SPM 13008. A TNC angle plug, SPM 93077, can be used in narrow spaces.



Ordering numbers

- 42000 Shock pulse transducer with TMU, M8
- 42100 Shock pulse transducer with TMU, UNC 5/16"

Technical data

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 conn. SPM13008
Temperature range	-30°C to +100°C
External overpressure	Max. 0.7 MPa (7 bar)
Torque	15 Nm, max. 20 Nm
Connector	TNC jack

Mounting tools

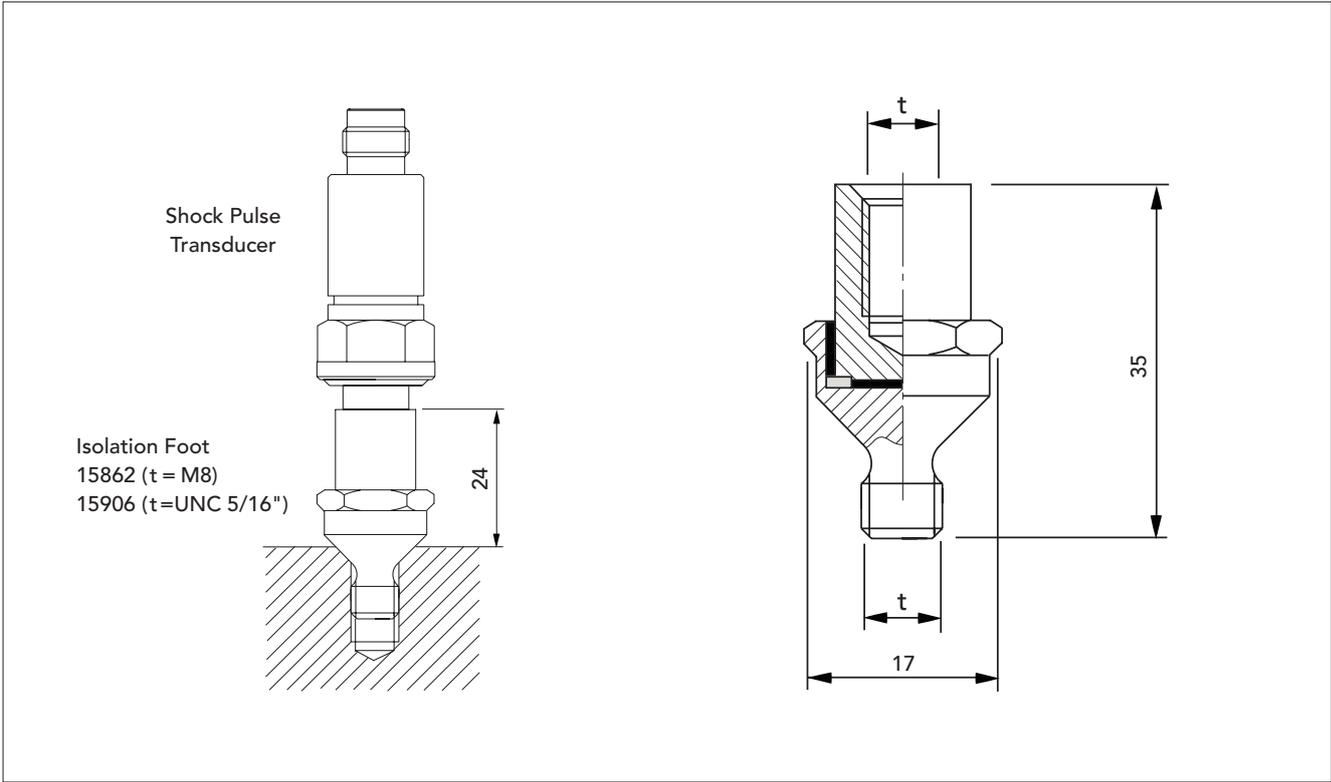
- 82053 Countersink with fixed pilot for M8
- 81027 Holder for countersink
- 81028 Countersink, angle 90°, 12 mm dia.
- 81031 Pilot for M8
- 81032 Pilot for UNC 5/16"

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).



Isolation Foot for Shock Pulse Transducers

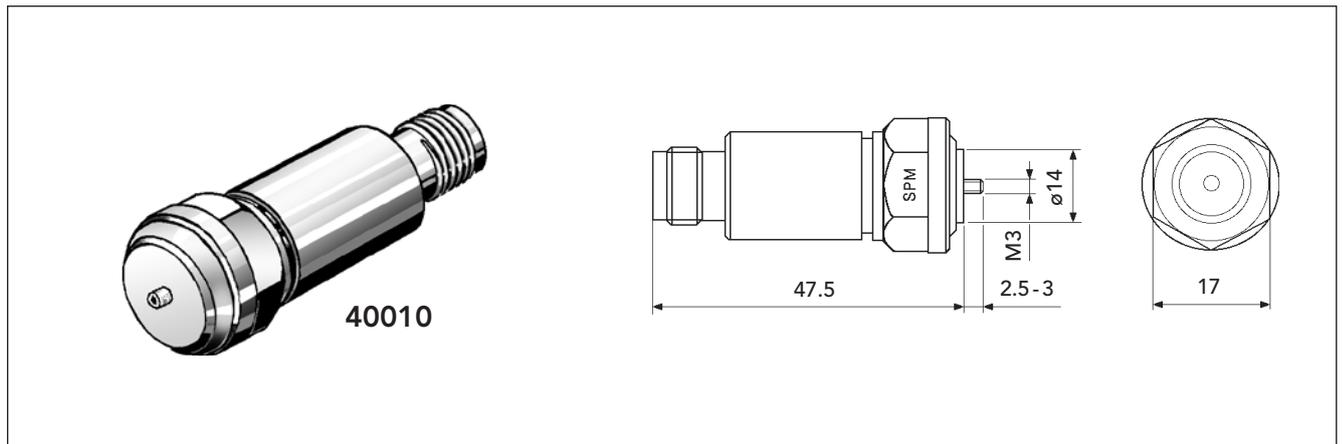


The isolation foot is intended for SPM Shock Pulse Transducers and should be used to provide electric isolation. The reason is that differences in earth potential between transducer and measuring equipment can cause measur-

ing faults. The isolation foot is installed in a countersunk mounting hole, in the same way as a standard transducer. SPM 15862 has M8 thread and SPM 15906 has UNC 5/16". The isolation exceed 1 Mohm at 500 V.



Glue-on Shock Pulse Transducer SPM 40010

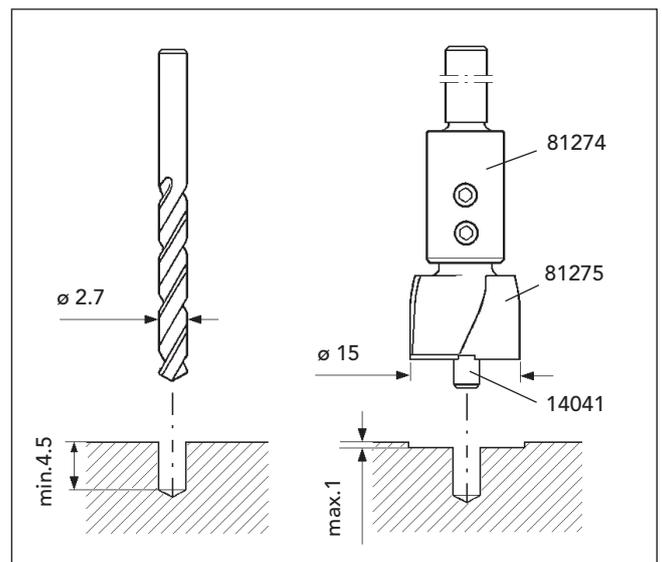


Glue-on transducers 40010 can replace standard transducers on thinwalled bearing housings and on machines where the drilling of standard mounting holes would affect equipment warranties. They have the same measuring characteristics as standard transducers, but a flat, circular base which is glued to 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.

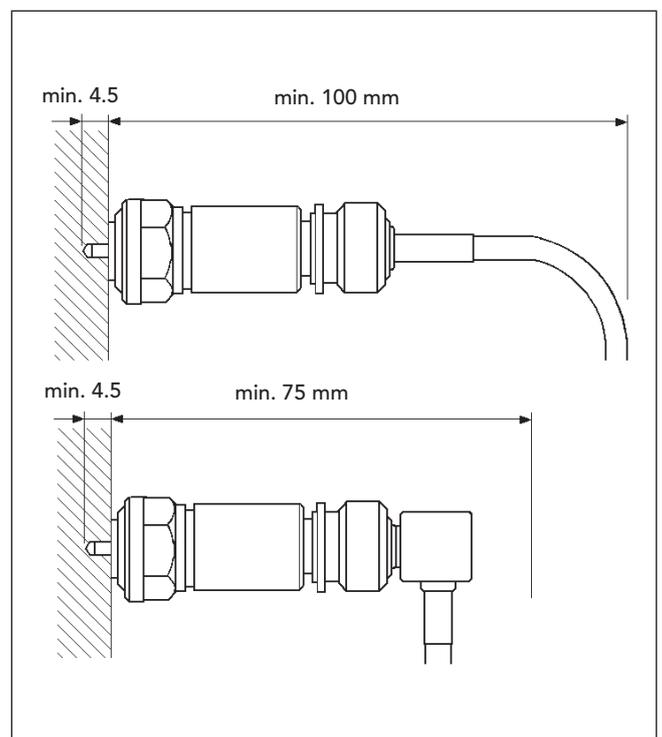


Technical data

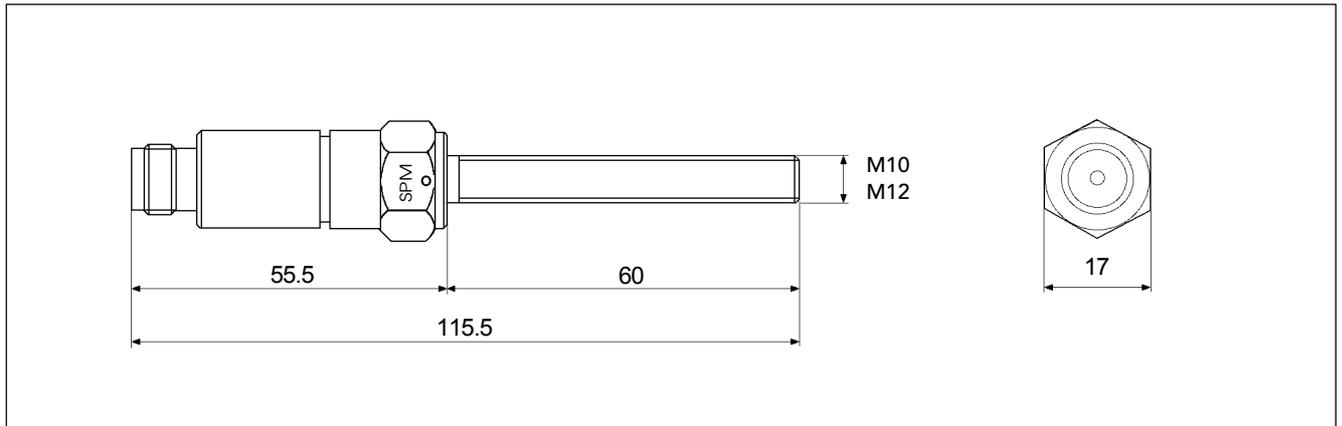
Measuring range:	Max. 100 dBsv
Housing, base:	Stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Design:	Sealed
Connector tightness:	IP65 with TNC connector IP 67 with conn. SPM13008
Temperature range:	-30° C to +150° C
External overpressure:	Max. 1 MPa (10 bar)
Recommended adhesive:	3M DP810, 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



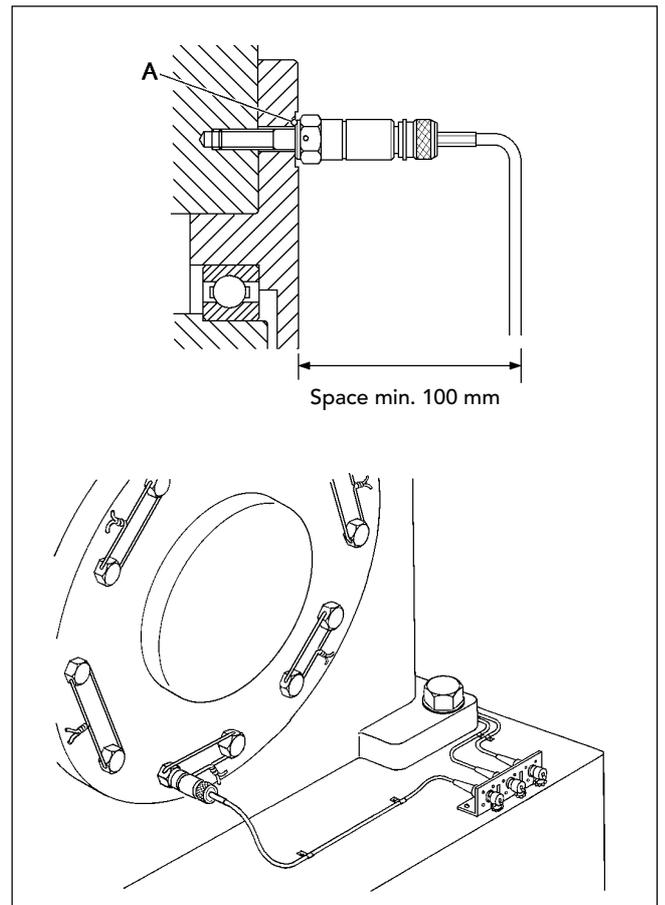
Shock Pulse Transducers in Bolt Design



A shock pulse transducer in bolt design is intended to replace one of the holding bolts of the bearing housing. It can be used in case there is an uninterrupted signal path between the bearing and the transducer's seat surface (A). This means that the seat surface (A) of the transducer is placed directly on the bearing housing. Shock pulses from the bearing are transmitted via that surface, not via the threads.

The transducer is mounted against a flat surface, milled and unpainted, within the load zone of the bearing. Washers must not be used. The transducer is pierced for a locking wire, hole diameter 1.5 mm.

Via a coaxial cable with TNC connector, the transducer is connected to a bearing damage detector or a measuring terminal for a portable shock pulse meter. In moist environments, a sealing TNC connector SPM 13008 must be used. An angle connector SPM 93077 is used in narrow spaces (min. space requirement 85 mm). Max. cable length is 4 m. The transducer is torqued with a torque wrench and a long 17 mm socket (SPM 81086).



Part numbers

41225 Transducer in bolt design, M10
41435 Transducer in bolt design, M12

Technical data

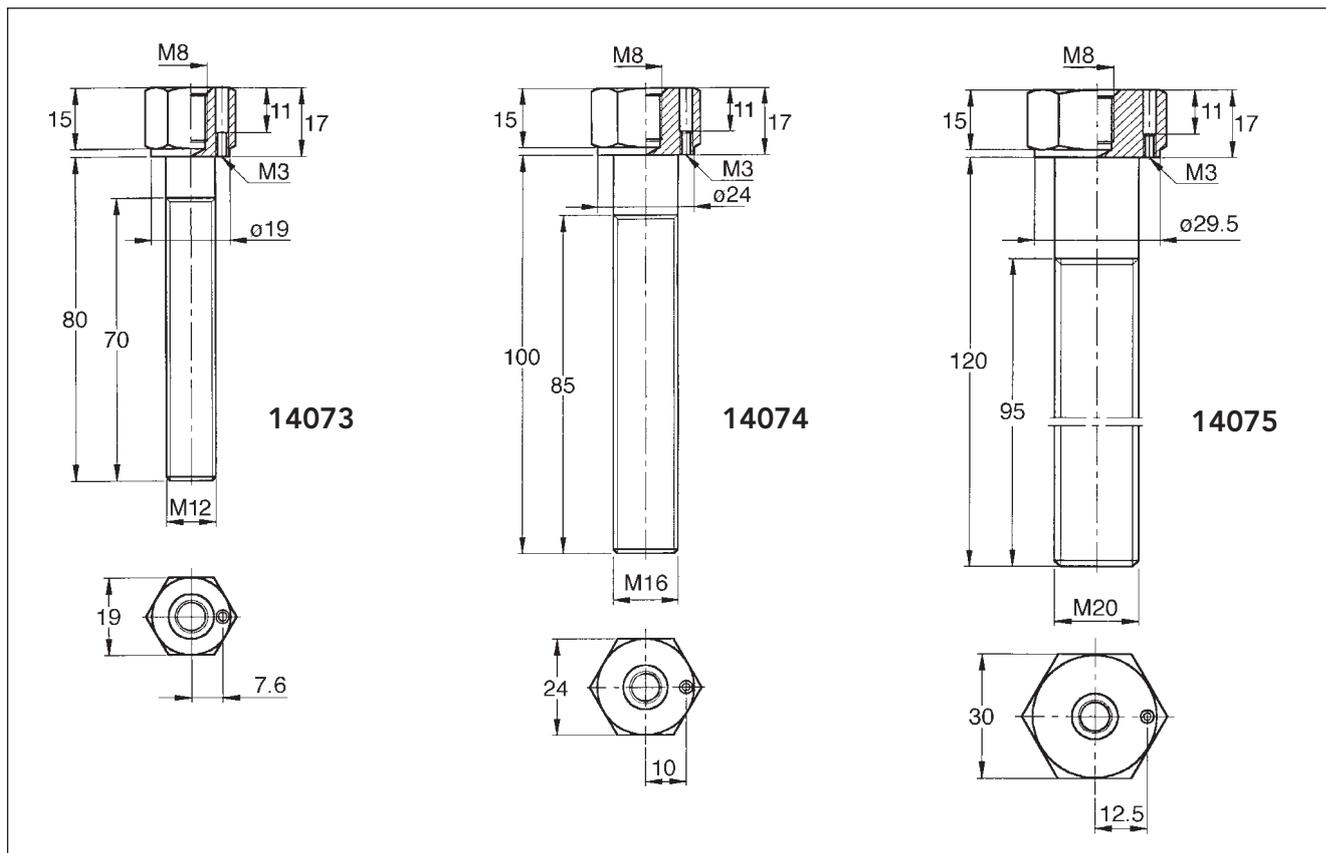
Measuring range	Max. 100 dBsv
Housing, base	Stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Design	Sealed
Connector tightness	IP65 with TNC connector IP67 with conn. SPM13008
Temperature range	-30°C to +150°C
External overpressure	Max. 1 MPa (10 bar)
Hole for locking wire	1.5 mm dia.
Connector	TNC jack
Torque:	Max. 20 Nm for M10, 30 Nm for M12

Mounting tools

81027	Holder for counterbore
81057	Counterbore, diameter 20 mm
81033	Pilot 8.5 mm (M10)
81035	Pilot 10.2 mm (M12)



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 turbochargers, where they function as holding bolts for bearing caps and receivers for standard shock pulse transducers with M8 threads (SPM 40000).

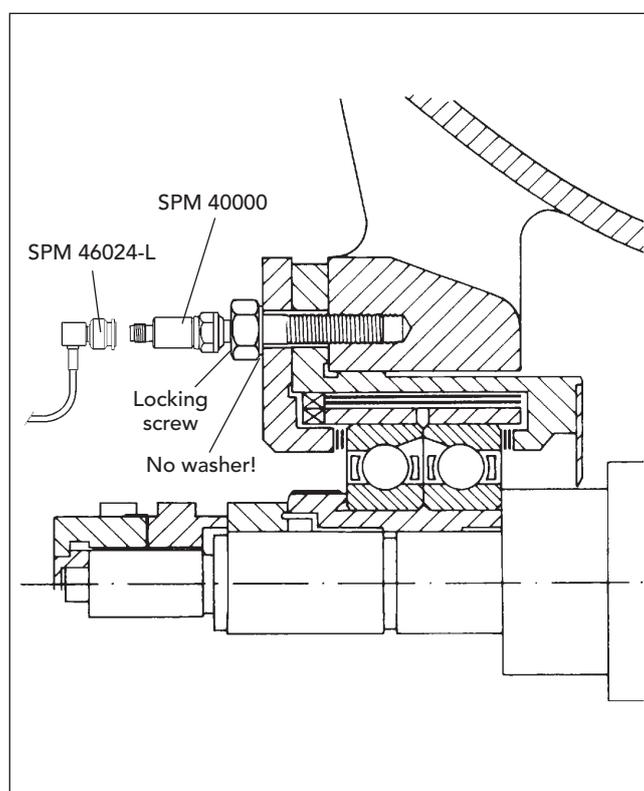
The bolts are made of high-tensile steel and must be mounted without washers. Each bolt is delivered with an M3 locking screw and an Allen key for this screw. The locking screw is secured in its hole. Bolts must not be re-used after unscrewing

Technical data

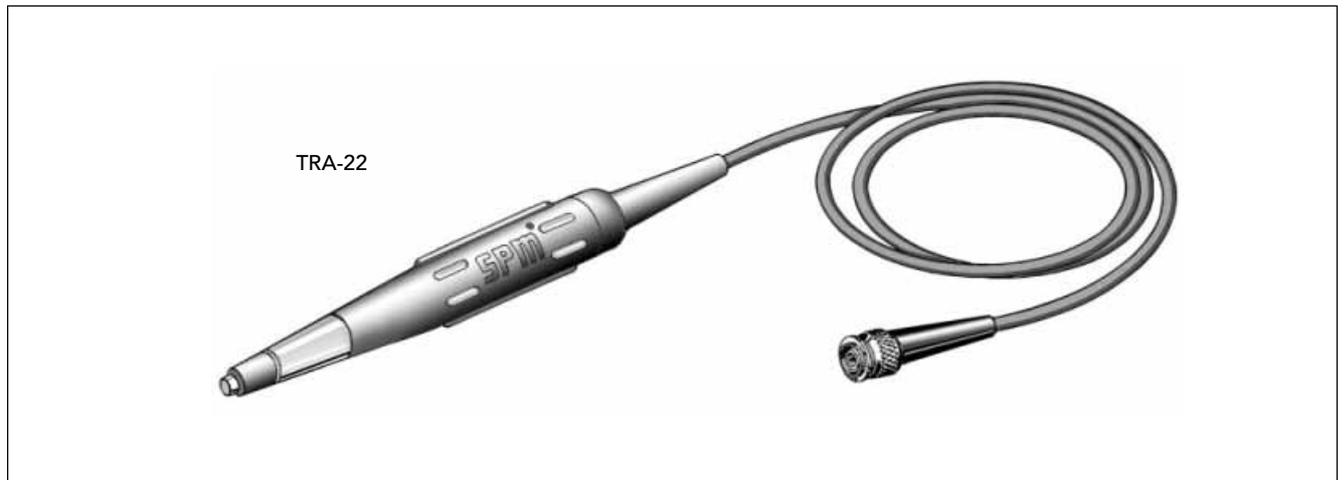
Material: High-tensile steel, SS-EN 2244-05, EN 10083-3:2006, 42CrMo4

Locking screw: SK6SS, M3 x 6

Turbo type	Bolt Art. no.	Thread size	Torque max.	Cable length (L)	Cable Art. no.
VTR454	14073	M12	100 Nm	450 mm	46024-0.45
VTR501	14073	M12	100 Nm	550 mm	46024-0.55
VTR564	14074	M16	230 Nm	550 mm	46024-0.55
VTR714	14075	M20	350 Nm	650 mm	46024-0.65



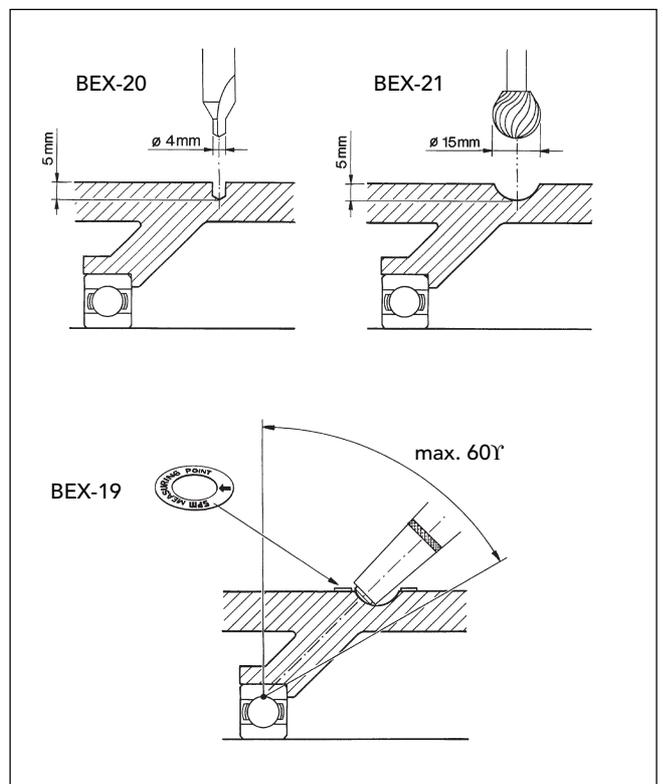
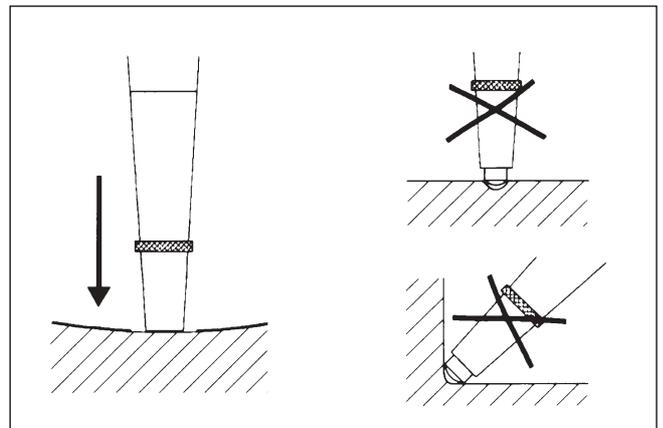
Shock Pulse Transducer with Probe TRA-22



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 $\pm 5^\circ$. The probe tip is Aspring 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 $\pm 45^\circ$ 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 $\pm 60^\circ$ 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 cavities and fillets which are smaller than the probe tip.



Ordering numbers

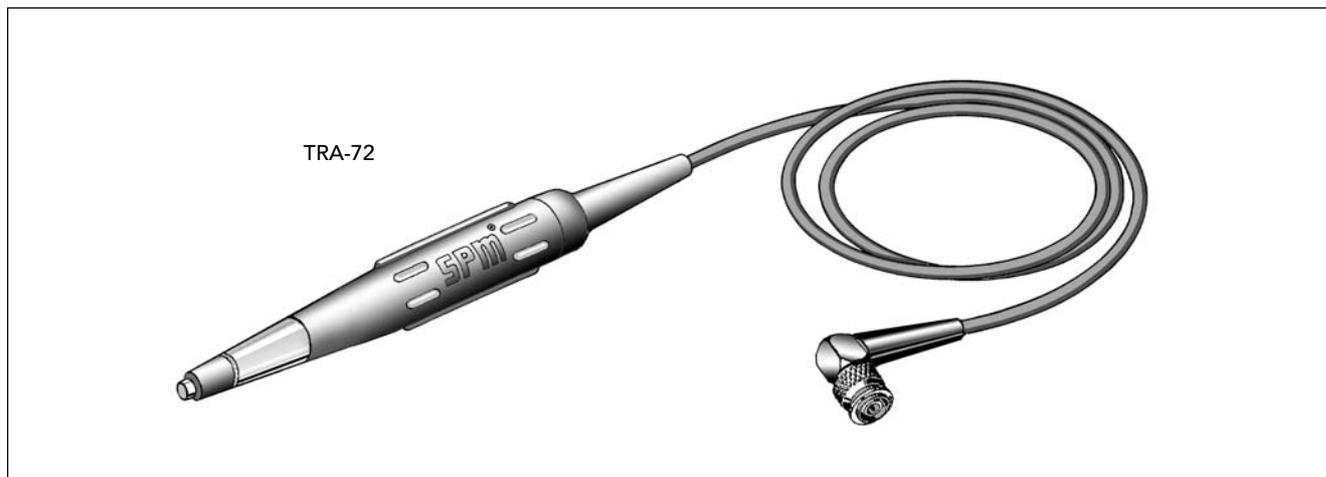
TRA-22	Shock pulse transducer, probe assembly
BEX-19	Measuring point marker
BEX-20	Center drill
BEX-21	Rotary file

Spare parts

TRA-15	Transducer with probe
BAX-10	Probe handle
CAB-06	Cable for TRA-22
13108	Sleeve for probe tip



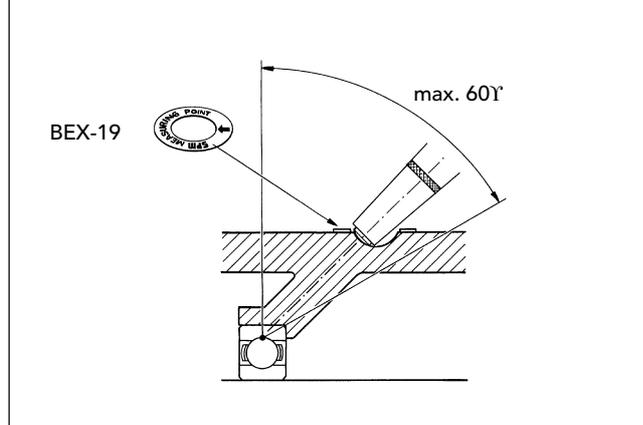
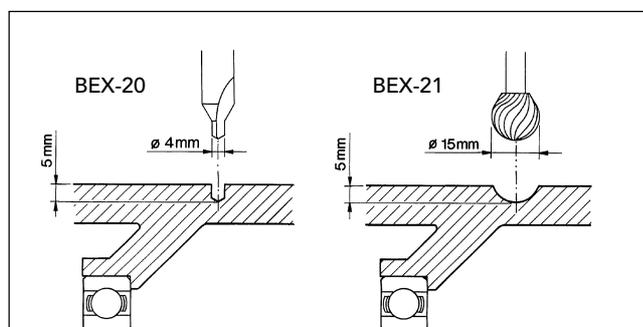
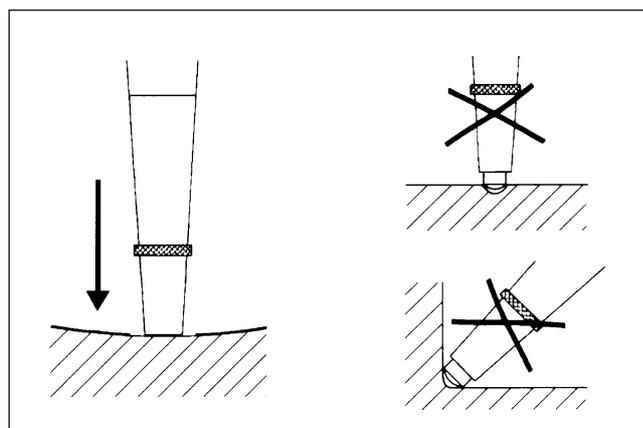
Shock Pulse Transducer with Probe TRA-72



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 $\pm 5^\circ$. 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 $\pm 45^\circ$ 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 $\pm 60^\circ$ 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 cavities and fillets which are smaller than the probe tip.



Ordering numbers

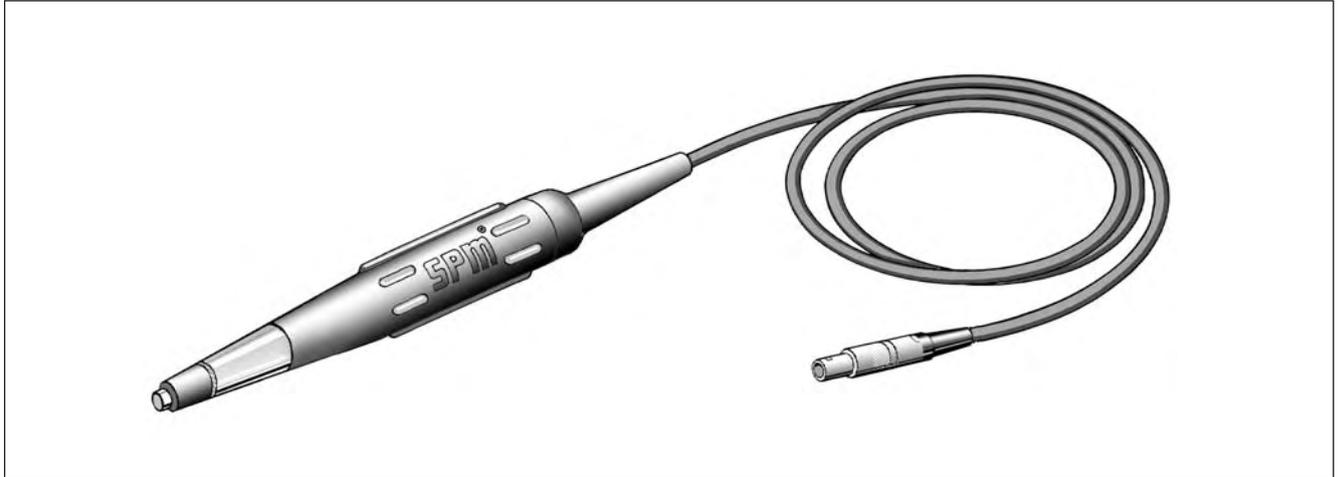
TRA-72	Shock pulse transducer, probe assembly
BEX-19	Measuring point marker
BEX-20	Center drill
BEX-21	Rotary file

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



Shock Pulse Transducer with Probe TRA-73



TRA-73 is a hand-held probe, which is used together with Bearing Checker. The probe is directionally sensitive and must be held aligned against the bearing and not deviate from this direction by more than $\pm 5^\circ$. 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 $\pm 45^\circ$ 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 $\pm 60^\circ$ 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 cavities and fillets which are smaller than the probe tip.

Technical data

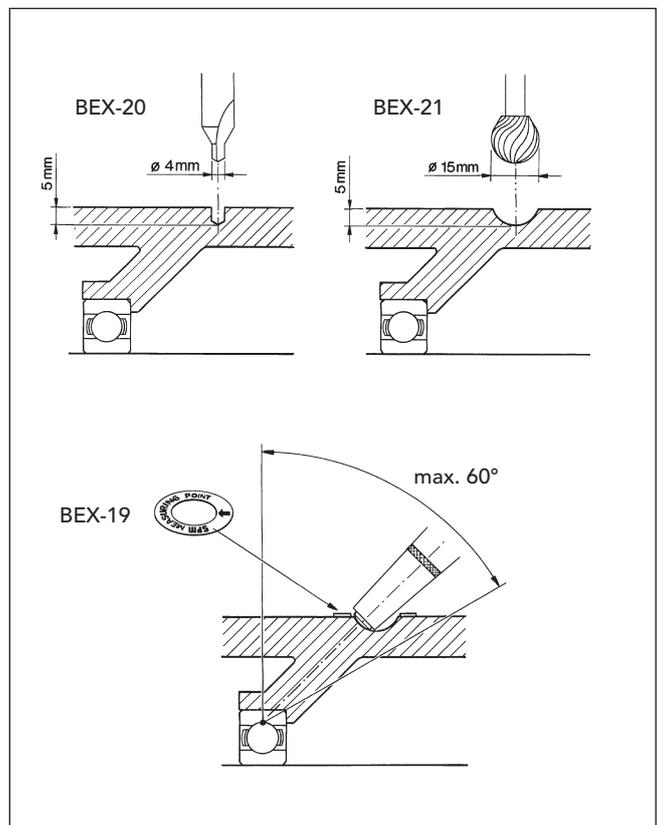
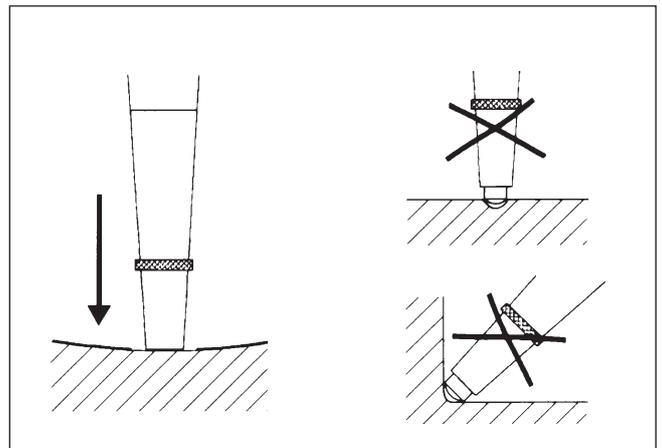
Coaxial cable	PVC, length 1.5 m (5 ft)
Connector	Lemo
Dimensions	260 x 25 mm (10.2 x 1 in)
Weight	275 g (9.7 oz)

Ordering numbers

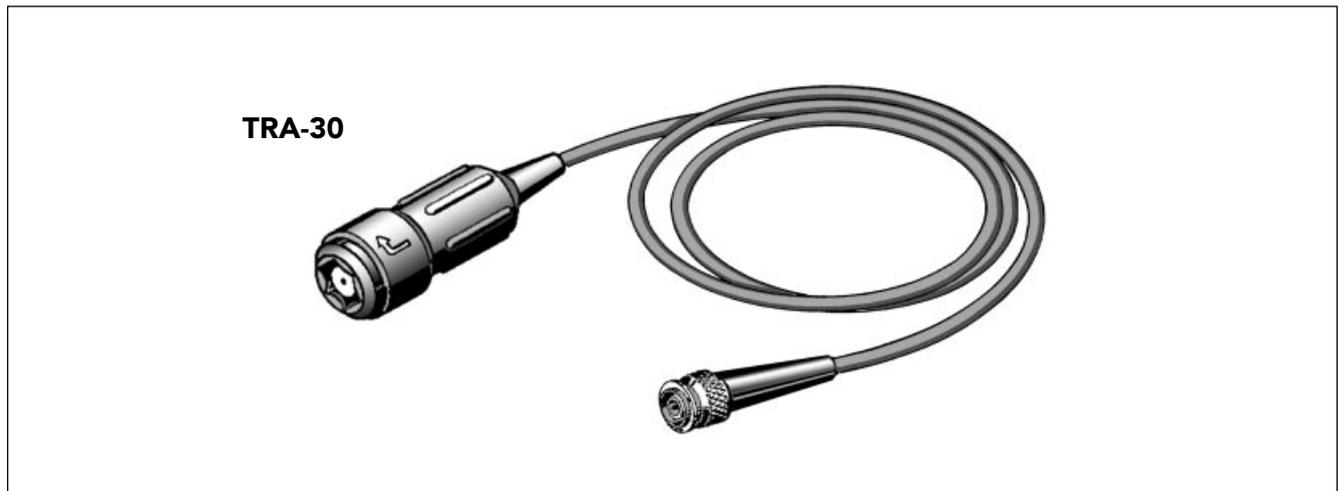
TRA-73	Shock pulse transducer, probe assembly
BEX-19	Measuring point marker
BEX-20	Center drill
BEX-21	Rotary file

Spare parts

TRA-15	Transducer with probe
BAX-10	Probe handle
CAB-73	Cable for TRA-73, LEMO connector, 1.5 m (5 ft)
13108	Sleeve for probe tip



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.

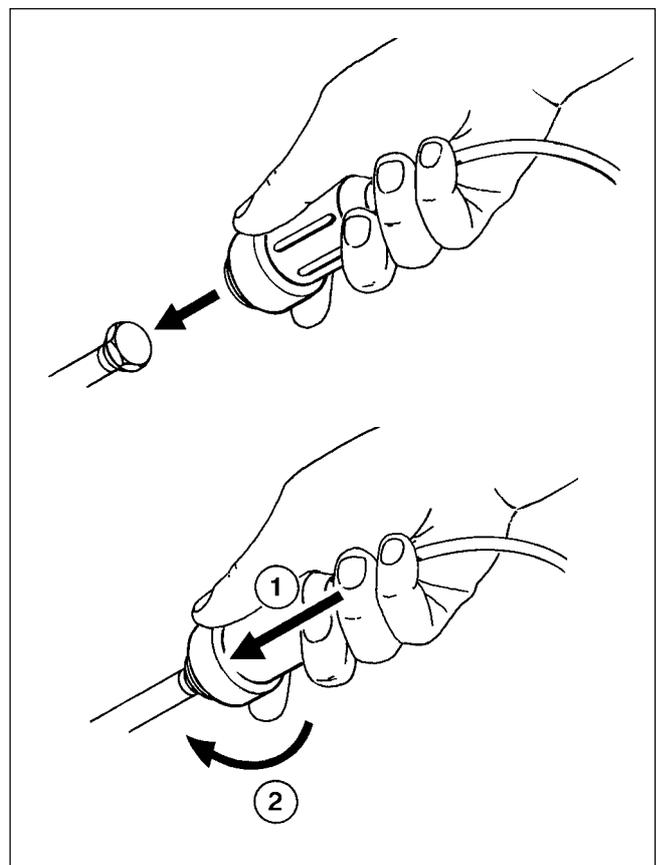
Twist counter clockwise to unfasten the transducer.

Technical data

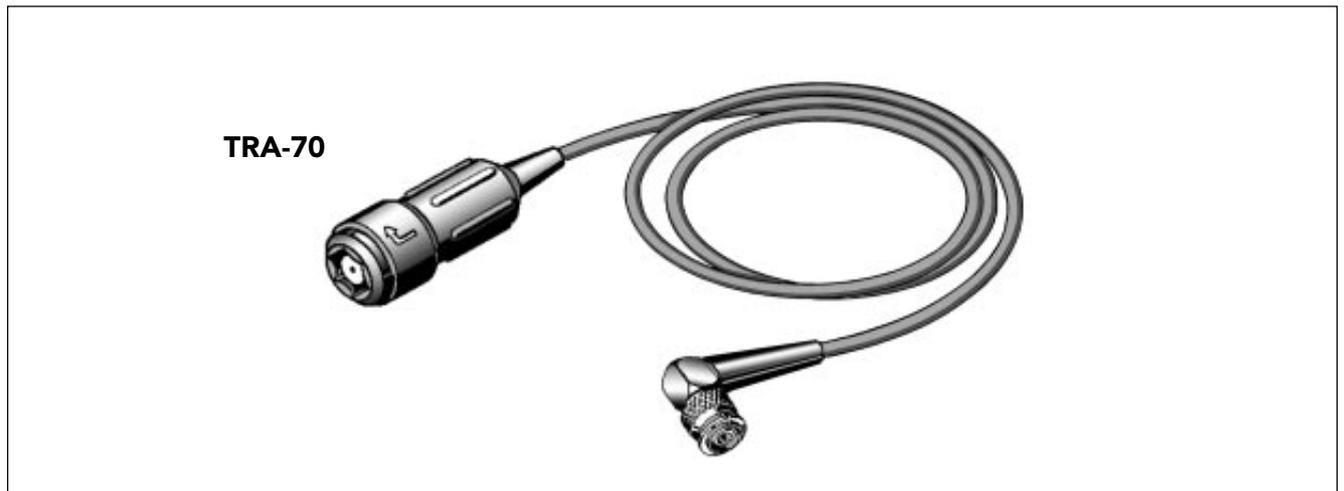
Measuring range	Max. 100 dBsv
Design	Sealed
Temperature range	-30°C to +70°C
Material, spanner	Blacknited steel
Handle cover	Urethan
Coaxial cable	PVC, length 1.5 m
Connector	TNC
Weight	250 g

Part numbers

TRA-30	Transducer with quick connector, incl. cable
CAB-30	Cable for TRA-30



Shock pulse transducer with quick connector TRA-70



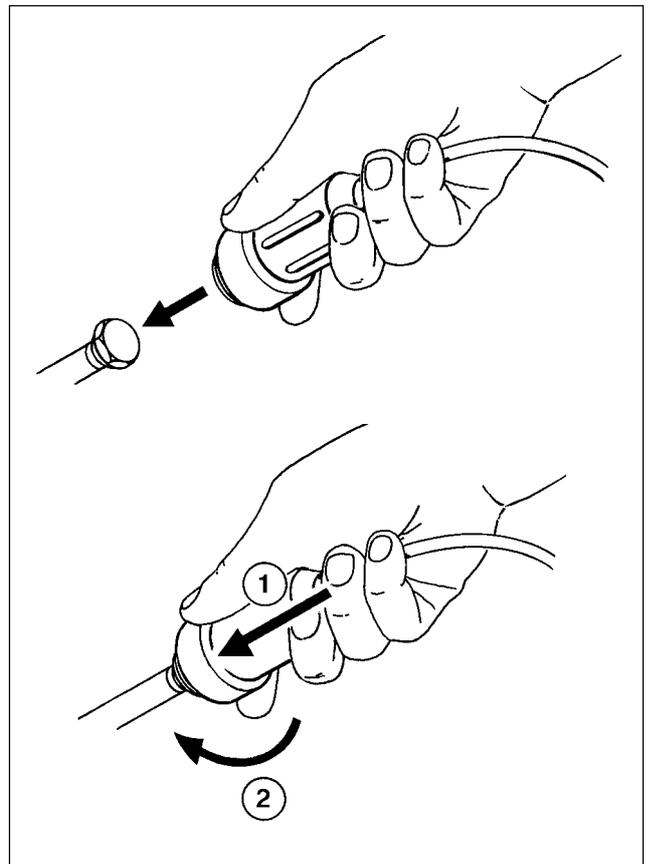
TRA-70 is a shock pulse transducer with quick connector for measurements on permanently installed adapters. The transducer can be used together with the handheld instrument Leonova. The quick connector forms a bayonet connection together with the permanently installed adapter.

To attach the TRA-70 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

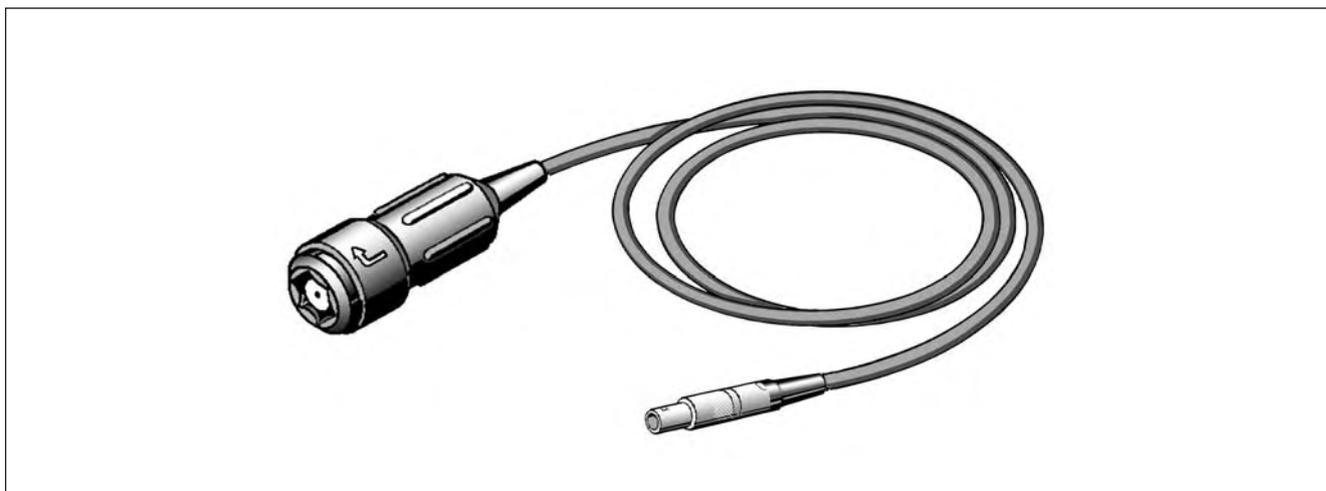
Twist counter clockwise to unfasten the transducer.

Technical data

Measuring range	Max. 100 dBsv
Design	Sealed
Temperature range	-30°C to +70°C
Material, spanner	Blacknited steel
Handle cover	Urethan
Coaxial cable	PVC, length 1.5 m
Connector	BNC
Weight	250 g



Shock pulse transducer with quick connector TRA-74



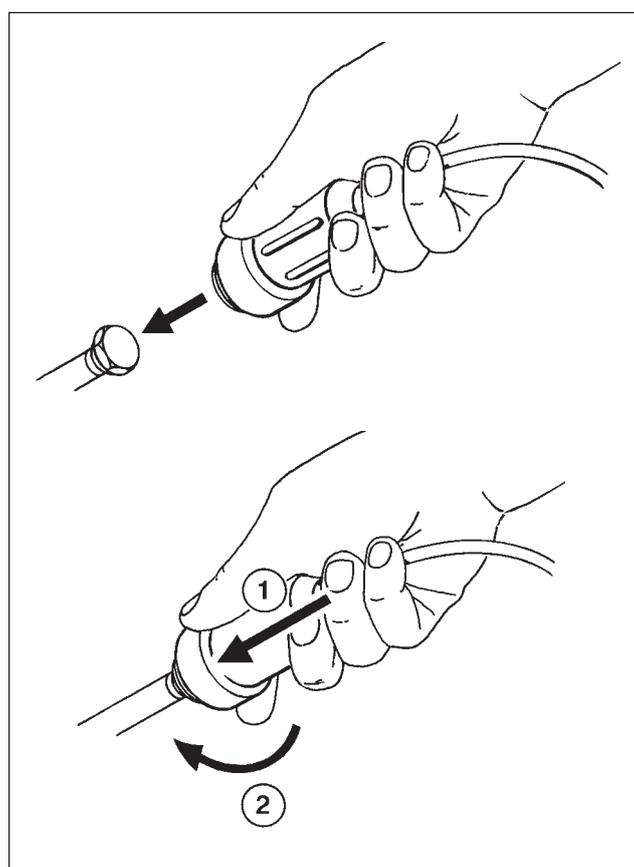
TRA-74 is a shock pulse transducer with quick connector for measurements on permanently installed adapters. The transducer can be used together with the handheld instrument Bearing Checker. The quick connector forms a bayonet connection together with the permanently installed adapter.

To attach the TRA-74 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

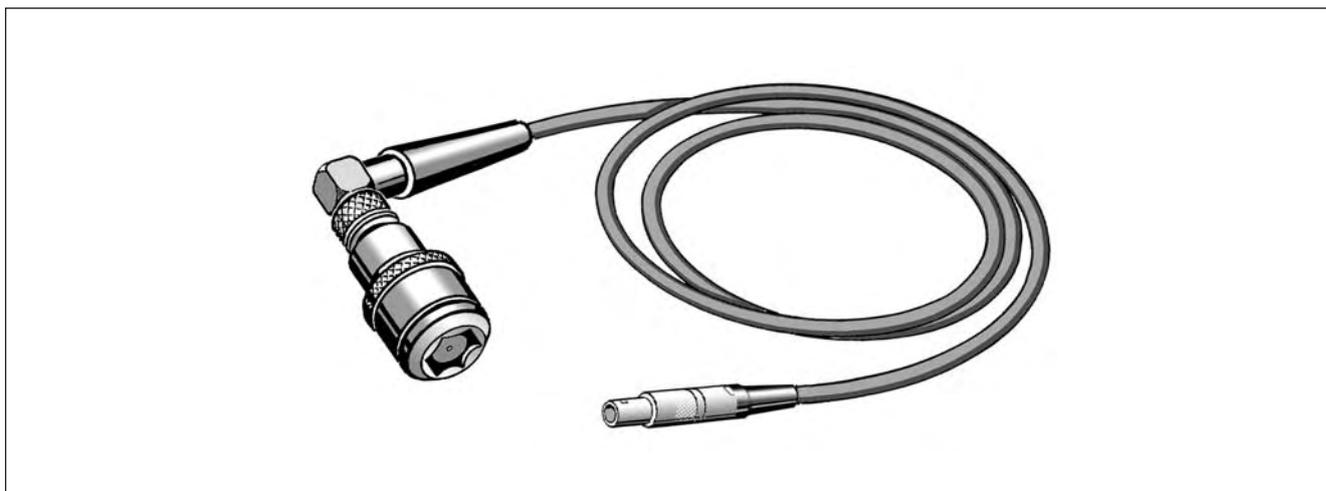
Twist counter clockwise to unfasten the transducer.

Technical data

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	Lemo
Dimensions	90 x 30 mm (1.2 x 3.5 in)
Weight	203 g (7.2 oz)



Transducer with quick connector TRA-75



TRA-75 is a shock pulse transducer with quick connector for Bearing Checker, specially designed for narrow spaces.

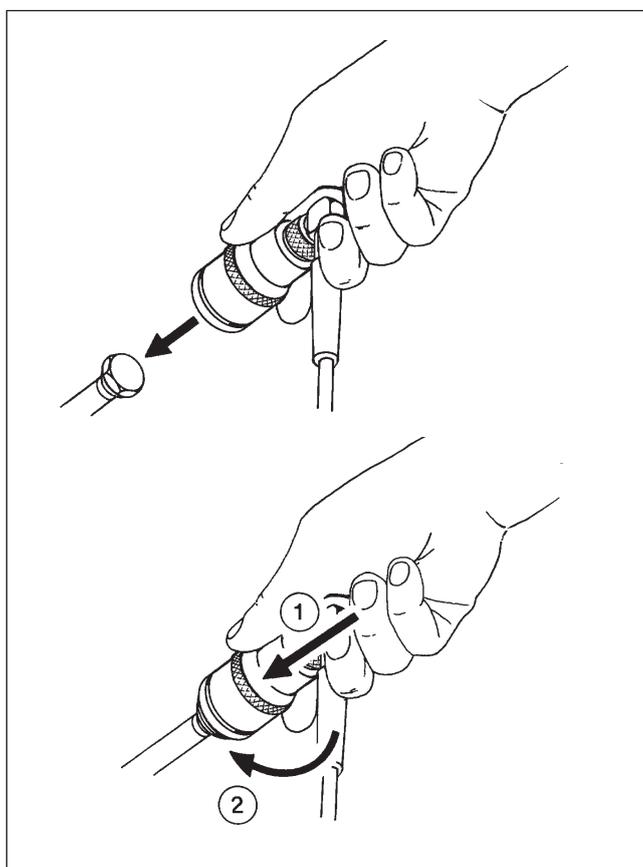
On TRA-75, the cable is fitted with an angle connector, making this transducer about 30 mm shorter than the standard model TRA-74. In all other respects, the two models are identical.

To attach the TRA-75 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

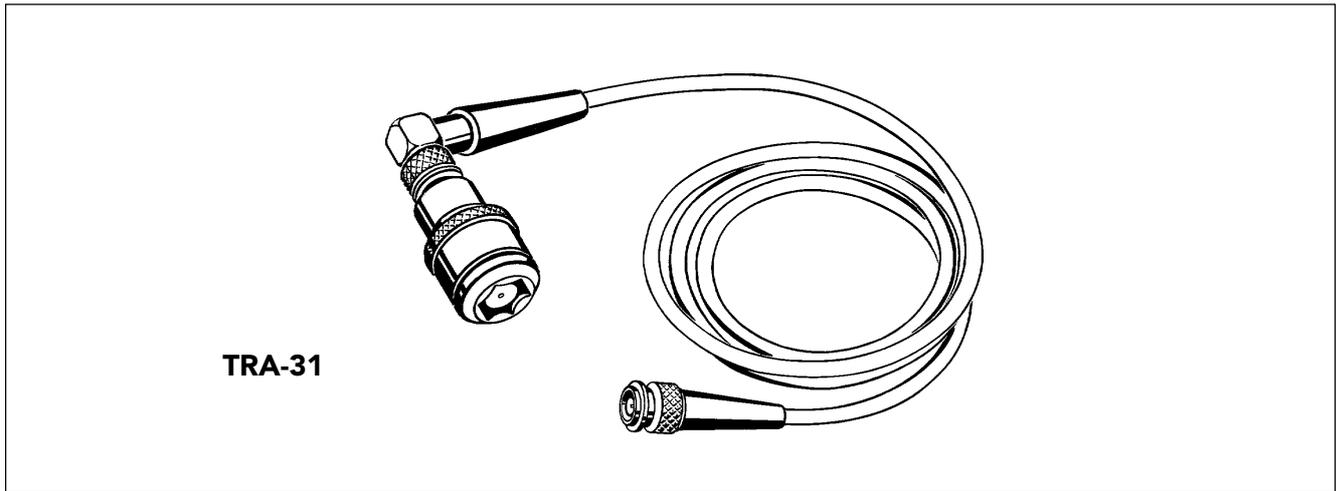
Twist counter clockwise to unfasten the transducer.

Technical data

Measuring range	Max. 100 dBsv
Design	Sealed
Temperature range	-30° to +70° C (-22° to +158° F)
Material, spanner	Blacknitid steel
Material, handle	Stainless steel
Coaxial cable	PVC, length 1.5 m (4.9 ft)
Connector	LEMO
Length	70 mm (2.8 in)
Weight	200 g (7 oz)



Transducer with quick connector 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.

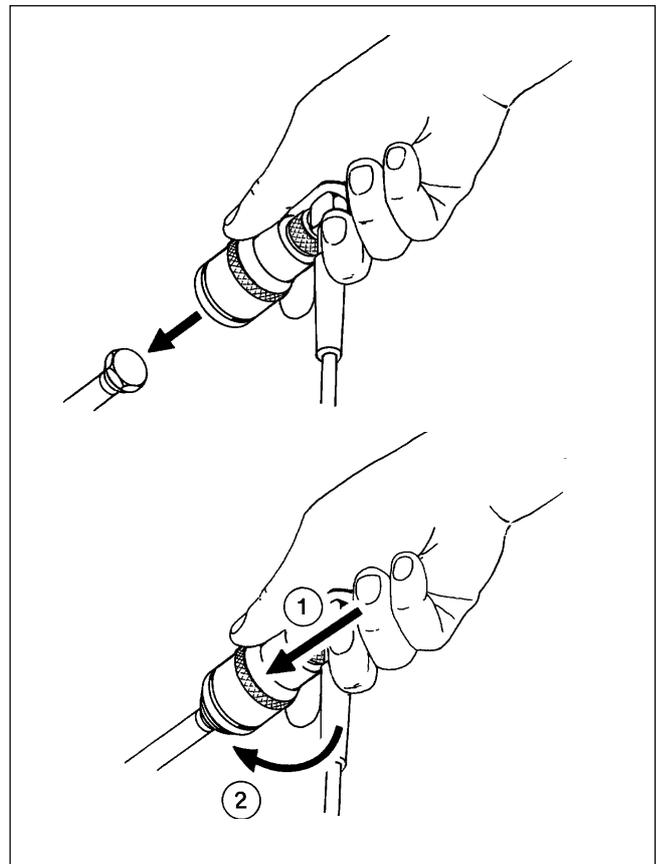
Twist counter clockwise to unfasten the transducer.

Technical data

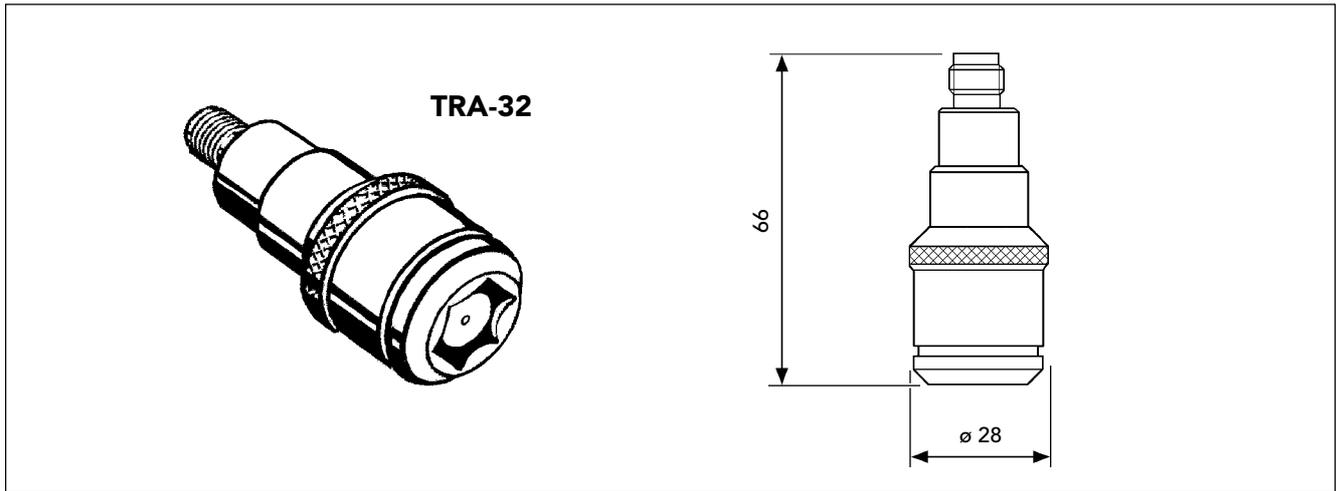
Measuring range	Max. 100 dBsv
Design	Sealed
Temperature range	-30° to +70° C
Material, spanner	Blacknited steel
Material, handle	Stainless steel
Coaxial cable	PVC, length 1.5 m
Connectors	TNC
Length	70 mm
Weight	220 g

Part numbers

TRA-31 Transducer with quick connector incl. cable
46012-1.5 Cable for TRA-31



Transducer with quick connector and TMU



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.

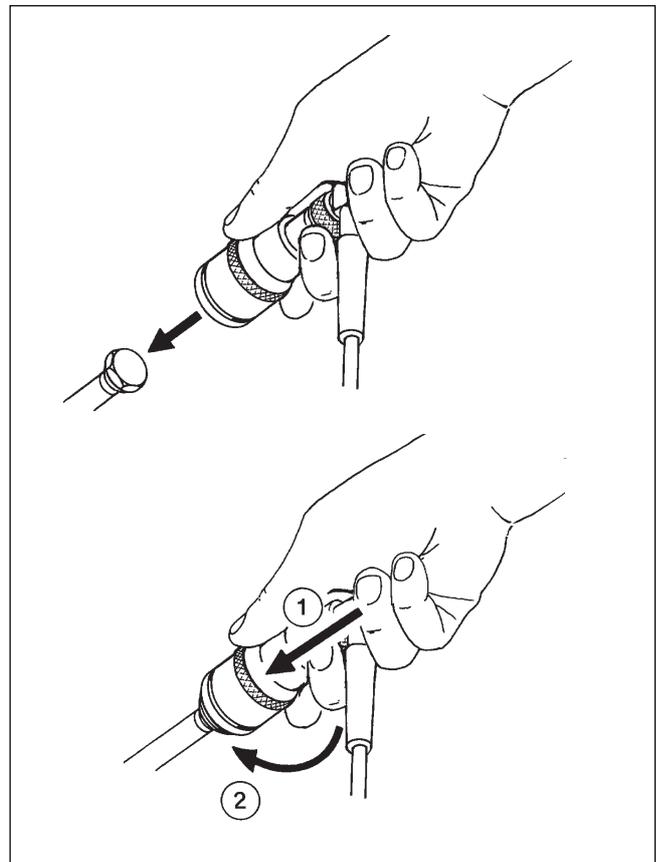
If transducer and measuring cable are used in moist environments, it is necessary to equip the cable with a sealing TNC cable plug SPM 13008.

To attach the TRA-32 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

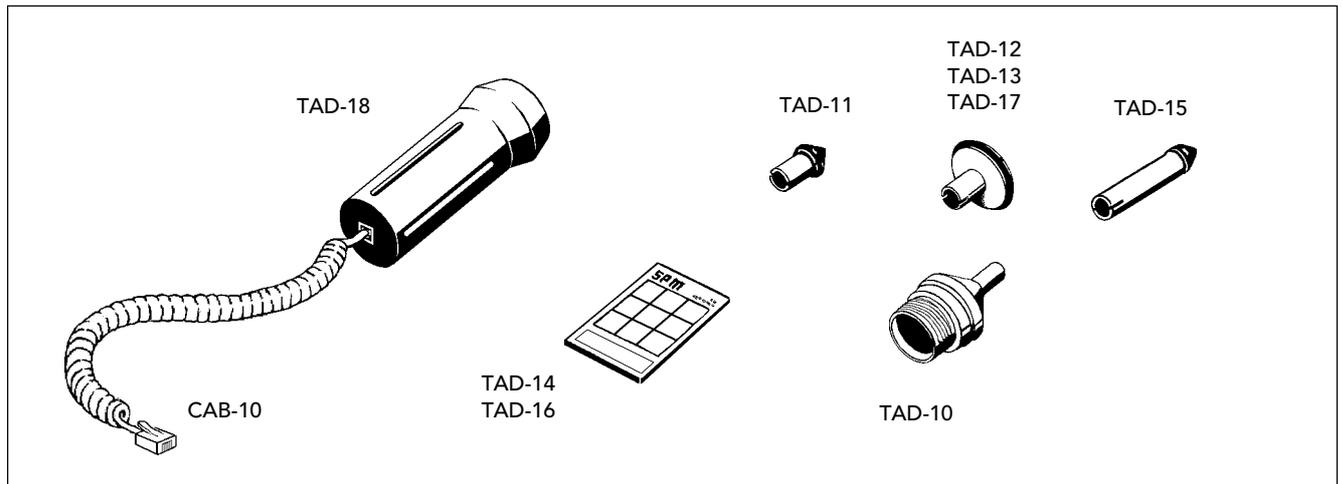
Twist counter clockwise to unfasten the transducer.

Technical data

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



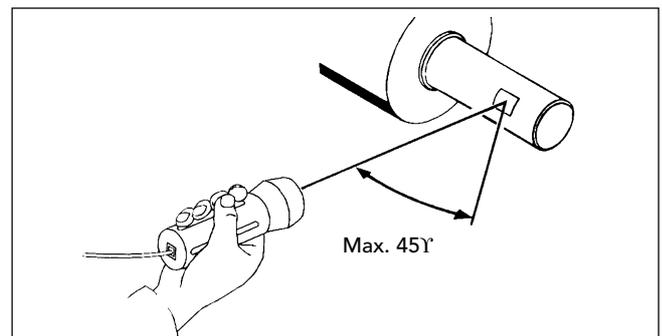
Tachometer Probe TAD-18



The Tachometer Probe TAD-18 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.

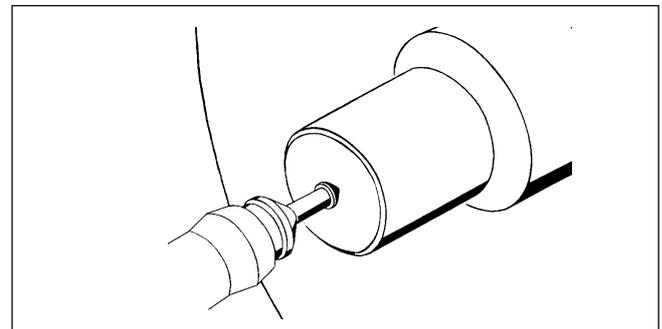
Optical measurement of the rate of rotation

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°.



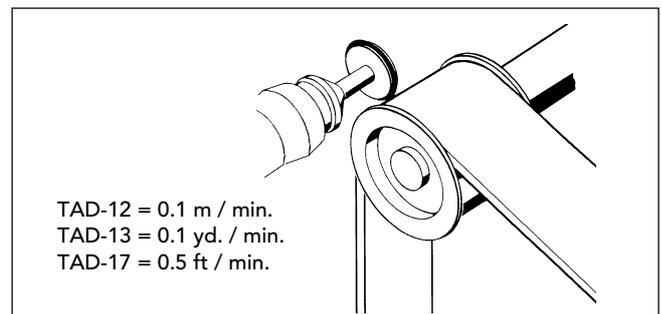
Contact measurement of rpm

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.

Ordering numbers

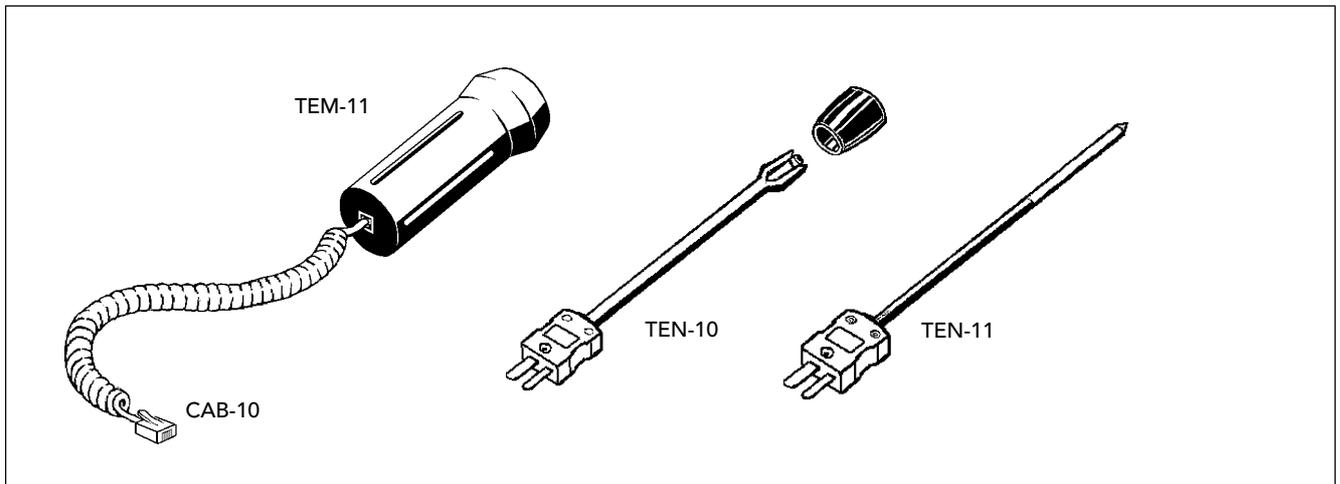
- TAD-18 Tachometer probe with cable
- CAB-10 Spiral cable
- TAD-10 Contact adapter
- TAD-11 Contact center, rpm, short
- TAD-15 Contact center, rpm, long
- TAD-12 Contact wheel, meter/min.
- TAD-13 Contact wheel, yards/min.
- TAD-17 Contact wheel, feet/min.
- TAD-14 Reflecting tape, pad of 5 sheets
- 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, TAD-18: 171 x 42 mm



Temperature probe TEM-11



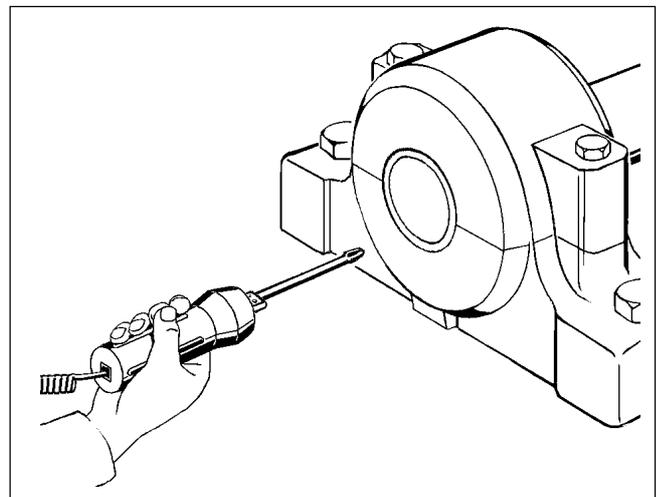
The temperature probe TEM-11 is used together with SPM's hand-held instruments, for temperature measurements in the range of -50 to $+440$ °C.

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 belong 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.



Ordering numbers

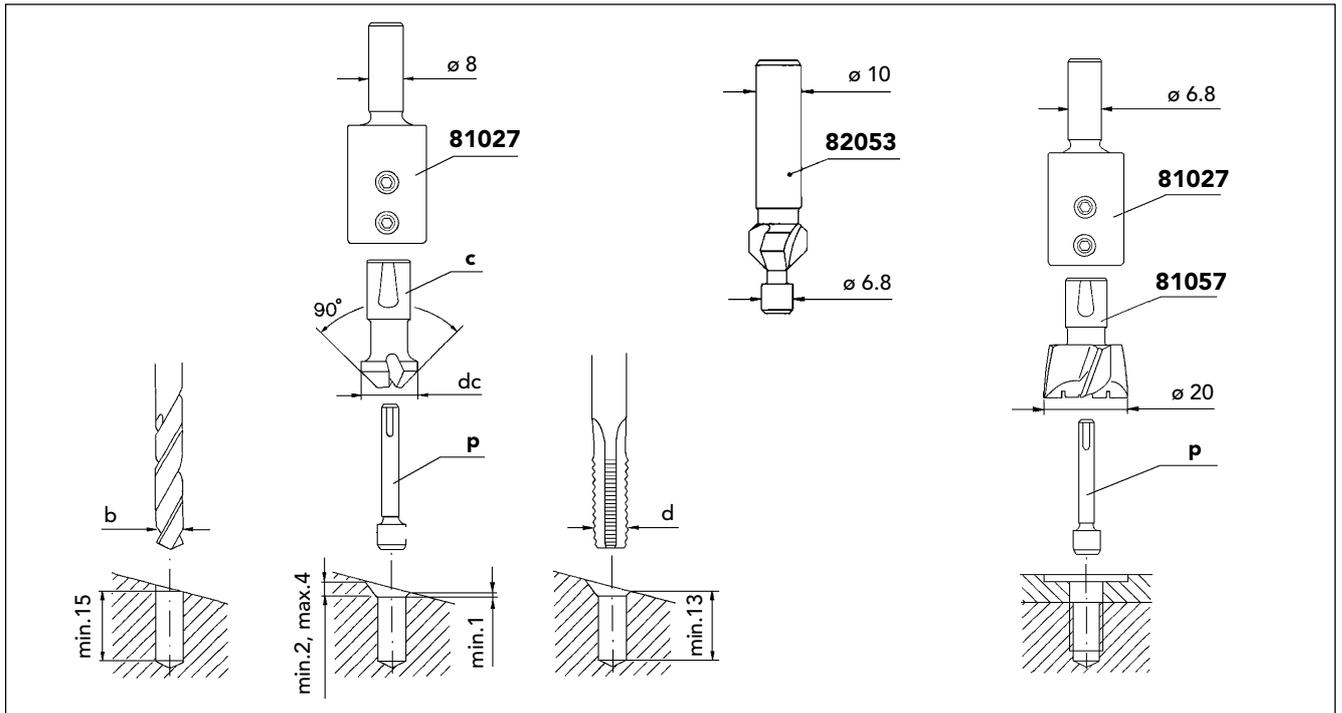
TEM-11	Temperature probe with cable
CAB-10	Spiral cable
TEN-10	Probe tip for solids
TEN-11	Probe tip for liquids.

Technical specifications

Measuring range:	-50 to $+440$ °C (-58 to $+824$ °F)
Maximum offset:	± 5 °C (± 9 °F)
Measuring uncertainty	± 1 °C
Sensitivity	10 mV / °C
Output range	0 to 5 V DC
Power supply	+5 V DC
Measuring time:	approx. 1 minute
Dimensions,	
TEM-11:	118 x \varnothing 42 mm
TEN-10:	length 122 mm with cap
TEN-11:	length 159 mm
Weight TEM-11:	94 g



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.

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.

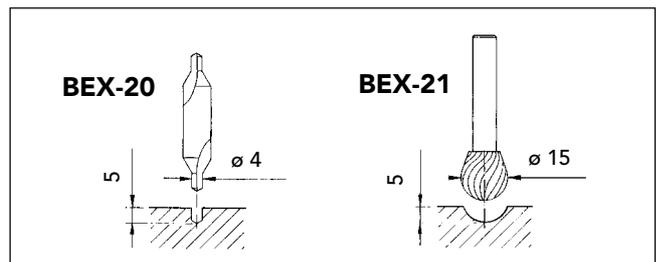
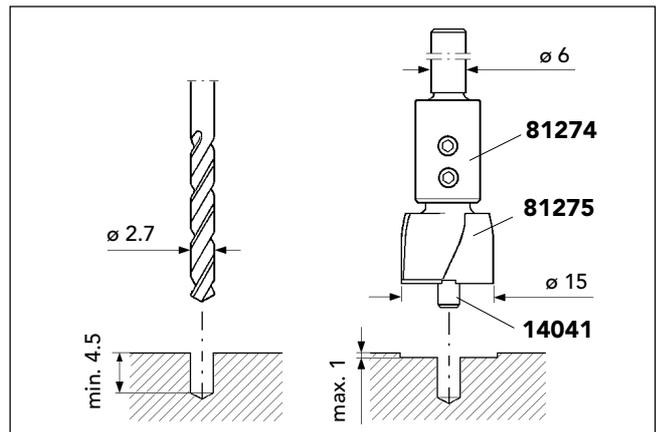
Counterbore for Glue-on Transducer 40010

- 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 facilitate drilling of mounting holes for adapters, studs, and transducers at an angle.

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"



SOLID Transducers and Transmitters - Overview

All SOLID transducers and transmitters are internally isolated. The vibration transducers have a temperature range of -40 to +120 °C (-40 to +248 °F), whereas the 4–20 mA transmitters operate in -40 to +85 °C (-40 to +185 °F).

Vibration Transducers

Article no.	Ex	Thread	Connector	Frequency range	Sensitivity	Compatible with	TD sheet
SLD 121 A	–	M8	SMB	2–1000 Hz	1.2 mV/m/s ²	CMM, MG4, Intellinova	TD-283
SLD 121 B	–	M8	2-pin	2–1000 Hz	1.2 mV/m/s ²	CMM, MG4, Intellinova	TD-283
SLD 121 E	–	UNF 1/4"	SMB	2–1000 Hz	1.2 mV/m/s ²	CMM, MG4, Intellinova	TD-283
SLD 121 F	–	UNF 1/4"	2-pin	2–1000 Hz	1.2 mV/m/s ²	CMM, MG4, Intellinova	TD-283
SLD 122 A	–	M8	SMB	2–5000 Hz	4 mV/m/s ²	MG4, Intellinova	TD-283
SLD 122 B	–	M8	2-pin	2–5000 Hz	4 mV/m/s ²	MG4, Intellinova	TD-283
SLD 122 E	–	UNF 1/4"	SMB	2–5000 Hz	4 mV/m/s ²	MG4, Intellinova	TD-283
SLD 122 F	–	UNF 1/4"	2-pin	2–5000 Hz	4 mV/m/s ²	MG4, Intellinova	TD-283
SLD 144 B	–	M8	2-pin	2–10 000 Hz	10 mV/m/s ²	LEO, VCM, Intellinova	TD-283
SLD 144 F	–	UNF 1/4"	2-pin	2–10 000 Hz	10 mV/m/s ²	LEO, VCM, Intellinova	TD-283
SLD 243 B	Ex	M8	2-pin	2–10 000 Hz	5 mV/m/s ²	LEO, VCM, Intellinova	TD-284
SLD 243 F	Ex	UNF 1/4"	2-pin	2–10 000 Hz	5 mV/m/s ²	LEO, VCM, Intellinova	TD-284
SLD 244 B	Ex	M8	2-pin	2–10 000 Hz	10 mV/m/s ²	LEO, VCM, Intellinova	TD-284
SLD 244 F	Ex	UNF 1/4"	2-pin	2–10 000 Hz	10 mV/m/s ²	LEO, VCM, Intellinova	TD-284

Vibration Transducers with Side Entry

Article no.	Thread	Connector	Frequency range	Sensitivity	Compatible with	TD sheet
SLD 144 S	M8	2-pin	2–10 000 Hz	10 mV/m/s ²	LEO, VCM, Intellinova	TD-282
SLD 144 S-UNF	UNF 1/4"	2-pin	2–10 000 Hz	10 mV/m/s ²	LEO, VCM, Intellinova	TD-282

The frequency range is specified for the transducer when permanently installed. The measuring results will be affected at higher frequencies when using a magnetic foot.

Note: Ex approved transducers must be used together with transducer interface SPM 15226 or Ex approved zener barrier when used in explosive environment.

4-20 mA Vibration Transmitters

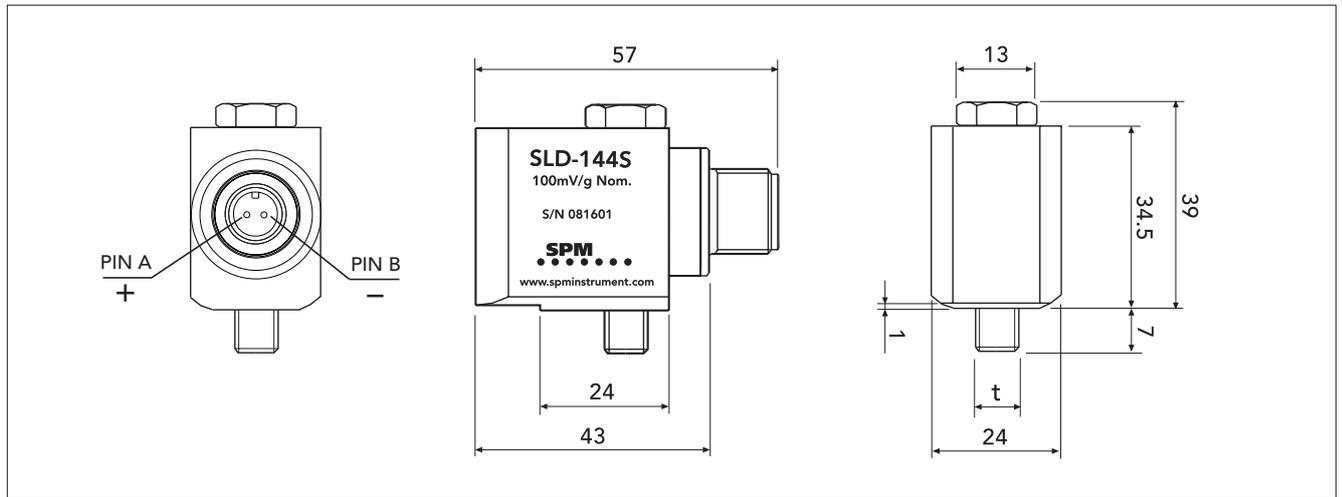
Article no.	Ex	Thread	Connector / Cable	Frequency range	Measuring range	TD sheet
SLD722 C	–	M8	Integrated cable, 3 m*	2 – 1000 Hz	0 – 12.5 mm/s	TD-285
SLD722 G	–	UNF 1/4"	Integrated cable, 3 m*	2 – 1000 Hz	0 – 0.5 in/s	TD-285
SLD 723 C	–	M8	Integrated cable, 3 m*	2 – 1000 Hz	0 – 25 mm/s	TD-285
SLD 723 -M10	–	M10	Integrated cable, 3 m*	2 – 1000 Hz	0 – 25 mm/s	TD-285
SLD 723 G	–	UNF 1/4"	Integrated cable, 3 m*	2 – 1000 Hz	0 – 1 in/s	TD-285
SLD 724 C	–	M8	Integrated cable, 3 m*	2 – 1000 Hz	0 – 50 mm/s	TD-285
SLD 724 G	–	UNF 1/4"	Integrated cable, 3 m*	2 – 1000 Hz	0 – 2 in/s	TD-285
SLD 733 C	–	M8	Integrated cable, 3 m*	10 – 1000 Hz	0 – 25 mm/s	TD-285
SLD 733 G	–	UNF 1/4"	Integrated cable, 3 m*	10 – 1000 Hz	0 – 1 in/s	TD-285
SLD 823 C	Ex	M8	Integrated cable, 3 m*	2 – 1000 Hz	0 – 25 mm/s	TD-286
SLD 823 G	Ex	UNF 1/4"	Integrated cable, 3 m*	2 – 1000 Hz	0 – 1 in/s	TD-286
SLD 833 C	Ex	M8	Integrated cable, 3 m*	10 – 1000 Hz	0 – 25 mm/s	TD-286
SLD 833 G	Ex	UNF 1/4"	Integrated cable, 3 m*	10 – 1000 Hz	0 – 1 in/s	TD-286

* Standard cable length is 3 meters, but optional lengths may be ordered (ex. SLDXXXX-L, L = length in meters, max. 30 m).

Note: Ex approved transmitters must be connected through a barrier when used in explosive environment.



Vibration Transducers with Side Entry



The vibration transducers series SLD144S are piezo-electric accelerometers 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.

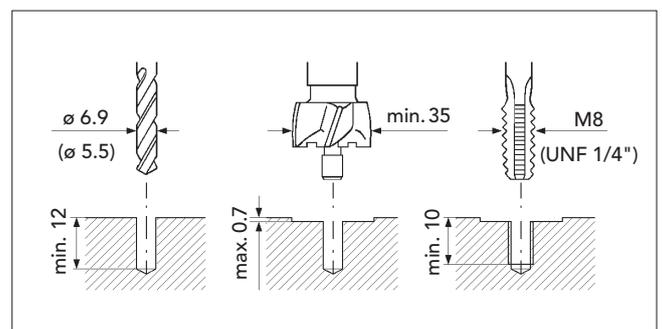
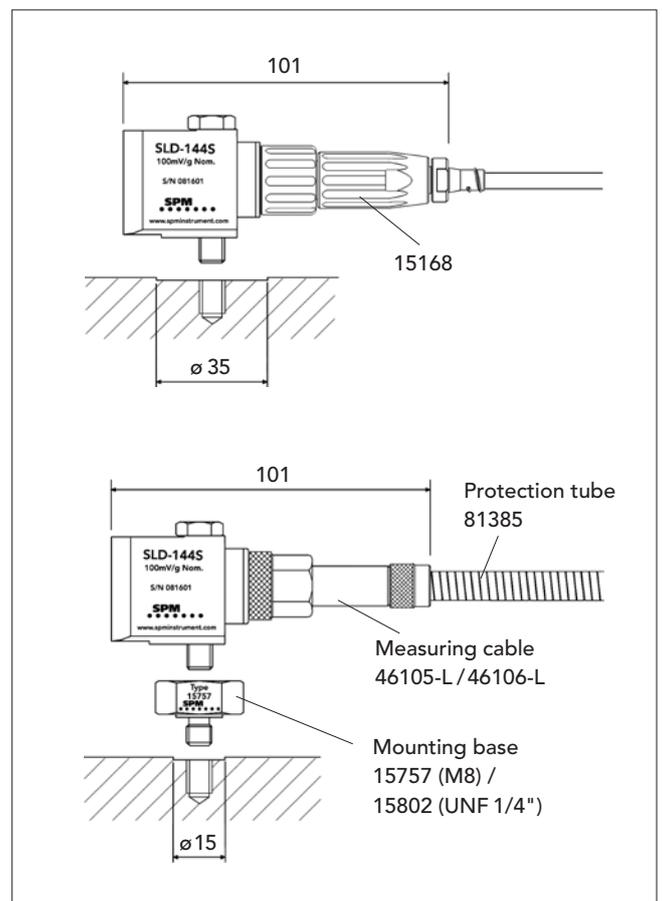
The transducer is mounted against a smooth, flat surface min. 35 mm in diameter (min. 16 mm is required when using mounting base SPM 15757 or 15802). The transducer has a captured bolt for mounting and is connected via a twisted pair cable with 2 pin connector. In moist environment, use the sealed connector with integrated measuring cable SPM 46105-L/46106-L together with cable protection tube SPM 81385.

Technical data

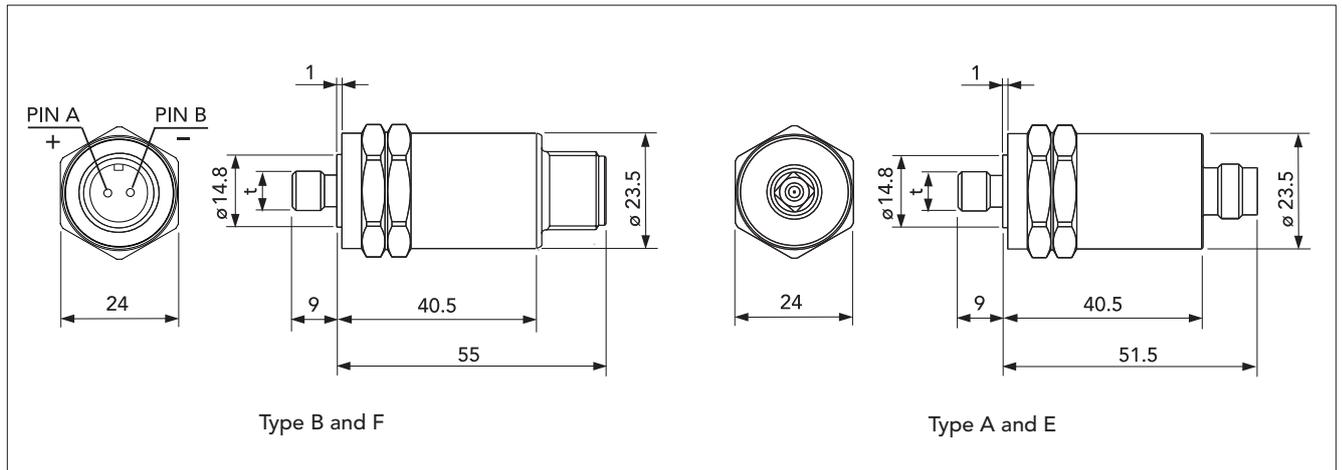
Nominal sensitivity, main axis:	10 mV/m/s ² * =100 mV/g
Transverse sensitivity:	max. 10%
Typical base strain sensitivity:	0.01 m/s ² /μ strain
Linear frequency range:	2 Hz to 10 kHz (±3 dB)
Max. peak acceleration:	600 m/s ² = 60 g
Settling time:	3 sec
Bias point:	11 to 14 V (typical 12 V)
Temperature range:	-40° to +125° C (-40° to 260° F)
Power requirements:	24 V / 2 to 5 mA
Casing:	Stainless acid proof steel
Sealing:	IP67 together with appropriate connector
Isolation:	Case isolated, > 1 Mohm
Torque limit:	10 Nm (7.4 lbf ft)
Weight:	200 grams (7 oz)
Connector type:	Compatible with 2 pin MIL-C-5015 style

* Individual value given on the calibration chart.

Article number	Name	Thread (t)
SLD 144S	Vibration transducer	M8
SLD 144S-UNF	Vibration transducer	UNF 1/4"



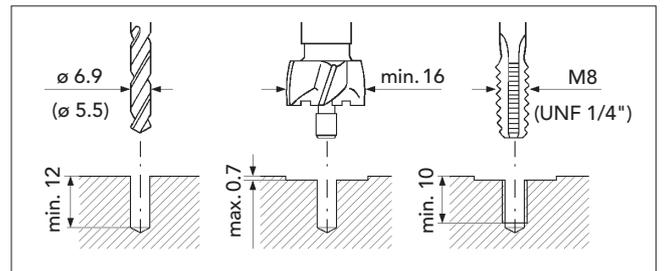
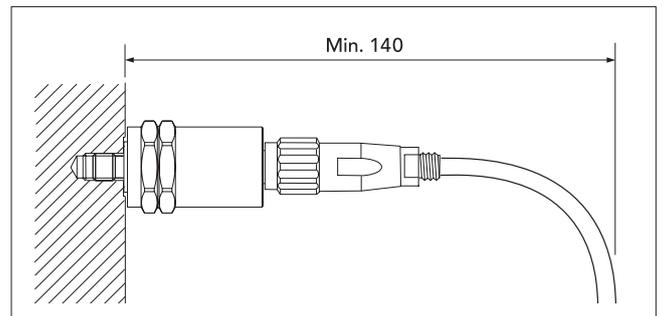
Vibration Transducers, Series SLD 100



The vibration transducers series SLD100 are piezo-electric accelerometers of compression type with built-in electronics, designed for vibration monitoring of industrial machinery. The transducer is mounted against a smooth, flat surface on the machine. The electrical signal is isolated from the transducer housing.

Technical data

Transverse sensitivity:	max. 10%
Typical base strain sensitivity:	0.01 m/s ² /μ strain
Max. peak acceleration:	600 m/s ² = 60 g
Settling time:	3 sec
Temperature range:	-40° C to +125° C (-40° F to 260° F)
Power requirements:	12 to 24 V, 2 to 5 mA
Casing:	Stainless acid proof steel
Sealing:	IP 67 together with appropriate connector
Isolation:	Case isolated, > 1 Mohm
Torque limit:	10 Nm (7.4 lbf ft)
Weight:	110 grams (4 oz)



Mounting tools

- 81027 Holder for counterbore
- 81057 Counterbore, diameter 20 mm
- 81030 Pilot for UNF 1/4"
- 81031 Pilot for M8

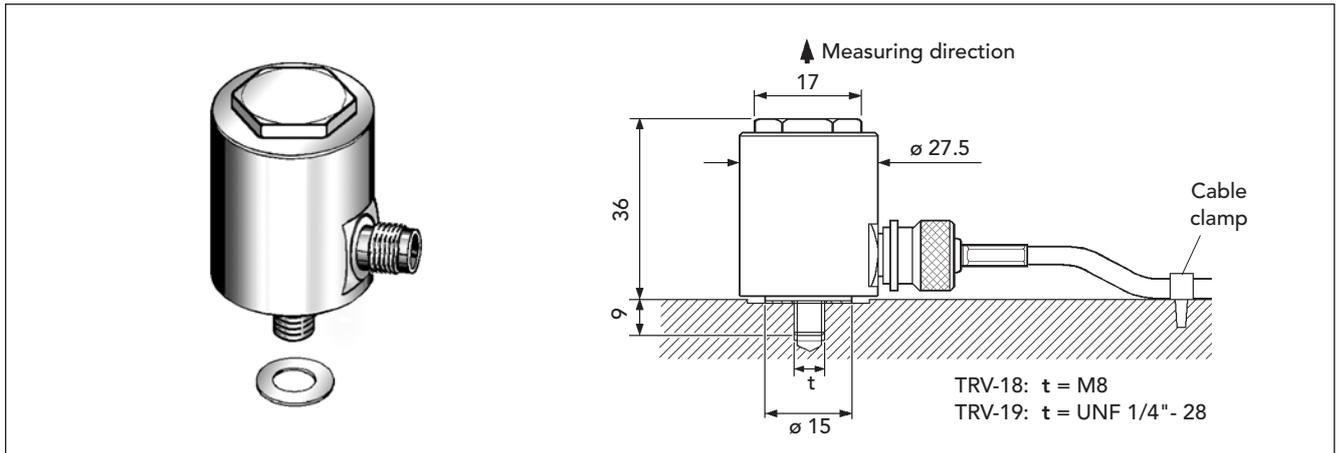
To drill the mounting hole, use drill bit 6.9 mm (M8) or 5.5 mm (UNF 1/4"). Torque the transducer with a 24 mm torque wrench.

Article number	Connector type	Thread (t)	Frequency range	Sensitivity (±1 dB) *	Bias (typical)
SLD 121 A	SMB	M8	2 – 1000 Hz	1.2 mV/m/s ² = 12 mV/g	6 – 9 V (8 V)
SLD 121 B	2-pin	M8	2 – 1000 Hz	1.2 mV/m/s ² = 12 mV/g	6 – 9 V (8 V)
SLD 121 E	SMB	UNF 1/4"	2 – 1000 Hz	1.2 mV/m/s ² = 12 mV/g	6 – 9 V (8 V)
SLD 121 F	2-pin	UNF 1/4"	2 – 1000 Hz	1.2 mV/m/s ² = 12 mV/g	6 – 9 V (8 V)
SLD 122 A	SMB	M8	2 – 5000 Hz	4 mV/m/s ² = 40 mV/g	6 – 9 V (8 V)
SLD 122 B	2-pin	M8	2 – 5000 Hz	4 mV/m/s ² = 40 mV/g	6 – 9 V (8 V)
SLD 122 E	SMB	UNF 1/4"	2 – 5000 Hz	4 mV/m/s ² = 40 mV/g	6 – 9 V (8 V)
SLD 122 F	2-pin	UNF 1/4"	2 – 5000 Hz	4 mV/m/s ² = 40 mV/g	6 – 9 V (8 V)
SLD 144 B	2-pin	M8	2 – 10 000 Hz	10 mV/m/s ² = 100 mV/g	11 – 13 V (12 V)
SLD 144 F	2-pin	UNF 1/4"	2 – 10 000 Hz	10 mV/m/s ² = 100 mV/g	11 – 13 V (12 V)

* Individual value given on the calibration chart.



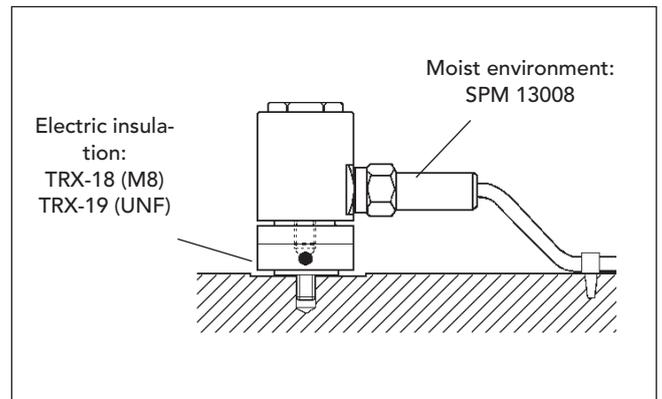
Vibration Transducer TRV-18 / 19



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).

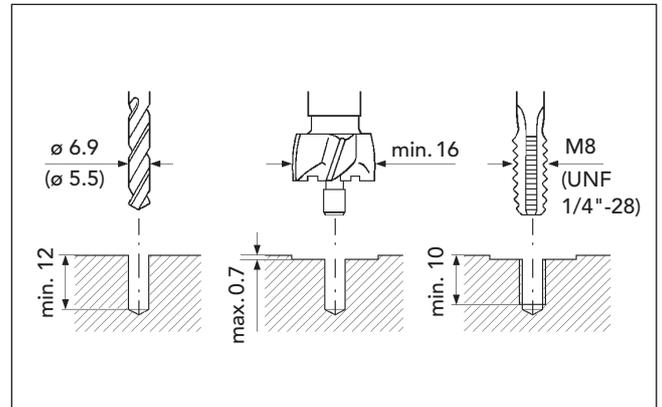
The transducer is mounted against a smooth, flat surface on the machine. TRV-18 has thread size M8 and TRV-19 has UNF 1/4"-28. The transducers are delivered with three washers for adjusting the connector angle. Each washer turns the transducer 90°. The coaxial cable (SPM 90005-L or 90267-L) with TNC 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 insulation foot TRX-18 / TRX-19.



Technical data

Nominal sensitivity, main axis:	1.2 mV/m/s ² *
Transverse sensitivity:	max. 10%
Typical base strain sensitivity:	0.01 m/s ² /μ strain
Linear frequency range:	3 to 1000 Hz
Max. peak acceleration:	600 m/s ²
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 conn. SPM13008
Weight:	135 grams (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)



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 (SPM 81086).

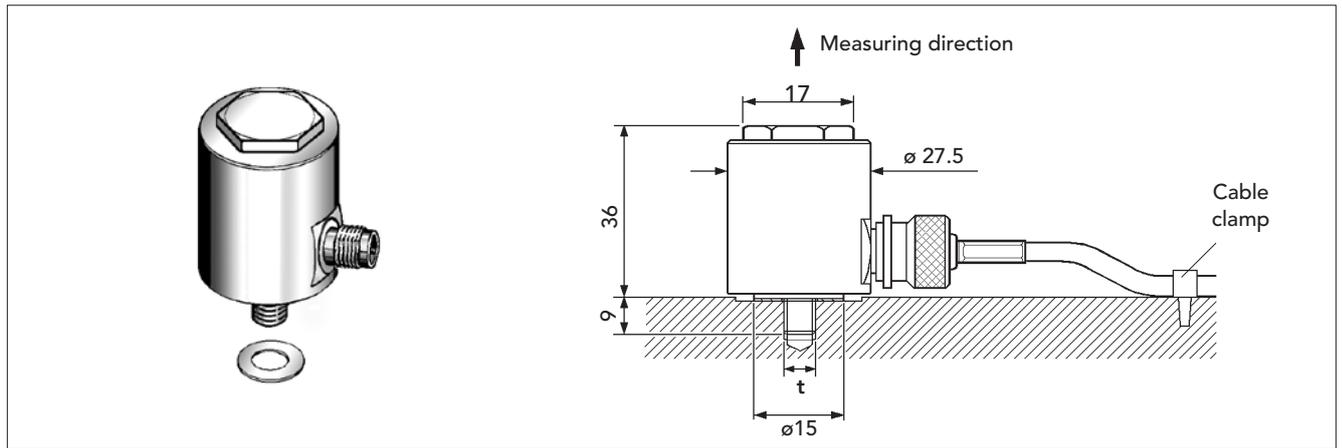
Mounting tools

81027	Holder for counterbore
81057	Counterbore, diameter 20 mm
81030	Pilot for UNF 1/4"-28 (TRV-19)
81031	Pilot for M8 (TRV-18)

* Individual value given on the calibration chart.



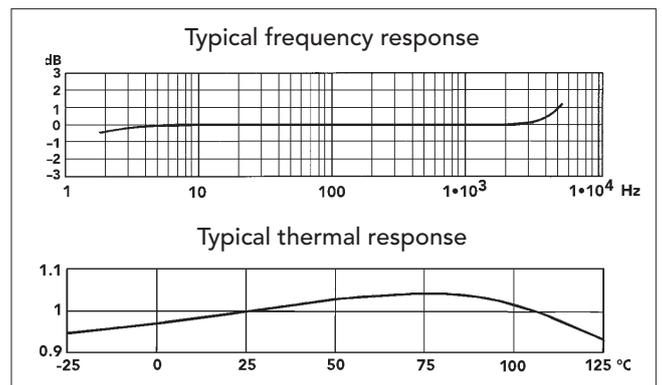
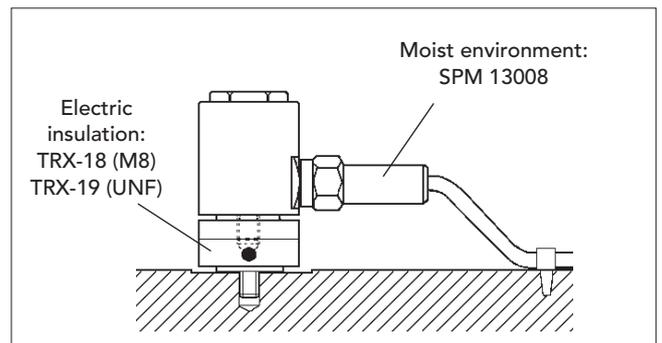
Vibration Transducer TRV-20/21



The transducers TRV-20 and TRV-21 are piezo-electric accelerometers of compression type with built-in pre-amplifier, 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.

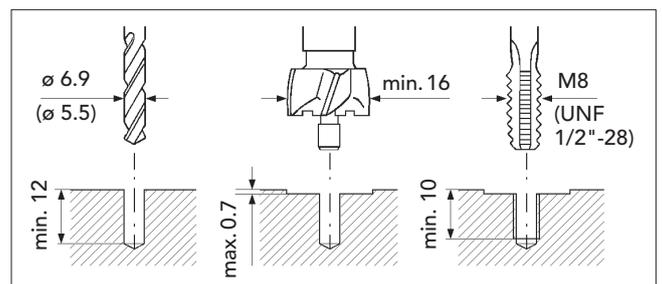
In moist environments, use sealing TNC cable plugs SPM 13008 to prevent cable corrosion. For electric insulation, use insulated installation foot TRX-18/19.



Technical data

Nominal sensitivity, main axis:	4.0 mV/m/s ² *
Transverse sensitivity:	max. 10%
Typical base strain sensitivity:	0.01 m/s ² /μ strain
Linear frequency range:	2 to 5000 Hz
Max. peak acceleration:	600 m/s ²
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.



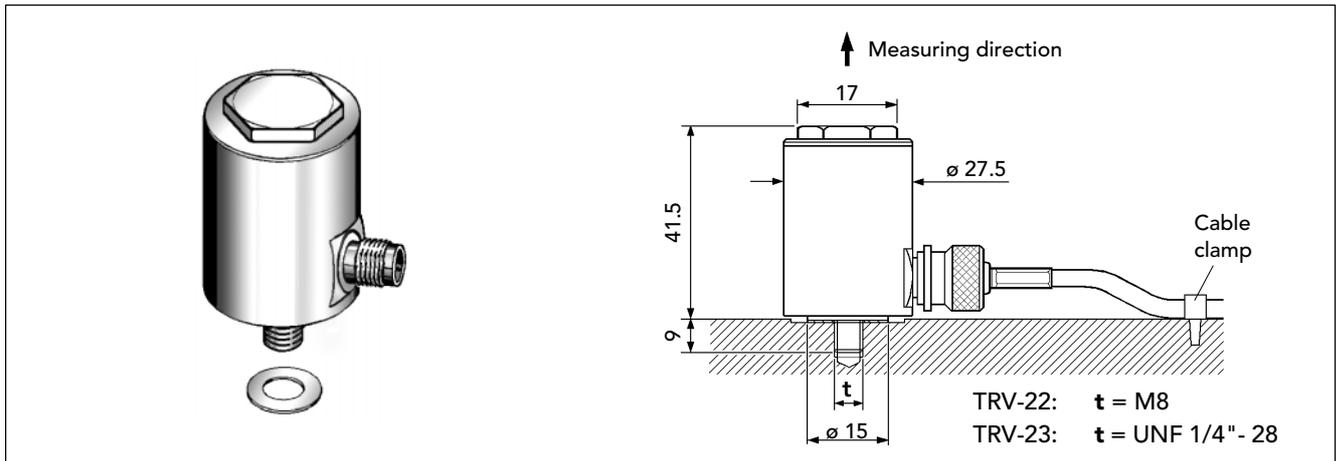
Mounting tools

- 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).



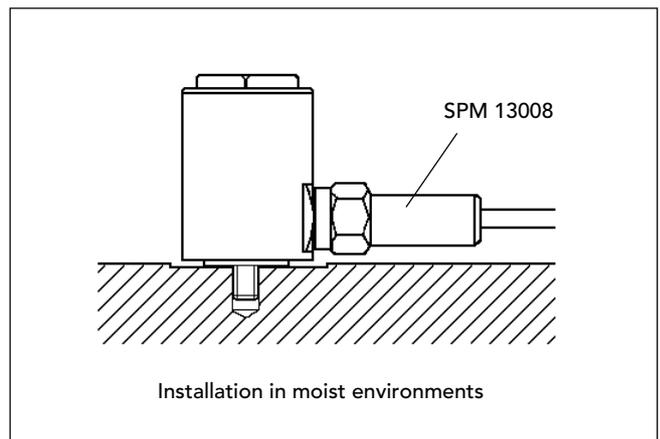
Vibration Transducer TRV-22 / 23



The transducers TRV-22 and TRV-23 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 (SPM 90176-L or 90292-L) with TNC connector with a clamp close to the transducer.

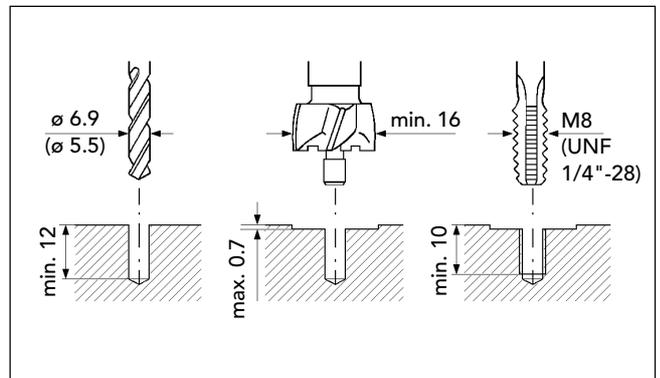
For installations in moist environments, use sealing TNC cable plugs SPM 13008 to prevent cable corrosion.



Technical data

Nominal sensitivity, main axis:	10 pC/m/s ² (7-12 pC/m/s ²) *
Transverse sensitivity:	max. 10%
Typical base strain sensitivity:	0.01 m/s ² /∞ strain
Linear frequency range:	0 to 5000 Hz
Max. peak acceleration:	600 m/s ²
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 conn. SPM13008
Weight:	171 grams (6 oz)
Connector type:	TNC
Torque limit:	10 Nm (7.4 lbf/ ft)

* Individual value given on the calibration chart.



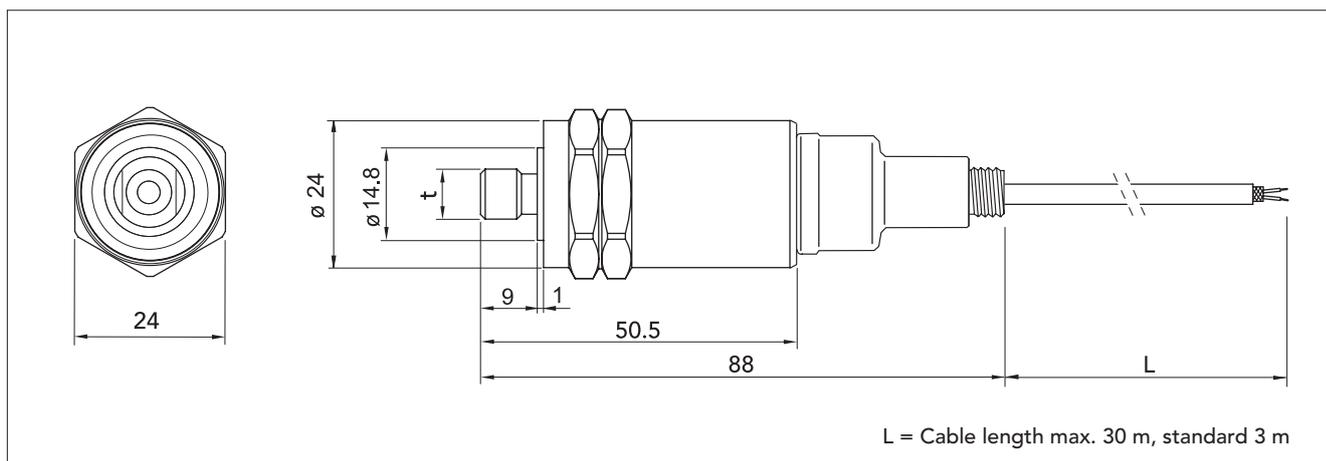
To drill the mounting hole, use drill bit 6.9 mm (M8) or 5.5 mm (UNF 1/4"-28). Torque and unscrew the transducer with a torque wrench and a 17 mm socket (SPM 81086).

Part Numbers

TRV-22	Vibration transducer, M8
TRV-23	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" (TRV-23)
81031	Pilot for M8 (TRV-22)

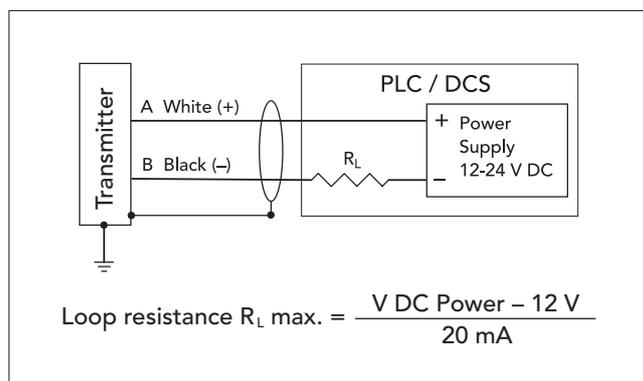


4-20 mA Vibration Transmitters



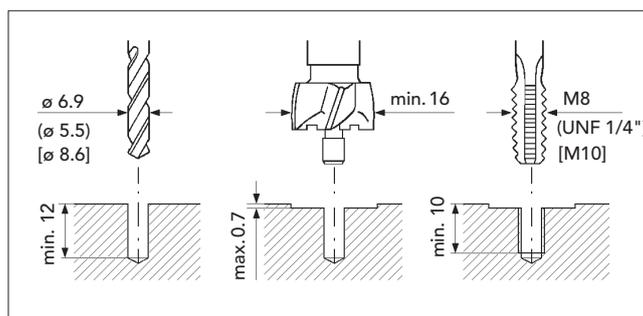
The 4-20 mA vibration transmitters are piezo-electric accelerometers of compression type and provide a 4-20 mA output signal proportional to the true RMS value of vibration velocity. The transmitters can be connected to common process control systems (PLC, DCS). The electrical signal is isolated from the transmitter housing. The transmitters operates by using power from a standard 4-20 mA loop.

The transmitter is mounted against a smooth, flat surface on the machine. Standard thread size is M8 or UNF 1/4"-28. The transmitter has an integral cable (shielded, twisted pair) for connection to the measuring device.



Technical data

Output signal:	4 to 20 mA
Turn on time, 4-20 mA loop:	< 60 seconds
Transverse sensitivity	< 10%
Power requirements:	12 to 24 V DC
Loop resistance at 24 VDC:	R_L max. 600 Ω
Casing material:	stainless acid proof steel
Operating temperature:	-40 to 85 °C (-40 to 185 °F)
Sealing:	IP 67
Isolation:	case isolated, > 1 Mohm
Integral cable:	PUR
Cable length:	max. 30 m (98 ft), standard 3 m (10 ft)
Torque limit:	10 Nm (7.4 lbf·ft)
Weight:	115 grams (4 oz)



Mounting tools

- 81027 Holder for counterbore
- 81057 Counterbore, diameter 20 mm
- 81030 Pilot for UNF 1/4"
- 81031 Pilot for M8
- 81033 Pilot for M10

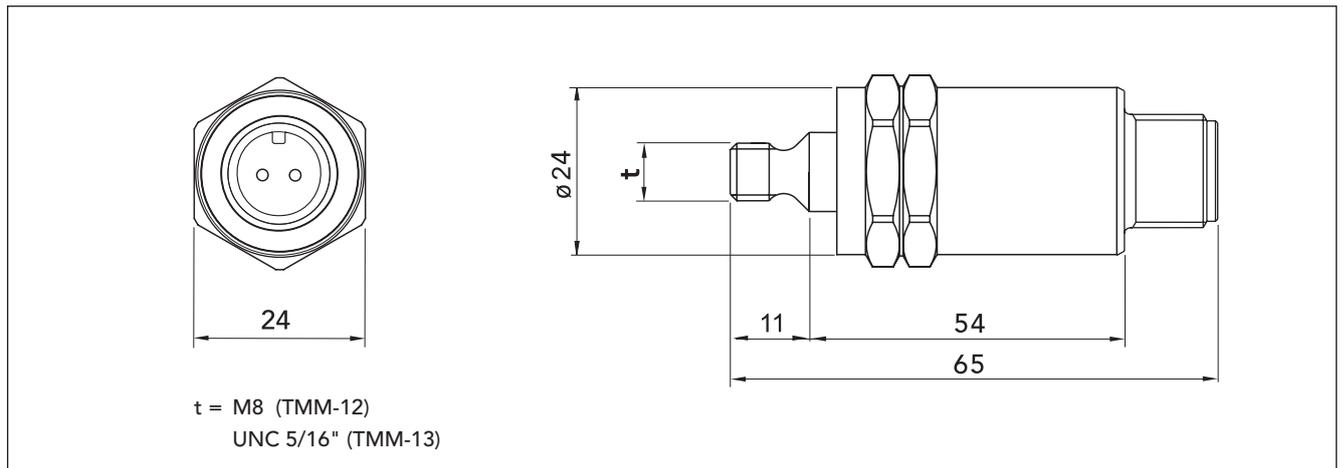
To drill the mounting hole, use drill bit 6.9 mm (M8), 8.6 mm (M10) or 5.5 mm (UNF 1/4"-28). Torque the transmitter with a 24 mm torque wrench.

Article number	Thread (t)	Measuring range	Frequency range
SLD722C	M8	0 - 12.5 mm/s	2-1000 Hz
SLD722G	UNF 1/4"	0 - 0.5 in/s	2-1000 Hz
SLD723C	M8	0 - 25 mm/s	2-1000 Hz
SLD723C-M10	M10	0 - 25 mm/s	2-1000 Hz
SLD723G	UNF 1/4"	0 - 1 in/s	2-1000 Hz
SLD724C	M8	0 - 50 mm/s	2-1000 Hz
SLD724G	UNF 1/4"	0 - 2 in/s	2-1000 Hz
SLD733C	M8	0 - 25 mm/s	10-1000 Hz
SLD733G	UNF 1/4"	0 - 1 in/s	10-1000 Hz

NB: Standard cable length is 3 meters, but optional lengths may be ordered (ex. SLDXXXX-L where L = length in meters, max. 30 m).



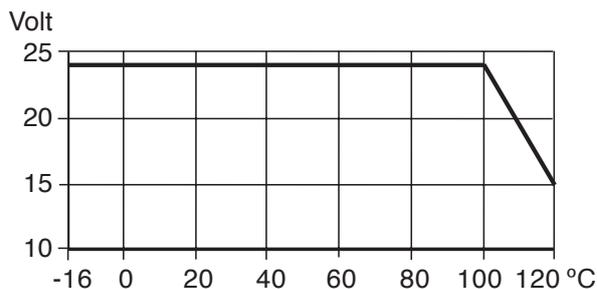
4-20 mA Temperature Transmitter TMM-12/13



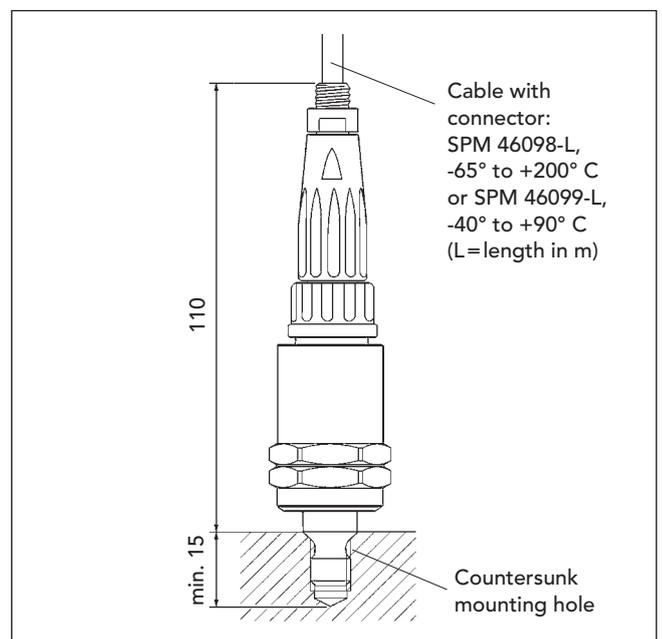
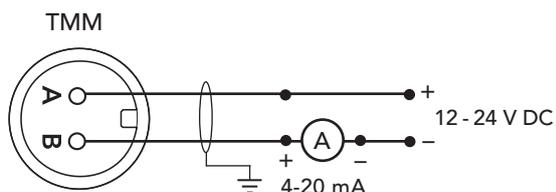
TMM-12 and TMM-13 are temperature transmitters with a measuring range from -16° to $+120^{\circ}$ C and an analog output of 4 to 20 mA. The transmitters are mounted in countersunk mounting holes. TMM-12 has thread size M8 and TMM-13 has thread size UNC 5/16". The transmitters are connected via twisted 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 Intelinova (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

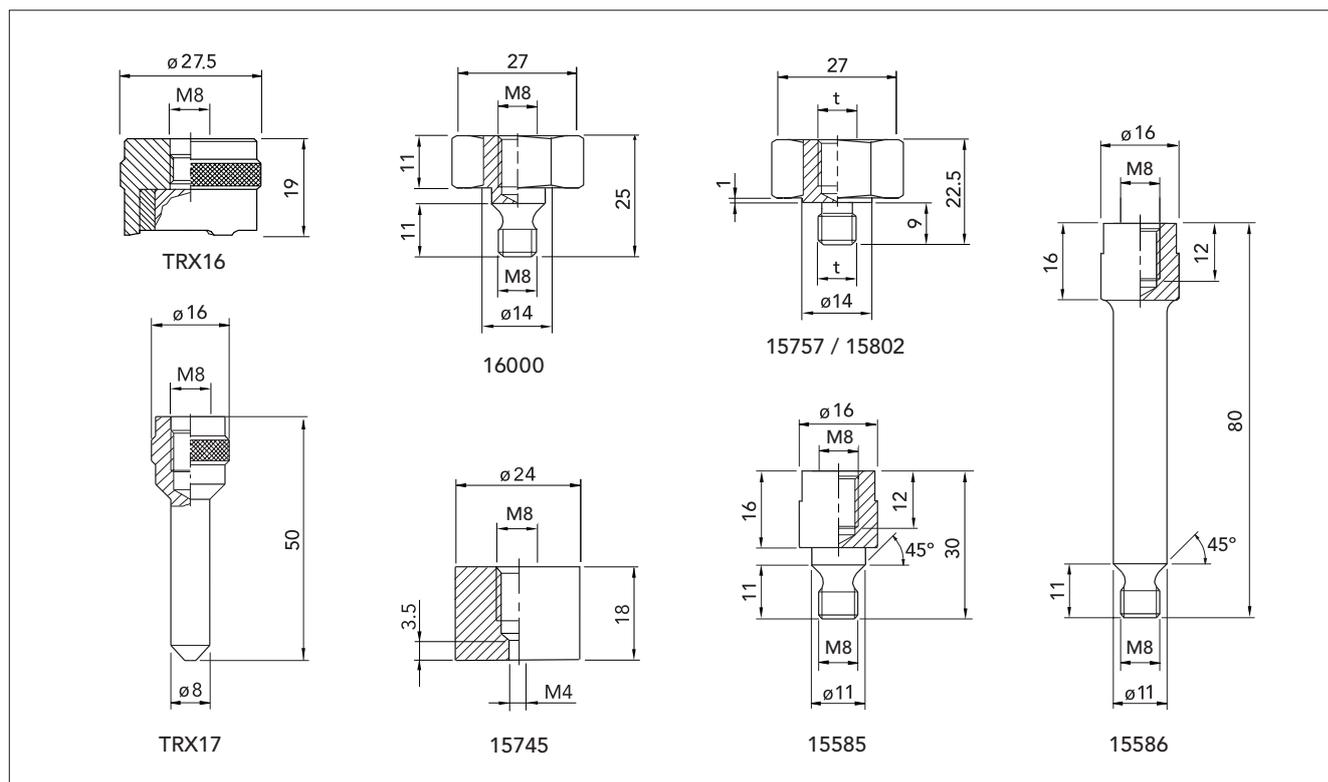


Technical data

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% $+0.5^{\circ}$ 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:	M8 (TMM-12), UNC 5/16" (TMM-13), 90° countersunk
Torque:	max. 15 Nm
Connector type:	SPM 15168 or compatible with 2 pin MIL-C-5015 style

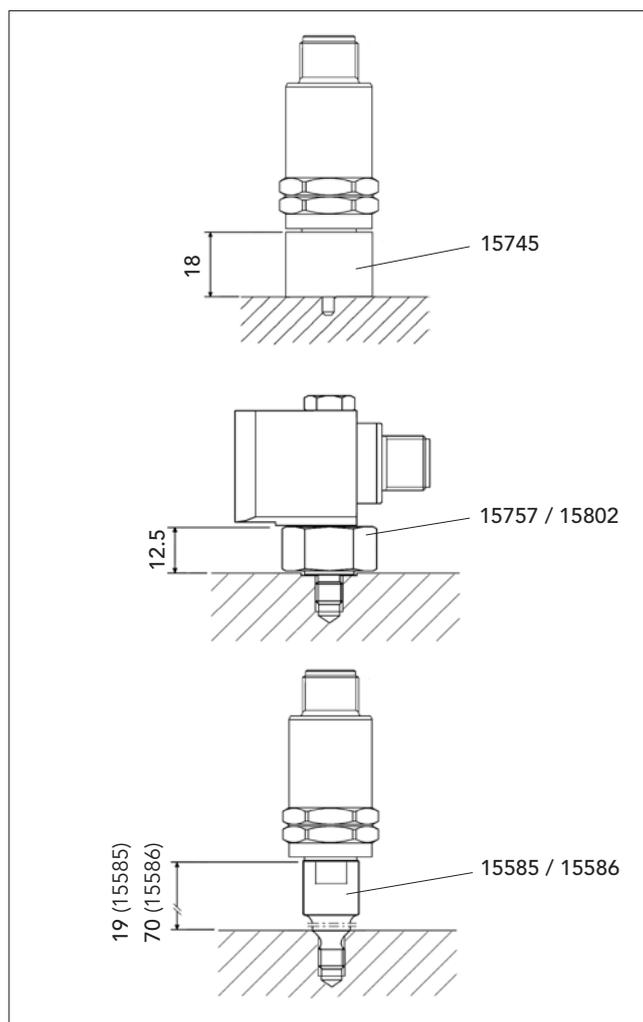


Accessories for Vibration Transducers and Transmitters

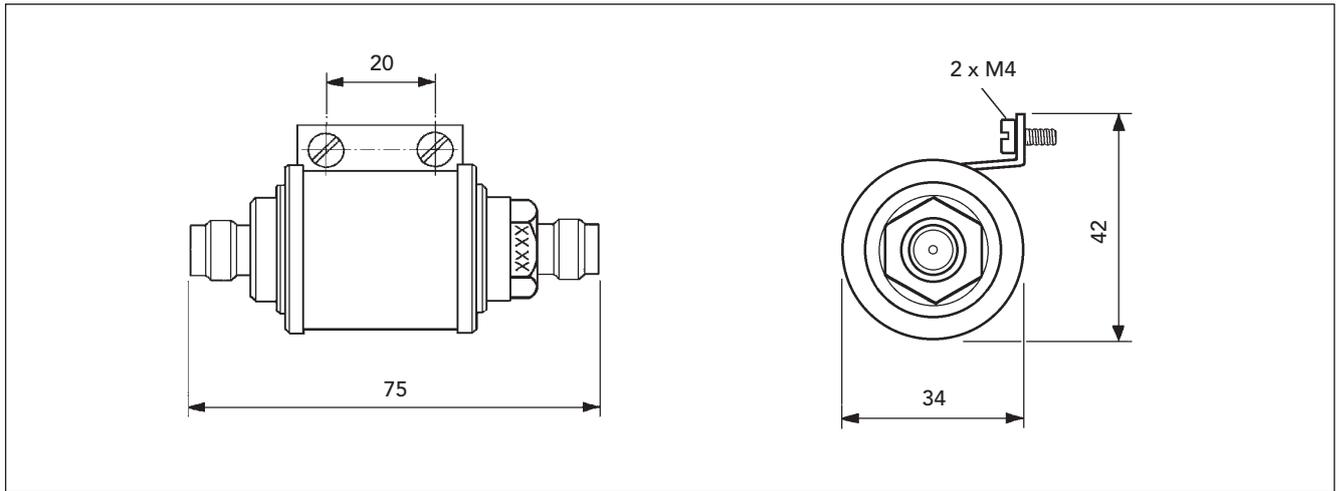


Mounting accessories for vibration transducers and vibration transmitters of type SLD:

- TRX16 Magnetic mounting base, M8. Not recommended for measurements above 2000 Hz.
- TRX17 Hand-held probe tip, M8, in stainless steel. Not recommended for measurements above 1000 Hz.
- 15757 Mounting base, M8, stainless steel
- 15802 Mounting base, UNF 1/4", stainless steel
- 15745 Glue-on adapter, M8, stainless steel, with an M4 for unloading and fixing
- 15868 Glue-on adapter, UNF 1/4", stainless steel, with an M4 for unloading and fixing
- 15585 Extension base, length 30 mm, M8, stainless steel
- 15586 Extension base, length 80 mm, M8, stainless steel
- 16000 Mounting base for transducer with side entry, M8, stainless steel



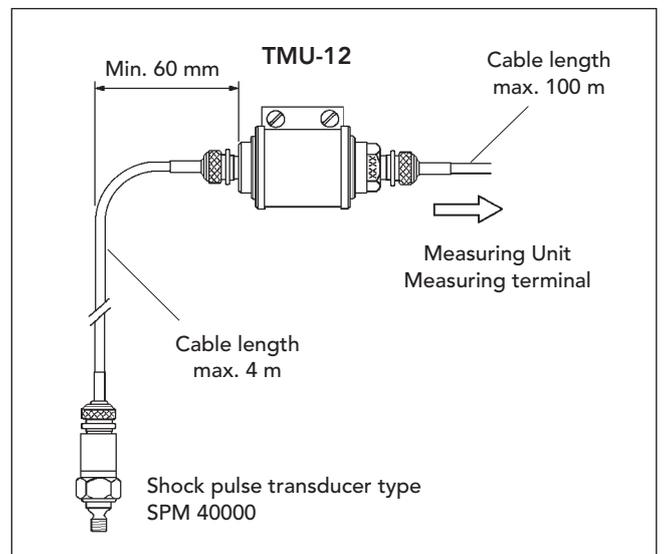
Transducer Matching Unit TMU 12



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 SPM 40000 and the measuring device 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.

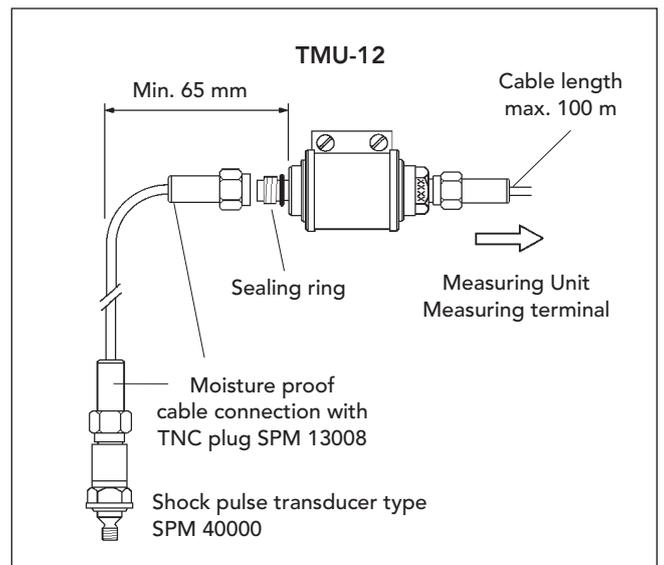
The TMU is used to extend the length of the coaxial cable between transducer and measuring device from max. 4 m to max. 100 m. The distance between the TMU and the transducer is always max. 4 m.

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 SPM 13008 to prevent cable corrosion.

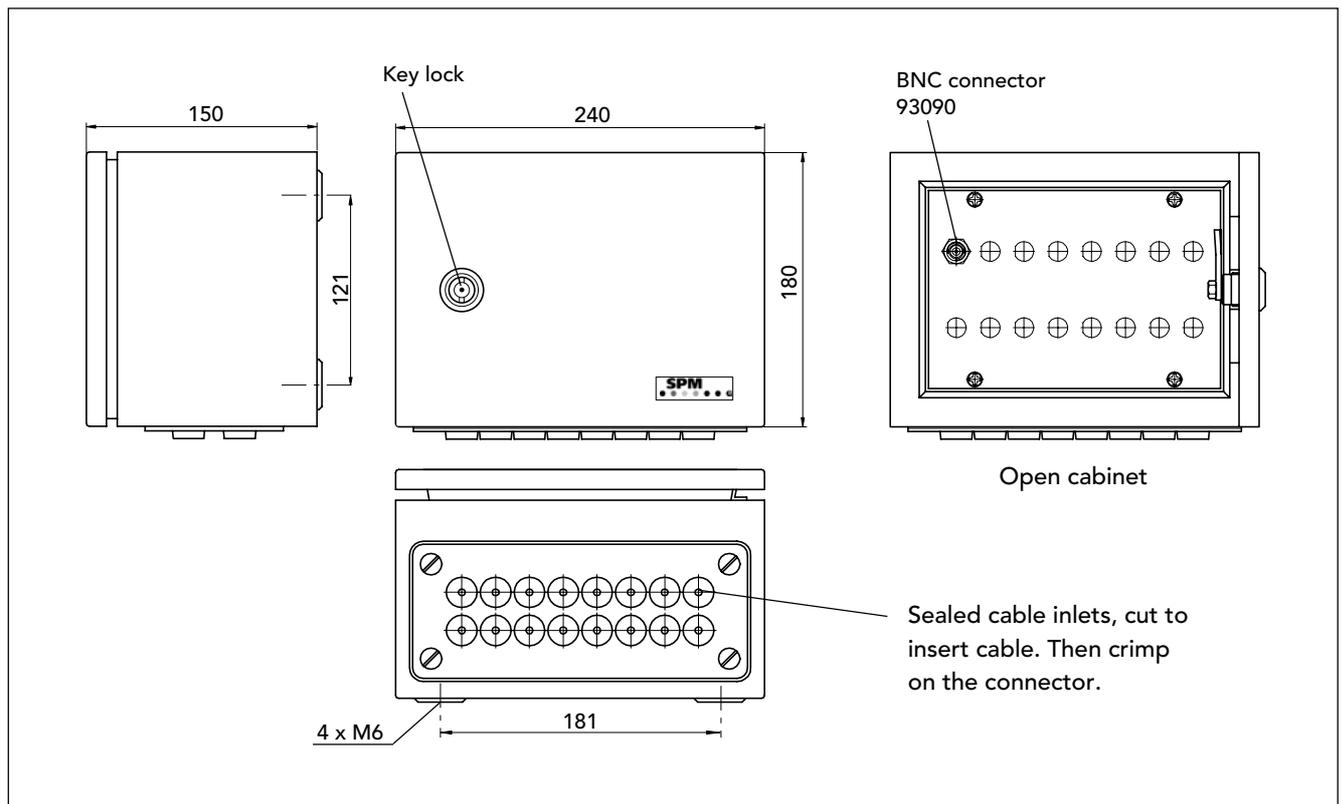


Technical data

Casing	stainless acid proof steel, Sandvik Grade:1802, EN:1.4523, and fluor rubber
Sealing	IP 65 with TNC connector, IP 67 with sealed TNC connector (SPM 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

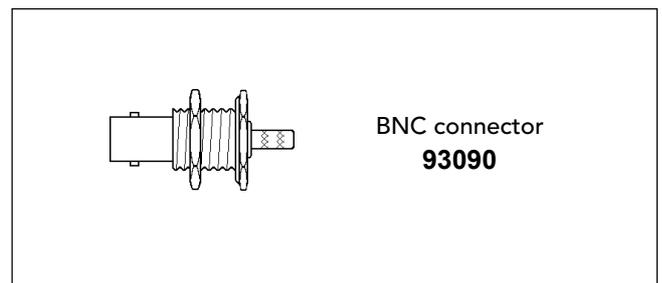


Terminal cabinet 14318



The terminal cabinet 14318 can receive up to 16 coaxial cables from shock pulse and vibration transducers. The individual cable is inserted through the chloroprene seal in the bottom plate. Afterwards, a BNC terminal connector SPM 93090 is crimped on to the transducer cable. The BNC terminal connectors are ordered separately.

Readings are taken using a coaxial cable with a BNC jack SPM 93060.



Technical data

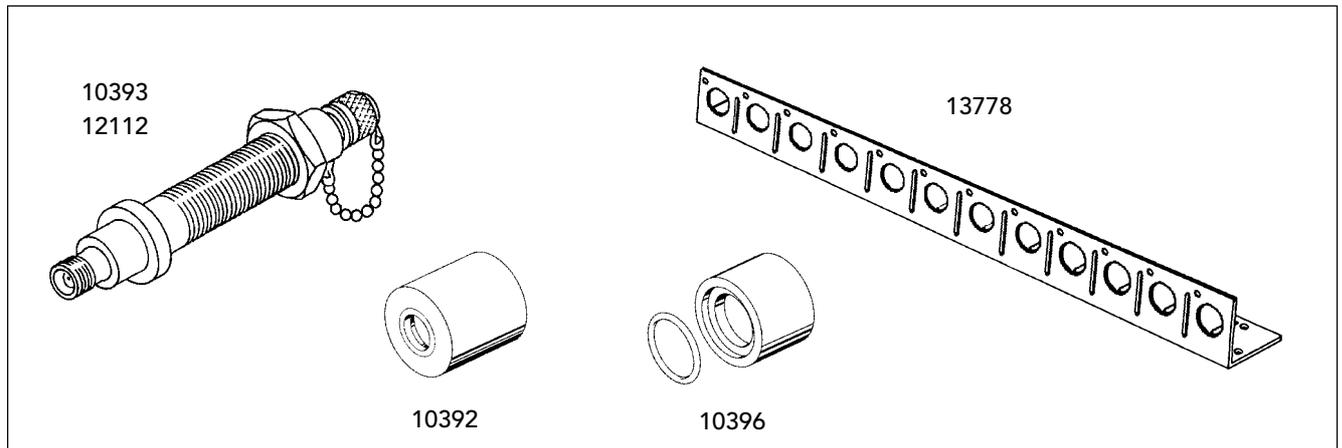
Dimensions	240 x 180 x 150 mm
Mounting holes	M6, spacing 181 x 121
Casing	Stainless steel, SS142333
Door lock	Removable key
Protection class	IP 66
Temperature range	-30 to +80 °C
Cable inlets	Chloroprene, IP 67
Cable diameter	5 to 7 mm

Ordering numbers

14318	Terminal cabinet
93090	BNC terminal connector, crimp



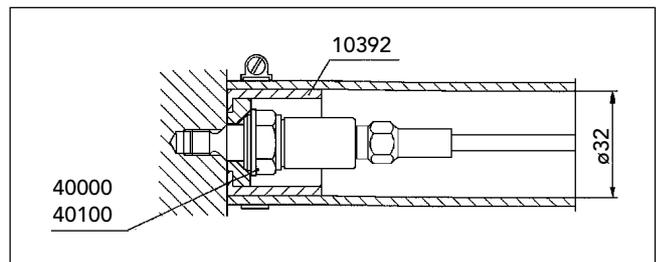
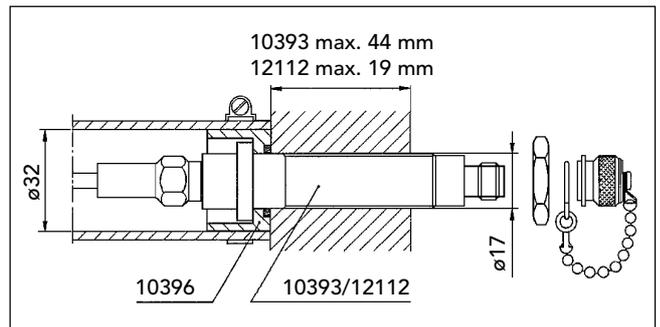
Accessories for Remote Monitoring



The terminal bracket SPM 13778 is supplied with holes for 12 sealed terminal connectors 13777 (TNC-TNC) or 13781 (TNC-BNC) alternatively crimp connectors SPM 93090 (BNC) or 93113 (TNC). The bracket is made of PVC and can easily be divided into desired number of holes.

The parts SPM 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.

The sealing sleeves are used to attach a flexible protection tube (32 mm inner dia.). The sleeve SPM 10392 can only be used together with standard transducers. The transducer is pressed through the teflon sealing when tightening. The sleeve SPM 10396 can be used together with bulkhead unions SPM 10393 and 12112.



Technical Data

Terminal bracket 13778

Material: PVC
 Dimensions: 310 x 25 x 25 x 3 mm
 Temp. range: -20°C to +70°C

Bulkhead union 10393 and 12112

Material: Nickel plated brass

Sealing sleeve 10392 for transducer

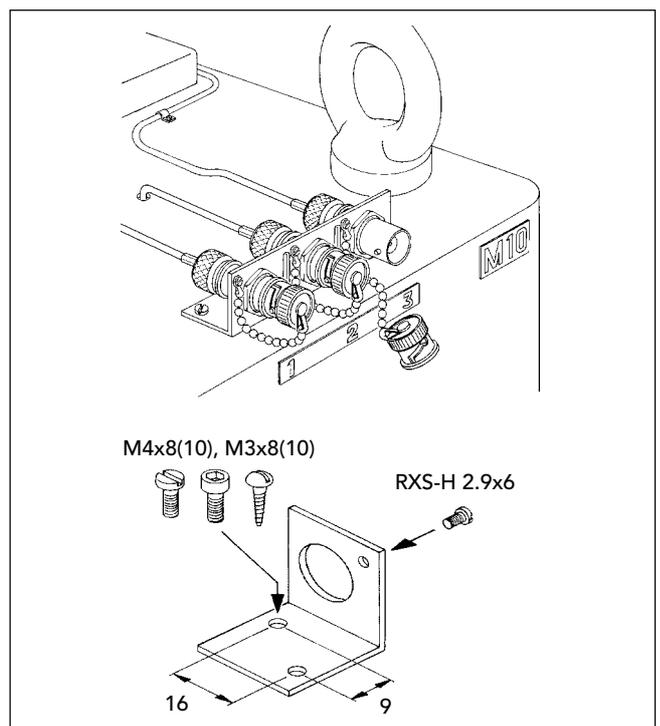
Material: Brass/Reinforced teflon

Sealing sleeve 10396 for bulkhead union

Material: Brass/Nitrile

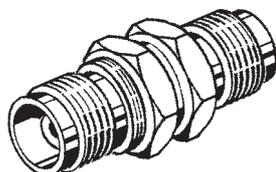
Part Numbers

- 13778 Terminal bracket
- 10393 Bulkhead union, max. wall thickness 50 mm
- 12112 Bulkhead union, max. wall thickness 25 mm
- 10392 Sealing sleeve for transducer
- 10396 Sealing sleeve for bulkhead union

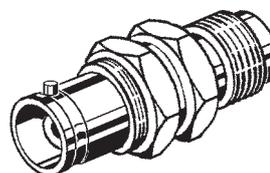


Terminal Connectors

SPM 13777



SPM 13781



The terminal connectors SPM 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 SPM 13778.

The terminal connectors can also be used as bulkhead unions for walls with a thickness of up to 4.5 mm. A sealed connection is achieved by using SPM 13008 as TNC cable connector.

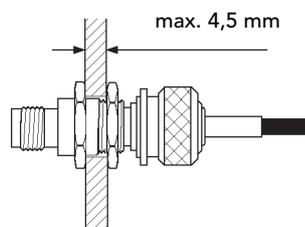
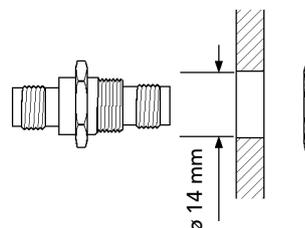
The open end of the connectors should always be protected by dust caps, SPM 93035 for TNC and SPM 93061 for BNC.

Technical data

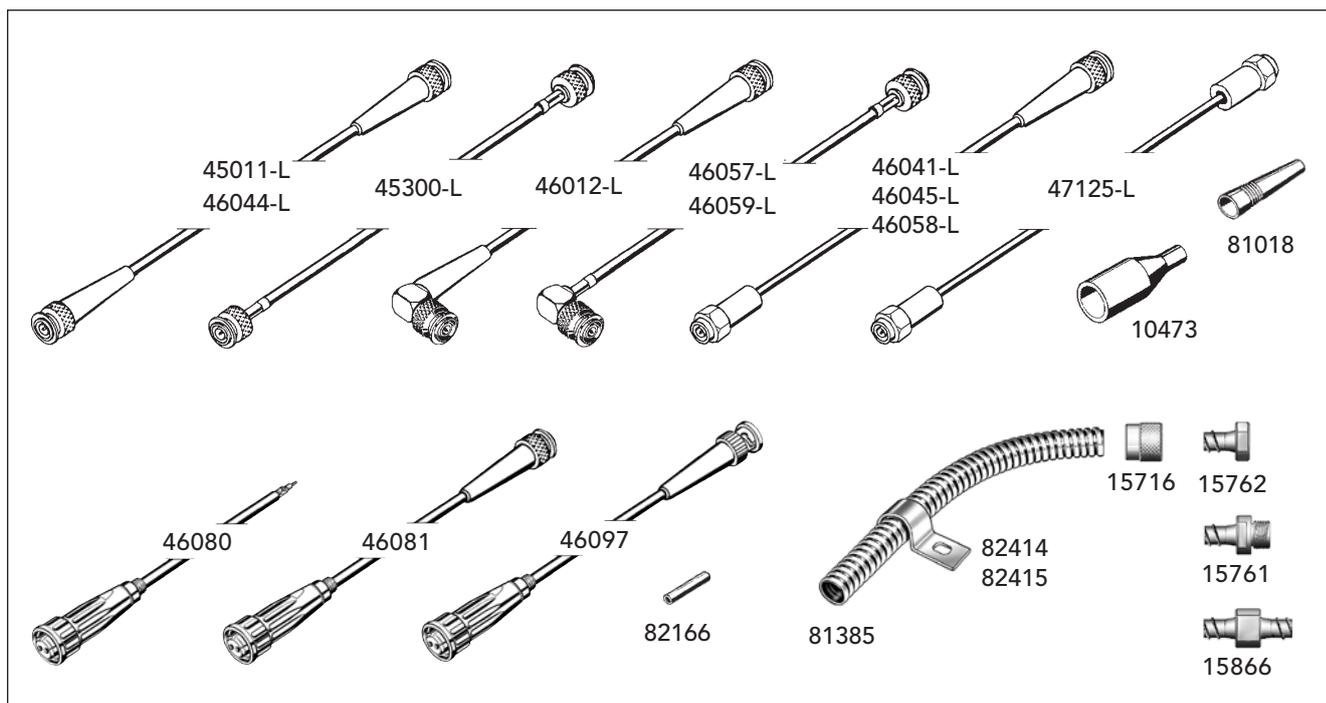
Total length	35 mm
Thread	TNC
Nut width	17 mm
Mounting hole	ø14 mm
Max wall thickness	4.5 mm
Material, connector body	Stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Material, nuts	Nickel plated brass

Ordering numbers

13777	Terminal connector, TNC-TNC
13781	Terminal connector, TNC-BNC



Coaxial cables and accessories



Coaxial cables for shock pulse transducers and vibration transducers with pre-amplifier

- 45011-L Cable with connectors, TNC-TNC, -10 to 70 °C
- 45300-L Cable with connectors, TNC-TNC, -55 to 150 °C
- 46012-L Cable with connectors, TNC-TNC, -10 to 70 °C
- 46041-L Cable with connectors, TNC-TNC, -55 to 150 °C
- 46050-L Cable with connectors, TNC-SMB, -10 to 70 °C
- 46057-L Cable with connectors, TNC-TNC, -55 to 150 °C
- 46058-L Cable with connectors, TNC-TNC, -10 to 70 °C
- 46080-L Cable with connector, 2pin, -55 to 150 °C
- 46081-L Cable with connectors, 2pin-TNC, -10 to 70 °C
- 46097-L Cable with connectors, 2pin-BNC, -10 to 70 °C
- 47125-L Cable with TNC sealing connectors, -55 to 150 °C
- 90005-L Coaxial cable without connectors, -10 to 70 °C
- 90267-L Coaxial cable without connectors, -55 to 150 °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 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

Coaxial cables for vibration transducers without pre-amplifier

- 46044-L Low noise cable with TNC connectors, -10 to 70 °C, L = max. 10 m
- 46045-L Low noise coaxial cable with one standard TNC and one sealing connector (SPM 13008), -10 to 70 °C, L = max. 10 m
- 46059-L Low noise cable with TNC connectors, -10 to 70 °C, L = max. 10 m
- 90176-L Low noise coaxial cable without connectors, -10 to 70 °C
- 90292-L Low noise coaxial cable without connectors, -65 to 150 °C

Coaxial cable for vibration transducer TRV-01

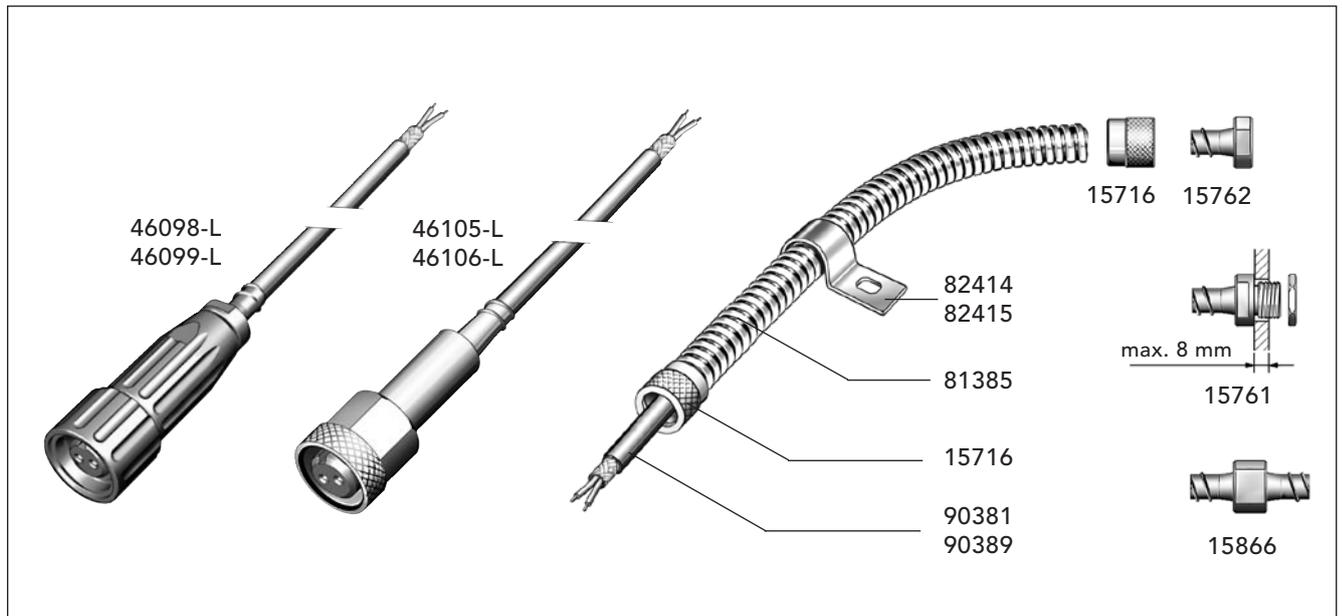
- 46019-L Low noise cable with connectors, TNC-SMA, -10 to 70 °C, L = max. 10 m

Note:

When ordering cables and/or protection tube, please state the desired length (L) in meters.



Twisted pair cables and accessories

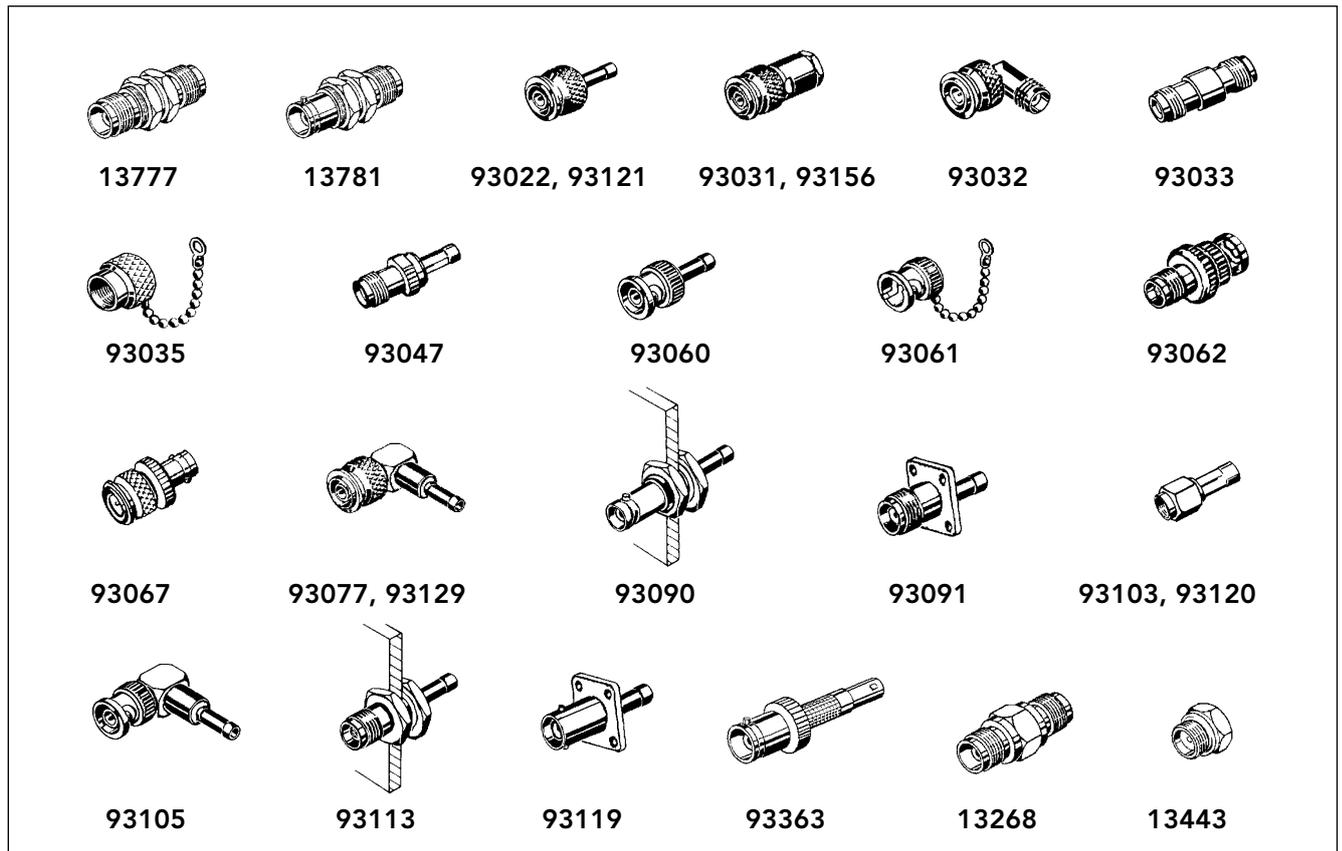


90381	Twisted pair cable, TEFZEL, AWG 20, diam. 4.8 mm Temp. range -65 to +200 °C (-85 to +392 °F)	81385	Protection tube, outer diameter 9.3 mm, stainless acid proof steel
90389	Twisted pair cable, PUR, AWG 20, diam. 4.8 mm Temp. range -40 to +90 °C (-40 to +194 °F)	82414	Clips JR 9.5 mm, stainless steel
46098-L	Twisted pair cable 90381 with 2-pin connector 15168, -65 to +200 °C (-85 to +392 °F)	82415	Clips JR 9.5 mm, stainless acid proof steel
46099-L	Twisted pair cable 90389 with 2-pin connector 15168, -40 to +90 °C (-40 to +194 °F)	15716	Sleeve for protection tube, stainless steel, required to enable dismounting of the protection tube
46105-L	Twisted pair cable 90381 with 2-pin connector, stainless steel, -65 to +200 °C (-85 to +392 °F)	15761	Fitting with locknut M10 x 1 for protection tube, stainless steel
46106-L	Twisted pair cable 90389 with 2-pin connector, stainless steel, -40 to +90 °C (-40 to +194 °F)	15762	End piece for protection tube, stainless steel
		15866	Coupler for protection tube, stainless steel

Note: When ordering cables and protection tubes, please state the desired length (L) in meters.



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.

TNC connections

- 13777 TNC-TNC terminal connector
- 13781 TNC-BNC terminal connector
- 93022 TNC cable connector, plug, crimp
- 93031 TNC cable connector, plug, screw-type
- 93032 TNC angle adapter, plug-jack
- 93033 TNC adapter, jack-jack
- 93035 TNC dust cap for jack
- 93047 TNC cable connector, jack, crimp
- 93067 TNC-BNC adapter, plug-jack
- 93077 TNC angle connector, crimp
- 93091 TNC terminal connector, flange, crimp
- 93113 TNC terminal connector, crimp
- 93121 TNC cable connector, crimp, for cable 90146
- 93129 TNC angle connector, solder/crimp, for cable 90146
- 93149 Contact pin, TNC/BNC for cable 90176
- 93156 TNC cable connector, screw-type with strain relief, solder/screw type

Sealed TNC connections

- 13008 TNC cable plug, crimp (see TD-009)
- 15163 TNC cable plug, crimp (see TD-262)
- 15291 TNC cable plug, composite, crimp (see TD-257)
- 13268 TNC adapter, jack-jack, for sealed connection
- 13443 Sealing plug for TNC connector 13008

BNC connections

- 93060 BNC cable connector, plug crimp
- 93061 BNC dust cap
- 93062 BNC-TNC adapter, plug-jack
- 93090 BNC terminal connector, crimp
- 93105 BNC angle connector, crimp
- 93119 BNC terminal connector, flange, crimp
- 93363 BNC-LEMO adapter (fits Bearing Checker)

SMA connections

- 93103 SMA cable connector, plug, crimp (fits TRV-01)
- 93120 SMA cable connector, crimp, for cable 90146

SMB connections

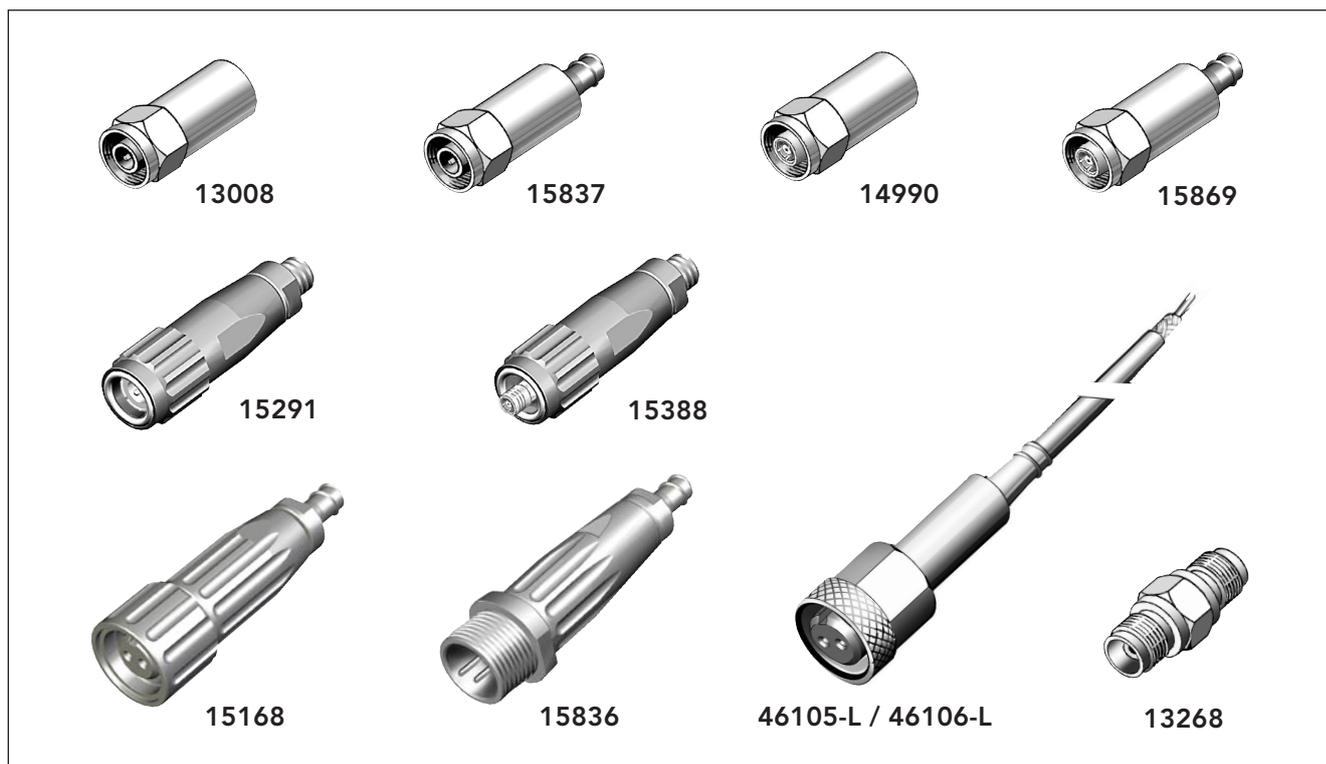
- 93286 SMB cable connector, crimp

Sealed SMB connections

- 14990 SMB cable plug, crimp (see TD-248)
- 15164 SMB cable plug, crimp (see TD-261)
- 15388 SMB cable plug, composite, crimp (see TD-258)



Sealed Connectors - Overview



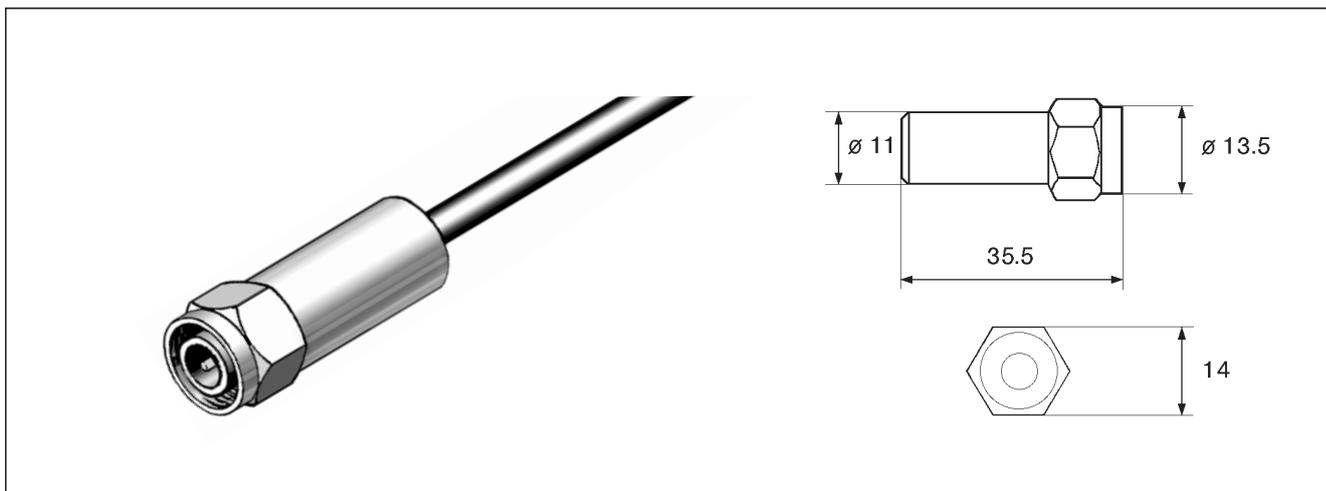
The listed equipment is used for SPM cable installations for shock pulse and vibration monitoring. See specific data sheets (TD) for installation descriptions and technical specifications

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
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
15168	2-pin	jack	Ex, IP67	composite	yes	TD-217
15836	2-pin	plug	Ex, IP67	composite	yes	TD-291
46105-L	2-pin	jack with integrated cable -65° to +200°C *	Ex, IP67	stainless steel	yes	TD-296
46106-L	2-pin	jack with integrated cable, -40° to +90°C *	Ex, IP67	stainless steel	yes	TD-296

* When ordering connector with integrated cable, please state the desired cable length (L) in meters.



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 \varnothing 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
- 81026 Crimping tool for fitting cable connectors.

To join two cables in moist environment, use the TNC adapter SPM 13268 (separate data sheet) together with two cable connectors SPM 13008.

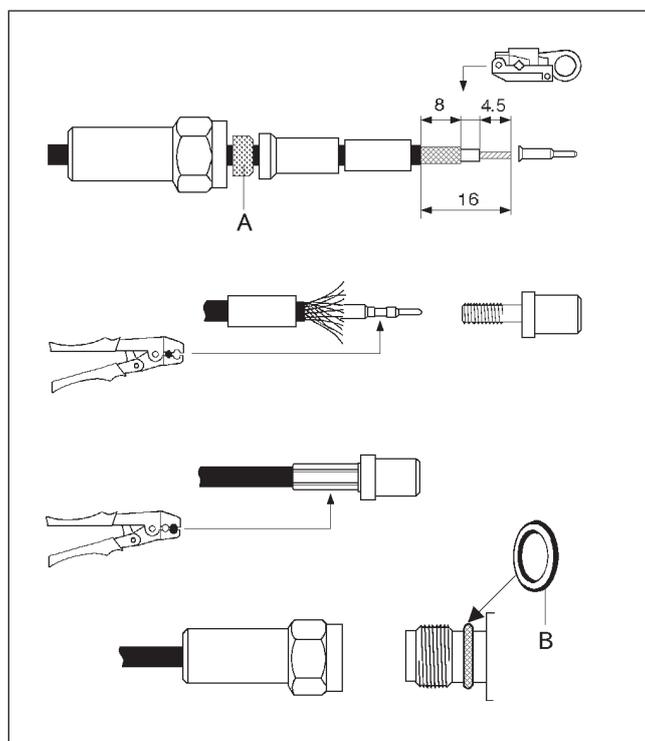
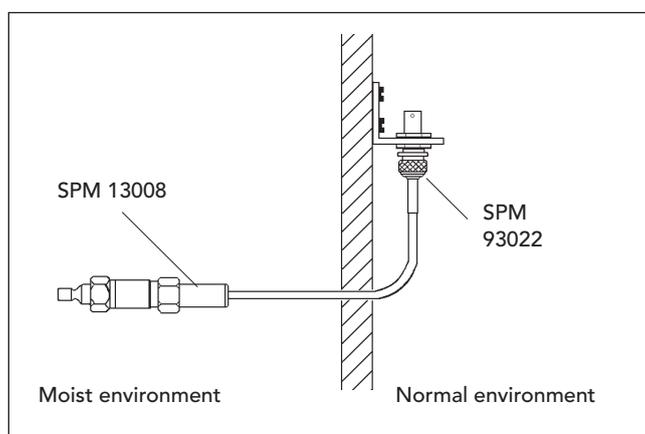
Technical data:

Material, connector body: Stainless acid proof steel,
Sandvik Grade:1802, EN:1.4523

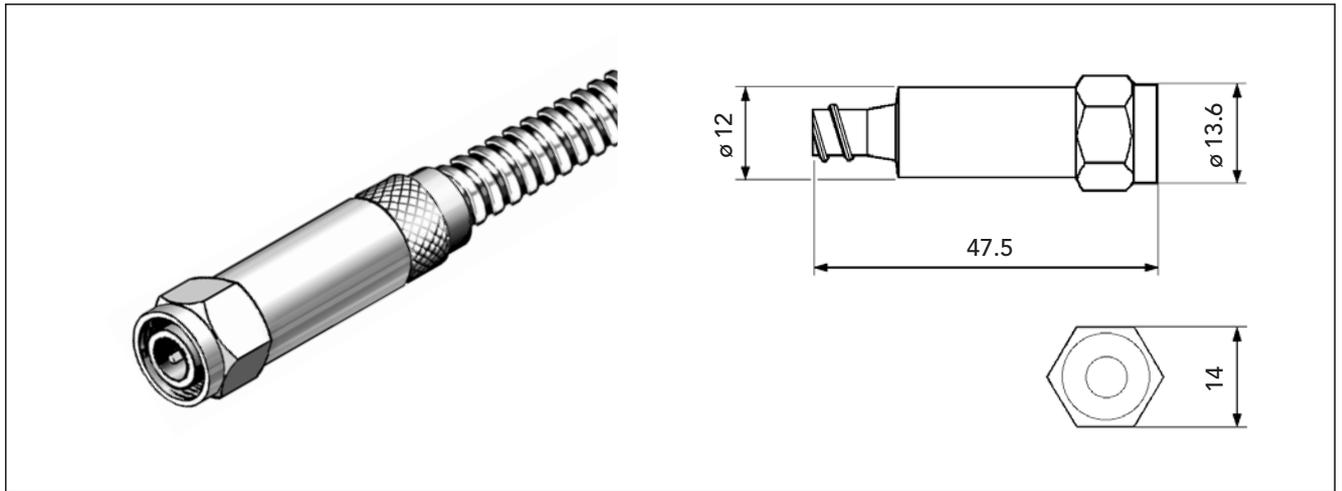
Connector type: TNC plug

Seals: Viton (fluor rubber)

Torque: Min. 7 Nm / Max. 9 Nm



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 \varnothing 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.

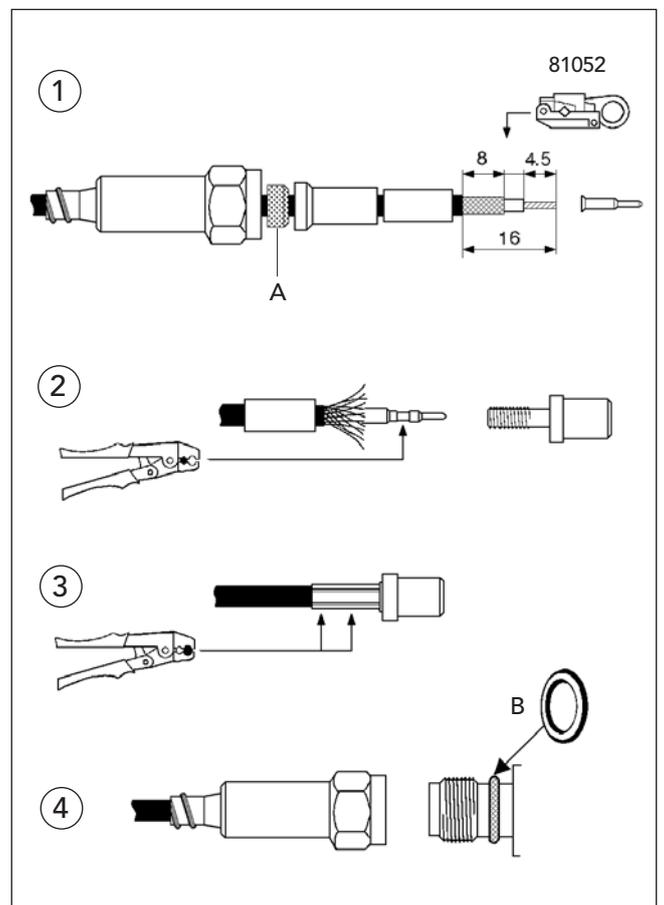
Note: The connector package contains two cable seals (B) of different sizes, marked in different colours:

- 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 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 data:

Material, connector body: Stainless acid proof steel
AISI 316L

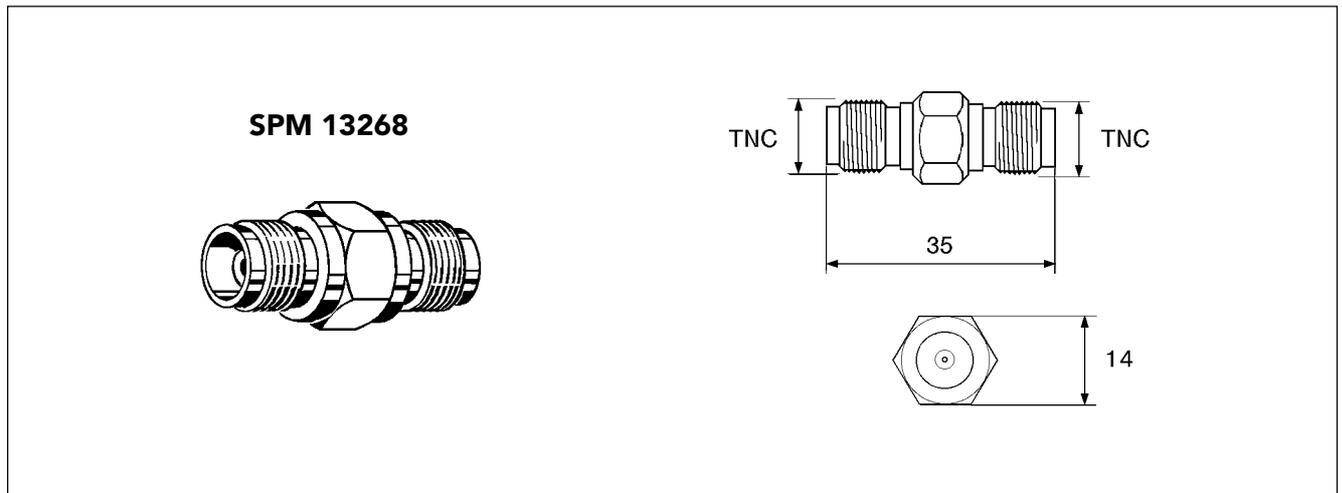
Connector type: TNC plug

Seals: Viton (fluor rubber), IP67

Torque: Min. 7 Nm / Max. 9 Nm

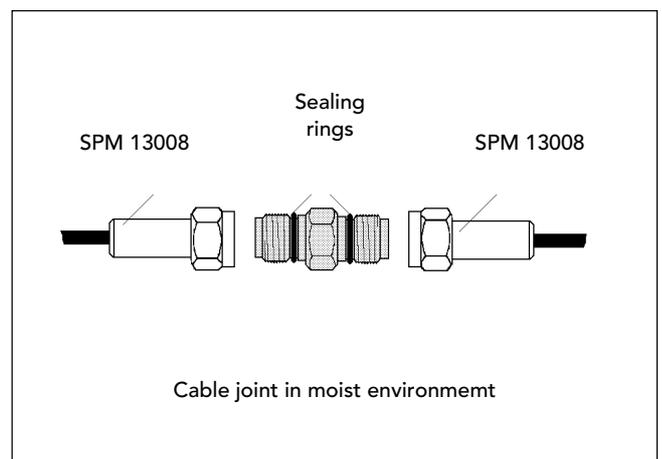


TNC Adapter for Sealed Installation



SPM 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 type SPM 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.



Technical Data

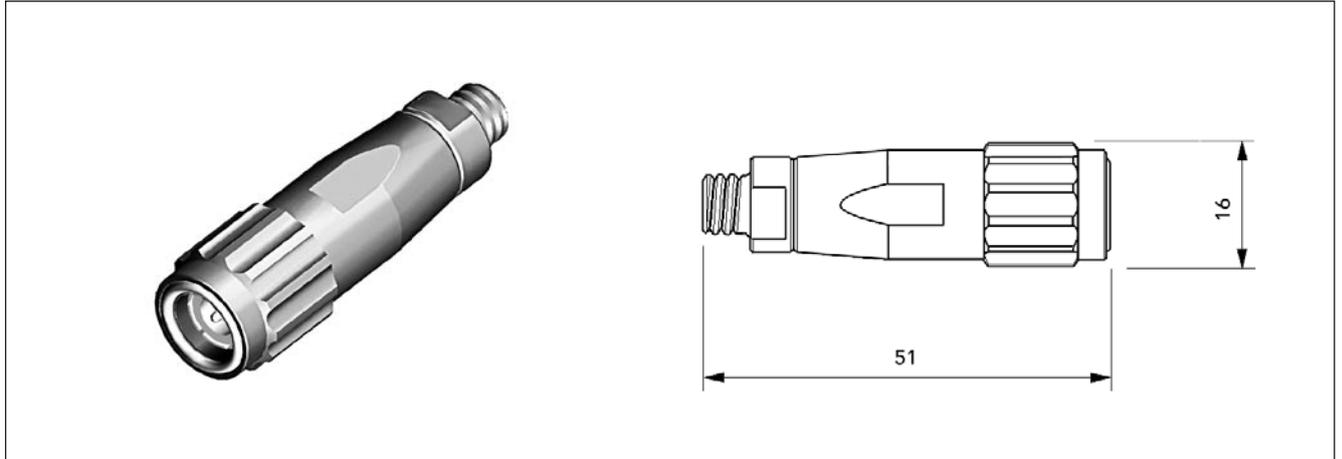
Material, adapter body: Stainless acid proof steel,
Sandvik Grade:1802, EN:1.4523

Connector tightness: IP65 with TNC connector
IP67 with conn. SPM13008

Connector type: TNC jack



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.

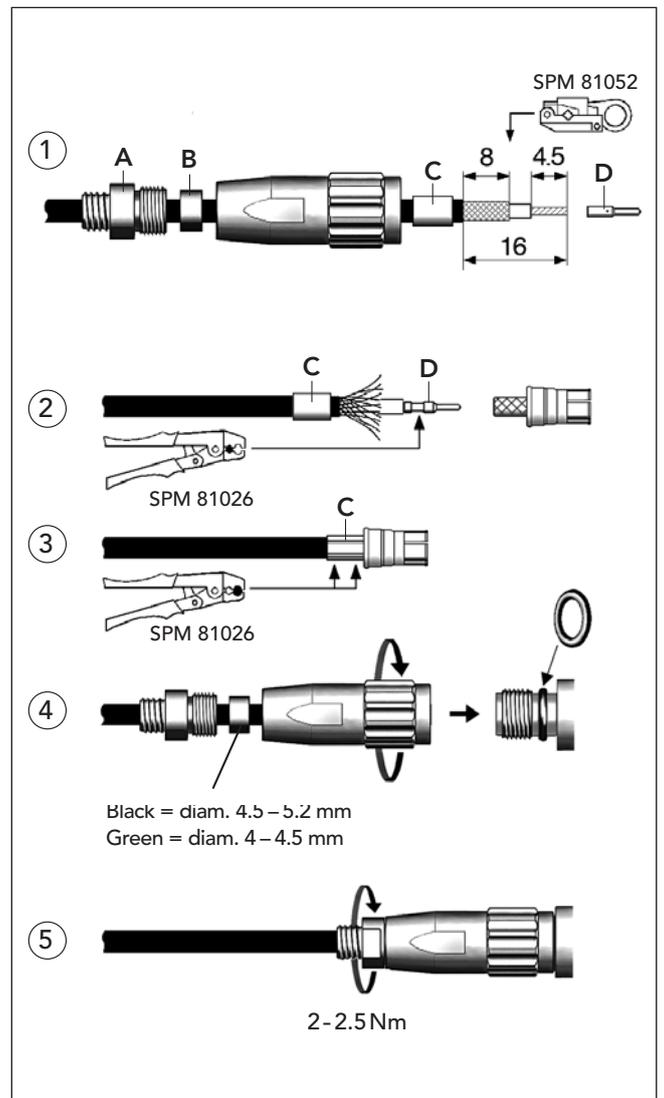
- Green seal for cable diameter 4 to 4.5 mm
- Black seal for cable diameter 4.5 to 5.2 mm.

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.

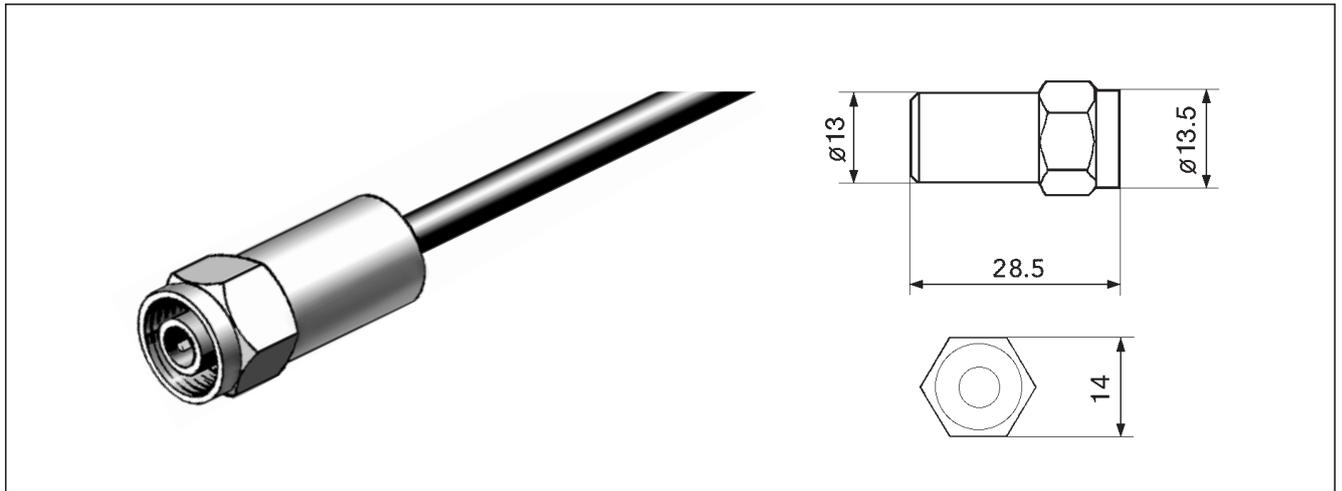
SPM offers two tools for connector mounting:
 81052 Cutting tool for stripping coaxial cables
 81026 Crimping tool for fitting cable connectors.

Technical Data

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



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
- 81026 Crimping tool for fitting cable connectors.

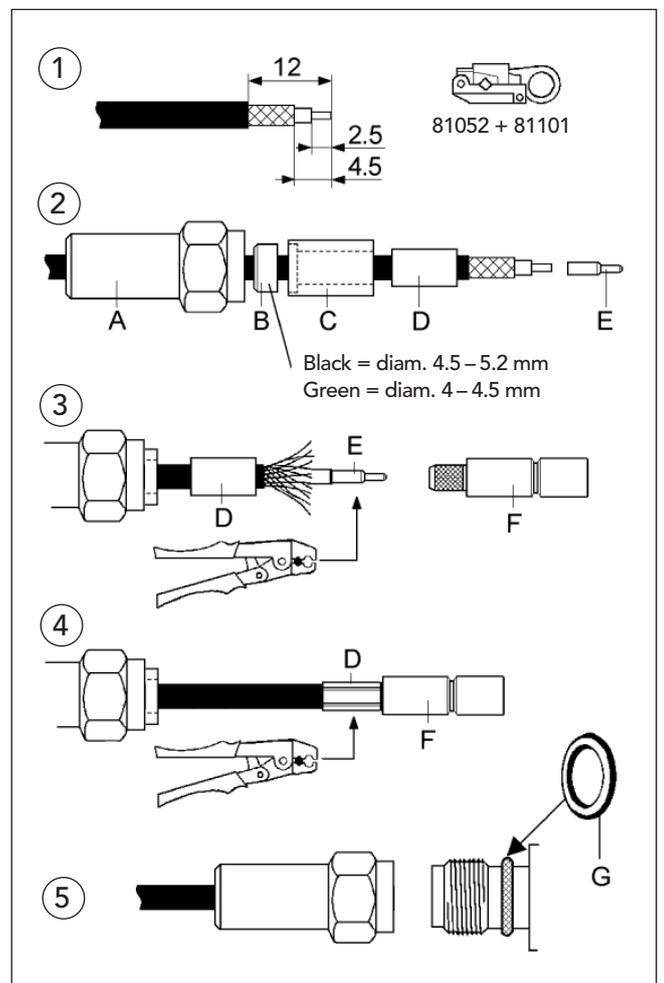
Technical data:

Material, connector body: Stainless acid proof steel, AISI 316L

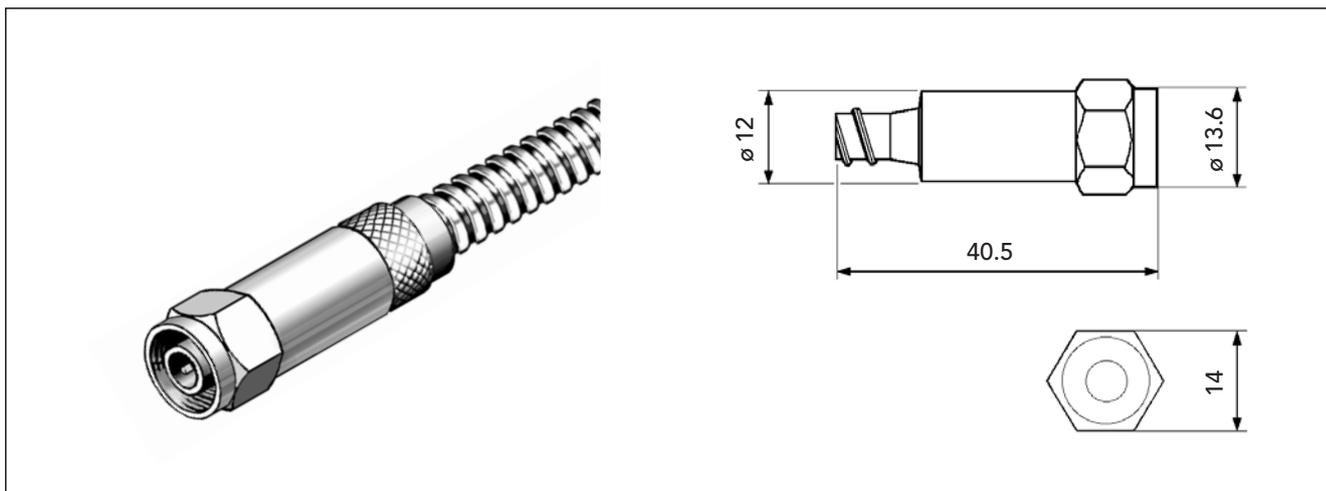
Connector type: SMB

Seals: Viton (fluor rubber)

Torque: Min. 7 Nm / Max. 9 Nm



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.

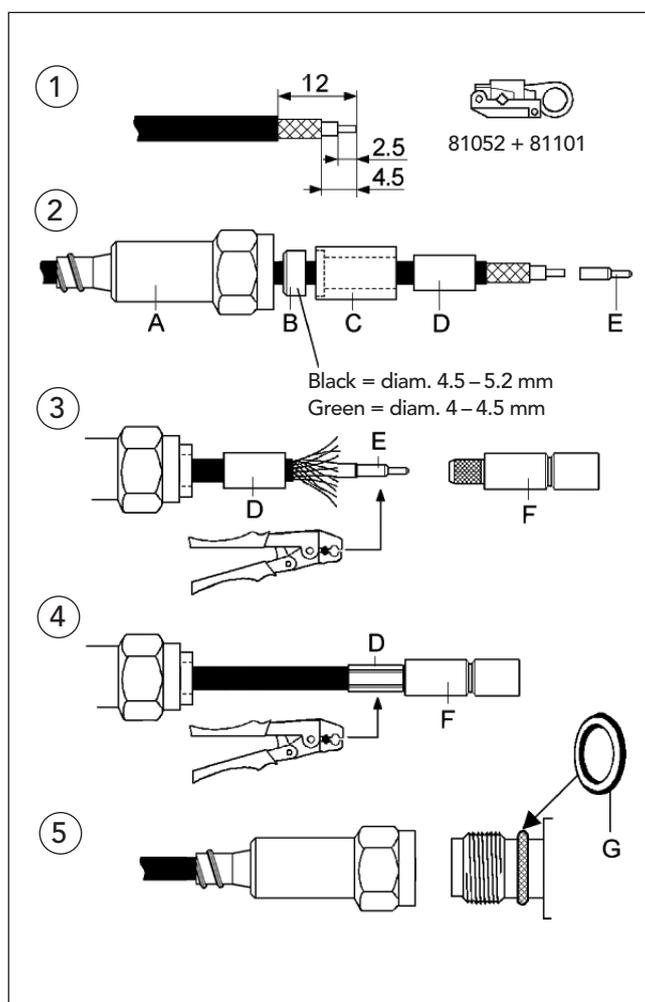
Technical data:

Material, connector body: Stainless acid proof steel, AISI 316L

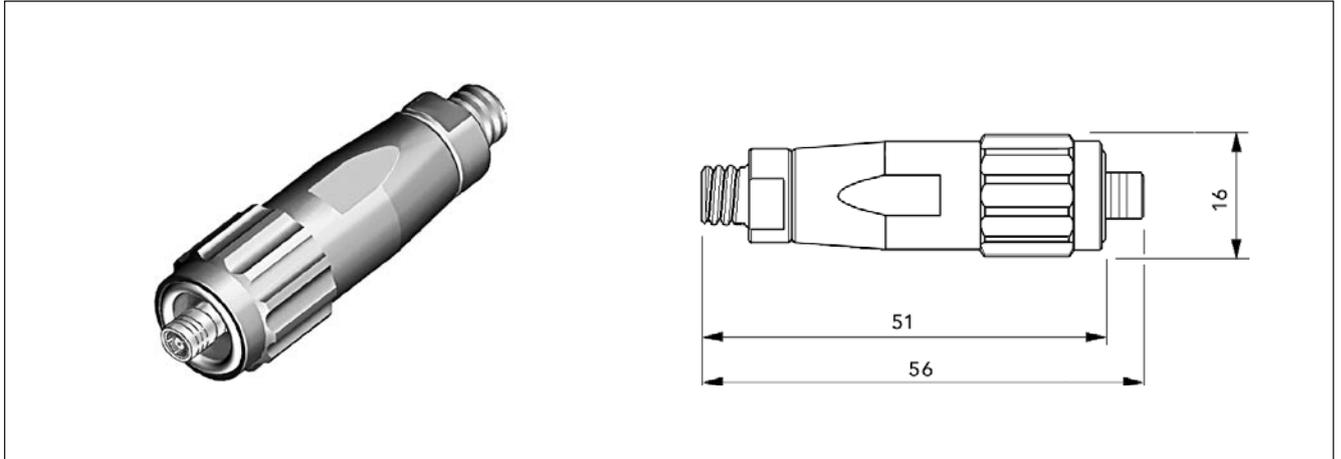
Connector type: SMB

Seals: Viton (fluor rubber), IP67

Torque: Min. 7 Nm / Max. 9 Nm



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:

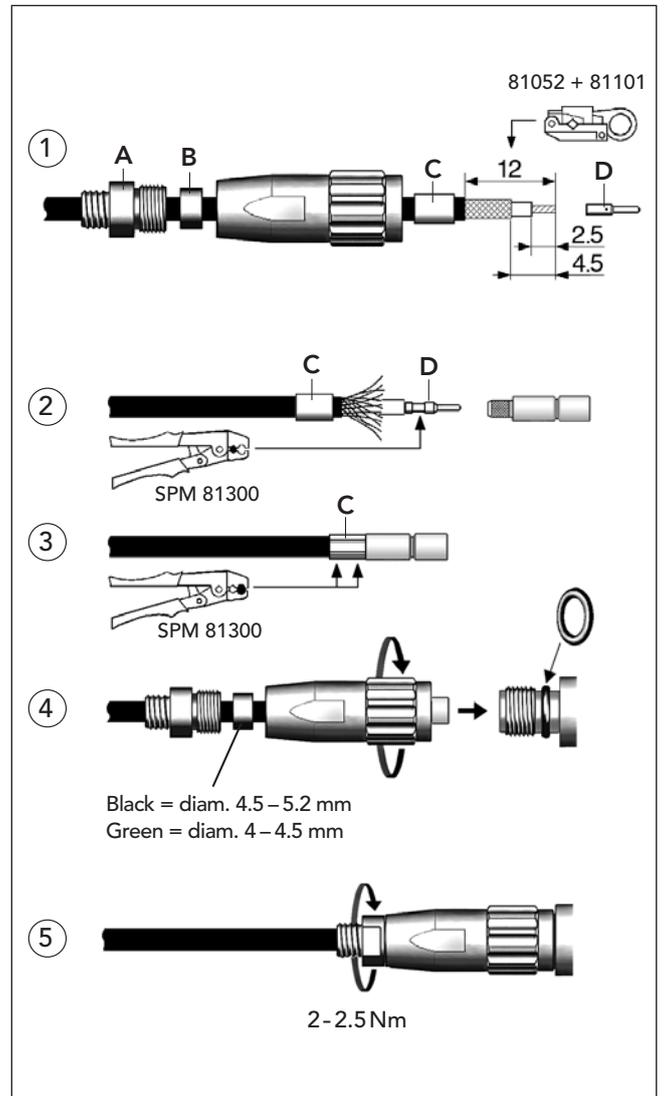
81052 Cutting tool for stripping coaxial cables

81101 Insert for cutting tool 81052

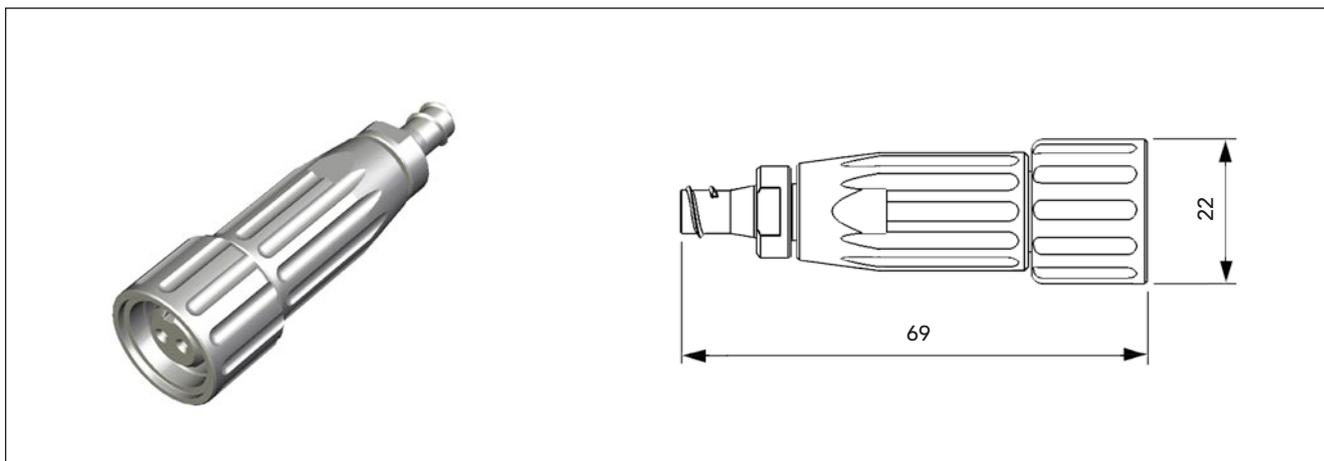
81300 Crimping tool for fitting cable connectors.

Technical Data

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



2-pin Cable Jack 15168



SPM 15168 is a 2-pin MIL style cable jack for connection of vibration transducers of type SLD to twisted pair cable or coaxial cable. It is specially designed for extreme environmental conditions and for applications with potentially explosive atmosphere. 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.

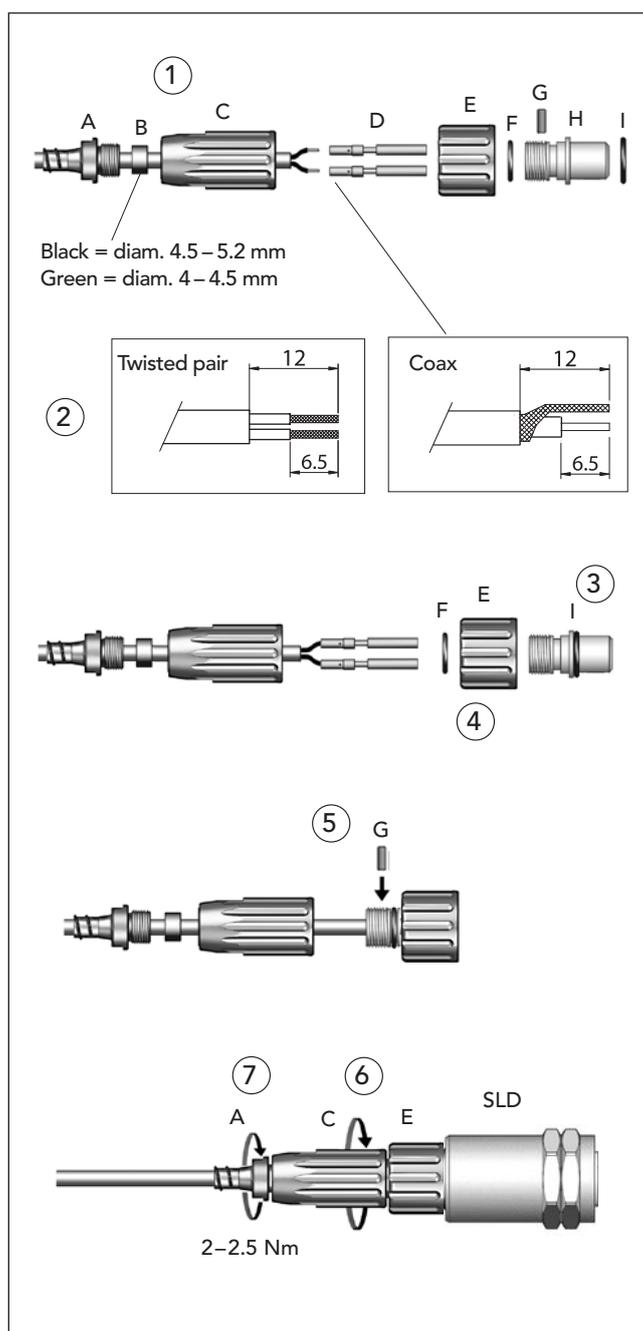
The cable seal, marked B in the figure, seals the cable entry when the connector collet (A) is tightened. Note: The connector package contains 3 sockets (D) and 2 cable seals (B) of different sizes, marked in different colours.

- Green seal for cable diameter 4 to 4.5 mm
- Black seal for cable diameter 4.5 to 5.2 mm.

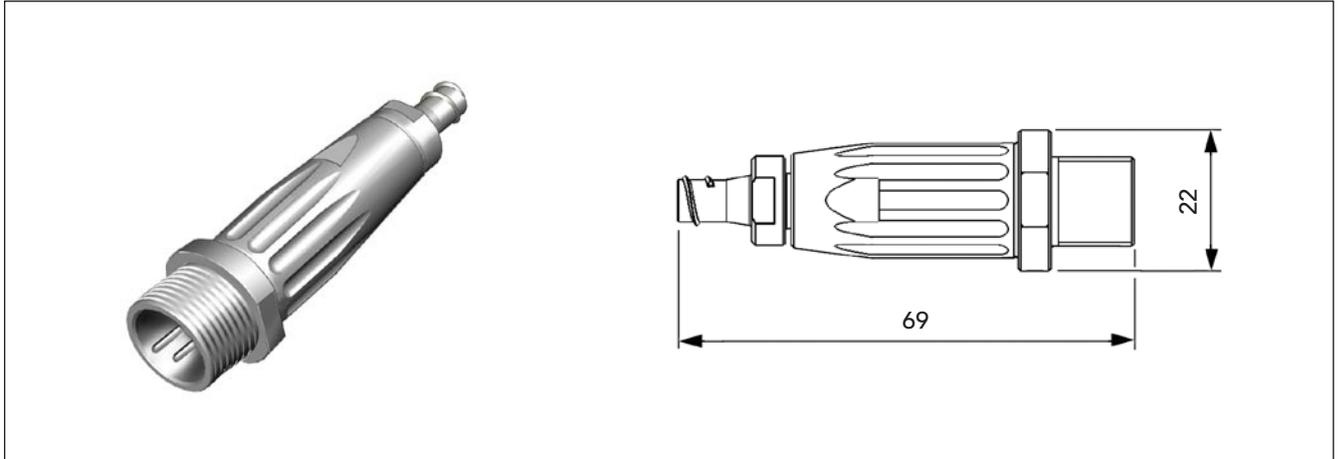
To mount the connector, slide the parts A, B and C over the cable. Cut and strip the cables as shown in the figure and crimp/solder the sockets (D). Use the socket 16-18 AWG for the shield when using coaxial cable. Mount the sealing ring (I) on the contact body (H). Slide the nut (E) over the connector 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 Data

Certificate of conformity:	NEMKO 05ATEX1179
Ex certification:	I M1/II 1GD T 112°C EEx ia I/ IIC T4 (for Group II category 1G, see CENELEC EN 50284 4.4.1) Not recommended for Group I.
CE number:	CE 0470
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
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



2-pin Cable Plug 15836



SPM 15836 is a sealed 2-pin MIL style cable plug for twisted pair cable or coaxial cable and is used together with cable plug SPM 15168 as cable joint. The end (A) of the connector is designed for use with cable protection tube (SPM 81385). The connector can easily be mounted in the field, either by crimping or soldering.

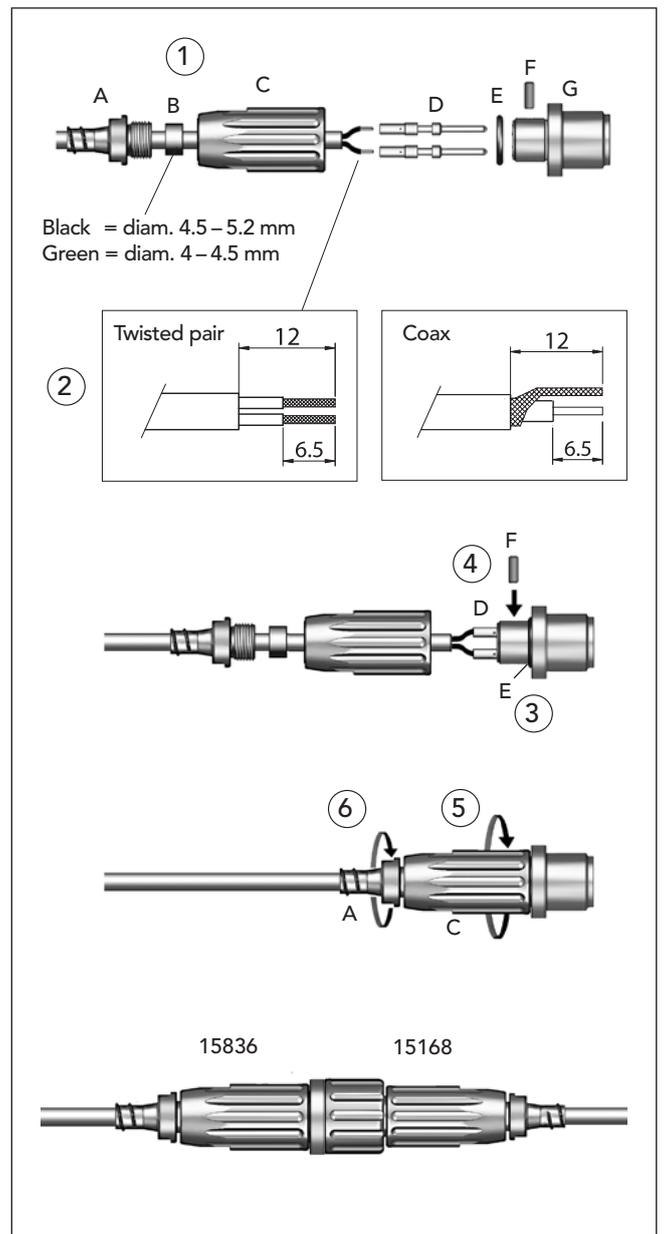
The cable seal, marked B in the figure, seals the cable entry when the connector collet (A) is tightened. Note: The connector package contains 3 contact pins (D) and 2 cable seals (B) of different sizes, marked in different colours.

- Green seal for cable diameter 4 to 4.5 mm
- Black seal for cable diameter 4.5 to 5.2 mm.

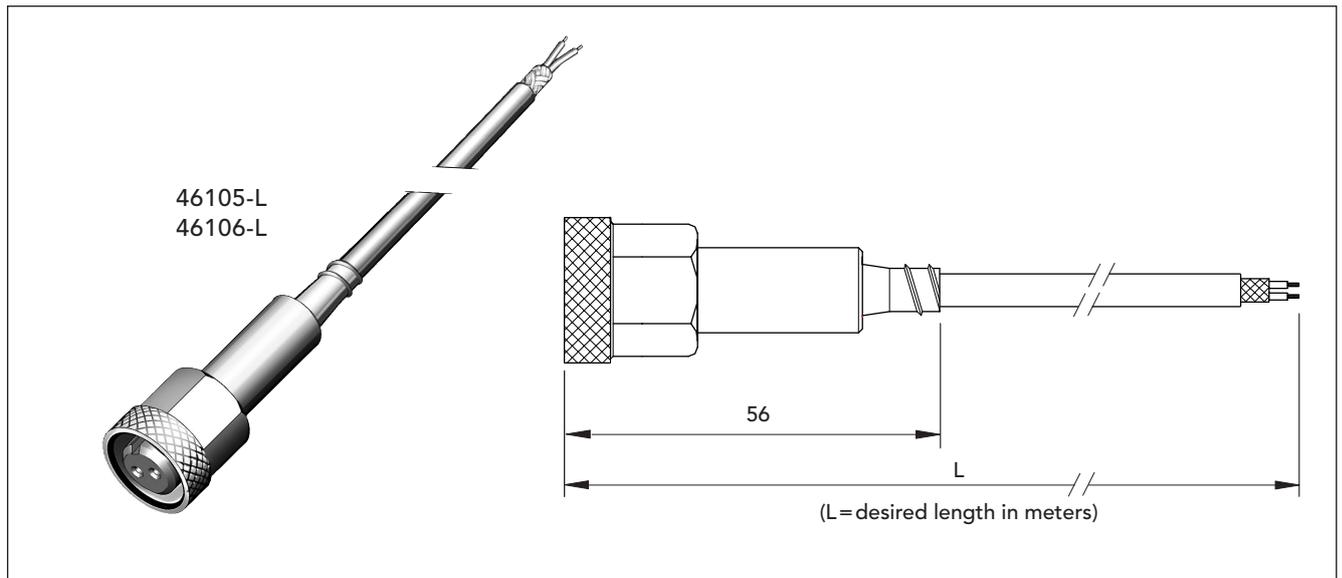
To mount the connector, slide the parts A, B and C over the cable. Mount the sealing ring (E) on the connector body (G). Cut and strip the cable as shown in the figure (2) and crimp/solder the cables into the contact pins (D). Use the contact pin 16-18 AWG for the shield when using coaxial cable. Push 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 Data

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
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



2-pin Cable Jack with Integrated Cable



SPM 46105-L and 46106-L are 2-pin MIL style cable jacks with integrated twisted pair cable for connection of vibration transducers of type SLD. They 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 SPM 81385 with sleeve SPM 15716.

Note: When ordering cables please state the desired length (L) in meters.

Technical Data

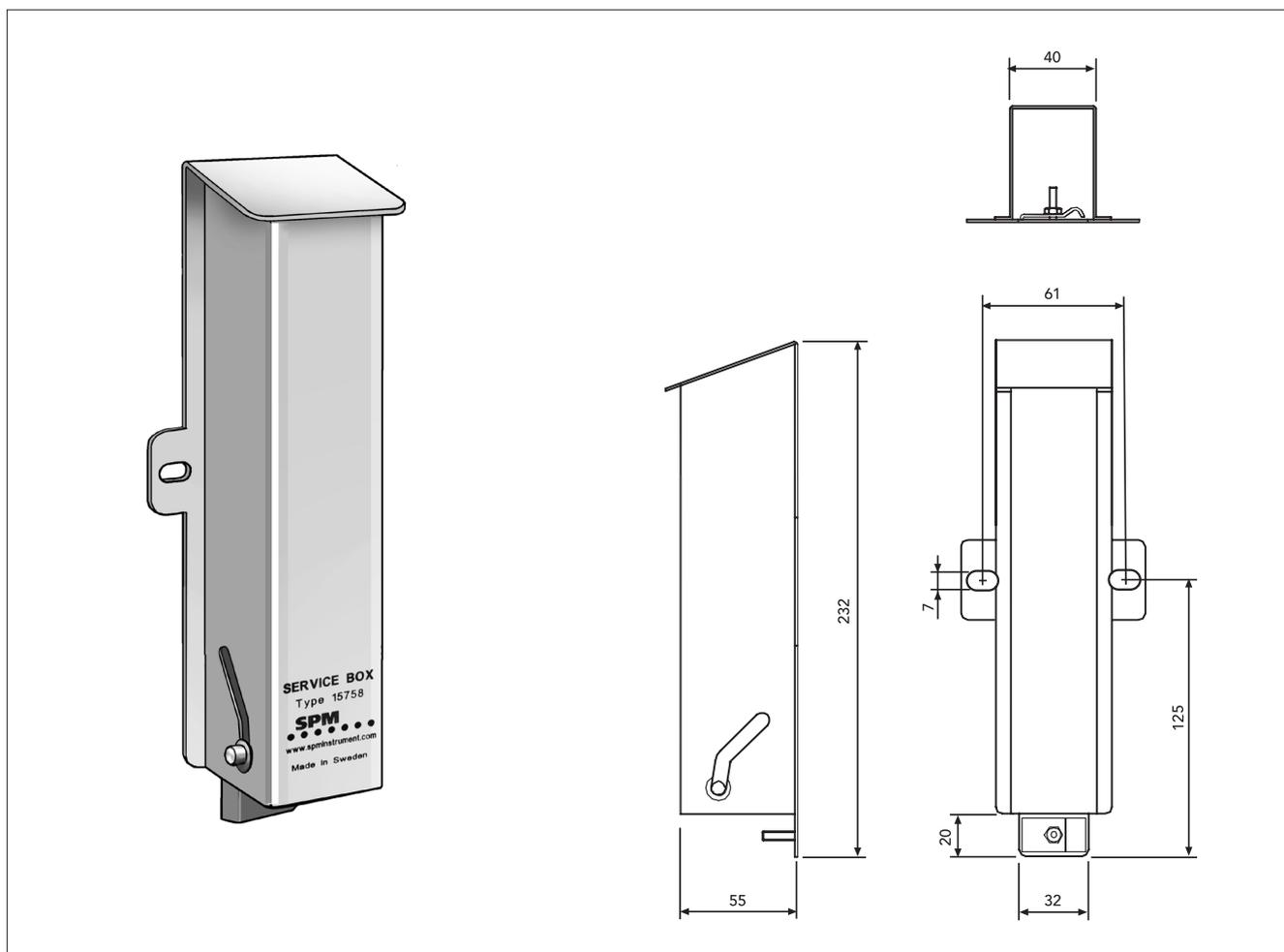
Certificate of conformity: NEMKO 05ATEX1179X
Ex certification: I M1/II 1GD T 112°C EEx ia I/IIC T4 (for Group II category 1G, see CENELEC EN 50284 4.4.1). Recommended for Group I.

CE number: **CE** 0470
Type: 2 pin MIL style, female
Material, body: Stainless steel
Contact plating: Gold
Seals: Viton (fluor rubber), IP 67

Temperature range:
46105-L -65 to +200 °C (-65 to +392 °F)
46106-L -40 to +90 °C (-40 to +194 °F)



Service Box 15758

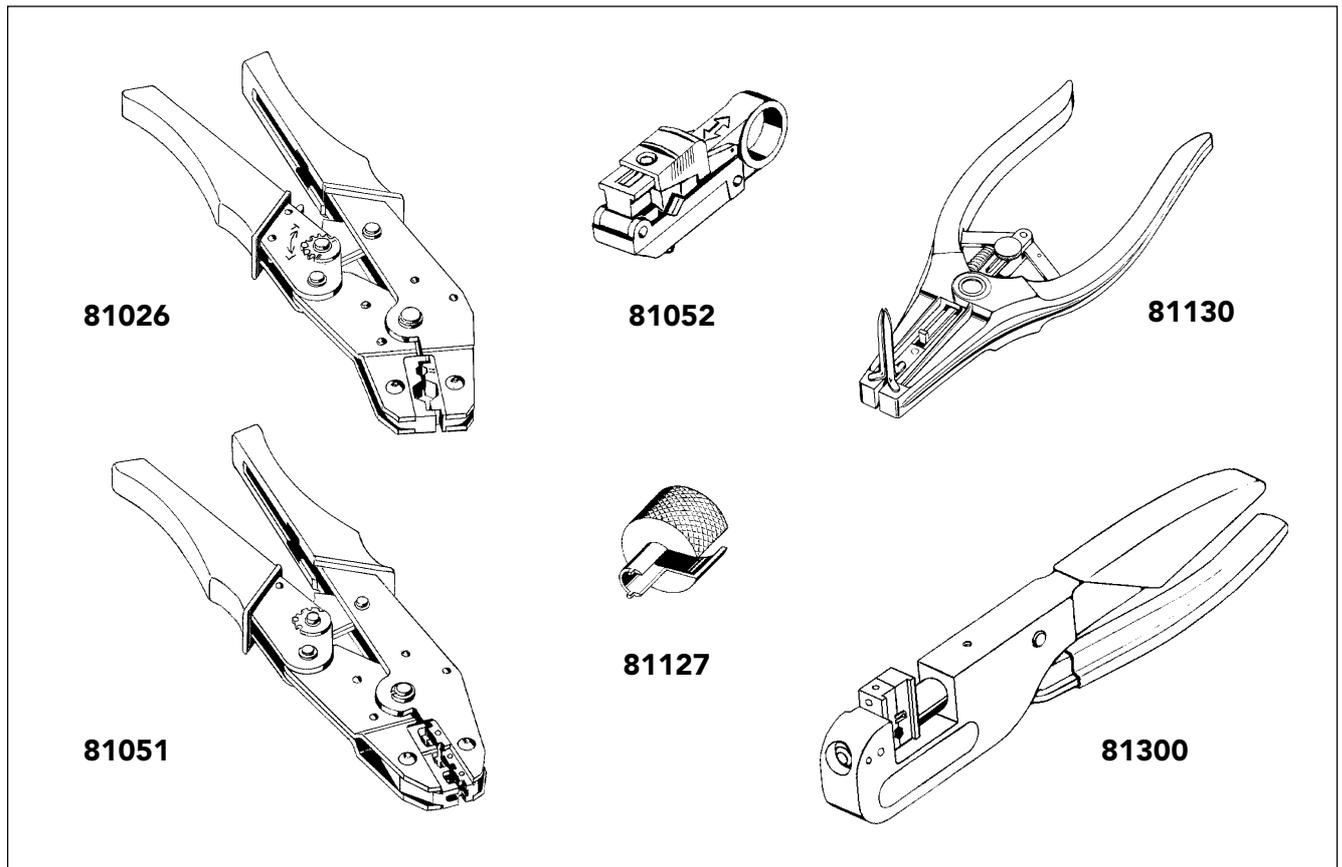


The Service Box 15758 is a protective cover for cable joint specially designed for extreme environmental conditions. It is made of stainless acid proof steel, AISI 316, and has an access opening in the bottom.

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.



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.

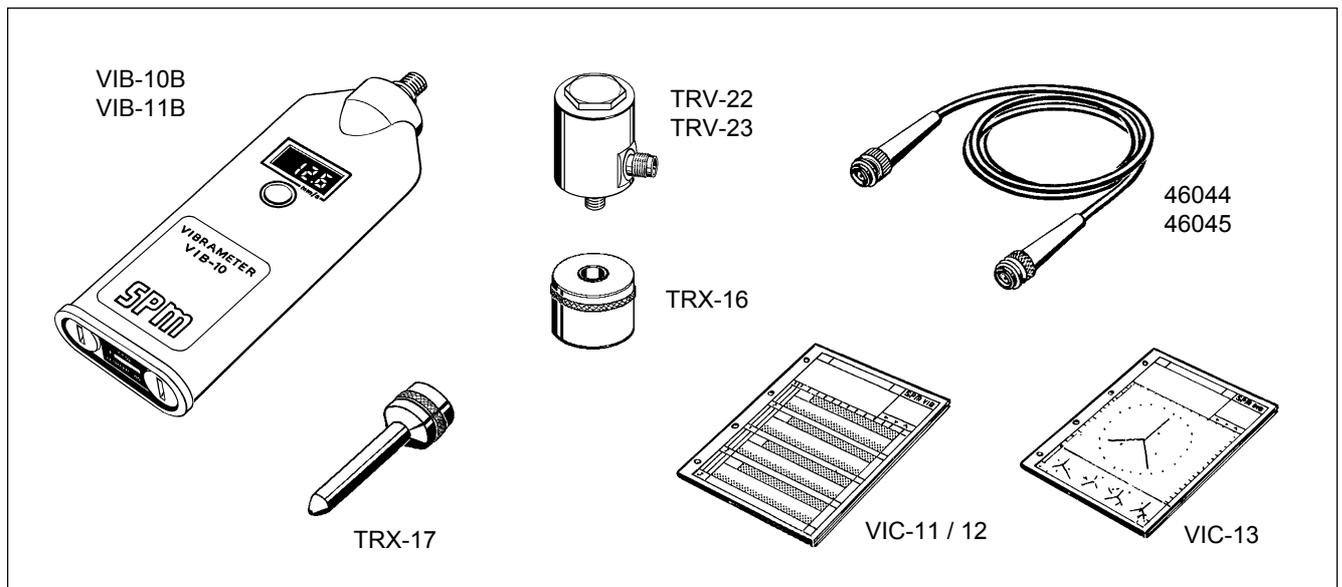
Crimping tool SPM 81026 and SPM 81300 are used for coaxial cables, SPM 81051 for single conductor cables.

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.

- | | |
|-------|--|
| 81026 | Crimping tool for fitting TNC/BNC connectors |
| 81051 | Crimping tool for fitting tab terminals |
| 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 SPM 82166 |
| 81300 | Crimping tool for fitting SMB connectors |



Vibrameter VIB-10 / VIB-11



Vibrameter VIB-10 (VIB-11) has been designed as a simple diagnostic tool for preventive maintenance. The instrument and the monitoring technique are based on the recommendations of ISO and the equivalent national standard organizations BS, VDI, etc.

These standards make the assumption that limited information, obtained easily and at a low cost, is often as useful as a detailed analysis at the price of expensive equipment and elaborate techniques. They state that it is possible to detect even minor changes in the operating condition of a machine by measuring its general vibration level. It is assumed that, once the change has been noted, a competent inspector or repair crew will be able to find the actual defects which caused it.

The evaluation of machine condition is based on a single parameter, vibration severity. This means that the instrument needs to display only one measured value, which reduces its cost and makes it easy to handle.

The standards also provide a set of norm values for the common types of industrial plant. The readings obtained on a particular machine are interpreted by comparing them with the norm values for similar machines.

Part Numbers

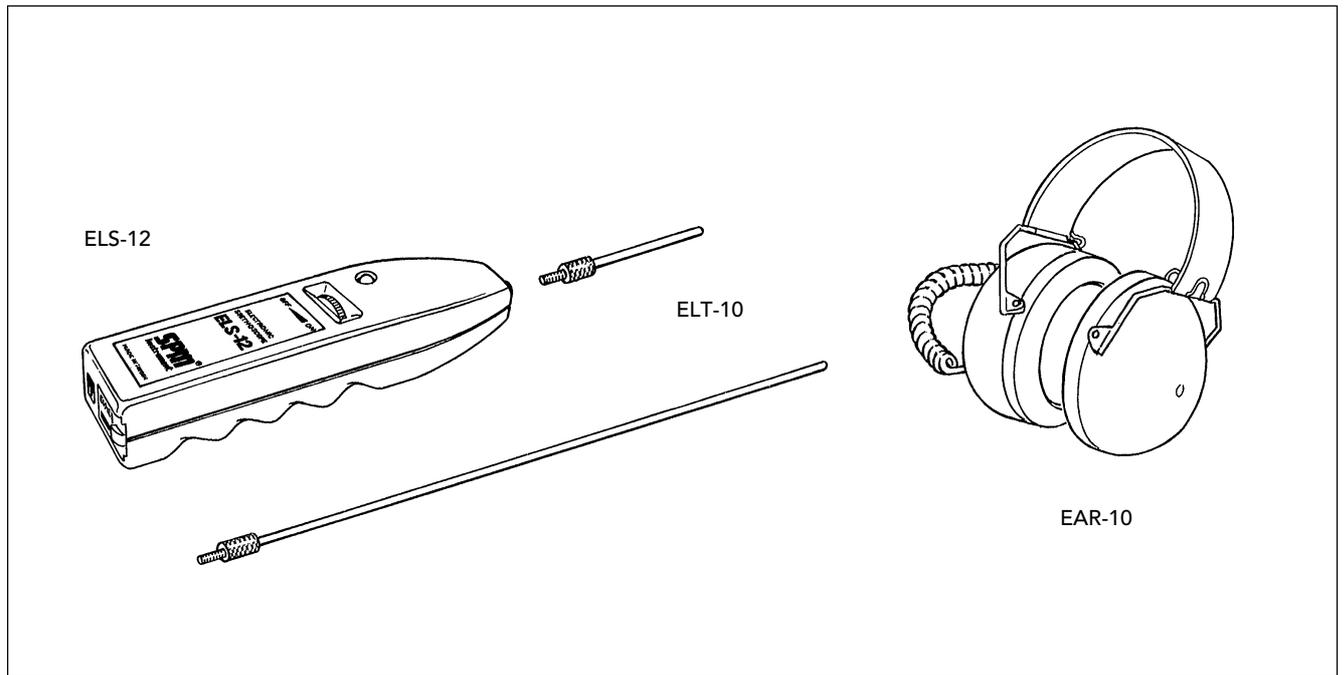
VIB-10B	Vibrameter mm/s, incl. battery cells
VIB-11B	Vibrameter in/s, incl. battery cells
TRV-22	Vibration transducer, M8
TRV-23	Vibration transducer, UNF 1/4"-28
TRX-16	Magnetic base for transducer TRV-22
TRX-17	Probe for transducer TRV-22
46044	Measuring cable with connectors, 1.5 m
46045	Measuring cable with sealing TNC plug, 1.5 m
VIC-11	Follow-up forms mm/s (VIB-10), pad of 25
VIC-12	Follow-up forms in/s (VIB-11), pad of 25
VIC-13	Follow-up forms, balancing, pad of 25
90022	Battery

Technical data

Measuring range	VIB-10B: 0.5 to 99.9 mm/s RMS, VIB-11B: 0.01 to 3.93 in/s RMS, 10 to 1000 Hz
Resolution:	0.1 mm/s (0.01 in/s)
Accuracy	2% ± 0.2 mm/s (2% ± 0.02 in/s)
Power supply	Four 1.5 V alkaline cells (e.g. MN 1500 or UCAR E91)
Temp. range	0 to +55 °C (32 to 131 °F)
Display	3 digits, red LED
Switch-off	Automatic
Protective cover	Polyurethane
Dimensions	210 x 75 x 30 mm (8.3" x 2.9" x 1.2")
Weight	410 grams (14 oz) incl. batteries
Connector type	TNC



Electronic Stethoscope ELS-12



Battery powered monitoring instrument for a large number of applications. ELS-12 is a sensitive electronic listening device for all kinds of mechanical noise within machinery: valve chatter, piston slap, gear and pump noise, electric relay operation, etc.

Noise sources are located with the probe tip (length 60 or 290 mm). The sound is fed via an amplifier with volume control to the headset. Ear defenders shut out background noise.

Part Numbers

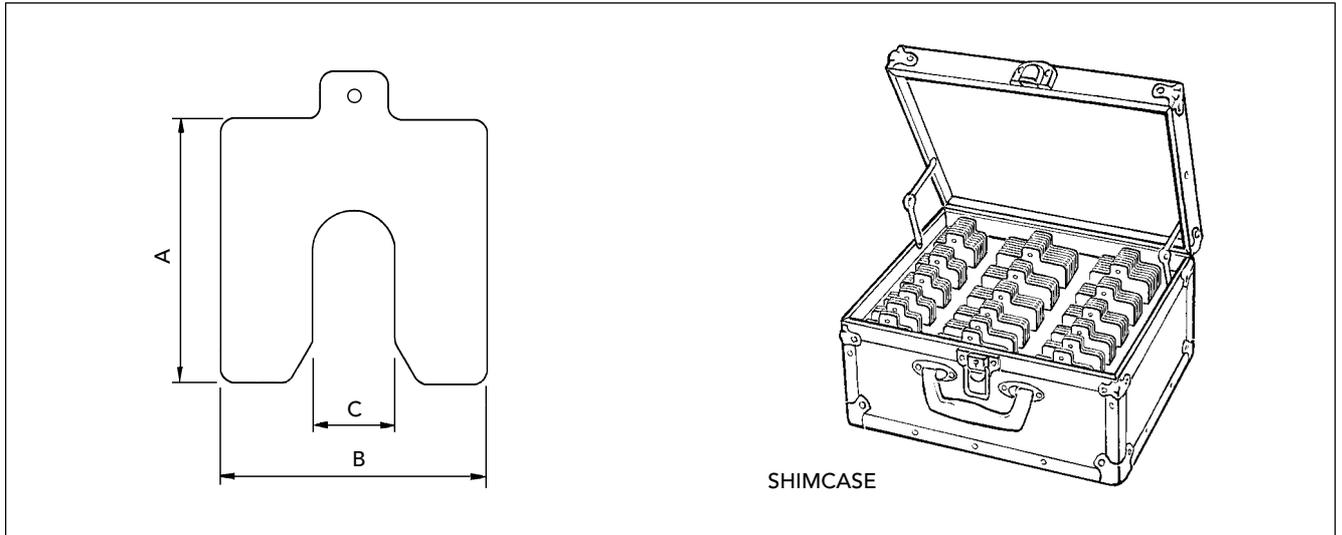
ELS-12	Electronic Stethoscope
ELT-10	Probes, 60 and 290 mm
EAR-10	Earphone incl. spiral cable
90109	Battery, 9 V, type IEC6LG22

Technical Data

Casing:	Splash proof ABS plastic
Nominal battery voltage:	9 V
Temperature range:	0Yto + 55YC
Weight:	300 g incl. battery and probe
Dimensions:	205 x 50 x 40 mm



Precut shims



The line of shimming materials contains five different sizes, fitting almost any type of machine foot. The user can choose between solid stainless steel shims and laminated shims in either brass or stainless steel.

Solid shims in stainless steel

Solid shims can be provided in a handy box, containing 10 shims each of 5 different thicknesses, from 0.05 to 1 mm. They are also available as packs of 10 in single thickness, in accordance with ordering number tables.

Laminated shims

Packs of 20 laminated shims are available in either brass or stainless steel. Each shim has a thickness of 1.00 mm, divided into 12 layers. Laminated shims always fit - just peel off the required thickness.

Cases with solid shims

Solid shims in stainless steel are available packaged in convenient aluminium framed cases with a compartmentalised high density foam insert. The refillable cases are available with four different assortments. The cases are overall 350 x 160 x 280 mm except for SHIMCASE 4 which is 540 x 210 x 320 mm.

Ordering numbers, cases with solid shims

SHIMCASE 1 360 shims: 2 x S1-, S2- and S3-PAK + 2 x S1-, S2- and S3-200. Weight 13 kg.

SHIMCASE 2 510 shims: 2 x S1-, S2- and S3-PAK + 2 x S1-, S2- and S3-020; 040; 070; 200. Weight 17 kg.

SHIMCASE 3 340 shims: 2 x S3- and S4-PAK + 2 x S3- and S4-020; 040; 070; 200. Weight 15 kg.

SHIMCASE 4 720 shims: 2 x S1-, S2-, S3- and S4-PAK + 2 x S1-, S2-, S3- and S4-020; 040; 070; 200. Weight 26 kg.

10 stainless steel shims, single thickness

Dimension			Ordering numbers					
			Thickness (mm)					
A	B	C	0.025	0.05	0.10	0.20	0.25	0.40
35	30	9		S0-005	S0-010	S0-020	S0-025	S0-040
50	50	13	S1-0025	S1-005	S1-010	S1-020	S1-025	S1-040
75	75	21	S2-0025	S2-005	S2-010	S2-020	S2-025	S2-040
100	100	32	S3-0025	S3-005	S3-010	S3-020	S3-025	S3-040
125	125	45	S4-0025	S4-005	S4-010	S4-020	S4-025	S4-040
200	200	55		S5-005	S5-010	S5-020	S5-025	S5-040

10 stainless steel shims, single thickness

Dimension			Ordering numbers				
			Thickness (mm)				
A	B	C	0.50	0.70	1.00	2.00	3.00
35	30	9	S0-050	S0-070	S0-100		
50	50	13	S1-050	S1-070	S1-100	S1-200	S1-300
75	75	21	S2-050	S2-070	S2-100	S2-200	S2-300
100	100	32	S3-050	S3-070	S3-100	S3-200	S3-300
125	125	45	S4-050	S4-070	S4-100	S4-200	S4-300
200	200	55	S5-050	S5-070	S5-100	S5-200	S5-300

50 stainless steel shims, 10 of each thickness, 0.05 - 1.00 mm

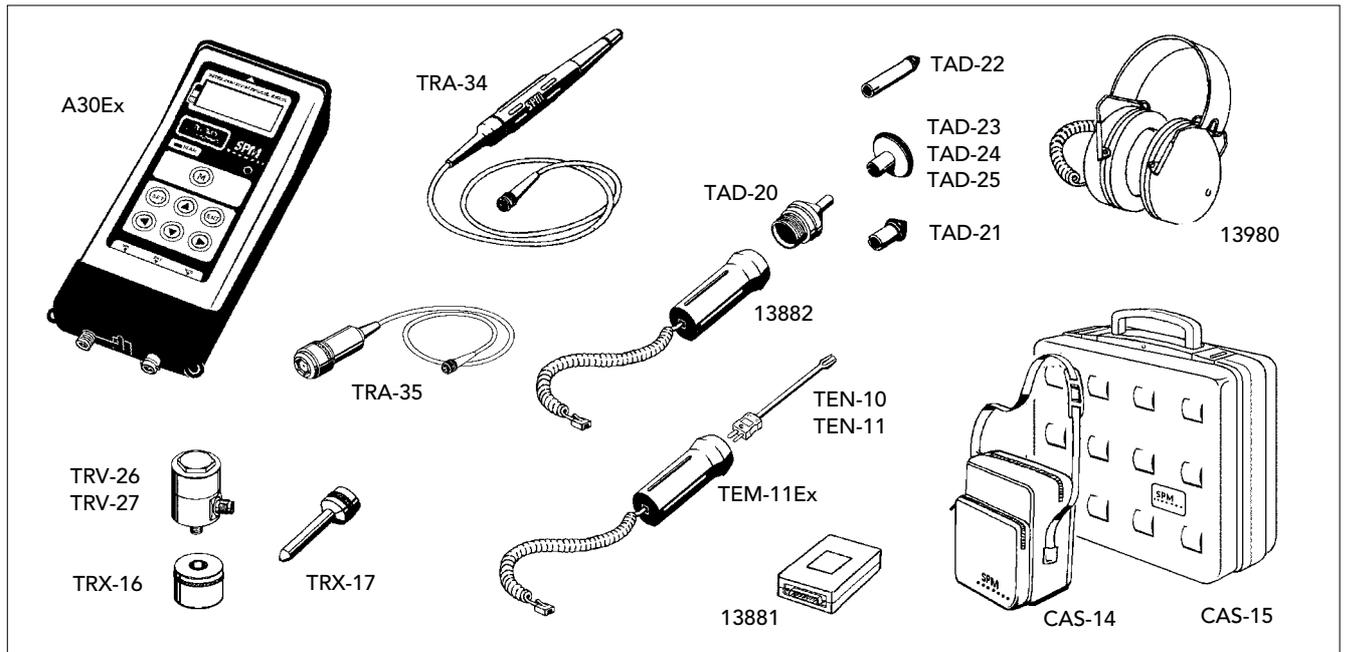
Dimension			Ordering numbers
			Thickness 0.05, 0.10, 0.25, 0.50 and 1.00 mm
A	B	C	
50	50	13	S1-PAK
75	75	21	S2-PAK
100	100	32	S3-PAK
125	125	45	S4-PAK
200	200	55	S5-PAK

Laminated shims, pack of 20, thickness 1.00 mm

Dimension			Ordering numbers	Ordering numbers
			Stainless steel	Brass
A	B	C		
50	50	13	LS1-PAK	LB1-PAK
75	75	21	LS2-PAK	LB2-PAK
100	100	32	LS3-PAK	LB3-PAK
125	125	45	LS4-PAK	LB4-PAK
200	200	55	LS5-PAK	LB5-PAK



Machine Condition Analyzer A30Ex



Part numbers

A30-1Ex	Machine Condition Analyzer A30 Basic Ex
A30-2Ex	Machine Condition Analyzer A30 Logger Ex
A30-3Ex	Machine Condition Analyzer A30 Expert Ex
13881	Communication module, Ex
CAB-35	Computer cable, 9 pole female plugs
93162	Cable adapter 9 male/ 25 female
CAS-14	Carrying case
CAS-15	Carrying case with foam insert
EMD-13	Carrying strap
FUP-02	Follow-up form for A30Ex, pad of 25 (mm)
FUP-04	Follow-up form for A30Ex, pad of 25 (inch)

Shock pulse measurement (SPM)

TRA-34	Shock pulse transducer, probe assembly, Ex
TRA-35	Shock pulse transd. with quick connector, Ex
13980	Earphones, headset with ear defenders, Ex
CAB-07	Cable for remote monitoring 1.5 m (5ft)

Vibration measurement

TRV-26	Vibration transducer M8, Ex
TRV-27	Vibration transducer 1/4" x 28 UNF, Ex
TRX-16	Magnetic foot for vibration transducer
TRX-17	Probe for vibration measurement
VIC-19	Cable for vibration transducer

Speed measurement

13882	Tachometer probe with cable, Ex
TAD-20	Contact adapter
TAD-21	Contact center, rpm, short
TAD-22	Contact center, rpm, long
TAD-23	Contact wheel, meter / min.
TAD-24	Contact wheel, yards / min.
TAD-25	Contact wheel, feet / min.
TAD-14	Reflecting tape, pad of 5 sheets
TAD-16	Reflecting tape for thin shafts, 5 sheets

Temperature measurement

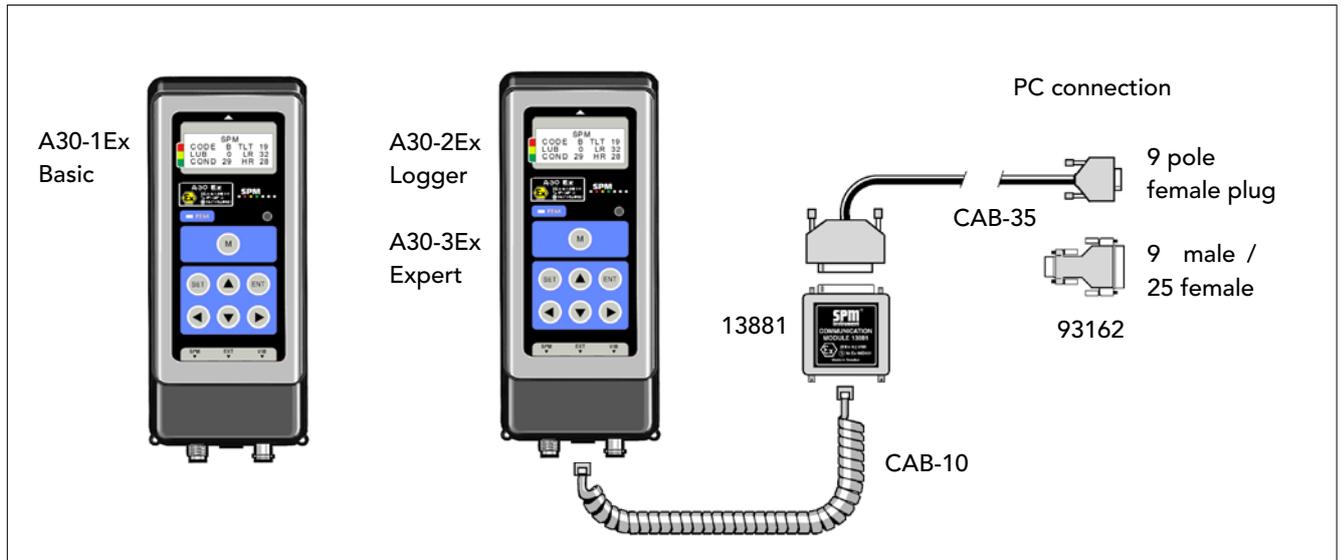
TEM-11Ex	Temperature probe incl. cable
TEN-10	Temperature probe tip surface
TEN-11	Temperature probe tip liquid

Spare parts

13915	Probe tip for TRA-34
13108	Sleeve for probe tip (TRA-34)
13892	Handle for probe TRA-34
CAB-34	Cable for TRA-34
CAB-10	Spiral cable for 13980, 13882, TEM-11Ex
45011-1.5	Cable for TRA-35
90098	Battery, 1.5 V, alkaline, IEC LR6/AA, approved T4
90099	Battery, 1.5 V, alkaline, IEC LR6/AA, approved T3



Machine Condition Analyzer A30Ex



A30 Ex is a machine condition analyzer designed for a reliable preventive maintenance of industrial machines. A30 Ex is available in three versions. With "Basic", measuring results are recorded manually. "Logger" is a data logger and works together with SPM software Condmaster®. "Expert" has all the logger features. In addition, it uses the EVAM® method for vibration analysis. A "Basic" version can be upgraded to "Logger" and "Expert".

Measuring techniques and other features	Analyzer A30 EX		
	Basic	Logger	Expert
Shock pulse, LR/HR	●	●	●
Vibration severity, ISO 10816	●	●	●
Temperature measurement	●	●	●
Speed, contact and optical	●	●	●
Continuous reading	●	●	●
Data logging with Condmaster®		●	●
Alternative measuring systems		●	●
Selectable comments		●	●
Display of check points		●	●
Long time recording		●	●
Vibration spectrum			●
Evaluated vibration analysis (EVAM)			●

Instrument specifications

Certificate of conformity:	NEMKO 03 ATEX 185
Ex certification:	I M2/II 2G EEx ib I/IIB T4/T3
CE Number:	CE 0470
Enclosure:	IP43
General features:	language selection, battery test, continuous reading, transducer line test, automatic idle / power off
Temperature range:	0 to +50 °C (32 to 120 °F)
Power supply:	6 x 1.5V LR6 alkaline cells, approved
Battery life:	power down 1 year, or 5000 typical measurements, or continuous recording 50 hours
Size:	255x105x60 mm (10 x 4.2 x 2.4 in)
Weight:	0.85 kg (1.9 lb)
Casing / protective cover:	polyurethane, conductive
Keypad:	sealed membrane
Display:	LCD, 4x16 characters LED, backlight adjustable, automatic on/off
Memory:	typical 500, max. 999 meas. points
Backup, memory/clock:	approx. 24 h.

Shock pulse (SPM® LR/HR)

Measuring range:	-19 to 80 dBsv
Resolution:	1 dBsv
Accuracy:	± 1 dBsv

Vibration severity (ISO 10816)

Measuring range:	0.5 to 49.9 mm/s RMS (0.02 to 2.0 in/s RMS)
Resolution:	0.1 mm/s (0.01 in/s)
Accuracy:	± (0.2 mm/s + 2% of reading)
Frequency range:	3 to 1000 Hz

Speed measurement

Measuring range:	10 to 19 999 rpm optical
Measuring distance:	max. 0.6 m (2 ft.)
Resolution:	1 rpm
Accuracy:	± (1 rev. + 0.1% of reading)

Temperature measurement

Measuring range:	0 to +300 °C (+32 to +572 °F)
Resolution:	1 °C (1 °F)

Alternative measuring systems

No. per meas.point:	2
Additional information:	date / time and comments

Long time recording

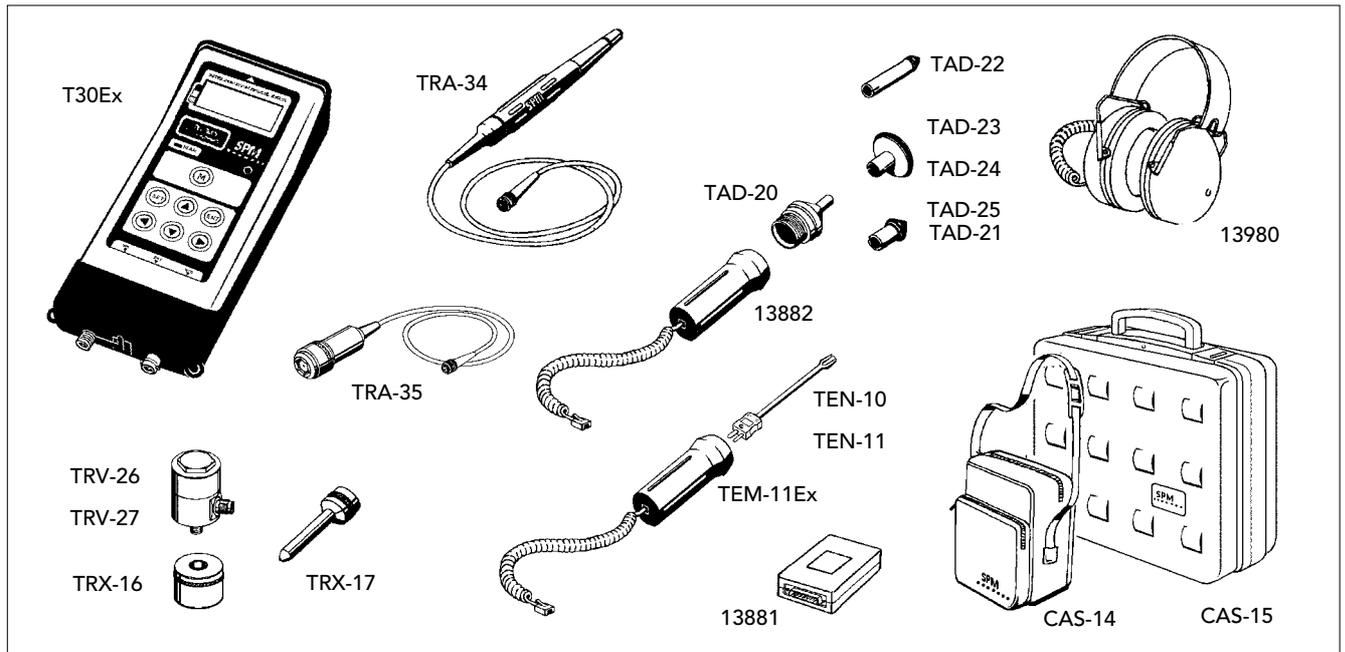
Measuring parameters:	SPM, VIB, temperature/speed
Measuring interval:	adjustable 0 - 60 minutes

Vibration analysis (EVAM®)

Window:	Hanning
Number of samples:	1024 / 2048
FFT result:	400 / 800 spectrum lines
Range, resolution at 400 / 800 lines:	3 to 200 Hz, 0.5 / 0.25 Hz 3 to 500 Hz, 1.25 / 0.625 Hz 3 to 1000 Hz, 2.5 / 1.25 Hz 3 to 2000 Hz, 5.0 / 2.5 Hz 3 to 5000 Hz, 12.5 / 6.25 Hz
Lines displayed:	15 highest, toggle Hz / cpm
Lines saved:	1 to 200 highest



Machine Condition Tester T30Ex



Part numbers

T30-1Ex	Machine Condition Tester T30 Basic Ex
T30-2Ex	Machine Condition Tester T30 Logger Ex
T30-3Ex	Machine Condition Tester T30 Expert Ex
13881	Communication module, Ex
CAB-35	Computer cable, 9 pole female plugs
93162	Cable adapter 9 male/ 25 female
EMD-13	Carrying strap
CAS-14	Carrying case
CAS-15	Carrying case with foam insert
FUP-01	Follow-up form for T30Ex, pad of 25 (mm)
FUP-03	Follow-up form for T30Ex, pad of 25 (inch)

Shock pulse measurement (SPM)

TRA-34	Shock pulse transducer, probe assembly, Ex
TRA-35	Shock pulse transd. with quick connector, Ex
13980	Earphones, headset with ear defenders, Ex
CAB-07	Cable for shock pulse terminal, 1.5 m (5 ft)

Vibration measurement

TRV-26	Vibration transducer M8, Ex
TRV-27	Vibration transducer 1/4" x 28 UNF, Ex
TRX-16	Magnetic foot for vibration transducer
TRX-17	Probe for vibration measurement
VIC-19	Cable for vibration transducer

Speed measurement

13882	Tachometer probe with cable, Ex
TAD-20	Contact adapter
TAD-21	Contact center, rpm, short
TAD-22	Contact center, rpm, long
TAD-23	Contact wheel, meter / min.
TAD-24	Contact wheel, yards / min.
TAD-25	Contact wheel, feet / min.
TAD-14	Reflecting tape, pad of 5 sheets
TAD-16	Reflecting tape for thin shafts, 5 sheets

Temperature measurement

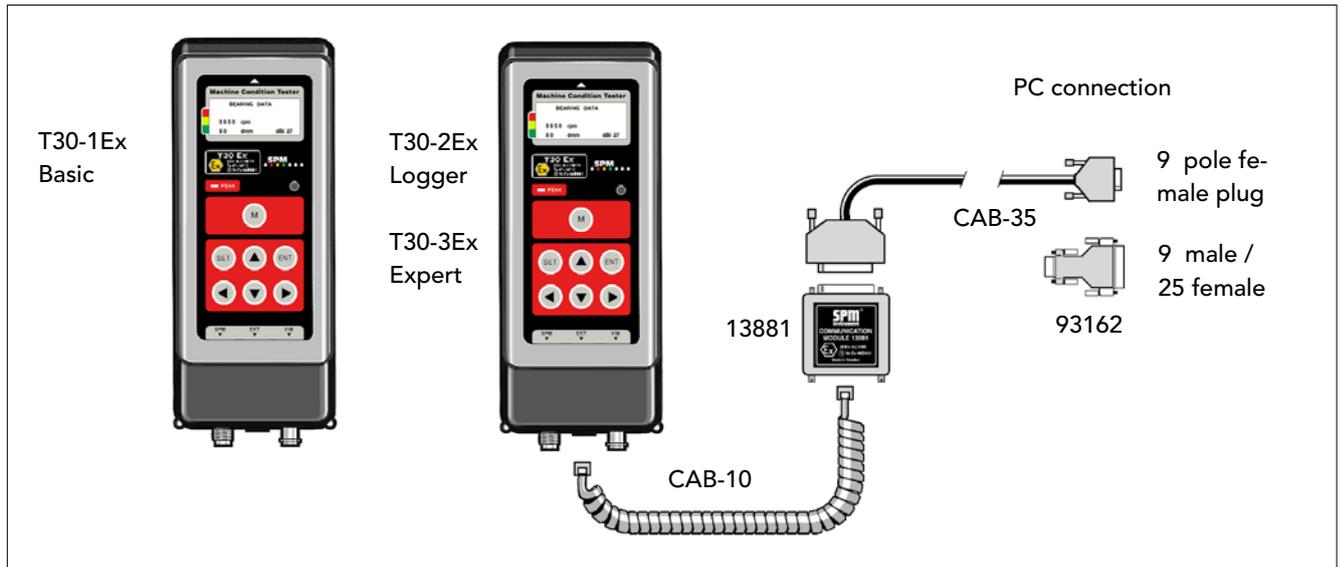
TEM-11Ex	Temperature probe incl. cable
TEN-10	Temperature probe tip surface
TEN-11	Temperature probe tip liquid

Spare parts

13915	Probe tip for TRA-34
13108	Sleeve for probe tip (TRA-34)
13892	Handle for probe TRA-34
CAB-34	Cable for TRA-34
CAB-10	Spiral cable for 13980, 13882, TEM-11Ex
45011-1.5	Cable for TRA-35
90098	Battery, 1.5 V, alkaline, IEC LR6/AA, approved T4
90099	Battery, 1.5 V, alkaline, IEC LR6/AA, approved T3



Machine Condition Tester T30Ex



T30 Ex is a machine condition analyzer designed for a reliable preventive maintenance of industrial machines. T30 Ex is available in three versions. With "Basic", measuring results are recorded manually. "Logger" is a data logger and works together with SPM software Condmaster®. "Expert" has all the logger features. In addition, it uses the EVAM® method for vibration analysis. A "Basic" version can be upgraded to "Logger" and "Expert".

Measuring techniques and other features	Analyzer T30 EX		
	Basic	Logger	Expert
Shock pulse, dBm/dBc	●	●	●
Vibration severity, ISO 10816	●	●	●
Temperature measurement	●	●	●
Speed, contact and optical	●	●	●
Continuous reading	●	●	●
Data logging with Condmaster®		●	●
Alternative measuring systems		●	●
Selectable comments		●	●
Display of check points		●	●
Long time recording		●	●
Vibration spectrum			●
Evaluated vibration analysis (EVAM)			●

Instrument specifications

Certificate of conformity: NEMKO 03 ATEX 185
 Ex certification: I M2/II 2G EEx ib I/II B T4/T3
 CE Number: **CE** 0470
 Enclosure: IP43
 General features: language selection, battery test, continuous reading, transducer line test, automatic idle / power off
 Temperature range: 0 to +50 °C (32 to 120 °F)
 Power supply: 6 x 1.5V LR6 alkaline cells, approved
 Battery life: power down 1 year, or 5000 typical measurements, or continuous recording 50 hours
 Size: 255x105x60 mm (10 x 4.2 x 2.4 in)
 Weight: 0.85 kg (1.9 lb)
 Casing / protective cover: polyurethane, conductive
 Keypad: sealed membrane
 Display: LCD, 4x16 characters LED, backlight adjustable, automatic on/off
 Memory: typical 500, max. 999 meas. points
 Backup, memory/clock: approx. 24 h.

Shock pulse (SPM® dBm/dBc)

Measuring range: -9 to 80 dBsv
 Resolution: 1 dBsv
 Accuracy: ± 1 dBsv

Vibration severity (ISO 10816)

Measuring range: 0.5 to 49.9 mm/s RMS (0.02 to 2.0 in/s RMS)
 Resolution: 0.1 mm/s (0.01 in/s)
 Accuracy: ± (0.2 mm/s + 2% of reading)
 Frequency range: 3 to 1000 Hz

Speed measurement

Measuring range: 10 to 19 999 rpm optical
 Measuring distance: max. 0.6 m (2 ft.)
 Resolution: 1 rpm
 Accuracy: ± (1 rev. + 0.1% of reading)

Temperature measurement

Measuring range: 0 to +300 °C (+32 to +572 °F)
 Resolution: 1 °C (1 °F)

Alternative measuring systems

No. per meas.point: 2
 Additional information: date / time and comments

Long time recording

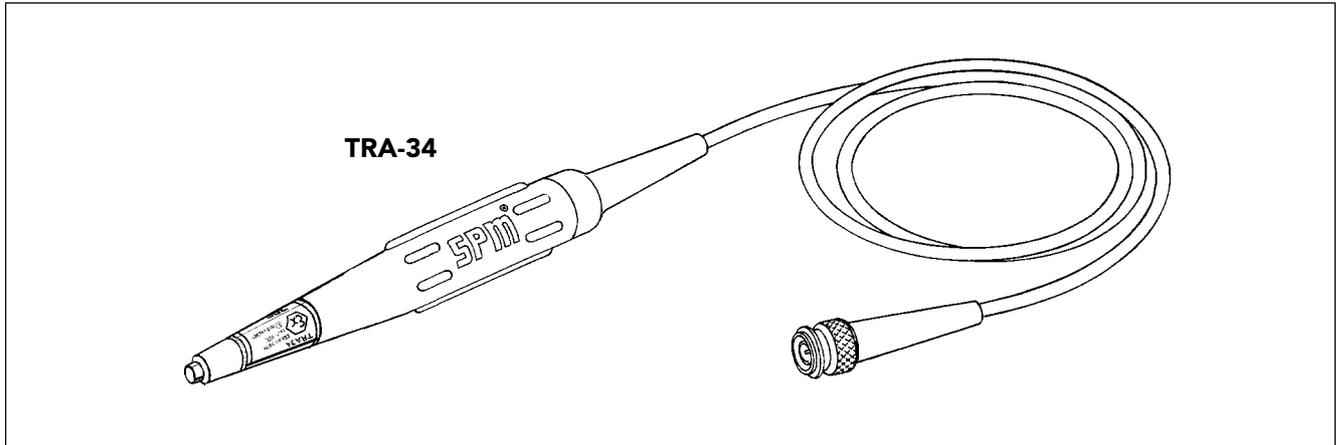
Measuring parameters: SPM, VIB, temperature/speed
 Measuring interval: adjustable 0 - 60 minutes

Vibration analysis (EVAM®)

Window: Hanning
 Number of samples: 1024 / 2048
 FFT result: 400 / 800 spectrum lines
 Range, resolution at 400 / 800 lines: 3 to 200 Hz, 0.5 / 0.25 Hz
 3 to 500 Hz, 1.25 / 0.625 Hz
 3 to 1000 Hz, 2.5 / 1.25 Hz
 3 to 2000 Hz, 5.0 / 2.5 Hz
 3 to 5000 Hz, 12.5 / 6.25 Hz
 Lines displayed: 15 highest, toggle Hz / cpm
 Lines saved: 1 to 200 highest



Shock Pulse Transducer with Probe TRA-34



TRA-34 is a hand-held probe, which is used together with hand-held SPM Tester T30 and Analyzer A30 instruments of Ex design. The probe is directionally sensitive and must be held aligned against the bearing and not deviate from this direction by more than $\pm 5^\circ$. The probe tip is spring loaded and moves within a sleeve made of chloroprene rubber and tolerates 110°C (230°F). Max. permanent temperature for the entire probe is 50°C (120°F). This probe is permitted for use in potentially explosive atmosphere.

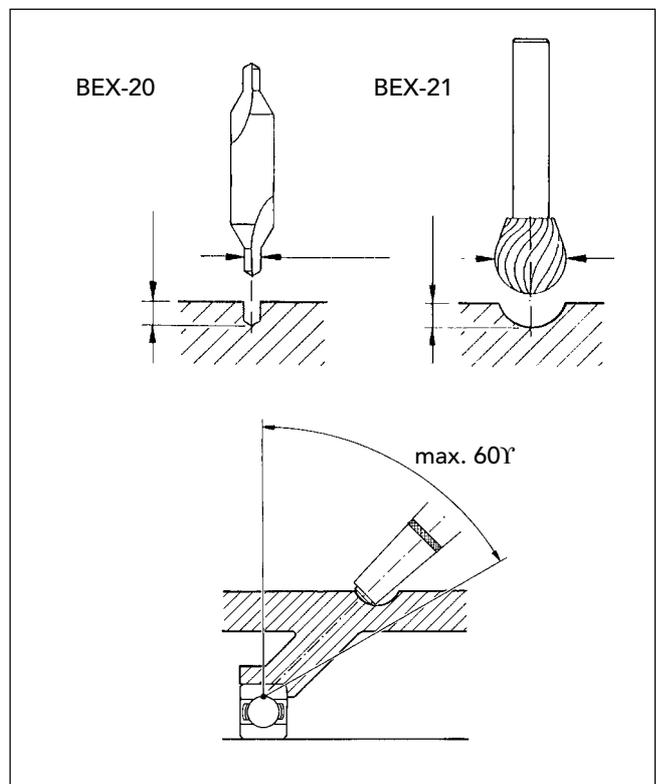
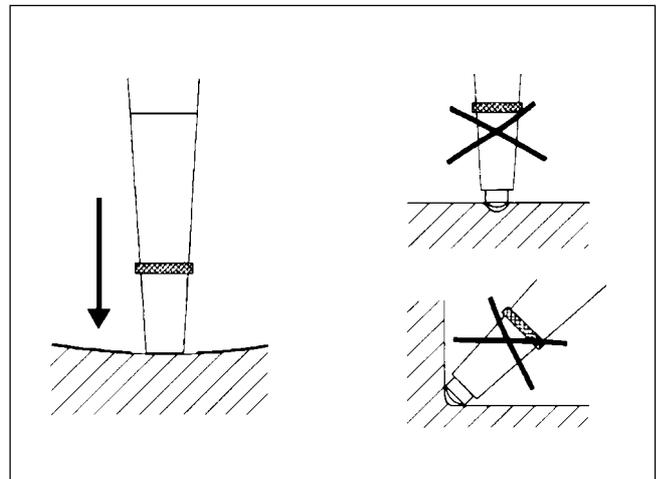
Measuring points for the probe transducer should be located directly on the bearing housing and the signal path should be in a direct line to the contact area. The strongest shock pulses are emitted from the loaded region of the rolling interface in the bearing. The loaded region for radial load covers a sector of $\pm 45^\circ$ 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 $\pm 60^\circ$ from the perpendicular to the rolling surface. Measuring points should be clearly marked.

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.

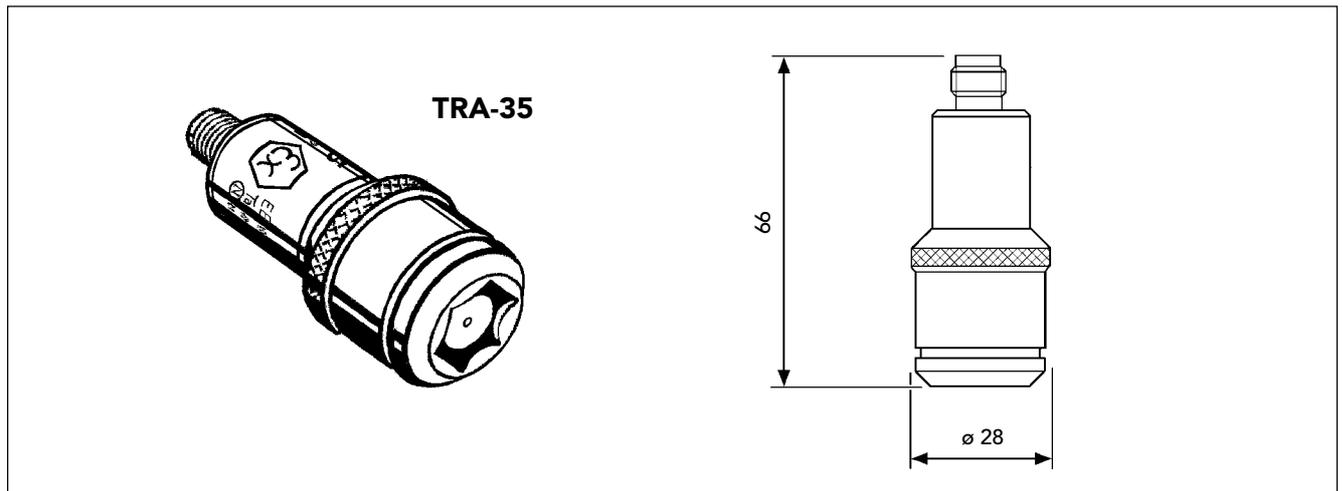
Certificate of conformity:	NEMKO 03 ATEX 185
Ex certification:	I M2/II 2 G EEx ib I/II B T4
CE number:	CE 0470
Ta:	0 to $+50^\circ\text{C}$ (32 to 120°F)

Part Numbers

TRA-34	Shock pulse transducer, probe assembly
BEX-20	Center drill
BEX-21	Rotary file



Transducer with Quick Connector and TMU



TRA-35 is a shock pulse transducer with quick connector that fits all SPM adapters. It is used together with hand-held SPM Tester T30 and Analyzer A30 instruments of Ex design. This transducer is specially designed for applications with potentially explosive atmosphere. It is provided with a transducer matching unit (TMU). Usually the transducer is connected to the instrument via a 1.5 m (5 feet) coaxial cable with TNC connections.

The transducer has bayonet catch. To attach the TRA-35 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

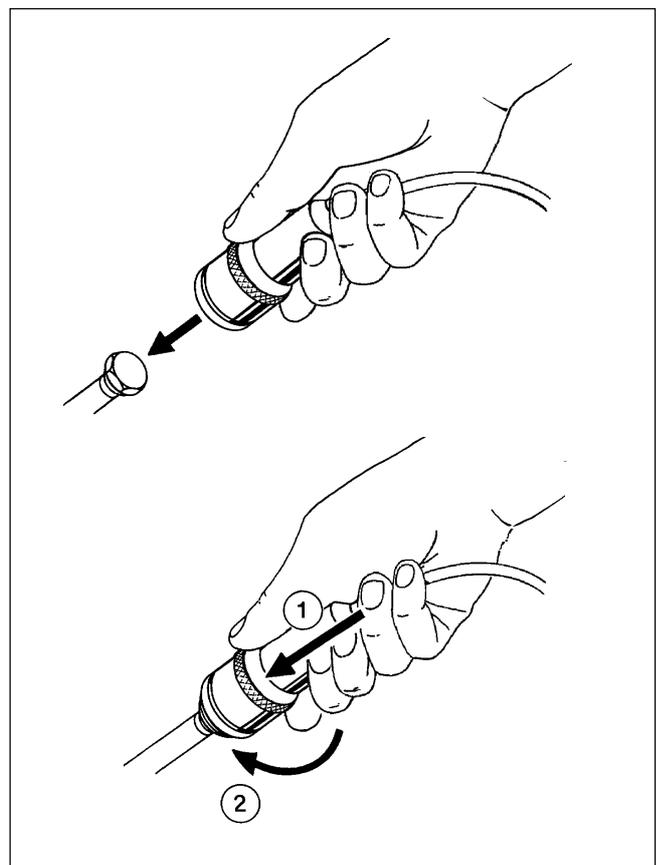
Twist counter clockwise to unfasten the transducer.

Technical Data

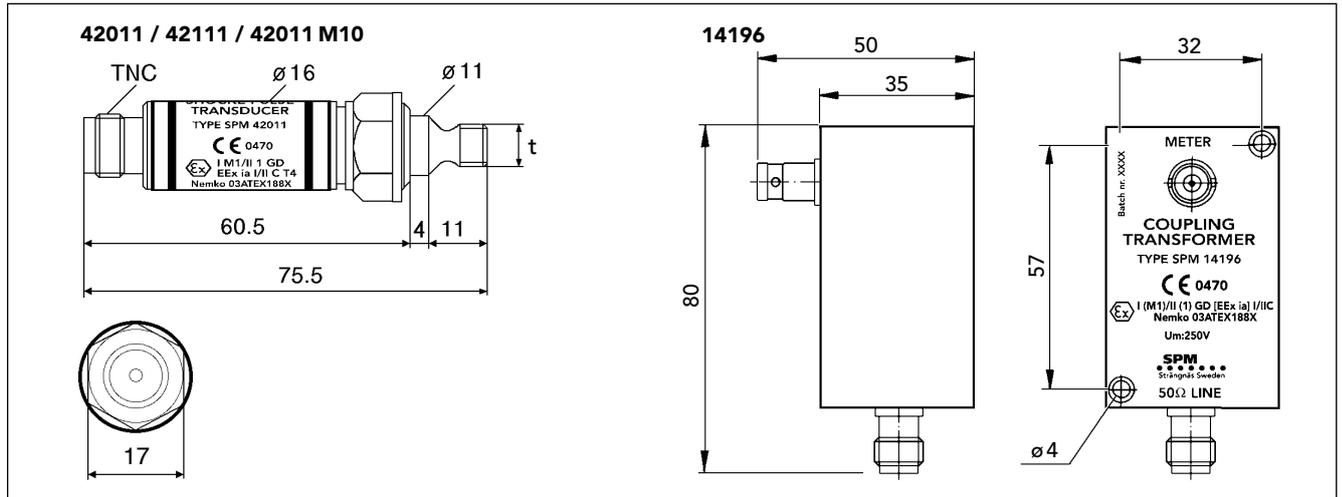
Certificate of conformity:	NEMKO 03 ATEX 185
Ex certification:	I M2/II 2 G EEx ib I/IIB T4
CE number:	CE 0470
Measuring range:	Max. 80 dBsv
Design:	Sealed
Temperature range:	0Yto + 50Y°C (32Yto +120Y°F)
Material, spanner:	Blacknited steel
Material, handle:	Stainless steel
Connector:	TNC
Weight:	140 g

Part Numbers

TRA-35	Shock pulse transducer for Ex-conditions incl. measuring cable 45011-1.5
45011-1.5	Measuring cable for transducer TRA-35, 1.5 m (5 feet)



Transducer and transformer for potentially explosive atmosphere

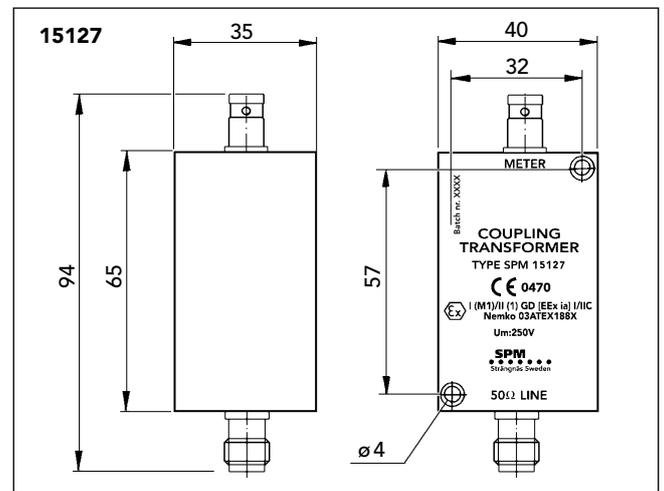


Shock Pulse Transducers

Transducer SPM 42011 (M8), SPM 42111 (UNC 5/16") and SPM 42011-M10 (M10), certificate NEMKO 03 ATEX 188X, must be used together with coupling transformer SPM 14196 or SPM 15127 when connected to external measuring units. They are installed inside the area with potentially explosive atmosphere in the same way as any standard SPM transducer. The Ex approved instruments, covered by the certificate NEMKO 03 ATEX 185, can be connected directly to the transducers if the environmental conditions permit.

Coupling Transformer

Coupling transformer SPM 14196 and SPM 15127, certificate NEMKO 03 ATEX 188X, connects the ex-proof transducers to the measuring equipment. While the transformer itself is ex-proof, it should always be mounted in none-explosive environment. The maximum cable length from the transducer via the transformer to the instrument is 100 m.

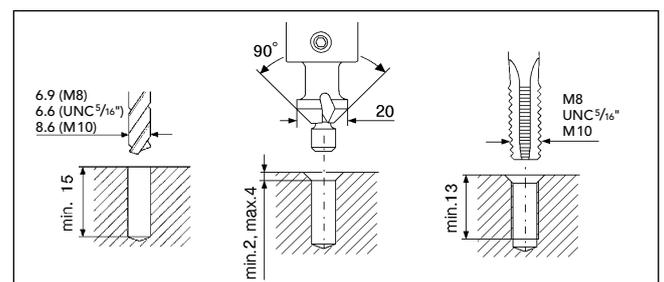
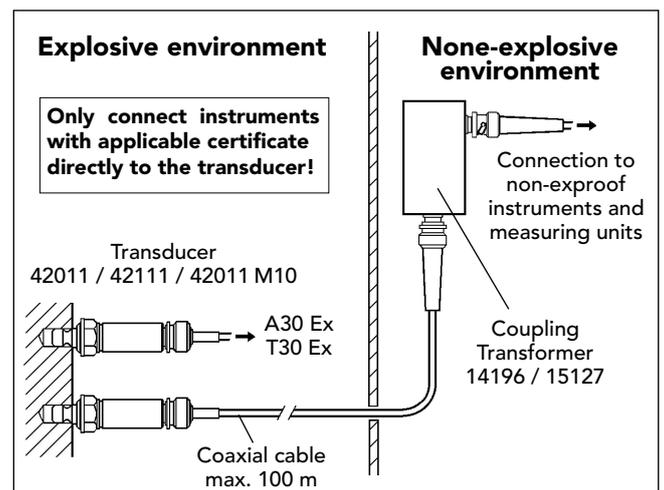


Technical data, transducer 42011 / 42111

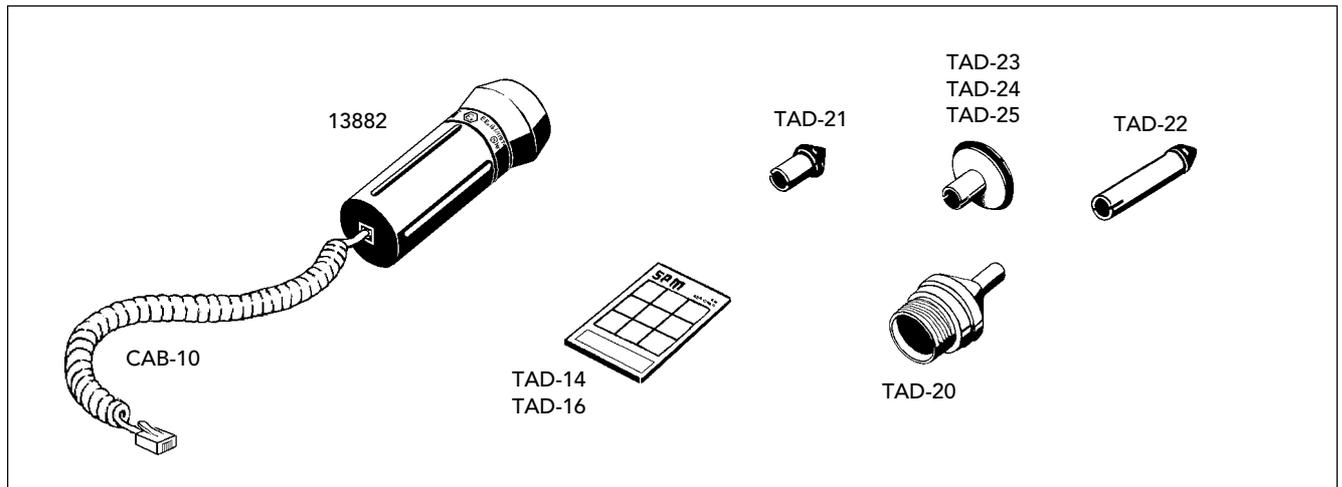
Certificate of conformity: NEMKO 03 ATEX 188X
 Ex certification: I M1/II 1 GD EEx ia I/IIC T4
 CE number: **CE** 0470
 Measuring range: Max. 80 dB_{SV}
 Temperature range: - 20° C to + 80° C
 External overpressure: Max. 0.7 MPa (7 bar)
 Design: Sealed, stainless acid proof steel, Sandvik Grade:1802, EN:1.4523,
 Connector tightness: IP65 with TNC connector
 IP 67 with conn. SPM13008
 Connector type: TNC
 Torque limit: 15 Nm

Technical data, transformer 14196 / 15127

Certificate of conformity: NEMKO 03 ATEX 188X
 Ex certification: I (M1)/II (1) GD [EEx ia] I/IIC
 CE number: **CE** 0470
 Um: 250 V
 Temperature range: - 20° C to + 55° C
 Design: Fenylen oxide plastic, epoxy resin, sealed
 Connector type: TNC to transducer,
 BNC to instrument



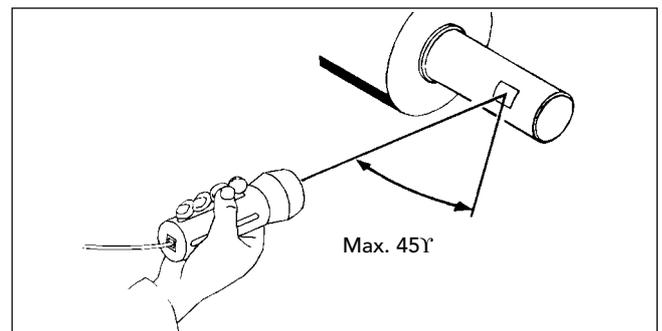
Tachometer Probe 13882



The Tachometer Probe 13882 is used together with hand-held instruments, e.g. Analyzer A30Ex/Tester T30Ex for optical measurement of the rate of rotation and for contact measurement of as well the rate of rotation as the peripheral speed. This equipment is also permitted to be used in atmosphere with a potential risk for explosions.

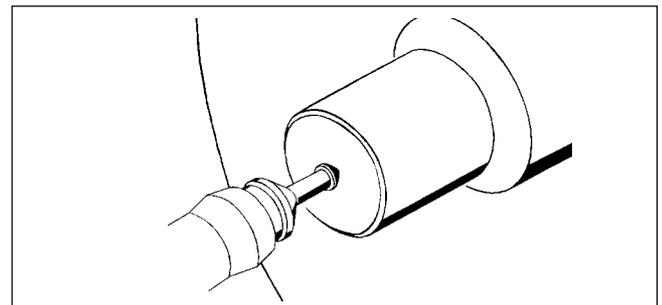
Optical Measurement of the Rate of Rotation

A light beam is directed against a reflecting tape on the rotating object, from a distance of max. 0.3 m and from an angle of max. 45°.



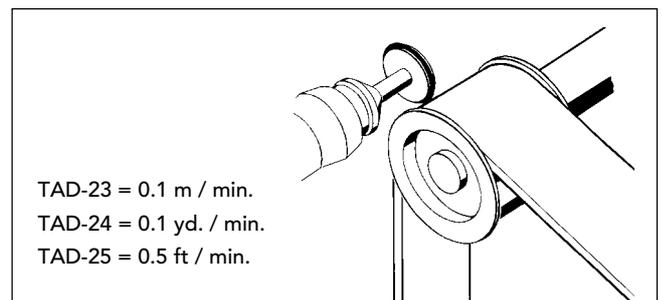
Contact Measurement of rpm

The contact adapter TAD-20 with a rubber tipped contact centre, TAD-21/22, is screwed onto the tachometer probe and then held against the centre of a shaft end or a wheel.



Contact Measurement of Peripheral Speed

The contact adapter TAD-20 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-23, divide result by 10

Yards per minute – use TAD-24, divide result by 10

Feet per minute – use TAD-25, divide result by 2.

Part Numbers

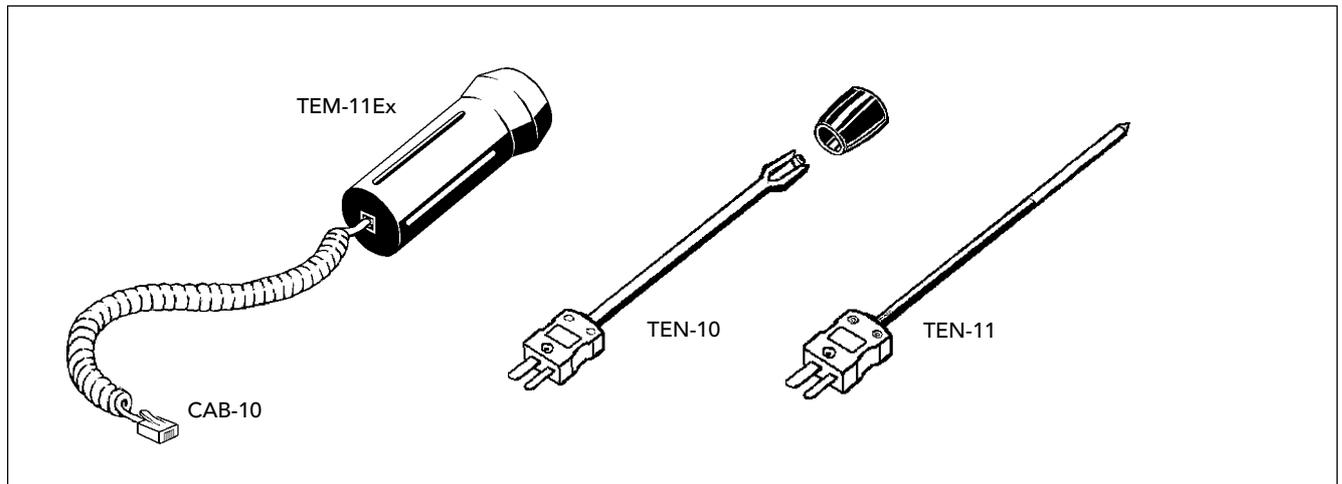
13882	Tachometer probe with cable
CAB-10	Spiral cable
TAD-20	Contact adapter
TAD-21	Contact centre, rpm, short
TAD-22	Contact centre, rpm, long
TAD-23	Contact wheel, meter/min.
TAD-24	Contact wheel, yards/min.
TAD-25	Contact wheel, feet/min.
TAD-14	Reflecting tape, pad of 5 sheets
TAD-16	Reflecting tape for thin shafts, 5 sheets

Technical Data

Certificate of conformity:	NEMKO 03 ATEX 185
Ex certification:	I M2/II 2 G EEx ib I/IIB T4
CE number:	CE 0470
Measuring range:	max. 19 999 rpm optical
Measuring distance:	max. 0.3 m (1 ft.)
Dimensions, 13882:	171 x ø 42 mm
Temperature range	0 to +50°C (32 to 120°F)



Temperature Probe TEM-11Ex



The Temperature Probe TEM-11Ex is used together with SPM's handheld instruments of types Analyzer A30Ex and Tester T30Ex for measurement and recording of temperatures, also in environment with risk for explosion.

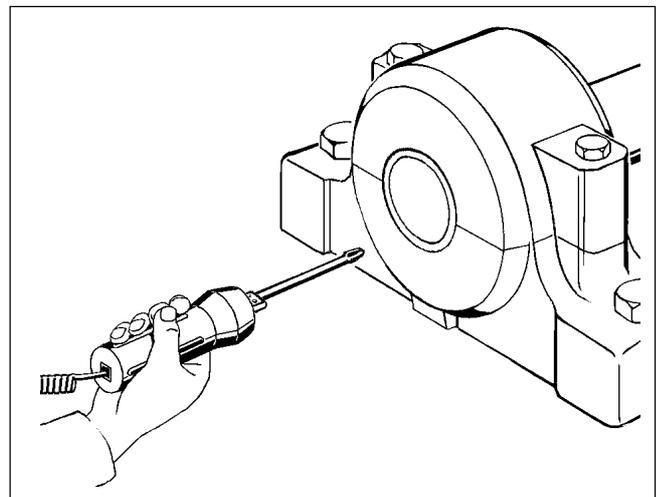
Connection of probe and probe tips

The probe, TEM-11Ex, is connected via its spiral cable, CAB-10, to the EXT connector of the instrument. This connector is also used for computer and tachometer probe. The TEMP menu turns up on the instrument as soon as the temperature probe is connected. It is also power supplied by the instrument. See further on in the instrument manual.

Two probe tips belong to TEM-11Ex:

- TEN-10 for measuring surface temperature on solids
- TEN-11 for measuring temperatures of liquids

When using a probe tip its connector is input into the front socket of the probe.



Temperature measurement

- connect TEM-11Ex to the instrument
- input the desired probe tip
- remove the protective cap (TEN-10)
- the instrument is set for temperature measurement
- press the probe tip carefully against the component surface alternatively into the liquid
- keep the M button depressed until a reading value appears on the screen.

Handling

Handle and store the probe tips with care. The protective cap of the TEN-10 should always be kept on when not in use.

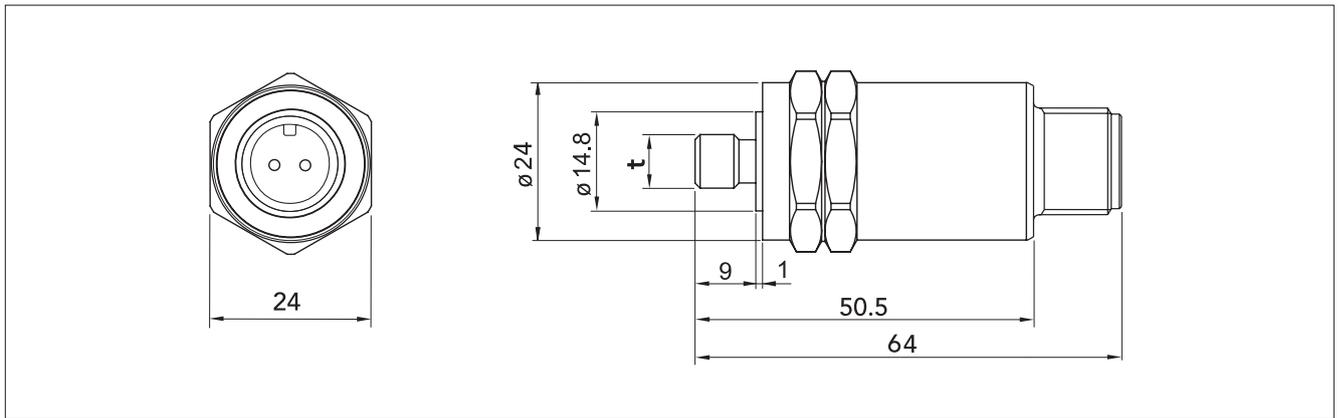
Ordering numbers

TEM-11Ex	Temperature probe with cable
CAB-10	Spiral cable
TEN-10	Probe tip for surface temperature of solids
TEN-11	Probe tip for temperature of liquids

Technical specifications

Certificate of conformity:	NEMKO 03 ATEX 185
Ex certification:	I M2/II 2 G EEx ib I/IIB T4
CE number:	CE 0470
Ta:	0 to +50 °C (+32 to +120 °F)
Measuring range:	0 to +300 °C (+32 to +572 °F)
Max. offset:	± 5 °C (± 9 °F)
Measuring uncertainty	± 1 °C
Sensitivity	10 mV/°C
Output range	0 to 3 V DC
Power supply	+5 V DC
Measuring time:	approx 1 minute
Dimensions, TEM-11Ex:	ø 42 x 118 mm
TEN-10:	length 122 mm (with cap)
TEN-11:	length 159 mm
Weight, TEM-11Ex:	94 g





The vibration transducers series SLD200 are piezo-electric accelerometers of compression type with built-in electronics, designed for vibration monitoring of industrial machines inside the area with potentially explosive atmosphere. They must be connected to Transducer Interface SPM 15226 or an Ex proof zener barrier when connected to an external measuring device. The barrier should always be mounted in none-explosive environment. The electrical signal is isolated from the transducer housing. The transducer is mounted against a smooth, flat surface on the machine.

Technical data

Certificate of conformity: Nemko 05ATEX1179

Ex certification: I M1/II 1GD T 112°C EEx ia I/IIC T4
 U_i: 28 V, I_i: 93 mA, P_i: 0.66 W, C_i: 54 nF,
 L_i: 10 μH

CE number: **CE** 0470

Transducer type: Piezo-electric accelerometer of compression type with built-in electronics

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)

Temperature range: -40° to +100° C (-40° to 210° F)

Power requirements: 24 V, 2 to 5 mA

Connector type: SPM 15168 NEMKO 05ATEX1179 (for Group II category 1G, see CENELEC EN 50284 4.4.1). Not recommended for Group I.
 2 pin MIL style type aluminium (for Group II category 1G, see CENELEC EN 50284 4.3.1). Not recommended for Group I.

Casing: Stainless acid proof steel

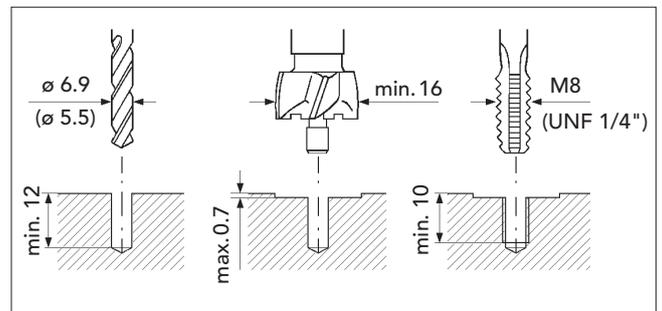
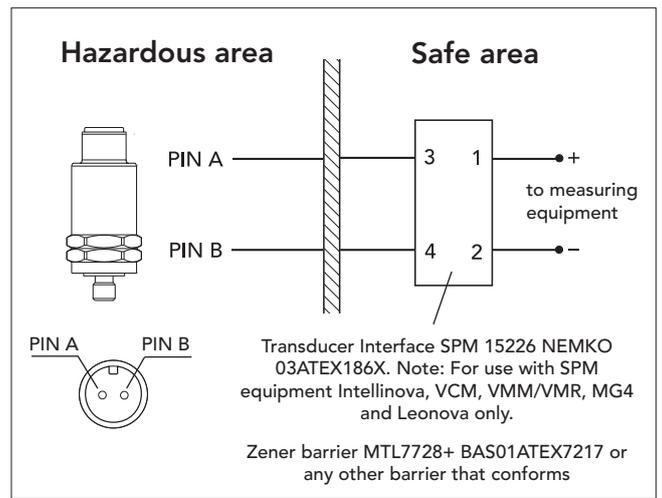
Sealing: IP 67

Torque limit: 10 Nm (7.4 lbf-ft)

Weight: 115 grams (4 oz)

Cable capacitance: Group IIA max 2.09 μF, Group IIB max 596 nF, Group IIC max 29 nF

Cable length: IIC max 100 m (328 ft) (cable capacitance 210 pF/m)



Article number	Thread (t)	Sensitivity *
SLD 243B	M8	5 mV/m/s ² = 50 mV/g
SLD 243F	UNF 1/4"	5 mV/m/s ² = 50 mV/g
SLD 244B	M8	10 mV/m/s ² = 100 mV/g
SLD 244F	UNF 1/4"	10 mV/m/s ² = 100 mV/g

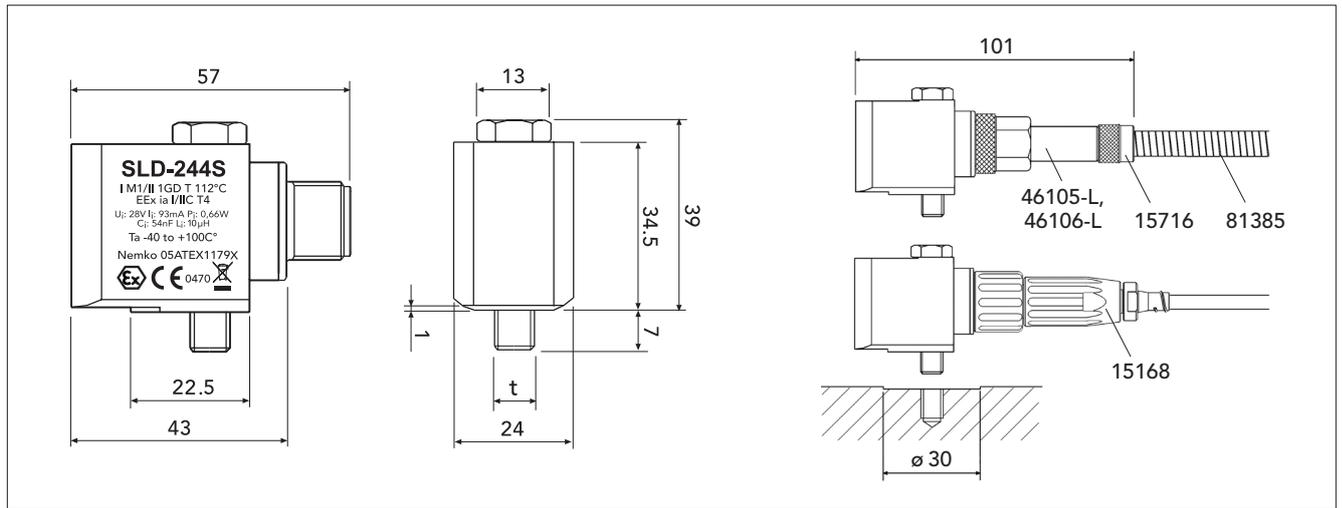
* Individual value given on the calibration chart.

Mounting tools

- 81027 Holder for counterbore
- 81030 Pilot for UNF 1/4"
- 81031 Pilot for M8
- 81057 Counterbore, diameter 20 mm

To drill the mounting hole, use drill bit 6.9 mm (M8) or 5.5 mm (UNF 1/4"). Torque the transducer with a torque wrench and a 24 mm socket.

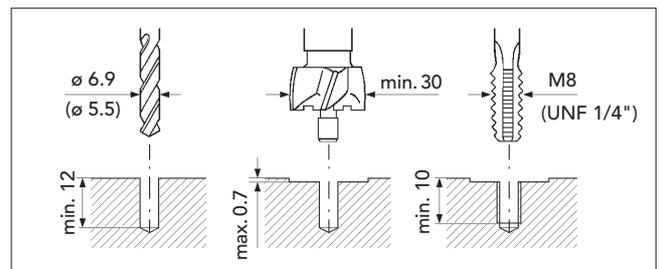
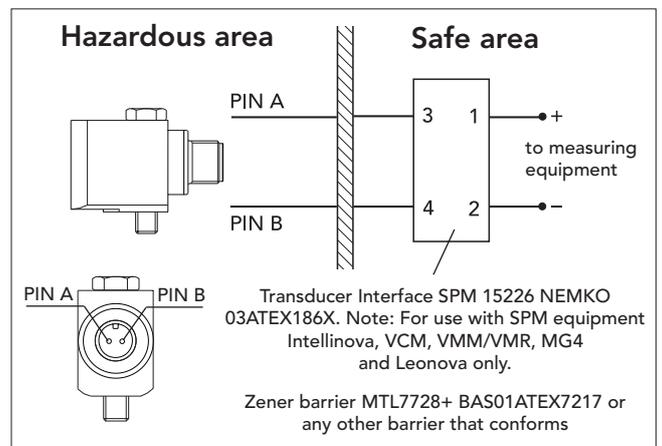
Vibration Transducers with Side Entry, SLD 244S



The vibration transducers series SLD244S are piezo-electric accelerometers of compression type with side entry and built-in electronics, designed for vibration monitoring of industrial machines inside the area with potentially explosive atmosphere. They must be connected to Transducer Interface SPM 15226 or an Ex proof zener barrier when connected to an external measuring device. The barrier should always be mounted in none-explosive environment. The electrical signal is isolated from the transducer housing. The transducer is mounted against a smooth, flat surface on the machine.

Technical data

Certificate of conformity: Nemko 05ATEX1179X
 Ex certification: I M1/II 1GD T 112°C EEx ia I/IC T4U_i; 28V, I_i: 93 mA, P_i: 0.66 W, C_i: 54 nF, L_i: 10 µH
 CE number: **CE** 0470
 Transducer type: Piezo-electric accelerometer of compression type with built-in electronics
 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)
 Temperature range: -40° to +100° C (-40° to 210° F)
 Power requirements: 24 V, 2 to 5 mA
 Connector type: SPM 15168 NEMKO 05ATEX1179X (for Group II category 1G, see CENELEC EN 50284 4.4.1). Not recommended for Group I. The connector should not be exposed to flow of non-conductive media and hazardous electrostatic charging is avoided.
 SPM 46105-L/46106-L NEMKO 05ATEX1179X (for Group II category 1G, see CENELEC EN 50284 4.4.1). Recommended for Group I.
 Casing: Stainless acid proof steel
 Sealing: IP 67 together with appropriate connector
 Isolation: Case isolated, > 1 Mohm
 Torque limit: 10 Nm (7.4 lbf-ft)
 Weight: 200 grams (7 oz)



Article number	Name	Thread (t)
SLD 244S	Vibration transducer	M8
SLD244S-UNF	Vibration transducer	UNF 1/4"-28

Cable capacitance: Group IIA max 2.09 µF, Group IIB max 596 nF, Group IIC max 29 nF
 Cable length: IIC max 100 m (328 ft) (cable capacitance 210 pF/m)

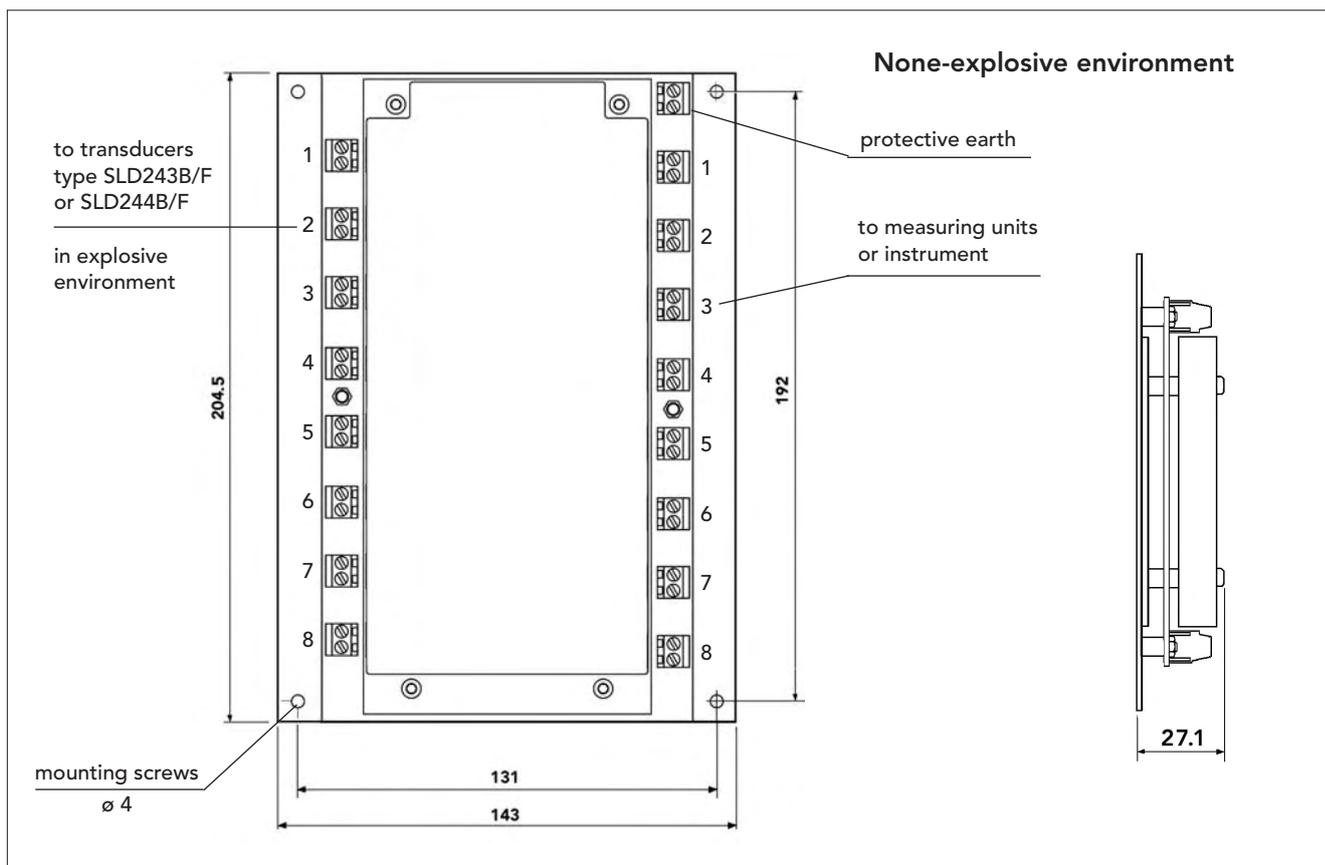
* Individual value given on the calibration chart.

Mounting tools

- 81393 Holder for counterbore
- 81394 Pilot for UNF 1/4"
- 81395 Pilot for M8
- 81396 Counterbore, diameter 30 mm



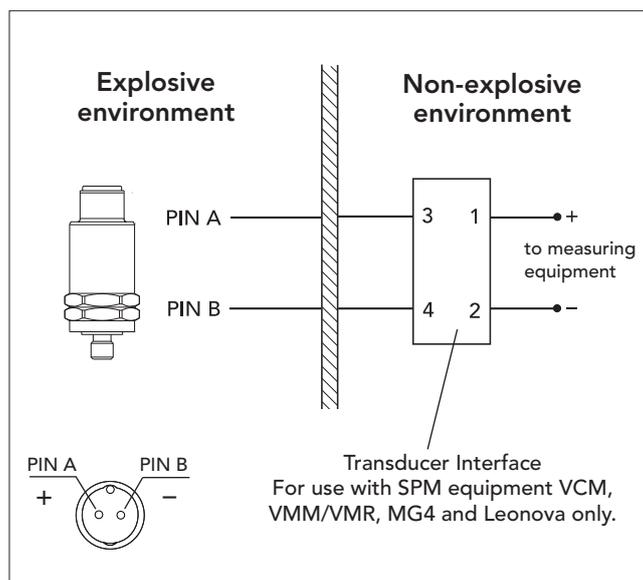
Vibration Transducer Interface 15226



The transducer interface 15226 is a 8 channel interface for mounting in non-hazardous area and connected to the certified intrinsically safe vibration transducers SLD243B/F or SLD244B/F (Nemko 05ATEX1179).

The transducer interface separates the intrinsically safe vibration transducers, which can be installed in potentially explosive atmosphere, and various SPM vibration measuring devices such as Leonova, VCM, VMM/VMR and MG4. The interface and the measuring devices must be installed in a non-explosive environment.

The interfaces do not have a complete enclosure and need to be mounted in a box or cabinet with a degree of protection appropriate for the environmental conditions but at least IP20. The intrinsically safe terminals shall be separated from other electrical circuits in the enclosure with at least 50 mm.



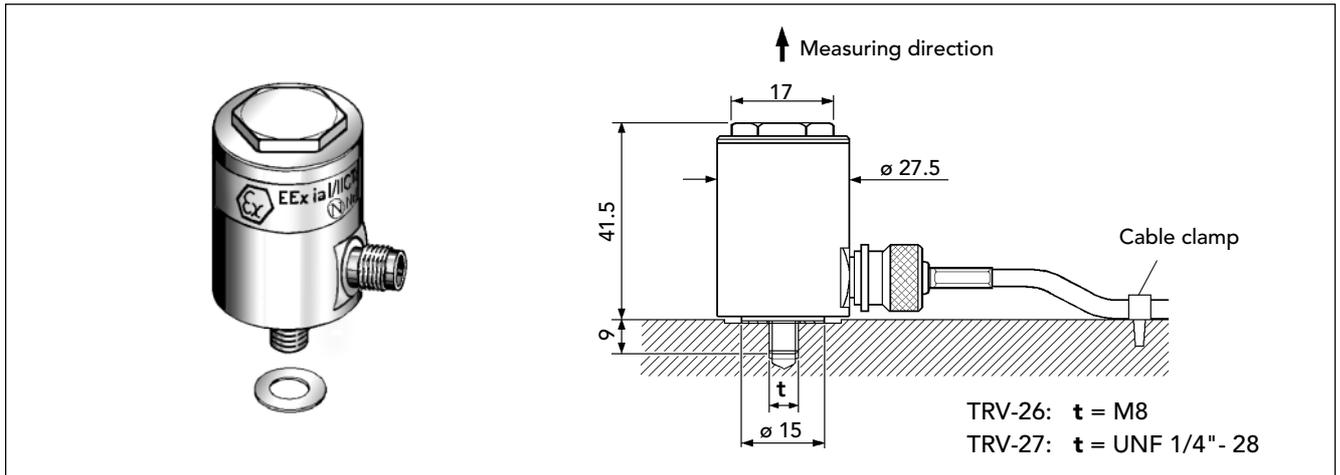
Technical data

Certificate of conformity: NEMKO 03 ATEX 186X
 Ex certification: I (M1)/II (1) GD [EEx ia] I/II C
 CE number: **CE** 0470
 Um: 250 V
 Channels: 8
 Transducer type: SLD243B/F, SLD244B/F
 Temperature range: -20° to 70° C (68° to 158° F)
 Dimensions: 204.5 x 143 x 27.1 mm

Output parameters: $U_o = 27.15 \text{ V}$
 $I_o = 90.5 \text{ mA}$
 $P_o = 0.615 \text{ W}$
 $C_o = 89 \text{ nF (IIC)}$
 $L_o = 4.5 \text{ mH (IIC)}$
 $L_o/R_o = 57.9 \mu\text{H}/\Omega \text{ (IIC)}$



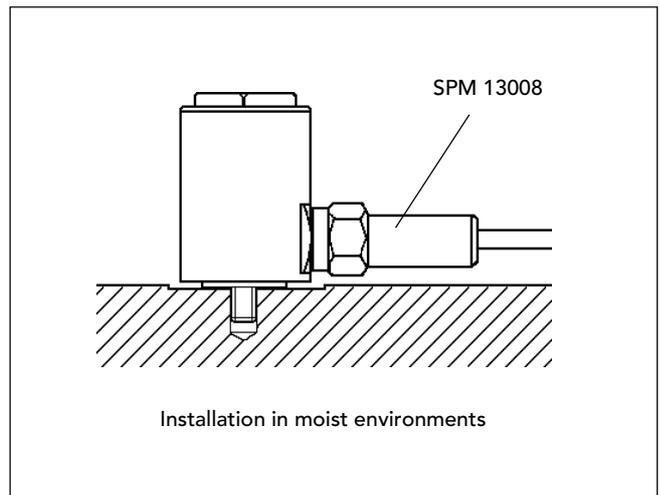
Vibration Transducer TRV-26 / 27



The transducers TRV-26 and TRV-27 are piezo-electric accelerometers of compression type, designed for vibration monitoring of industrial machinery. Intended for use with the handheld instruments Tester T30Ex and Analyzer A30Ex in potentially explosive atmosphere.

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 (SPM 90176-L or 90292-L) with TNC connector with a clamp close to the transducer.

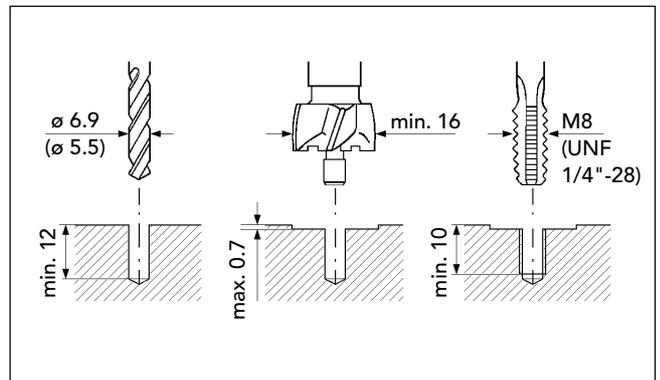
For installations in moist environments, use sealing TNC cable plugs SPM 13008 to prevent cable corrosion.



Technical data

Certificate of conformity:	NEMKO 03 ATEX 185
Ex certification:	I M2/II 2 G EEx ib I/II B T4
CE number:	CE 0470
Nominal sensitivity, main axis:	10 pC/m/s ² (7-12 pC/m/s ²) *
Transverse sensitivity:	max. 10%
Typical base strain sensitivity:	0.01 m/s ² /∞ strain
Linear frequency range:	0 to 5000 Hz
Max. peak acceleration:	600 m/s ²
Temperature range:	0°C to +50°C (+32°F to +120°F)
Typical temperature drift:	0.25% / °C
Casing:	Stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Design:	Sealed
Connector tightness:	IP 65 with TNC connector IP 67 with conn. SPM 13008
Weight:	171 grams (6 oz)
Connector type:	TNC
Torque limit:	10 Nm (7.4 lbf/ ft)

* Individual value given on the calibration chart.



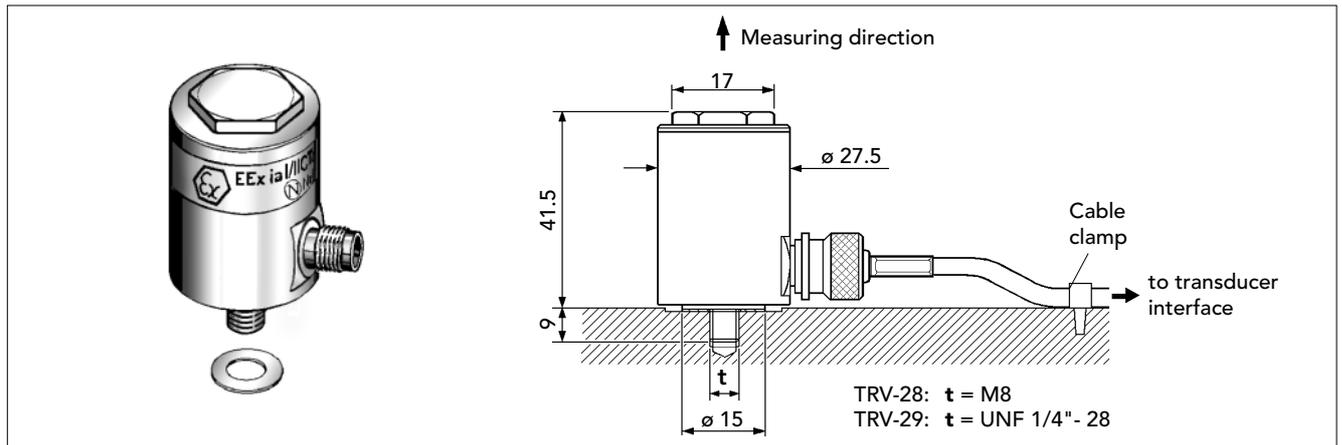
To drill the mounting hole, use drill bit 6.9 mm (M8) or 5.5 mm (UNF 1/4"-28). Torque and unscrew the transducer with a torque wrench and a 17 mm socket (SPM 81086).

Part Numbers

TRV-26	Vibration transducer, M 8
TRV-27	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" (TRV-27)
81031	Pilot for M8 (TRV-26)



Vibration Transducer TRV-28/29



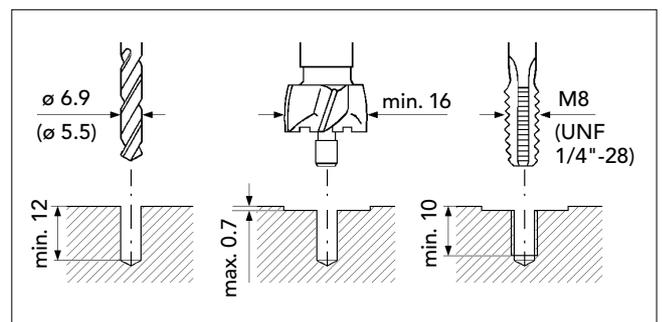
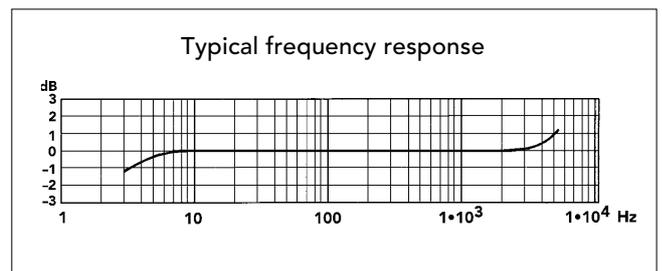
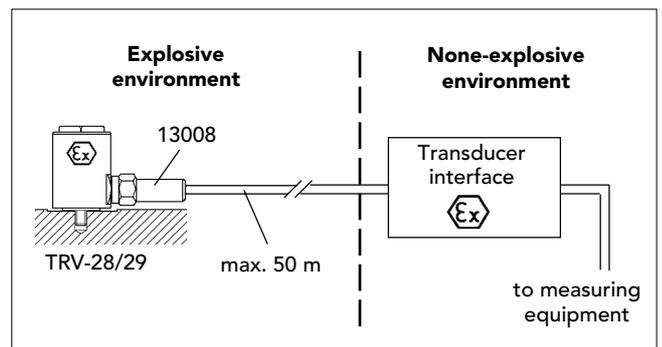
The transducers TRV-28 and TRV-29 are piezo-electric accelerometers of compression type with built-in pre-amplifier, designed for vibration monitoring of industrial machinery inside the area with potentially explosive atmosphere. It must be used together with transducer interface SPM 14423, 14424 or 14540 when connected to an external measuring unit. The transducer interface should always be mounted in none-explosive environment. The cable length between transducer and measuring unit via the interface is max. 50 m.

The transducer is mounted against a smooth, flat surface on the machine. 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.

Technical data

Certificate of conformity:	NEMKO 03 ATEX 187X
Ex certification:	I M1/II 1GD EEx ia I/II C T4
CE number:	CE 0470
Nominal sensitivity, main axis:	3 mV/mm/s *
Transverse sensitivity:	max. 10%
Typical base strain sensitivity:	0.01 m/s ² /∞ strain
Linear frequency range:	3 to 5000 Hz
Max. peak acceleration:	600 m/s ²
Temperature range:	-20°C to +100°C (-4°F to +210°F)
Housing, base:	Stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Design:	sealed
Connector tightness:	IP 65 with TNC connector IP 67 with conn. SPM 13008
Connector type:	TNC
Weight:	171 grams (6 oz)
Torque limit:	10 Nm (7.4 lbf · ft)
Cable length:	max. 50 m (165 ft)

* Individual value given on the calibration chart.



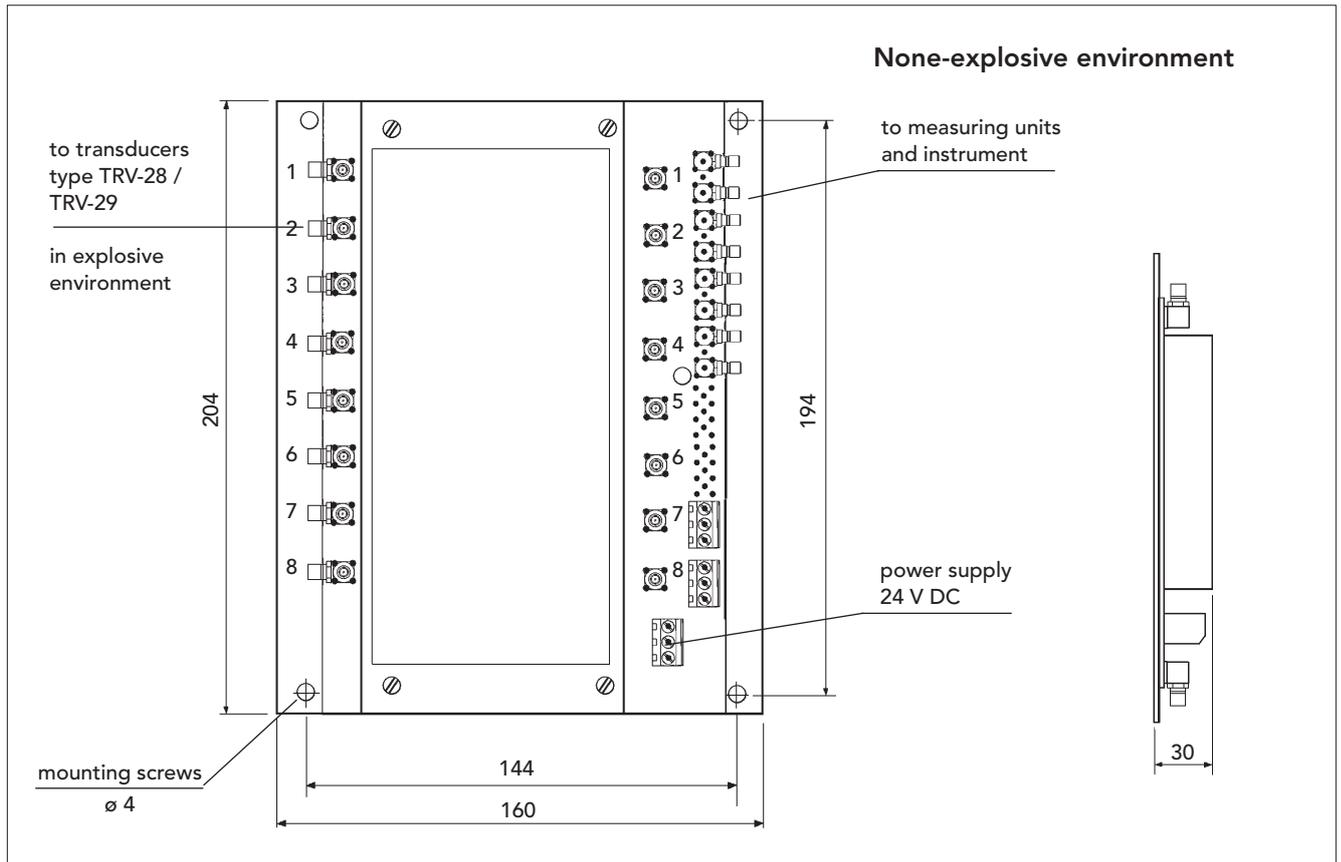
To drill the mounting hole, use drill bit 6.9 mm (M8) or 5.5 mm (UNF 1/4"-28). Torque and unscrew the transducer with a torque wrench and a 17 mm socket (SPM 81086).

Part Numbers

TRV-28	Vibration transducer Ex, M 8
TRV-29	Vibration transducer Ex, UNF 1/4"-28
13008	Sealing TNC cable plug
81027	Holder for counterbore
81057	Counterbore, diam. 20 mm
81030	Pilot for UNF 1/4" (TRV-29)
81031	Pilot for M8 (TRV-28)



Vibration Transducer Interface 14424



The transducer interface 14424 is a 8 channel interface for mounting in non-hazardous area and connected to the certified intrinsically safe vibration transducers TRV-28 and TRV-29. The transducers are connected via coaxial cables with SMB connectors.

The transducer interface provides a galvanically separated connection between the intrinsically safe vibration transducer, which can be installed in potentially explosive atmosphere, and various SPM vibration measuring devices. The interface and the measuring devices must be installed in a non-explosive environment. Transducer and interface are connected to a common equipotential ground circuit.

The transducer measures vibration velocity and outputs a voltage, nominally 3.3 mV/mm/s. This signal is converted into three different outputs: mV/m/s² for Intellinova and VCM measuring units, μ A/mm/s for VMS measuring units, and pC/m/s² for MG4 and portable instruments.

The transducer interface is available in three versions with different connector configuration for the measuring devices.

The interfaces do not have a complete enclosure and need to be mounted in a box or cabinet with a degree of protection appropriate for the environmental conditions but at least IP20.

Technical data

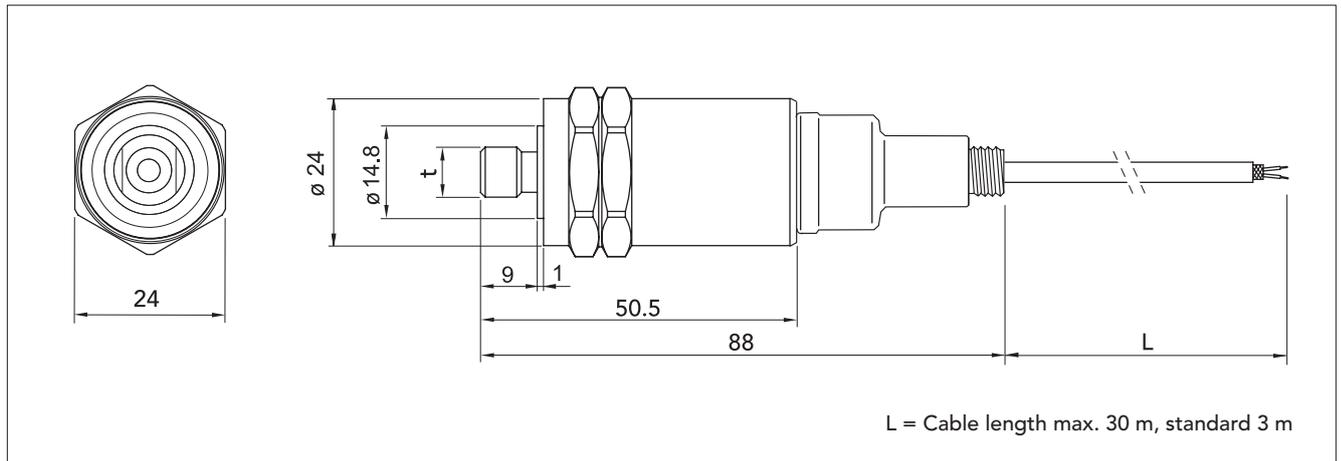
Certificate of conformity:	NEMKO 03 ATEX 186X
Ex certification:	I (M1)/II (1) GD [Ex ia] I/II C
CE number:	CE 0470
Um:	250 V
Channels:	8
Transducer type:	TRV-28, TRV-29
Power supply:	24 V DC ($\pm 10\%$ according to EN 50082-2)
Supply current:	max. 40 mA
Temperature range:	-20° C to +70° C
Dimensions:	204 x 160 x 30 mm

Ordering number / connector type (output signal):

- 14424 A: SMB connectors for Intellinova/VCM (mV/m/s²) and portable instruments (pC/m/s²)
- 14424 B: SMB connectors for VMS (μ A/mm/s) and portable instruments (pC/m/s²)
- 14424 C: Screw terminals for Intellinova/VCM (mV/m/s²) and VMS (μ A/mm/s), SMB for instruments (pC/m/s²)
- 14424: SMB connectors for MG4 (pC/m/s²) and portable instruments (pC/m/s²)

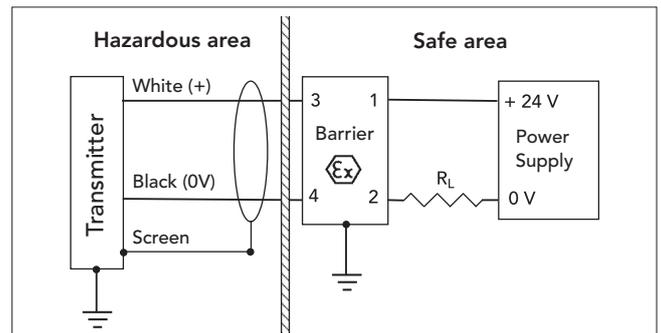


4-20 mA Vibration Transmitters, Ex



The intrinsically safe 4-20 mA vibration transmitters are piezo-electric accelerometers of compression type and 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 transmitters have an integrated cable (shielded, twisted pair) for connection to the measuring device. The connection must be made through a barrier mounted in the non-hazardous area.



Technical data

Certificate of conformity: Nemko 05ATEX1179

Ex certification: I M1/II 1GD EEx ia I/II B T4

Barrier: MTL7787 or any approved barrier with following safety description:
 $U_0=28V_{DC}$, $I_0=93 mA_{DC}$, $P_0=0,65W$

CE number: CE 0470

Output signal: 4 to 20 mA

Turn on time: < 60 seconds

Transverse sensitivity < 10%

Power requirements: 24 V DC

Loop resistance: R_L max. 300 Ω at 24 V DC

Casing material: stainless acid proof steel

Temperature range: -40° to 85° C (-40° to 185° F)

Sealing: IP 67

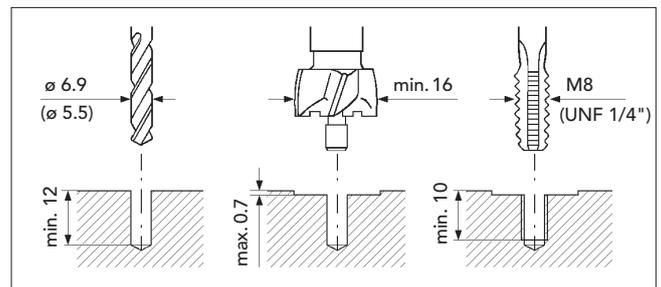
Isolation: case isolated

Integral cable: shielded twisted pair

Cable length: max. 30 m (98 ft),
standard 3 m (10 ft)

Torque limit: 10 Nm (7.4 lbf-ft)

Weight: 115 grams (4 oz)



Article number	Thread (t)	Measuring range	Frequency range
SLD823C	M8	0 - 25 mm/s	2-1000 Hz
SLD823G	UNF 1/4"	0 - 1 in/s	2-1000 Hz
SLD833C	M8	0 - 25 mm/s	10-1000 Hz
SLD833G	UNF 1/4"	0 - 1 in/s	10-1000 Hz

NB: Standard cable length is 3 meters, but optional lengths may be ordered (ex. SLDXXXX-L where L = length in meters, max. 30 m).

Mounting tools

81027 Holder for counterbore

81057 Counterbore, diameter 20 mm

81030 Pilot for UNF 1/4"-28

81031 Pilot for M8

To drill the mounting hole, use drill bit 6.9 mm (M8) or 5.5 mm (UNF1/4"-28). Torque the transmitter with a 24 mm torque wrench.

