Leonova® EMERALD

Technical data sheets 2019-03

Australian / New Zealand Distributor---------

Machinery Vibration Specialists Aust P/L

121 St. Johns Avenue GORDON NSW 2072

Ph: +61-2-9880-2422 Fx: +61-2-9880-2466

Em: mvsaust@ozemail.com.au

Web: www. MachineryVibrationSpecialists.com.au

SPM

Trademarks

CondID, Condmaster, DuoTech, EVAM, HD ENV, Intellinova, Leonova, Leonova Diamond, Leonova Emerald, SPM and SPM HD are trademarks of SPM Instrument AB.

All other trademarks are the property of their respective owners.

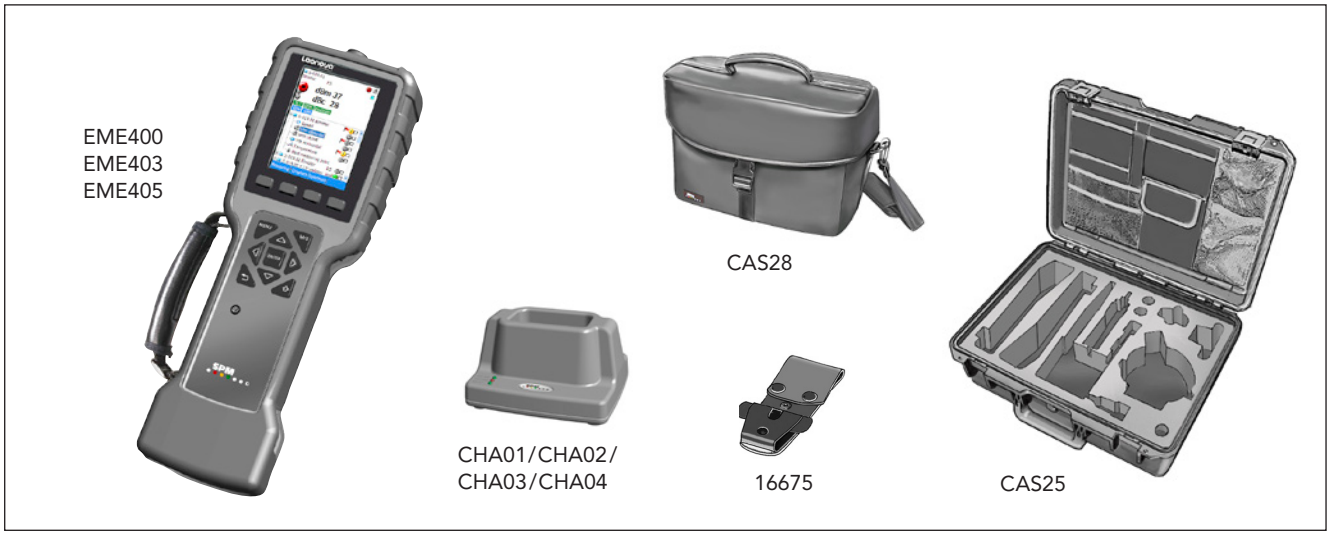
© Copyright SPM Instrument AB. ISO 9001 certified.

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

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data subject to change without notice.
ISO 9001 certified. © Copyright SPM 2019-03. Emerald B

Leonova Emerald® – Platform



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

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

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

Part numbers

EME400	Leonova Emerald, SPM HDm/HDc
EME403	Leonova Emerald, SPM LR/HR
EME405	Leonova Emerald, SPM HDm/HDc and LR/HR
16573	Optional battery pack
16644	Battery adapter unit
CHA01	Battery charger incl. AC adapter, Euro-plug
CHA02	Battery charger incl. AC adapter, UK-plug
CHA03	Battery charger incl. AC adapter, US-plug
CHA04	Battery charger incl. AC adapter, AU-plug
93484	Car charger cable 12V
CAB94	Communication cable, USB-miniUSB
16675	Belt clip, complete
16646	Shoulder strap
CAS25	Carrying case, plastic with foam insert 54x41x21 cm
CAS28	Carrying case, soft with modular insert 37x20x27 cm
81468	Code lock, TSA approved, for CAS25

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

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

Spare parts

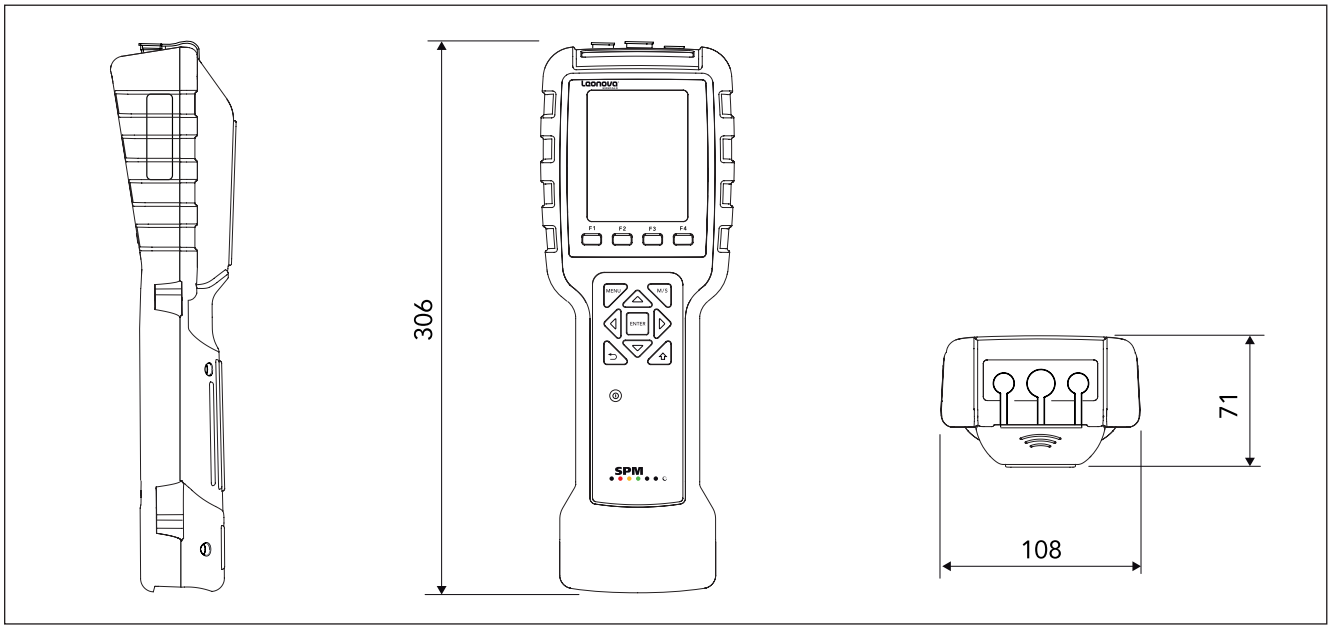
16686	Protection foil display
14661	Wrist strap
81469	Silica gel (moisture absorbent) for CAS25
90362	AC adapter, Euro-plug, 100-240 V AC
90380	AC adapter, UK-plug, 100-240 V AC
90379	AC adapter, US-plug, 100-240 V AC
90528	AC adapter, Australia plug, 100-240 V AC
16574	Battery charger
PRO52	Leonova Service Program
71971	Leonova Emerald User guide

Patents: DE#60304328.3 - US#7,054,761 - US#7,167,814 - US#7,200,519 - US#7,301,616 - US#7,313,484 US#7,324,919 - US#7,711,519 - US#7,774,166 - DE#60336383.0 - US#7,949,496 - DE#60337804.8 GB#1474662 - GB#1474663 - DE#60338365.3 - ZA#2011/04946 - SE#0951017-3 - DE#60341502.4 GB#1474659 - SE#1000631-0 - US#8,762,104 - US#8,812,265 - US#8,810,396 - CN#ZL200980155994.1 CN#ZL201080019737.8 - KZ#020791 - RU#020791 - AU#2009330744 - RU#021908 - KZ#021908 US#9,200,980 - US#9,213,671 - CN#ZL201180006321.7 - KZ#022630 - RU#022630 - US#9,279,715 US#9,304,033 - KZ#024339 - RU#024339 - CN#ZL201380007381.X - AU#2015203801 - AU#2013215672 RU#201491377 - CN#ZL201280034754 8 - US#6,873,931 - DE#602013021988.5 - DK/FI/FR/IT/NL/NO/ES/ GB#2810027 - SE#13744257.0 - AU# 2015203361 - RU# 027452 - GB# 2505984 - US# 9,772,219

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2017-11. TD-371 B Rev.0

Leonova Emerald® – Instrument specifications



Technical specifications

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

Output/input

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

Temperature measurement

Input:	TTP10 Tachometer/Temp. probe

Stethoscope

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

Vibration monitoring

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

Bearing monitoring

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

Tachometer input

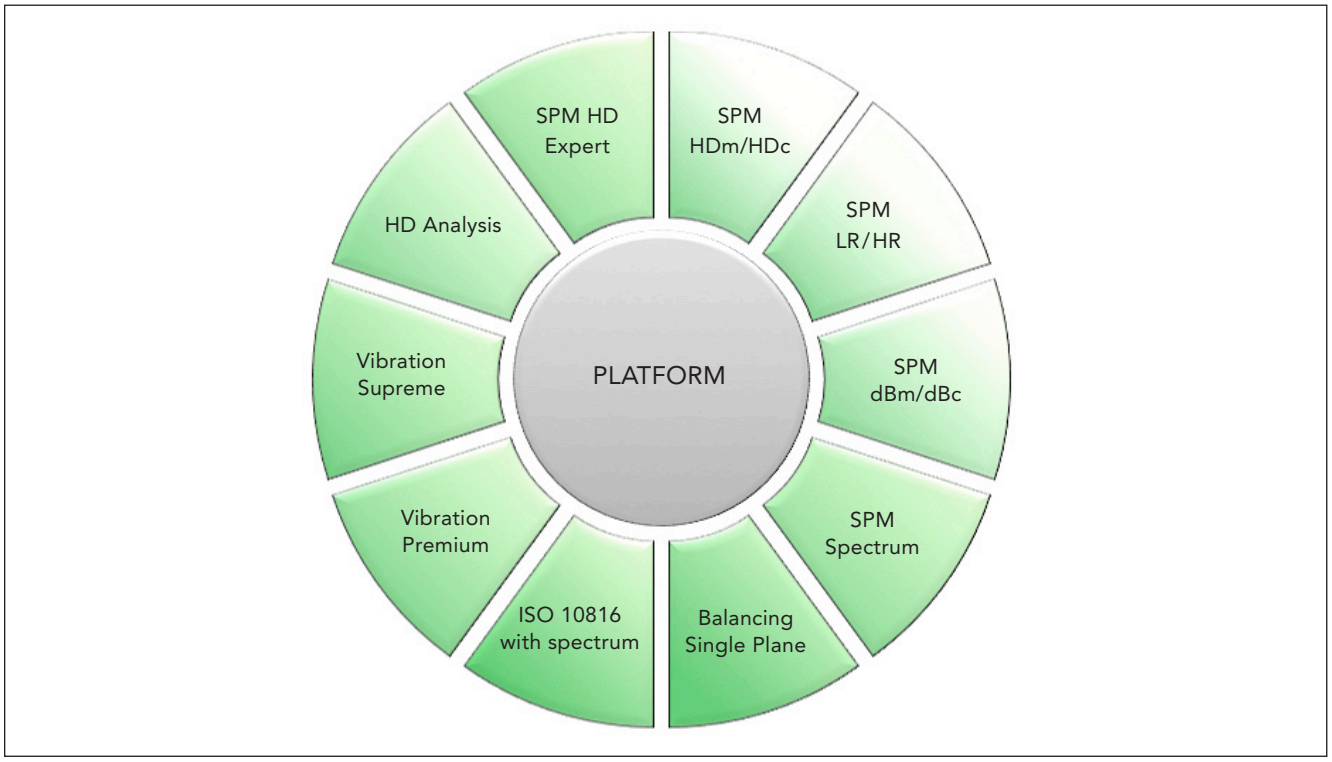
Measuring range:	1 to 150 000 PPM
Resolution:	1 pulse
Accuracy:	± (1 pulse + 0.01% of reading)
Transducer types:	SPM TTP10, TTL pulses, Keyphasor® and proximity switch NPN/PNP.
Output:	TTL output for stroboscope and 12 VDC

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

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 225 00 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2017-11. TD-373 B Rev.0

Leonova Emerald® – User selected functions



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

Platform

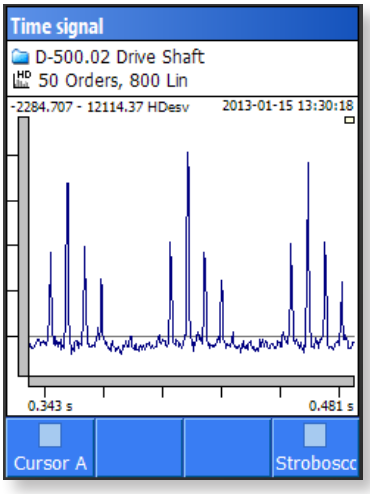
- SPM HDm/HDc and/or SPM LR/HR
- RMS vibration, ISO 2372
- Speed measurement
- Temperature measurement
- Stethoscope function
- Measuring point identification with CondID® memory tags
- Recording
- Manual recording, free quantity
- Check points, free text
- Recording of vocal comments
- Supports up to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

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

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 225 00 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. ©Copyright SPM 2015-11. TD-375 B Rev.0

Leonova Emerald® – Shock pulse measurement, SPM HD®



The signal

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

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

Shock pulse amplitude is due to three basic factors:

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

Input data

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

Technical data

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

Output data

HDm/HDc (part of platform)

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

Time Signal HD (part of EME195)

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

SPM Spectrum HD (part of EME195)

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

High Definition Order Tracking (part of EME195)

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

Evaluation

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

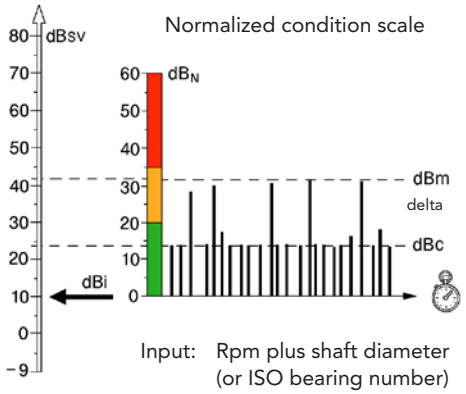
Part numbers

EME195 Shock pulse method SPM HD, Expert unlimited use

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. ©Copyright SPM 2013-01. TD-435 B Rev.0

Leonova Emerald® – Shock pulse measurement, dBm/dBc



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

The signal

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

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

Measurement

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

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

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

Shock pulse amplitude is due to three basic factors:

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

Input data

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

Evaluation

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

Technical specifications

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

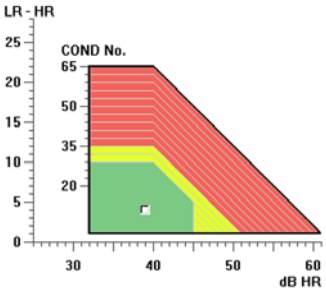
Part numbers

EME130 Shock pulse method dBm/dBc, unlimited use

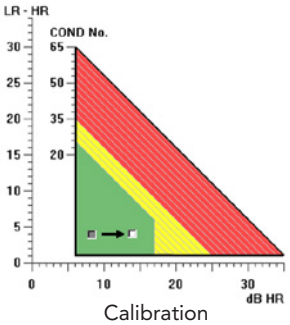
SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. ©Copyright SPM 2013-01. TD-440 B Rev.0

Leonova Emerald® – Shock pulse measurement, LR/HR



Evaluation boxes determined by bearing geometry and speed



Calibration

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

Signal and measurement

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

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

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

Input data

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

Evaluation

After measurement Leonova returns

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

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

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

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

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

Calibration

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

Technical specifications

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

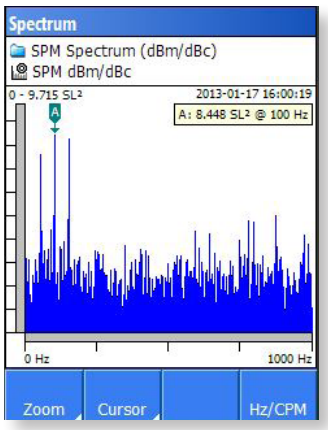
Part numbers

EME131 Shock pulse method LR/HR, unlimited use

SPM
SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. ©Copyright SPM 2013-01. TD-436 B Rev.0

Leonova Emerald® – SPM Spectrum



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

Signal and measurement

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

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

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

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

Input data

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

Evaluation

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

Technical specifications

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

Part numbers

EME132 SPM Spectrum, unlimited use

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2013-01. TD-441 B Rev.0

Leonova Emerald® – HD ENV

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

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

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

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

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

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

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

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

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

Technical specifications

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

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

Part numbers

EME199	HD ENV, unlimited use**

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

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2015-11. TD-512 B Rev.0

Leonova Emerald® – HD Analysis

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

HD ENV

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

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

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

SPM HD

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

The SPM HD method produces four different types of results:

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

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

Patented algorithms

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

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

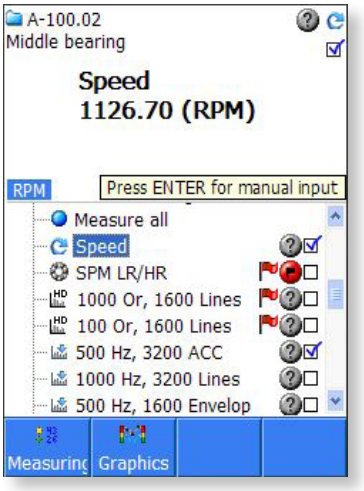
Part numbers

EME140 HD Analysis

SPM Instrument AB • Box 504 • S-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2015-11. TD-515 B Rev.0

Leonova Emerald® – Recording function



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

Leonova has three channels on three separate connectors, for:

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

Simultaneous measurement can be done on up to two channels.

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

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

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

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

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

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

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

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. ©Copyright SPM 2013-01. TD-444 B Rev.0

Leonova Emerald® – Vibration ISO 2372

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

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

The features are:

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

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

Technical specifications

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

* Integral Electronic PiezoElectric

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2013-01. TD-446 B Rev.0

Leonova Emerald® – Vibration ISO 10816 with spectrum

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

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

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

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

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

Features of ISO 10816 are:

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

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

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

Technical specifications

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

* Integral Electronic PiezoElectric

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

Part numbers

EME133 Vibration ISO10816 with spectrum, unlimited use

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2013-01. TD-442 B Rev.0

Leonova Emerald® – Vibration Premium

The effect of order tracking

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

High Definition Order Tracking

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

FFT with Symptoms

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

This function generates three sets of machine condition data:

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

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

HD ENV

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

Time signal

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

Post trigger

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

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

The package consists of:

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

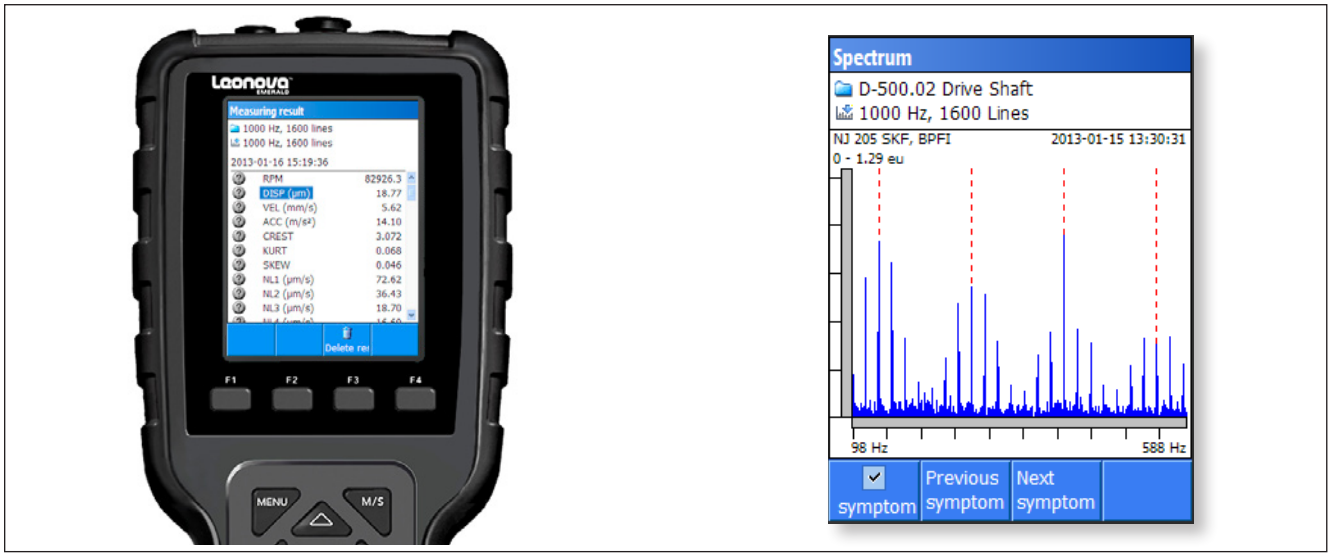
Part numbers

EME134 Vibration Premium

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 225 00 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. ©Copyright SPM 2015-11. TD-366 B Rev.0

Leonova Emerald® – Vibration Supreme



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

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

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

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

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

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

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

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

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

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

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

The package consists of:

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

Part numbers
EME193 Vibration Supreme

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. ©Copyright SPM 2015-11. TD-445 B Rev.0

Leonova Emerald® – FFT spectrum with symptoms

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

This function generates three sets of machine condition data:

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

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

Condition parameters

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

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

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

Spectrum analysis with 'symptoms'

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

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

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

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

Technical specifications

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

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

Part numbers

EME134 Vibration Premium

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 225 00 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. ©Copyright SPM 2013-08. TD-367 B Rev.0

Leonova Emerald® – EVAM evaluated vibration analysis

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

The EVAM method generates three sets of machine condition data:

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

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

Condition parameters

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

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

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

Spectrum analysis with 'symptoms'

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

Machine specific condition codes

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

Technical specifications

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

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2013-08. TD-438 B Rev.0

Leonova Emerald® – High Definition Order Tracking

The effect of order tracking

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

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

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

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

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

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

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

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

SPM

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. ©Copyright SPM 2015-05. TD-439 B Rev.0

Leonova Emerald® – Balancing

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

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

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

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

Leonova calculates a number of alternatives for correcting the unbalance:

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

Part numbers

EME109 Balancing, single plane, unlimited use

SPM
SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. ©Copyright SPM 2013-01. TD-443 B Rev.0

Leonova Emerald® – Services

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

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

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

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

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

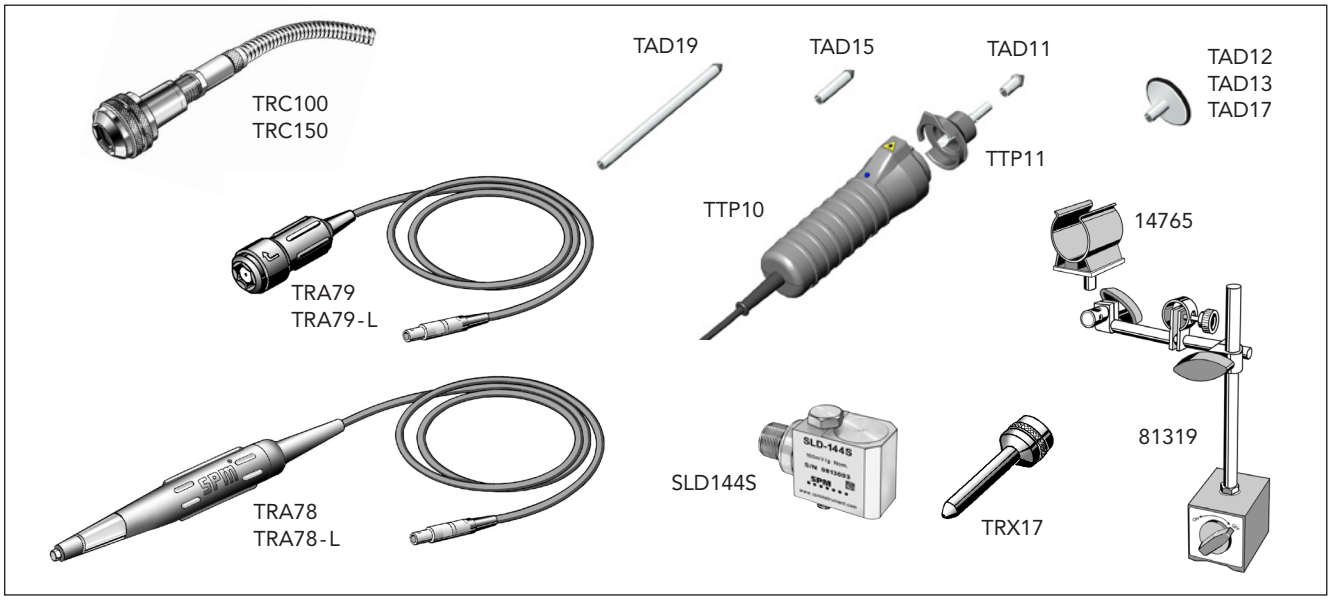
Part numbers

PRO52 Leonova Service Program

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2013-02. TD-437 B Rev.0

Leonova Diamond®/Emerald® – Transducers and measuring cables



Shock pulse monitoring

CAB80	Measuring cable, mini coax - BNC slip on, 1.5 m
CAB81	Measuring cable, mini coax - BNC 1.5 m
CAB101	Measuring cable, mini coax - TNC, 1.5 m
TRA78	Shock pulse transducer with probe, cable length 1.5 m (TD-400)
TRA78-L	Shock pulse transducer with probe, L=cable length, max. 20 m (TD-400)
TRA79	Shock pulse transducer with quick connector for measuring adapters, cable length 1.5 m (TD-410)
TRA79-L	Shock pulse transducer with quick connector for adapters, L=cable length, max. 20 m (TD-410)
EAR12	Headphones with headband (TD-404)
EAR13	Headpones with helmet brackets (TD-404)
EAR15	Headphones with neckband (TD-404)
EAR16	Headset with headband (TD-382)
EAR17	Headset with helmet brackets (TD-382)
EAR18	Headset with neckband (TD-382)
EAS11	Hygiene set for headset and headphones

Vibration monitoring

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

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

Current and voltage monitoring

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

Speed and temperature monitoring

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

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

Balancing

81319	Magnetic base
14765	Holder for tachometer probe TTP10

Spare parts

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

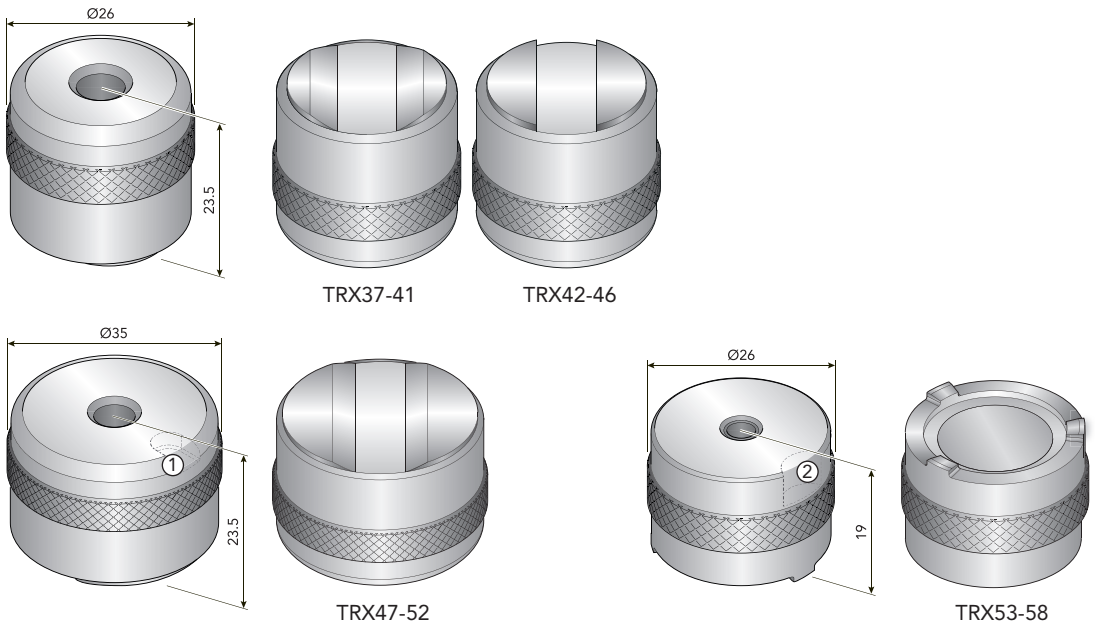
Others

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

SPM Instrument AB • Box 504 • S-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2019-02. TD-377 B Rev.1

Magnetic mounting bases



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

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

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

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

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

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

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

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

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

Technical specifications

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

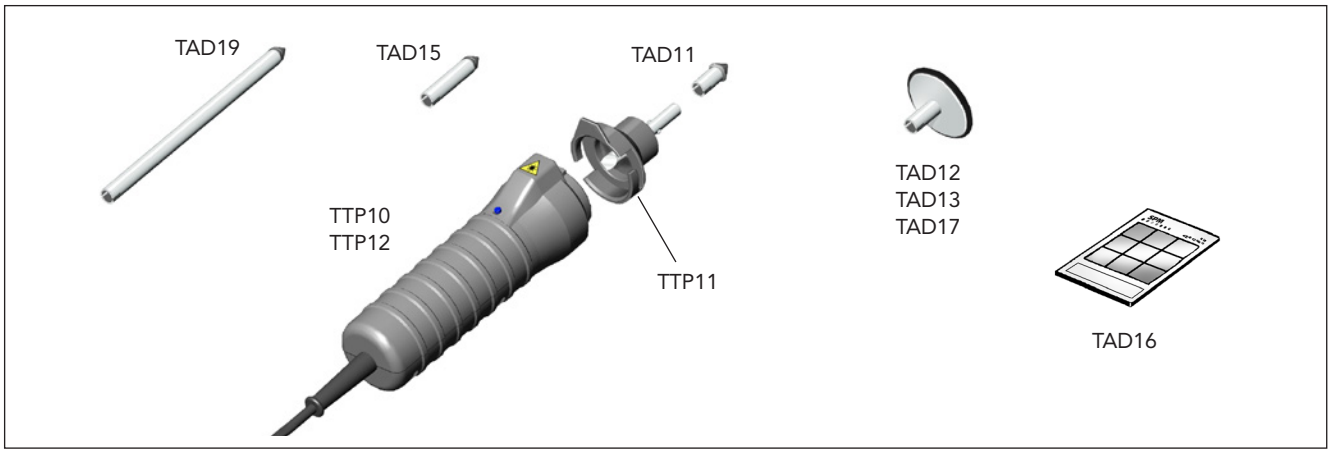
Options

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

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2018-01. TD-548 B Rev.0

Tachometer and Temperature Probe TTP10 / TTP12



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

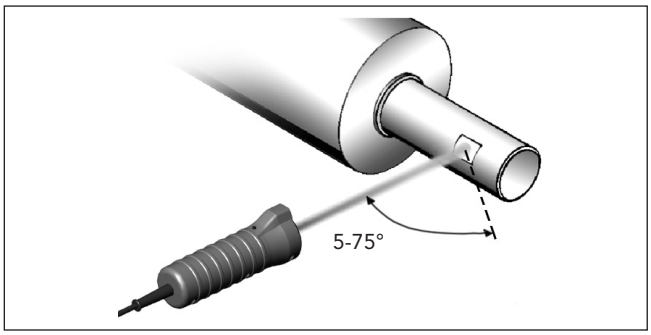
Optical measurement of the rate of rotation
A laser light beam is directed against a reflecting tape on the rotating object, from a distance of 30-2000 mm and from an angle of 5-75°.

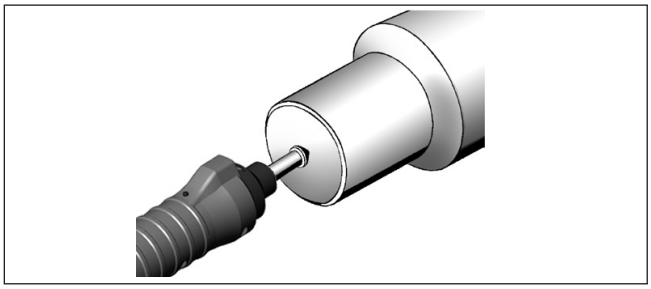
Contact measurement of rpm
The contact adapter TTP11 with a rubber tipped contact center, TAD-11/15/19, is attached onto the probe and then held against the center of a shaft end or a wheel.

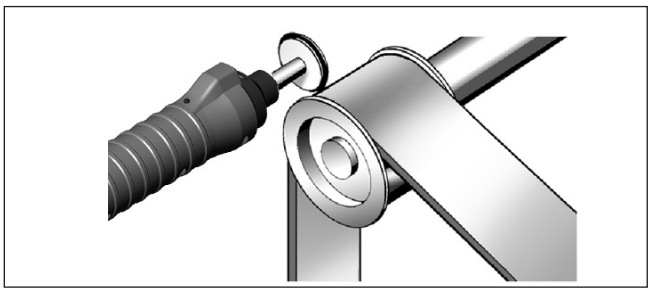
Contact measurement of peripheral speed
The contact adapter TTP11 with contact wheel is held against the circumference of a shaft, a belt, etc. The speed is read out in units, depending on which contact wheel is used: TAD-12/13/17.

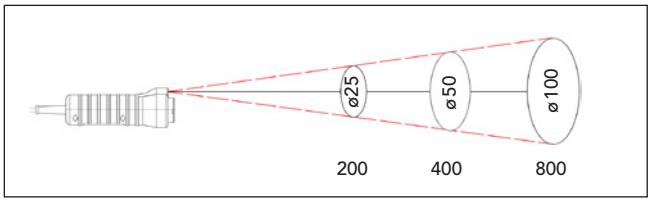
Temperature measurement

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









Part numbers

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

Technical specifications

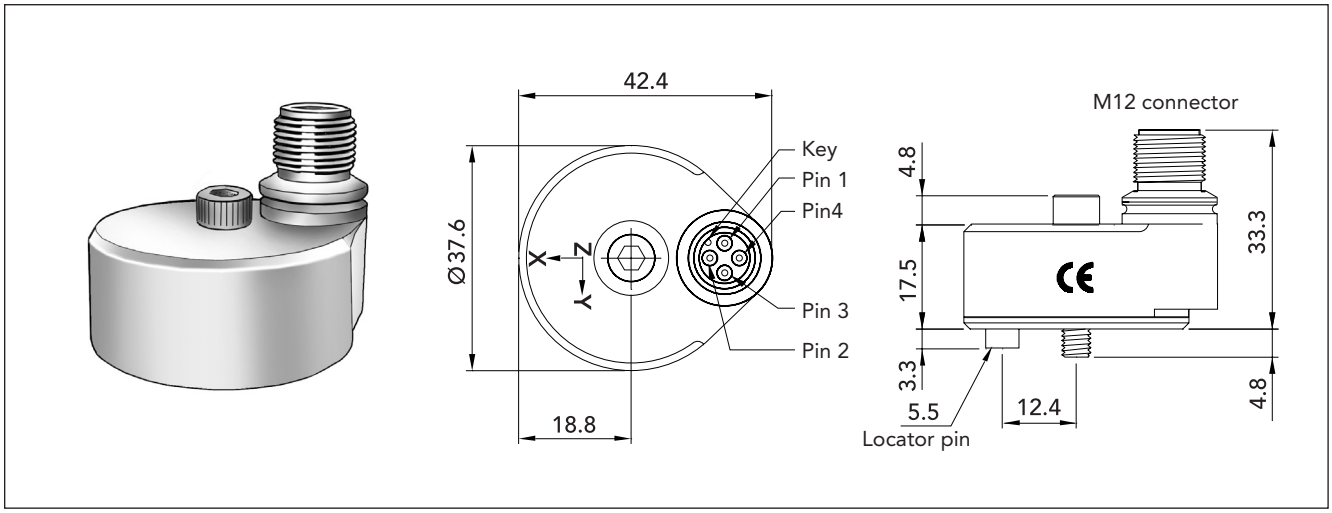
Measuring range, rpm	max. 100 000 (pulses) optical
Measuring distance, rpm	30 to 2000 mm
Indicator, rpm	blue LED
Measuring range, temp.	–20 to +300 °C
Measuring accuracy, temp.	± 2,5° C*
Dimensions	137 x 50 mm, 179 x 50 mm incl. TTP11
Operating temperature	0 to + 40 °C
Weight	160 g (TTP10), 300 g (TTP12)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

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

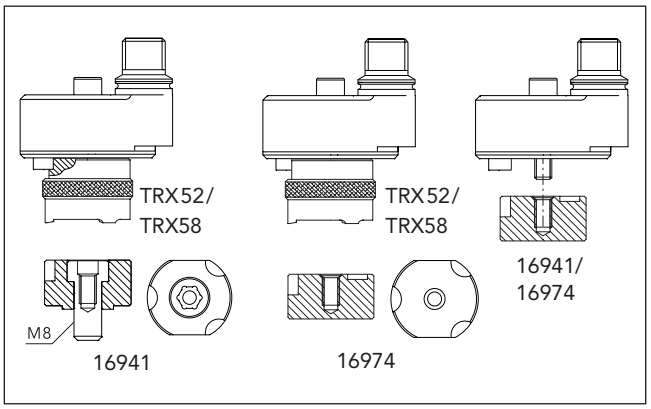
SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 225 00 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2013-10. TD-380 B Rev.0

Triaxial Vibration Transducer 90546



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



Technical specifications

Dynamic

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

Electrical

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

Environmental

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

Physical

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

Connections

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

Part numbers

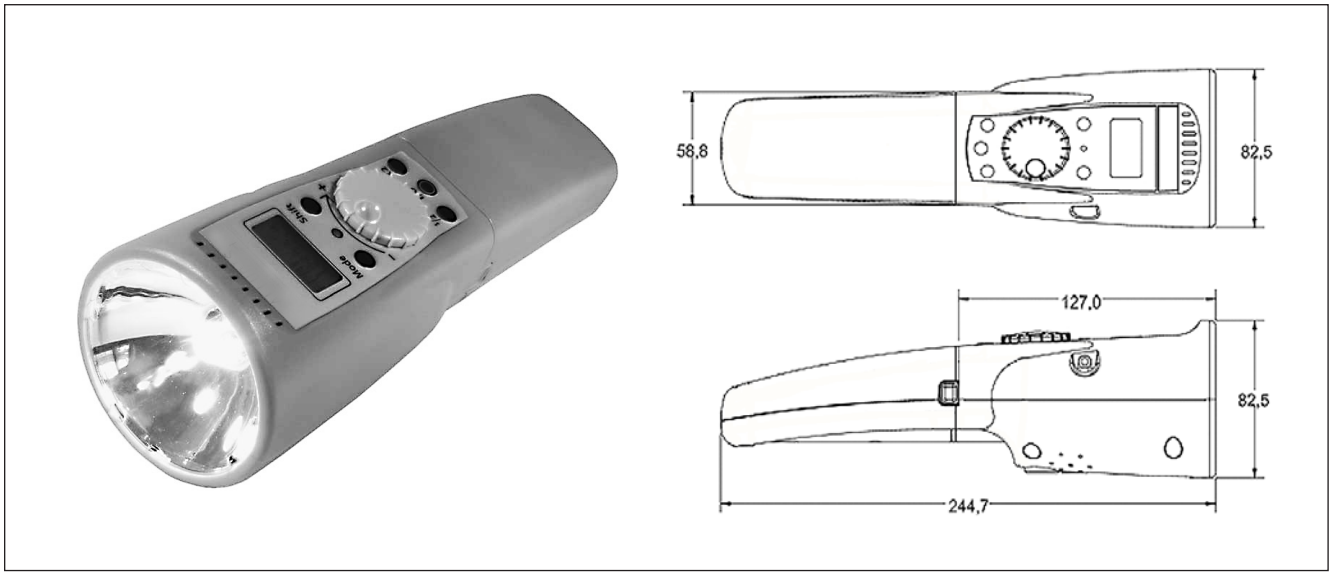
90546	Triaxial vibration transducer
CAB91	Cable for 90546, 8-pin/4-pin M12 connectors
16941	Mounting foot for 90546, screw
16974	Mounting foot for 90546, glue
90510	Connector M12S female, straight

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

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. ©Copyright SPM 2017-04. TD-454 B Rev.0

Digital Hand Stroboscope 16936



The Digital Hand Stroboscope 16936 is suitable for non-contact RPM measurements and for observation of fast, repeated motions of machines, their moving components or handled material from a distance of 20 to 50 cm.

The revolving or oscillating machine component can be visualised as a stop-motion picture by adjusting the light flashes synchronously to the rate of the movement.

With the multiplier/divider function, the actual RPM or frequency of the motion can be determined accurately. The phase-shift function enables visual positioning of the observed component, as well as the incremental observation of a complete course of motion in 5° steps.

Due to its flash rate with low deviation from the actual motion frequence, the courses of motion can be observed under a slow-motion effect.

Technical specifications

Range:	40 to 12500 fpm
Accuracy:	0.01% (+/–0,5 fpm)
Resolution:	0.1 fpm
Phase shift:	360°
Multiplier:	X 2, X ½
Output signal:	5 V TTL Low <0.5 V / High >4.0 V / pulse length 20 to 24 µs
Input Signal:	5 V TTL Low <0.8 V / High >2.8 V / pulse >5 µs
Illuminance:	50 cm distance / 6.000 fpm > 400 Lux @ D=10 cm > 150 Lux @ D=20 cm
Flash tube:	Xenon 10 W, white 6500 °K Life time 100 mio flashes Flashing time 10 to 15 µsec Flash energy ~400 Lux
Display type:	2 x 8-digit Dot-Matrix
Battery:	Removable rechargeable NiMH battery pack 2,6 Ah
Operation time:	approx. 120 min @ 1500 fpm
Recharge time:	approx. 2 to 4 h, overcharge protection
Battery charger:	100 to 240 VAC (50 to 60 Hz) universal adapter EU/USA/GB/AUS
Temp. range:	Operation 10 to 40 °C Storage –20 to 45 °C
Weight:	650 g (instrument with battery)
Housing material:	Polycarbonate
Tripod fixing:	1/4-20 UNC, length 8 mm

Part numbers

16936	Stroboscope incl. battery pack, battery charger with exchangeable plugs, spare flash tube, operation manual, plastic carrying case with foam insert
CAB90	Stroboscope cable for Leonova Diamond/Emerald 5 pin - phones 3.5 mm, 1.5 m, spiral

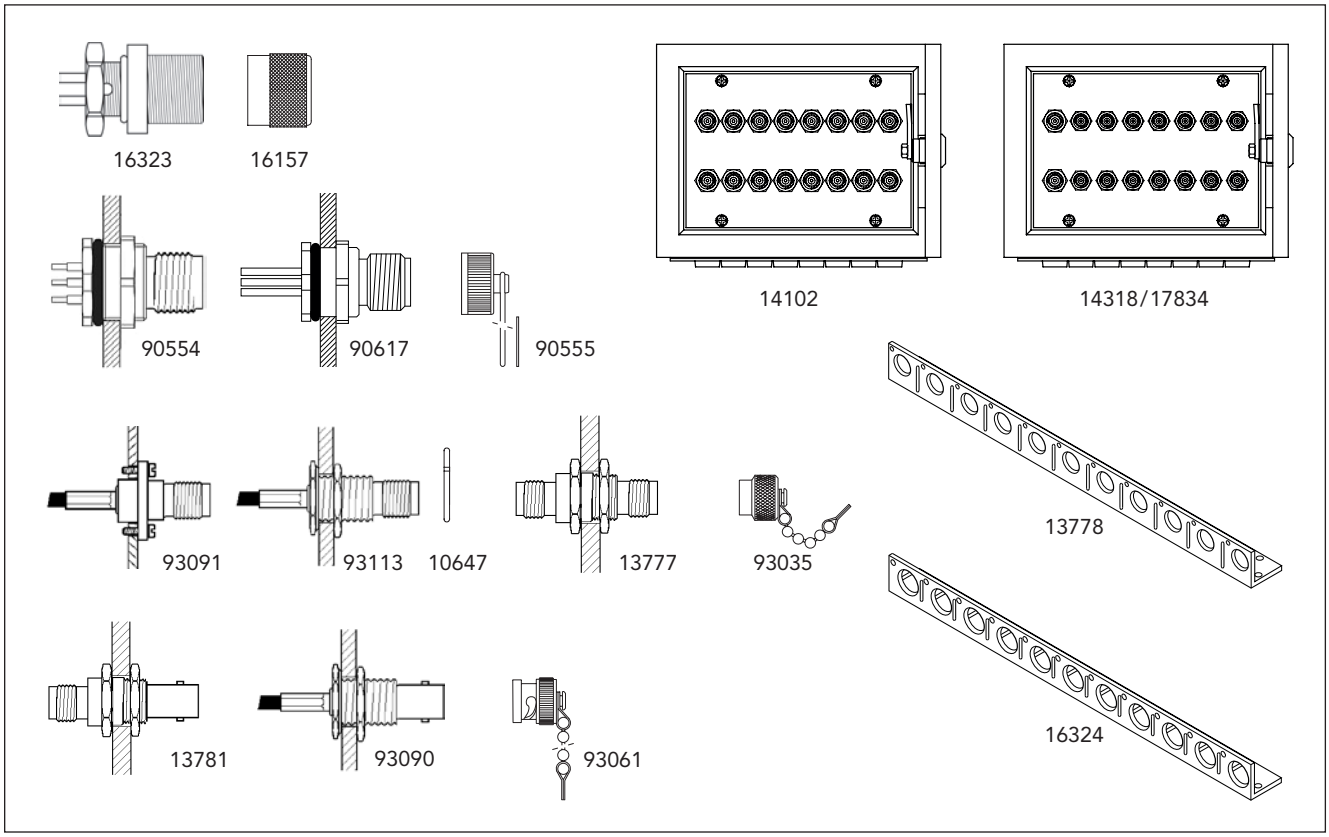
Spare parts

90545	Rechargable battery pack
90544	Spare flash tube
81508	Spare front glass

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. ©Copyright SPM 2014-04. TD-453 B Rev.0

Accessories for remote measuring points

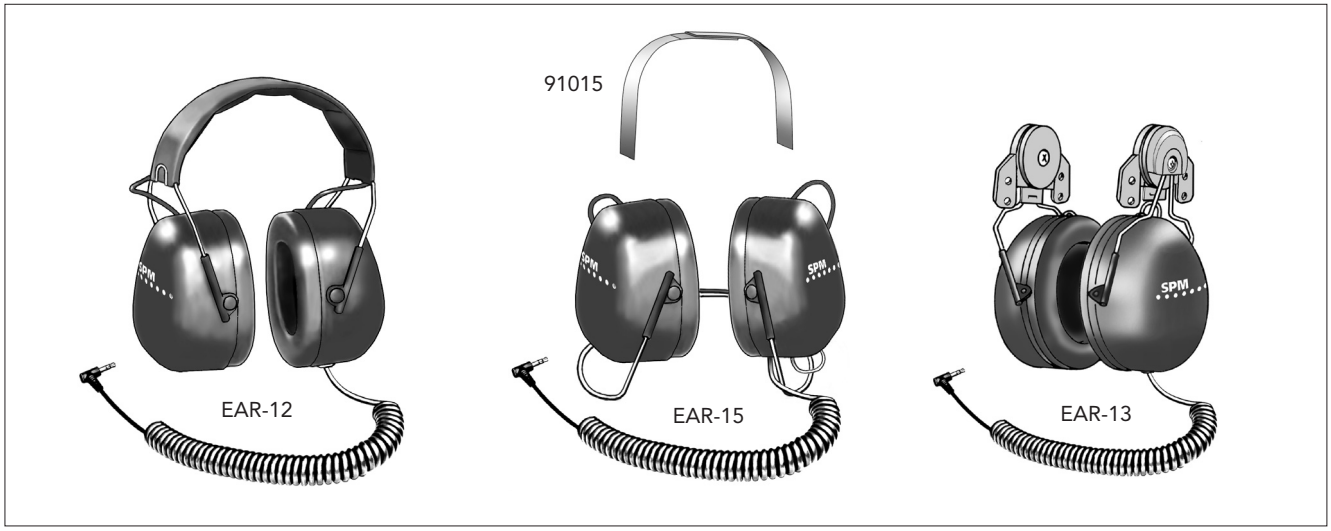


Part number	Description	Connector type	Backing	Mounting	Cap	IP class	DIA/EME measuring cable	TD sheet
90554	Connector	M12	Solder	Counternut	90555	IP67	CAB92	TD384
90617	Connector	M12	Cable 0.5 m	Counternut	90555	IP67	CAB92	TD384
90555	Protection cap	M12						TD480
13777	Connector	TNC	TNC	Counternut	93035/10647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

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2018-10. TD-480 B Rev.0

Headphones in eardefenders



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

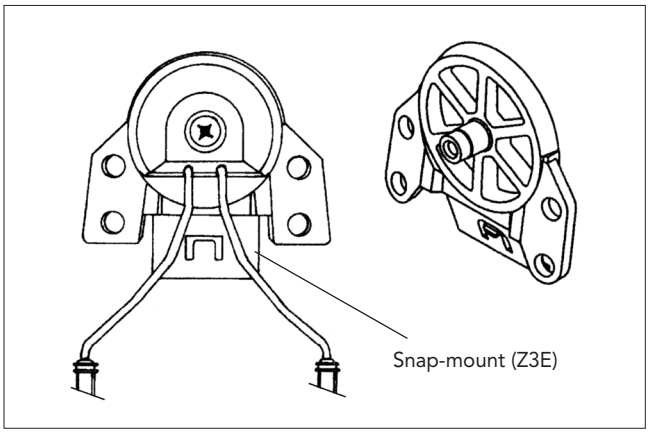
- Individually sprung headband wires of stainless sprung steel provide an even distribution of pressure around the ears. Steel headband wires retain their resilience better than plastic through a wide temperature range.
- Low, two-point fasteners and easy height adjustment with no protruding parts.
- Soft, wide foam and fluid-filled sealing rings with built-in pressure-evening channels provide low pressure, effective sealing and ideal comfort.
- Connection cord, 0.75 to 1.4 m, of soft spiral polyurethane with a 3,5mm stereoplug.

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

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

Heaphones with neckband, EAR15
EAR15 is a headphone set with two parallel connected earphones. It is equipped with neckband for use with or without helmet. A soft headband with velcro is optional.

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



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

Part numbers

EAR12	Headphones with headband
EAR13	Headpones with helmet brackets
EAR15	Headphone with neckband
EAS11	Hygiene set (consists of two sets of attenuating cushions and snap-in sealing rings)
91015	Headband with velcro for EAR15

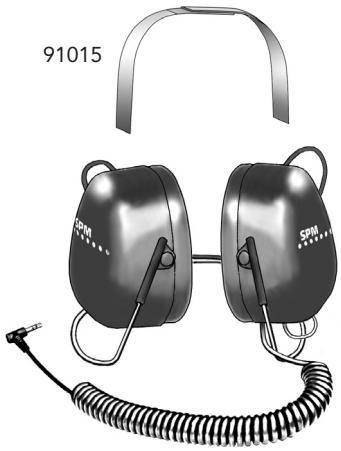
SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2015-03. TD-404 B Rev.0

Headset with microphone

EAR-16

EAR-17



EAR-18

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

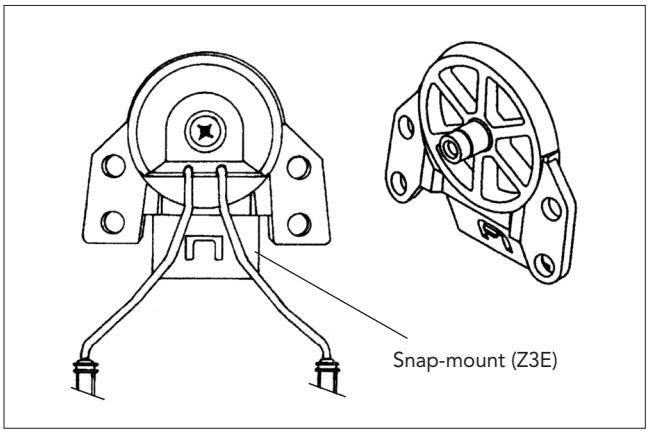
- Individually sprung headband wires of stainless sprung steel provide an even distribution of pressure around the ears. Steel headband wires retain their resilience better than plastic through a wide temperature range.
- Low, two-point fasteners and easy height adjustment with no protruding parts.
-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

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

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

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

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



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

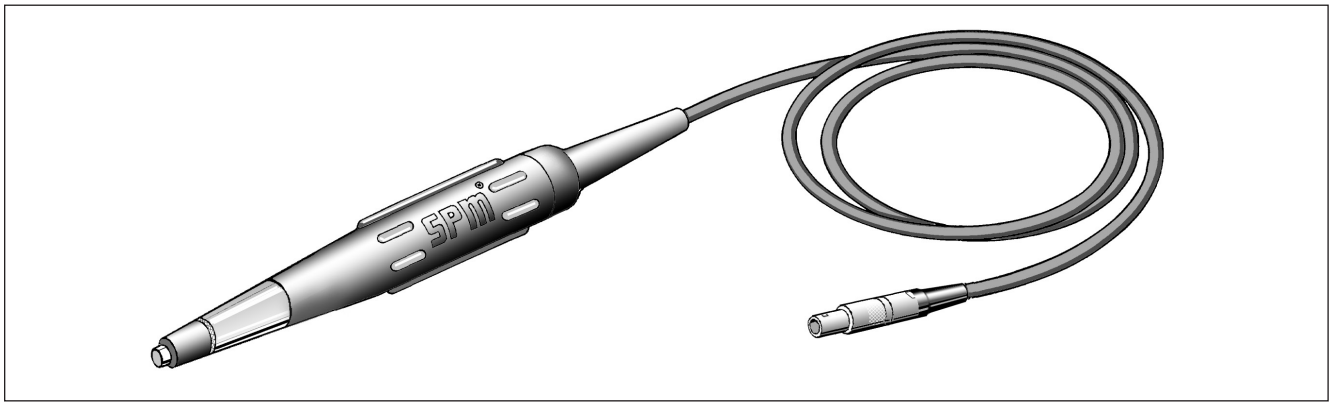
Part numbers

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

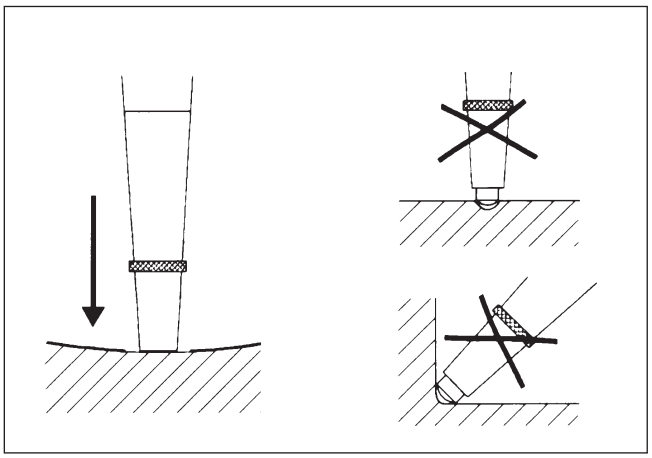
SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2015-03. TD-382 B Rev.0

Shock Pulse Transducer with Probe TRA78

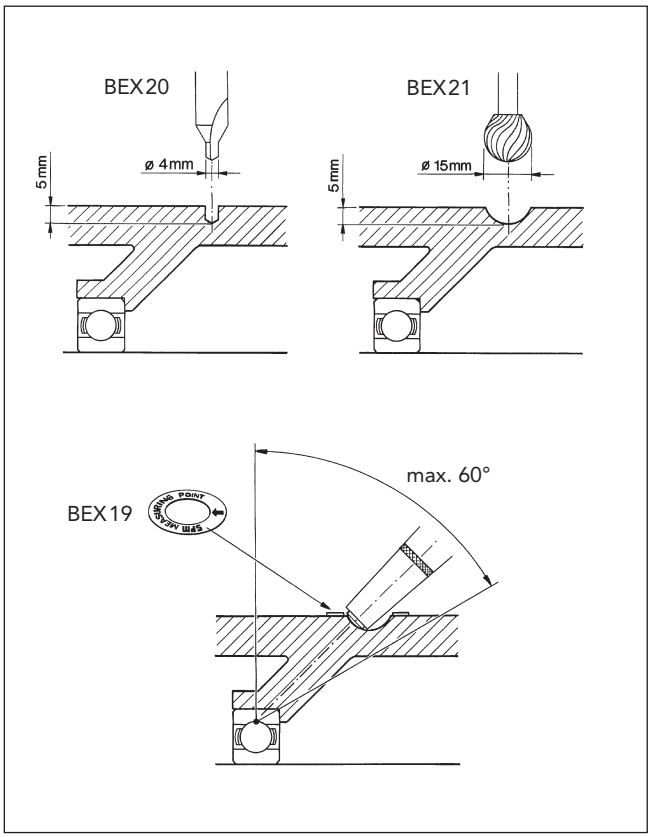


TRA78 is a handheld probe, used together with Leonova Diamond® and Emerald®. The probe is directionally sensitive and must be held aligned against the bearing and not deviate from this direction by more than ±5°. The probe tip is spring loaded and moves within a sleeve made of chloroprene rubber (neoprene) and tolerates 110 °C (230 °F). Standard cable length is 1.5 m. Other lengths up to 20 m can be ordered.



Measuring points for the probe transducer should be located directly on the bearing housing and the signal path should be in a direct line to the contact area. The strongest shock pulses are emitted from the loaded region of the rolling interface in the bearing. The loaded region for radial load covers a sector of ±45° from the load direction. For axial load the region is 360°. Since the transfer of shock pulses to the bearing housing is limited by the width of the bearing, direct radiation of pulses will be restricted to a sector of ±60° from the perpendicular to the rolling surface. Measuring points should be clearly marked, for instance with the SPM marker BEX19.

To maintain a steady pressure on the tip, press the probe tip against the measuring point until the rubber sleeve is in contact with the surface. Avoid pressing the probe tip against cavities and fillets which are smaller than the probe tip.



Technical specifications

Coaxial cable:	PVC, standard length 1.5 m (5 ft) or other length, max 20 m (65.6 ft.)
Measuring range:	Max. 85 dBsv
Temp. range:	–30° to +70 °C
Connector:	Mini coax
Dimensions:	260 x 25 mm (10.2 x 1 in)
Weight:	275 g (9.7 oz)

Part numbers

TRA78	Shock pulse transd. with probe, cable length 1.5 m
TRA78-L	Shock pulse transd. with probe, L = cable length, max 20 m
BEX19	Measuring point marker
BEX20	Center drill
BEX21	Rotary file

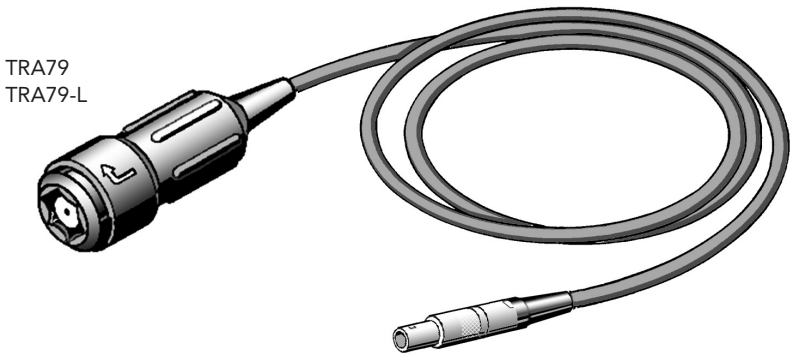
Spare parts

TRA15	Transducer with probe
16626	Probe handle
CAB79	Cable for TRA78, mini coax connector, 1.5 m (5 ft)
13108	Sleeve for probe tip

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2014-06. TD-400 B Rev.0

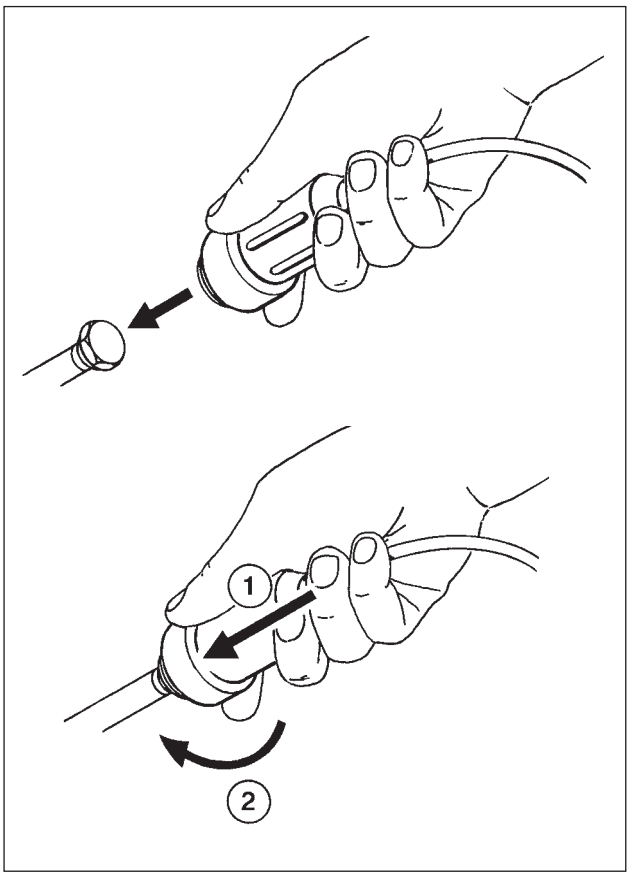
Shock pulse transducer with quick connector TRA79



TRA79 is a shock pulse transducer with quick connector, used together with the handheld instrument Leonova Diamond® and Emerald®, for measurements on permanently installed adapters. The quick connector forms a bayonet connection together with the permanently installed adapter. Standard cable length is 1.5 m. Other lengths up to 20 m can be ordered.

To attach the TRA79 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

Twist counter clockwise to unfasten the transducer.



Technical specifications

Measuring range:	Max. 100 dBsv
Design:	Sealed
Temperature range:	–30° to +70 °C (–22° to +158 °F)
Material, spanner:	Black oxide steel
Handle cover:	Polyurethane
Coaxial cable:	PVC, standard length 1.5 m (5 ft) or other length, max 20 m (65.6 ft.)
Connector:	Mini coax
Dimensions:	90x30 mm (1.2x3.5 in)
Weight:	210 g (7,4 oz)

Part numbers

TRA79	Shock pulse transducer with quick connector, cable length 1.5 m
TRA79-L	Shock pulse transducer with quick connector, L=cable length, max. 20 m

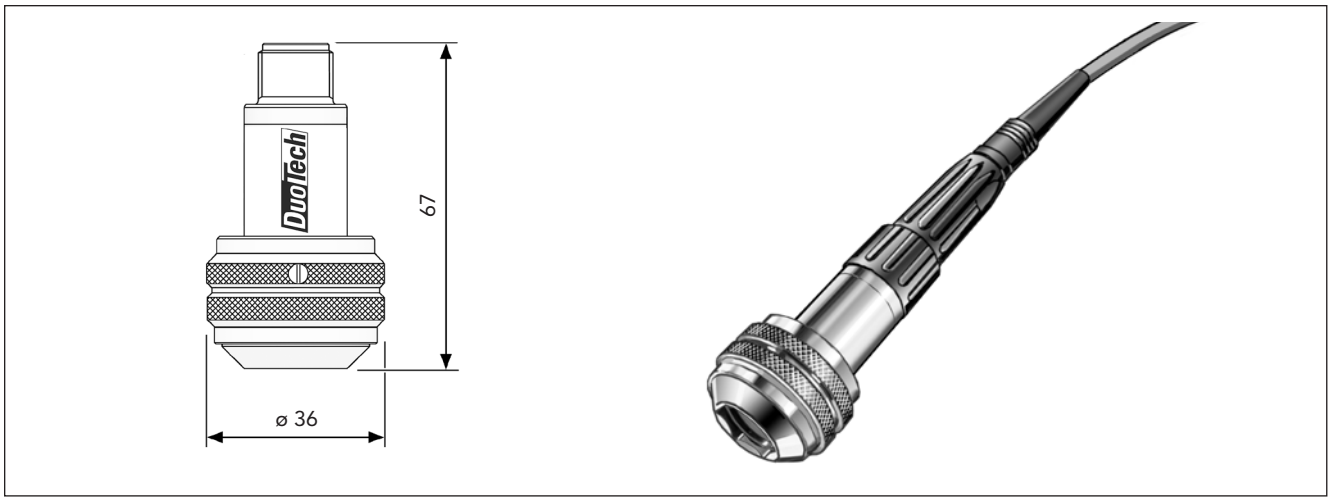
Spare part

CAB103	Cable for TRA79, 1.5 m, mini coax. connector

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

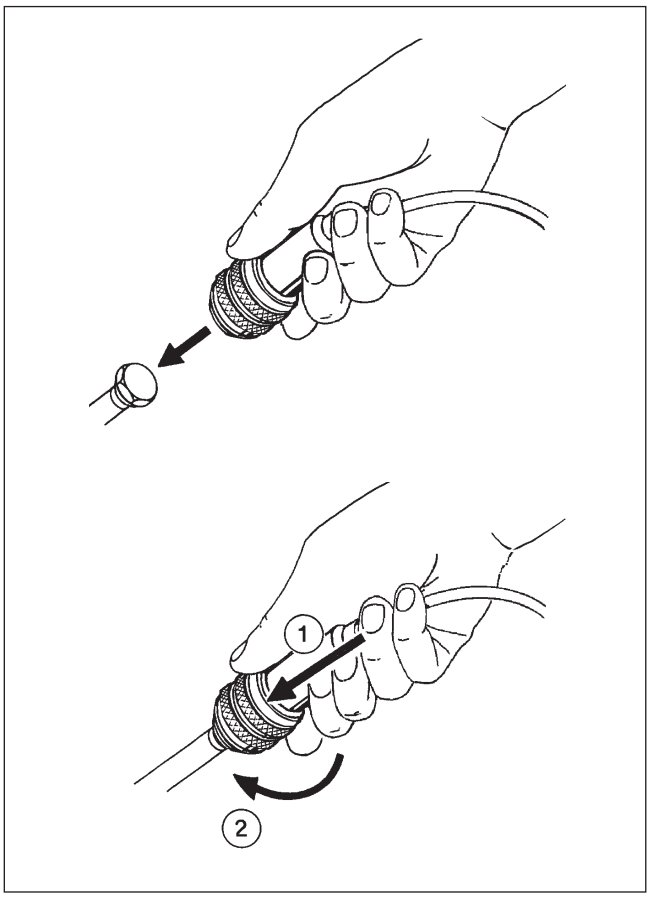
Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2014-06. TD-410 B Rev.0

DuoTech Accelerometer with Quick Connector TRC100



TRC100 is a DuoTech accelerometer with quick connector, used together with the handheld instrument Leonova Diamond and Emerald, for measurements on permanently installed adapters. The quick connector forms a bayonet connection together with the permanently installed adapter. The accelerometer is internally isolated in a Faraday shield providing maximum protection from ground loops and RF interference.

To attach the transducer to an adapter, push the transducer firmly onto the adapter and twist it clockwise. Twist counter clockwise to unfasten the transducer.



Technical specifications

Nom. sensitivity, main axis:	100 mV/g *
Measuring range, vibration:	600 m/s^2 = 60 g
Measuring range, shock pulse:	−12 to 75 dB
Transverse sensitivity:	max. 10%
Base strain sensitivity:	0.01 m/s^2/µ strain
Frequency range, vibration:	2 Hz to 5 kHz (±3 dB)
Settling time:	3 sec.
Bias point:	10 to 13V (typical 12V)
Power supply:	24 V, 4 to 5 mA
Design:	sealed IP66/67
Temperature range:	−40° to + 125° C
Material:	stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Sealings:	Viton (fluor rubber)
Connector:	2-pin MIL-C-5015
Cable length:	max. 100 m
Weight:	165 g

* Individual value given on the calibration chart.

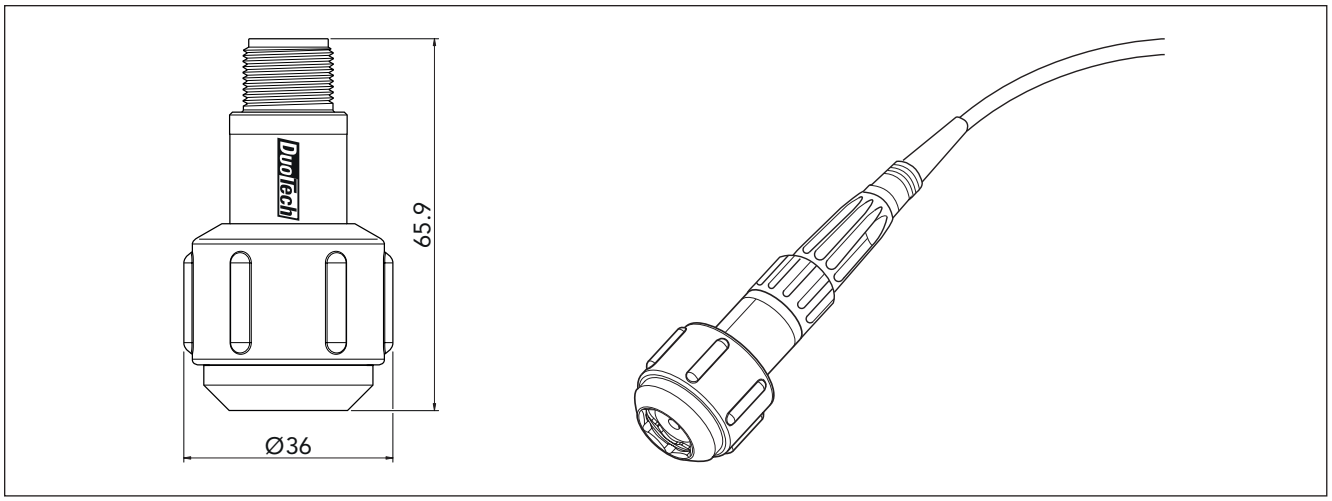
Part numbers

TRC100	DuoTech accelerometer with quick connector for SPM adapters
CAB110	Measuring cable, 8 pin-M12, 1.5 m, straight
CAB93	Measuring cable, 8 pin-2 pin, 1.5 m, straight
CAB82	Measuring cable, 8 pin-2 pin, 1.5 m, spiral
CAB83	Measuring cable, 8 pin-2 pin, 10 m
CAB83-L	Measuring cable, 8 pin-2 pin (L= length in meter)

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

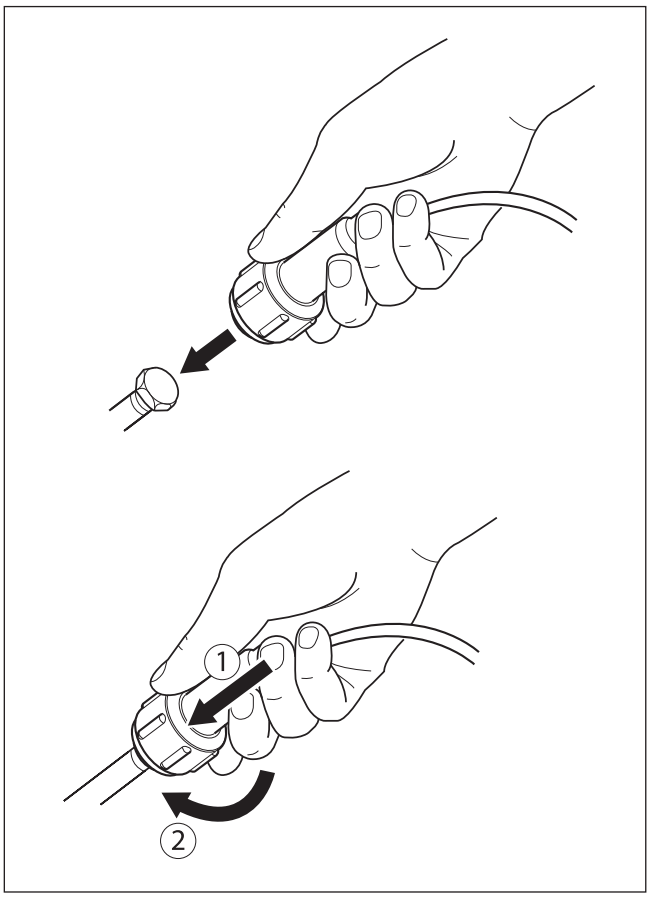
Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2017-09. TD-518 B Rev.0

DuoTech accelerometer with quick connector TRC150



TRC150 is a DuoTech accelerometer with quick connector, used together with the handheld instrument Leonova Diamond and Emerald, for measurements on permanently installed adapters. The quick connector forms a bayonet connection together with the permanently installed adapter. The accelerometer is internally isolated in a Faraday shield providing maximum protection from ground loops and RF interference.

To attach the transducer to an adapter, push the transducer firmly onto the adapter and twist it clockwise. Twist counter clockwise to unfasten the transducer.



Technical specifications

Nom. sensitivity, main axis:	100 mV/g*
Measuring range, vibration:	600 m/s² = 60 g
Measuring range, shock pulse:	−12 to 75 dB
Transverse sensitivity:	max. 10%
Base strain sensitivity:	0.01 m/s²/µ strain
Frequency range, vibration:	2 Hz to 3 kHz (±3 dB)
Settling time:	3 sec.
Bias point:	10 to 13V (typical 12V)
Power supply:	24 V, 4 to 5 mA
Design:	sealed IP66/67
Temperature range:	−40° to +125 °C
Material:	stainless acid proof steel, Sandvik Grade:1802, EN:1.4523
Material, sleeve:	Isothane 3085AU
Sealings:	Viton (fluor rubber)
Connector:	2-pin MIL-C-5015
Cable length:	max. 100 m
Weight:	165 g

* Individual value given on the calibration chart.

Part numbers

TRC150	DuoTech accelerometer with quick connector for SPM adapters
CAB93	Measuring cable, Lemo 8 pin-2 pin, 1.5 m, straight
CAB82	Measuring cable, Lemo 8 pin-2 pin, 1.5 m, spiral
CAB83	Measuring cable, Lemo 8 pin-2 pin, 10 m
CAB83-L	Measuring cable, Lemo 8 pin-2 pin (L= length in meter)

SPM Instrument AB • Box 504 • SE-645 25 Strängnäs • Sweden
Tel +46 152 22500 • info@spminstrument.se • www.spminstrument.com

Technical data are subject to change without notice.
ISO 9001 certified. © Copyright SPM 2017-09. TD-551 B Rev.0