



Leonova[®]
DIAMOND

Technical data sheets



Leonova Diamond® – Platform



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

- Data logging with Condmaster® Ruby
- Shock pulse method SPM HDm/HDc
- ISO 2372 vibration monitoring
- 2-channel simultaneous vibration monitoring
- Speed and temperature measurements
- Analog signals, current and voltage
- Stethoscope function
- Reading from and writing to CondID® memory tags
- Manual recording and check points

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

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

Recording function	TD-409
Instrument specifications	TD-357
User selected functions	TD-359
Shock pulse method SPM HD	
frequency and time domain analysis	TD-361
SPM Shock pulse method dBm/dBc	TD-406
SPM Shock pulse method LR/HR	TD-362
SPM Spectrum®	TD-407
Vibration monitoring ISO 10816 with spectrum	TD-363
3-channel simultaneous vibration monitoring	TD-364
Vibration Expert	TD-365
ConditionManager/EVAM Vibration analysis	TD-401
Run up/Coast down and Bump test	TD-402
HD Order tracking	TD-403
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Balancing, single and dual plane	TD-369
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Transducers and measuring cables	TD-377
LineLazer® detector units	TD-267
Leonova Service Program	TD-379
Tachometer/Temperature probe	TD-380
Vibration monitoring ISO2372	TD-408

Article numbers

DIA300	Leonova Diamond, incl. wrist strap
DIA162	Extra memory, 4 GB
DIA163	Extra memory, 8 GB
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 with safety buckle
CAS25	Carrying case, plastic with foam insert

81469	Silica gel (moisture absorbent) spare for CAS25
81468	Code lock, TSA approved, for CAS 25

Spare parts

16645	Protection foil for display
14661	Wrist strap
90362	AC adapter, Euro plug, 100-240 V AC
90380	AC adapter, UK plug, 100-240 V AC
90379	AC adapter, US plug, 100-240 V AC
90528	AC adapter, AU plug, 100-240 V AC
16574	Battery charger
PRO49	Leonova Service Program
71949	Instruction, "Getting started"
71950	Leonova Diamond User guide

Patent No.: US#7,313,484, US#7,167,814, US#7,200,519, US#7,054,761, US#7,324,919, EP#1474664, DE#60304328.3, FR#1474664, GB#1474664, NL#1474664, SE03731865.6, US#7,711,519, US#7,949,496, EP#1474660, EP#1474662, EP#1474663, FR#1474660, US#7,774,166, EP#1474659, UK#1474659, US#6,725,723, US#6,499,349, SE#0400586-4, SE#0951017-3, US#7,301,161C-1

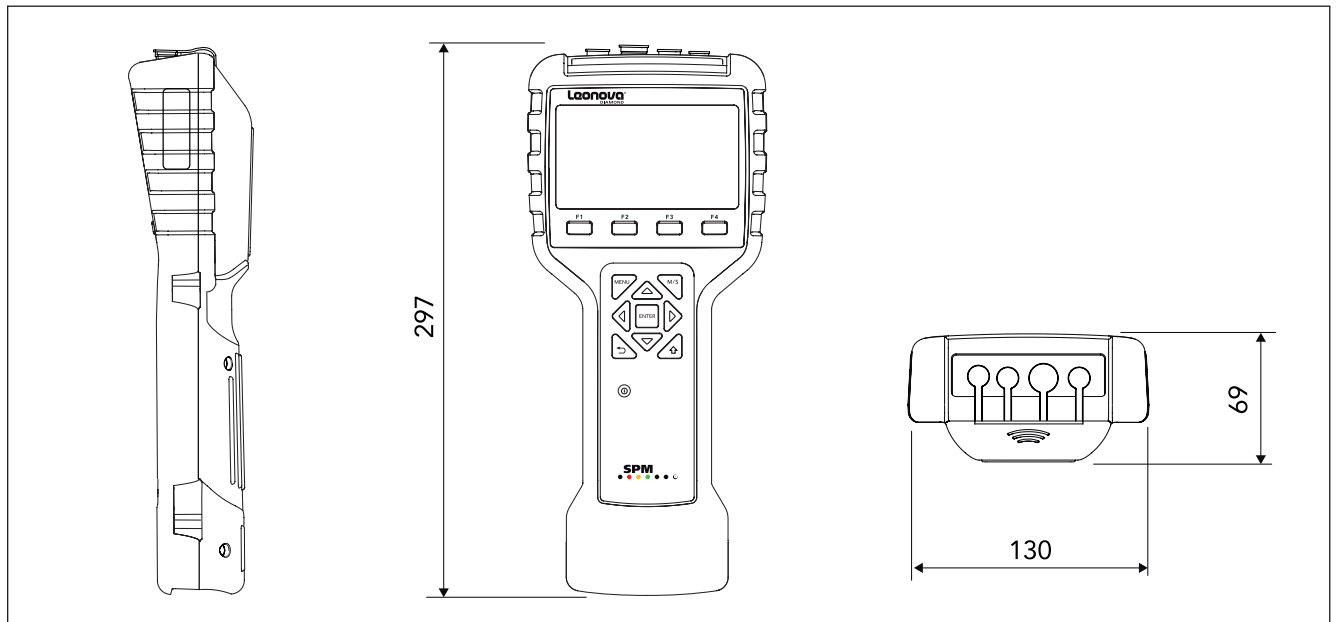


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Leonova Diamond® – Instrument specifications



Technical data, instrument

Housing:	ABS/PC/TPE, IP65
Dimensions:	297 x 130 x 69 mm
Weight:	890 g
Keypad:	Sealed, snap action
Display:	TFT colour, 480 x 272 pixels, 4.3 inch widescreen, adjustable backlight
Main processor:	400 MHz ARM
Memory:	256 MB RAM, 512 MB Flash, 1GB expandable up to 8GB
Operating system:	Microsoft Windows® CE
DSP processor:	300 MHz floating point
Communication:	USB 2.0
Power supply:	Rechargeable Lithium-Ion battery pack, 5200 mAh or power adapter
Battery power:	For minimum 16 hours normal use
Operating temperature:	-20 to 50 °C , non condensing
Charging temperature:	0 to 45 °C
General features:	Language selection, battery status indication, transducer line test, metric or imperial units
Meas. point identification:	NFC transponder for communication with ConDiD™ tags, read/write distance max. 50 mm (2 inch)

Vibration monitoring

Vibration channels:	3 simultaneous
Frequency range:	0 (DC) to 40 kHz
Resolution:	Max. 25 600 lines
Vibration transducer input:	< 24 Vpp. Transducer supply of 2,5 mA for IEPE (ICP) type can be set On/Off
Transducer types:	Any transducers (disp., vel. or acc.) with voltage output

Measuring techniques:	ISO 2372, ISO 10816, FFT with symptoms, EVAM, Cepstrum, Orbit, Current analysis, 3 channels simultaneously, balancing
Dynamic range:	Up to 130 dB

Bearing monitoring

Measuring range:	SPM HD: -20 to 110 dB (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

Tacho input

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

Analog signals

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

Output/input

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

Temperature measurement

Inputs:	TTP10 or via analog input
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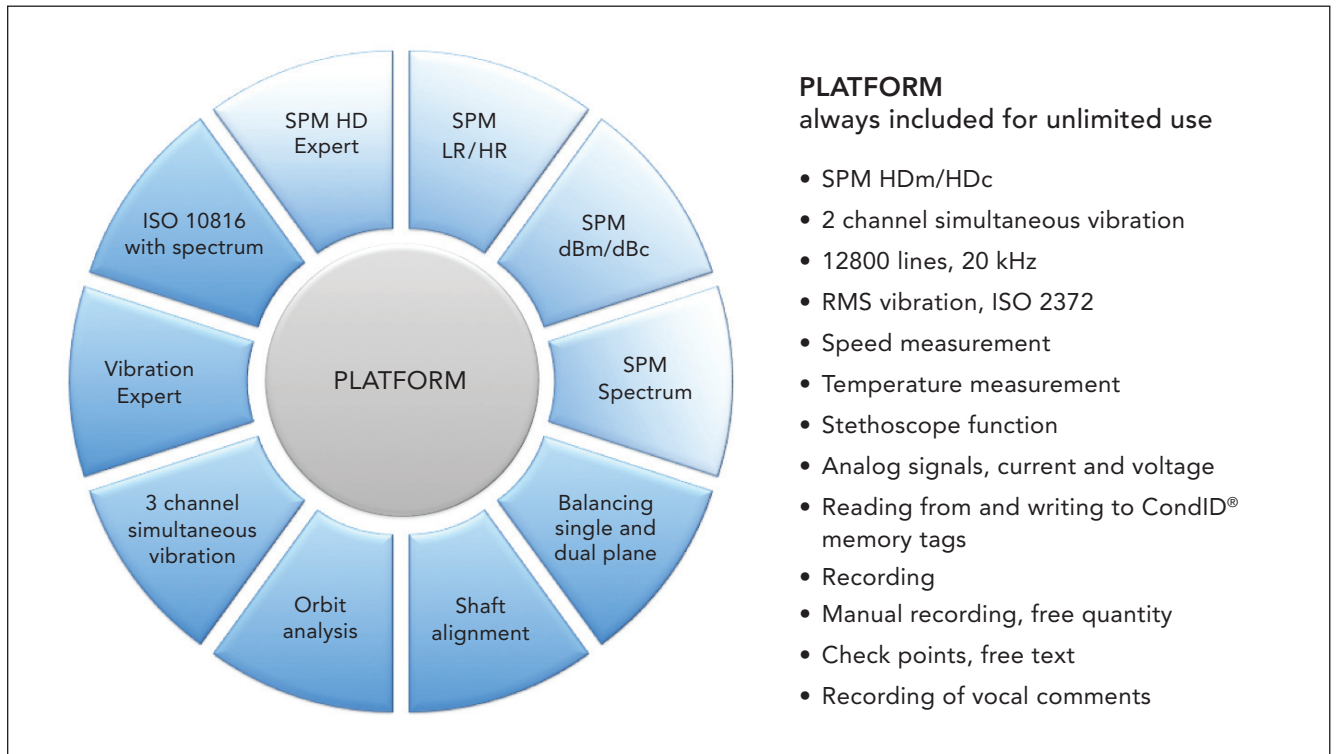
Stethoscope

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

Patent No.: US#7,313,484, US#7,167,814, US#7,200,519, US#7,054,761, US#7,324,919, EP#1474664, DE#60304328.3, FR#1474664, GB#1474664, NL#1474664, SE03731865.6, US#7,711,519, US#7,949,496, EP#1474660, EP#1474662, EP#1474663, FR#1474660, US#7,774,166, EP#1474659, UK#1474659, US#6,725,723, US#6,499,349, SE#0400586-4, SE#0951017-3, US#7,301,161C-1



Leonova Diamond® – User selected functions



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

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

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

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

Functions for Unlimited Use

DIA195	SPM HD Expert, time and frequency domain analysis
DIA130	Shock pulse method dBm/dBc
DIA131	Shock pulse method LR/HR
DIA132	SPM Spectrum
DIA133	Vibration ISO 10816 with spectrum
DIA138	Orbit analysis
DIA192	3 channel simultaneous vibration
DIA193	Vibration Expert HD Ordertracking Time signal Post trigger 25600 lines, 40 KHz Condition Manager incl. EVAM Run up Coast down Bump test
DIA109	Balancing, single and dual plane
DIA155	Shaft alignment

Functions for Limited Use (Function & Use)

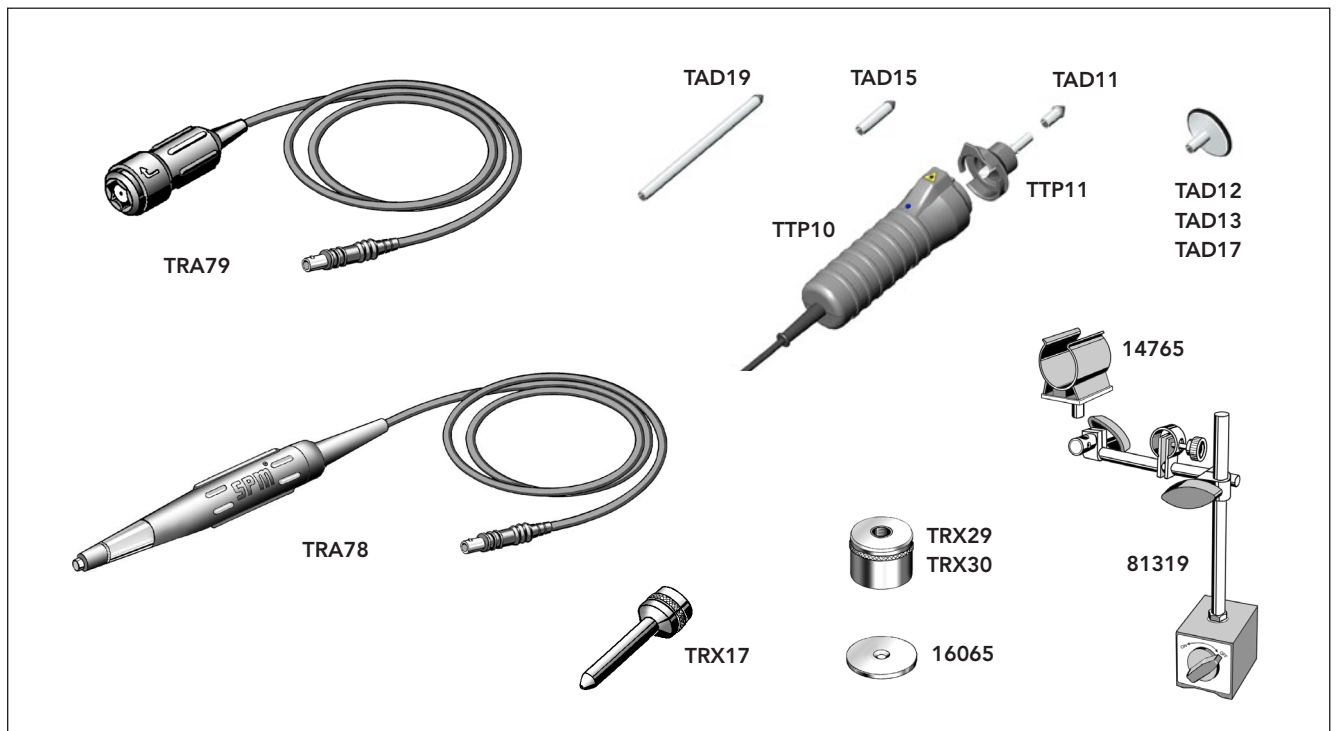
DIA295	SPM HD Expert, time and frequency domain analysis (3)
DIA230	Shock pulse method dBm/dBc (1)
DIA231	Shock pulse method LR/HR (2)
DIA232	SPM Spectrum (2)
DIA233	Vibration ISO 10816 with spectrum (1)
DIA238	Orbit analysis (5)
DIA292	3 channel simultaneous vibration (6)
DIA293	Vibration Expert incl. HD Order Tracking, Time signal, Post trigger (25), 25600 lines, 40 KHz, Condition Manager incl. EVAM (2) Run up / Coast down (50) Bump test (25)
DIA209	Balancing, single and dual plane Single plain (4 runs 16, 2 runs 42) Dual plane (80)
DIA255	Shaft alignment (30)

Credit consumption is stated within brackets.

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



Leonova Diamond® – 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 (TD400)
- TRA79 Shock pulse transducer with quick connector for measuring adapters (TD410)
- EAR12 Headphones with headband (TD404)
- EAR13 Headphones with helmet brackets (TD404)
- EAR15 Headphones with neckband (TD404)
- EAR16 Headset with headband (TD382)
- EAR17 Headset with helmet brackets (TD382)
- EAR18 Headset with neckband (TD382)
- EAS11 Hygiene set for headset and headphones

Vibration monitoring

- TRX29 Magnetic foot for vibration transducer, M8
- TRX30 Magnetic foot for vibration transducer, UNC5/16"
- 16065 Mounting disc for magnetic foot TRX29/30
- TRX17 Probe for vibration transducer, M8
- CAB82 Measuring cable, 8 pin-2 pin 1.5 m, spiral
- CAB83 Measuring cable, 8 pin-2 pin 10 m
- CAB89 2 channel vibration split cable, 8 pin, 0.25 m
- CAB88 3 channel vibration split cable, 8 pin, 0.25 m
- CAB97 Measuring cable, 8 pin-BNC, 1.5 m, spiral

Vibration transducers, see TD260.

Current and voltage monitoring

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

Speed and temperature monitoring

- TTP10 Tachometer and temperature Probe (TD380)
- TAD11 Contact center, rpm, short
- TAD15 Contact center, rpm, long
- TAD19 Contact center, rpm, extra long
- 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 TD383 and TD384.

Balancing

- 81319 Magnetic base
- 14765 Holder for tachometer probe TTP10

Spare parts

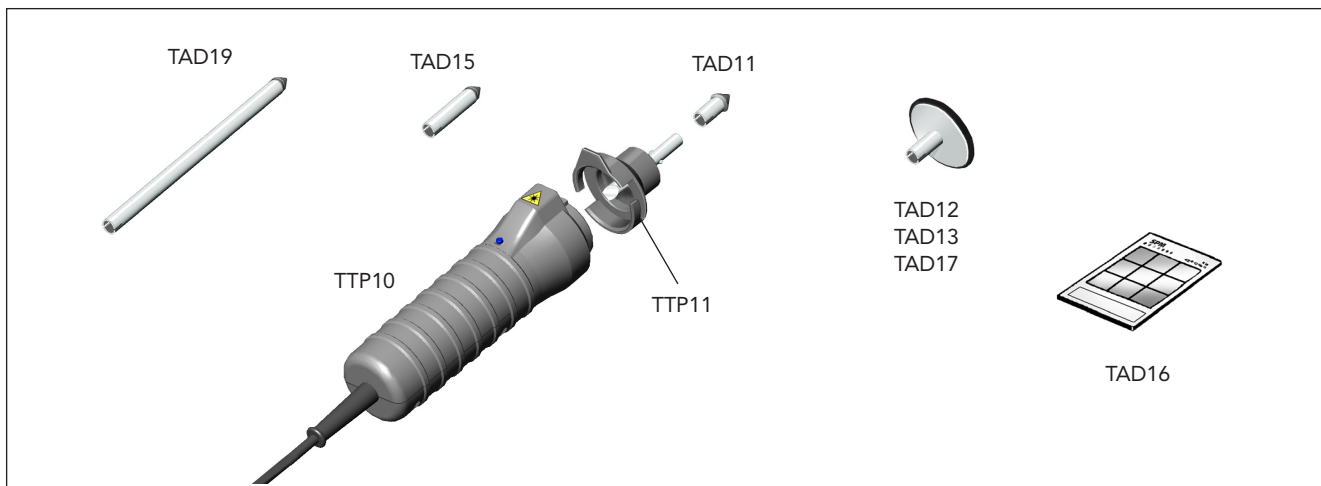
- 13108 Sleeve for probe tip (TRA78)
- TTP11 Contact adapter for TTP10
- CAB79 Cable for TRA78, 1.2 m
- CAB100 Cable for TTP10, 1.5 m, spiral
- CAB103 Cable for TRA79, 1.5 m

Others

- CAB94 USB communication cable, 1 m
- CAB96 Communication cable for 'iLearn'
- LLA400 LineLazer alignment kit (TD370)



LeonovaDiamond® – Tachometer and Temperature Probe TTP10



The Tachometer and Temperature Probe TTP10 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 $\pm 75^\circ$.

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

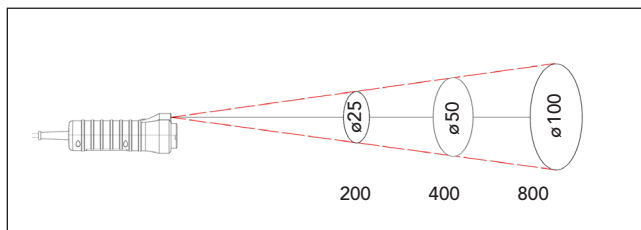
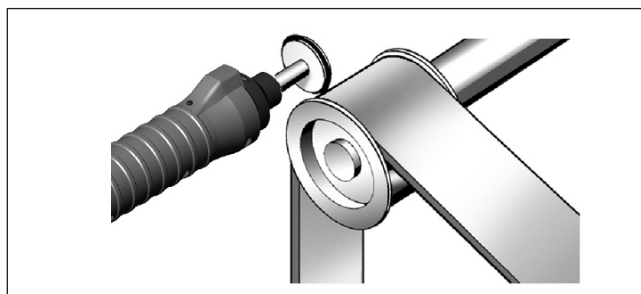
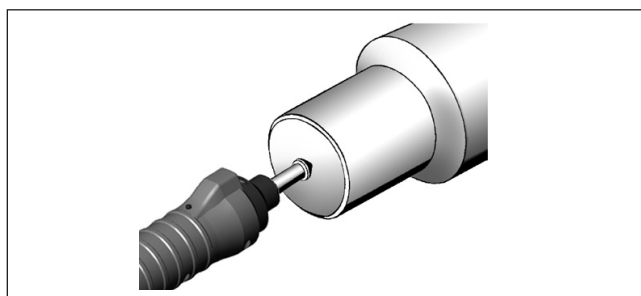
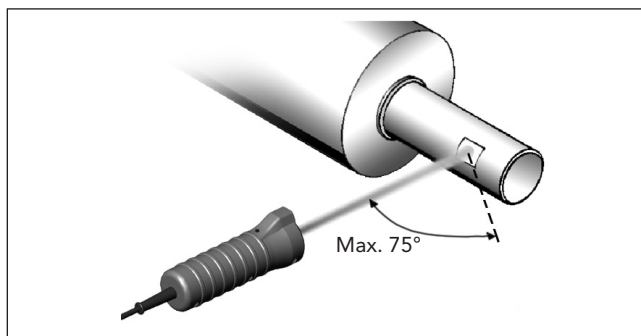
The Tachometer and Temperature Probe TTP10 is also used together with Leonova Diamond/Emerald for temperature measurements with a thermopile element in the range -20 to $+300^\circ\text{C}$.

Ordering numbers

TTP10	Tachometer and Temperature Probe, incl. TTP11
TAD11	Contact center, rpm, short
TAD15	Contact center, rpm, long
TAD19	Contact center, rpm, extra long
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 (spare part)

Technical specifications TTP10

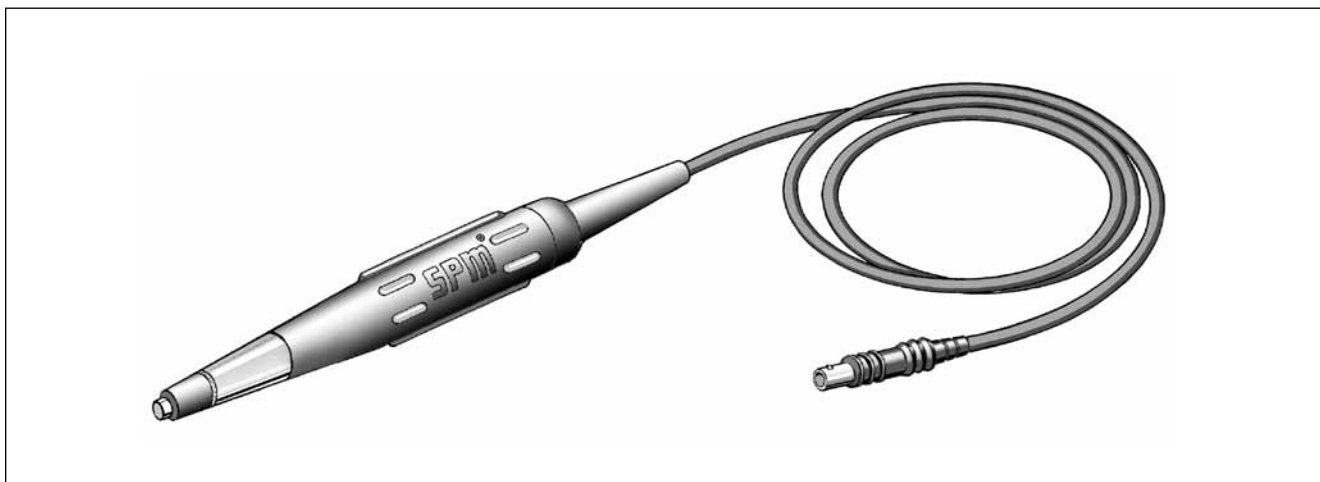
Measuring range, rpm	max. 100 000 (pulses) optical
Measuring distance, rpm	30 to 2000 mm
Indicator, rpm	blue LED
Measuring range, temp.	-20 to $+300^\circ\text{C}$
Measuring accuracy, temp.	$\pm 2,5^\circ\text{C}$
Dimensions	137 x 50 mm, 179 incl. TTP11



Operating temperature	0 to $+40^\circ\text{C}$
Weight	160 g
D:S	8:1



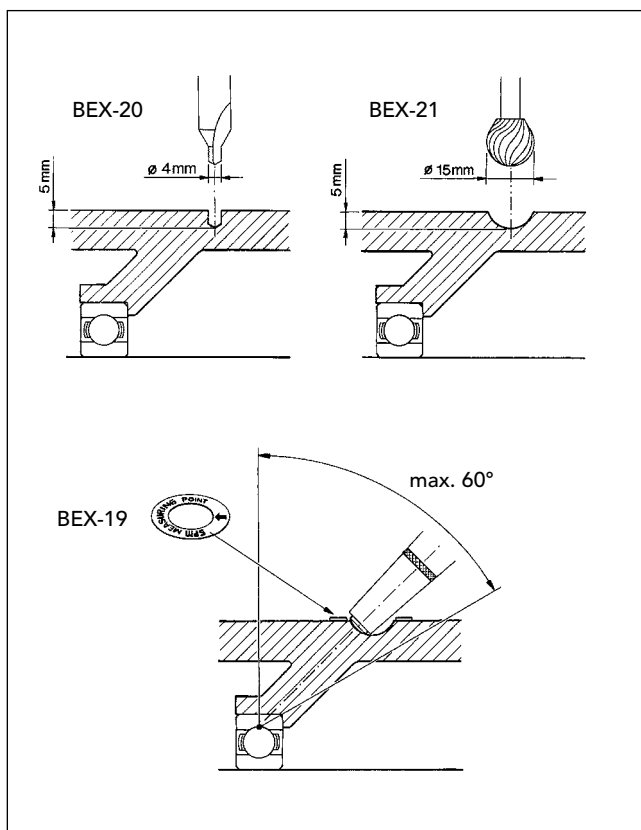
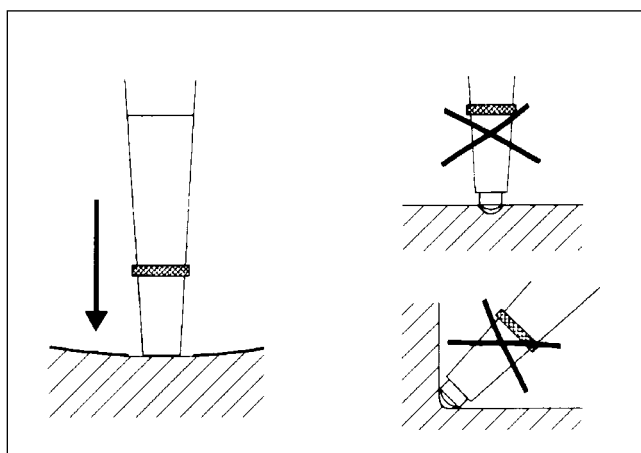
Shock Pulse Transducer with Probe TRA-78



TRA-78 is a handheld probe, used together with Leonova Diamond. 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	Mini coax
Dimensions	260 x 25 mm (10.2 x 1 in)
Weight	275 g (9.7 oz)

Ordering numbers

TRA-78	Shock pulse transducer, probe assembly
BEX-19	Measuring point marker
BEX-20	Center drill
BEX-21	Rotary file

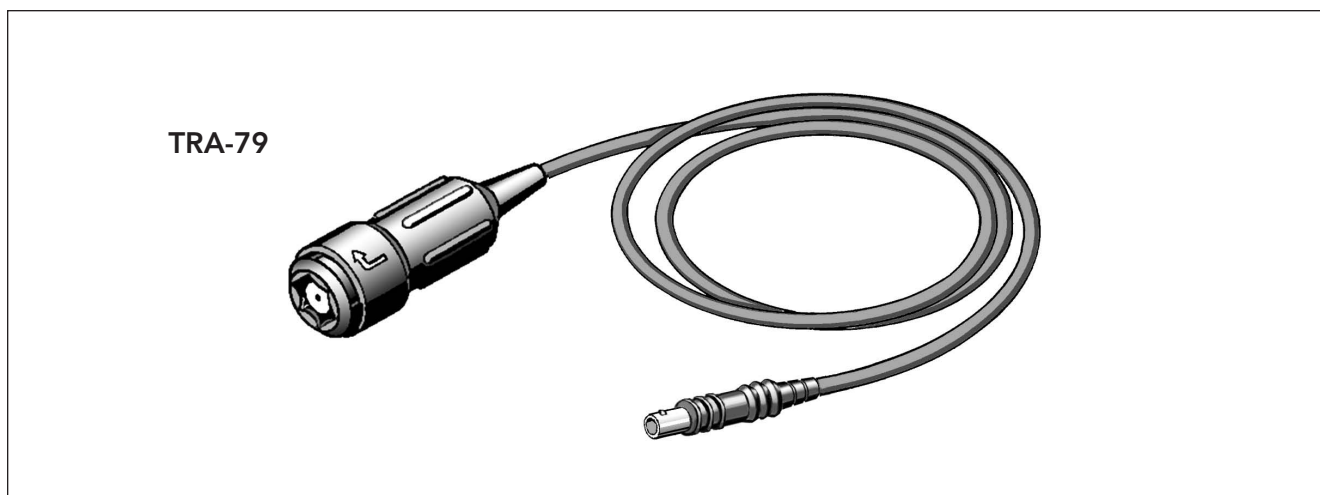
Spare parts

TRA-15	Transducer with probe
BAX-10	Probe handle
CAB-79	Cable for TRA-78, mini coax connector, 1.5 m (5 ft)
13108	Sleeve for probe tip

* Measuring range max 85 dBsv, temp. range -30°C to $+70^\circ\text{C}$



Shock pulse transducer with quick connector TRA-79



TRA-79 is a shock pulse transducer with quick connector for measurements on permanently installed adapters. The transducer is used together with the handheld instrument Leonova Diamond. The quick connector forms a bayonet connection together with the permanently installed adapter.

To attach the TRA-79 to an adapter, push the transducer firmly onto the adapter and twist it clockwise.

Twist counter clockwise to unfasten the transducer.

Technical data

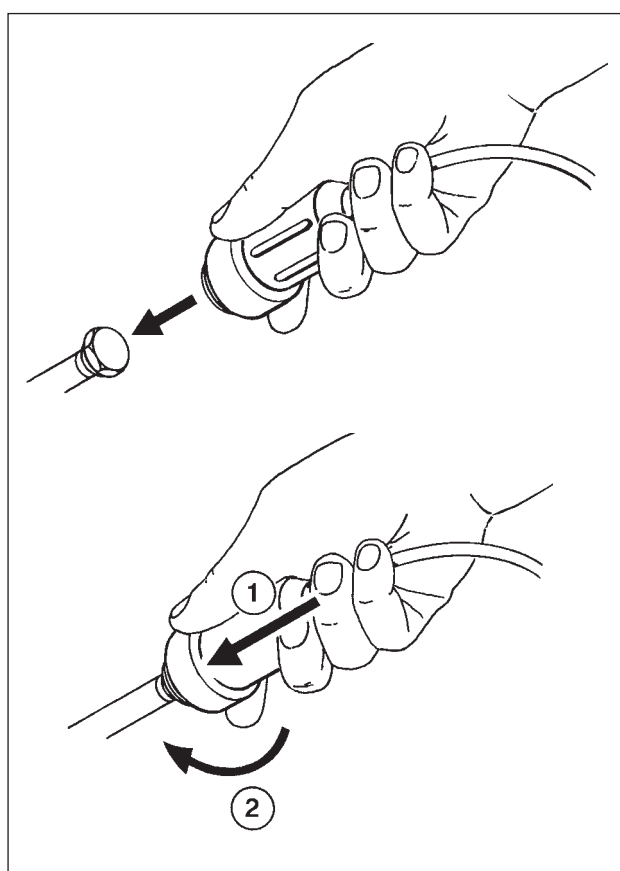
Measuring range	Max. 100 dBsv
Design	Sealed
Temperature range	-30° to +70° C (-22° to +158° F)
Material, spanner	Blacknited steel
Handle cover	Urethan
Coaxial cable	PVC, length 1.5 m (5 ft)
Connector	Mini coax
Dimensions	90 x 30 mm (1.2 x 3.5 in)
Weight	210 g (7,4 oz)

Ordering number

TRA-79 Shock pulse transducer with quick connector

Spare part

CAB-103 Cabel for TRA79, 1.5 m, mini coax. connector



Leonova – Headset with microphone



EAR16/17/18 are specially selected headsets, 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 modular telephone connector.

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

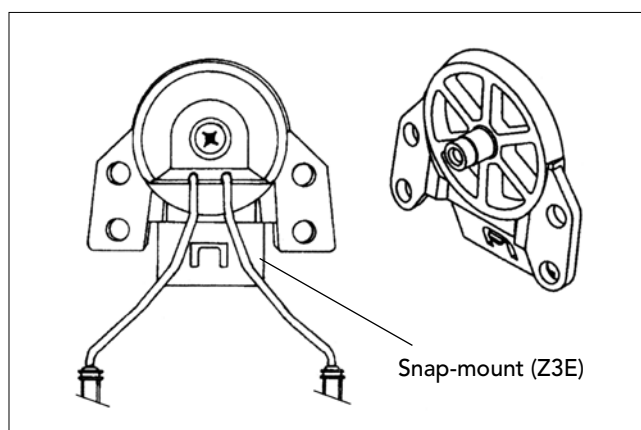
The headset EAR16 is a headset with two parallel connected earphones and a microphone. It has a collapsible headband for convenient storage when you are not using the headset.

Headset, EAR18

The headset EAR18 is a headset with two parallel connected earphones and a microphone. It has a neckband for use with or without helmet.

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.



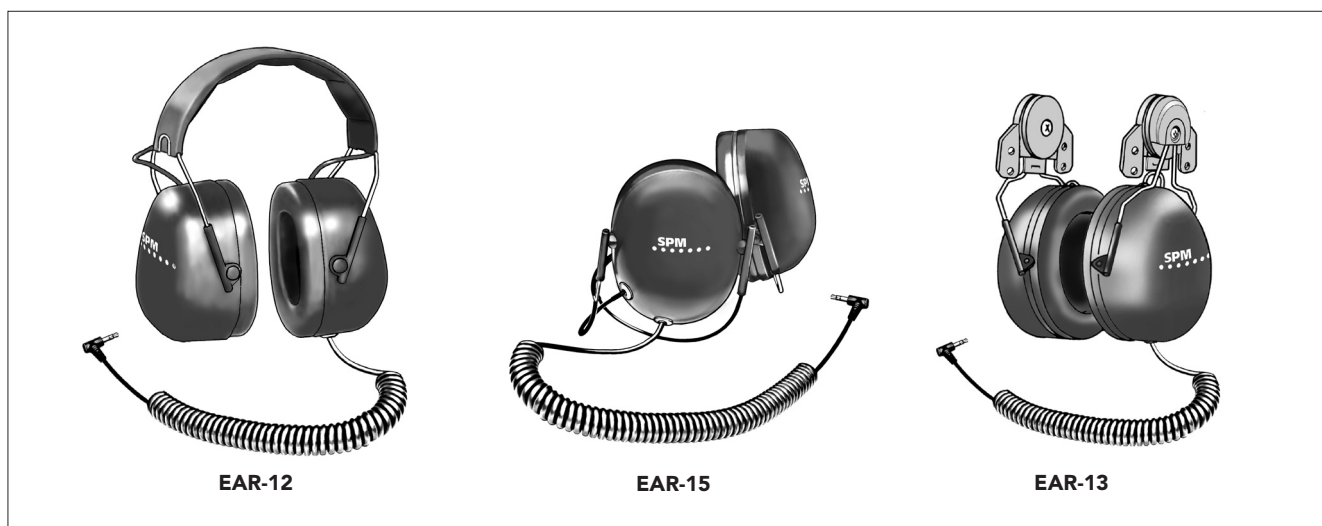
To mount the headphone, snap the helmet attachment into the slot on the helmet. Note: The cups can be set in three positions: working position, ventilation position and parking position. When in use, the cups must be placed in working position. Press the wires inward until you hear a click on both sides. 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.

Ordering number

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.)



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 stereo plug.

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.

Headphones with headband, EAR12

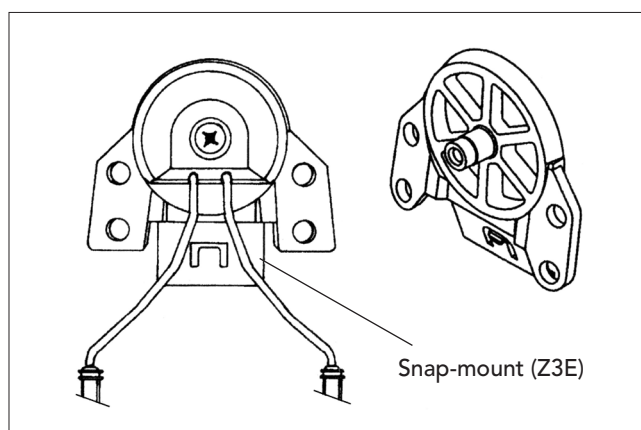
The headphones EAR12 is a headphone set with two parallel connected earphones. It has a collapsible headband for convenient storage when you are not using the headphones with eardefenders.

Headphones with neckband, EAR15

The headphones EAR15 is a headphone set with two parallel connected earphones. It is equipped with neckband for use with or without helmet.

Headphones for helmet, EAR13

The headphones EAR13 is a headphone set with two parallel 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.

Ordering number

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

