FAG

FAG Alignment Tools

Top-Laser:
SMARTY2
TRUMMY2
EQUILIGN
SHIM

SCHAEFFLER

Foreword

Higher cost-effectiveness

Correct alignment can help to achieve higher cost-effectiveness. Even machines with very high performance can sometimes still be incapable of fulfilling expectations, for example if they are not adequately aligned. Even minimal deviations can lead to major damage. With the products presented here, Schaeffler assists in the optimum alignment of belts and precise alignment of coupled and non-coupled machine shafts.

Savings

Alignment is worth performing and gives savings in resources. Precise alignment ensures lower operating and maintenance costs in the long term. In addition, wear is reduced, the lifetime of machinery is increased and energy costs are cut.

For your success

Products and service for your success – reliable, versatile, competent. Even after the purchase of a product, Schaeffler offers lasting solutions relating to mounting and maintenance. With the aid of the diverse portfolio of products and services, operating life and performance capability of production plant can be increased and overall costs can be reduced. In addition, the presence of Schaeffler engineers worldwide guarantees that you receive competent support directly at your location.

The portfolio of products and services encompasses not only mounting, lubrication, condition monitoring and rolling bearing reconditioning but also training. All the products and services presented here have been tested in practical use and are certified in accordance with ISO 9001.

Foreword

Important to know

In the interests of rapid assistance, Schaeffler has brought together valuable knowledge relating to the mounting and dismounting of rolling bearings in the Mounting Toolbox. Videos show what must be observed in order to achieve correct lubrication, mounting and alignment. The Virtual Plant makes it possible to watch the work of fitting personnel at close quarters, *Figure 1*.

http://mounting-toolbox.schaeffler.com

Figure 1
Mounting Toolbox

Contents

Belt pulley alignment device
Top-Laser SMARTY2

LASER-SMARTY2

Belt tension measuring device
Top-Laser TRUMMY2

LASER-TRUMMY2

Shaft alignment device
Top-Laser EQUILIGN

LASER-EQUILIGN

Shims
Top-Laser SHIM

LASER-SHIM

Alignment

Features

These products assist you in the alignment of shafts and belt pulleys and the checking of belt tension values.

Belt pulley alignment device FAG Top-Laser SMARTY2

The FAG Top-Laser SMARTY2 is a line laser for the alignment of belt pulleys and chain sprockets with a diameter of more than 60 mm.

The alignment of belt pulleys and chain sprockets reduces wear and energy losses in tension drives, their bearings and seals. Less heat is generated and the lifetime and reliability of the machines is increased.

The features of the line laser are as follows:

- The parallelism and angular errors of the two pulleys are displayed.
- Alignment can be carried out on both horizontally and vertically mounted belt pulleys.
- Alignment is significantly more rapid and more precise than with conventional methods.
- Alignment can be carried out by one person working alone.
- The measuring device is attached to the pulleys by magnetism.

The target marks are available in an optical and an electronic design, *Figure 1*. In the case of electronic target marks, the adjustment values are displayed in real time on the digital display.
Angular errors are shown in degrees, while the parallelism offset is shown in millimetres.

Caution ⚠ Do not look into the laser beam and do not point the laser beam into the eyes of other people.

Figure 1
Electronic target mark

Alignment

All the parts are supplied in a lined case, *Figure 2*.

Scope of delivery
1 emitter
2 optical target marks, attached by magnetism
1 battery
1 lined case

Ordering designation **LASER-SMARTY2**

① Emitter
② Target mark, optical
③ Battery
④ Lined case

Figure 2
Scope of delivery
FAG Top-Laser SMARTY2

Replacement part 1 optical target mark, attached by magnetism

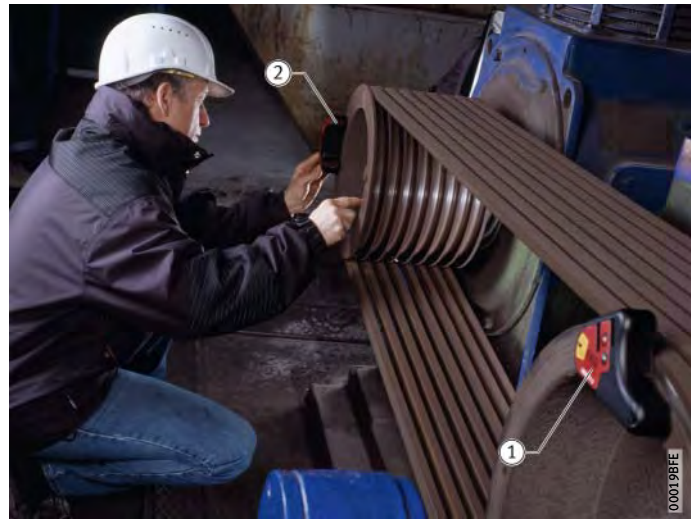
Ordering designation **LASER-SMARTY2.TARGET**

Accessories 1 electronic target mark, attached by magnetism
1 case

Ordering designation **LASER-SMARTY2.TARGET-DIGITAL**

Application

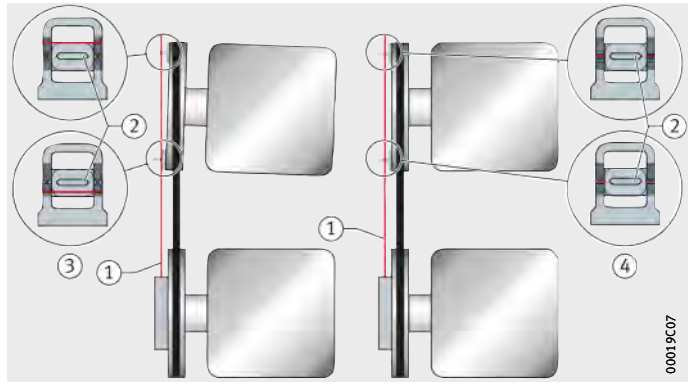
The FAG Top-Laser SMARTY2 can be mounted in just a few seconds, *Figure 3*.



① Laser
② Target mark, electronic

Figure 3
Mounting

The laser can be clearly seen on the target marks. Once the laser beam is adjusted to coincide with the slots in the target marks, the machine is correctly aligned, *Figure 4*.



① Laser beam
② Target mark, slot
③ Not parallel
④ Correct alignment

Figure 4
Alignment

Technical data

A summary of the technical data is shown in the table.

FAG Top-Laser SMARTY2

Laser emitter		
Power supply		Battery, 1×LR6 (AA) DC 1,5 V
Operating time		8 h
Operating temperature		+10 °C to +40 °C
Laser class		2
Laser beam	Angle	78°
	Wavelength	635 nm to 670 nm
Output power		< 1 mW
Measurement distance		10 m (maximum)
Measurement accuracy[1)]		Better than 0,5 mm or 0,2°
Housing		
Dimensions (W×H×D)		145 mm×86 mm×30 mm
Mass		270 g
Material		ABS, Al

1) General rule for deviation, depending on belt type: less than 0,25° (4,4 mm/m).

Belt tension measuring device FAG Top-Laser TRUMMY2

The robust, handy FAG Top-Laser TRUMMY2 is an optical-electronic manual measuring instrument for belt tension (strand force).

The correct belt tension is an essential prequisite for achieving the maximum life of the belt drive. In addition, this also gives reduced wear of the drive components, lower energy costs and increased cost-efficiency.

The FAG Top-Laser TRUMMY2 comprises a measurement probe without cable for direct connection, a measurement probe with cable for difficult to access locations and a manual control device that displays the relevant measurables for belt tension as a frequency in Hz or force in N.

All the parts of the belt tension measuring device are supplied packed in a case, *Figure 5*.

The simple and reliable user instructions are given in several languages.

Caution ⚠ Do not look into the laser beam and do not point the laser beam into the eyes of other people.

Scope of delivery

1 manual control device

1 measurement probe for direct connection

1 measurement probe with cable

1 case

Ordering designation **LASER-TRUMMY2**

① Manual control device
② Measurement probe for direct connection
③ Measurement probe with cable
④ Case

Figure 5
Scope of delivery
FAG Top-Laser TRUMMY2

Alignment

Calibration

We recommend, in accordance with ISO 9001, that the belt tension measuring device should be checked or calibrated at intervals of no more than 2 years. The belt tension measuring device can be sent to us for calibration. Before sending the device, please contact our Technical Support.

Service: Calibration

Ordering designation: **LASER-TRUMMY.CALI-CHECK**

Application

Before calculating the belt tension, the belt mass and length must be entered. Vibration of the belt is then induced. The device measures the natural frequency by means of clock pulse light and uses this to determine the belt tension, *Figure 6*. This technique is less prone to disruptive influences in comparison with measurement using sound waves.

① Belt
② TRUMMY2, cable less measurement probe

Figure 6
Measurement

Technical data

A summary of the technical data is shown in the table.

FAG Top-Laser TRUMMY2

Laser emitter	
Power supply	Battery, DC 9 V
Operating time	8 h
Operating temperature	+10 °C to +50 °C
Measurement range	10 Hz to 800 Hz
Digital sampling error	< 1%
Total error	< 5%
Display	LCD, 2 lines, 16 characters per line
Strand length, max.	9,999 m
Specific belt mass, max.	9,999 kg/m
Housing	
Dimensions (W×H×D)	80 mm×126 mm×37 mm
Mass	300 g
Material	ABS

Shaft alignment device FAG Top-Laser EQUILIGN

The FAG Top-Laser EQUILIGN, *Figure 7*, is an alignment system for coupled and decoupled shafts in motors, pumps, ventilators and gearboxes with rolling bearings.

The advantages of the system are as follows:

- simple mounting
- error-free handling even by untrained personnel using step-by-step display on the manual control device
- automatic tolerance checking.
  A symbol indicates when the shafts are correctly aligned
- more precise alignment than with conventional methods
- rapid, simple measurement by means of Active Clock measurement mode
- robust control device.
  Watertight and insensitive to contamination in accordance with IP65
- user interface in 19 languages
- easy generation of reports
- real time display of displacement in all axes.

Caution ⚠ Do not look into the laser beam and do not point the laser beam into the eyes of other people.

Figure 7
Shaft alignment device FAG Top-Laser EQUILIGN

All the parts of the shaft alignment device are supplied packed in a case, *Figure 8*.

Scope of delivery

1 manual control device
1 emitter/receiver including cable 2 m long
1 reflector
5 batteries
1 Allen key
1 cable for connecting USB memory stick to device
1 cable for connecting device to PC via USB port
2 brackets
2 chains, 300 mm long
4 posts, 115 mm long
1 tape measure
1 case

Ordering designation **LASER-EQUILIGN**

① Manual control device
② Emitter/receiver
③ Reflector
④ Batteries, LR6 (AA) DC 1,5 V, 5 pieces
⑤ Allen key, 4 mm
⑥ Cable for USB memory stick
⑦ Cable for PC
⑧ Bracket
⑨ Chain, 300 mm long
⑩ Post,115 mm long
⑪ Tape measure
⑫ Case

Figure 8
Scope of delivery
FAG Top-Laser EQUILIGN

Replacement parts

Batteries and Allen keys are standardised and can be obtained from trade outlets. All other parts are available as replacement parts, see table.

Replacement parts, individual parts

Description	Scope of delivery Quantity	Designation
Manual control device	1	**LASER-EQUILIGN-DEVICE**
Emitter/receiver with cable	1	**LASER-EQUILIGN.TRANS**
Reflector	1	**LASER-EQUILIGN.REFLECT**
Cable for USB memory stick, 0,5 m long	1	**LASER-EQUILIGN.USB-CABLE**
PC, 2 m long	1	**LASER-EQUILIGN.PC-CABLE**
Bracket	2	**LASER.BRACKET**
Chain, 300 mm long	2	**LASER.CHAIN300-SET**
Post, 115 mm long	4	**LASER.POST115-SET**
Tape measure, 1 m long	1	**LASER.TAPE**
Case	1	**LASER-EQUILIGN.CASE**

Accessories

A comprehensive range of accessories is available in order to expand the possible applications of the base device FAG Top-Laser EQUILIGN, see tables and *Figure 9*, page 15.

The accessories can be ordered as a set in a handy, robust case or as individual parts.

Accessories, individual parts

Description		Scope of delivery Quantity	Designation
Chain	600 mm long	2	**LASER.CHAIN600-SET**
	1500 mm long	2	**LASER.CHAIN1500-SET**
Post	150 mm long	4	**LASER.POST150-SET**
	200 mm long	4	**LASER.POST200-SET**
	250 mm long	4	**LASER.POST250-SET**
	300 mm long	4	**LASER.POST300-SET**
Magnetic holder including 2 posts, 150 mm long		1	**LASER.BRACKET-MAGNET**

Accessories, set

Description		Scope of delivery Quantity	Designation
Chain	600 mm long	2	**LASER.ACCESS-SET**
	1500 mm long	2	
Post	150 mm long	4	
	200 mm long	4	
	250 mm long	4	
	300 mm long	4	
Magnetic holder including 2 posts, 150 mm long		2	
Case		1	

① Chains, 600 mm
② Chains, 1500 mm
③ Posts, 150 mm
④ Posts, 200 mm
⑤ Posts, 250 mm
⑥ Posts, 300 mm
⑦ Magnetic holder
⑧ Case

Figure 9
Accessories, set

Alignment

Handling and use

The emitter/receiver is mounted on the shaft of the non-movable side of the subassembly by means of a clamping device.
The reflector is then mounted on the shaft of the movable opposing side, *Figure 10*. The emitter/receiver and manual control device are then connected to each other by means of a cable. The manual control device is switched on and the dimensions of the machine are inputted.

Actions to be taken before alignment

A soft foot is defined as a machine foot that lifts off the floor when the foot screw connection is slackened. If a soft foot is present, this must be removed before alignment is carried out.

Each individual foot screw connection is loosened and the device is monitored to see if it displays any changes between the foot screwed firmly into place and the loosened foot. The soft foot can then be eliminated using shims, page 21.

① Emitter/receiver
② Reflector
③ Soft foot, display
④ Soft foot, foot screw connection

Figure 10
Finding the soft foot

Alignment

Once the soft foot has been eliminated, the alignment process can be started. During measurement, at least three positions are approached at different angles. These must be measured at an angle of at least 90°. The intelligent control system prevents incorrect usage here. The actual condition of the subassembly is then displayed, *Figure 11*.

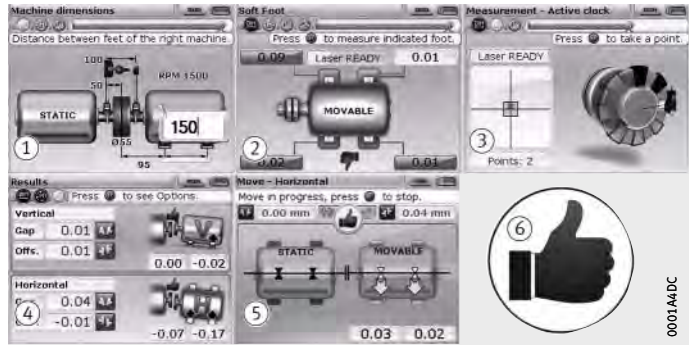
Once the foot screw connections have been loosened, the vertical misalignment is first eliminated by means of shims.
FAG Top-Laser EQUILIGN shows the displacement in real time. This means that the user can monitor on the display how the measurement results change as soon as the subassembly is moved. Horizontal adjustment is then carried out until the symbol with the thumb pointing upwards is displayed. Once the foot screw connections are tightened, the shafts are aligned.

① Display of actual condition
② Foot screw connection
③ Direction of vertical displacement
④ Direction of horizontal displacement

Figure 11
Alignment

Compilation of results

After just five operating steps, the subassembly is aligned, *Figure 12*.



① Input of dimensions
② Identification of soft foot
③ Measurement
④ Display of actual condition
⑤ Display of displacement
⑥ Symbol “thumbs up = everything is OK”

Figure 12
Compilation of results

Control measurement

Finally, a control measurement is carried out and the measurement result is recorded with the aid of the report generator function integrated in the device.

Technical data

A summary of the technical data is shown in the tables.

FAG Top-Laser EQUILIGN

Manual control device	
Power supply	Batteries, 5× LR6 (AA) DC 1,5 V
Operating time[1)]	9 h
Operating temperature	0 °C to +50 °C
Hardware	
Processor	Intel XScale PXA270 312 MHz
Memory	■ 64 MB RAM ■ 32 MB Flash
Connectors	
Data transfer	■ USB 2.0, Host & Slave ■ RS 232
LCD display	
Type	TFT, transmissive
Display	65 535 greyscales
Size	8,9 cm (3,5 inch)
Resolution	320×240 pixels
Illumination	■ LED background illumination ■ Integrated photometer for automatic adjustment of display brightness to environment
Status displays	
Battery display	LED, multi-colour
Laser alignment, alignment status	LED, multi-colour
Keyboard	
Key elements	■ Navigation keys: – “up”, “down”, “left”, “right” ■ “Enter” key ■ “Back” key ■ “Delete” key ■ “Menu” key ■ Alphanumeric keyboard ■ Additional keys for functions: – Dimensions, Measurement, Results, Soft foot, LiveMove
Housing	
Dimensions (W×H×D)	220 mm×165 mm×45 mm
Mass	742 g
Protection type	IP65

1) In operating cycle:
33% measurement, 33% data processing, 33% standby.

FAG Top-Laser EQUILIGN
(continued)

Emitter/receiver	
Measurement distance	5 m (maximum)
Dimensions (W×H×D)	107 mm×70 mm×49 mm
Mass	177 g
Protection type	IP67
Laser	
Principle	Coaxial, reflected laser beam
Type	Ga-Al-As semiconductor laser
Class	2, FDA 21 CFR 1000 & 1040
Laser beam, wavelength	675 nm, red, visible
Output power	< 1 mW
Detector	
Measurement range	Any, dynamically expandable
Resolution	1 µm
Accuracy	> 98%
Inclinometer	
Measurement range	0° to 360°
Resolution	< 1°
Reflector	
Design	90 mm roof prism
Accuracy	> 1%
Dimensions (W×H×D)	100 mm×41 mm×35 mm
Mass	65 g
Protection type	IP67
Case	
Dimensions (W×H×D)	500 mm×410 mm×140 mm
Mass	4,1 kg
Material	ABS
User interface	
Language versions	German, English, US English, Chinese (traditional), Chinese (simplified), Finnish, French, Indonesian, Italian, Japanese, Korean, Dutch, Polish, Portuguese, Russian, Swedish, Spanish, Thai, Czech

Shims
FAG Top-Laser SHIM

Shims FAG Top-Laser SHIM are used to eliminate vertical misalignment or soft feet.

These shims are made from corrosion-resistant alloy steel and are available in seven thicknesses (0,05 mm, 0,1 mm, 0,2 mm, 0,5 mm, 0,7 mm, 1 mm 2 mm) and in four sizes (dimension c = 15 mm, 23 mm, 32 mm, 44 mm), *Figure 13* and table, page 22.

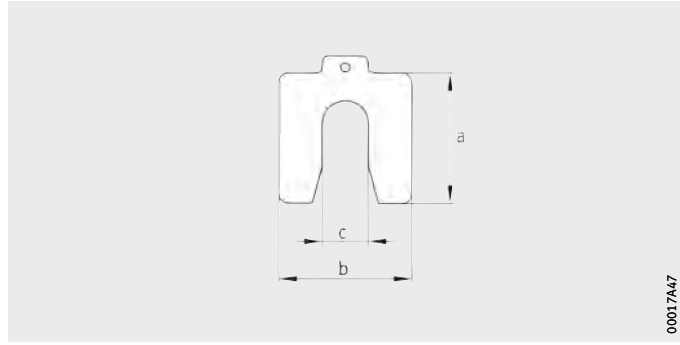


Figure 13
Shim, dimensions

Scope of delivery
Basic set

1 case

360 shims:
20 shims each in three sizes (dimension c = 15 mm, 23 mm, 32 mm) and six thicknesses (0,05 mm to 1 mm)

1 extraction hook

Ordering designation **LASER.SHIM-SET**

Replacement parts

As replacement parts, we supply 10 shims each in one of the 4 sizes and one of the 7 thicknesses.

Ordering example 1: 10 shims with dimension c = 15 mm and 0,2 mm thickness

Ordering designation **LASER.SHIM15X0,20**

Ordering example 2: 10 shims with dimension c = 44 mm and 0,1 mm thickness

Ordering designation **LASER.SHIM44X0,10**

Available shims

Designation	Mass	Dimensions			
	m	a	b	c	Thick-ness
	g/10 pieces	mm	mm	mm	mm
LASER.SHIM15X0,05	8	55	50	15	0,05
LASER.SHIM15X0,10	17	55	50	15	0,1
LASER.SHIM15X0,20	40	55	50	15	0,2
LASER.SHIM15X0,50	80	55	50	15	0,5
LASER.SHIM15X0,70	120	55	50	15	0,7
LASER.SHIM15X1,00	170	55	50	15	1
LASER.SHIM15X2,00	334	55	50	15	2
LASER.SHIM23X0,05	16	75	70	23	0,05
LASER.SHIM23X0,10	31	75	70	23	0,1
LASER.SHIM23X0,20	60	75	70	23	0,2
LASER.SHIM23X0,50	150	75	70	23	0,5
LASER.SHIM23X0,70	220	75	70	23	0,7
LASER.SHIM23X1,00	320	75	70	23	1
LASER.SHIM23X2,00	630	75	70	23	2
LASER.SHIM32X0,05	16	90	80	32	0,05
LASER.SHIM32X0,10	38	90	80	32	0,1
LASER.SHIM32X0,20	80	90	80	32	0,2
LASER.SHIM32X0,50	190	90	80	32	0,5
LASER.SHIM32X0,70	270	90	80	32	0,7
LASER.SHIM32X1,00	390	90	80	32	1
LASER.SHIM32X2,00	774	90	80	32	2
LASER.SHIM44X0,05	50	125	105	44	0,05
LASER.SHIM44X0,10	90	125	105	44	0,1
LASER.SHIM44X0,20	140	125	105	44	0,2
LASER.SHIM44X0,50	363	125	105	44	0,5
LASER.SHIM44X0,70	505	125	105	44	0,7
LASER.SHIM44X1,00	694	125	105	44	1
LASER.SHIM44X2,00	1362	125	105	44	2

Mounting

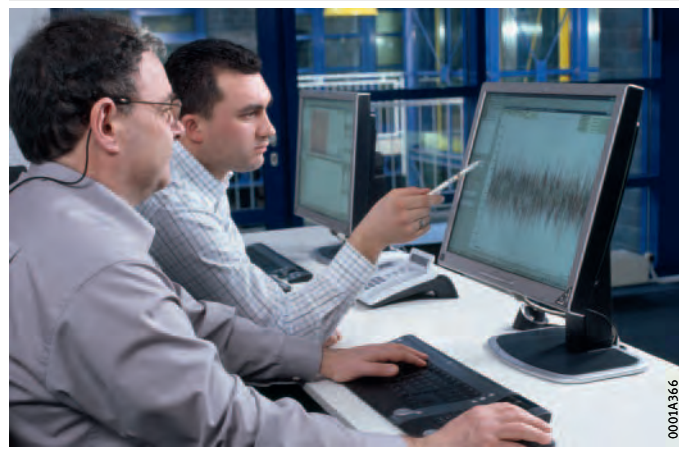
MOUNT-HOUR

Lubrication

ARCA-PUMP

Condition monitoring

CM-HOUR-ENGINEER



Services

In addition to alignment as a service, Schaeffler can provide numerous solutions for your specific requirements. Here are some examples from the product portfolio of Schaeffler Industrial Aftermarket.

Mounting

Our experienced fitters can support you in the mounting and dismounting of rolling bearings and advise you on the selection of suitable mounting tools. Correct mounting is an essential precondition for achieving the maximum operating life of bearings. In the case of the London Eye, Schaeffler supplied the rolling bearings and carried out the mounting operations, *Figure 1*.

Figure 1
Double row FAG spherical roller bearing in the London Eye

Lubrication

Unsuitable lubrication can impair the operating life of rolling bearings and cause damage. In order to achieve the most suitable lubrication, Schaeffler can provide specifically designed and tested greases, *Figure 2*.

Figure 2
Rolling bearing grease for every bearing arrangement

Rolling bearing grease Arcanol

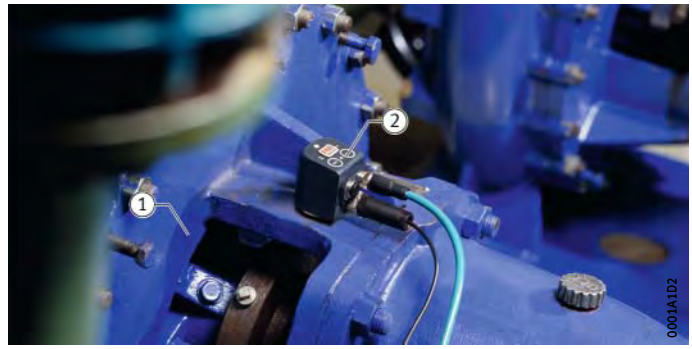
The 17 different greases cover almost all applications. They are developed by experienced application engineers and are produced by the best manufacturers in the market. Different greases are used depending on the particular application. At high operating temperatures, the thermally stable special grease Arcanol TEMP120 is used.

Rolling bearing greases under the name Arcanol are subject to 100% quality inspection. The inspection methods at Schaeffler are among the most demanding in the market.
As a result, rolling bearing greases Arcanol fulfil the highest quality requirements.

Condition monitoring

The malfunction-free and optimised operation of complex machinery and plant can only be achieved by means of condition-based maintenance. In many cases, Schaeffler uses vibration diagnosis. For example, FAG SmartCheck is an innovative measuring system for real time monitoring with a patented diagnosis technology. Due to the low purchase costs, it can be used economically even on smaller subassemblies.

The compact measuring device can be installed quickly, is easy to use and contributes through its trendsetting characteristics to process optimisation and the reduction of life cycle costs.
In this way, you receive the best information on the condition of your machinery, *Figure 3*.



① Pump
② FAG SmartCheck

Figure 3
FAG SmartCheck, application example

Notes

Notes

Notes

Notes

Further information

Industrial Aftermarket
Products and services for your success
www.schaeffler.com/services

Schaeffler Mounting Toolbox
Virtual Plant: About the Mounting Service
http://mounting-toolbox.schaeffler.com

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Schaeffler Technologies
GmbH & Co. KG

Postfach 1260
97419 Schweinfurt
Germany

Georg-Schäfer-Straße 30
97421 Schweinfurt
Germany

Phone +49 2407 9149-66
Fax +49 2407 9149-59
E-mail industrial-services@schaeffler.com
Internet www.schaeffler.com/services

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