FAG Alignment Tools
Top-Laser: SMARTY2 · TRUMMY2 · INLINE2 · SHIM
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This Technical Product Information contains the current ordering designations of Schaeffler Group Industrial. Different designations may be used as appropriate in some countries (please see the comparison on page 17).
FAG Top-Laser SMARTY2

The FAG Top-Laser SMARTY2 is an economical measuring device for the alignment of belt pulleys and chain sprockets. Through the use of this device, the wear of belts, belt pulleys, bearings and seals is reduced. Less vibration is generated and the running time and reliability of the machinery is increased.

Features and advantages

• Parallelism and misalignment of both pulleys displayed
• Significantly quicker and more precise than other, conventional methods
• Suitable for both horizontally and vertically mounted machinery
• Only one person required for alignment
• System can also be used on non-magnetic sprockets or pulleys.

Main applications

<table>
<thead>
<tr>
<th>Flat belts</th>
<th>Vee belts</th>
<th>Toothed belts</th>
<th>Sprockets</th>
</tr>
</thead>
</table>

Types of misalignment

- Angular misalignment
- Parallel misalignment
- Angular misalignment + parallel misalignment
Tools for belt and chain drives
Belt pulley alignment device FAG Top-Laser SMARTY2

Easy to use
The FAG Top-Laser SMARTY2 can be mounted in just a few seconds. The laser beam 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. Nothing could be simpler.

Target marks
The target marks are available in optical and digital form. In the case of the digital target mark, adjustment values are shown in real time in the display. Angular misalignments are presented in degrees and the parallel misalignment in mm. This allows simple documentation of the alignment process.

Aluminium pulleys
Since the measuring instrument is so light, the emitter and target marks can be easily attached to non-magnetic drive pulleys using a strong, double-sided adhesive tape.

Laser beam adjustment
The laser beam emitted by the measuring instrument is adjusted parallel to the magnetic holders of the measuring instrument. If a deviation is found, this can be checked locally on a flat surface by the operator and readjustment carried out if necessary.

Alignment example using a belt drive
For drives with pulleys of different widths, the marks should be moved within the target marks
Tools for belt and chain drives

Belt pulley alignment device FAG Top-Laser SMARTY 2

Technical data

<table>
<thead>
<tr>
<th>Laser emitter</th>
<th>≥ 60 mm ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belt pulleys</td>
<td></td>
</tr>
<tr>
<td>Laser beam angle</td>
<td>78°</td>
</tr>
<tr>
<td>Laser class</td>
<td>2</td>
</tr>
<tr>
<td>Measurement distance</td>
<td>10 m</td>
</tr>
<tr>
<td>Batteries</td>
<td>1 × R6 (AA) 1.5 V</td>
</tr>
<tr>
<td>Battery life</td>
<td>8 h continuous</td>
</tr>
<tr>
<td>Output power</td>
<td>&lt; 1 mW</td>
</tr>
<tr>
<td>Laser wavelength</td>
<td>635...670 nm</td>
</tr>
<tr>
<td>Housing</td>
<td>ABS plastic, aluminium</td>
</tr>
<tr>
<td>Device dimensions</td>
<td>145 × 86 × 30 mm</td>
</tr>
<tr>
<td>Mass</td>
<td>270 g</td>
</tr>
</tbody>
</table>

Targets

2 magnetic target marks

Measurement accuracy

better than 0.5 mm or 0.2° *)

*) General rule for deviations (depending on belt type):
less than 0.25° [4.4 mm/m]

Ordering designation and scope of delivery:

Laser measuring instrument, complete, including 2 target marks, 2 batteries and user manual in padded case:

LASER-SMARTY2

Replacement part:

1 optical magnetic target mark

LASER-SMARTY2.TARGET

Accessories:

1 digital magnetic target mark incl.
1 case for digital magnetic target mark and FAG Top-Laser SMARTY 2

LASER-SMARTY2.TARGET-DIGITAL

Safety guidelines

Do not look into the laser beam.
Do not point the laser beam into other persons' eyes.

Calibration:

It is recommended that the FAG Top-Laser SMARTY 2 should be calibrated every two years (to ISO 9001-2000)

LASER-SMARTY.CALI-CHECK
Tools for belt and chain drives
Belt tension measuring device FAG Top-Laser TRUMMY2

FAG Top-Laser TRUMMY2
The robust, handy Top-Laser TRUMMY2 is an optical-electronic instrument for measuring and setting optimum belt tension (strang force). Through the use of this device, the maximum output and optimum life of belt drives, bearings and seals can be achieved.

Easy to use
The user-friendly FAG Top-Laser TRUMMY2 can be used in many locations and comprises a cableless measurement probe, a measurement probe with a cable for difficult to access locations and a handheld device that indicates relevant measurables for belt tension either as frequency [Hz] or force [N]. By means of an impulse (for example by striking the stationary belt), the tensioned belt is excited to natural vibration. The individual static natural frequency thus generated is measured within seconds by the FAG Top-Laser TRUMMY2 sensor using clock pulse light and displayed. In order to calculate the strang force of the belt drive, the belt mass and length are entered in the FAG TRUMMY2 before measurement. The device uses these to calculate the strang force, which is then compared with the specified nominal value.

Features and advantages
- Maximum life of belt drives can be ensured
- Reduced wear of drive components
- Reduced energy costs and increased cost-efficiency
- Absolutely reliable results due to new measurement method (clock pulse light)
- Simple and easy to use
- Multilingual operator interface.

Measurement using cableless measurement probe
Tools for belt and chain drives

Belt tension measuring device FAG Top-Laser TRUMMY2

Technical data

Measurement range 10 Hz to 800 Hz
Digital sampling error < 1 %
Total error < 5 %
Operating temperature +10 °C to +50 °C
Housing ABS plastic
Device dimensions 80 × 126 × 37 mm
Mass 300 g
Display 2 lines LCD, 16 characters
Input limits
  Free strand length up to 9,990 m
  Belt mass up to 9,999 kg/m
Power supply 9 Volt battery

Ordering designation and scope of delivery:
Laser measuring device in plastic case incl. 1 cableless measurement probe and 1 measurement probe with cable:
LASER-TRUMMY2

Calibration:
It is recommended that the FAG Top-Laser TRUMMY2 should be calibrated every two years (to ISO 9001-2000)
LASER-TRUMMY.CALI-CHECK
Tools for shaft couplings

Shaft alignment device FAG Top-Laser INLINE2

FAG Top-Laser INLINE2

More than half of all unplanned machine downtime can be attributed to misalignment and imbalance. These problems can also arise in the use of flexible couplings.

The FAG Top-Laser INLINE2 is a PC-based system for aligning coupled shafts which can be used to significantly increase the availability of machinery.

Application

The FAG Top-Laser INLINE2 is suitable for aligning coupled shafts in motors, pumps, ventilators and gearboxes (with rolling bearings).

Features and advantages

- Easy to fit
- Error-free handling even by untrained personnel due to automatic measurement and positioning process
- More precise alignment than with conventional methods (dial gauge and straight edge)
- Rapid measurement by continuous measurement mode; at least 70° rotary motion is adequate for measurement (any position and direction of rotation)
- Optimised for commonly available netbook or laptop with USB interface
- Optional wireless connection for user-friendly handling without troublesome tangle of cables
- Reduced vibration and friction losses
- Increased productivity through longer machine running times
- Significantly lower energy consumption

Scope of delivery:
1. 1 transceiver (incl. 3 m cable)
2. 1 reflector
3. 2 brackets
4. 2 chains (300 mm)
5. 4 posts (115 mm)
6. Software (manual, help CD)
7. Case
8. USB adapter

Ordering designation:
FAG Top-Laser INLINE2 complete: LASER INLINE2
Tools for shaft couplings
Shaft alignment device FAG Top-Laser INLINE2

Actions before alignment

Before any alignment operation, any soft foot (machine foot that lifts off the floor when slackened) should be removed in order to avoid faulty measurements due to housing distortion. The FAG Top-Laser INLINE2 helps to quickly identify and eliminate the so-called soft foot. It is only necessary to loosen each individual screw foot connection. The computer determines any foot movement. The soft foot can then be eliminated using shims (see page 13).

Accessories

The possible applications of the basic device can be expanded with the aid of a comprehensive range of accessories. The accessories can be ordered as a set in a handy, robust case or – individually compiled – as individual parts.

<table>
<thead>
<tr>
<th>Accessories for FAG Top-Laser INLINE2</th>
<th>Scope of delivery</th>
<th>Ordering designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain, 600 mm long</td>
<td>2 pieces</td>
<td>LASER INLINE.CHAIN600</td>
</tr>
<tr>
<td>Chain, 1500 mm long</td>
<td>2 pieces</td>
<td>LASER INLINE.CHAIN1500</td>
</tr>
<tr>
<td>Post, 150 mm long</td>
<td>4 pieces</td>
<td>LASER INLINE.POST150</td>
</tr>
<tr>
<td>Post, 200 mm long</td>
<td>4 pieces</td>
<td>LASER INLINE.POST200</td>
</tr>
<tr>
<td>Post, 250 mm long</td>
<td>4 pieces</td>
<td>LASER INLINE.POST250</td>
</tr>
<tr>
<td>Post, 300 mm long</td>
<td>4 pieces</td>
<td>LASER INLINE.POST300</td>
</tr>
<tr>
<td>Magnetic holders incl. 4 posts, 150 mm long</td>
<td>1 piece</td>
<td>LASER INLINE.MAGNET</td>
</tr>
<tr>
<td>Accessory set, complete</td>
<td>1 piece</td>
<td>LASER INLINE.ACCESS-SET</td>
</tr>
</tbody>
</table>

Wireless upgrade 1 piece LASER INLINE2.UPG-WI

Chains
For mounting of brackets on shafts
- 600 mm long for max. shaft diameter of 200 mm
- 1500 mm long for max. shaft diameter of 500 mm

Posts
For mounting of measuring components on clamping device
- 150 mm long
- 200 mm long
- 250 mm long
- 300 mm long

Magnetic holders
For rapid mounting and fine adjustment of measuring components on narrow coupling flanges of shafts with a diameter of more than 500 mm.
Tools for shaft couplings
Shaft alignment device FAG Top-Laser INLINE2

**Transceiver**

Compact, robust transceiver as source and recipient for visible laser beam (red)

Ordering designation:
LASER-INLINE.TRANS

**Cable**

For supplying power to transceiver and exchanging data with control unit

Ordering designation:
LASER-INLINE2.USB-ADAP-CABLE

**USB adapter**

Adapter for connecting FAG Top-Laser INLINE2 to the USB port on the netbook

Ordering designation:
LASER-INLINE2.USB-ADAP

**Reflector**

Roof prism with compact housing, mounted on clamping device by means of lever

Ordering designation:
LASER-INLINE.REFLECT
Tools for shaft couplings
Shaft alignment device FAG Top-Laser INLINE2

Bracket

Basic element of compact chain clamping device

Ordering designation:
LASER INLINE.BRACKET

Chains, available in lengths 300 mm, 600 mm, 1500 mm

For max. shaft diameters 100 mm, 200 mm, 500 mm for mounting of brackets on shafts

Ordering designations:
LASER INLINE.CHAIN300
LASER INLINE.CHAIN600
LASER INLINE.CHAIN1500
Minimum order quantity:
2 pieces each

Posts, available in lengths 115 mm, 150 mm, 200 mm, 250 mm, 300 mm

For mounting of measuring components on clamping device

Ordering designations:
LASER INLINE.POST115
LASER INLINE.POST150
LASER INLINE.POST200
LASER INLINE.POST250
LASER INLINE.POST300
Minimum order quantity:
4 pieces each
Tools for shaft couplings

Shaft alignment device FAG Top-Laser INLINE2

Software

Windows-compatible PC program for storage of machine dimensions and alignment conditions, evaluation and printing of results

Ordering designation:
LASERINLINE.SOFTW

Case

Black plastic case with foam insert for safe transport of the device

Ordering designation:
LASERINLINE2.CASE

Calibration

It is recommended to check the calibration of FAG Top-Laser INLINE2 every two years (to ISO 9001-2000)

Ordering designation:
LASERINLINE.CALI-CHECK

If the measurement results are out of tolerance, relinearisation is necessary

Ordering designation:
LASERINLINE.CALI-RELIN
Tools for shaft couplings
Shaft alignment device FAG Top-Laser IN LINE2

Easy to use

Before alignment, eliminate any soft foot (see page 8). Mount the chain clamping device at the same angle on both sides of the shaft coupling. Mount the transceiver on the side of the shaft coupling defined as stationary (pump, ventilator). Mount the reflector on the side of the shaft coupling defined as movable (motor). Connect the transceiver to the netbook using the USB adapter. The FAG Top-Laser IN LINE2 software will start.

1. Enter three machine dimensions, see example “Input data for coupling”.

2. Enter position of transceiver and reflector relative to the coupling. The laser beam is centred on the screen in accordance with the instructions, see example “Scan”.

The deviations in the horizontal and vertical directions are measured by rotating the coupled shaft by at least 70° (in any direction).

3. The result is given as the amounts in mm (inch), by which the front or rear foot must be adjusted up or down (by inserting or removing the shims FAG Top-Laser SHIM, see page 13). The horizontal alignment can be monitored and corrected in real time on the screen (live view).

Finally, correct alignment is checked by means of a verification measurement.
## Technical data

### Transceiver
- **Measurement method:** coaxial, reflected laser beam
- **Protection class:** IP67 (dustproof, immersion proof)
- **Protection against ambient light:** yes
- **Storage:** −20 °C to +80 °C
- **Operation:** 0 °C to +55 °C
- **Dimensions (W × H × D):** approx. 107 mm × 70 mm × 49 mm
- **Mass:** approx. 177 g

### Laser (Ga-Al-As semiconductor laser)
- **Wavelength (typical):** 670 nm (red, visible)
- **Laser class:** 2; FDA 21CFR 1000 & 1040
- **Beam power:** < 1 mW
- **Interface:** USB 2.0 via adapter
- **Max. recommended distance:** 3 m

### Detector
- **Measurement range:** ± 4 mm
- **Resolution:** 1 μm
- **Accuracy:** better than 2 %

### Inclinometer
- **Measurement range:** 0 to 360°
- **Resolution:** less than 1°

### Reflector
- **Type:** 90° roof prism
- **Protection class:** IP67 (dustproof, immersion proof)
- **Accuracy:** better than 1 %
- **Storage:** −20 °C to +80 °C
- **Operation:** −20 °C to +60 °C
- **Dimensions (W × H × D):** approx. 100 mm × 41 mm × 35 mm
- **Mass:** approx. 65 g
Tools for shaft couplings
Shaft alignment device FAG Top-Laser INLINE2

<table>
<thead>
<tr>
<th>Carry case</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Material:</td>
<td>standard ABS, black</td>
</tr>
<tr>
<td>Dimensions (W x H x D):</td>
<td>approx. 460 mm x 380 mm x 170 mm</td>
</tr>
<tr>
<td>Mass of components:</td>
<td>approx. 3.7 kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Range of application</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft diameter:</td>
<td>min. 12 mm, max. 500 mm (with standard chains). Larger shaft diameters possible using magnetic holders.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USB adapter</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector:</td>
<td>USB 2.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wireless module (optional)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Range:</td>
<td>10 m</td>
</tr>
<tr>
<td>Power supply:</td>
<td>2 x AA batteries (rechargeable batteries can be used)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Software</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating system:</td>
<td>Windows XP / Windows 7</td>
</tr>
<tr>
<td>System requirements:</td>
<td>Screen resolution optimised for 1024 x 576</td>
</tr>
<tr>
<td></td>
<td>Hardware: See minimum requirements for Windows XP / Windows 7</td>
</tr>
</tbody>
</table>
Accessories for alignment
Shims FAG Top-Laser SHIM

FAG Top-Laser SHIM

Any vertical misalignment detected by the FAG Top-Laser can be eliminated using shims FAG Top-Laser SHIM. These shims are available in seven thickness values (0,05; 0,10; 0,20; 0,50; 0,70; 1,00 and 2,00 mm) and four sizes (dimension C = 15, 23, 32 or 44 mm).

Scope of delivery of a set (basic version):

The handy case contains 20 shims in each of 3 sizes C = 15, 23 and 32 mm and 6 thicknesses (0,05 to 1,00 mm), i.e. a total of 360 shims plus 1 extraction hook.

Ordering designation:
LASER.SHIM-SET

FAG Top-Laser SHIM set

<table>
<thead>
<tr>
<th>Ordering designation</th>
<th>Dimensions A mm</th>
<th>Dimensions B mm</th>
<th>Dimensions C mm</th>
<th>Thickness mm</th>
<th>Total quantity Shims</th>
<th>Mass kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>LASER.SHIM-SET</td>
<td>55</td>
<td>50</td>
<td>15</td>
<td>0,05–1,0</td>
<td>360</td>
<td>6,7</td>
</tr>
<tr>
<td></td>
<td>75</td>
<td>70</td>
<td>23</td>
<td>0,05–1,0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>80</td>
<td>32</td>
<td>0,05–1,0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scope of delivery of FAG Top-Laser SHIM
## Individual or replacement parts

As individual or spare parts, we supply **10** shims each in one of the four sizes stated above (dimension C = 15, 23, 32 or 44 mm) and one of the seven thicknesses.

### Ordering examples:

- **10** shims of dimension C = 15 mm and 0,20 mm thickness: 
  `LASER.SHIM15X0,20`

- **10** shims of dimension C = 44 mm and 0,10 mm thickness:  
  `LASER.SHIMS44X0,10`

- **10** shims of dimension C = 23 mm and 2,00 mm thickness: 
  `LASER.SHIM23X2,00`
## Comparison of ordering designations

<table>
<thead>
<tr>
<th>Current ordering designation (EP1)</th>
<th>Old ordering designation (Pxx)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LASER-INLNE2</td>
<td>LASER.INLINE2</td>
</tr>
<tr>
<td>LASER-INLNE.ACCESS-SET</td>
<td>LASER.INLINE.ACCESS.SET</td>
</tr>
<tr>
<td>LASER-INLNE.BRACKET</td>
<td>LASER.INLINE.BRACKET</td>
</tr>
<tr>
<td>LASER-INLNE2.USB-ADAP-CABLE</td>
<td>LASER.INLINE2.USB.ADAP.CABLE</td>
</tr>
<tr>
<td>LASER-INLNE2.CASE</td>
<td>LASER.INLINE2.SUITCASE</td>
</tr>
<tr>
<td>LASER-INLNE.ACCESS-SET</td>
<td>LASER.INLINE.ACCESS.SUITCASE</td>
</tr>
<tr>
<td>LASER-INLNE.CHAIN300 (~600; ~1500)</td>
<td>LASER.INLINE.CHAIN300 (~600; ~1500)</td>
</tr>
<tr>
<td>LASER-INLNE.MAGNET</td>
<td>LASER.INLINE.MAGNET</td>
</tr>
<tr>
<td>LASER-INLNE2.USB-ADAP</td>
<td>LASER.INLINE2.USB.ADAP</td>
</tr>
<tr>
<td>LASER-INLNE.POST115 (~150; ~200; ~250; ~300)</td>
<td>LASER.INLINE.POST115 (~150; ~200; ~250; ~300)</td>
</tr>
<tr>
<td>LASER-INLNE.REFLECT</td>
<td>LASER.INLINE.REFL</td>
</tr>
<tr>
<td>LASER-INLNE.SOFTW</td>
<td>LASER.INLINE.SOFTWARE</td>
</tr>
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<td>LASER-INLNE.TRANS</td>
<td>LASER.INLINE.TRANS</td>
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<td>LASER-INLNE.CALI-RELIN</td>
<td>LASER.INLINE.CALI.RELIN</td>
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<td>LASER-INLNE2.UPG-USB</td>
<td>LASER.INLINE2.UPG.USB</td>
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<tr>
<td>LASER-INLNE2.UPG.WI</td>
<td>LASER.INLINE2.UPG.WI</td>
</tr>
<tr>
<td>LASER.SHIM-SET</td>
<td>LASER.SHIMS.SET</td>
</tr>
<tr>
<td>LASER.SHIM15X0,05 (~0,10; ~0,20 ... ~2,00)</td>
<td>LASER.SHIMS15.0,05 (~0,10; ~0,20 ... ~2,00)</td>
</tr>
<tr>
<td>LASER.SHIM23X0,05 (~0,10; ~0,20 ... ~2,00)</td>
<td>LASER.SHIMS23.0,05 (~0,10; ~0,20 ... ~2,00)</td>
</tr>
<tr>
<td>LASER.SHIM32X0,05 (~0,10; ~0,20 ... ~2,00)</td>
<td>LASER.SHIMS32.0,05 (~0,10; ~0,20 ... ~2,00)</td>
</tr>
<tr>
<td>LASER.SHIM44X0,05 (~0,10; ~0,20 ... ~2,00)</td>
<td>LASER.SHIMS44.0,05 (~0,10; ~0,20 ... ~2,00)</td>
</tr>
<tr>
<td>LASER.SMARTY2</td>
<td>LASER.SMARTY2</td>
</tr>
<tr>
<td>LASER.SMARTY2.TARGET</td>
<td>LASER.SMARTY2.TARGET</td>
</tr>
<tr>
<td>LASER.SMARTY2.TARGET-DIGITAL</td>
<td>LASER.SMARTY2.TARGET.DIGITAL</td>
</tr>
<tr>
<td>LASER.SMARTY.CALI-CHECK</td>
<td>LASER.SMARTY2.CALI.CHECK</td>
</tr>
<tr>
<td>LASER.TRUMMY2</td>
<td>LASER.TRUMMY2</td>
</tr>
<tr>
<td>LASER.TRUMMY.CALI-CHECK</td>
<td>LASER.TRUMMY.CALI.CHECK</td>
</tr>
</tbody>
</table>
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