



FAG

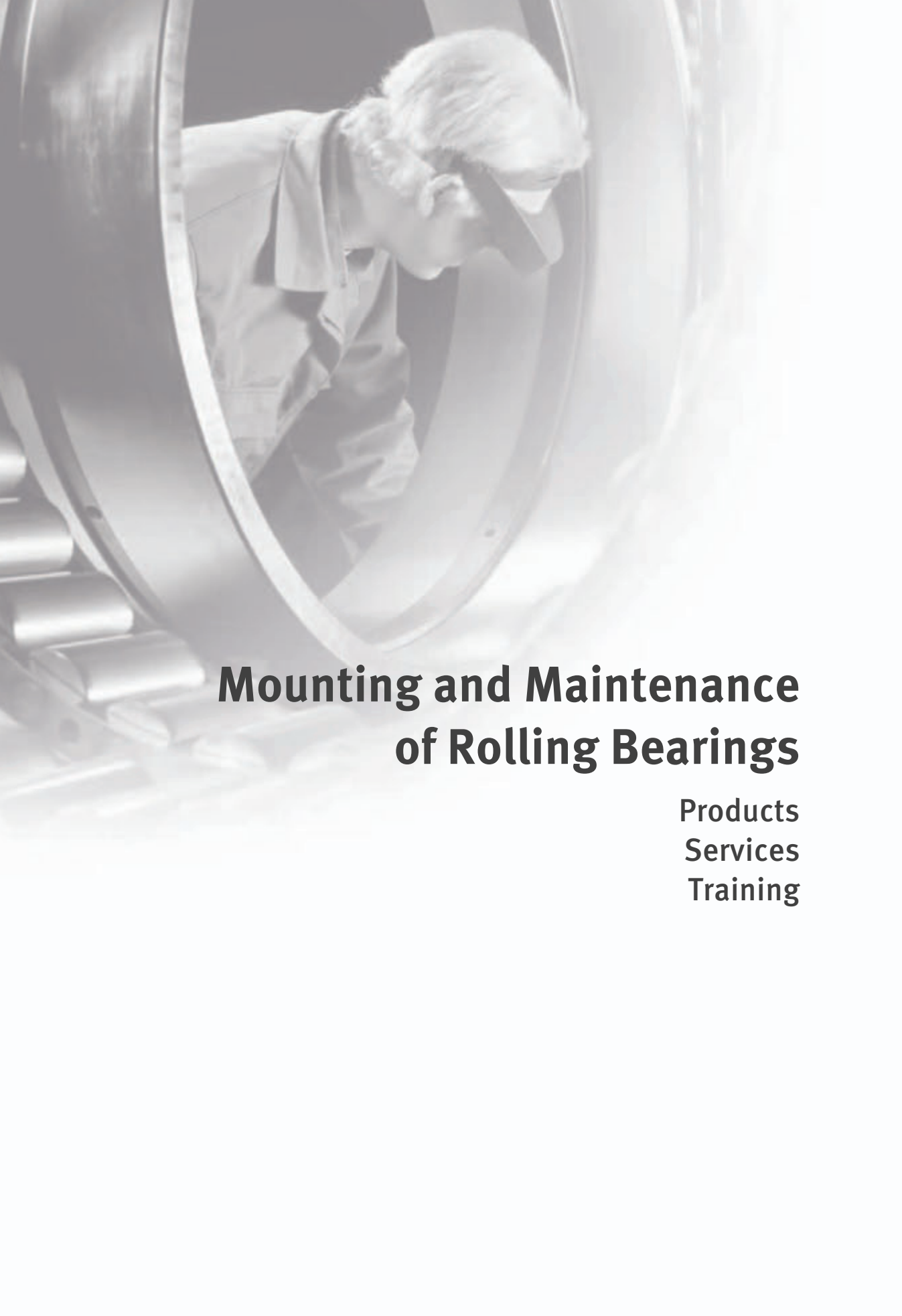


Mounting and Maintenance of Rolling Bearings

Products
Services
Training

SCHAEFFLER





Mounting and Maintenance of Rolling Bearings

**Products
Services
Training**

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Foreword

Industrial Service

This catalogue is aimed principally at maintenance managers and operators of plant in which rolling bearings and other rotating machine components play a critical role in determining the quality of products and processes. Those responsible for maintenance and production processes must be able to rely every day on the quality of their tools and the expertise of their service providers.

Through its Industrial Service function, the Schaeffler Group therefore offers high quality products, services and training, *Figure 1*.

Portfolio

This catalogue gives an overview of the portfolio:

- Mechanical maintenance
- Lubrication
- Condition monitoring
- Reconditioning
- Maintenance management.

The employees of the Schaeffler Group worldwide will be pleased to help you select the ideal products, services and training, *Figure 1*.

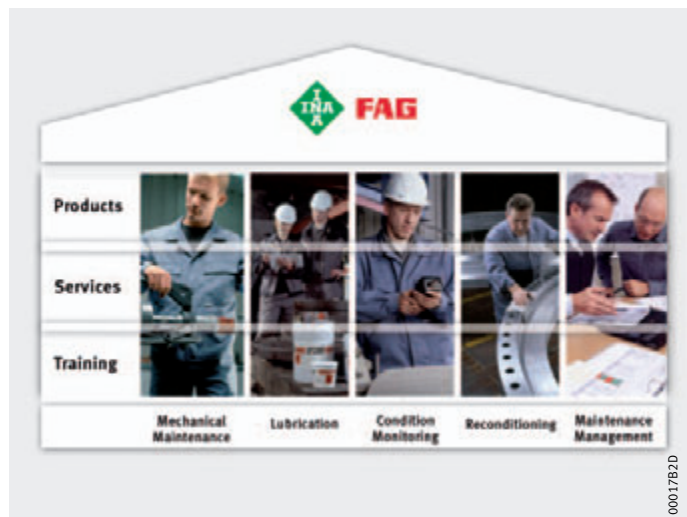


Figure 1
Portfolio

Foreword

Industrial Aftermarket

The Business Division Industrial Aftermarket of the Schaeffler Group Industrial (IAM) is responsible for replacement parts and service business for end customers and sales partners in all significant industrial sectors. On the basis of innovative solutions, products and services relating to rolling and plain bearings as well as intelligent implementation of the Total Cost of Ownership philosophy, the Industrial Aftermarket service function offers a comprehensive portfolio that covers all phases in the lifecycle of the rolling bearing.

The aim is to help customers save on maintenance costs, optimise plant availability and avoid unforeseen machine downtime.

The Schaeffler Group has centres of competence all around the world. This means we can provide customers worldwide with products, services and training quickly and professionally. All service employees worldwide undergo a comprehensive training programme and are audited regularly. This ensures that services throughout the world conform to a uniformly high standard of quality.

Every request, every task is different, so the Industrial Aftermarket function offers an individual concept for each customer. The quality requirements are strongly influenced by a long history of high precision rolling bearing manufacture. The production and provision of all products and services in this catalogue is proven in practice and is secured by a quality management system certified to ISO 9001:2008.

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Products
Mechanical maintenance
Lubrication
Condition monitoring



00017AF2

Services



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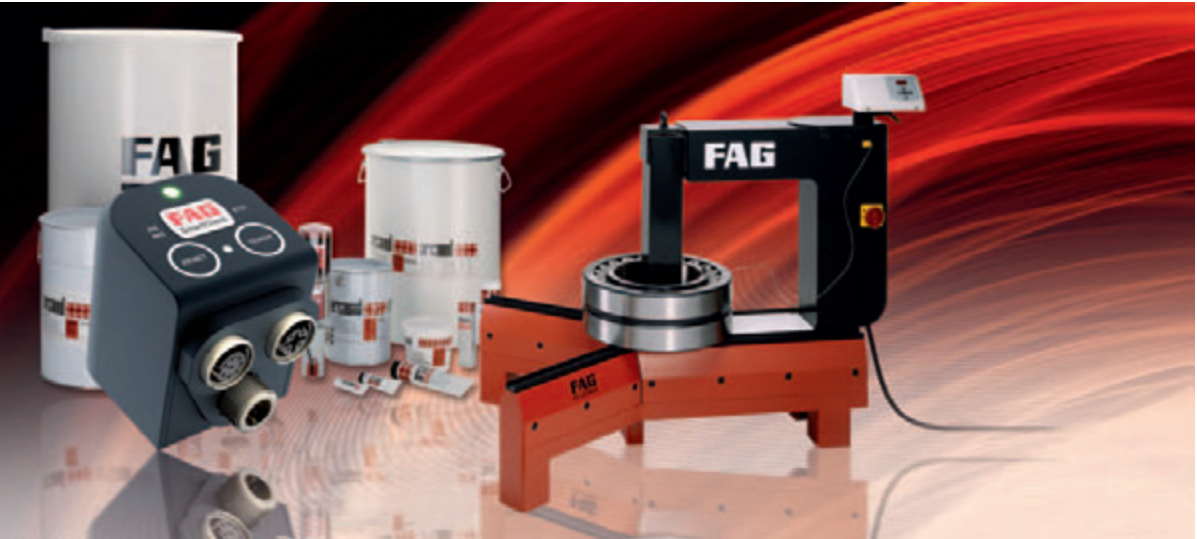
Training



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Publications
Addresses

FAG



Products

Mechanical maintenance
Lubrication
Condition monitoring

Products

Mechanical maintenance 18

Our product range comprises tools for the mechanical, hydraulic and thermal mounting and dismantling of rolling bearings. Mechanical tools are used predominantly for smaller bearings. Medium-sized and large rolling bearings are mainly mounted and dismantled using hydraulic or thermal tools. The range is logically rounded off by measurement and inspection devices (such as transport tools and gloves).

Lubrication 66

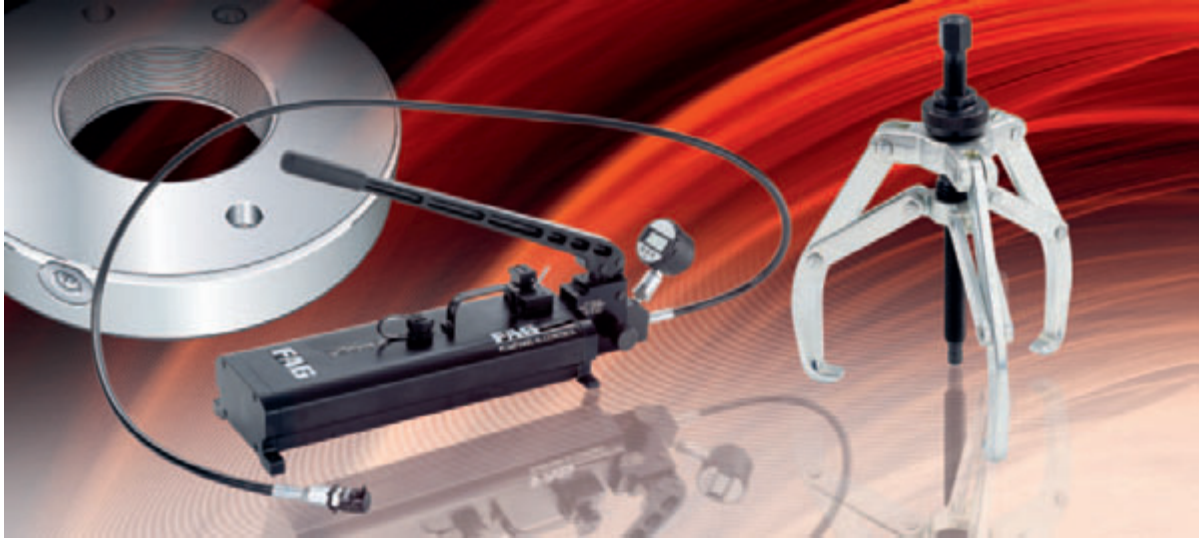
Rolling bearing greases Arcanol offer the best conditions for achieving reliable, durable and cost-effective bearing arrangements. These greases are designed to give favourable running behaviour of the bearings and thus make an important contribution to preventing premature bearing failure. The Arcanol range is graduated such that almost all areas of application can be covered to an optimum extent. It includes both standard and special greases.

Condition monitoring 84

Condition monitoring contributes to achieving high availability and long life of machinery and plant. FAG products help in planning maintenance work and reducing costs. The range includes devices for the alignment of shafts and belt pulleys. Temperature measuring and sonar devices make it possible to check the operating condition. An important element of the range comprises measuring systems that monitor vibration, torque and lubricants.



FAG



Mechanical maintenance



Mechanical maintenance

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Product overview Mechanical mounting and dismounting

Mounting tool sets

FITTING-TOOL-ALU-10-50



Socket wrenches

LOCKNUT-SOCKET



Hook and pin wrenches

Hook wrenches

LOCKNUT-HOOK



Jointed hook wrenches
Jointed pin wrenches

LOCKNUT-FLEXIHOOK



LOCKNUT-FLEXIPIN



Jointed face wrenches
Double hook wrenches

LOCKNUT-FACEPIN



LOCKNUT-DOUBLEHOOK



Double hook wrench sets

LOCKNUT-DOUBLEHOOK-...SET



Mechanical extractors
Two-arm and three-arm extractors

PULLER-2ARM-SET,
PULLER-2ARM,
PULLER-2ARM-SEPARATOR



PULLER-3ARM



Hydraulic pressure tools

PULLER-SUPPORT



Product overview Mechanical mounting and dismounting

Special bearing extractors
Separation and extraction devices

PULLER-SPECIAL-BASIC,
PULLER-SPECIAL



Internal extractors

PULLER-BORE...-SET



PULLER-INTERNAL10/100-SET



Hydraulic extractors

PULLER-HYD



PULLER-HYD (40, 60, 80)






Three-section
extraction plates

PULLER-TRISECTION



Mechanical mounting and dismantling

Features	These mechanical tools are designed for the mounting and dismantling of bearings. The mounting forces are transmitted by the geometrical locking effect.	
Mounting tool sets	<p>The mounting tool sets are suitable for the simple mounting of rolling bearings up to 50 mm bore. They can also be used for the mounting of sleeves, intermediate rings, seals and similar parts.</p> <p>A mounting tool set contains mounting sleeves made from aluminium and mounting rings made from plastic.</p> <p>An error frequently made during mounting is to transmit the mounting forces through the rolling elements and raceways. This error can be avoided by driving the inner ring onto the shaft or driving the outer ring into the housing by applying hammer blows to an appropriate mounting sleeve. The carefully matched precision parts ensure that the forces are uniformly transmitted to the side faces of the bearing rings.</p>	
Scope of delivery	Mounting tool set comprising 33 mounting rings for bearing bore 10 mm to 50 mm and outside diameter up to 110 mm 3 mounting sleeves Recoilless hammer, mass 1 kg Case	
Ordering designation	FITTING-TOOL-ALU-10-50 Also available as individual parts.	
Further information	<ul style="list-style-type: none">■ For detailed information, see TPI WL 80-56, FAG Tools for Mechanical Mounting and Dismounting of Rolling Bearings.■ Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.	

Mechanical mounting and dismounting

Socket wrenches	<p>Socket wrenches LOCKNUT-SOCKET are suitable for easily tightening and loosening locknuts on shafts, adapter sleeves and withdrawal sleeves. They require less space on the circumference of the nut than hook wrenches and allow the use of ratchets and torque wrenches.</p> <p>For increased reliability, socket wrenches should be secured using a locking pin and rubber washer. They therefore have a hole for the locking pin and a groove for the rubber washer. The locking pin and rubber washer are included in delivery.</p> <p>Socket wrenches are available in sizes suitable for locknuts KM0 to KM20. Other sizes and special solutions are available by agreement.</p>
Scope of delivery	<p>Socket wrench Locking pin Rubber washer</p>
Ordering example	Socket wrench, suitable for locknut KM5
Ordering designation	LOCKNUT-SOCKET-KM5 Special sizes available by agreement.
Further information	<ul style="list-style-type: none">■ For detailed information, see TPI WL 80-56, FAG Tools for Mechanical Mounting and Dismounting of Rolling Bearings.■ Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Hook and pin wrenches

These wrenches can be used for the mounting and dismounting of small bearings on shaft seats, adapter sleeves or withdrawal sleeves.



Hook wrenches

Hook wrenches LOCKNUT-HOOK can be used to dismount not only bearings but also withdrawal sleeves with the aid of extraction nuts. Hook wrenches are available in sizes suitable for locknuts KM0 to KM40. Other sizes available by agreement.

Ordering example
Ordering designation

Hook wrench, suitable for locknuts KM18, KM19 and KM20

LOCKNUT-HOOK-KM18-20

Hook wrenches can also be ordered as a set. Special sizes available by agreement.

Jointed hook wrenches

The joint allows one hook wrench LOCKNUT-FLEXIHOOK to be used for mounting or dismounting locknuts of various sizes.

Jointed hook wrenches are available in sizes suitable for locknuts KM1 to KM36. Other sizes available by agreement.

Ordering example
Ordering designation

Jointed hook wrench, suitable for locknuts KM14 to KM24

LOCKNUT-FLEXIHOOK-KM14-24

Jointed pin wrenches

The jointed pin wrench LOCKNUT-FLEXIPIN is hooked into radially arranged holes in the nut.

Jointed pin wrenches are available in sizes suitable for locknuts AM15 to AM90. Other sizes available by agreement.

Ordering example
Ordering designation

Jointed pin wrench, suitable for precision locknuts AM35 to AM60

LOCKNUT-FLEXIPIN-AM35-60

Jointed face wrenches

The jointed face wrench LOCKNUT-FACEPIN is hooked into axially arranged holes in the nut.

Jointed pin wrenches are available in sizes suitable for precision locknuts LPN017 to LPN170. Other sizes available by agreement.

Ordering example
Ordering designation

Jointed face wrench, suitable for precision locknuts LPN017 to LPN170

LOCKNUT-FLEXIPIN-LPN17-25



Mechanical mounting and dismounting

Double hook wrenches

Double hook wrenches LOCKNUT-DOUBLEHOOK are intended for the mounting of self-aligning ball bearings with a tapered bore. They are available as kits, sets or individual wrenches.

The double hook wrench kits and sets contain a torque wrench. This allows a precisely defined tightening torque to be achieved at the start of the mounting operation.

Double hook wrench sets are suitable for several sizes of locknuts. There is one set each for locknuts KM5 to KM8 and for locknuts KM9 to KM13.

Each double hook wrench is engraved with the torsion angles for the appropriate self-aligning ball bearings. The drive-up distance and reduction in radial internal clearance can therefore be precisely set.

Ordering example
for individual wrench
Ordering designation

Double hook wrench, suitable for locknut KM7

LOCKNUT-DOUBLEHOOK-KM7

Ordering example
Ordering designation

Double hook wrench kit, suitable for locknut KM5

LOCKNUT-DOUBLEHOOK-KM5-KIT

**Scope of delivery
of double hook wrench set**

Several double hook wrenches

Torque wrench

User manual

Case

Ordering example
Ordering designation

4 double hook wrenches, suitable for locknuts KM5 to KM8

LOCKNUT-DOUBLEHOOK-KM5-8-SET

Ordering example
Ordering designation

5 double hook wrenches, suitable for locknuts KM9 to KM13

LOCKNUT-DOUBLEHOOK-KM9-13-SET

Further information

- For detailed information, see TPI WL 80-56, FAG Tools for Mechanical Mounting and Dismounting of Rolling Bearings.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Mechanical extractors

Mechanical extractors can be used to dismantle small and medium sized rolling bearings that are located with a tight fit on a shaft or in a housing. The bearing can be dismantled without damage if the extractor is in contact with the tightly fitted bearing ring.

In the case of mechanical extractors, the extraction force is normally applied by means of threaded spindles.

In addition to the two-arm and three-arm devices as well as a hydraulic pressure tool, special solutions are also possible.

For dismantling of larger bearings, hydraulic extractors should be used, see page 30.



Two-arm and three-arm extractors

Two-arm and three-arm extractors, *Figure 1*, table and table, page 28, are used for the extraction of complete rolling bearings or tightly fitted inner rings.

The two-arm extractor PULLER-2ARM and three-arm extractor PULLER-3ARM can also be used to extract other parts such as gears.

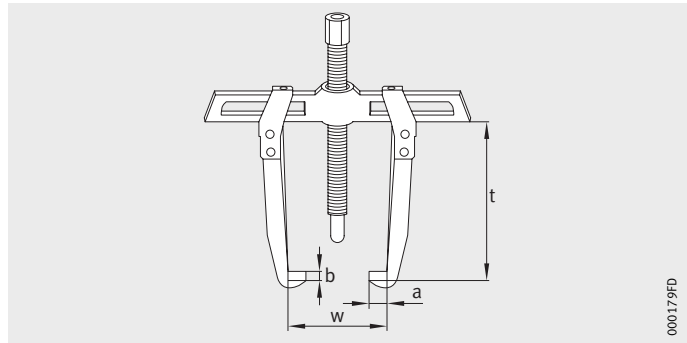


Figure 1
Dimensions of the gripper

Available two-arm extractors

Designation	Grip span w mm	Grip depth t mm	Dimensions		Extraction force kN
			a mm	b mm	
PULLER-2ARM90	90	100	14 + 1	18 + 1	30
PULLER-2ARM130	130	100	14 + 1	18 + 1	30
PULLER-2ARM160	160	150	18 + 1	26 + 2	50
PULLER-2ARM200	200	150	18 + 1	26 + 2	50
PULLER-2ARM250	250	200	20 + 1	28 + 2	75
PULLER-2ARM350	350	200	20 + 1	28 + 2	75
PULLER-2ARM-SEPARATOR45	45	65	2,5	12 + 1	10
PULLER-2ARM-SEPARATOR90	90	100	2,5	14 + 1	40
PULLER-2ARM-SEPARATOR150	150	150	2,5	28 + 1	40

Mechanical mounting and dismounting

Available three-arm extractors

Designation	Grip span mm	Grip depth mm	Dimensions		Extraction force kN
			a mm	b mm	
PULLER-3ARM160	130	105	14 + 1	15 + 1	40
PULLER-3ARM230	230	150	19 + 1	22 + 1	100
PULLER-3ARM310	295	235	19 + 1	22 + 1	100
PULLER-3ARM430	390	270	20 + 2	30 + 2	150
PULLER-3ARM660	640	300	22 + 2	34 + 2	150

Hydraulic pressure tool



The pressure tool PULLER-SUPPORT, see table, is used to loosen tightly fitted parts in conjunction with mechanical extractors. It is applied between the shaft end and extractor spindle.

The spindle diameter of the extractor must not be less than the stated minimum value, see table.

The maximum torque must be observed.

Available pressure tools

Designation	Axial force	Minimum spindle diameter	Maximum torque
	kN	mm	Nm
PULLER-SUPPORT80	80	M22	25
PULLER-SUPPORT150	150	M30	50

Special bearing extractors

Special bearing extractors PULLER-SPECIAL can be used to dismount radial bearings of the following types: deep groove ball bearings, self-aligning ball bearings, cylindrical roller, tapered roller and spherical roller bearings (inner rings only), angular contact and four point contact bearings.

The special bearing extractor comprises the base device and a collet. When the base device is progressively screwed down, this closes the collet and clamps it against the inner ring.

The base device is available in four sizes. The collet must be specifically ordered to match the bearing.

Ordering example
Base device

Base device for bearings with inside diameter up to 30 mm

Ordering designation

PULLER-SPECIAL-BASIC30

Ordering example
Collet

Collet for deep groove ball bearing 6000

Ordering designation

PULLER-SPECIAL-A-6000

Ordering example
Collets

Collets for pair of tapered roller bearings 30203-A in X arrangement

Ordering designation

PULLER-SPECIAL-B-300203A, PULLER-SPECIAL-C-300203A

Internal extractor sets

The internal extractor set PULLER-BORE, see table, can be used for the dismantling of small deep groove and angular contact ball bearings where the outer ring has a tight fit. The inner ring bore must be easily accessible.

The internal extractors can also be ordered individually.

The internal extractor set PULLER-INTERNAL can be used for the dismantling of standard deep groove ball bearings where the outer ring has a tight fit. It is not necessary to dismount the shaft. The individual parts can also be ordered individually.



Available internal extractor sets

Designation	Diameter range		Scope of delivery
	mm min.	mm max.	
PULLER-BORE5-39-SET	5	39	6 internal extractors 1 countersupport 1 impact extractor
PULLER-BORE40-79-SET	40	79	4 internal extractors 1 countersupport 1 impact extractor
PULLER-INTERNAL-10/100-SET	10	10	6 extraction legs 2 screw spindles



Further information

- For detailed information, see TPI WL 80-56, FAG Tools for Mechanical Mounting and Dismounting of Rolling Bearings.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.



Mechanical mounting and dismantling

Hydraulic extractors

The hydraulic extractors, see tables, are used where higher extraction forces are required.

These devices allow rolling bearings, gears, sleeves and many other shrink fitted parts to be quickly and easily dismantled.

For larger grip depths, longer extraction arms are available (accessories).

Operating personnel can be protected by means of a safety grid or a safety cover.

The advantageous features of hydraulic extractors are as follows:

- Parts under mechanical load are made from high quality chromium-molybdenum steel
- The smooth-running piston is made from chromium plated, hardened and tempered steel
- Stroke travel adjustable by means of standard adapter
- Screw thread for setting of optimum grip depth
- Simple centring by spring-loaded steel cone
- Simple conversion to two-arm operation if there is insufficient space for three arms
- Optimum operating position due to rotatable pump hand lever or separate pump.

Available hydraulic extractors with integral hand pump

Designation	Extraction force kN	Grip span		Grip depth		Stroke mm
		Standard mm	XL mm	Standard mm	XL mm	
PULLER-HYD40	40	260	–	165	–	55
PULLER-HYD60 (-XL)	60	260	260	165	195	82
PULLER-HYD80 (-XL)	80	355	380	210	240	75
PULLER-HYD100 (-XL)	100	310	340	195	250	75
PULLER-HYD120 (-XL)	120	370	400	240	280	75
PULLER-HYD200 (-XL)	200	430	450	275	330	80
PULLER-HYD250 (-XL)	250	480	540	315	385	100
PULLER-HYD300 (-XL)	300	540	610	375	405	100

Available hydraulic extractors with separate hand pump

Designation	Extraction force kN	Grip span		Grip depth		Stroke length mm
		Standard mm	XL mm	Standard mm	XL mm	
PULLER-HYD175 (-XL)	175	360	450	250	305	82
PULLER-HYD400 (-XL)	400	580	1 000	420	635	100

Further information

- For detailed information, see TPI WL 80-56, FAG Tools for Mechanical Mounting and Dismounting of Rolling Bearings.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Three-section extraction plates

Three-section extraction plates PULLER-TRISECTION, see table, can be used with hydraulic and mechanical extractors.

These allow the extraction of complete bearings, tightly fitted inner rings and other components. The load capacity and extraction force are precisely matched to each other.

The extraction claws grip directly under the screw studs of the extraction plates and give uniform distribution of force. Even where parts have a tight fit, there is no tilting or bending. The high extraction forces are concentrated on the bearing inner ring. In general, the bearing and shaft remain intact and can be used again.

The extraction plates can be fitted under the bearing with just a few movements.

Available three-section extraction plates

Designation	Dimensions		Recommended for extractor	
	d _{min} mm	d _{max} mm	PULLER-HYD	PULLER-3ARM
PULLER-TRISECTION-50	12	50	–	160
PULLER-TRISECTION-100	26	100	40, 60, 80, 100	230
PULLER-TRISECTION-160	50	160	80, 100, 120, 175, 200	310
PULLER-TRISECTION-260	90	260	175, 200, 250, 300	430
PULLER-TRISECTION-380	140	380	250, 300, 400	660

Further information

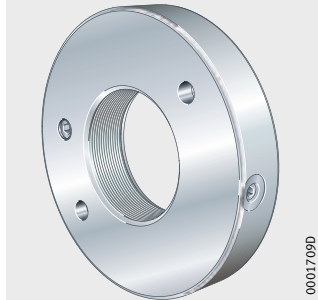
- For detailed information, see TPI WL 80-56, FAG Tools for Mechanical Mounting and Dismounting of Rolling Bearings.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.



Product overview Hydraulic mounting and dismantling

Hydraulic nuts Oil injectors

HYDNUT



INJECT2500, INJECT1600



Hand pumps Single stage

PUMP1000-0,7L



Twin stage

PUMP1000-4L, PUMP1000-8L, PUMP1600-4L, PUMP1600-8L,
PUMP2500-4L, PUMP2500-8L



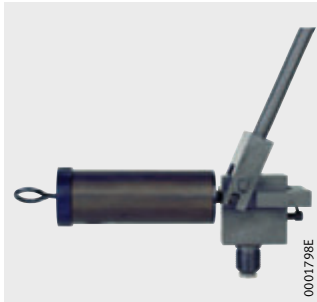
For drive-up distance

PUMP1000-4L-CONTROL



High pressure pumps

PUMP4000-0,2L



PUMP2500-0,2L-KIT



Hydraulic units Mobile

TOOL-RAILWAY-AGGREGATE



Connectors, accessories Adapters and reduction nipples

PUMP.NIPPLE-A,
PUMP.NIPPLE-B



PUMP.ADAPTER-A,
PUMP.ADAPTER-B



Pump holder Digital manometer

PUMP.HOLDER-2,
PUMP.HOLDER-3



PUMP1000.MANO-DIGI



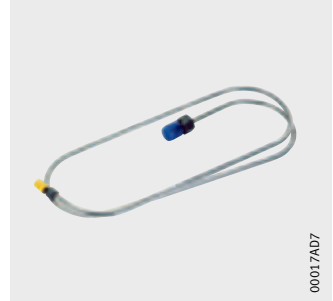
Product overview Hydraulic mounting and dismantling

Manometer
High pressure pipe

PUMP1000.MANO-G1/2,
PUMP1600.MANO-G1/2,
PUMP2500.MANO-G1/2



PUMP.PIPE



Sleeve connector
Hydraulic oil

PUMP.SLEEVE-CONNECTOR



PUMP.OIL46





**Matrix for preselection
of pressure generation devices**

Type	Designation	Oil container	Connector
Oil injector	INJECT2500	0,008	G ³ / ₈
	INJECT1600	0,027	G ³ / ₄
Hand pump Single stage Twin stage	PUMP1000-0,7L	0,7	G ¹ / ₄
	PUMP1000-4L	4	G ¹ / ₄
	PUMP1000-4L-CONTROL	4	G ¹ / ₄
	PUMP1600-4L	4	G ¹ / ₄
	PUMP2500-4L	4	G ¹ / ₄
High pressure pump	PUMP4000-0,2L	0,2	G ³ / ₄
	PUMP2500-0,2L-KIT	0,2	G ¹ / ₄
Hydraulic unit	Available by agreement	–	–

Maximum oil pressure bar	Maximum shaft diameter mm	Maximum contact pressure in interference fits N/mm ²	Application
2 500	80	125	– Mounting and dismounting of bearings with tapered bore
1 600	150	80	– Mounting and dismounting of bearings with tapered bore
1 000	250	50	– Mounting and dismounting of rolling bearings – For driving hydraulic nuts up to HYDNUT395 or HYDNUT300-HEAVY
1 000	Unlimited	50	– Mounting and dismounting of rolling bearings – Mounting and dismounting of components such as ships'propellers – For driving hydraulic nuts up to HYDNUT800
1 000	Unlimited	50	– Mounting and dismounting of rolling bearings – In conjunction with a hydraulic nut
1 600	Unlimited	80	– Mounting and dismounting of rolling bearings – Mounting and dismounting of components such as rudder splines and rudder blades
2 500	Unlimited	125	– Mounting and dismounting of bearings – Mounting and dismounting of components such as gears and couplings
4 000	Unlimited For rolling bearings: 250	> 100	– Dismounting of bearings with cylindrical bore – For interference fits with high contact pressure – Delivery rate and oil reservoir are small
2 500	Unlimited	> 100	– Dismounting of bearings with cylindrical bore – For interference fits with high contact pressure – Delivery rate and oil reservoir are small
–	–	–	–



Hydraulic mounting and dismounting

Features

Hydraulic tools can be used to apply large forces. These tools are therefore particularly suitable for the mounting and dismounting of large bearings or parts with a tapered bore.

Hydraulic nuts are used as a mounting tool. Pressure can be generated using oil injectors, hand pumps or hydraulic units.

Software Mounting Manager

The software Mounting Manager gives assistance in selecting the correct mounting of bearings and offers the following options:

- It shows various mechanical and hydraulic mounting methods.
- It calculates the data required for mounting in relation to reduction in radial internal clearance, drive-up distance and start pressure.
- It gives advice on mounting.
- It generates a list of the accessories and tools required.

The software contains a library with references to publications giving further information and an electronic learning system. The software Mounting Manager is available online at www.schaeffler-iam.com

Mounting methods

Bearings with a tapered bore are mounted either directly on the tapered shaft or journal or by means of an adapter sleeve or withdrawal sleeve on the cylindrical shaft. The internal clearance is set either by measurement of the axial drive-up distance or by conventional means using feeler gauges.

Measurement of the axial drive-up distance

The bearing is placed in its start position on the tapered bearing seat using a hydraulic nut. The start pressure, which is defined for each bearing, is checked using a digital manometer on the hand pump PUMP1000-4L-CONTROL. A certain quantity of oil is required in order to reach the specified drive-up distance. This is achieved by using a defined number of strokes. The number of strokes can be read off from the stroke counter on this hand pump.

The advantages of this mounting method are as follows:

- simplified mounting
- very high security and accuracy
- correct mounting of sealed bearings.

Measurement of the reduction in radial internal clearance

When the bearing is driven onto the tapered seat, the inner ring is expanded and the radial internal clearance is thereby reduced. This reduction in radial internal clearance is an indication of the tight fit of the bearing. Measurement is carried out using a feeler gauge.

Hydraulic nuts

Hydraulic nuts HYDNUT, see table, are used to press components with a tapered bore onto their tapered seat. Presses are mainly used if the drive-up forces required cannot be applied using other accessories, e.g. shaft nuts or pressure screws.

The main applications are as follows:

- mounting and dismounting of rolling bearings with tapered bore.
The bearings can be seated directly on a tapered shaft, an adapter sleeve or a withdrawal sleeve. The hydraulic nut can also be used for the dismounting of adapter or withdrawal sleeves.
- mounting and dismounting of components such as couplings, gears and ships' propellers.



Available hydraulic nuts

Designation	Design	Application
HYDNUT50 to HYDNUT200	With metric fine pitch thread to DIN 13	Standardised adapter and withdrawal sleeves
HYDNUT205 to HYDNUT1180	With trapezoidal thread to DIN 103	With metric dimensions
HYDNUT90-INCH to HYDNUT530-INCH	With inch size thread to ABMA "Standards for Mounting Accessories, Section 8, Locknut Series N-00"	Sleeves with inch dimensions
HYDNUT100-HEAVY to HYDNUT900-HEAVY	Increased capacity design with smooth bore	For high mounting forces, for example in shipbuilding



Further information

- For detailed information, see TPI 196, FAG Hydraulic Nuts.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Hydraulic mounting and dismounting

Pressure generation devices

Pressure generation devices are available in various designs: from oil injectors, through hand pump sets, to high pressure pumps.

Oil injectors

Oil injectors have only a small delivery volume, see table. They are suitable for the dismounting of rolling bearings and other press fits with direct seating on tapered shafts.

Conventional O rings can be used as replacement seals: OR6~1,5 (for INJECT2500), OR10~2,0 (for INJECT1600).

The oil injector can be refilled with oil without losses by connecting a valve nipple.

Available oil injectors

Designation		Connector	Oil volume cm ³	Maximum oil pressure bar	For shaft diameters up to mm
Oil injector	Valve nipple				
INJECT2500	INJECT2500.VALVE	G ³ /8	8	2 500	80
INJECT1600	INJECT1600.VALVE	G ³ /4	27	1 600	150

Oil injectors and valve nipples can also be ordered as a set.

Ordering example
Ordering designation

Oil injector with maximum oil pressure of 1 600 bar
INJECT1600

Ordering example
for set
Ordering designation

Oil injector with maximum oil pressure of 2 500 bar
Valve nipple
INJECT2500-SET

Hand pumps Hand pumps have a single stage or twin stage pump with a manometer.

Single stage pump The hand pump PUMP1000-0,7L has an oil container with a volume of 0,7 l. The maximum pressure is 1000 bar, see table. A digital manometer is available as an accessory.

Available single stage pump

Designation	Maximum oil pressure bar
PUMP1000-0,7L	1 000

Twin stage pump The twin stage pumps, see table, have a high delivery rate up to 50 bar and then switch automatically to the high pressure stage. This gives a high work rate.
Where there is an increased oil requirement, the twin stage pumps are available with a 8 l oil container (suffix 8L). In those cases where the type of installation of the adapter or withdrawal sleeve requires a separate oil supply, a two-way valve is available (suffix D).
For pumps with an oil pressure of 1000 bar and a connector, digital manometers are also available as accessories.

Available twin stage pumps

Designation	Maximum oil pressure bar
PUMP1000-4L	1 000
PUMP1600-4L	1 600
PUMP2500-4L	2 500



Hydraulic mounting and dismounting

Pump for drive-up distance

The hand pump PUMP1000-4L-CONTROL is particularly suitable as a pressure generation device where rolling bearings are to be driven onto their tapered seat using a hydraulic nut, *Figure 1*.

First, the bearing is driven smoothly onto the tapered seat as far as the initial position. A suitable hydraulic nut is then screwed onto the shaft and the hand pump is connected. The hand pump is then operated until the pressure to reach the start position is achieved. The pump is then operated further to drive the bearing by the required drive-up distance and thus achieve the final position.

The user manual for the pump PUMP1000-4L-CONTROL contains a table that shows the number of strokes necessary to achieve the required drive-up distance of the bearing.

The required drive-up distance is calculated using the software Mounting Manager.

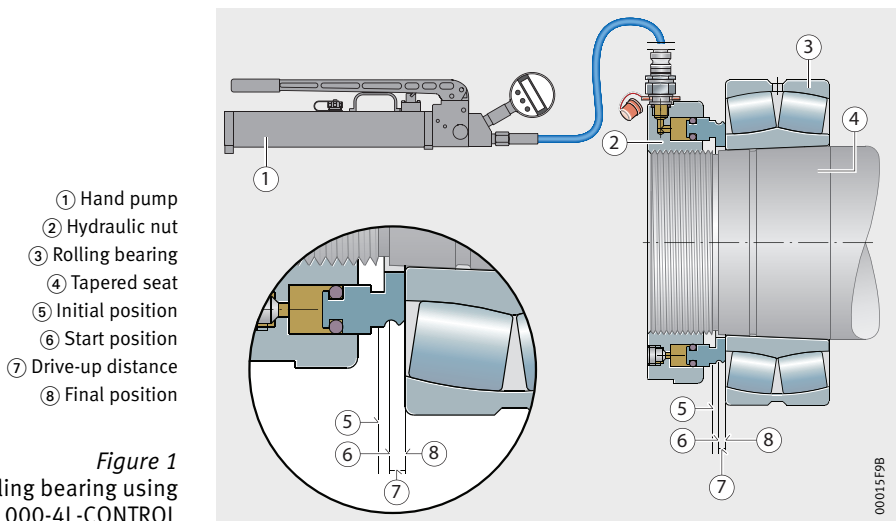


Figure 1
 Mounting of a rolling bearing using
 PUMP1000-4L-CONTROL

Scope of delivery

- Hand pump with digital manometer
- High pressure hose with coupling sleeve
- Spacer ring (HYDNUT50 to HYDNUT150)
- Plug-in coupling nipple
- User manual

Metal case

Ordering designation

PUMP1000-4L-CONTROL

High pressure pump

The high pressure pump, see table, is suitable for the mounting and dismounting of rolling bearings for shaft diameters up to 250 mm. Due to the high oil pressure available, the pump can also be used to expand and mount heavy shaft couplings and gears by means of the hydraulic method.

The high pressure pump can be connected directly or by means of thick-walled adapters. It can also be connected by means of a pump holder and a 2 m long flexible high pressure pipe. The oil pressure in this case must not exceed 2 500 bar.



Always operate the pump together with a manometer.

Available high pressure pump

Designation	Connector	Oil container capacity l	Delivery volume per stroke cm ³	Maximum oil pressure bar
PUMP4000-0,2L	G ³ /4	0,2	0,3	4 000

Ordering designation

PUMP4000-0,2L

Available by agreement

Hydraulic units driven by pneumatic and electric means are available by agreement.

Further information

- For detailed information, see TPI 195, FAG Pressure Generation Devices.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Hydraulic mounting and dismantling

Mobile hydraulic unit

The mobile hydraulic unit, *Figure 2*, is used for the mounting and dismantling of tapered roller bearing units, also known as TAROL units. These units are used as wheelset bearings in rail vehicles such as goods wagons and passenger carriages.

The mobile unit has a valve-controlled, double direction pressure cylinder driven by a motor pump. The pressure cylinder is adjustable in height.

Guide bushes, mounting sleeves, traction and pressure spindles, drawing frames and other tool sets must be ordered according to the individual application (TOOL-RAILWAY-AXLE). When making enquiries or placing orders, information on the bearing types and power connection as well as installation drawings (shaft, housing, additional parts) are required.



Figure 2
Mobile hydraulic unit

Ordering designation

TOOL-RAILWAY-AGGREGATE

Further information

- For detailed information, see TPI 195, FAG Pressure Generation Devices.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Connectors, accessories

Various connectors and accessories are available for use with the devices for hydraulic mounting and dismounting.

Adapters and reduction nipples

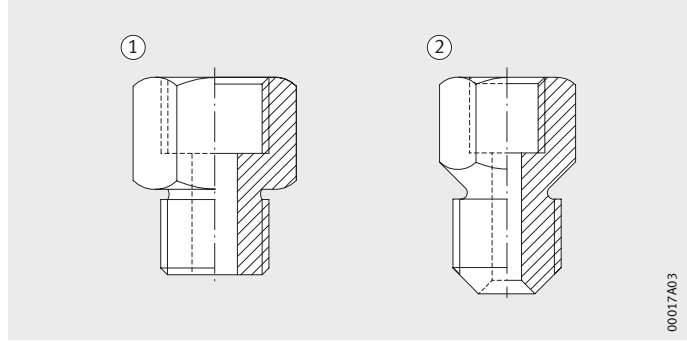
Adapters and reduction nipples are matched to the threads of high pressure hoses and pipes, see *Figure 3* and tables.

Adapters and reduction nipples of type A (with sealing ring) are suitable for oil pressures up to 800 bar, *Figure 3*. Type B (with blade sealing) is suitable for oil pressures up to 2 500 bar, *Figure 3*.

- ① Type A
- ② Type B

Figure 3

Adapters and reduction nipples



Available adapters and reduction nipples

Designation	Designation
PUMP.NIPPLE-A-G1/4-G1/8	PUMP.NIPPLE-A-G3/4-G1/8
PUMP.NIPPLE-B-G1/4-G1/8	PUMP.NIPPLE-B-G3/4-G1/8
PUMP.NIPPLE-A-G1/4-G1/2	PUMP.NIPPLE-A-G3/4-G1/4
PUMP.NIPPLE-B-G1/4-G1/2	PUMP.NIPPLE-B-G3/4-G1/4
PUMP.NIPPLE-A-G1/4-G3/4	PUMP.NIPPLE-A-G3/4-G3/8
PUMP.NIPPLE-B-G1/4-G3/4	PUMP.NIPPLE-B-G3/4-G3/8
PUMP.NIPPLE-A-G1/4-M14	PUMP.NIPPLE-A-M18X1,5-G1/4
PUMP.NIPPLE-B-G1/4-M14	PUMP.NIPPLE-A-M18X1,5-G3/8
PUMP.NIPPLE-A-G1/4-M18X1,5	PUMP.NIPPLE-A-M18X1,5-G3/8
PUMP.NIPPLE-A-G3/8-G1/4	–
PUMP.NIPPLE-B-G3/8-G1/4	–

Available adapters

Designation	Designation
PUMP.ADAPTER-A-G1/4	PUMP.ADAPTER-A-G3/4
PUMP.ADAPTER-B-G1/4	PUMP.ADAPTER-B-G3/4

Hydraulic mounting and dismounting

Pump holders Pump holders are available with and without a connector G¹/₂ for a manometer, see table.

Available pump holders

Designation	Design
PUMP.HOLDER-2	Pump holder without connector for manometer
PUMP.HOLDER-3	Pump holder with connector for manometer

Manometers In addition to the manometer with digital display, there are three analogue manometers with an indicator, see table.



When selecting a manometer, pay attention to the maximum oil pressure.

Available manometers

Designation	Threaded connector mm	Maximum oil pressure bar
PUMP1000.MANO-DIGI	G ¹ / ₄	1 000
PUMP1000.MANO-G1/2	G ¹ / ₂	1 000
PUMP1000.MANO-G1/2	G ¹ / ₂	1 600
PUMP1000.MANO-G1/2	G ¹ / ₂	2 500

High pressure pipes

High pressure pipes used with high pressure pumps are sheathed in a PVC hose. The maximum permissible oil pressure is 2 500 bar.

The connector to the pump holder is G³/₄. The connector to the consumer device is available in the sizes G¹/₄, G³/₈, G¹/₂ and G³/₄. For other thread sizes, a reduction nipple can be used.



Check the oil pressure using a manometer.

Ordering example

High pressure pipe with a connector G¹/₄ on the consumer device side

Ordering designation

PUMP.PIPE-G1/4

Sleeve connectors

Sleeve connectors can be used at pressures up to 800 bar. The connector to the pump holder is G¹/₄. The connector to the consumer device is available in the sizes M6, M8, G¹/₈ and G¹/₄. For other thread sizes, a reduction nipple can be used.



Check the oil pressure using a manometer.



Ordering example
Ordering designation

Sleeve connector with a connector G¹/₈ on the consumer device side
PUMP.SLEEVE-CONNECTOR-G1/8

Hydraulic oil

The hydraulic oil is a zinc-free high performance hydraulic oil for use in the mounting and dismounting of bearings.

For refilling, the hydraulic oil is available in containers holding 1 l, 5 l and 20 l.



Ordering example
Ordering designation

5 l hydraulic oil in a canister

PUMP.OIL46-5L

Further information

- For detailed information, see TPI WL 80-56, FAG Tools for Mechanical Mounting and Dismounting of Rolling Bearings.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.



Product overview Thermal mounting and dismounting

Electric heating plates

HEATER-PLATE

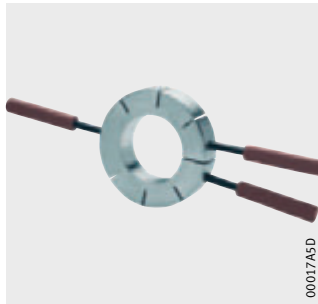


HEATER-PLATE-370C



Heating rings Heat conducting paste

HEATING-RING



HEATING-RING.PASTE



Induction heating devices

HEATER (10, 20, 35, 150, 300)



HEATER600, HEATER1200



Medium frequency devices

HEAT-GENERATOR,
HEAT-INDUCTOR



HEAT-GENERATOR,
HEAT-INDUCTOR



Thermal mounting and dismounting

Features

Devices for thermal mounting and dismounting are used to heat rolling bearings and other components with a cylindrical bore where a tight fit on the shaft or in the housing is intended.

These devices include electric heating plates, heating rings and induction heating devices, with either mains frequency or medium frequency operation.

Adequate expansion of the bearings is achieved in most cases at +80 °C to +100 °C. During the heating operation, the maximum heating temperature must be observed. The temperature of rolling bearings must not normally exceed +120 °C, in order to prevent changes to the structure and hardness of the bearing. In all devices for heating, the temperature can be steplessly controlled.



Wear protective gloves during mounting and dismounting of heated parts.

Electric heating plates

Heating plates, see table, are used to heat rolling bearings or small machine parts by means of contact heat. Heating plates are maintenance-free and easy to use.

The heating plate HEATER-PLATE-370C is suitable principally for the heating of heating rings HEATING-RING.

Heating plates HEATER-PLATE are also available as a version with 115 V/60 Hz (suffix 115V).

Available heating plates

Designation	Dimensions		Power at 230 V/50 Hz W	Temperature	
	Device mm	Heating plate mm		°C	
			min.		max.
HEATER-PLATE	390×270×56	380×180	1 500	+50	+200
HEATER-PLATE-370C	360×360×170	350×350	2 200	+100	+370



Thermal mounting and dismounting

Heating rings

Heating rings HEATING-RING are suitable for the dismounting of inner rings with a rib and the inner rings of cylindrical and needle roller bearings without ribs. Heating rings are particularly advantageous for the occasional extraction of small and medium-sized bearing rings with a bore diameter of 50 mm to 200 mm.

The heating rings are made from aluminium alloy. They are easy to handle due to the heat-insulated handles.

Heating rings are heated using an electric heating plate to a temperature between +200 °C and +300 °C.

Each bearing size requires a specific heating ring.

In order to prepare a quotation, we require the following information:

- the bearing designation or ring dimensions
- a drawing of the mounting position including information on fits
- the approximate number of parts to be extracted per day.

Recommended accessories

- Electric heating plate HEATER-PLATE-370C
- Temperature measuring device TEMP-CHECK-PLUS or TEMP-CHECK-PRO
- Gloves GLOVE-PRO-CUT
- Heat conducting paste HEATING-RING.PASTE-20ML.

Ordering example

Heating ring for the inner ring of a cylindrical roller bearing NU320-E, NJ320E and similar components

20 ml heat conducting paste in expendable syringe

Ordering designation

HEATING-RING-320E

Further information

- For detailed information, see TPI 180, FAG Tools for Thermal Dismounting.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Heat conducting paste

The silicone-free heat conducting paste HEATING-RING.PASTE is used as an aid in the dismounting of bearing inner rings by means of heating rings.

The cylindrical outside surface of the bearing inner ring is coated with the heat conducting paste before it is extracted. This gives optimum heat transfer.

Ordering example

20 ml heat conducting paste in expendable syringe

Ordering designation

HEATING-RING.PASTE-20ML

Further information

- For detailed information, see TPI 180, FAG Tools for Thermal Dismounting.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Induction heating devices

Even large parts can be mounted using the induction heating method. It is also suitable for batch mounting of complete bearings, inner rings and rotationally symmetrical steel parts such as labyrinth rings, roll couplings and bands.

The induction heating device gives uniform and controlled heating of the parts. Non-metallic components and the device itself remain cold.

Once the set temperature is reached, the workpiece is automatically demagnetised.

The heating device HEATER10 is a portable table top device. It is supplied with a carry case. HEATER20 is also portable and is supplied in a case. The devices HEATER35 and HEATER150 are also designed as table top devices.

The heating device HEATER300 can be used as a table top device. It can also be placed on the trolley HEATER300.TROLLEY.

The higher power rating standalone devices HEATER600 and HEATER1200 can be used for the heating of workpieces up to 1200 kg. The technical data for the heating devices and the ledges are compiled in the table, page 51, *Figure 1*, page 52, and the tables, page 52.

Induction heating devices, technical data

Designation	Maximum power consumption ¹⁾ kVA	Rated voltage ²⁾ V	Frequency ²⁾ Hz	Current consumption A	Mass kg
HEATER10	2,3	230	50	10	7
HEATER20	3,6	230	50	16	17
HEATER35	3,6	230	50	16	31
HEATER150	12,8	400	50	32	51
HEATER300	12,8	400	50	32	75 (+25) ³⁾
HEATER600	25	400	50	63	350
HEATER1200	40	400	50	100	850

¹⁾ If lower voltage is used, the power will be reduced.

²⁾ Heating devices with other rated voltages and frequencies and with higher power ratings are available on request.

³⁾ Convertible to a mobile version by means of HEATER300.TROLLEY.

Thermal mounting and dismounting

Induction heating devices, technical data, continued

Designation	Dimensions in mm				
	Length	Width	Height	a	b
HEATER10	230	200	240	65	95
HEATER20	345	200	240	120	100
HEATER35	420	260	365	180	160
HEATER150	505	260	440	210	210
HEATER300	870	300	580 (900) ¹⁾	330	260
HEATER600	1 100	850	1 250	430	400
HEATER1200	1 500	1 100	1 400	700	450

¹⁾ Height with trolley HEATER300.TROLLEY.

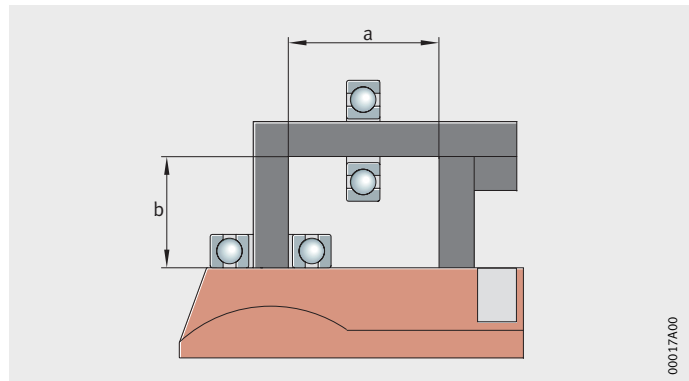


Figure 1
Dimensions a and b

Induction heating devices, ledges

Designation	Ledges for workpieces with bore diameter in mm	
	Supplied min.	Available accessory min.
HEATER10	15, 30, 45	10
HEATER20	20, 35, 60	10, 15, 45
HEATER35	70	15, 20, 35, 45, 60
HEATER150	100	20, 30, 45, 60, 70, 85
HEATER300	115	30, 45, 60, 70, 85, 100
HEATER600	145	45, 60, 70, 85, 100, 115, 130
HEATER1200	215	85, 115, 145

Further information

- For detailed information, see TPI 200, FAG Heating Devices PowerTherm for Mounting of Rolling Bearings.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Induction units with medium frequency technology

The FAG heating device with medium frequency technology gives rapid, simple and effective heating of medium-sized to large rolling bearings and similar steel parts for mounting and dismounting. The device always comprises two parts: an inductor and a generator.

The inductor can be of a flexible design, *Figure 2*, or rigid design, *Figure 3*, page 54. The rigid design is particularly suitable for batch applications. The flexible design of inductor can be wound around the components, *Figure 2*. The flexible inductor can also be used with subframes, *Figure 4*, page 55, to rationalise repetitive work. Overall, this gives a wide range of applications, see table.

Each device is designed for the specific application and is fitted, depending on the workpiece, with flexible or rigid inductors. The necessary information can be seen in the table, page 55.

Due to its compact construction, the device can also be used for mobile operation. The device can therefore be moved to the location of the workpiece. It can therefore be used, for example, at construction sites for wind turbines or for other large components that are difficult to transport.



Figure 2
The flexible inductor can be wrapped around the component

Versatile in application

Workpieces	
Inner rings of cylindrical roller bearings	Machine supports
Labyrinth rings	Gears
Couplings	Rotationally symmetrical steel parts
Ring rolls	Housings
Medium-sized to very large bearings	–

Thermal mounting and dismounting



Figure 3
Rigid inductor in the dismounting
of wheelset bearings

Advantages

The advantages of the heating device with medium frequency technology are as follows:

- suitable for mounting
- suitable for dismounting
- operating frequency from 10 kHz to 25 kHz
- efficiency of the generator higher than 90%
- low energy requirements
- short heating times
- control of heating according to time and temperature
- automatic demagnetisation
- flexible and rigid inductors available
- suitable for use either inside or outside component
- lower mains connection power than heating devices with mains frequency
- almost silent
- air-cooled system.

Figure 4
In order to rationalise work,
the inductor is wrapped around
a subframe



Application

Examples of the use of medium frequency technology include:

- heating of bearings for mounting and dismounting
- batch dismounting of bearing inner rings and labyrinth rings, for example in the case of wheelset bearings in rail vehicles, *Figure 3*, page 54
- dismounting of bearing inner rings from traction motors in rail vehicles
- heating of large components, for example bearings or bearing seats in wind turbines
- heating of roll rings and couplings, for example in steelworks
- loosening of shrink fit connections.

Data required in enquiries

Ordering information
Bearing dimensions, if possible with drawings
Representation of the adjacent construction
Data on the fit conditions
Description of the mounting process and its frequency
Power supply data
Ambient conditions
Your address

Product overview Measurement and inspection

Feeler gauges Taper ring gauges

FEELER-GAUGE-100,
FEELER-GAUGE-300



KLR



Taper gauges

MGK133



MGK132



Snap gauges

SNAP-GAUGE



Enveloping circle gauges

MGI21



MGA31



Measurement and inspection

Features Feeler gauges and measurement gauges can be used to inspect the production of bearing seats and the mounting of bearings.

Feeler gauges Feeler gauges FEELER-GAUGE, see table, are used to measure the radial internal clearance, especially in mounting on tapered shaft seats and on adapter and withdrawal sleeves.

Available feeler gauges

Designation	Feeler length mm	Feeler thickness		
		mm		
FEELER-GAUGE-100	100	0,03	0,08	0,14
		0,04	0,09	0,16
		0,05	0,1	0,18
		0,06	0,12	0,2
		0,07	–	–
FEELER-GAUGE-300	300	0,03	0,12	0,2
		0,04	0,13	0,25
		0,05	0,14	0,3
		0,06	0,15	0,35
		0,07	0,16	0,4
		0,08	0,17	0,45
		0,09	0,18	0,5
		0,1	0,19	–

Taper ring gauges and taper gauges

These gauges are used to inspect tapered bearing seats in production facilities. This is necessary to ensure a good match between the fit surfaces of the bearing and bearing seat.

With the exception of taper ring gauges, gauges are available for different taper angles.

Taper ring gauges

Taper ring gauges KLR are the simplest option for inspecting the bearing seat on small bearings. Inking is used to determine the matching of the ring gauge and bearing seat. The bearing seat is machined until the ring gauge is supported over its whole width. The inner rings of bearings are not suitable, since they can be damaged during inking.

Taper ring gauges are available in designs for taper diameters of 30 mm to 240 mm.

Ordering example

Taper ring gauge for bearings with 100 mm bore, for example double row cylindrical roller bearings NN3020-AS-K

Ordering designation

KLR-NN3020



Measurement and inspection

Taper gauge for tapers 1:12 and 1:30

The taper gauge MGK133 is used for the measurement of external tapers 1:12 and 1:30 with a taper diameter of 27 mm to 205 mm.

The reproducibility of the measurement results is less than 1 μm .

The gauge rests on the workpiece with four hardened and polished pins. The position of the gauge on the taper is defined by these pins and a stop. The stop can be attached to either the front or back of the gauge.

The gauge has two movable measuring brackets. One of these is in contact with the small taper diameter, the other with the large taper diameter. There is a fixed spacing between the measuring brackets. The deviation of the taper diameter from the nominal value is displayed in both measurement planes by a precision indicator.

The gauge is set using a reference taper (available by agreement).

Ordering designation

Available by agreement

Taper gauge for taper angle 0° to 6°

The taper gauge MGK132 is used for the measurement of external tapers with a taper angle of 0° to 6° and a taper diameter of 90 mm to 420 mm.

The reproducibility of the measurement results is less than 1 μm .

The gauge rests on the workpiece with four hardened, ground and lapped ledges. The ledges form an angle of 90°. The position of the gauge on the taper is defined by a stop on the front or back of the gauge.

The measurement slide runs between the support ledges.

A dial gauge in the housing acts against the measurement slide and displays the deviation of the taper diameter from the nominal value.

The deviation of the taper from the nominal value is displayed by a precision indicator on the measurement slide.

The gauge is set using a reference taper (available by agreement).

Ordering designation

Available by agreement

Snap gauges

Snap gauges SNAP-GAUGE, see table, can be used to inspect the diameter of cylindrical workpieces directly on the machine tool. The snap gauge is also used to set the enveloping circle gauge MGI21.

The snap gauge functions as a comparator gauge. It is set using shims. The deviation from the set value can then be determined.



Available snap gauges

Designation	Diameter range mm	
	min.	max.
SNAP-GAUGE-30/60	30	60
SNAP-GAUGE-60/100	60	100
SNAP-GAUGE-100/150	100	150
SNAP-GAUGE-150/200	150	200
SNAP-GAUGE-200/250	200	250
SNAP-GAUGE-250/300	250	300



Shims for numerous diameters are available as accessories.

Ordering example Snap gauge for shaft diameter 120 mm
Ordering designation **SNAP-GAUGE-100/150**

Ordering example Shim for shaft diameter 120 mm
Ordering designation **SNAP-GAUGE.MASTER120**



Measurement and inspection

Enveloping circle gauges

Enveloping circle gauges, see table, can be used to set the radial internal clearance or preload of cylindrical roller bearings.

Available enveloping circle gauges

Designation	Type	For bearings	
		from	to
MGI21	For cylindrical roller bearings with separable inner ring	NNU4920-K	NNU4948-K
		NNU4920	NNU4948
MGA31	For cylindrical roller bearings with separable outer ring	NN3006-K	NNU3048-K
		N1006-K	N1048-K

Bearings with separable inner rings

The enveloping circle gauge MGI21 is used to measure, by means of two hardened and precision ground surfaces, the internal enveloping circle of a roller and cage assembly. One measurement surface is movable.

Before measurement, the gauge is set to the internal enveloping circle of the roller and cage assembly. This setting operation requires a snap gauge such as SNAP-GAUGE.

After mounting of the outer ring together with the roller and cage assembly, the enveloping circle diameter is then determined using the gauge MGI in a comparative measurement.

In the case of a bearing with a tapered bore, the enveloping circle measurement is used to calculate its position on the tapered seat of the shaft. During mounting, the bearing is driven to this position. This results in the internal clearance or the preload.

In the case of bearings with a cylindrical bore, preground inner rings (suffix F12) are used and finish ground to the required bearing diameter.

Ordering example
Ordering designation

Enveloping circle gauge for cylindrical roller bearing NNU4920
MGI21-NNU4920

Bearings with separable outer rings

The enveloping circle gauge MGI31 is used to measure, by means of two hardened and precision ground surfaces, the external enveloping circle of the roller and cage assembly.

The gauge is set to the raceway diameter of the mounted outer ring. This dimension is determined using conventional internal gauge.

The tapered shaft with the premounted inner ring and roller and cage assembly is then inserted in the gauge. The shaft is driven axially by the hydraulic method until the required radial internal clearance or preload is achieved.

Ordering example
Ordering designation

Enveloping circle gauge for cylindrical roller bearing NN3006-K
MGA31-NN3006



Product overview Accessories

Transport and mounting tool

BEARING-MATE



Gloves

GLOVE-PRO,
GLOVE-PRO-CUT



Mounting paste

ARCANOL-MOUNTINGPASTE



Anti-corrosion oil

ARCANOL-ANTICORROSIONOIL



Accessories

Features Accessories are used to assist in the storage, transport and mounting of rolling bearings.



Transport and mounting tool

The transport and mounting tool BEARING-MATE, see table, is an accessory for the easy handling of medium-sized and large rolling bearings. It can also be used in the heating of bearings prior to mounting.

The tool comprises two handles and two steel strips. The steel strips are tightly clamped on the outer ring of the bearing. During transport of spherical roller bearings and self-aligning ball bearings, tilting of the inner rings is prevented by the brackets supplied.

The bearing together with the tool is carried by either two people or by means of a crane. While it is being transported by crane, the bearing is suspended by the tool using the carrying slings and can be rotated into any position required.



The bearing can remain in the tool during heating. It expands to the same extent as the bearing.

The tool can be used for bearings up to a mass of 500 kg and at temperatures up to +160 °C.

Available tools

Designation	Bearing outside diameter mm		Mass of tool kg
	over	incl.	
BEARING-MATE250-450	250	450	6,3
BEARING-MATE450-650	450	650	6,4
BEARING-MATE650-850	650	850	6,5



Ordering example Transport and mounting tool for bearings with inside diameter of 250 mm to 450 mm with 2 short brackets

Ordering designation **BEARING-MATE250-450**

Accessories

Accessories, brackets	2 long brackets to prevent tilting of the inner rings of spherical roller bearings
Ordering designation	BEARING-MATE-LOCKBAR270
Accessories, carrying slings	2 carrying slings, 1 m long
Ordering designation	BEARING-MATE.SLING-1M
Accessories, pack of small parts	Pack of small parts
Ordering designation	BEARING-MATE.SERVICE-KIT
Gloves	The heat-resistant gloves are particularly suitable for the handling of heated rolling bearings or other heated components in mounting and dismounting. The gloves are cut-resistant and durable.
Resistant up to +150 °C	Gloves GLOVE-PRO are resistant up to +150 °C.
Ordering designation	GLOVE-PRO
Resistant up to +250 °C	Gloves GLOVE-PRO-CUT comprise several layers, are oil-resistant and are suitable for temperatures up to +250 °C. The gloves are non-flammable and are also heat-resistant even when damp. They are authorised in accordance with DIN EN 388 to mechanical influences and in accordance with DIN EN 407 to thermal influences.
Ordering designation	GLOVE-PRO-CUT

Mounting paste

The mounting paste, see table, facilitates the sliding of bearing rings and prevents stick/slip effects, scoring, wear and fretting corrosion. It also gives protection against corrosion.

The operating temperature range is between $-30\text{ }^{\circ}\text{C}$ and $+150\text{ }^{\circ}\text{C}$.

The paste is resistant to water, water vapour and many alkaline and acidic media.



Available mounting pastes

Designation	Container
ARCANOL-MOUNTINGPASTE-70G	Tube containing 70 g
ARCANOL-MOUNTINGPASTE-250G	Tube containing 250 g
ARCANOL-MOUNTINGPASTE-400G	Cartridge containing 400 g
ARCANOL-MOUNTINGPASTE-1KG	Can containing 1 kg



Anti-corrosion oil

This oil gives protection of bearings that have been unpacked. It also gives long term protection against corrosion of bright metallic surfaces, for example on devices and machinery, during storage indoors.

In general, it is not necessary to wash the anti-corrosion oil out of rolling bearings. It gives neutral behaviour towards conventional rolling bearing greases and oils.

The oil can be removed using alkaline solvents or neutral cleaning agents.

Ordering example
Ordering designation

Spray can containing 0,4 l

ARCANOL-ANTICORROSIONOIL-400G



FAG



Lubrication



Lubrication

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Multipurpose greases

Designation	Thickener	Base oil	Base oil viscosity at +40 °C mm ² /s	Consistency NLGI	Operating temperature °C	
					over	incl.
MULTI0P	Lithium soap	Partially synthetic oil	≧ ISO VG 68	2	-40	+140
MULTI2	Lithium soap	Mineral oil	≧ ISO VG 68	2	-30	+120
MULTI3	Lithium soap	Mineral oil	≧ ISO VG 68	3	-30	+120

Definition of symbols
 ++ extremely suitable
 + highly suitable
 o suitable
 - less suitable
 -- not suitable

Greases for high loads

Designation	Thickener	Base oil	Base oil viscosity at +40 °C mm ² /s	Consistency NLGI	Operating temperature °C	
					over	incl.
LOAD150	Lithium complex	Mineral oil	≧ ISO VG 150	2	-20	+140
LOAD220	Mixed thickener	Mineral oil	≧ ISO VG 220	1 - 2	-20	+140
LOAD400	Mixed thickener	Mineral oil	≧ 400	2	-20	+140
LOAD460	Aluminium complex	Mineral oil	≧ 400	1	-30	+130
LOAD1000	Mixed thickener	Mineral oil	≧ ISO VG 1000	2	-20	+120

Definition of symbols
 ++ extremely suitable
 + highly suitable
 o suitable
 - less suitable
 -- not suitable

Continuous limit temperature °C	Characteristic applications	Temperatures		Low friction, high speed	High load, low speed	Vibrations	Support for seals	Relubrication facility
		Low	High					
+80	Ball and roller bearings in rolling mills, construction machinery, automotive engineering, spinning and grinding spindles	++	+	+	++	+	o	++
+75	Ball bearings up to 62 mm diameter in small electric motors, agricultural and construction machinery, household appliances	+	o	o	o	o	o	++
+75	Ball bearings from 62 mm diameter in large electric motors, agricultural and construction machinery, ventilators	+	o	o	o	+	+	+



Continuous limit temperature °C	Characteristic applications	Temperatures		Low friction, high speed	High load, low speed	Vibrations	Support for seals	Relubrication facility
		Low	High					
+90	Ball, roller and needle roller bearings, linear guidance systems in machine tools	o	+	-	++	+	+	+
+80	Ball and roller bearings in rolling mills, rail vehicles	o	o	-	++	+	+	+
+80	Ball and roller bearings in mining machinery, construction machinery, wind turbines	o	o	-	++	+	+	+
+80	Ball and roller bearings, wind turbines	+	o	-	++	+	-	+
+80	Ball and roller bearings in mining machinery, construction machinery	o	o	--	++	+	+	+



**Greases
for wide temperature ranges**

Definition of symbols
 ++ extremely suitable
 + highly suitable
 o suitable
 – less suitable
 -- not suitable

Designation	Thickener	Base oil	Base oil viscosity at +40 °C mm ² /s	Consistency NLGI	Operating temperature °C	
					over	incl.
TEMP90	Mixed thickener	Synthetic oil	≧ ISO VG 100	2	-30	+140
TEMP110	Lithium complex	Synthetic oil	≧ ISO VG 68	2 – 3	-40	+160
TEMP120	Polycarbamide	Synthetic oil	≧ ISO VG 460	2	-30	+180
TEMP200	PTFE	Fluoridated polyether oil	≧ ISO VG 220–460	2	-30	+250

Special greases

Definition of symbols
 ++ extremely suitable
 + highly suitable
 o suitable
 – less suitable
 -- not suitable

Symbol	Thickener	Base oil	Base oil viscosity at +40 °C mm ² /s	Consistency NLGI	Operating temperature °C	
					over	incl.
SPEED2,6	Lithium complex	Synthetic oil	≧ ISO VG 22	2 – 3	-30	+120
VIB3	Lithium complex	Mineral oil	≧ ISO VG 150	3	-30	+150
BIO2	Mixed thickener	Synthetic oil	≧ ISO VG 55	2	-30	+120
FOOD2	Aluminium complex	White oil	≧ ISO VG 100	2	-30	+120
CLEAN-M	Polycarbamide	Synthetic oil	= ISO VG 100	2	-40	+200

Continuous limit temperature °C	Characteristic areas of application	Temperatures		Low friction, high speed	High load, low speed	Vibrations	Support for seals	Relubrication facility
		Low	High					
+90	Ball and roller bearings in couplings, electric motors, automotive engineering	++	+	0	0	0	0	0
+110	Ball and roller bearings in electrical equipment, automotive engineering	++	++	0	0	0	0	0
+120	Ball and roller bearings in continuous casting plant	+	++	-	++	0	0	0
+200	Ball and roller bearings in guide rollers in baking machinery, piston pins in compressors, kiln trucks, chemical plant	+	++	--	+	0	0	0



Continuous limit temperature °C	Characteristic applications	Temperatures		Low friction, high speed	High load, low speed	Vibrations	Support for seals	Relubrication facility
		Low	High					
+80	Ball bearings in machine tools, instrument engineering	++	0	++	--	-	0	+
+90	Ball and roller bearings in blade adjusters in wind turbine rotors, packaging machinery, rail vehicles	+	+	-	+	++	+	-
+80	Ball and roller bearings in environmentally hazardous applications	+	0	0	0	0	0	++
+70	Ball and roller bearings in applications with food contact	+	-	0	0	0	0	++
+90	Ball, roller and needle roller bearings as well as linear guidance systems in clean room applications	++	++	0	0	0	0	+



Lubricants

Features

The lubricants available from the Schaeffler Group are designed and tested for bearing arrangement engineering.

Rolling bearing greases Arcanol

The Arcanol rolling bearing greases offer very good preconditions for favourable running behaviour of bearings and a long operating life and high operational security of the bearing arrangement. The lubricant range is graduated such that almost all areas of application are covered.

The areas of application of Arcanol greases were determined under widely differing operating conditions and with rolling bearings of all types by means of modern testing methods and testing systems. Arcanol rolling bearing greases have superior characteristics in all areas compared to normal greases, *Figure 1*.

L = rating life
n = speed
R = mixed friction
t = lubrication interval

① Normal grease

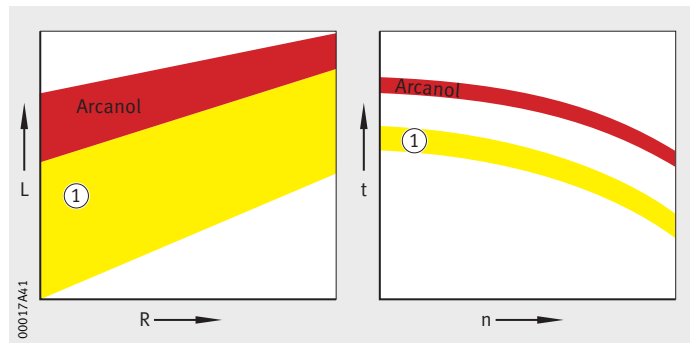


Figure 1
Characteristics of lubricants

**Available greases,
examples**

Designation	Rolling bearing grease	Container
ARCANOL-MULTITOP-5KG	Arcanol MULTITOP	Bucket containing 5 kg
ARCANOL-MULTI2-20G	Arcanol MULTI2	50 tubes each containing 20 g
ARCANOL-MULTI3-25KG	Arcanol MULTI3	Hobbock containing 25 kg
ARCANOL-LOAD150-12,5KG	Arcanol LOAD150	Bucket containing 12,5 kg
ARCANOL-LOAD220-180KG	Arcanol LOAD220	Drum containing 180 kg
ARCANOL-LOAD400-400G	Arcanol LOAD400	10 cartridges each containing 400 g
ARCANOL-LOAD460-1KG	Arcanol LOAD460	Bucket containing 1 kg
ARCANOL-LOAD1000-5KG	Arcanol LOAD1000	Bucket containing 5 kg
ARCANOL-TEMP90-1KG	Arcanol TEMP90	Can containing 1 kg
ARCANOL-TEMP110-400G	Arcanol TEMP110	Cartridge containing 400 g
ARCANOL-TEMP120-25KG	Arcanol TEMP120	Hobbock containing 25 kg
ARCANOL-TEMP200-70G	Arcanol TEMP200	Tube containing 70 g
ARCANOL-SPEED2,6-250G	Arcanol SPEED2,6	10 tubes each containing 250 g
ARCANOL-VIB3-25KG	Arcanol VIB3	Hobbock containing 25 kg
ARCANOL-BIO2-1KG	Arcanol BIO2	Can containing 1 kg
ARCANOL-FOOD2-12,5KG	Arcanol FOOD2	Bucket containing 12,5 kg
ARCANOL-CLEAN-M-400G	Arcanol CLEAN-M	Tube containing 400 g

For further information

- For detailed information, see TPI 168, Arcanol Rolling Bearing Greases.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.



Product overview Lubrication devices

Lubricators Motion Guard COMPACT

ARCALUB, ARCALUB-CLEAR,
ARCALUB-POLAR



0001797F

ARCALUB-ACTIVE



000179AD

Motion Guard CHAMPION

ARCALUB.DRIVE



00017980

ARCALUB.LC



000179AC

Lubrication systems

ARCALUB-C6



000179AA

ARCALUB-C6.LC



000179AB

Pistol grease guns

ARCA-PUMP-BARRELL.GUN-METER



00017AC3

**Service pumps
for wind turbines**

ARCA-PUMP-WIND-SERVICE-KIT

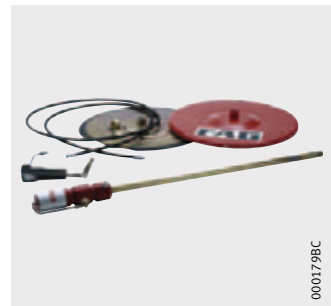


Grease pumps
Grease dispensing units
Drum pumps

ARCA-PUMP



ARCA-PUMP-BARRELL



Lever grease guns

ARCA-GREASE-GUN



Lubrication devices

Features Lubricators and lubrication systems automatically provide bearings with the correct quantity of lubricant. This prevents the most frequent cause of rolling bearing failure: inadequate or incorrect lubrication. Approximately 90% of bearings are lubricated with grease. Relubrication with the correct quantity of grease at the appropriate intervals gives a significant increase in the life of bearings.

For manual relubrication, grease guns are suitable.

Software **Motion Guard Select Manager**

The software Motion Guard Select Manager gives the following options:

- assistance in the selection of suitable lubricators
- definition of dispensing times and relubrication quantities
- selection of suitable and preferred Arcanol greases
- management of a lubrication and maintenance plan.

The software Motion Guard Select Manager is available online at www.schaeffler-iam.com

Lubricators

Automatic lubricators convey fresh grease in the defined quantity at the correct time to the contact points of the rolling bearing.

The devices adhere to the lubrication and maintenance intervals and prevent undersupply or oversupply of grease. Plant downtime and maintenance costs are reduced as a result.

The lubricators are matched to the bearing position. They have a wide range of applications, for example on pumps, compressors and fans, in conveying equipment, machinery etc.

Lubricators have the following advantages:

- individually configured, precise supply to each bearing position
- fully automatic, maintenance-free operation
- reduced personnel costs compared to manual relubrication
- different dispensing times can be selected
- pressure buildup to max. 25 bar, thereby overcoming any obstructions.

**Lubricators
FAG Motion Guard COMPACT**

This automatic lubricator is driven by a chemical system. The metal housing contains 120 cm³ of Arcanol rolling bearing grease. The dispensing time is determined by the different coloured activation screws, see table Activation screws. Greases and chain oils can be combined if necessary with the activation screws, see table Combination of lubricant and activation screws.



Activation screws

Designation	Dispensing time	Colour
ARCALUB-ACTIVE-1M	1 month	Yellow
ARCALUB-ACTIVE-3M	3 months	Green
ARCALUB-ACTIVE-6M	6 months	Red
ARCALUB-ACTIVE-12M	12 months	Grey

**Combination of lubricant and
activation screws**

Lubricant Arcanol	Activation screw ARCALUB-ACTIVE			
	1 month	3 months	6 months	12 months
MULTITOP	●	●	●	–
MULTI2	●	●	●	–
LOAD400	●	●	●	●
LOAD1000	●	●	●	●
TEMP90	●	●	●	●
TEMP120	●	●	●	●
TEMP200	●	●	●	●
FOOD2	●	●	●	●
CHAINOIL	●	●	●	●



Lubricators FAG Motion Guard COMPACT are available individually with an activation screw. Other delivery options: box containing 10 lubricators without activation screws. The exception here is lubricators with TEMP200, which are packed individually. For examples of available lubricators, see table.

**Available lubricators,
examples**

Designation	Lubricant Arcanol	Activation screw	Scope of delivery
ARCALUB-MULTITOP	MULTITOP	Not included in delivery	10 lubricators
ARCALUB-TEMP90	TEMP90	Not included in delivery	10 lubricators
ARCALUB-MULTITOP-1M	MULTITOP	1 for 1 month	1 lubricator
ARCALUB-MULTI2-3M	MULTI2	1 for 3 months	1 lubricator
ARCALUB-MULTITOP-6M	MULTITOP	1 for 6 months	1 lubricator
ARCALUB-LOAD400-12M	LOAD400	1 for 12 months	1 lubricator

Lubrication devices

Lubricators Motion Guard COMPACT variant CLEAR

The variant CLEAR of the lubricator is suitable for explosion-protected and corrosion-inducing humidity areas. The transparent plastic housing can be used at ambient temperatures from 0 °C to +40 °C. It is filled with 100 cm³ of lubricant.

The variant CLEAR is available with the same lubricants as the standard design, see table Combination of lubricant and activation screws, page 77.

Lubricators COMPACT of the variant CLEAR are supplied in a box of 10 pieces. The appropriate activation screws with dispensing times of 1, 3 or 6 months must be ordered separately in units of 10 pieces, see table.

Activation screws

Designation	Dispensing time	Colour
ARCALUB-ACTIVE-CLEAR-1M	1 month	Yellow
ARCALUB-ACTIVE-CLEAR-3M	3 months	Green
ARCALUB-ACTIVE-CLEAR-6M	6 months	Red

Ordering example
Ordering designation

10 lubricators COMPACT, variant CLEAR, filled with Arcanol FOOD2
ARCALUB-CLEAR-FOOD2

Lubricators Motion Guard COMPACT variant POLAR

The variant POLAR of the lubricator has a metal housing and can be used at temperatures from -25 °C to +10 °C. The variant POLAR of the lubricator is available only with 120 cm³ Arcanol MULTITOP.

There is only a black activation screw and the dispensing time is dependent on the temperature, see table.

The lubricator COMPACT of the variant POLAR is supplied in a box of 10 pieces without activation screws. The black activation screws must be ordered separately in units of 10 pieces.

Dispensing time

Temperature °C	Dispensing time
+10	1 week
±0	2 weeks
-10	6 weeks
-20	14 weeks
-25	26 weeks (6 months)

Ordering example
Ordering designation
Ordering example
Ordering designation

10 lubricators COMPACT, variant POLAR, filled with Arcanol MULTITOP

ARCALUB-POLAR-MULTITOP

10 activation screws

ARCALUB.ACTIVE-POLAR

**Lubricator
FAG Motion Guard CHAMPION**

This lubricator comprises a drive unit, an LC unit (Lubricant Cartridge) containing lubricant and a battery set. It is connected to the lubrication point by means of a support adapter or a hose, see table.

A battery-driven geared motor allows dispensing times of 1, 3, 6 or 12 months, irrespective of the temperature. The drive unit can be used again. The battery set is replaced each time the LC unit is changed.

LC units are available with 60 cm³, 120 cm³ and 250 cm³ dispensing volumes, with a battery set included in each case.

The lubricator Motion Guard CHAMPION is suitable for all Arcanol lubricants as well as chain oil.

Special fillings and drive units for machine-controlled operation are available by agreement.

Available accessories

Designation	Lubricant	Quantity cm ³	Scope of delivery
ARCALUB.DRIVE	–	–	Drive unit
ARCALUB.LC60-MULTITOP	MULTITOP	60	LC unit with battery set
ARCALUB.LC120-LOAD400	LOAD400	120	LC unit with battery set
ARCALUB.LC250-VIB3	VIB3	250	LC unit with battery set
ARCALUB.ADAPTER	–	–	Support adapter
ARCALUB.TUBE	–	–	Hose with two connectors, 3 m long

**Lubricator set
FAG Motion Guard CHAMPION**

The lubricator is available with the grease MULTITOP as a set. A set comprises a drive unit, support adapter and LC unit with battery set. The LC units in the set can contain 120 cm³ or 250 cm³ of grease.

Ordering example
Ordering designation

Lubricator set filled with 120 cm³ MULTITOP
ARCALUB.LC120-MULTITOP-KIT

Lubrication devices

Lubrication system Motion Guard CONCEPT6

This single-point and multi-point lubrication system can supply up to six different lubrication points precisely and irrespective of temperature. The dispensing times can be adjusted from 1 day up to 24 months and LC units are available in the sizes 250 cm³ and 500 cm³.

Starter kits

The starter kits are premounted on a retaining plate and form the basis for the multi-point lubrication system Motion Guard CONCEPT6. The distribution system MP-6 allows the independent supply of between two and six lubrication points. The geared motor in the distribution system is powered and controlled by the drive unit.

Lubricant is distributed independent of its consistency or solid particle content. If the distributor identifies an obstruction in an individual outlet, this is indicated on the display of the drive unit. The other outlets continue to be supplied with lubricant.

Variants CONTROL

In the variant CONTROL of the lubricator CONCEPT6, the lubricator is controlled by the machine. Lubricant is only dispensed while the machine is running.

We also supply starter kits for this variant as a basis for multi-point lubrication systems. For single-point lubrication, the parts required are ordered individually from the range of accessories.

Available designs

The hose and connectors for the lubrication points as well as the LC units must be ordered separately, see table, page 81. The lubrication system is available in four designs, see table.

Available lubricators CONCEPT6

Designation	Features
ARCALUB-C6-250-KIT	<ul style="list-style-type: none"> ■ Control by lubricator ■ For LC units containing 250 cm³
ARCALUB-C6-CONTROL-250-KIT	<ul style="list-style-type: none"> ■ Control by machine ■ For LC units containing 250 cm³
ARCALUB-C6-500-KIT	<ul style="list-style-type: none"> ■ Control by lubricator ■ For LC units containing 500 cm³
ARCALUB-C6-CONTROL-500-KIT	<ul style="list-style-type: none"> ■ Control by machine ■ For LC units containing 500 cm³

Available LC units

Designation with	
250 cm ³	500 cm ³
ARCALUB-C6.LC250-MULTITOP	ARCALUB-C6.LC500-MULTITOP
ARCALUB-C6.LC250-MULTI2	ARCALUB-C6.LC500-MULTI2
ARCALUB-C6.LC250-LOAD150	ARCALUB-C6.LC500-LOAD150
ARCALUB-C6.LC250-LOAD220	ARCALUB-C6.LC500-LOAD220
ARCALUB-C6.LC250-LOAD400	ARCALUB-C6.LC500-LOAD400
ARCALUB-C6.LC250-LOAD1000	ARCALUB-C6.LC500-LOAD1000
ARCALUB-C6.LC250-TEMP90	ARCALUB-C6.LC500-TEMP90
ARCALUB-C6.LC250-TEMP110	ARCALUB-C6.LC500-TEMP110
ARCALUB-C6.LC250-TEMP120	ARCALUB-C6.LC500-TEMP120
ARCALUB-C6.LC250-TEMP200	ARCALUB-C6.LC500-TEMP200
ARCALUB-C6.LC250-SPEED2,6	ARCALUB-C6.LC500-SPEED2,6
ARCALUB-C6.LC250-BIO2	ARCALUB-C6.LC500-BIO2
ARCALUB-C6.LC250-FOOD2	ARCALUB-C6.LC500-FOOD2

LC units are also available by agreement with other greases.

Further information

- For detailed information, see WL 80-346, FAG Motion Guard – The Intelligent Lubricators.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Pistol grease guns

Pistol grease guns have a 4 digit digital counter that displays the lubricant quantity in grams. The specific mass of the lubricant can be set.

Ordering designation

ARCA-PUMP-BARREL.GUN-METER

Service pumps for wind turbines

These service pumps, see table, are particularly suitable for the relubrication of bearings in wind turbines. They comprise a rigid frame with rollers, an electrically driven grease pump, a holder for the grease container and a pistol grease gun with a 4 m long hose.

A hook and eye on the frame can be used to transport the service pump securely into the nacelle. The rollers, one of which can be anchored, can be used to move the device within the nacelle.

The service pump can be used at temperatures from +10 °C to +40 °C. The greases Arcanol LOAD400, LOAD460 and MULTIPTOP in 12,5 kg buckets can be used for filling.

Available service pumps for wind turbines

Designation	Maximum delivery pressure bar	Delivery rate cm ³ /min
ARCA-PUMP-WIND-SERVICE-KIT	200	280

Lubrication devices

Grease pumps

Grease pumps are driven by pneumatic, electrical or manual means.

Grease dispensing units

Grease dispensing units ARCA-PUMP, see table, are used for the metered greasing of rolling bearings. The metering range is between 10 cm³ and 133 cm³ per stroke. Larger metering ranges can also be achieved by operating the device several times. By means of a pneumatically driven, double direction piston pump, the medium is conveyed directly from the grease container (25 kg or 180 kg) via the metering valve to the application point.

A grease dispensing unit comprises:

- a cover
- a piston
- a metering valve
- a hose connecting the pump and valve
- a hose, 2,5 m long
- a metering pistol.

Available grease dispensing units

Designation	Pump ratio	Delivery rate cm ³ /min	Metering range		Suitable for container sizes kg
			min.	max.	
ARCA-PUMP-25	10:1	400	10	133	25
ARCA-PUMP-180	10:1	400	10	133	100

Drum pumps

Drum pumps ARCA-PUMP-BARREL, see table, are pneumatically driven and suitable for delivering large quantities of grease under high pressure over long distances. Drum pumps can be used either as delivery pumps for individual greasing stations or as a supply pump for central lubrication systems.

Available drum pumps

Designation	Pump ratio	Delivery rate at 6 bar	Air consumption	Suitable for container sizes kg
		g/min	l/min	
ARCA-PUMP-BARREL-25-S	70:1	1 100	150	12 – 25
ARCA-PUMP-BARREL-50-S	70:1	1 100	150	50
ARCA-PUMP-BARREL-180-S	70:1	1 100	150	180

The following accessories are available for the drum pumps: drum cover (dust cover), follower plate, high pressure delivery hoses and pistol grease guns.

Lever grease gun and reinforced hose

The lever grease gun, see table, can be used to manually relubricate rolling bearings via lubrication nipples.

The container on the lever grease gun can be filled with 500 g loose grease or by means of a 400 g cartridge. The cartridge must correspond to DIN 1284 (diameter 53,5 mm, length 235 mm).

The lever grease gun is connected to the lubrication nipple via a reinforced hose. The reinforced hose must be ordered separately, see table. The connector thread is G¹/₈. The reinforced hose has a hydraulic grip coupling for connection to the taper type lubrication nipple in accordance with DIN 71412.

Alternatively, the reinforced hose can be fitted with a connector for cylindrical lubrication nipples in accordance with DIN 3404.

In place of the hydraulic grip coupling, slide couplings for button head lubrication nipples in accordance with DIN 3404 or other nozzles can be connected. These connectors are available from normal trade outlets.



Available lever grease guns

Designation	Maximum delivery pressure bar	Delivery quantity per stroke cm ³
ARCA-GREASE-GUN	800	2

Available reinforced hoses

Designation	Length mm	Connector
ARCA-GREASE-GUN.HOOK-ON-HOSE	300	Cylindrical lubrication nipple with head 16 mm to DIN 3404
ARCA-GREASE-GUN.HOSE	300	Taper type lubrication nipple to DIN 71412



FAG



Condition monitoring



Condition monitoring

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Product overview Alignment

Belt pulley alignment device
Top-Laser SMARTY2

Belt tension measuring device
Top-Laser TRUMMY2

LASER-SMARTY2



LASER-TRUMMY2



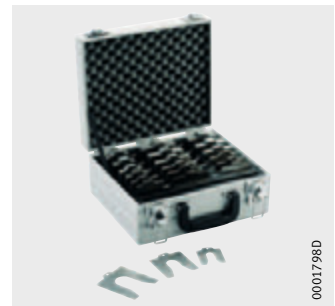
Shaft alignment device
Top-Laser INLINE2

Shims
Top-Laser SHIM

LASER-INLINE2



LASER-SHIM



Alignment

Features

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

Belt pulley alignment device FAG Top-Laser SMARTY2

FAG Top-Laser SMARTY2 is a line laser for the alignment of belt pulleys and chain sprockets with a diameter larger than 60 mm. Alignment of belt pulleys and chain sprockets reduces wear and energy losses in traction drives and the associated bearings and seals. Less heat is generated and the running time and reliability of the machinery is increased.

The features of the line laser are as follows:

- The parallelism and misalignment of both pulleys are displayed.
- Both horizontally and vertically mounted belt pulleys can be aligned.
- Alignment is significantly quicker and more precise than with conventional methods.
- Only one person is required for alignment.
- The measuring device adheres by magnetism to the pulleys.
- The device can also be used on non-magnetic sprockets or pulleys. Due to the low mass, the emitter and target marks can be easily attached to non-magnetic drive pulleys using strong, double-sided adhesive tape.

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.

The target marks are available in optical and electronic versions, *Figure 1*. In the case of electronic target marks, the adjustment values are shown in the digital display in real time. Misalignments are presented in degrees, the parallelism offset is presented in mm.

Do not look into the laser beam or point the laser beam into another person's eyes.

Caution 



Figure 1
Electronic target mark

Alignment

Scope of delivery	1 emitter
Base device	2 optical target marks, attached by magnetism
	1 battery
	1 lined case
Ordering designation	LASER-SMARTY2
Spare parts	Optical target marks, attached by magnetism
Ordering designation	LASER-SMARTY2.TARGET
Accessories	Electronic target marks, attached by magnetism
	Case
Ordering designation	LASER-SMARTY2.TARGET-DIGITAL

Belt tension measuring device FAG Top-Laser TRUMMY2

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

The correct belt tension is an essential prerequisite 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 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 microprocessor that displays relevant measurables for belt tension as a frequency (in Hz) or force (in N).

The simple and reliable user menu is given in several languages.

Before measuring 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. This technique is less prone to disruptive influences in comparison with measurement sound waves.

Do not look into the laser beam or point the laser beam into another person's eyes.



Scope of delivery
Base device

Microprocessor
Probe for direct connection
Probe with cable
Plastic case

Ordering designation

LASER-TRUMMY2

Accessories

Calibration device

Ordering designation

LASER-TRUMMY.CALI-CHECK



Alignment

Shaft alignment device FAG Top-Laser INLINE2

FAG Top-Laser INLINE2, *Figure 2*, is a PC-based alignment system for coupled 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 laptop or netbook
- more precise alignment than with conventional methods
- rapid, simple measurement by means of continuous rotary motion
- reduced vibration and friction losses
- longer machine running times
- usable with conventional laptops with a USB interface
- optional wireless connection for ease of use without a troublesome tangle of cables.

Caution 

Do not look into the laser beam or point the laser beam into another person's eyes.



Figure 2
Scope of delivery
FAG Top-Laser INLINE2

Actions before alignment

If a so-called soft foot is present, this should be removed before alignment is carried out. In this way, any increased vibration tendency and bearing damage due to housing distortion is prevented. A soft foot is a machine foot that lifts off the floor when slackened. The FAG Top-Laser INLINE2 helps to quickly identify and eliminate the soft foot. Each individual screw foot 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 computer determines any foot movement. The soft foot can then be eliminated using shims.

Scope of delivery
 Base device

- 1 transceiver (including cable 3 m)
- 1 reflector
- 2 brackets
- 2 chains (300 mm long)
- 4 posts (115 mm long)
- 1 software
- 1 case
- 1 USB adapter

Ordering designation **LASER-INLINE2**
 All the parts included in the delivery are also available as replacement parts.

Comprehensive range of accessories
 A comprehensive range of accessories is available in order to expand the possible applications of the base device FAG Top-Laser INLINE2, see table and *Figure 3*.

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

Accessories

Accessories for FAG Top-Laser INLINE2	Scope of delivery Quantity	Designation
Chain, 600 mm long	2	LASER-INLINE.CHAIN600
Chain, 1500 mm long	2	LASER-INLINE.CHAIN1500
Post, 150 mm long	4	LASER-INLINE.POST150
Post, 200 mm long	4	LASER-INLINE.POST200
Post, 250 mm long	4	LASER-INLINE.POST250
Post, 300 mm long	4	LASER-INLINE.POST300
Magnetic holder including 4 posts, 150 mm long	1	LASER-INLINE.MAGNET
Accessory set, complete	1	LASER-INLINE.ACCESS-SET This contains all the parts listed above
Wireless upgrade	1	LASER-INLINE2.UPG-WI

- ① Chain
- ② Post
- ③ Magnetic holder

Figure 3
 Accessories



000179E7

Alignment

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), see *Figure 4* and table, page 93.

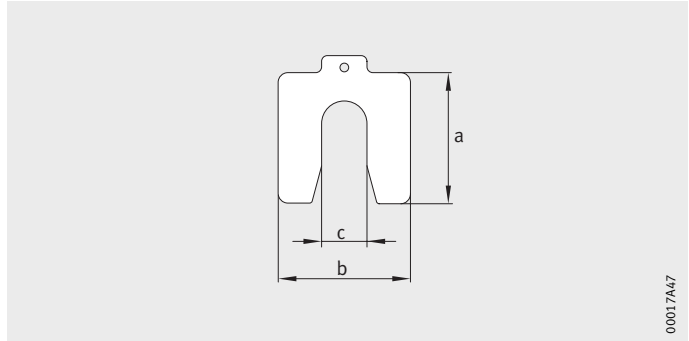


Figure 4
Shim, dimensions

Scope of delivery Basic set	Case 360 shims: 20 shims each in 3 sizes (dimension $c = 15$ mm, 23 mm, 32 mm) and 6 thicknesses (0,05 mm to 1 mm) 1 extraction hook
Ordering designation	LASER.SHIM-SET
Replacement parts	As replacement parts, we can supply 10 shims each in one of the 4 sizes and one of the 7 thicknesses stated above. 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 m g	Dimensions in mm			
		a	b	c	Thick- ness
LASER.SHIM15X0,05	11	55	50	15	0,05
LASER.SHIM15X0,10	22	55	50	15	0,1
LASER.SHIM15X0,50	44	55	50	15	0,5
LASER.SHIM15X0,50	110	55	50	15	0,5
LASER.SHIM15X0,70	154	55	50	15	0,7
LASER.SHIM15X1,00	220	55	50	15	1
LASER.SHIM15X2,00	440	55	50	15	2
LASER.SHIM23X0,05	21	75	70	23	0,05
LASER.SHIM23X0,10	42	75	70	23	0,1
LASER.SHIM23X0,20	84	75	70	23	0,2
LASER.SHIM23X0,50	210	75	70	23	0,5
LASER.SHIM23X0,70	294	75	70	23	0,7
LASER.SHIM23X0,00	420	75	70	23	1
LASER.SHIM23X0,00	840	75	70	23	2
LASER.SHIM32X0,05	29	90	80	32	0,05
LASER.SHIM32X0,10	58	90	80	32	0,1
LASER.SHIM32X0,20	116	90	80	32	0,2
LASER.SHIM32X0,50	290	90	80	32	0,5
LASER.SHIM32X0,70	406	90	80	32	0,7
LASER.SHIM32X0,00	580	90	80	32	1
LASER.SHIM32X0,00	1 160	90	80	32	2
LASER.SHIM44X0,05	53	125	105	44	0,05
LASER.SHIM44X0,10	106	125	105	44	0,1
LASER.SHIM44X0,20	212	125	105	44	0,2
LASER.SHIM44X0,50	530	125	105	44	0,5
LASER.SHIM44X0,70	742	125	105	44	0,7
LASER.SHIM44X0,00	1 050	125	105	44	1
LASER.SHIM44X0,00	2 120	125	105	44	2



Further information

- For further information on FAG alignment devices, see TPI 182, FAG Alignment Tools – Top-Laser: SMARTY2 · TRUMMY2 · INLINE2 · SHIM.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Product overview Checking the operating condition

Temperature measuring device
TempCheck PLUS
TempCheck PRO

TEMP-CHECK-PLUS



TEMP-CHECK-PRO



Digital hand tachometer
TACHOMETER
Sonar device SOUND-CHECK

TACHOMETER



SOUND-CHECK



Checking the operating condition

Features

These devices can be used to manually check the following parameters of rolling bearing arrangements: temperature, speed and noise.

Infrared thermometer FAG TempCheck PLUS

The infrared thermometer FAG TempCheck PLUS is suitable for the thermal monitoring of machine components. This prevents unplanned downtime of machinery.

The infrared thermometer measures the infrared radiation emitted by an object and uses this to calculate the surface temperature. The non-contact measurement makes it possible to easily determine the temperature of difficult to access or moving objects.

The features of FAG TempCheck PLUS are as follows:

- up-to-date infrared temperature technology with high precision glass optics for precise non-contact temperature measurement
- small measurement spot of 13 mm at a distance of up to 140 mm
- measurement spot size corresponds to 20:1 (distance: measurement spot size) at distance of more than 140 mm
- rapid, precise temperature measurement over a temperature range of -32 °C to $+530\text{ °C}$
- degree of emission adjustable to material
- low mass (150 g)
- USB interface
- report software
- simple to use
- low purchase costs.

Caution

Do not look into the laser beam or point the laser beam into another person's eyes.

Scope of delivery Base device

Measuring device
Battery
Wrist strap
Adapter for camera tripod
Carry case
Protective rubber slip cover
User manual
Report software
Case

Ordering designation

TEMP-CHECK-PLUS

For further information

- For detailed information, see publication WL 80 377, FAG Temperature Measuring Devices.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.



Checking the operating condition

Infrared thermometer FAG TempCheck PRO

The infrared thermometer FAG TempCheck PRO is suitable for the thermal monitoring of machine components and fluids. Temperatures can be measured by either non-contact or contact means.

The infrared thermometer measures the infrared radiation emitted by an object and uses this to calculate the surface temperature. The non-contact measurement makes it possible to easily determine the temperature of difficult to access or moving objects.

Compared with the FAG TempCheck PLUS, the FAG TempCheck PRO has a wider measurement range, higher optical resolution, a data memory and two additional temperature sensors for contact temperature measurement. The surface temperature sensor can be used to measurement the temperature of surfaces by contact means. The immersion sensor can be used to measure the temperature of, for example, fluids or lubricants.

The features of FAG TempCheck PRO are as follows:

- up-to-date infrared temperature technology with high precision glass optics for precise non-contact temperature measurement
- small measurement spot of 13 mm at a distance of up to 260 mm
- measurement spot size corresponds to 40:1 (distance: measurement spot size) at distance of more than 260 mm
- rapid, precise temperature measurement over a temperature range of -32 °C to $+760\text{ °C}$
- degree of emission adjustable to material
- additional temperature sensors for contact measurements
- low mass (150 g), simple handling
- USB interface, memory, report software
- low purchase costs.

Caution 

Do not look into the laser beam or point the laser beam into another person's eyes.

Scope of delivery
Base device

Measuring device
Battery
Wrist strap
Adapter for camera tripod
Carry case
Protective rubber slip cover
Immersion sensor for temperature measurement of fluids
Surface temperature sensor
User manual
Report software
Case

Ordering designation

TEMP-CHECK-PRO

For further information

- For detailed information, see publication WL 80 377, FAG Temperature Measuring Devices.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Digital hand tachometer FAG TACHOMETER

The speed counter is suitable for two types of operation:

- direct speed measurement using an adapter, track wheel and measurement stylus
- non-contact optical speed measurement using a reflective mark.



Direct speed measurement

For direct speed measurement, the supplied adapter must be fitted. The rubber stylus of the adapter tracks the end face and this is used to determine the speed. The track wheel, which is in contact with the circumference of the shaft or the surface of the belt, measures the surface velocity.

Non-contact speed measurement

For non-contact measurement, a reflective mark is applied to the machine part to be measured. This mark is detected by photoelectric means using visible red light. The device displays the speed in revolutions per minute.



Scope of delivery Base device

- 1 digital hand tachometer
- 1 adapter for direct measurement 1:1
- 1 measurement wheel 6 inch
- 1 measurement wheel 100 mm
- 1 rubber stylus
- 10 reflective marks
- 1 user manual
- 1 case



Ordering designation

TACHOMETER

Replacement parts

- 10 reflective marks

Ordering designation

TACHOMETER.MARKS-REFLEX

Sonar device FAG SOUND-CHECK

The sonar detector can be used to check rolling bearing noise very easily, quickly and reliably.

Changes in noise due to wear, pitting formation or distortion of the bearing can be detected at an early stage if regular inspection is carried out. In this way, unforeseen operational stoppages and more significant machine damage can be prevented.

The device is used in the same way as a doctor's stethoscope. The tips of the earpiece are placed in the ear canals to provide insulation against background noise. The insulated grip is held between the thumb and index finger like a pencil. The sensor is placed firmly on the part to be measured. If a noise is heard, the sensor is moved until its volume reaches a maximum.

Ordering designation

SOUND-CHECK

Product overview Vibration diagnosis

Vibration measuring device
Detector III

DETECT3-KIT, DETECT3-KIT-RFID, DETECT3.BALANCE-KIT



00017988

Online monitoring system
SmartCheck

SMART-CHECK



00017465

Online monitoring system
DTECT X1 s

DTECT X1 s



0001798F

Online monitoring system
WiPro s

WiPro s



0001798E

**Online monitoring system
ProCheck**

ProCheck



000179B9



**Online monitoring system
VibroCheck**

VibroCheck



00017A9D



Vibration diagnosis

Features

Vibration diagnosis is the most reliable method for identifying the start of machine damage at an early stage. It can be used to precisely detect not only imbalance and misalignment but also rolling bearing damage and gear tooth defects.

FAG vibration measuring devices help in planning maintenance work, increasing bearing life and reducing costs. As a result, plant availability is increased and the risk of unplanned downtime is reduced.

Monitoring devices – offline and online

In the field of offline monitoring devices (regular monitoring), the Schaeffler Group offers FAG Detector III.

The online monitoring systems (continuous measurement) include FAG SmartCheck, FAG DTECT X1 s, FAG WiPro s, FAG ProCheck and FAG VibroCheck.

In order to achieve optimum networking to plant control facilities or monitoring centres, all online systems have versatile communication options as standard.

Worldwide service

On all devices relating to condition monitoring, Schaeffler Group Industrial offers a worldwide service – from the customer hotline to customer-specific service contracts.

Vibration measuring device FAG Detector III

FAG Detector III is a handy, easy to use vibration measuring device. Due to preinstalled standard configurations in accordance with DIN ISO 10816, this is a plug-and-play solution allowing early and authoritative information on the condition of machinery, entirely without time-consuming training or system configuration work.

This allows, for example, rapid inspection of ventilators, pumps, electric motors, compressors or vacuum pumps. All the user must do is start the measurement process by pressing a few buttons and wait until it is completed. The device evaluates the measurement results and presents the results, with self-explanatory symbols, on the device display, *Figure 1*.

- ① Value OK
- ② Prealarm
- ③ Main alarm

Figure 1
Symbols in the device display



The system also has the following features:

- non-contact temperature measurement
- speed detection
- route function
- report generator.



Analysis software

For more detailed analysis, the PC software Trendline is available free of charge and includes comprehensive functions.

These include the Viewer, which gives the user a wide range of tools for data evaluation. The integrated rolling bearing database, containing approximately 20 000 bearings from various manufacturers, facilitates easier and more efficient analysis of the measured data. Since the damage frequencies can be incorporated in the measurement results, simple damage analysis is possible.



Automatic detection of measurement points

The automatic detection of measurement points through the use of RFID technology gives error-free and precise identification of the measurement points on a measurement route. FAG Detector III identifies the measurement points by means of RFID tags on the machinery. With the proven FAG Detector III, mobile vibration and temperature monitoring is thus quicker, simpler and more reliable. The functionality of automatic measurement point detection is not available worldwide.

Further information

- Please direct enquiries to: info@schaeffler-iam.com.



Balancing function

A further special feature of FAG Detector III is the balancing function. For this purpose, the optionally available Balancing Kit is required. This makes it possible to not only detect but also eliminate imbalances.

The results of the balancing process are also transferred to the Trendline software for evaluation.

Vibration diagnosis

Ordering examples	The vibration measuring device FAG Detector III is available in two variants, with the balancing function available for ordering in an upgraded version.
Scope of delivery Base device	Base device with rechargeable battery Accelerometer, attached by magnetism Infrared temperature sensor Charger with worldwide compatibility PC data cable (serial and USB) User manual Protective bag with holder for temperature sensor Trendline PC software free of charge Case
Ordering designation	DETECT3-KIT
Scope of delivery Device with automatic measurement point detection	As DTECT3-KIT RFID reader (integrated) 5 RFID tags
Ordering designation	DETECT3-KIT-RFID
Scope of delivery Upgrade level with balancing function	Accelerometer, attached by magnetism, and sensor cable Trigger sensor (optical and induction) Reflective mark for trigger sensor Balance Magnetic holder for trigger sensor Extension for magnetic holder Cable for trigger sensor, 10 m Dongle for activation of balancing function Case
Ordering designation	DETECT3.BALANCE-KIT
Accessories	Sensor extension cables 5 m or 15 m long are available by agreement. The charging dock, mounting pads and additional RFID tags are available by agreement.
Further information	<ul style="list-style-type: none">■ For detailed information, see TPI WL 80-64, FAG Detector III – The Solution for Monitoring and Balancing or www.FAG-DetectorIII.com.■ Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Online monitoring system FAG SmartCheck

FAG SmartCheck is a compact, innovative, modular online measuring system for continuous monitoring of machinery and process parameters on a decentralised basis. It can be used on assemblies where such monitoring was previously too cost-intensive.

FAG SmartCheck is suitable, for example, for early detection of rolling bearing damage, imbalances and misalignments on:

- electric and geared motors
- vacuum and fluid pumps
- ventilators and fans
- gearboxes and compressors
- spindles and machine tools
- separators and decanters.

Plug-and-play system

FAG SmartCheck is ready for immediate use. When supplied, it already has a set of key data that facilitate general, reliable machinery monitoring.

In addition, predefined configuration templates are available for monitoring of items such as fans, pumps and bearings. These can easily be matched to individual requirements. Due to the integrated bearing database of FAG and INA standard bearings, data configuration and later analysis are simpler. The system has a patented, independent teaching mode that identifies the alarm thresholds.

Parameters monitored

In addition to the standard parameters of vibration and temperature, it is possible to record other classic operating parameters such as pressure or flow rate. All parameters can be correlated with each other and included in the alarm configuration.

The data are recorded and analysed centrally by the system. The current machine condition can be displayed directly on the device or transferred to any control facility as required. It is only necessary to integrate FAG SmartCheck in the existing network structure.

Access via the Internet

FAG SmartCheck has an intuitive user concept designed as a Web interface. It is therefore possible to access the system via the Internet using any standard Internet browser. The Web interface can be used to configure the system and view current data.

Remote monitoring

The data can be transferred to other locations by remote access and analysed there by the operator or external service providers such as the vibration experts of the Schaeffler Group. This is particularly important for customers who still have little experience of data analysis or wish to outsource this function.

Further information

- For detailed information, see TPI 214, FAG SmartCheck or www.FAG-SmartCheck.com.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.



Vibration diagnosis

Online monitoring system FAG DTECT X1 s

FAG DTECT X1 s is a flexible online system for the monitoring of rotating components and elements in the machinery and plant industry. Typical applications can be found, for example, in the steel, raw materials, paper and marine industries.

The system gives early, reliable detection of possible damage and thus helps to prevent unplanned and expensive downtime. This reduces the risk of possible production shutdowns. This increases the capacity utilisation of machinery and plant.

Versatile system

The system can be tailored to customer-specific requirements by means of the software.

The base device is available as an 8 channel system. The system is suitable for connection of all conventional acceleration, speed and travel sensors.

Due to its compact size and robust housing (class IP 67), it is suitable for a wide range of monitoring applications. It has standardised connectors allowing easy installation on machinery and plant.

Remote monitoring

Defects and damage can be detected on machinery without the need for a diagnosis expert on site. The data can be transferred to other locations by remote access and analysed there, for example by the vibration experts of the Schaeffler Group.

Further information

- For detailed information, see WL 80 372, flyer FAG DTECT X1 s.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

**Online monitoring system
FAG WiPro s**

FAG WiPro s allows online monitoring of wind farms – onshore and offshore. The system gives early and reliable detection of possible machine damage. This helps to prevent unplanned downtime and expensive secondary damage. Due to its small size, it can easily be accommodated in small spaces such as the nacelle of a wind turbine.



Versatile system

FAG WiPro s is equipped with a signal processor and evaluates all measurement signals internally. Due to the intelligent linking of expert knowledge with information from the turbine, it is possible to keep the transferred data volume very small. This is particularly important where a large number of turbines must be continuously monitored over a long period.

Any wind farm can be networked using the system, whether the turbines are connected using copper cables, fibre optics, ISDN or analogue lines or even if no telephone connection at all is present.



Certification

The system is certified by Germanischer Lloyd.

Remote monitoring

The automatic messaging function by means of TCP/IP, wifi modem (optional), landline modem or DSL router allows efficient worldwide monitoring. The data can be transferred to other locations by remote access and analysed there, for example by the vibration experts of the Schaeffler Group.

Further information

- For detailed information, see WL 80 373, flyer FAG WiPro s.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.



Vibration diagnosis

Online monitoring system FAG ProCheck

FAG ProCheck is an online monitoring system. It can be used to prevent unplanned downtime and for quality control. The system offers a high level of functionality and is available in a range of variants – from an 8 channel to a 16 channel system.

Parameters monitored

FAG ProCheck continuously records data on vibration, temperature and other process parameters and subsequently carries out their evaluation. As a result, incipient damage and its causes can be detected at a very early stage and the appropriate countermeasures can be introduced in good time. This gives a considerable reduction in operating costs.

In addition, FAG ProCheck offers the possibility of correlating a large number of analogue and digital input and output signals to the vibration data. These channels also allow simple communication with higher level systems such as process control systems.

Versatile system

Due to its extremely robust and compact design, this system is ideally suited for use in almost all industrial segments. The system can be used in steelworks, paper machinery, cement plants or in the oil and gas industry.

Remote monitoring

Defects and damage can be detected on machinery without the need for a diagnosis expert on site. The data can be transferred to other locations by remote access and analysed there, for example by the vibration experts of the Schaeffler Group.

Explosion-protected variant

An explosion-protected version of FAG ProCheck is available by agreement. In this version, a specially pressure-encapsulated housing prevents the system coming into contact with an explosive atmosphere. This is because wherever flammable gases, vapours, fluids or dust occur, the presence of oxygen and an ignition source can rapidly cause an explosion.

Further information

- For detailed information, see TPI WL 80-69, FAG ProCheck – State of the Art Machine Monitoring for Maximum Availability.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Online monitoring system FAG VibroCheck

The online monitoring system FAG VibroCheck is used wherever a large number of measurement points must be continuously and reliably monitored. Typical applications can be found in paper plants, wire rolling mills, cement plants and power stations.

Through the high predictive accuracy and early identification of forthcoming damage, optimum use can be made of planned stoppages and downtimes due to failure can be drastically reduced.

Parameters monitored

FAG VibroCheck allows monitoring using up to 2 048 sensors. For the detection of defects such as imbalance and misalignment, FAG VibroCheck generates spectrum-based parameters that are managed within narrow frequency bands according to speed.

In addition to vibration signals, other process parameters can be detected such as:

- temperature
- power
- pressure
- torque.

In addition to general parameter monitoring, the user has access to an automatic, rule-based expert system. The system can monitor up to 20 components per sensor. This allows monitoring of all rolling bearing types and tooth meshes in the vicinity of a sensor in relation to the occurrence of component-specific frequency windows.

Remote monitoring

Defects and damage can be detected on the machine without the need for a diagnosis expert on site. The data can be transferred to other locations by remote access and analysed there, for example by the vibration experts of the Schaeffler Group.

Customer-specific solutions

The display, which is individually tailored to the customer's requirements, gives a user interface that allows a rapid overview of the condition of the plant. Depending on the complexity of the plant, this display can be arranged on several levels.

Other online monitoring systems

Other monitoring systems for the requirements of specific sectors are available by agreement.



Product overview Monitoring of components

Online monitoring system ProTorq

ProTorq



Monitoring of components

Features	Online monitoring systems of this type are used for estimating the remaining life of heavily loaded components as well as for process monitoring.	
Online monitoring system FAG ProTorq	<p>The online monitoring system FAG ProTorq is suitable for monitoring applications in many sectors due to its versatility. It facilitates:</p> <ul style="list-style-type: none">■ early detection of overload and possible failure of components■ reliable estimates of remaining life■ optimised component utilisation and maintenance planning■ increased quality and production performance■ design verification and optimisation of power train elements.	
Function	FAG ProTorq can be used to detect signals such as torque, elongation, force, pressure, temperature and displacement changes. These can be correlated with product-specific data for evaluation of the signals. In addition, the system allows calculation and comparison of signals with each other. As a result, the user receives a reliable statement on the condition of the component or process. The measurement sensor system is also suitable for harsh ambient conditions such as those in rolling mill or offshore applications.	
Customer-specific solutions	The versatile application possibilities covered by FAG ProTorq require precise definition of the parameters to be monitored when configuring the hardware and software. Each system thus represents an individual solution. The Schaeffler Group accompanies the customer throughout the project phase. Following system configuration by the Schaeffler Group, the user receives intensive training, that equips him to use the system independently. Upon customer request, the experts of the Schaeffler Group can undertake evaluation of the measurement data.	
Troubleshooting	If a permanent installation is not required, there is also the option of temporary measurement carried out by the Schaeffler Group. The objective here is to find short term approaches to solutions where unexpected component failure occurs.	
Further information	<ul style="list-style-type: none">■ For detailed information, see TPI 199, FAG ProTorq.■ Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.	

Product overview Monitoring of lubricants

Oil sensor
Wear Debris Monitor

Wear Debris Monitor



Monitoring of lubricants

Features

Oil sensors of this type can be used to determine wear at an early stage in heavily loaded industrial gearboxes on the basis of particles in the oil. The debris particles that can indicate a failure can be detected in the oil several months in advance. Such particles can be identified at an early stage through monitoring of the lubricant. This helps to prevent failures and downtime.



Oil sensor FAG Wear Debris Monitor

FAG Wear Debris Monitor is an oil sensor that monitors the number of particles in the oil and classifies the particles by size and material. The oil sensor is installed in an ancillary flow of the recirculating lubrication system in the gearbox ahead of the filter or in a separate circuit.

Typical applications for the FAG Wear Debris Monitor can be found, for example, in gearboxes in raw material extraction plants, planetary gearboxes in wind turbines or in ship propulsion systems.



The features of the oil sensor are as follows:

- monitoring of the number of particles in the oil
- differentiation of the particles into ferrous and non-ferrous metals
- classification of the particles according to size
- possible integration in an online monitoring system for linking of oil particle and vibration data.

Where oil and vibration monitoring facilities are combined, damage in gearboxes with recirculating oil lubrication can be detected at an early stage and the source can be determined. In this way, it is possible to prevent production shutdowns or secondary damage.



Further information

- For detailed information, see WL 80 366, Flyer Wear Debris Monitor.
- Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.



FAG



Services

Services

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Services

Features The Schaeffler Group offers, irrespective of the manufacturer of the bearing arrangement, a wide range of services relevant to the lifecycle of a rolling bearing: starting with mounting and progressing through maintenance to the reconditioning of rolling bearings.

During the operational phase, the experts of the Schaeffler Group provide support through services in the fields of condition monitoring and corrective maintenance. Companies that wish to build up their knowledge in the areas of rolling bearings and condition monitoring also have access to the training and consultancy portfolio of the Schaeffler Group. In this way, customers benefit from the expertise of a leading supplier of rolling and plain bearings.

Mounting The industrial service experts of the Schaeffler Group offer mounting services for rolling bearings that are applicable across industrial sectors. They have detailed knowledge and extensive experience in all industrial sectors.

The mounting personnel in the Industrial Service function of the Schaeffler Group are trained and skilled personnel who can provide reliable, rapid and competent assistance. The mounting services are provided either at the customer's location or in the workshop facilities of the Schaeffler Group.

Mounting services The mounting services, *Figure 1*, page 115, include:

- the mounting and dismounting of rolling bearings of all types
- approval inspection of adjacent parts (shafts and housings)
- measurement and production inspection of tapered shaft seats, together with provision of the necessary measuring equipment
- maintenance and inspection of bearing arrangements
- troubleshooting on "problem" bearings
- support in achieving optimum mounting operations
- the use of modern mounting tools, such as heating by means of the versatile medium frequency technique
- the design and manufacture of special tools.



Figure 1
Mounting services

Advantages

The mounting services give the following advantages:

- extended bearing life
- considerable cost reductions
- less unplanned downtime
- increased plant availability
- correct use of rolling bearings.

Further information

- Enquiries: tel. +49 9721 91-3142, fax +49 9721 91-3639.

Equipment rental

Customers who require special mounting and measuring equipment only infrequently, for example in order to carry out repairs, can rent these from the Schaeffler Group on a weekly basis for a fee.

The Schaeffler Group offers rental of the following equipment:

- enveloping circle gauges
- hydraulic nuts
- hand pump sets
- heating devices.

The devices are checked after each use by the experts of the Schaeffler Group and, where necessary, returned to full working condition.

Further information

- Enquiries: tel. +49 9721 91-1133, fax +49 9721 91-3809.
- Service Hotline: Tel. +49 2407 9149-99.



Services

Lubrication In more than half of all cases, inadequate lubrication is the cause of unplanned machine downtime. The life of rotating machine elements can be significantly extended by the use of greases appropriate to the different operating and environmental conditions as well as the definition of and adherence to lubrication intervals and quantities.

- Services** Services relating to lubrication, *Figure 2*, include:
- the selection of lubricants and lubrication systems
 - the lubrication of bearing positions
 - the preparation of lubrication and maintenance plans
 - lubrication point management
 - consultancy on lubricants
 - lubricant investigations and tests.

- Advantages** The lubrication service of the Schaeffler Group helps to:
- prevent failures of rotating components.
 - increase productivity.
 - reduce lubrication costs.

An extensive selection of high quality rolling bearing greases is available. These greases were specially tested and selected for use in rolling bearings.



Figure 2
Lubrication as a service

Condition Monitoring

The malfunction-free and optimised operation of complex machinery and plant can only be achieved by means of condition-based maintenance. The Schaeffler Group uses vibration diagnosis as a preferred method here.

This method makes it possible to detect damage in machinery at a very early stage. This means that, for example, damaged components can be replaced as part of planned downtime. Unscheduled downtime is avoided.

Depending on the type of machine and its importance for the production process, condition monitoring can be carried out by means of either continuous (online) monitoring or regular (offline) monitoring.

Continuous monitoring

For production-critical machinery, continuous monitoring, *Figure 3*, by means of vibration diagnosis is indispensable in many cases. Investment in such monitoring systems often pays for itself after a few months due to the reduced failure costs. Depending on the area of application, the Schaeffler Group offers a wide range of solutions, including single channel standalone solutions for smaller equipment, medium-sized systems with up to 8 channels that can be extended on a modular basis and also complex monitoring systems with up to 2 048 sensor channels.

In addition to giving advice on selecting the right system, the Schaeffler Group also implements monitoring of the machine. This includes not only hardware selection but also system configuration and, where necessary, its integration into existing systems.

The customer can decide whether to carry out plant monitoring himself or to enlist the services of the Schaeffler Group for online monitoring. Due to the communication options of the monitoring systems, remote analysis can be carried out by the experts of the Schaeffler Group.



Figure 3
Continuous monitoring



Services

Regular monitoring

The failure of so-called “B” or “C” category plant items not does lead directly to downtime and does not therefore lead to expensive secondary damage. For such machine parts, offline monitoring is generally recommended as a more economical option. The experts of the Schaeffler Group can assist in identifying the most economically appropriate solution between cost-effective continuous monitoring and regular monitoring.

In this type of monitoring, machinery is examined and assessed by vibration analysis at regular intervals, for example every four weeks. This regularity gives more in-depth knowledge of the normal condition of the machine. Deviations can thus be detected. For the monitoring concept, the selection of measurement points and monitoring accessories as well as the measurement interval play a decisive role. If deviations occur during measurement or if trends are to be investigated, the data can be sent to the Diagnosis Centre of the Schaeffler Group. Vibration experts will then analyse the data and prepare a diagnosis report. Through working with the experts of the Schaeffler Group, customers can build up their own know-how in analysis.

If no personnel are available for data logging, the Schaeffler Group can also offer support in data logging. The company’s experts can carry out regular measurements on site.

Troubleshooting

Where malfunctions occur on a machine, defects must be detected and rectified very quickly. Based on many years of experience with different sectors and applications, the diagnosis experts of the Schaeffler Group are well versed in such troubleshooting tasks. Various types of information are fed into the analysis. These include earlier measurement records or repair reports. If no measurement records are available, the diagnosis experts orient themselves to the specific task through observation, perusing the machine documentation and discussions with the machine operators.

Problems or malfunctions in machine operation often become apparent through changes in vibration behaviour, unusual temperature patterns or similar phenomena. Where the diagnosis experts carry out measurements on the machine themselves, the measurement method is selected as a function of the specific machine and the type of malfunction. The diagnosis experts of the Schaeffler Group are familiar with all analytical techniques, from vibration measurement to torque analysis or endoscopy. As a result, they can quickly identify malfunctions and prepare proposed solutions. The investigation is closed out by a handover discussion between the diagnosis experts and all relevant employees on site. In addition to the results of the investigation, the recommended countermeasures are discussed in particular.

- Vibration measurements In many areas relating to rolling bearings, vibration measurements are the standard method for detecting problems. The vibration expert can assess the condition of the machine without the need for any dismantling work. A large proportion of possible causes of damage can thus be detected and assessed with little work.
- Modal analysis Modal analysis is a particular form of vibration diagnosis. This method does not examine individual components of a machine but the machine as a whole. The aim is to determine the overall vibration behaviour of the machine. A model of the machine is created on the computer and a large number of measurement points are defined. The machine is then specifically excited to vibration using an impulse hammer. Based on parallel measurement of the excitation and resulting machine vibrations at the various measurement points, a vibration model of the machine can be determined by the computer and presented in three dimensions. Modal analysis has a wide variety of possible applications:
- determination of natural frequencies or resonance frequencies:
 - Due to design-related factors such as mass and rigidity, each machine has one or more natural frequencies. If the speed of the motor in a machine is within the range of a natural frequency, extreme vibrations may occur in the machine. With the aid of modal analysis, the vibration experts of the Schaeffler Group can submit recommendations for design improvements to the machine.
 - detection of the “soft spot” in a machine:
 - If a high level of vibration occurs during initial operation or after a technical modification of a machine, this may be due to a so-called “soft spot”. This is defined as a rigidity problem, often caused by a poor quality connection between two machine parts, for example at a screw connection. For analysis, the measurements are used to produce an animation showing the movements of the machine. Showing the movement of the individual machine parts in relation to each other quickly leads to the “soft spot” in the machine. A joint discussion can be held to prepare proposals for improving the design of the machine.



Services

Torque and force measurements

With torque measurement, the Schaeffler Group offers a service that can be used to estimate the remaining life of drive components. In addition, production processes can be monitored and optimised. In contrast to vibration measurement, FAG ProTorq can be used to monitor values that act on the structural elements. These include moments, forces and other physical units where changes can be detected at scanning rates of less than 1 kHz.

Monitoring of torque, including those cases where it is in addition to vibration measurement, is always appropriate where drive elements must be protected against overload or the physical value “torque” plays an important role in production. Typical areas of use include steel and aluminium, paper, oil and gas, raw material extraction and processing, wind power and pulp and paper.

Endoscopy

Digital, optical endoscopes can be used to examine the interior of a machine, *Figure 4*, to determine the extent of damage. The images can be stored as a digital photograph or video and forms the basis of diagnosis by the experts of the Schaeffler Group. The condition of individual components such as rolling bearings or gear teeth can be assessed. If the bearings inspected are products of Schaeffler Technologies GmbH & Co. KG, the customer also has access to the knowledge of the application engineers of the Schaeffler Group. These experts will prepare a detailed damage analysis and submit proposals for improvement.



Figure 4
Endoscopy

Thermography Thermography is one of the most important non-destructive diagnostic techniques, *Figure 5*. Many technical problems manifest themselves in the form of heat generation, which can be detected with the aid of a high resolution infrared camera. The major advantage of thermography is the rapid, non-contact collection of temperature data. If a photograph is taken at the same time, the temperature patterns present in a machine part can be assigned on site.

Thermography can be used for assessment in relation to numerous objects, such as in the case of:

- electrical connections in switch cabinets
- rolling bearing arrangements in motors and fans
- thermal linings in cement kilns.

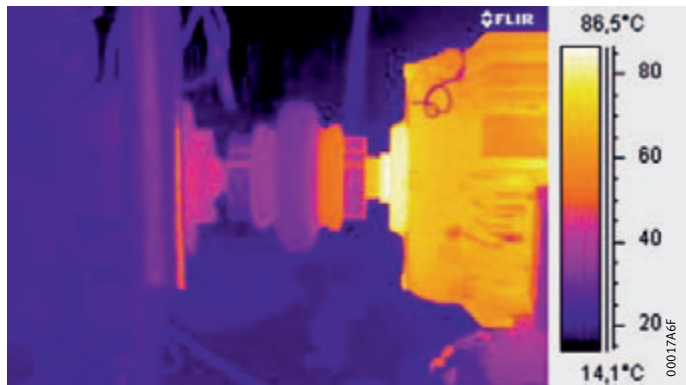


Figure 5
Thermography® FLIR systems
Approval inspection of new plant

The combination of different diagnostic techniques enables the experts of the Schaeffler Group to carry out assessment of new plant irrespective of the manufacturer. Frequently occurring installation defects can thus be detected in the initial operation phase. These defects include: misalignment of motors, pumps or fans as well as incorrect electrical connections in switch cabinets. The experts of the Schaeffler Group check the most common problems and record the actual status. Where necessary, corrective measures can then be requested from the plant manufacturer or operator in good time. If such defects remain undetected over the period of the warranty, their removal and the secondary damage may incur considerable costs and downtime.

Further information ■ Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.



Services

Corrective maintenance

Once a machine problem has been diagnosed, it should be eliminated as quickly as possible. Two of the most frequent problems, namely imbalance in pumps and fans as well as misalignment of machine components to each other, can be corrected directly by the experts of the Schaeffler Group.

Balancing

Imbalance is one of the most frequent defects that lead to unexpected failure of rotating machine elements. Correct balancing gives a decisive increase in the life of rotating machine parts. This increases the productivity and availability of the machine. The experts of the Schaeffler Group reduce to a normal level the imbalance that occurs, for example, due to contamination, wear and repairs. They can detect and eliminate the causes on machinery operating at a speed of 40 min^{-1} to $10\,000 \text{ min}^{-1}$. Typical examples of such machines include pumps, ventilators, compressors, turbines and motors. The Schaeffler Group offers not only a detailed analysis of the causes of the problem but also the elimination of imbalances.

Alignment

Many machines consist of different components, such as electric motors and pumps. After installation, repair or overhaul, the components of such machines must be aligned with each other, *Figure 6*. If this is carried out incorrectly or not at all, this results in high loads being placed on the bearings as well as increased energy demand and wear.

In addition to laser alignment systems, the Schaeffler Group alignment of machinery as a service. Where necessary, the service technicians of the Schaeffler Group will take the necessary laser alignment system to the customer and carry out alignment of the machine in accordance with the manufacturer's specifications. The work is then documented.



Figure 6
Alignment

Further information

■ Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Rolling bearing reconditioning

During maintenance work, many bearings are replaced even though they have not yet reached the limits of their performance capacity. Reconditioning of rolling bearings may represent an economically attractive alternative here, *Figure 7*.

- ① Before reconditioning
- ② After reconditioning



Figure 7
Rolling bearing raceway and rollers before and after reconditioning

Advantages

The advantages for the customer are as follows:

- longer useful life due to high quality maintenance work
- short downtime periods due to swift implementation of the maintenance process
- little mounting work, since the wheelset bearings are returned in a condition ready for mounting
- reduced maintenance costs due to preventive maintenance.

Reconditioning levels

Before reconditioning, the bearing is dismounted, cleaned and examined. The processing steps required are established and a proposal is prepared. Levels of rolling bearing reconditioning, see table.

Level I to Level IV

Processing steps	Level			
	I	II	III	IV
Removal of fretting corrosion	■	■	■	■
Polishing of raceways	–	■	–	–
Regrinding of raceways	–	–	■	■
Manufacture of rolling elements	–	–	■	■
Replacement of cage	–	–	■	■
Replacement or rework of rolling bearing rings	–	–	–	■
Assembly	■	■	■	■
Preservation or greasing	■	■	■	■
Packing	■	■	■	■
Despatch	■	■	■	■



Services

Standard bearings up to 425 mm outside diameter and wheelset bearings for rail vehicles

In particular, bearings with smaller dimensions are regularly replaced during maintenance work although they could be reconditioned with little work and then used for a further period. The same applies to the wheelset bearings of rail vehicles. These are among the most heavily loaded of vehicle parts and are subjected to regular maintenance. The Schaeffler Group therefore offers operators of all rail vehicles the opportunity to have their wheelset bearings professionally dismantled, cleaned and reconditioned.

The service portfolio of the Schaeffler Group applies to:

- all wheelset bearings as well as cylindrical, spherical and tapered roller bearings up to a maximum width of 180 mm and a maximum outside diameter of 425 mm
- products from all rolling bearing manufacturers
- all rail vehicles.

The service comprises:

- professional dismantling, cleaning, failure analysis and reconditioning of bearings in the Service Centre of the Schaeffler Group
- identification marking of each individual bearing before dismantling
- where required, documentation for each bearing of all maintenance activities carried out.

Further information

- For detailed information, see TPI 207, Reconditioning and Repair of Rolling Bearings.
- Enquiries: tel. info@schaeffler-iam.com, +49 9721 91-1919, fax +49 9721 91-3639.

Large rolling bearings of outside diameter greater than 425 mm

Through professional cleaning and reconditioning, it is also possible to return larger standard and special rolling bearings to an acceptable, functionally secure condition. In general, the costs of such rolling bearing reconditioning are significantly lower than the costs of a new bearing – and delivery times are shorter in most cases. In individual cases, customers may also receive the same warranty on the reconditioned bearing as on a new bearing.

Further information

- For detailed information, see TPI 207, Reconditioning and Repair of Rolling Bearings.
- Enquiries: info@schaeffler-iam.com, tel. +49 202 293-2226, fax 49 202 293-2437.

Technical consultancy

Companies that wish to change to the concept of condition-based maintenance are supported by the Schaeffler Group with training, attendance during the introductory phase, ongoing advice during the period of use and service contracts. Furthermore, the Schaeffler Group offers support in the introduction and adaptation of Computerised Maintenance Management Systems (CMMS). These systems help to improve transparency of the services and costs involved in maintenance.

Condition-oriented maintenance

In condition-oriented maintenance, machinery and plant no longer undergo maintenance work on the basis of failures or times but on their assessed condition. In partnership with the customer, the advisory experts of the Schaeffler Group prepare plans that give recommendations for action on the basis of the results of condition monitoring. These recommendations result in targeted maintenance measures and thus to reduced costs.

Service concepts for plant manufacturers and operators

Services are not “off the shelf” products and the requirements vary according to the machine and the knowledge on site. Due to the wide portfolio of services from the Schaeffler Group, it is possible to weave together the right package of training and services from the Schaeffler Group together with in-house activities. The scope is enormous and dependent on the prior knowledge and usable work capability as well as the requirements for quality of monitoring.

The following four examples show the extent of the scope and how widely service concepts can vary. Starting from the customer requirements, the experts of the Schaeffler Group prepare a concept to meet the needs and assist in its implementation.

Example 1: Instruction

Company A has employees with experience in the field of condition diagnosis.

In this case, it is sufficient to instruct the employees of the company in the use of the systems and accompany them while making the initial steps. In difficult cases, assistance can be requested from the experts of the Schaeffler Group. These will help in the analysis and formulation of measures.



Services

Example 2: Teaching Company B would like to build up its own knowledge in the field of condition diagnosis.

Condition diagnosis is a complex subject. Building up knowledge therefore takes time. In such cases, the Schaeffler Group offers a two-year programme, after which even customers without prior knowledge can themselves monitor the condition of their machinery. The support given by the experts of the Schaeffler Group is progressively reduced in stages and the customer's employees use their new knowledge directly in their daily work.

Example 3: Outsourcing Company C would like to completely outsource the area of condition diagnosis.

The Schaeffler Group offers complete packages under which the entire service is provided by the Schaeffler Group. This begins with the initial operation of systems and progresses through continuous monitoring to complete leasing of the hardware, such that no initial costs are incurred by the customer. Such monitoring packages are very attractive, for example, to operators of wind turbines.

Example 4: Offering a service Company D is a plant manufacturer and would like to offer condition monitoring as a service itself.

In this case, the Schaeffler Group acts as a subcontractor for the mostly portable monitoring systems, as a trainer to the service employees of the plant manufacturer and as an expert team. The expert team always moves into action when machines show sets of characteristics that cannot be clearly assessed by the employees of the plant manufacturer. The plant manufacturer can thus offer its customers a highly qualified monitoring service without having to establish its own experts.

Further information

■ Enquiries: info@schaeffler-iam.com, +49 2407 9149-66.

Maintenance management

The Schaeffler Group offers consultancy in order to make maintenance more transparent and efficient, as well as services relating to computerised maintenance management systems.

Maintenance consultancy

Maintenance consultancy by the Schaeffler Group helps to make costs more transparent and design maintenance more effectively. In this case, the experts of the Schaeffler Group move beyond classical consultancy and place the emphasis on technical perspectives, *Figure 8*.

The consultancy process starts with a comprehensive analysis of processes. Building on this base, the experts prepare improvement concepts with the aim of integrating individual solutions within an overall solution. During and after implementation, the experts of the Schaeffler Group support the customer by means of comprehensive services – from system installation, through system modification, to the support provided by the Schaeffler Group beyond the project phase.

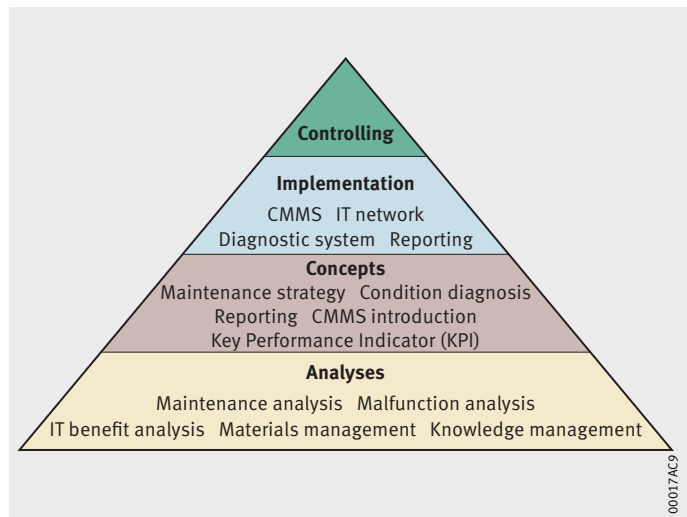


Figure 8
Phases in a consultancy process

Analyses

The experts of the Schaeffler Group hold discussions on site with employees and analyse the available documents.

The analysis considers subjects including:

- business processes, costs, personnel structure, tasks and responsibilities, machine utilisation
- commercial and production measurables
- technical characteristics of the processes
- utilisation of IT and measurement systems
- maintenance strategies
- knowledge management
- measurables systems relevant to maintenance
- co-operation between departments.

The consultancy experts evaluate the information obtained and place it within an overall context. Anonymous data from other companies and sectors are also drawn upon for comparison. As requested, the results are prepared for the management and plant level.



Services

Concepts and implementation The concepts prepared by the consultancy experts of the Schaeffler Group with the customer are aligned to the situation and objectives of the customer. There are no standard processes that are imposed on the customer. Each customer is given individual treatment. The concepts prepared are implemented in partnership. We apply, for example, the following approaches to achieving solutions:

Maintenance strategy

- ABC analysis of plant stock in relation to priorities
- TCO (Total Cost of Ownership)
- LCC (Life Cycle Cost)
- TPM (Total Productive Maintenance)
- Condition-oriented maintenance.

Introduction concept for CMMS

- Software selection
- Master data structures
- Strategy for recurring maintenance and inspection tasks
- Specification and implementation of interfaces
- Inclusion of old data.

IT linkage

- Selection of software based on the catalogue of requirements
- Preparation of a thorough data model
- Specification of interfaces between software packages
- Specification of the necessary hardware.

Improvement of reporting system

- Performance figure system
- Automated printed measurables reports for management
- Electronic reporting via the Internet
- Benchmarking against partner companies.

Sustainability of the developed solutions In order to maintain the optimisation of costs and benefits achieved in the long term, regular assessments are carried out after the implementation phase. These measures are carried out by the customer, while the Schaeffler Group stands ready as a neutral partner. Maintenance controlling can be carried out through extension of the reporting system by means of systems of maintenance-relevant performance figure and benchmarking projects.

Maintenance controlling should be regularly inspected. It is only in this way that its authoritativeness and influence on the process can be ensured.

Computerised maintenance management systems

In the field of computerised maintenance management systems (CMMS), the Schaeffler Group draws on its sound technical knowledge to offer analysis of customer-specific requirements independent of the manufacturer.

The experts of the Schaeffler Group implement a CMMS optimised for the customer. This is based on standard software packages available in the market.

The Schaeffler Group service covers both complete solutions in the form of CMMS implementation as well as individual modules for the following areas.

Systems integration

Through the implementation of interfaces, for example to ERP (Enterprise Resource Planning) systems, the CMMS is integrated in the IT environment of a company. This allows holistic assessment and data analyses in a complete system, so that redundant data maintenance and multiple inputting of data can be avoided.

Process operations are standardised and optimised, and the exchange of information across departments is improved.

Mobile solutions

The use of electronic checklists on a handheld PC enables data to be collected during inspection. The data determined and checked for consistency are transferred via a workshop PC to the CMMS database. Damage can thus be notified and processed without delay.

The mobile system facilitates a computer-aided maintenance process and eliminates manual order processing using paper forms. Data quality and analysis options are increased by the use of standardised coding.

Creation and expansion of the reporting system

The integration of reports into the CMMS gives an authoritative reporting system that offers versatile possibilities for data analysis and representation. Typical applications in this field include evaluation and failure analyses with multi-stage reports, stock and master data lists as well as internal and external business paperwork. Reports can be prepared quickly and easily. Due to their standardised form, they fulfil the requirements involved in certification.

Other services relating to CMMS

The Schaeffler Group also offers the following services in this area:

- release and database platform changeover
- CMMS modifications and expansion functions
- data analysis and corrective data maintenance
- implementation of automated processes
- training of personnel to user and administrator level.





FAG



Training

Training

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Product overview Training

Rolling bearing technology Training example

X-life



Mounting of rolling bearings Training example

PUMP1000-0,7L-DIGI



Machinery monitoring Training example

Detector III



Training

Features The Schaeffler Group training courses communicate comprehensive knowledge on rolling bearings, linear guidance systems and plain bearings.

In order to achieve a long life for rolling bearings, plain bearings and linear guidance systems, correct mounting and dismounting as well as correct selection of lubrication, mounting tools and methods are of decisive importance. The necessary technical knowledge is provided by training courses on these subjects. Other courses show how the condition of bearings can be monitored during operation. The interpretation of vibration measurements is also covered in the teaching.

Target groups Our training courses cover the information needs of employees in a very wide variety of areas of activity within a company. In this way, the technically oriented employee, whether a designer, fitter or maintenance person can find the right training course, in the same way as the employee in business administration, for example in purchasing.

Structure The starting point in the training program is the same for all participants. The first stage is product-oriented training that covers the types, designations and preferred applications as well as the bearing arrangement systems.

This is followed by modules covering rolling bearing theory as well as selected applications. Rolling bearing theory conveys the necessary knowledge on subjects such as bearing clearance, load distribution in the bearing, rating life or lubrication. This knowledge is important in order that bearings can achieve the calculated life and do not fail prematurely.

Workshops concentrate on applications, for example the bearing arrangements in a machine tool or a shaft bearing arrangement. All process steps are covered – from bearing selection and bearing calculation through to mounting.

The mounting and dismounting of rolling bearings and linear guidance systems is shown and practised in thematically oriented modules on the mounting of rolling bearings. The mounting training covers a wide range of applications, starting from mounting exercises with individual products through to bearing mounting on various assemblies such as gearboxes or rail wheelsets.

In addition to the training portfolio in the areas of rolling bearing theory and technology as well as mounting, the Schaeffler Group also offers modules on condition monitoring. These give the training participants an opportunity to acquire and deepen their knowledge of vibration analysis of machinery. Our trainers communicate the theoretical principles of vibration monitoring, the practical handling of measurement systems and the use of configuration and analysis software. The knowledge is embedded by means of practical exercises with the measurement systems.



Training

Training locations

The Schaeffler Group has its own training centres worldwide. Alternatively, we will be pleased to train your employees at your location.

Training Centre Schweinfurt

With an area of nearly 500 m², the Schaeffler Group Training Centre in Schweinfurt (Germany) offers state of the art training facilities in the areas of rolling bearing technology and mounting, starting with standard training on mounting and progressing to the mounting of large rolling bearing arrangements. With the aid of mounting tables and training “islands” with large rolling bearing arrangements typical of industry, the participants can practice dealing with bearings and tools, in an environment representative of actual conditions and under skilled instruction, and deepen their knowledge of mounting work.

Quality assurance

Through continuous market monitoring and exchange of experience, the Schaeffler Group is in a position to continuously improve its training courses. What is particularly important to us are the ideas and suggestions that we receive through feedback from our training participants. Certification of the INA and FAG Technical Training Centres to ISO 9001:2008 underlines our continuous aspiration to increasing quality.

Training courses, standard and individual

The standard programme of training courses is sufficient in most cases to achieve acquisition of the knowledge necessary for day-to-day work. Upon customer request, the Schaeffler Group also offers individually tailored training courses. In these cases, customers can themselves define the key components of the content. The standard training programme for the areas of rolling bearing technology and mounting as well as condition monitoring is already comprehensive; an excerpt is shown in table.

Excerpt from the training portfolio of the Schaeffler Group

Training courses	
Rolling bearing technology and mounting	Basic training: Rolling bearing technology
	Basic training: Mounting of rotary bearings
	Basic training: Mounting of rolling bearings (in gearboxes)
	Practical training: Mounting of rolling bearings (using large rolling bearings)
	Linear – Products and applications
	Basic training: Mounting of linear bearings
	Rolling bearing failures: Identifying causes – Optimising operation
Condition monitoring	Maintenance of main spindle bearings
	FAG SmartCheck – Introductory product training
	FAG SmartCheck – Advanced product training
	Software Administrator
	FAG ProCheck
	FAG DTECT X1 and X1 s
	FAG Detector III – Beginners' training
	FAG Detector III – Principles of vibration analysis
FAG Detector III – Machine diagnosis	
FAG Detector III – Balancing	
Special training	Training completely oriented to the application

Further information on the Internet

- Detailed information can be found at www.schaeffler-iam.com or www.fag.com or www.ina.com in the menu Services, Training Courses.

Ordering designation		Title
New:	Old (for comparison purposes only!)	
General formula		
FIS001	–	Smart Performance Program
TPI 177	–	Optimising Processes in the Paper Industry
WL 80 601	–	Optimising Processes in the Steel Industry
Fitting		
TPI WL 80-56	–	FAG Tools for Mechanical Mounting and Dismounting of Rolling Bearings
TPI 195	TPI WL 80-50	FAG Pressure Generation Devices
TPI 196	TPI WL 80-57	FAG Hydraulic Nuts
TPI 180	–	FAG Tools for Thermal Dismounting
TPI 200	TPI WL 80-54	FAG Heating Devices PowerTherm for Mounting of Rolling Bearings
WL 80 100	–	Mounting and Dismounting of Rolling Bearings
WL 80 376	–	Flyer: FAG Medium Frequency Heating Device
WL 80 369	–	Service flyer: Bearing Heating Using Medium-frequency Heating Device Technology
WL 82 102	–	Rolling Bearing Damage
Lubrication		
TPI 168	–	Arcanol Rolling Bearing Greases
TPI 176	WL 81 115	Lubrication of Rolling Bearings
WL 80 346	–	FAG Motion Guard – the Intelligent Lubricators
Condition monitoring		
TPI WL 80-64	–	FAG Detector III – The Solution for Monitoring and Balancing
TPI WL 80-67	–	FAG VibroCheck – Online Monitoring System for Heavy Industry
TPI WL 80-69	–	FAG ProCheck – State of the Art Machine Monitoring for Maximum Availability
WL 80 363	–	Flyer: FAG ProCheck Ex
TPI 182	TPI WL 80-55	FAG Alignment Tools – Top-Laser: SMARTY2 · TRUMMY2 · INLINE2 · SHIM
TPI 199	–	FAG ProTorq
WL 80 365	–	Flyer: FAG ProTorq
TPI 214	–	FAG SmartCheck
WL 80 375	–	Flyer: FAG SmartCheck
WL 80 366	–	Flyer: FAG Wear Debris Monitor
WL 80 372	–	Flyer: FAG DTECT X1 s
WL 80 373	–	Flyer: FAG WiPro s
WL 80 377	–	Flyer: FAG Temperature Measuring Devices
WL 80 368	–	Service flyer: Thermography
WL 80 374	–	Service flyer: Endoscopy
Rolling bearing reconditioning		
TPI 207	TPI WL 80-72	Reconditioning and Repair of Rolling Bearings
WL 80 367	–	Flyer: Maintenance Service on Wheelset Bearings



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