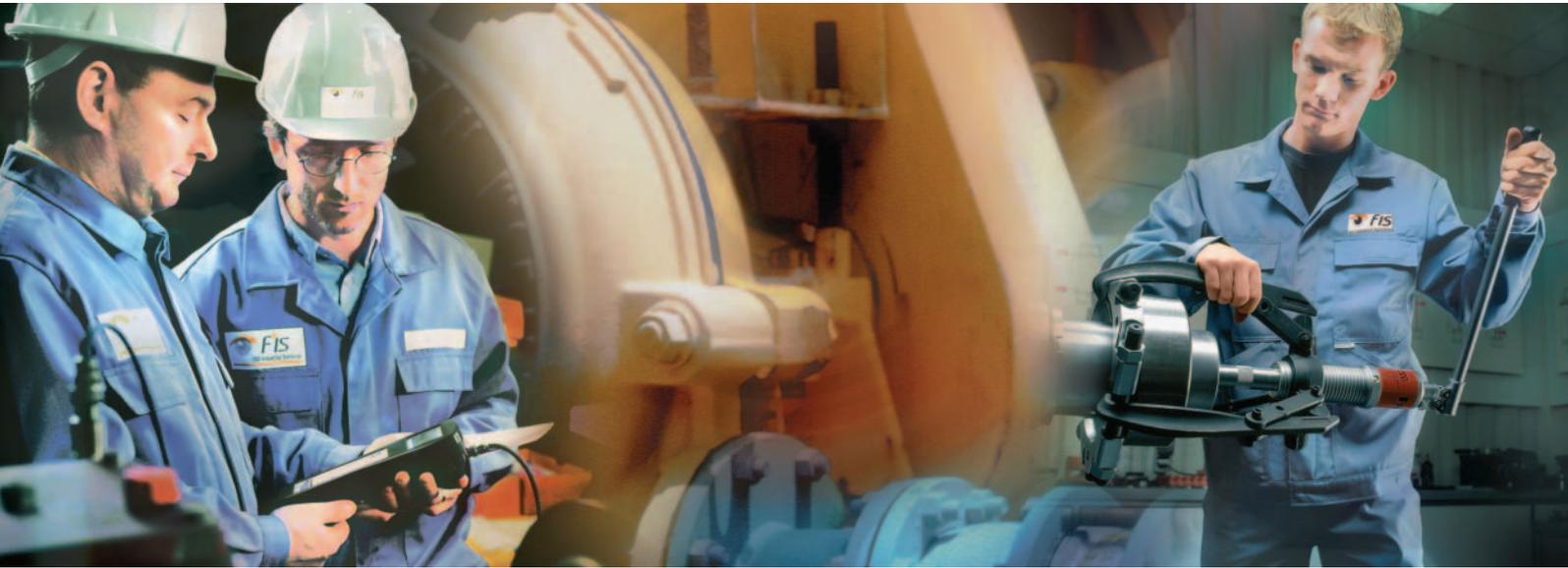


FAG



FAG Equipment and Services for the Mounting and Maintenance of Rolling Bearings

**For increased operational reliability
of rolling bearing arrangements**

SCHAEFFLER GROUP
INDUSTRIAL

About this catalogue

This catalogue is aimed principally at maintenance managers responsible for plants in which rolling bearings and other rotating machine components play a critical role in determining the quality of products and processes.

Maintenance managers are responsible for the maintenance and production process. They must be able to rely every day on the quality of their tools and the expertise of their service providers.

FAG Industrial Services (F'IS) therefore offers high quality products, services and training. This catalogue gives a complete guide to the range on offer from F'IS.

F'IS employees worldwide will be pleased to help you select the ideal products, services and training for your needs.

Management Board of
FAG Industrial Services:
Dipl.-Ing. Armin Kempkes (left)
Dr.-Ing. Hans-Willi Kessler (right)



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FAG Industrial Services – Competence in maintenance

FAG Industrial Services

FAG Industrial Services GmbH (F'IS), headquartered in Herzogenrath near Aachen, is an independent company that takes responsibility for the worldwide service business of Schaeffler Group Industrial covering the brands INA and FAG.

F'IS has set itself the goal of helping customers to reduce maintenance costs, optimise plant availability and prevent unforeseen machine downtime. The services are provided irrespective of the brand of the machine components used. F'IS is therefore **the** specialist contact for the maintenance of rotating components. In order to provide a rapid, competent supply of F'IS products,

services and training to customers worldwide, F'IS has specialist centres around the world.

All F'IS employees worldwide undergo a comprehensive training programme and are audited regularly. This ensures that F'IS services throughout the world comply with a uniformly high standard of quality.

Since each customer has a different set of requirements, F'IS offers concepts individually tailored to the 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 secured by a quality management system certified to ISO 9001:2000 and is checked in practical use.

The F'IS range

F'IS has undertaken ongoing expansion of its range in recent years. It encompasses products, services and training in the areas of

- Mounting
- Lubrication
- Condition monitoring
- Rolling bearing reconditioning
- Maintenance management

The designation system of the INA and FAG brands has been harmonised. This catalogue contains the new ordering designations, which are currently only valid for Europe. Customers outside Europe are requested to continue using the old ordering designations (please see the comparison on page 109).

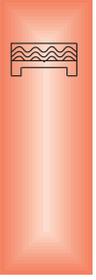
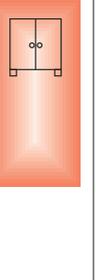
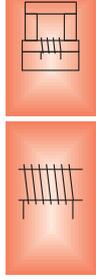
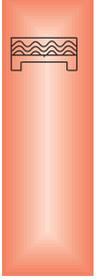
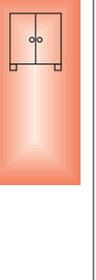
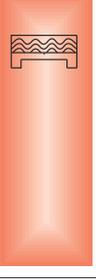


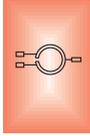
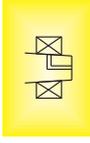
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Tools for mounting and dismounting

Overview

Bearing type	Bearing bore	Bearing size	Mounting			
			With heating			
 Deep groove ball bearings  Tapered roller bearings	Cylindrical	Small	   			
 Angular contact ball bearings  Spindle bearings  Four point contact bearings		Medium				
 Self-aligning ball bearings		Large				
 Cylindrical roller bearings	Cylindrical	Small	   			
		Medium				
 Needle roller bearings		Large				
 Thrust ball bearings  Angular contact thrust ball bearings  Cylindrical roller thrust bearings  Spherical roller thrust bearings	Cylindrical	Small	   			
		Medium				
		Large				
 Self-aligning ball bearings Self-aligning ball bearings with adapter sleeve  Barrel roller bearings Barrel roller bearings with adapter sleeve  Spherical roller bearings Spherical roller bearings with adapter sleeve Spherical roller bearings with withdrawal sleeve  Adapter sleeve  Withdrawal sleeve	Tapered	Small	 			
		Medium				
		Large				
 Cylindrical roller bearings, double row	Tapered	Small	 			
		Medium				
		Large				

	Dismounting				Hydraulic method	Symbols
	Hydraulic method	With heating	Without heating	Hydraulic method		
			 			      
		 				  
						   
 			 			 
			 			

Products · Mounting

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Products · Mounting

Mechanical mounting and dismounting

Mounting tool sets

FAG mounting tool sets FITTING-TOOL-ALU-10-50 and FITTING-TOOL-STEEL-10-50

FAG mounting tool sets allow economical and secure mounting of rolling bearings up to 50 mm bore. They can also be used to easily mount sleeves, intermediate rings, seals and similar parts.

Where inner or outer rings with a tight fit are to be driven onto a shaft or into a housing bore respectively, this can be achieved by applying hammer blows to an appropriate mounting sleeve. This prevents the mounting forces being transmitted through the rolling elements and raceways, which can lead to damage. The carefully matched FAG precision parts ensure that the forces are uniformly transmitted to the side faces of the bearing rings.

The FITTING.TOOL.ALU-SET10-50 includes mounting sleeves made from aluminium and mounting rings made from plastic. The parts are economical and easy to use. The steel mounting sleeves and steel mounting rings in the FITTING-TOOL-STEEL-10-50 give long wear-free operating life. These tools can also be used in conjunction with workshop power presses.

FAG mounting tool sets FITTING-TOOL-ALU-10-50 and FITTING-TOOL-STEEL-10-50

Included in delivery

Ordering designation

FITTING-TOOL-ALU-10-50

FITTING-TOOL-STEEL-10-50

Mounting rings	33 pieces	33 pieces
For bearing bore	10–50 mm	10–50 mm
Outside diameter up to	110 mm	110 mm
Mounting sleeves	3 pieces	5 pieces
Hammer, recoilless	1 kg	0,7 kg
Dimensions of case	440×350×95 mm	370×320×70 mm
Mass of complete set	4,5 kg	21 kg

Also available as individual parts

For detailed information, see TPI WL 80-56.



Products · Mounting

Mechanical mounting and dismounting

Socket wrenches and hook wrenches for mounting and dismounting

FAG socket wrenches

LOCKNUT-SOCKET...

For locknuts KM0 to KM20

Locknuts can be easily tightened and loosened on shafts, adapter sleeves and extraction sleeves using FAG socket wrenches LOCKNUT-SOCKET...

They require less space on the circumference of the nut than hook wrenches and allow the use of ratchets and torque wrenches. For increased reliability, socket wrenches should be secured using a locking pin and rubber washer. FAG socket wrenches 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.

Ordering example for FAG socket wrench, suitable for locknut KM5:

LOCKNUT-SOCKET-KM5

For detailed information, see TPI WL 80-56.



FAG hook wrenches

LOCKNUT-HOOK...

For locknuts KM0 to KM40

FAG hook wrenches of series LOCKNUT-HOOK... can be used to tighten and loosen locknuts on shafts, adapter sleeves and extraction sleeves.

FAG hook wrenches can be used to mount small bearings on tapered shaft seats, adapter sleeves or extraction sleeves.

Extraction sleeves can also be dismantled using FAG hook wrenches together with the extraction nuts.

Ordering example for FAG hook wrench, suitable for locknuts KM18, KM19, KM20:

LOCKNUT-HOOK-KM18-20

For detailed information, see TPI WL 80-56.



Products · Mounting

Mechanical mounting and dismounting

Hook wrenches and pin wrenches for mounting and dismounting

FAG jointed hook wrenches LOCKNUT-FLEXIHOOK...

For locknuts KM1 to KM36 and precision locknuts ZM12 to ZM150 as well as ZMA15/33 to ZMA100/140

FAG jointed hook wrenches of series LOCKNUT-FLEXI-HOOK... can be used to tighten and loosen locknuts (precision locknuts) on shafts, adapter sleeves and extraction sleeves if no torque value is specified.

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

Ordering example for FAG jointed hook wrench, suitable for locknuts KM14 to KM24:

LOCKNUT-FLEXIHOOK-KM14-24

For detailed information, see TPI WL 80-56.

FAG jointed pin wrenches LOCKNUT-FLEXIPIN...

For precision locknuts AM15 to AM90

FAG jointed pin wrenches of series LOCKNUT-FLEXI-PIN... can be used to tighten and loosen precision locknuts on shafts if no torque value is specified.

FAG jointed pin wrenches can be used to mount small bearings on tapered shaft seats.

Tightening is achieved by means of radially arranged holes.

Ordering example for FAG jointed pin wrench, suitable for locknuts AM35 to AM60:

LOCKNUT-FLEXIPIN-AM35-60

For detailed information, see TPI WL 80-56.

FAG jointed face wrenches LOCKNUT-FACEPIN...

For precision locknuts LNP017 to LNP170

FAG jointed face wrenches of series LOCKNUT-FLEXI-PIN... can be used to tighten and loosen precision locknuts on shafts if no torque value is specified.

FAG jointed face wrenches can be used to mount small bearings on tapered shaft seats.

Tightening is achieved by means of axially arranged holes.

Ordering example for FAG jointed face wrench, suitable for precision locknuts LNP017 to LNP025:

LOCKNUT-FACEPIN-LNP17-25

For detailed information, see TPI WL 80-56.



Products · Mounting Mechanical mounting and dismounting

Hook wrenches and pin wrenches for mounting and dismounting

FAG double hook wrenches

For locknuts KM5 to KM13

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

FAG double hook wrench kits

LOCKNUT-DOUBLEHOOK...-KIT

comprise a case containing a double hook wrench, a torque wrench and a user manual.

The torque wrench allows a precisely defined tightening torque to be achieved at the start of the mounting operation.

FAG double hook wrench sets

LOCKNUT-DOUBLEHOOK...-SET

contain four or five double hook wrenches. The other items in the case are the same as in the kits.

Individual double hook wrenches

LOCKNUT-DOUBLEHOOK-KM5 to

LOCKNUT-DOUBLEHOOK-KM13

are also available. Each double hook wrench is engraved with the torsion angles for the self-aligning ball bearings to be mounted using that particular wrench, so that the displacement and reduction in radial internal clearance can be precisely set.

For detailed information, see TPI WL 80-56.



Double hook wrench kits, e. g. LOCKNUT-DOUBLEHOOK-KM5-KIT and LOCKNUT-DOUBLEHOOK-KM13-KIT



Double hook wrench kits LOCKNUT-DOUBLEHOOK-KM5-8-SET and LOCKNUT-DOUBLEHOOK-KM9-13-SET



Double hook wrenches, e. g. LOCKNUT-DOUBLEHOOK-KM5 and LOCKNUT-DOUBLEHOOK-KM13

Products · Mounting

Mechanical mounting and dismounting

Mechanical extractors

Mechanical extractors FAG PowerPull

Mechanical extractors can be used to dismount small rolling bearings up to approx. 100 mm bore diameter that are located with a tight fit on a shaft or in a housing. The bearing can be dismounted without damage

if the extractor is in contact with the tightly fitted bearing ring. In mechanical FAG extractors, the extraction force is normally applied by means of a threaded spindle. In addition to devices with two, three or four arms and a hydraulic pressure tool, we also offer special extraction devices.

For detailed information, see TPI WL 80-56.

Note:
For dismounting of larger bearings, hydraulic extractors should be used (page 15).

Two-arm extractor 54

- For extraction of complete rolling bearings or tightly fitted inner rings as well as other parts, e.g. gears
- Grip width 10 mm to 350 mm, grip depth up to 250 mm
Available as set (stand with 6 extractors) or individually

Ordering designation:
PULLER54-SET
PULLER54-100
PULLER54-200
PULLER54-300
PULLER54-400
PULLER54-500
PULLER54-600



Two-arm bearing extractor 47

- For extraction of complete rolling bearings or tightly fitted inner rings
- Grip width 8 mm to 90 mm, grip depth up to 100 mm

Ordering designation:
PULLER47-100
PULLER47-200



Three-arm extractor 52

- For extraction of complete rolling bearings or tightly fitted inner rings
- Grip width 15 mm to 640 mm, grip depth up to 300 mm

Ordering designation:
PULLER52-085
PULLER52-130
PULLER52-230
PULLER52-295
PULLER52-390
PULLER52-640



Products · Mounting

Mechanical mounting and dismounting

Mechanical extractors

Hydraulic pressure tool 44

- For loosening of tightly fitted parts in conjunction with mechanical extractors
- Significant reduction in effort through generation of an axial force of 80 or 150 kN, with a hydraulic return mechanism on the larger device

Ordering designation:

PULLER44-080

PULLER44-150



Ball bearing extractor 56

- For extraction of complete radial ball bearings
- For tightly fitted outer rings
- For bearings without radial access
- Three sets with different claws available

Ordering designation:

PULLER56-020-SET

PULLER56-120-SET

PULLER56-220-SET



Special bearing extractor 64

- For radial bearings (deep groove ball bearings, self-aligning ball bearings as well as cylindrical roller, tapered roller and spherical roller bearings); please state the bearing manufacturer
- For tightly fitted inner ring or outer ring

Ordering example

for deep groove ball bearing 6000:

Base device **PULLER64-400**

+ collet **PULLER64.COLLET-A-6000**

Ordering example for tapered

roller bearing pair 30203-A in

X arrangement:

Base device **PULLER64-400**

+ collet **PULLER64.COLLET-B-30203A**

+ collet **PULLER64.COLLET-C-30203A**



Products · Mounting

Mechanical mounting and dismounting

Mechanical extractors

Extraction device 49

- For all rolling bearing types.
For extraction of complete rolling bearings or tightly fitted inner rings.
The extractor and the separator device are available in five sizes with grip widths of up to 210 mm.
- Principally for cases in which the inner ring is adjacent to a shoulder on the shaft without extraction slots. Good radial access to the bearing position is required.

Ordering designation:

PULLER49-100-060
PULLER49-100-075
PULLER49-200-115
PULLER49-300-150
PULLER49-400-210



Internal extractor 62

- For deep groove ball bearings and angular contact ball bearings.
The internal extractor set comprises nine extractors and can be used on bearings with a bore diameter from 5 mm to approx. 70 mm.
- For tightly fitted outer rings.
- The inner ring bore must be free.

Ordering designation
(nine internal extractors with two countersupports in a rigid metal case):

PULLER62-SET

The nine internal extractors can also be ordered individually.



Internal extractor

PULLER-INTERNAL10/100-SET

- For standard deep groove ball bearings. The set, comprising 6 sets of extraction legs and 2 threaded spindles, can be used on bores from 10 to 100 mm.
- For tightly fitted outer rings.
- Without dismounting of the shaft.

Ordering designation

(six sets of extraction legs and two threaded spindles in a toolbox):

PULLER-INTERNAL10/100-SET

The parts can also be ordered individually.



Products · Mounting

Mechanical mounting and dismounting

Hydraulic extractors

Hydraulic extractors FAG PowerPull

The hydraulic extractors FAG PowerPull are used where higher extraction forces are required. The ten extractor sizes have a range of extraction forces from 40 to 400 kN, covering a very wide range of possible applications. These devices allow rolling bearings, gears, sleeves and many other

shrink fitted parts to be quickly and easily dismantled. In addition, the low mass of the extractors mean that they can be used in any position.

Where necessary, a greater grip depth can be achieved by the use of extra long extraction arms (available as accessories).

For the protection of operators, the extractors PULLER-HYD40 to

PULLER-HYD80 are equipped with a safety grid. All larger hydraulic extractors are supplied with a transparent, very tough safety cover. The cover can be easily placed around the workpiece or tool and secured using velcro strips.

For detailed information, see TPI WL 80-56.

Overview of significant advantages

- Safety grip allows pumping while wearing industrial gloves
- Optimum operating position due to 360° rotary coupling for pump handle (separate pump in the case of PULLER-HYD175 and PULLER-HYD400)
- Pressure build-up or reduction by rotation of handle on cut-off valve
- Pressure control valve prevents overload
- Parts under mechanical load are made from high quality chromium-molybdenum steel
- Maximum possible reduction in torsional and frictional forces due to chromium plated piston made from quenched and tempered steel
- Stroke travel adjustable by means of standard adapter
- High load capacity of extraction arms and claws through manufacture as single piece
- Simple centring by spring-loaded steel cone
- “Quick” screw thread for setting of optimum grip depth
- Simple conversion to two-arm operation if there is insufficient space for three arms



Products · Mounting

Mechanical mounting and dismantling

Hydraulic extractors

PULLER-HYD40...80:
Hydraulic standard extractor with integral hand pump

Compact extractor for extraction forces up to 80 kN, together with safety grid in rigid case

PULLER-HYD40...80

Ordering designation Extractor	Extraction force kN	Grip width mm	Grip depth mm	Stroke mm	Mass kg
PULLER-HYD40	40	150	165	55	7,2
PULLER-HYD60	60	200	165 (195*)	82	7,5
PULLER-HYD80	80	250	210 (240*)	82	8,6

* With optional longer extraction arms



PULLER-HYD100...300:
Extra strong hydraulic extractor with integral hand pump

For difficult dismantling work with extraction forces up to 300 kN, with longer extraction arms on request. With accessories in rigid metal case.

PULLER-HYD100...300

Ordering designation Extractor	Extraction force kN	Grip width mm	Grip depth mm	Stroke mm	Mass kg
PULLER-HYD100	100	280	195 (250*)	82	11,6
PULLER-HYD120	120	305	240 (280*)	82	9,5
PULLER-HYD200	200	360	275 (330*)	82	23,7
PULLER-HYD250	250	410	315 (385*)	100	35,6
PULLER-HYD300	300	540 (610*)	375 (405*)	100	50

* With optional longer extraction arms



PULLER-HYD175 + 400:
Extra strong hydraulic extractor with separate hand pump

Extractor for restricted spaces, connected to hand pump by hydraulic hose, extraction force up to 400 kN

PULLER-HYD175 + 400

Ordering designation Extractor	Extraction force kN	Grip width mm	Grip depth mm	Stroke mm	Mass kg
PULLER-HYD175	175	360 (450*)	250 (305*)	82	21,8
PULLER-HYD400	400	650 (1000*)	420 (635*)	250	118

* With optional longer extraction arms



Products · Mounting Mechanical mounting and dismounting

Three-section extraction plates

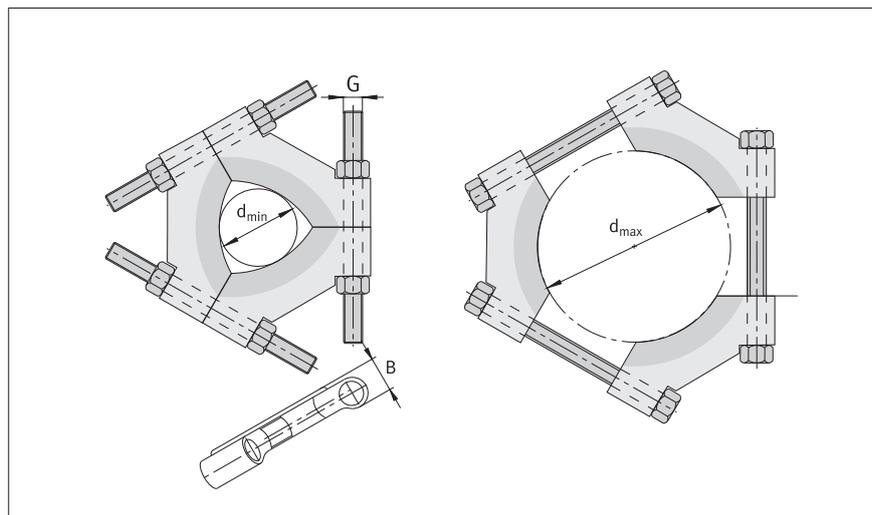
Three-section extraction plates FAG PowerPull PULLER-TRISECTION... for hydraulic and mechanical extractors

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 PULLER-TRISECTION 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, for example, on the bearing inner ring. In general, the bearing and shaft remain intact and can be used again.

The PULLER-TRISECTION is proven in practical use and can be fitted under the bearing with just a few movements.

For detailed information, see TPI WL 80-56.



Three-section extraction plates FAG PowerPull PULLER-TRISECTION...

Ordering designation Extraction plate	Dimensions		Thread		Mass kg	Recommended for hydraulic extractor	mechanical extractor PULLER
	d _{min} mm	d _{max}	B	G		PULLER-HYD	
PULLER-TRISECTION-50	12	50	17	M10×1,25	0,5	–	52-085/52-130
PULLER-TRISECTION-100	26	100	28	M16×2	2,6	40/60/80/100	52-230
PULLER-TRISECTION-160	50	160	37	M22×2,5	6,1	80/100/120/175/200	52-295
PULLER-TRISECTION-260	90	260	53	M32×2,5	19,5	175/200/250/300	52-390
PULLER-TRISECTION-380	140	380	71	M44×2,5	50	250/300/400	52-640

Products · Mounting

Hydraulic mounting and dismounting

Hydraulic nuts

FAG hydraulic nuts HYDNUT...

Hydraulic nuts HYDNUT... can be used to press parts 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.

They are mainly used for:

- mounting of rolling bearings with a tapered bore. The bearings can be seated directly on a tapered shaft, on an adapter sleeve or an extraction sleeve. If the bearing is located using a extraction sleeve or an adapter sleeve, the hydraulic nut can also be used for dismounting.
- mounting of couplings, gears, ships' propellers etc.

For detailed information, see TPI WL 80-57.



FAG hydraulic nuts HYDNUT...		
Ordering designation	Design	Main application
HYDNUT50 to HYDNUT200	With metric precision thread to DIN 13	Standardised adapter and extraction sleeves with metric dimensions
HYDNUT205 to HYDNUT1180	With trapezoidal thread to DIN 103	
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	Reinforced design with smooth bore	For high mounting forces, e.g. in shipbuilding

Products · Mounting

Hydraulic mounting and dismounting

Mounting Manager

FAG Mounting Manager

The computer program **FAG Mounting Manager** is a user-friendly aid for ensuring 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, displacement and start pressure
- it gives useful mounting advice
- and it generates a list of the accessories and tools required

Further information on mounting and dismounting of bearings is offered in the integrated library containing appropriate publications, Technical Information documents etc. and our electronic learning system.

Calculation possibilities for 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 extraction sleeve on the cylindrical shaft. The internal clearance is set either by conventional means using feeler gauges or by means of the axial displacement.

a) Mounting of bearings with tapered bore by measurement of the axial displacement

The bearing is placed in its starting position on the tapered bearing seat with a hydraulic nut. The required starting pressure defined for each individual bearing is set in the hydraulic nut by means of the digital manometer. The displacement gauge axially mounted on the hydraulic nut is used to measure the axial displacement until the final position is reached on the tapered seat.

This mounting method:

- gives considerably shorter and simpler mounting
- offers very high security and accuracy
- allows the correct mounting of sealed bearings

b) Mounting of bearings with tapered bore by measurement of the reduction in radial internal clearance

When the bearing is pushed onto the tapered seat, the inner ring is expanded and the radial internal clearance is thereby reduced. This reduction in radial internal clearance is valid as a measure of the tight fit of the bearing. It is measured by means of a feeler gauge.

The FAG Mounting Manager is available on CD-ROM.

Ordering designation:
CD-MM 1.1



Products · Mounting

Hydraulic mounting and dismounting

Overview of pressure generation devices

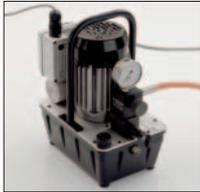
Overview of pressure generation devices					
	Pressure generation device Oil injector		Hand pump set		
	INJECT2500	INJECT1600	Single stage PUMP1000-0,7L	Twin stage PUMP1000-4L	PUMP1600-4L
					
Oil container volume [l]	0,008	0,027	0,7	4	4
Connector	G ³ / ₈	G ³ / ₄	G ¹ / ₄	G ¹ / ₄	G ¹ / ₄
Max. oil pressure [bar]	2 500	1 600	1 000	1 000	1 600
(psi)	36 250	23 200	14 500	14 500	23 200
Applications	Mounting and dismounting of bearings with tapered bore. Press fits up to approx. 125 N/mm ² contact pressure.	Mounting and dismounting of bearings with tapered bore. Press fits up to approx. 80 N/mm ² contact pressure.	Mounting and dismounting of rolling bearings. Mounting of press fits up to approx. 50 N/mm ² contact pressure. For driving hydraulic nuts up to HYDNUT395 / HYDNUT300-HEAVY	Mounting and dismounting of rolling bearings. Mounting of press fits up to approx. 50 N/mm ² contact pressure, e.g. of ships' propellers. For driving hydraulic nuts up to HYDNUT800	Mounting and dismounting of rolling bearings. Mounting of press fits up to 80 N/mm ² contact pressure, e.g. of rudder spindles and rudder blades
Max. shaft ø [mm]	80	150	250	Unlimited	Unlimited

Products · Mounting

Hydraulic mounting and dismounting

Overview of pressure generation devices

Overview of pressure generation devices

	Pressure generation device				
	Hand pump set	High pressure pump	High pressure pump set	Hydraulic unit	
	Twin stage			Compressed air	Electric
	PUMP2500-4L	PUMP4000-0,2L	PUMP2500-0,2L-KIT	AGGREG-P1000-1/P2500-2	AGGREG-E700
					
Oil container volume [l]	4	0,2	0,2	13	10
Connector	G ¹ / ₄ (direct)	G ³ / ₄ (direct)	G ¹ / ₄ with high pressure hose	G ¹ / ₄	G ¹ / ₄
Max. oil pressure [bar]	2 500	4 000	2 500	2 500	700
(psi)	36 250	58 000	36 250	36 250	10 150
Applications	Mounting and dismounting of bearings. Mounting of press fits up to approx. 125 N/mm ² contact pressure, e.g. of gears and couplings.	For press fits with high contact pressure (> 100 N/mm ²). Dismounting of bearings with cylindrical bore. Flow rate and oil reservoir are small.	For press fits with high contact pressure (> 100 N/mm ²). Dismounting of bearings with cylindrical bore. Flow rate and oil reservoir are small.	Mounting of shaft couplings and press fits, gears etc. by the hydraulic method. Contact pressure up to 100 N/mm ² .	For driving large hydraulic nuts up to HYDNUT1180. Mounting of large press fits: ship shaft couplings, ships' propellers, gears, contact pressure up to 50 N/mm ² .
Max. shaft ø [mm]	Unlimited	Unlimited For rolling bearings up to d = 250 mm	Unlimited	Unlimited	Unlimited

Detailed information on FAG pressure generation devices is given in TPI WL 80-50.

Products · Mounting

Hydraulic mounting and dismounting

Oil injectors

FAG oil injectors

Oil injectors have a small volume displacement; they can be used in the hydraulic method for the dismounting of rolling bearings and other press fits with direct seating on tapered shafts, e.g. in machine tools for cylindrical roller bearings FAG NNU49..-S-K, NN30..-AS-K, N10..-K, N19..-K.

The INJECT2500 can be used for shaft diameters up to 80 mm, the INJECT1600 up to 150 mm.

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

For detailed information, see TPI WL 80-50.



FAG oil injectors					
Oil injector	Valve nipple	Connector	Oil volume	Max. oil pressure	Mass ≈
Ordering designation			cm ³	bar	kg
INJECT2500	INJECT2500.VALVE	G ³ / ₈	8	2 500	0,91
INJECT1600	INJECT1600.VALVE	G ³ / ₄	27	1 600	2,18

The oil injector can be refilled with oil without losses by connecting the valve nipple to the oil injector. In this case, the oil injector is ordered with a valve nipple.
 Ordering designation for INJECT2500 + INJECT2500.VALVE: **INJECT2500-SET**
 Ordering designation for INJECT1600 + INJECT1600.VALVE: **INJECT1600-SET**

Products · Mounting

Hydraulic mounting and dismounting

Hand pump sets

FAG hand pump sets

We offer one hand pump set with a single stage pump and three hand pump sets with a twin stage pump. The twin stage pumps have a high flow rate in the low pressure range (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 an 8 litre oil container (suffix 8L). In cases where the type of installation of the adapter or

extraction sleeve requires a separate oil supply, we can upon request supply a two-way valve (suffix D).

For detailed information, see TPI WL 80-50.



PUMP1000-0,7L-DIGI



PUMP1600-4L-D

FAG hand pump sets (overview of ordering designations)

Pump	Hand pump set Base design	With 8 l oil container	With distributor	With 8 l oil container and distributor
Single stage 1 000 bar	PUMP1000-0,7L*			
Twin stage 1 000 bar	PUMP1000-4L*	PUMP1000-8L*	PUMP1000-4L-D	PUMP1000-8L-D
1 600 bar	PUMP1600-4L	PUMP1600-8L	PUMP1600-4L-D	PUMP1600-8L-D
2 500 bar	PUMP2500-4L	PUMP2500-8L	PUMP2500-4L-D	PUMP2500-8L-D

* The 1 000 bar pumps with one connector are also available with a digital manometer.

Ordering example: **PUMP1000-0,7L-DIGI**

Products · Mounting Hydraulic mounting and dismounting

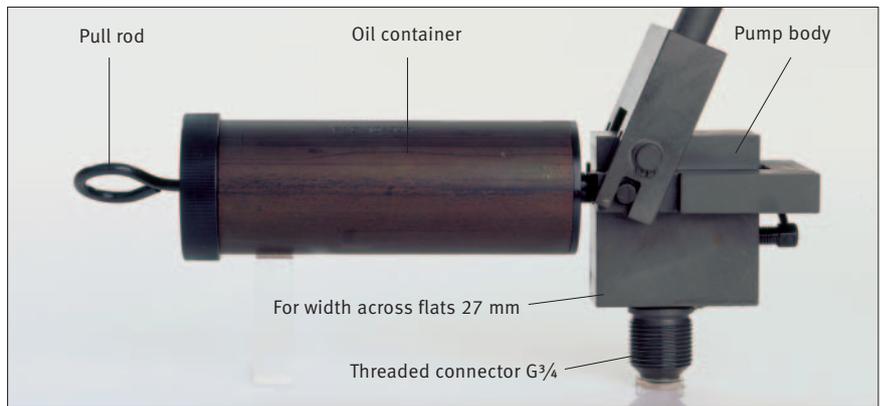
High pressure pump · High pressure pump sets

FAG high pressure pump PUMP4000-0,2L

The high pressure pump is suitable for mounting and dismounting of rolling bearings for shaft diameters up to 250 mm. Since it generates pressures of up to 4 000 bar, the pump can be used to expand heavy shaft couplings and gears by the hydraulic method. The pump is connected directly or via thick-walled adapters.

The high pressure pump can also be connected via a pump holder (with or without a manometer) and a 2 m long flexible high pressure hose (maximum permissible oil pressure 2 500 bar). The pump must always be operated with a manometer.

For detailed information, see TPI WL 80-50.



FAG high pressure pump PUMP4000-0,2L

High pressure pump	Connector	Oil container volume	Flow rate	Max. oil pressure	Mass
Ordering designation		l	cm ³ /stroke	bar	≈ kg
PUMP4000-0,2L	G ³ / ₄	0,2	0,3	4 000	3,8
comprising					
PUMP4000-0,2L.BODY (pump body)					
PUMP4000-0,2L.TANK (oil container)					

FAG high pressure pump sets

In order to make it easier to select the right device, we supply complete sets in storage cases:



FAG high pressure pump set PUMP2500-0,2L-KIT

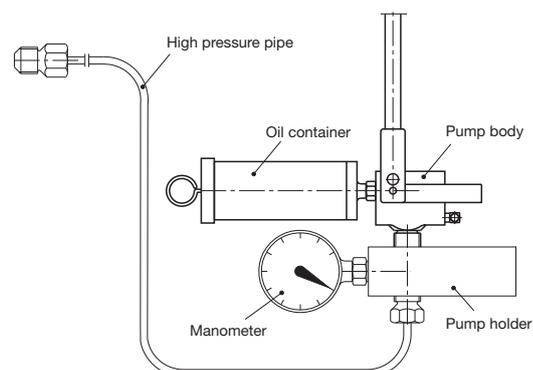
For detailed information, see TPI WL 80-50.

FAG high pressure pump set PUMP2500-0,2L-KIT with manometer up to 2 500 bar

Included in delivery:

- | | |
|------------------------------------|----------------------|
| 1 high pressure pump PUMP4000-0,2L | 1 manometer |
| 1 pump holder | 1 high pressure pipe |
| 3 reduction nipples | 1 storage case |

Ordering designation for set: **PUMP2500-0,2L-KIT**



Products · Mounting

Hydraulic mounting and dismantling

Hydraulic units

Compressed air driven FAG hydraulic unit

The compressed air driven FAG hydraulic unit AGGREG-P1000-1/P2500-2 is mobile and comprises a 13 litre oil container made from light metal and two pumps (1000 bar and 2500 bar).

We can supply designs for other operating pressures by agreement. The pump (2500 bar) has two separately controllable outputs and is suitable as a pressure device for expanding shaft couplings and gears by the hydraulic method. The pump (1000 bar) can drive a hydraulic nut at the same time. The pump is suitable for press fits with contact pressures up to 100 N/mm².

Compressed air driven FAG hydraulic unit

Hydraulic unit	Oil container volume	Max. oil pressure	Mass ≈
Ordering designation	l	bar	kg
AGGREG-P1000-1/P2500-2	13	1000 or 2500	40 (without oil)

Included in delivery:
Base device, ready-to-use,
incl. 1 manometer 0 to 1000 bar,
1 manometer 0 to 2500 bar,
3 high pressure hoses 2500 bar, 2 m

Electrically driven FAG hydraulic unit

These units are suitable for driving large hydraulic nuts and mounting of large press fits such as ship shaft couplings, ships' propellers and gears (contact pressure up to 50 N/mm²).

Electrical connection:
plug, voltage 400 V at 50 Hz.
Other voltages and frequencies by agreement.

Included in delivery:
Base device, ready-to-use,
incl. 1 manometer 0 to 1000 bar,
1 high pressure hose 1000 bar,
2 m, 1 pressure control valve

Electrically driven FAG hydraulic unit

Hydraulic unit	Oil container volume (suction quantity)	Oil volume flow	Max. oil pressure	Motor rating	Mass ≈
Ordering designation	l	l/min	bar	kW	kg
AGGREG-E700	10	0,9	700	1,1	40 (with oil)

Products · Mounting Hydraulic mounting and dismounting

Hydraulic units

Mobile FAG hydraulic unit for batch mounting

The mobile hydraulic unit is suitable for the mounting and dismounting of TAROL units.

TAROL units (Tapered Roller Bearing) are used for the bearing arrangements of wheelsets on rail vehicles such as freight wagons and passenger carriages. They can be quickly and easily fitted: the bearing is pressed onto the shaft journal in a single operation and secured by means of additional parts and screws.

The mobile unit has a valve-controlled, double direction pressure cylinder (pressure force 700 kN, stroke 215 mm) driven by a motor pump. The height position of the cylinder can be varied between 290 and 690 mm by means of a lifting cylinder and rocker. Accessories such as guide bushes, mounting sleeves, traction and pressure spindles and drawing frames must be ordered according to the individual application. When making enquiries or placing orders, information on the bearing type and power connection as well

as installation drawings (shaft, housing, additional parts) are required.

This unit is predominantly used for the mounting and dismounting of FAG wheelset bearings TAROL (see also TPI WL 80-50).

Ordering designation:
TOOL-RAILWAY-AGGREGATE



Products · Mounting

Hydraulic mounting and dismounting

Connectors, accessories

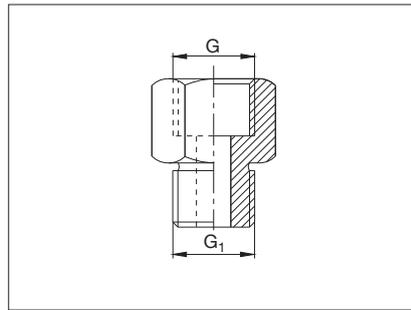
FAG adapters and reduction nipples

Adapters and reduction nipples are matched to the threads of high pressure hoses and pressure pipes. Adapters and reduction nipples of type A (with sealing ring) are suitable for oil pressures up to 800 bar.

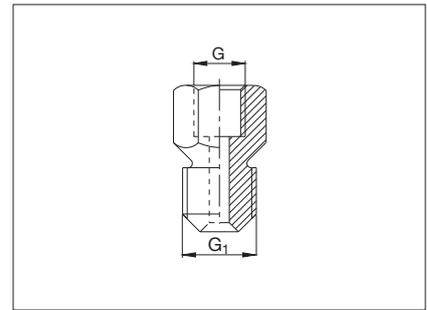
Type B (with blade sealing) is suitable for oil pressures up to 2 500 bar.

Other adapters and reduction nipples can be supplied by agreement.

For detailed information, see TPI WL 80-50.



Type A (with sealing ring)



Type B (with blade sealing)



Reduction nipple

Reduction nipple $G > G_1 / G < G_1$
Ordering designation

PUMP.NIPPLE-A-G¹/₄-G¹/₈

PUMP.NIPPLE-B-G¹/₄-G¹/₈

PUMP.NIPPLE-A-G¹/₄-G¹/₂

PUMP.NIPPLE-B-G¹/₄-G¹/₂

PUMP.NIPPLE-A-G¹/₄-G³/₄

PUMP.NIPPLE-B-G¹/₄-G³/₄

PUMP.NIPPLE-A-G¹/₄-M14

PUMP.NIPPLE-B-G¹/₄-M14

PUMP.NIPPLE-A-G¹/₄-M18X1,5

PUMP.NIPPLE-A-G³/₈-G¹/₄

PUMP.NIPPLE-B-G³/₈-G¹/₄

PUMP.NIPPLE-A-G³/₄-G¹/₈

PUMP.NIPPLE-B-G³/₄-G¹/₈

PUMP.NIPPLE-A-G³/₄-G¹/₄

PUMP.NIPPLE-B-G³/₄-G¹/₄

Reduction nipple

Reduction nipple $G > G_1 / G < G_1$
Ordering designation

PUMP.NIPPLE-A-G³/₄-G³/₈

PUMP.NIPPLE-B-G³/₄-G³/₈

PUMP.NIPPLE-A-M18X1,5-G¹/₄

PUMP.NIPPLE-A-M18X1,5-G³/₈

PUMP.NIPPLE-A-M18X1,5-G³/₄

Adapter

Adapter $G_1 = G$
Ordering designation

PUMP.ADAPTER-A-G¹/₄

PUMP.ADAPTER-B-G¹/₄

PUMP.ADAPTER-A-G³/₄

PUMP.ADAPTER-B-G³/₄

Products · Mounting

Hydraulic mounting and dismounting

Connectors, accessories

FAG pump holders

FAG pump holders		
Pump holder	Ordering designation	Mass ≈ kg
Without connector for manometer	PUMP.HOLDER-2	1,95
With connector G $\frac{1}{2}$ for manometer	PUMP.HOLDER.3	1,95



FAG manometers

When selecting a manometer, pay attention to the max. operating pressure.



FAG manometers				
Manometer	Threaded connector	Pressure display	Diameter ≈ mm	Mass ≈ kg
Ordering designation		bar		
PUMP1000.MANO-DIGI	G $\frac{1}{4}$	0–1 000	73	0,4
PUMP1000.MANO-G$\frac{1}{2}$	G $\frac{1}{2}$	0–1 000	100	0,8
PUMP1600.MANO-G$\frac{1}{2}$	G $\frac{1}{2}$	0–1 600	100	1,5
PUMP2500.MANO-G$\frac{1}{2}$	G $\frac{1}{2}$	0–2 500	100	1,7

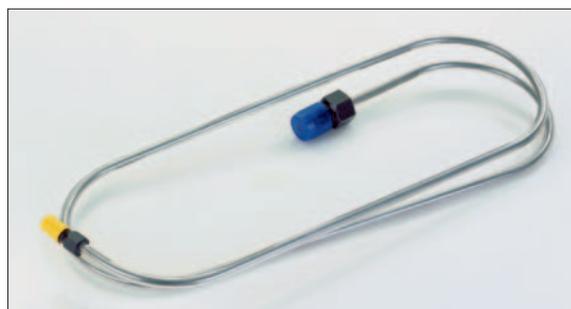
For detailed information, see TPI WL 80-50.

Products · Mounting

Hydraulic mounting and dismantling

Connectors, accessories

FAG high pressure pipes for high pressure pumps, sheathed in PVC hose (max. permissible pressure of 2 500 bar should be monitored by manometer)



FAG high pressure pipe

High pressure pipe	Connector	Mass ≈ kg
Ordering designation		
PUMP.PIPE-G ¹ / ₄	G ¹ / ₄	0,6
PUMP.PIPE-G ³ / ₈	G ³ / ₈	0,6
PUMP.PIPE-G ¹ / ₂	G ¹ / ₂	0,6
PUMP.PIPE-G ³ / ₄	G ³ / ₄	0,8

The connector for the pump holder is G³/₄.

For other connectors, a suitable reduction nipple must be used in addition.

For detailed information, see TPI WL 80-50.

FAG sleeve connectors for adapter and extraction sleeves
(up to 800 bar)

(special lengths available by agreement)



FAG sleeve connectors

Connector	Threaded connector	Mass ≈ kg
Ordering designation		
PUMP.SLEEVE-CONNECTOR-M6	M6	0,22
PUMP.SLEEVE-CONNECTOR-M8	M8	0,245
PUMP.SLEEVE-CONNECTOR-G ¹ / ₈	G ¹ / ₈	0,285
PUMP.SLEEVE-CONNECTOR-G ¹ / ₄	G ¹ / ₄	0,42

The connector for the hand pump set is G¹/₄.

For detailed information, see TPI WL 80-50.

Products · Mounting

Thermal mounting and dismounting

Electric heating plates · Induction heating devices

Electric FAG heating plate HEATER-PLATE

The temperature-controlled FAG heating plate HEATER-PLATE can be used to heat rolling bearings (up to a maximum of +120 °C) or small machine components up to 5 kg mass.

The removable housing cover protects the workpieces from contaminants and ensures uniform and rapid heating.

This inexpensive device is maintenance-free and easy to handle.

Dimensions (W×D×H):
390×270×156 mm
Plate size 380×180 mm
Power: max. 1 500 W
at 230 V/50 Hz
Temperature control:
continuously variable
from +50 °C to +200 °C
Mass: 5,6 kg

Ordering designation:
HEATER-PLATE

Ordering designation for version
with 115 V/60 Hz:
HEATER-PLATE-115V



FAG heating plate HEATER-PLATE

Electric FAG heating plate HEATER-PLATE-370C

The HEATER-PLATE-370C is used principally for heating the FAG aluminium heating rings HEATING-RING (see page 34). It can also be used for the heating of rolling bearings.

Heating rings are suitable for dismantling the inner rings of cylindrical roller and needle roller bearings without ribs and inner rings with one rib. The heating rings are heated to a temperature of +200 °C to +300 °C.

The outside diameter of the workpieces can be up to max. 350 mm, the mass can be up to 20 kg.

Dimensions (W×D×H):
360×360×170 mm
Plate size 350×350 mm
Power: max. 2 200 W
at 230 V/50 Hz
Power control: 0 to 100 %
Temperature control:
continuously variable from
+100 °C to +370 °C

Mass: approx. 13 kg
Ordering designation:
HEATER-PLATE-370C

Ordering designation for version
with 115 V/60 Hz:

By agreement



FAG heating plate HEATER-PLATE-370C

Induction FAG heating devices

Many rolling bearings and other rotationally symmetrical parts made from steel have tight fits on the shaft. In particular, larger parts can be mounted more easily if they are heated first.

Rapid and clean induction heating is superior to the conventional methods. It is therefore particularly suitable for batch mounting. Heating is carried out on complete bearings, rings for cylindrical roller or needle roller bearings and rotationally symmetrical steel parts such as labyrinth rings, roll couplings, tyres etc.

Advantages

- Rapid, energy-efficient operation
- Suitable for rolling bearings and other ring-shaped steel parts
- Very safe operation
- Environmentally friendly, oil-free (no disposal required)
- Uniform, controlled heating
- Easy to use
- Automatic demagnetisation
- High cost-effectiveness through selection of the most suitable size of device for the particular application

• Suitable for batch mounting
For the mounting of workpieces up to 300 kg mass, we supply five table-top heating devices PowerTherm HEATER10 to 300 suitable for mobile and/or stationary use.

For workpieces up to 3 000 kg mass, we recommend the particularly heavy duty standalone devices HEATER600, HEATER1200 and HEATER3000.

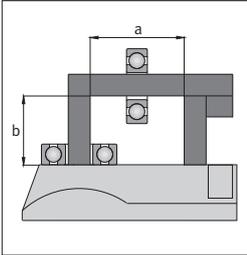
For detailed information, see TPI WL 80-54.

Products · Mounting

Thermal mounting and dismounting

Induction heating devices

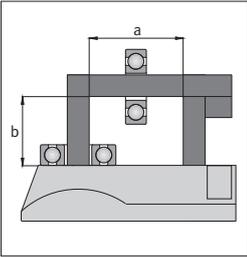
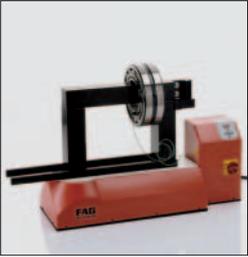
Overview of induction heating devices

Heating device	HEATER10	HEATER20	HEATER35	HEATER150
				
Power consumption max.¹⁾	2,3 kVA	3,6 kVA	3,6 kVA	12,8 kVA
Voltage/frequency²⁾	230 V/50 Hz	230 V/50 Hz	230 V/50 Hz	400 V/50 Hz
Current	10 A	16 A	16 A	32 A
Mass	7 kg	17 kg	31 kg	51 kg
Length	230 mm	345 mm	420 mm	505 mm
Width	200 mm	200 mm	260 mm	260 mm
Height	240 mm	240 mm	365 mm	440 mm
Dimension a	65 mm	120 mm	180 mm	210 mm
Dimension b	95 mm	100 mm	160 mm	210 mm
Ledges (incl.) For workpieces of min. bore	20/45/65 mm (graduated supports)	20 mm 35 mm 60 mm	70 mm	100 mm
Ledges (accessories) For workpieces of min. bore	10 mm 15 mm	10 mm 15 mm 45 mm	15 mm 20 mm 35 mm 45 mm 60 mm	20 mm 30 mm 45 mm 60 mm 70 mm 85 mm

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

²⁾ Upon request, we can also supply heating devices with other rated voltages and frequencies as well as higher power ratings.

Overview of induction heating devices

Heating device	HEATER300 ³⁾	HEATER600	HEATER1200	HEATER3000
				
Power consumption max.¹⁾	12,8 kVA	25 kVA	40 kVA	100 kVA
Voltage/frequency²⁾	400 V/50 Hz	400 V/50 Hz	400 V/50 Hz	400 V/50 Hz
Current	32 A	63 A	100 A	250 A
Mass	75 kg (+25 kg) ³⁾	350 kg	850 kg	1 800 kg
Length	870 mm	1 100 mm	1 500 mm	2 500 mm
Width	300 mm	850 mm	1 100 mm	1 500 mm
Height	580 mm (900 mm) ³⁾	1 250 mm	1 400 mm	1 800 mm
Dimension a	330 mm	430 mm	700 mm	700 mm
Dimension b	260 mm	400 mm	450 mm	800 mm
Ledges (incl.) For workpieces of min. bore	115 mm	145 mm	215 mm	285 mm
Ledges (accessories) For workpieces of min. bore	30 mm 45 mm 60 mm 70 mm 85 mm 100 mm	45 mm 60 mm 70 mm 85 mm 100 mm 115 mm 130 mm	85 mm 115 mm 145 mm	145 mm 215 mm

³⁾ Convertible to a mobile version by adding HEATER300.TROLLEY.

Products · Mounting

Thermal mounting and dismantling

Heating rings · Heat conducting paste

FAG heating rings

Heating rings are suitable for dismantling the inner rings of cylindrical roller and needle roller bearings without ribs and inner rings with one rib. Heating rings are particularly advantageous for the occasional extraction of small and medium-sized bearing rings (bore diameter 50 to 200 mm). Depending on the size of the ring, heating takes between 5 and 30 seconds.

The heating rings are made from light metal. They have a radial slot. They are easy to handle due to the heat-insulated handles.

Heating rings are heated to between +200 °C and +300 °C by means of an electric heating plate. The cylindrical outside surface of the bearing inner ring must be coated with a silicone-free heat conducting paste (HEATING-RING.PASTE). This gives optimum heat transfer. The heating ring is then slid over the inner ring to be extracted.

The bearing ring must be removed from the heating ring immediately after extraction in order to prevent overheating.

Each bearing size requires a specific heating ring. By agreement, we can supply these heating rings made from a special aluminium alloy.

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

1. Bearing designation or ring dimensions,
2. Drawing of mounting position including information on fits.
3. Approximate number of parts to be extracted per day

Recommended FAG accessories

- Electric heating plate for temperatures up to +370 °C
HEATER-PLATE-370C
- Temperature gauge
TEMP-CHECK-CONTACT
(see page 61)
- Gloves **GLOVE2**
- Heat conducting paste (see below)
HEATING.RING.PASTE-20ML
(20 ml included in delivery)

Ordering examples for heating rings

HEATING-RING-320E

(for the inner ring of a cylindrical roller bearing NU320-E, NJ320-E etc.)

HEATING-RING-2317E

(for the inner ring of a cylindrical roller bearing NU2317-E, NJ2317-E etc.)

For detailed information, see publication TPI 180.



FAG heat conducting paste HEATING-RING.PASTE

The silicone-free heat conducting paste HEATING.RING.PASTE is used as an aid in the dismantling 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 extraction in order to achieve optimum heat transfer from the heating ring to the bearing inner ring.

Ordering designation (expandable syringe containing 20 ml silicone-free heat conducting paste):

HEATING-RING.PASTE-20ML

For detailed information, see publication TPI 180.



Products · Mounting

Thermal mounting and dismounting

Electric induction heating devices

Electric induction heating devices

Electric induction heating devices are suitable for the dismounting of inner rings on medium-sized and large cylindrical roller and needle roller bearings (bore diameter 90 mm and larger). They can also be used to heat labyrinth rings, couplings, ring rolls and other rotationally symmetrical parts.

Low voltage heating devices

This design comprises an induction coil and a transformer.

The coil runs on non-hazardous low voltage and is water-cooled. This allows continuous heating, which is particularly suitable for batch mounting. Due to the lightweight construction, these devices are easy to handle. Each bearing size requires a specific coil.

The coil is connected to a mobile transformer that can be designed for any mains voltage. The voltage for the coil is adjustable between 20 V and 40 V.

We supply transformers for the induction coils in six different power steps.

The largest transformer and the corresponding coil can be used to heat inner rings up to a maximum mass of 1 200 kg to the required dismounting temperature of +80 °C...+120 °C (maximum mass of 600 kg for couplings).

Ordering example for bearing inner rings 120×150×144 mm:

COIL152X145-LOW (coil)

COIL.TRAFO-45KVA-400V-50HZ

(transformer)



Low voltage heating device with transformer for dismounting of the inner rings of cylindrical roller bearings

Mains voltage heating devices

In addition to coils for low voltage, FAG also supplies coils for mains voltage (with a switch box or foot switch). This economical alternative without water cooling is used for sporadic dismounting (where batch dismounting is not required).

Ordering examples:

COIL150X100-MAIN-L

(mains voltage coil for labyrinth rings)

COIL.SWITCH-PEDAL-50KVA-400V-50HZ

(foot switch for mains voltage device)

COIL.SWITCH-CABINET-80KVA-400V-50HZ

(switch box for mains voltage device)



Mains voltage heating device with switch box for dismounting of the inner rings of cylindrical roller bearings

Information required for quotation

FAG induction heating devices are always produced in single-item production.

For detailed information and a guide to the information required in order to prepare a quotation, see TPI 180.

Products · Mounting Measurement and inspection

Feeler gauges

FAG feeler gauges FEELER-GAUGE-100 and FEELER-GAUGE-300

Feeler gauges are used to measure the radial internal clearance, especially in mounting on tapered shaft seats and on adapter and extraction sleeves.

FAG feeler gauges FEELER-GAUGE-100 and FEELER-GAUGE-300

Ordering 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	0,10	0,18
		0,06	0,12	0,20
		0,07		
FEELER-GAUGE-300	300	0,03	0,12	0,20
		0,04	0,13	0,25
		0,05	0,14	0,30
		0,06	0,15	0,35
		0,07	0,16	0,40
		0,08	0,17	0,45
		0,09	0,18	0,50
		0,10	0,19	



FAG feeler gauges FEELER-GAUGE-100 and FEELER-GAUGE-300

Products · Mounting Measurement and inspection

Taper gauges

Taper gauges

When a bearing with a tapered bore is seated directly on the shaft, the tapered bearing seat must be precisely machined so that the fit surfaces match exactly.

We supply various gauges for measuring the taper. Most bearings with a tapered bore have a taper 1:12. Only spherical roller bearings of series 240 and 241 have a taper 1:30.

FAG taper ring gauge

The simplest means of measuring tapered shaft seats on small bearings is the taper ring gauge. By application of inking material, it can be determined whether the shaft and ring gauge match; corrections are made until the ring gauge is in contact over its whole width. The inner rings of the bearings are not suitable as ring gauges because their walls are too thin and could be damaged.

We supply taper ring gauges for taper diameters from 30 to 240 mm.

Ordering designation (example):

KLR20

Taper ring gauge for bearings of 100 mm bore, e.g. for double row cylindrical roller bearings NN3020-AS-K or NNU4920-S-K.

FAG taper ring gauge

Taper ring gauge	Taper diameter mm
Ordering designation	
KLR06...KLR48	30...240



FAG taper gauge MGK 133

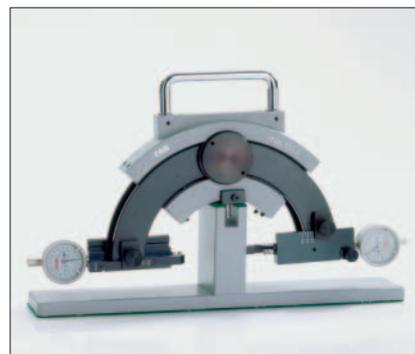
for external tapers 1:12 and 1:30 and 27 to 205 mm taper diameter.

The taper gauge MGK 133 rests on the taper with four hardened and polished support pins. The position of the gauge on the taper is defined by these pins and one stop. The stop can be attached to either the front or back of the gauge. The gauge contains two movable measuring brackets, one of which is in contact with the smaller taper diameter while the other, at a fixed

distance, is in contact with the larger taper diameter.

The deviation of the taper diameter from the nominal value is displayed in both measurement planes by a precision indicator.

The reproducibility of the measurement results is less than 1 µm. The gauge is set using a reference taper (available by agreement).



FAG taper gauge MGK 133

Products · Mounting Measurement and inspection

Taper gauges · Snap gauge

FAG taper gauge MGK 132
for external tapers with 0° to 6°
taper angle and 90 to 510 mm
taper diameter.

With the taper gauge MGK 132, the
reproducibility of the measurement
results is within 1 µm.
The MGK132 rests on the workpiece
with four hardened, ground and
lapped ledges. The ledges form an
angle of 90°. A stop on the front or
rear precisely defines the position
of the gauge on the taper.

Between the support ledges,
the measurement slide runs on
preloaded roller bearings. A dial
gauge fixed in the housing acts
against the measurement slide and
indicates the deviation of the taper
diameter from the nominal value.
A precision indicator is fixed to the
measurement slide. Its blade-shaped
tip is in contact with the workpiece
and measures the deviation of the
taper from the nominal value.
The gauge is set using a reference
taper (available by agreement).



FAG taper gauge MGK 132

FAG snap gauge SNAP-GAUGE-.../...
for inspecting the diameter of
cylindrical shafts and workpieces of
all types, directly on the machine
tool and for setting the enveloping
circle gauge MGI 21 (see page 39).

The actual dimension of the
workpiece can be determined
precisely.

The snap gauge functions as a
comparator gauge. Its setting is
checked using shims. We supply
the shims required for each
diameter.

Available snap gauges

Ordering designation	Measurement range mm
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

Ordering example
for shaft diameter 120 mm:
SNAP-GAUGE-100/150
(snap gauge)
SNAP-GAUGE.MASTER120
(shim)



FAG snap gauge

Products · Mounting Measurement and inspection

Enveloping circle gauges

FAG enveloping circle gauge MGI 21 for setting the radial internal clearance of cylindrical roller bearings NNU4920-K to NNU4948-K and NNU4920 to NNU4948.

Bearings of bore diameter 100 to 240 mm have removable inner rings.

In the FAG enveloping circle gauge MGI 21, the internal enveloping circle of the roller and cage assembly is measured by two hardened and precision ground surfaces, one of which is movable.

After mounting of the outer ring, the gauge is set to the internal enveloping circle of the roller and

cage assembly. This dimension is measured using a snap gauge, for example the SNAP-GAUGE.../... (see page 38).

It is then possible to set the inner ring to the diameter that gives the required radial internal clearance. Bearings with a tapered bore are slid onto the tapered seat of the shaft.

For bearings with a cylindrical bore, preground inner rings are used (suffix F12) and finish ground to the required raceway diameter.

Ordering example for NNU4920:
MGI21-4920



FAG enveloping circle gauge MGI 21 for setting the radial internal clearance or preload of cylindrical roller bearings with removable inner ring

FAG enveloping circle gauge MGA 31 for setting the radial internal clearance of cylindrical roller bearings NN3006-K to NN3048-K and N1006-K to N1048-K.

Bearings with a tapered bore have removable outer rings.

The gauge is used to precisely set the radial internal clearance or preload of cylindrical roller bearings.

The raceway diameter of the mounted outer ring is measured using a conventional internal gauge. This dimension is transferred

to the two hardened and precision ground measuring surfaces of the enveloping circle gauge.

The tapered shaft with the premounted inner ring and roller and cage assembly can then be inserted in the gauge. The shaft is moved axially by the hydraulic method until the precision indicator of the enveloping circle gauge shows the required radial internal clearance or preload.

Ordering example for NN3006-K:
MGA31-3006



FAG enveloping circle gauge MGA 31 for setting the radial internal clearance of cylindrical roller bearings with removable outer ring

Products · Mounting Accessories

Transport and mounting tool

FAG transport and mounting tool

BEARING.MATE is an accessory for the secure, rapid and easy handling of medium-sized and large rolling bearings. It can also be used where bearings are heated prior to mounting.

The tool comprises two handles and two steel strips. Turning the handles clamps the steel strips firmly on the outer ring of the rolling bearing. The compact packaging also includes two brackets. These are used on spherical roller bearings and self-aligning ball bearings in order to prevent tilting of the inner rings. The tool and bearing is carried either by two people or a crane. If two carrying slings are used, the rolling bearing can be rotated to any position when transported by crane. During heating on an induction heating device, the tool remains mounted on the bearing. The steel strips expand uniformly with the bearing. Optimum tension is thus maintained. The three sizes of tool are matched to different bearing outside diameters, see table below.



Accessories

Long brackets to prevent tilting of self-aligning bearing inner rings (2 pieces)

Ordering designation:

BEARING-MATE.LOCKBAR270

Carrying sling, 1 m long (2 pieces)

BEARING-MATE.SLING-1M

Spare parts

Short brackets to prevent tilting of self-aligning bearing inner rings (2 pieces)

Ordering designation:

BEARING-MATE.LOCKBAR170

Pack of spare parts

BEARING-MATE.SERVICE-KIT

FAG transport and mounting tool					
Ordering designation Transport and mounting tool	Bearing outside diameter		Bearing mass max. kg	Operating temperature max. °C	Tool mass kg
	min. mm	max.			
BEARING-MATE250-450	250	450	500	160	6,3
BEARING-MATE450-650	450	650	500	160	6,4
BEARING-MATE650-850	650	850	500	160	6,5

Products · Mounting Accessories

Gloves

Heat-resistant FAG gloves GLOVE1

Heat-resistant FAG gloves are particularly suitable for the handling of heated rolling bearings or other parts in mounting or dismounting. The outside comprises rugged polyester and can withstand temperatures up to 150 °C. The inside is made from comfortable cotton.

The principal characteristics are:

- Resistant up to +150 °C
- Lint-free
- Asbestos-free
- Comfortable
- Cut-resistant

Ordering designation:
GLOVE1



Heat-resistant and oil-resistant FAG gloves GLOVE2

Heat-resistant and oil-resistant FAG gloves are particularly suitable for the handling of heated and lubricated rolling bearings in mounting or dismounting.

Their principal characteristics derive from the multiple layer construction comprising different fibres.

The principal characteristics are:

- Resistant up to +250 °C
- Non-flammable
- Heat-resistant even when damp
- Authorised for protection against mechanical (DIN EN 388) and thermal (DIN EN 407) influences
- Cotton-free
- Cut-resistant

Ordering designation:
GLOVE2



Products · Mounting Accessories

Mounting paste · Anti-corrosion oil

FAG mounting paste

This mounting and multi-purpose paste has proven valuable particularly for the mounting of rolling bearings. It facilitates the sliding of bearing rings and prevents stick-slip, scoring, wear and fretting corrosion. It also gives good protection against corrosion. It is pale in colour and does not cause contamination.

The mounting paste is applied in a very thin layer so that the metallic sheen turns matt.

The paste can be used at temperatures between -30 °C and $+150\text{ °C}$. It is resistant to water, steam and many alkaline and acid agents.

Available in:
70 g tubes
250 g tubes
400 g cartridges
1 kg cans

Ordering designation:
ARCANOL-MOUNTINGPASTE-70G
ARCANOL-MOUNTINGPASTE-250G
ARCANOL-MOUNTINGPASTE-400G
ARCANOL-MOUNTINGPASTE-1KG



FAG anti-corrosion oil

The anti-corrosion oil is suitable particularly for unpacked rolling bearings. It can also be sprayed on bright metal surfaces of devices, machines and machine elements to give long term anti-corrosion protection when stored indoors. It is not generally necessary to wash anti-corrosion oil out of rolling bearings since it is neutral in behaviour towards all conventional rolling bearing greases and oils.

It can be easily and effectively removed using alkaline solvents and neutral cleaning agents.

Available in:
0,4 litre spray can with ozone-safe propellant CO_2

Ordering designation:
ARCANOL-ANTICORROSIONOIL-400G



Products • Lubrication

FAG
400



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Products · Lubrication Lubricants

Arcanol rolling bearing greases

Special rolling bearing greases such as Arcanol offer the best conditions for achieving reliable, durable and cost-effective bearing arrangements. For Arcanol gives you certainty, since Schaeffler Group carries out selection tests, provides quality assurance and gives practice-based lubrication recommendations. Bearings that fail prematurely due to incorrect grease selection, together with all the unpleasant and expensive consequences, are increasingly a thing of the past.

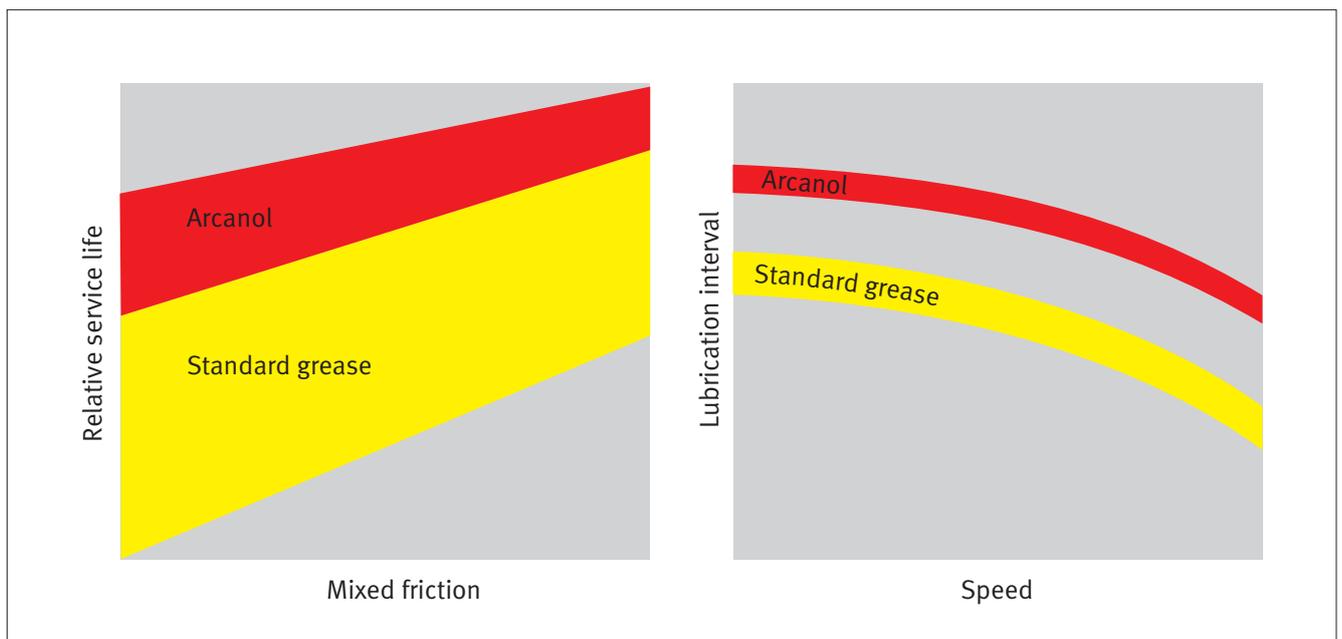
In co-operation with renowned lubricant manufacturers, we have for many years developed lubricating greases that are particularly suitable for rolling bearings. However, before a new grease is included in the Arcanol range, it must pass a series of stringent tests in the Schaeffler lubricant laboratory.

The greases are tested thoroughly. On our lubricant test rigs FE8 (DIN 51819) and FE9 (DIN 51821), the greases are tested in rolling bearings to find out how they improve service life and reduce friction and wear. Only the best greases are then selected to undergo the subsequent tests under simulated field conditions in far more complicated rolling bearing test rigs. If the results fulfil the stringent Schaeffler specifications, the greases are “honoured”. They receive the Arcanol seal of quality.

In addition, we test every single batch to ensure the uniform quality of the product. Only after this final test the approval can be given to designate the grease as Arcanol. The range is structured such that these greases give optimum coverage of almost all fields of application.

The overview on page 46 and page 47 shows chemical-physical data, fields of application and the conditions for which these greases are suitable. The selection of a suitable grease is considerably facilitated by the electronic INA/FAG rolling bearing catalogue *medias® professional*.

- **More than 80% of all rolling bearings are lubricated with grease**
- **Inadequate lubrication causes more than 40% of all cases of rolling bearing damage**
- **Users therefore need lubricants and recommendations relating to lubricants that they can rely on**
- **Arcanol rolling bearing greases ensure that a bearing can be used to its full performance capacity**
 - long service life
 - good running behaviour
 - high operational reliability



Products · Lubrication

Lubricants

Arcanol rolling bearing greases · Ordering examples

Arcanol rolling bearing greases · Ordering examples

Ordering example	Description
ARCANOL-MULTITOP-5KG	FAG rolling bearing grease Arcanol MULTITOP in 5 kg bucket
ARCANOL-MULTI2-20G	FAG rolling bearing grease Arcanol MULTI2 in 20 g tube (50 pieces)
ARCANOL-MULTI3-25KG	FAG rolling bearing grease Arcanol MULTI3 in 25 kg hobbock
ARCANOL-LOAD150-10KG	FAG rolling bearing grease Arcanol LOAD150 in 10 kg bucket
ARCANOL-LOAD220-180KG	FAG rolling bearing grease Arcanol LOAD220 in 180 kg drum
ARCANOL-LOAD400-400G	FAG rolling bearing grease Arcanol LOAD400 in 400 g cartridge (10 pieces)
ARCANOL-LOAD1000-5KG	FAG rolling bearing grease Arcanol LOAD1000 in 5 kg bucket
ARCANOL-TEMP90-1KG	FAG rolling bearing grease Arcanol TEMP90 in 1 kg can
ARCANOL-TEMP110-400G	FAG rolling bearing grease Arcanol TEMP110 in 400 g cartridge
ARCANOL-TEMP120-25KG	FAG rolling bearing grease Arcanol TEMP120 in 25 kg hobbock
ARCANOL-TEMP200-70G	FAG rolling bearing grease Arcanol TEMP200 in 70 g tube
ARCANOL-SPEED2,6-250G	FAG rolling bearing grease Arcanol SPEED2,6 in 250 g tube (10 pieces)
ARCANOL-VIB3-25KG	FAG rolling bearing grease Arcanol VIB3 in 25 kg hobbock
ARCANOL-BIO2-1KG	FAG rolling bearing grease Arcanol BIO2 in 1 kg can
ARCANOL-FOOD2-10KG	FAG rolling bearing grease Arcanol FOOD2 in 10 kg bucket

An overview of the available container sizes can be found at www.fis-services.com in the section Products/Lubrication.

Products · Lubrication Lubricants

Arcanol rolling bearing greases · Selection table

Overview of Arcanol rolling bearing greases							
	Arcanol MULTITOP	MULTI2	MULTI3	LOAD150	LOAD220	LOAD400	LOAD1000
Previous designation	(L135V)	(L78V)	(L71V)	(-)	(L215V)	(L186V)	(L223V)
Thickener	Lithium soap	Lithium soap	Lithium soap	Lithium complex	Mixed thickener	Mixed thickener	Mixed thickener
Base oil	Partially synthetic oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil	Mineral oil
Base oil viscosity at 40 °C [mm ² /s]	≥ ISO VG 68	≥ ISO VG 68	≥ ISO VG 68	≥ ISO VG 150	ISO VG 220	≥ 400	ISO VG 1000
Consistency (NLGI class)	2	2	3	2	1–2	2	2
Operating temperature [°C]	-40...+140	-30...+120	-30...+120	-20...+140	-20...+140	-20...+140	-20...+140
Long term limit temperature [°C]	+80	+75	+75	+90	+80	+80	+80
Characteristic areas of application	Universal grease for ball and roller bearings in rolling mills, construction machinery, automotive, spinning and grinding spindles with increased speeds, high load, low and high temperatures	Universal grease for ball bearings øD ≤ 62 mm in small electric motors, agricultural and construction machinery, household appliances	Universal grease for ball bearings øD > 62 mm in large electric motors, agricultural and construction machinery, fans	Special grease for ball, roller and needle roller bearings, linear guidance systems in machine tools with high load, wide speed range, swivel motion	Special grease for ball and roller bearings in rolling mill plant, rail vehicles with high load, wide speed range, high humidity	Special grease for ball and roller bearings in mining machinery, construction machinery, wind turbines with very high load, moderate temperature, moderate speed	Special grease for ball and roller bearings in mining machinery, construction machinery, mainly under shock load and large bearings with very high load, moderate temperature, low speed
Low temperatures	++	+	+	0	0	-	0
High temperatures	0	0	0	0	0	0	0
Low friction, high speed	+	0	0	-	-	-	--
High load, low speed	+	0	0	++	++	++	++
Vibrations	+	0	+	+	+	+	+
Support for seals	0	0	+	+	+	+	+
Relubrication facility	++	++	+	+	+	+	+
ISO VG =	++ highly suitable		0 suitable		- less suitable		
ISO viscosity group	+ very suitable					-- not suitable	

TEMP90	TEMP110	TEMP120	TEMP200	SPEED2,6	VIB3	BIO2	FOOD2
(L12V)	(L30V)	(L195V)	(L79V)	(L75V)	(L166V)	(-)	(-)
Mixed thickener	Lithium complex	Polycarbamide	PTFE	Polycarbamide	Lithium complex	Mixed thickener	Aluminium complex
Synthetic oil	Synthetic oil	Synthetic oil	Fluorinated polyether oil	Synthetic oil	Mineral oil	Synthetic oil	White oil
≥ ISO VG 100	≥ ISO VG 68	ISO VG 460	ISO VG 220-460	≥ ISO VG 22	≥ ISO VG 150	≥ ISO VG 68	≥ ISO VG 100
2	2-3	2	2	2-3	3	2	1-2
-30...+140	-40...+160	-30...+180	-30...+250	-30...+120	-30...+150	-30...+120	-30...+120
+90	+110	+120	+200	+80	+90	+80	+70
Special grease for ball and roller bearings	Special grease for ball and roller bearings	Special grease for ball and roller bearings	Special grease for ball and roller bearings	Special grease for ball bearings	Special grease for ball and roller bearings	Special grease for ball and roller bearings	Special grease for ball and roller bearings
in couplings, electric motors, automotive engineering	in electrical machinery, automotive engineering	in continuous casting plant	in track rollers in baking machinery, piston pins in compressors, kiln trucks, chemical plant	in machine tools, instrument engineering	in blade adjusters in wind turbine rotors, packaging machinery, rail vehicles	in environmentally harmful applications	in applications with food contact; H1 to USDA
with high temperature, high load	with high temperature, high speed	with high temperature, high load	with very high temperature, chemically aggressive environment	with very high speed, low temperature	with high temperature, high load, oscillating motion		
++	++	+	++	++	+	+	+
+	++	++	++	0	+	0	-
0	+	-	--	++	-	0	0
0	0	++	+	--	+	0	0
0	0	0	-	-	++	0	0
0	0	0	0	0	0	0	0
0	0	0	0	+	-	+	++

Products · Lubrication

Lubrication systems

Motion Guard · Motion Guard SELECT MANAGER

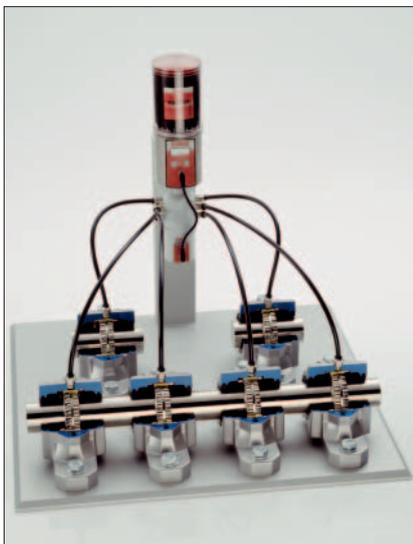
Automatic lubricators FAG Motion Guard

Reliable and economical lubrication for a long bearing life

Rolling bearings are reliable machine components that normally achieve a long operating life. The most frequent cause of failure is inadequate or incorrect lubrication. Approximately 90% of all bearings are lubricated with grease. Providing a reliable supply of suitable grease is therefore particularly important.

If an automatic lubricator is used for controlled relubrication, a sufficient quantity of fresh grease is continuously supplied to the contact points of the rolling bearing.

This results in a significant increase in bearing life. These reliable, economical devices give extended lubrication and maintenance intervals and also prevent under-supply or oversupply of grease.



Plant downtime and maintenance costs are reduced as a result.

The sparing and environmentally friendly use of lubricants contributes to higher cost-efficiency.

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

The single point lubrication systems FAG Motion Guard COMPACT and CHAMPION can be used to dispense respectively eight Arcanol greases and all the Arcanol greases described on pages 46 to 47. FAG Motion Guard CONCEPT6 is used as a single point or multi-point lubrication system with thirteen Arcanol greases.

Advantages of lubricators

- Individually configured, precise supply to each bearing position immediately after initial operation
- Fully automatic, maintenance-free operation
- Savings on personnel costs compared to manual relubrication
- Various dispensing times can be selected (1, 3, 6 or 12 months; for CONCEPT6: 1 day to 24 months)
- No risk of confusion or contamination of lubricants
- Pressure build-up to 4 bar (COMPACT), to 5 bar (CHAMPION) or to 25 bar (CONCEPT6), thus overcoming any obstructions
- Suitable for connection to the monitoring system FAG Easy Check
- Comprehensive range of accessories

FAG Motion Guard SELECT MANAGER

The software FAG Motion Guard SELECT MANAGER Version 2.0 allows:

- selection of lubricators
- definition of dispensing times and relubrication quantities
- selection of suitable/preferred Arcanol greases
- management of a lubrication and maintenance plan

Detailed information on FAG automatic lubricators is given in publication WL 80 346.

Products · Lubrication Lubrication systems

Motion Guard COMPACT · Lubricators and activation screws

Lubricators

FAG Motion Guard COMPACT

This automatic lubricator is driven by an electrochemical system. The electrolyte is environmentally friendly citric acid.

The metal housing is filled with 120 cm³ of FAG Arcanol rolling bearing grease.

The dispensing time is determined by the different coloured activation screws.

Automatic lubricators FAG Motion Guard COMPACT are available with suitable lubricants as standard in packs of 10 containers, except in the case of TEMP200.

Ordering examples:

ARCALUB-MULTITOP

(filled with MULTITOP, pack of 10 containers without activation screw)

ARCALUB-TEMP90

(filled with TEMP90, pack of 10 containers without activation screw)

COMPACT lubricators filled with suitable Arcanol lubricants are also available in single packs including activation screws, while those with TEMP200 are only supplied in single packs with activation screws.

Ordering examples:

ARCALUB-MULTITOP-1M

(filled with MULTITOP, including activation screw for 1 month)

ARCALUB-MULTI2-3M

(filled with MULTI2, including activation screw for 3 months)

ARCALUB-MULTITOP-6M

(filled with MULTITOP, including activation screw for 6 months)

ARCALUB-LOAD400-12M

(filled with LOAD400, including activation screw for 12 months)



ARCALUB-TEMP200-6M

Arcanol

Suitable Arcanol greases, chain oils and activation screws

1M 3M 6M 12M

MULTITOP	•	•	•	
MULTI2	•	•	•	
LOAD400	•	•	•	•
LOAD1000	•	•	•	•
TEMP90	•	•	•	•
TEMP120	•	•	•	•
TEMP200	•	•	•	•
FOOD2	•	•	•	•
CHAINOIL	•	•	•	•

Activation screws

Ordering designations (10 pieces):

ARCALUB.ACTIVE-1M

for 1 month (yellow)

ARCALUB.ACTIVE-3M

for 3 months (green)
(example of previous designation ARCA.LUB.ACTIVE.3M)

ARCALUB.ACTIVE-6M

for 6 months (red)

ARCALUB.ACTIVE-12M

for 12 months (grey)
(12M **cannot** be used for MULTITOP and MULTI2)



Products · Lubrication

Lubrication systems

Motion Guard COMPACT · Variants CLEAR and POLAR

Variant CLEAR

The variant CLEAR of the lubricator FAG Motion Guard COMPACT is suitable for explosion-protected and corrosion-inducing humidity areas. The lubricator can be used at operating temperatures from 0 °C to +40 °C. The upper temperature limit is determined by the transparent plastic housing with a volume of 100 cm³.

Ordering example:

ARCALUB-CLEAR-FOOD2

(filled with FOOD2, pack of 10 containers without activation screw)

In addition to FOOD2, seven other Arcanol grease grades as listed for COMPACT on page 49, as well as chain oil can be used.

The special activation screws for the variant CLEAR with dispensing times of 1, 3 or 6 months are offered separately.

Ordering designation (10 pieces):

ARCALUB.ACTIVE-CLEAR-1M

ARCALUB.ACTIVE-CLEAR-3M

ARCALUB.ACTIVE-CLEAR-6M



Variant POLAR

The variant POLAR of the lubricator FAG Motion Guard COMPACT is designed for operation in temperatures from -25 °C to +10 °C.

The metal housing is filled with 120 cm³ of Arcanol rolling bearing grease MULTITOP (it is only available with this grease).

Ordering designation:

ARCALUB-POLAR-MULTITOP

(filled with MULTITOP, pack of 10 containers without activation screw)

For the dispensing time as a function of the actual temperature present, see the following table.

Variant POLAR

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

The black activation screw must be ordered separately.

Ordering designation (10 pieces):

ARCALUB.ACTIVE-POLAR



Products · Lubrication Lubrication systems

Motion Guard CHAMPION · Lubricator drives, LC units, sets and accessories

Lubricators

FAG Motion Guard CHAMPION

The automatic lubricator FAG Motion Guard CHAMPION is driven by an electromechanical system.

The robust, electronically controlled geared motor can be used more than once. It allows the dispensing times to be adjusted depending on the temperature and variably to 1, 3, 6 or 12 months. It is battery powered and the battery set is replaced whenever the cartridge is changed.

Ordering designation:

ARCALUB.DRIVE

Special drive units are optionally available for machine-controlled operation.

The lubricator FAG Motion Guard CHAMPION is suitable for all the Arcanol rolling bearing greases described on page 46 and page 47 as well as chain oil. Filled LC (Lubricant Cartridge) units with a dispensing volume of 60 cm³, 120 cm³ and 250 cm³ are available and are screwed onto the drive unit. Once the LC unit is empty, it cannot be refilled.

Ordering examples

(one battery set is included in the delivery):

ARCALUB.LC60-MULTITOP

(filled with MULTITOP, 60 cm³)

ARCALUB.LC120-LOAD400

(filled with LOAD400, 120 cm³)

ARCALUB.LC250-VIB3

(filled with VIB3, 250 cm³)



The complete lubricator, comprising a drive unit, LC unit and battery set, is connected to the lubrication point by means of an adapter or hose.

Ordering designations:

ARCALUB.ADAPTER

ARCALUB.TUBE

(3 m hose with connectors)



Lubricator sets

FAG Motion Guard CHAMPION

The automatic lubricator Motion Guard CHAMPION is filled with Arcanol MULTITOP and is available in sizes 120 cm³ and 250 cm³ as a complete lubricator set.

The sets comprise:

- a drive unit
- an adapter
- an LC unit with battery set

Ordering designations:

ARCALUB.LC120-MULTITOP-KIT

ARCALUB.LC250-MULTITOP-KIT

The lubricator CHAMPION has only been tested in conjunction with Arcanol lubricants.

By agreement, we can also supply the lubricator CHAMPION with special fillings.

Accessories for

FAG Motion Guard COMPACT and CHAMPION

The FAG Motion Guard product range is supplemented by a comprehensive range of accessories. For detailed information, see publication WL 80 346.

Products · Lubrication Lubrication systems

Motion Guard CONCEPT6

Lubrication system FAG Motion Guard CONCEPT6

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

Starter kits FAG Motion Guard CONCEPT6

The starter kits are premounted on a retaining plate and form the basis for the multi-point lubrication system FAG Motion Guard CONCEPT6.



The patented distribution system MP-6 allows independent supply of between two and six lubrication points.

The geared motor in the MP-6 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.

Ordering designations:
ARCALUB-C6-250-KIT
ARCALUB-C6-500-KIT

Only the following must be ordered specially: hose and connectors for the lubrication point and LC units in sizes 250 cm³ and 500 cm³.

LC units are available with the 13 suitable Arcanol grease grades (see page 46 and page 47, except for MULTI3 and VIB3).

Ordering examples:
ARCALUB-C6.LC250-MULTITOP
ARCALUB-C6.LC250-LOAD400
ARCALUB-C6.LC500-SPEED2,6
ARCALUB-C6.LC500-TEMP200

By agreement, we supply LC units with other greases whose suitability has been checked.

Variant CONTROL

The variant CONTROL of the lubricator CONCEPT6 is controlled by the machine, i.e. lubricant is only dispensed while the machine is running. We also supply starter kits for the variant CONTROL as a basis for multi-point lubrication systems.

Ordering designation:
ARCALUB-C6-CONTROL-250-KIT
ARCALUB-C6-CONTROL-500-KIT



For **single point lubrication**, the parts required are ordered individually from the range of accessories.



For detailed information, see publication WL 80 346.

Products · Lubrication Lubrication systems

Grease metering devices · Drum pumps · Grease metering pistols

FAG grease metering devices

These devices are used for the metered greasing of rolling bearings. The metering range is between 10 cm³ and 133 cm³. Larger metering ranges can also be achieved by operating the devices several times.

By means of a pneumatically driven, double direction piston pump, the medium is delivered directly from the grease container (25 kg or 180 kg) via the metering valve to the application point.

The grease metering device comprises:

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

Technical data:

Pump ratio: 10 : 1
 Delivery quantity: 400 cm³/min
 Metering range: 10–133 cm³

Ordering designations:

ARCA-PUMP-25
ARCA-PUMP-180



ARCA-PUMP-180

FAG drum pumps

FAG drum pumps are suitable for use as compressed air-driven pumps 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. The ratio of 70:1 ensures high delivery rates at conventional industrial pressures (6 bar) from compressed air supply equipment.

Drum pumps are available for drums in sizes of

- 15–25 kg
- 50 kg
- 180 kg

Technical data:

Pressure ratio 70:1
 Air consumption 150 l/min
 Delivery rate 1100 g/min (at 6 bar)

Accessories:

Drum cover (dust cover)
 Plate
 High-pressure delivery hoses
 Metering pistols

Ordering designation:

ARCA-PUMP-BARREL-25-S
ARCA-PUMP-BARREL-50-S
ARCA-PUMP-BARREL-180-S



FAG grease metering pistols

FAG grease metering pistols with 4 digit digital counter
 Display in grams

Adjustable to various specific masses

Ordering designation:

ARCA-PUMP-BARREL.GUN-METER



Products · Lubrication Lubrication systems

Grease gun

FAG grease gun with reinforced hose

In difficult operating conditions or aggressive environments, rolling bearings must be frequently relubricated via lubrication nipples. With the FAG grease gun and the matching reinforced hose, this operation can be carried out easily, cleanly and quickly. The parts comply with DIN 1283.



ARCA-GREASE-GUN with
ARCA-GREASE-GUN.HOSE and
ARCA-GREASE-GUN.HOOK-ON-HOSE

FAG grease gun

Container diameter 56 mm
Total length of gun 390 mm
Delivery quantity 2 cm³/stroke
Pressure max. 800 bar

The gun can either be filled with bulk grease or fitted with a cartridge to DIN 1284.

- 500 cm³ container volume with bulk grease or
- 400 g cartridge to DIN 1284 (diameter 53,5 mm, length 235 mm)

Connector thread G $\frac{1}{8}$
Mass approx. 1,5 kg

Ordering designation:
ARCA.GREASE-GUN

Reinforced hose

Length 300 mm
Threaded connector G $\frac{1}{8}$
Fitted with hydraulic grip coupling for tapered lubrication nipple to DIN 71412

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

Ordering designation:
ARCA-GREASE-GUN.HOSE

A hose with a connector for cylindrical nipples to DIN 3404 is optionally available.

Ordering designation:
ARCA-GREASE-GUN.HOOK-ON-HOSE

Products · Condition monitoring



Alignment 56

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Products · Condition monitoring Alignment

Belt pulley alignment device

Belt pulley alignment device FAG Top-Laser SMARTY2

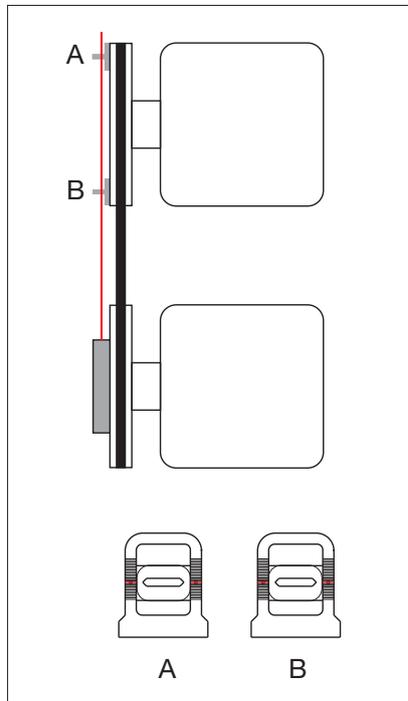
The FAG Top-Laser SMARTY2 is an economical measuring device for the alignment of belt pulleys and chain sprockets.

Through the use of this device, the wear of belt drives, bearings and seals is reduced. Less vibration is generated and the running time and reliability of the machinery is increased.

Features and advantages:

- Parallelism and misalignment of both pulleys displayed
- Significantly quicker and more precise than conventional methods
- Suitable for both horizontally and vertically mounted machinery
- Only one person required for alignment
- Also suitable for non-magnetic sprockets or pulleys

The measuring device can be mounted in just a few seconds. The laser beam can be clearly seen on the target marks. Once the laser beam is adjusted to coincide with the slots in the target marks, the machine is correctly aligned. The target marks are available in



optical and digital form. In the case of the digital target mark, adjustment values are shown in the display in real time. Misalignments are presented in degrees and the parallelism offset in mm. Since the measuring instrument is so light, the emitter and target marks can be easily attached to non-magnetic drive pulleys using a strong, double-sided adhesive tape.

Ordering designation and scope of delivery:

Complete laser measuring device incl.

2 optical target marks,
2 batteries and user manual in padded case:

LASER-SMARTY2

Replacement part:

1 optical magnetic target mark
LASER-SMARTY2.TARGET

Accessories:

1 digital magnetic target mark
LASER-SMARTY2.TARGET-DIGITAL

For detailed information, see publication TPI 182.



Products · Condition monitoring Alignment

Belt tension measuring device

Belt tension measuring device FAG Top-Laser TRUMMY2

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

Optimum belt tension, like precise alignment of the belt pulleys (see FAG Top-Laser SMARTY2, page 56), is an essential precondition for achieving the maximum possible life of the belt drive. There is also less wear of the drive components, energy costs are reduced and cost-effectiveness is increased. The user-friendly FAG Top-Laser TRUMMY2 can be used in many locations and comprises a cableless measurement probe, a measurement

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

In comparison with systems operating for example by sound waves, this new measurement technique using clock pulse light is clearly superior, since the measurement result cannot be distorted by disruptive influences. The simple and reliable user instructions are given in several languages.

Ordering designation:
Laser measuring device in plastic case:

LASER-TRUMMY2

For detailed information, see publication TPI 182.



Products · Condition monitoring Alignment

Shaft alignment device

Shaft alignment device FAG Top-Laser INLINE

The FAG Top-Laser INLINE is a PC-based alignment system for coupled shafts in motors, pumps, ventilators and gearboxes (with rolling bearings).

The advantages include:

- Simple to mount
- Error-free handling even by untrained personnel due to automatic measurement and positioning process
- More precise alignment than with conventional methods
- Rapid measurement due to continuous rotary motion
- Reduced vibration and friction losses
- Longer machine running times
- Usable with conventional laptops with a PCMCIA interface

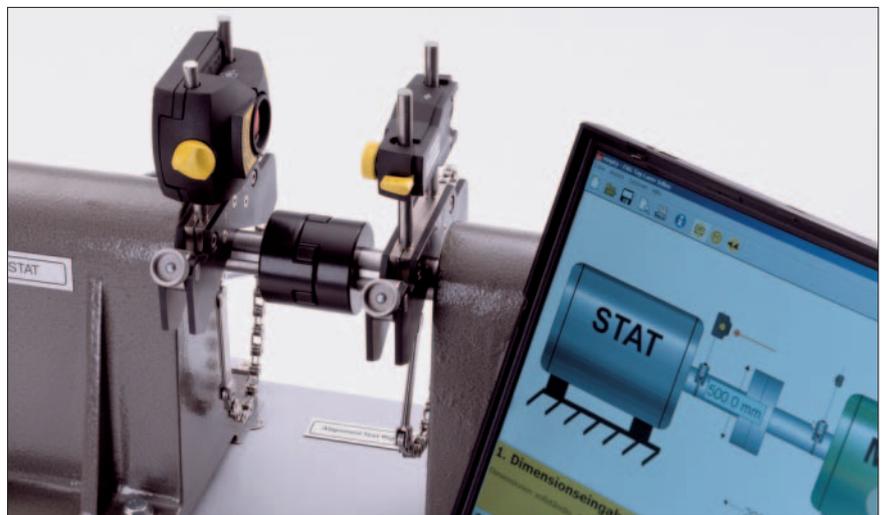
Included in delivery:

- 1 transceiver (incl. 3 m cable)
- 1 reflector
- 2 brackets
- 2 chains (300 mm)
- 4 posts (115 mm)
- 1 software
- 1 case
- 1 serial PC card

All the parts included in the delivery are also available as replacement parts.

Ordering designation:

Complete FAG Top-Laser INLINE:
LASER-INLINE



Actions to be taken before alignment

Before any alignment operation, any tilting foot (machine foot that lifts off the floor when slackened) should be removed in order to prevent increased vibration tendency and bearing damage due to housing distortion.

The FAG Top-Laser INLINE helps to quickly identify and eliminate the so-called soft foot. It is only necessary to loosen each individual screw foot connection. The computer determines any foot movement. The tilt foot can then be eliminated using shims.

Products · Condition monitoring Alignment

Shaft alignment device

Accessories

The possible applications of the FAG Top-Laser INLINE base device can be expanded with the aid of a comprehensive range of accessories (see table). The accessories can be ordered as a set in a handy, robust case or as individual parts.

For detailed information, see publication TPI 182.

Accessories for LASER-INLINE		
Individual parts and accessories	Included in delivery	Ordering designation
Chain, 600 mm long	2 pieces	LASER-INLINE.CHAIN600
Chain, 1 500 mm long	2 pieces	LASER-INLINE.CHAIN1500
Post, 150 mm long	4 pieces	LASER-INLINE.POST150
Post, 200 mm long	4 pieces	LASER-INLINE.POST200
Post, 250 mm long	4 pieces	LASER-INLINE.POST250
Post, 300 mm long	4 pieces	LASER-INLINE.POST300
Magnetic holder	1 piece	LASER-INLINE.MAGNET
Accessory case, empty	1 piece	LASER-INLINE.CASE-ACCESSORIES
Accessory set, complete	1 piece	LASER-INLINE.ACCESS-SET

This contains all the items stated above in the necessary quantity with the exception of the four posts, 150 mm long.



Products · Condition monitoring Alignment

Shims

Shims FAG Top-Laser SHIM

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

Composition of set:

The handy case contains 20 shims each of 3 sizes (C = 15, 23 and 32 mm) and 6 thickness values (0,05 mm to 1,0 mm), i.e. a total of 360 shims, together with one extraction hook.

Ordering designation:

LASER.SHIM-SET

Individual or replacement parts

As replacement parts, we supply 10 shims in one of the 4 sizes and one of the 7 thickness values stated above.

Ordering examples:

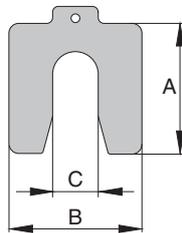
10 shims of dimension C = 15 mm and 0,20 mm thickness:

LASER.SHIM15X0,20

10 shims of dimension C = 44 mm and 0,10 mm thickness:

LASER.SHIM44X0,10

For detailed information, see publication TPI 182.



LASER.SHIM-SET

Ordering designation Set FAG	Dimensions			Thickness	Total quantity of shims	Mass kg
	A	B	C			
LASER.SHIM-SET	55	50	15	0,05–1,0	360	6,7
	75	70	23	0,05–1,0		
	90	80	32	0,05–1,0		

LASER.SHIM Individual or replacement parts

Ordering designation Individual or replacement parts FAG	Dimensions			Thickness	Total quantity of shims	Mass g
	A	B	C			
LASER.SHIM15X...	55	50	15	0,05–2,0	10 each	11–440
LASER.SHIM23X...	75	70	23	0,05–2,0	10 each	21–840
LASER.SHIM32X...	90	80	32	0,05–2,0	10 each	29–1 160
LASER.SHIM44X...	125	105	44	0,05–2,0	10 each	53–2 100

Products · Condition monitoring Operating condition

Temperature measuring devices

Infrared thermometer FAG TempCheck PLUS

The infrared thermometer FAG TempCheck PLUS measures the infrared radiation emitted by an object and uses this to calculate the surface temperature.

The contact-free measurement makes it possible to easily determine the temperature of difficult to reach or moving objects.

The device is very light, weighing only 150 g, and can be taken practically anywhere it is needed. The infrared thermometer FAG TempCheck PLUS can measure temperatures in a range between -32°C and $+530^{\circ}\text{C}$. It has a high precision glass optic for accurate contact-free temperature measurement and is suitable for the thermal monitoring of machine components.

Overview of the advantages of FAG TempCheck PLUS:

- Rapid and precise temperature measurement
- State of the art infrared temperature measurement technology
- Simple to use
- Reduction of unplanned downtime
- Low purchase cost

Ordering designation and scope of delivery:

TEMP-CHECK-PLUS

(measuring device with battery, strap, user manual and carry case)



Safety advice

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

Temperature measuring device FAG TempCheck CONTACT

The handy temperature measuring device FAG TempCheck CONTACT has a display range of -60°C to $+1000^{\circ}\text{C}$. In conjunction with the surface temperature sensor TEMP-CHECK-CONTACT.SENSOR included in the delivery, a measurement range of -60°C to $+300^{\circ}\text{C}$ can be covered. The device is suitable for measuring the temperature of

- rolling bearings, housings and lubrication systems for operational monitoring
- heated rolling bearings and joints during mounting

The microprocessor-controlled measuring device has a single line display. The touch keyboard has the following switching functions:

- On/Off
- Hold (hold the measurement value in the display)

Ordering designation and scope of delivery:

TEMP-CHECK-CONTACT

(measuring device with sensor TEMP-CHECK-CONTACT.SENSOR and service case)

FAG temperature sensor as replacement part

(can be ordered individually): Rapid reaction surface sensor

Ordering designation:
TEMP-CHECK-CONTACT.SENSOR

FAG temperature sensor as accessory

(can be ordered individually, for measuring the temperature of fluids, lubricants etc.):

Immersion/insertion sensor

Ordering designation:

TEMP-CHECK-CONTACT.SENSOR-IMMERSION



For detailed information, see TPI WL 80-54.

Products · Condition monitoring Operating condition

Digital hand tachometer

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.

Through contact with the component, the rubber stylus measures the speed or the surface speed is determined in conjunction with a track wheel.

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 photo-electric means using visible red light. The device displays the speed in revolutions per minute.

Ordering designation:
TACHOMETER

Included in delivery:

- Digital hand tachometer
- Adapter for direct measurement 1:1
- Track wheel, 6 inch
- Track wheel 1/10 m
- Rubber stylus
- 10 reflective marks
- User manual
- Case

Replacement parts

10 reflective marks

Ordering designation:

TACHOMETER.MARKS-REFLEX



Products · Condition monitoring Operating condition

Sonar device

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 insulating grip is held like a pencil between index finger and thumb and 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



Products · Condition monitoring Vibration diagnosis

Detector III

Condition monitoring by vibration diagnosis

Vibration diagnosis is the most reliable method for identifying machine damage at an early stage. Imbalance and misalignment defects can be detected accurately, as well as rolling bearing damage and gear tooth defects. For this area, we therefore offer a comprehensive product portfolio, ranging from simple vibration monitors to complex monitoring systems with a large number of measurement points. FAG vibration measuring devices help to plan maintenance work, extend bearing life, reduce costs and increase plant availability.

In the field of **offline monitoring devices**, we offer FAG Detector III. The **online monitoring devices** include products from the economical FAG Easy Check series as well as the online monitoring systems FAG DTECT X1, FAG WiPro, FAG VibroCheck and FAG ProCheck. For all these devices and on all aspects of condition monitoring, FIS offers a worldwide service – from the FIS Customer Hotline to customer-specific service contracts. In order to achieve optimum networking, all online systems have versatile communication options as standard.

FAG Detector III

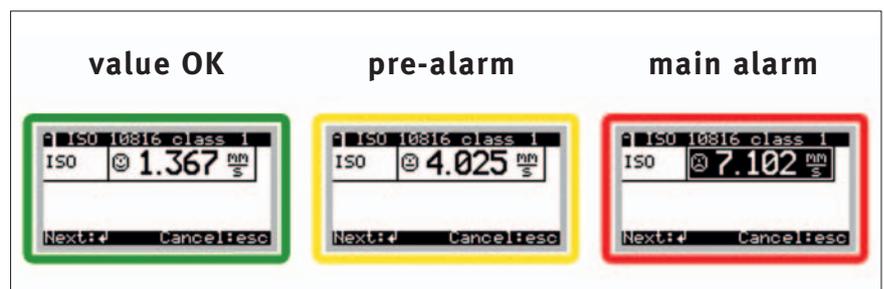
The FAG Detector III is a handy, easy to use vibration measuring device. Preinstalled standard configurations in accordance with DIN ISO 10816 make this a Plug-and-Play solution and allow authoritative information on the machinery condition – entirely without time-consuming training or system configuration. This allows, for example, rapid inspection of ventilators, pumps, electric motors, compressors or vacuum pumps. The user simply has to start the measurement process by pressing a few buttons and wait until it is completed. Interpretation of the measurement results is carried out in a self-explanatory manner by means of simple symbols on the device display.

For more detailed analysis, the software FIS Trendline with comprehensive functions is available free of charge.

These include among others the FIS Viewer, which offers the user a large number of tools for evaluating the data. Due to the integrated rolling bearing database containing approx. 20 000 bearings from various manufacturers, simpler and more efficient analysis of the measured data is possible. Since the damage frequencies can be incorporated in the measurement results, simple damage analysis is possible.

Automatic detection of measurement points

Thanks to the functionality of automatic measurement point detection (RFID technology), the measurement points defined for a measurement route can be identified precisely and without error. The measurement points are detected automatically by the system due to the RFID tags applied at the machinery. With the proven FAG Detector III, mobile vibration and temperature monitoring is quicker, simpler and more reliable. The functionality of automatic measurement point detection is not yet available worldwide. Please direct enquiries to: info@fis-services.com



Symbols (smileys) in the device display allow rapid interpretation of results

Products · Condition monitoring

Vibration diagnosis

Detector III

In addition to vibration measurement, contact-free temperature measurement and data collection, FAG Detector III also has a balancing function. As a result, imbalance can not only be detected but easily and efficiently eliminated. For this purpose, the optionally available Balancing Kit is required.

The results of the balancing process are transferred to the software F'IS Trendline for evaluation.

Further highlights of the system:

- Expanded memory allowing storage of up to 1600 measurement points in parallel with up to 270 time signals
- Recording of speed
- Report generator

Ordering designation:

DETECT3-KIT

Included in delivery:

- Base device with rechargeable battery
- Acceleration sensor with magnetic foot
- Infrared temperature sensor
- Charger with worldwide compatibility
- PC data cable (serial/USB)
- User manual
- Protective bag with holder for temperature sensor
- Free of charge PC software F'IS Trendline
- Case

Ordering designation:

DETECT3-KIT-RFID

Included in delivery:

- As DTECT3-KIT
- RFID reader (integrated)
- RFID tags

Ordering designation:

DETECT3.BALANCE-KIT

Included in delivery:

- Acceleration sensor with magnetic foot and sensor cable
- Trigger sensor (optical and inductive)
- Reflective mark for trigger sensor
- Weighing balance
- Magnetic holder for trigger sensor
- Extension for magnetic holder
- Cable for trigger sensor (length 10 m)
- Dongle for activation of balancing function
- Case

Accessories

- Sensor extension cables for lengths of 5 m and 15 m are available on request
- Further RFID tags are available on request

For detailed information, see TPI WL 80-64 or www.FAG-DetectorIII.com. Please direct enquiries to: info@fis-services.com



RFID tags for automatic measurement point detection



FAG Detector III and Balancing Kit

Products · Condition monitoring Vibration diagnosis

Easy Check · DTECT X1

FAG Easy Check series

The FAG Easy Check devices are economical vibration monitors for permanent monitoring of critical machinery in plant with constant operating conditions, e.g. pumps, fans, electric motors etc.

Since FAG Easy Check vibration monitors are easy to mount and operate, they can also be used without difficulty by employees who have no knowledge of condition monitoring. The devices monitor vibration in accordance with ISO 10816, the condition of rolling bearings with the aid of the demodulated signal method and the temperature at the bearing positions.

The use of FAG Easy Check devices can contribute to a considerable cost reduction since incipient damage is detected at an early stage and the necessary work can be integrated into maintenance planning.

FAG Easy Check base device

FAG Easy Check is a standalone device that is powered by a battery



FAG Easy Check base device

and is applied directly to the critical machine. The vibration monitor draws attention to any problem by means of LEDs (traffic light function). The status of the LEDs on the FAG Easy Check must be checked at regular intervals.

Ordering designation:
EASY-CHECK

FAG Easy Check Online

In contrast to the base device, FAG Easy Check Online has an external power supply. Additional alarm outputs for vibration and temperature offer the possibility of presenting alarm conditions on a control station or traffic light device. This eliminates the need for regular inspections and allows the monitoring of difficult to access locations. Using the input, FAG Easy Check Online can be administered remotely, for example, for resetting the alarms, starting the learning phase or activating a measurement cycle.

Ordering designation:
EASY-CHECK-ONLINE



FAG Easy Check Online

For detailed information, see TPI WL 80-68. Please direct enquiries to: info@fis-services.com

FAG DTECT X1

FAG DTECT X1 allows early detection of damage by selective frequency vibration monitoring based on individually adjustable frequency bands. By means of the selective frequency method, specifically selected machine parts can be monitored. The system is versatile and can be specially matched to the requirements of the application. The base device is available as a 2 or 8 channel system with an external multiplexer. All conventional acceleration, speed and displacement sensors can be attached. It is possible to record process variables such as speed, temperature, torque and pressure.



FAG DTECT X1

Products · Condition monitoring Vibration diagnosis

DTECT X1 · WiPro

The signal collected by the sensor is broken down into its frequency components by means of Fast Fourier Transformation (FFT). It is thus possible to monitor amplitudes within fixed, very narrow frequency bands for specified limit values and trigger an alarm. The remote monitoring function makes it possible to detect damages and defects on machinery without the need for a diagnostic expert to be on site. Any changes are automatically notified via telecommunication systems (fixed line, mobile or GSM modem) to the operating company, plant manufacturer or service provider irrespective of where the system is located throughout the world. Stored and current data can be remotely retrieved and analysed by the FIS Diagnosis Centre.

For detailed information, see TPI 170.
Please direct enquiries to:
info@fis-services.com

FAG WiPro

The FAG WiPro is a cost-effective online monitoring system for the condition-based maintenance of wind turbines.

It can be used to monitor not only the complete drive train (main bearing, gearbox, coupling, generator) but also vibrations of the tower. If required, other information such as rotor blade speeds or oil quality can be integrated in the condition monitoring. The FAG WiPro is equipped with a signal processor and evaluates all measurement signals in the nacelle itself. Due to the intelligent linking of expert knowledge with information from the turbine, it is possible to keep the transfer data volume very small. This is particularly important where a large number of turbines must be continuously monitored over a long period. Due to the different communication options, an appropriate solution can be found for any wind farm.

FAG WiPro ensures that operators are kept informed at all times of the condition of the most important components. This gives a high level of investment security and active machine protection.

Due to the modular concept of FAG WiPro, it can be retrofitted to all types of wind turbines. 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.

Since FAG WiPro is recognised by Allianz Zentrum für Technik (AZT), insurance companies offer more favourable conditions where it is used. Furthermore, both the system and the FIS Diagnosis Centre have Germanischer Lloyd certification.

For detailed information, see TI WL 80-66.
Please direct enquiries to:
info@fis-services.com



FAG WiPro

Products · Condition monitoring Vibration diagnosis

VibroCheck

FAG VibroCheck

The online monitoring system FAG VibroCheck is ideally used wherever a large number of measurement points must be continuously and reliably monitored, such as in rolling mills, paper factories or power stations. In its most extended configuration, up to 2 048 sensors can be integrated in the system. 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 general parameter monitoring, the user has available an automatic, rule-based expert system that can monitor up to 20 components per sensor. This allows monitoring of all rolling bearing types and gear meshes in the vicinity of a sensor in relation to the occurrence of component-specific frequency windows. In addition to vibration signals, other process parameters such as temperature, power, pressure, torque etc. can also be monitored.

By remote access, the data can also be analysed by external service providers or vibration experts at other locations.

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. 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.

For detailed information, see TPI WL 80-67. Please direct enquiries to: info@fis-services.com



FAG VibroCheck

Products · Condition monitoring

Vibration diagnosis

ProCheck

FAG ProCheck

FAG ProCheck is a powerful and flexible online condition monitoring system for prevention of unplanned downtime and for ensuring quality control. It offers a high level of functionality at an extremely attractive price and is available in a range of variants – from an 8 channel to a 16 channel system. The ProCheck continuously records data on vibration, temperature and other process parameters and evaluates these subsequently. 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. FAG ProCheck also provides 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.

Due to its flexibility, scalability and extremely robust and compact design, this system is destined for use in all industrial segments.

The system has almost no limits, whether it is used in steelworks, paper machinery, cement plants or in the oil and gas industry.

A further contribution is made in this respect by the explosion-proofed version of FAG ProCheck, available by agreement.

In this version, a specially pressure-encapsulated housing prevents the system coming into contact with an explosive ambient 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.

FAG ProCheck is thus proven as a versatile online condition monitoring system.

For detailed information, see TPI WL 80-69. Please direct enquiries to: info@fis-services.com

Further online monitoring systems

Further online monitoring systems for the requirements of specific sectors are available on request.



FAG ProCheck



Explosion-proofed version of FAG ProCheck

Products · Maintenance management



CMMS Interface

72

Products · Maintenance management

CMMS Interface

CMMS Interface

With the CMMS* Interface, F'IS offers an intelligent link between vibration measurement / analysis and the CMMS MAXIMO®.

By means of a software module, the portable vibration measuring device FAG Detector and its software F'IS Trendline is linked to the CMMS MAXIMO® – a product of IBM Germany.

In addition to the product-specific advantages of the two systems, the link created by the CMMS Interface generates convincing synergy effects:

- Central storage of diagnostic and maintenance data
- Redundancy-free administration of master data
- Fully automatic generation of current routes for FAG Detector
- Automatic generation / updating of follow-on orders in MAXIMO® in an alarm situation
- Buildings of a measurement value history in MAXIMO®



Please direct enquiries to:
info@fis-services.com

* Computerised Maintenance
Management System

Services

Services relating to rolling bearings

Mounting 75

Mounting service 75

Equipment rental 76

Lubrication 77

Condition monitoring 78

Continuous measurement (online) 78

Regular measurement (offline) 78

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Maintenance consultancy 86

Maintenance planning and control systems 88



Services · Services relating to rolling bearings

F'IS defines itself as an independent full service supplier and covers the complete range of services relating to the life cycle of a rolling bearing: from mounting, through maintenance to reconditioning of rolling bearings.

During the operational phase, F'IS experts provide support through services in the field of condition monitoring and corrective maintenance. Companies that wish to build up their knowledge in the areas of rolling bearings and condition monitoring have access to the F'IS training and consultancy portfolio.

Through the association with the Schaeffler Group, customers also benefit from the expertise of a leading supplier of rolling and plain bearings.

Detailed information on the individual services is given on the following pages.



Services · Services relating to rolling bearings

Mounting

Mounting service

Mounting service

The F'IS Mounting Team offers mounting services for rolling bearings across market sectors. We have extensive experience, for example, in railways, raw material extraction and processing, steel and aluminium, wind power, paper, oil and gas etc.

The F'IS mounting personnel are specially trained and will provide reliable and rapid assistance. The mounting services are provided either at the customer's location or in the F'IS workshop facilities.

The mounting service includes:

- mounting and dismantling of rolling bearings of all types
- approval inspection of adjacent parts (shafts and housings)
- maintenance and inspection of bearing arrangements
- defect analysis on bearing arrangements not running satisfactorily
- advice on rationalisation of mounting operations
- design and manufacture of special tools

The advantages include:

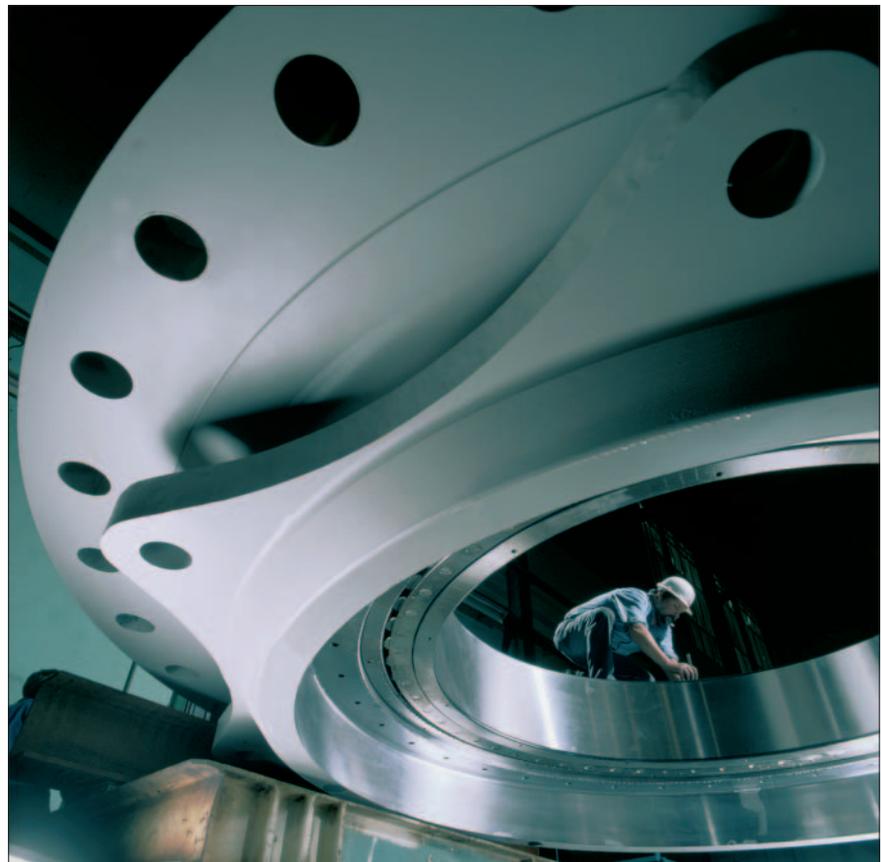
- extended bearing life
- considerable cost reductions
- less unplanned downtime
- increased plant availability
- improved awareness among employees of the correct handling of rolling bearings

Please direct enquiries about the services described to:

**Schaeffler Technologies
GmbH & Co. KG**

Tel. +49 9721 91-3142 or -2573

Fax +49 9721 91-3639



Services · Services relating to rolling bearings Mounting

Equipment rental

Equipment rental

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

The principal items available for rental from FAG Industrial Services include

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

The equipment is stored at our mounting workshop facility and its function is checked and maintained by our mounting specialists.

Please direct enquiries about this service to:

Schaeffler Technologies

GmbH & Co. KG

Tel. +49 9721 91-1133

Service Hotline:

Tel. +49 2407 9149-99



Services · Services relating to rolling bearings Lubrication

Lubrication as a service

In more than half of all cases, inadequate lubrication is the cause of unplanned machine downtime.

The use of suitable greases for different operating and environmental conditions as well as know-how in when, how frequently and with what quantities bearings should be lubricated, makes it possible to significantly extend the life of rotating machine elements.

F'IS services cover:

- selection of the correct lubricants and lubrication systems
- installation
- lubrication of bearing positions
- preparation of lubrication and maintenance plans
- lubrication point management
- lubrication consultancy
- lubricant investigations and tests.

A comprehensive selection of high quality FAG Arcanol rolling bearing greases specially tested and selected for use in rolling bearings is available. The consistent quality of Arcanol lubricants is ensured by ongoing investigations on special test rigs.

The F'IS team also deals with special requirements such as rapidly biodegradable greases and greases for use in the food industry. FAG Arcanol rolling bearing greases are also suitable for use in automatic lubricators of the FAG Motion Guard series.

The software FAG **Motion Guard SELECT MANAGER** Version 2.0 allows:

- selection of lubricators
- definition of dispensing times and relubrication quantities
- selection of suitable/preferred Arcanol greases
- management of a lubrication and maintenance plan

The F'IS lubrication service helps to:

- prevent failures of rotating components
- increase productivity
- reduce lubrication costs.



Services · Services relating to rolling bearings

Condition monitoring

Continuous measurement · Regular measurement

Condition monitoring

The malfunction-free and optimised operation of complex machinery and plant can only be achieved by means of condition-based maintenance.

The key method used by F'IS in condition-based maintenance is vibration diagnosis. This method makes it possible to detect incipient damage in machinery at a very early stage. This means that, for example, damaged components can be replaced as part of planned downtimes.

The advantages of vibration monitoring include:

- prevention of unplanned downtimes
- increased productivity.

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

Continuous measurement (online)

For reasons that are well known, continuous monitoring by means of vibration diagnosis is frequently indispensable in the case of production-critical machinery. Investment in online monitoring systems often pays for itself after a few months due to the reduced failure costs. Depending on the area of application, F'IS offers a wide range of solutions, including 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 sensors.

In addition to giving expert advice in selecting the right system, F'IS also implements plant monitoring. This includes not only hardware selection but also system configuration and, if necessary, its integration into existing systems. Depending on the know-how level of the customer, he can either carry out plant monitoring himself or enlist the F'IS monitoring service. The F'IS monitoring systems have e-service functionality, allowing external monitoring by F'IS experts under favourable terms.



Regular measurement (offline)

The failure of so-called “B” or “C” category plant items not does lead directly to stoppages and does not therefore bring expensive secondary damage.

For such machine parts, the more economical offline monitoring is generally recommended. In this case, costs and benefits are in an optimum ratio.

In offline 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, allowing deviations to be easily detected. When preparing the offline monitoring concept, the selection of measurement points and monitoring accessories as well as the definition of the measurement interval play a decisive role. It is not absolutely essential to have expertise on site. In the case of irregularities in measurements and trend analyses, F'IS offers the e-service. At the push of a button, all relevant data are exported from the database and sent by e-mail to the F'IS Diagnosis Centre. It is then subjected to expert analysis.

The customer quickly receives easily understandable and authoritative diagnosis reports by electronic means.

Through close teamwork with the F'IS experts, the customer soon acquires excellent analytical know-how.

Where the company's own personnel cannot be made available, F'IS also offers support in data acquisition and carries out regular on-site measurements.



Services · Services relating to rolling bearings

Condition monitoring

Troubleshooting

Troubleshooting

If malfunctions or other problems occur on a machine, a detailed defect analysis must be quickly carried out. This can be likened to detective work. Based on many years' experience in different sectors and applications, the F'IS diagnosis experts are well versed in such troubleshooting tasks. Their analysis incorporates various information, for example from visual observation, examination of the machine documentation and discussions with machine operators. Problems or malfunctions in machine operation often become apparent through changes in vibration behaviour, unusual temperature patterns or similar phenomena. The F'IS experts therefore also carry out measurements on the machine. The measurement methods used will depend on the particular application. The F'IS experts are familiar with all measurement techniques, from vibration measurement to torque analysis or endoscopy. As a result, they can quickly identify malfunctions and prepare proposed solutions. At completion of an investigation, F'IS holds a handover meeting with all relevant employees of the customer to discuss not only the results of the investigation but also the recommended countermeasures.

Vibration measurements

In the field of troubleshooting too, the use of vibration measurements are also the state of the art method for detecting problems. In a similar way to a doctor with a stethoscope, the vibration expert can assess the

condition of the machine without the need for any dismantling. 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**

Each machine has one or more natural frequencies that are determined by its design (mass and rigidity). If a machine is run in such a way that excitation (e.g. the speed of the motor) occurs in the region of a natural frequency, extreme vibration of the machine can occur. Based on the results of modal analysis, our experts can submit recommendations for design improvements to the machine.

- **Detection of a “soft point” of a machine**

If a high level of vibration occurs at initial operation or after a technical modification of a machine, this may be due to a “soft point”. This is defined as a rigidity problem, often caused by a poor quality connection between two machine parts (for example 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 point” of the machine. A discussion can then be held to prepare proposals for improving the design of the machine.

Services · Services relating to rolling bearings

Condition monitoring

Troubleshooting

Torque/force measurements

If damage accumulates at a particular point in the plant, a design problem may be surmised. Overloading of shafts or bearing positions that was not taken into consideration in the design of the machine can be detected by means of torque or force measurements and taken into consideration in an improved structure of the machine. Depending on the application, temporary installations or fixed installations can be used.

In particular, continuous torque measurement carried out directly on rotating shafts is highly demanding on a technical level: the measurement data must be transferred from the rotating shaft and the contact-free supply of energy must be provided. Implementing the long term installation of such telemetry systems under industrial conditions requires considerable experience, which the F'IS experts have gained over many years.

Endoscopy

If damage has been detected, for example, but the component cannot be replaced in the short term for production reasons, the precise extent of the damage can be determined using endoscopy. The interior of the machine is examined using digital endoscopes. The images are stored in the form of digital photographs or videos and are used as the basis of diagnosis by F'IS experts. Individual components such as rolling bearings or gear teeth can then be easily assessed. If the

bearings inspected are Schaeffler Group products, the customer also has access to the knowledge of Schaeffler application engineers. They will prepare a detailed damage analysis and submit well-qualified proposals for improvement. This is an advantage that clearly demonstrates the benefits of obtaining products and services from a single source.

Thermography

Thermography is one of the most important non-destructive diagnostic techniques. 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. Simultaneous recording of a digital image allows precise allocation of the temperature gradients to visible features on site.

There is a wide range of objects that can be examined by this method: it extends from assessment of electrical connections in switch cabinets, through rolling bearing arrangements in motors and fans, to thermal linings in cement kilns.

Approval inspection of new plant

The combination of different diagnostic techniques enables F'IS to carry out assessment of new plant irrespective of the manufacturer. Frequently occurring installation errors such as defective alignment of motors and pumps/fans to each other or incorrect electrical connections in switch cabinets can thus be detected in the initial operation phase and their correction required of the plant manufacturer. If such defects remain undetected over the period of the warranty, their removal and the secondary damage may incur considerable costs and downtime. As part of the new plant approval inspection, F'IS checks the most common problems and records the actual status. Where necessary, corrective measures can then be required of the plant manufacturer or operator in good time.



© FLIR systems

Services · Services relating to rolling bearings Corrective maintenance

Balancing · Alignment

Corrective maintenance

Once a machine problem has been diagnosed, it should be eliminated as quickly as possible. Two of the most frequent problems – imbalance in pumps and fans as well as machine components incorrectly aligned to each other – can be corrected directly by F'IS.

Balancing

Imbalance is one of the main sources of malfunctions 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 plant availability. The F'IS experts reduce to a normal level the increased vibration that occurs due to contamination, wear, repairs, etc. They detect and eliminate the causes of imbalances on machines at speeds of 40 to 10 000 rpm such as pumps, ventilators, compressors, turbines, motors etc. Irrespective of the sector, F'IS offers not only a detailed analysis of the reasons for the malfunction but also the removal of imbalances in any plane of adjustment.

Alignment

Many of the standard pieces of equipment used in the plant are composed of several components, for example an electric motor and pump/fan. After installation, repair or overhaul, the components of such plant must be aligned with each other.

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.

The methods and tools for machine alignment have changed in recent years: away from demanding and

inaccurate methods using a dial gauge and straight edge to laser alignment systems. These are highly accurate and effective. In addition to service products in this area (see page 55), F'IS also offers alignment of machinery as a service. Where necessary, the F'IS service technician will take the necessary laser alignment system to the customer and carry out alignment of the machine in accordance with the manufacturer's specifications. Successful completion of the work is then documented.

Please direct enquiries to:
info@fis-services.com



Services · Services relating to rolling bearings

Rolling bearing reconditioning

Rolling bearing reconditioning

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

Many applications incorporate bearings of smaller dimensions that are regularly replaced as part of scheduled maintenance work although they have not yet reached the limits of their performance capacity. Reconditioning of rolling bearings may represent an economically attractive alternative here. The same applies to the wheelset bearings of rail vehicles. These belong to the most heavily loaded vehicle parts and are subjected to regular maintenance. F'IS therefore offers operators of all rail vehicles the opportunity to have their wheelset bearings professionally dismantled, cleaned and reconditioned. Customers thus benefit from the in-depth knowledge of rolling bearings that is only available from a bearing manufacturer. The technical expertise of F'IS employees guarantees the highest quality in maintenance and the achievement of maximum bearing life.

The F'IS service offer applies to:

- all wheelset bearings and 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 includes:

- professional dismantling, cleaning, damage analysis and reconditioning of bearings at the F'IS Service Centre
- identification marking of each individual bearing before dismantling
- if required, bearing-specific documentation of all maintenance activities carried out

The advantages include:

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

Please direct enquiries about the services described to:

Schaeffler Technologies GmbH & Co. KG

Georg-Schäfer-Straße 30
97421 Schweinfurt (Germany)
Tel. +49 9721 91-1919
Fax +49 9721 91-3639



Large rolling bearings of outside diameter >425 mm

The statements on wheelset bearings and standard bearings up to an outside diameter of 425 mm can also be applied to larger standard and special rolling bearings. Within the framework of maintenance activities, rolling bearings are replaced for reasons of safety that could be restored to an acceptable and functionally secure condition through appropriate cleaning and reconditioning. In general, the costs of such reconditioning are significantly lower than the costs of a new bearing – with shorter delivery times in most cases. In individual cases, customers may also receive the same warranty on the reconditioned bearing as on a new bearing.

Please direct enquiries to:

Schaeffler Technologies GmbH & Co. KG

Mettmanner Straße 79
42115 Wuppertal (Germany)
Tel. +49 202 293-2226
Fax +49 202 293-2437

For detailed information, see TPI WL 80-72.

Services · Services relating to rolling bearings

Rolling bearing reconditioning

Overview of the individual levels in rolling bearing reconditioning

Assessment – Inspection

Dismounting
 Washing
 Examination
 Definition of repair operations
 Preparation of proposal

Level I – Requalifying

Measurement
 Mounting
 Preservation, greasing if appropriate
 Packaging, long term packaging if appropriate
 Despatch

Level II – Refurbishment

Polishing of raceways
 Removal of fretting corrosion
 Mounting
 Preservation, greasing if appropriate
 Packaging, long term packaging if appropriate
 Despatch

Level III – Remanufacturing

E.g.
 Regrinding of raceways
 Manufacture of new rolling elements
 Replacement of cage if appropriate
 Removal of fretting corrosion
 Mounting
 Preservation, greasing if appropriate
 Packaging, long term packaging if appropriate
 Despatch

Level IV – Remanufacturing Plus

E.g.
 Regrinding of raceways
 Manufacture of inner ring with new bore diameter
 Redimensioning of internal clearance
 Manufacture of new rolling elements
 Replacement of cage if appropriate
 Removal of fretting corrosion
 Mounting
 Preservation, greasing if appropriate
 Packaging, long term packaging if appropriate
 Despatch



Services · Services relating to rolling bearings Technical consultancy

Technical consultancy

In addition to providing services, consultancy is one of the main activities of F'IS.

Companies that wish to change to the concept of condition-based maintenance are supported by F'IS with initial training, attendance during the introductory phase, expert backup and customised service contracts.

Furthermore, F'IS 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 (see page 88).

Introduction of condition-based maintenance

Many customers intend to convert their maintenance activities wholly or partly to a condition-based maintenance strategy in the coming years. Maintenance of machinery and plant will no longer be based on failures or times but on their assessed condition. The aim of the F'IS consultants is to find the happy medium between the costs and benefits of condition assessment. In partnership with the customer, plans are prepared that generate recommended activities for the maintenance personnel derived from the results of condition monitoring. Ultimately, it is these recommendations and not alarm messages that lead to targeted maintenance activities and thus to cost savings.



Service concepts for plant manufacturers and operators

Services are not volume products – the needs and requirements vary from customer to customer – so the service concept must be tailored as a result.

Due to the wide range of services F'IS can offer its customers, it is possible to knit together for each customer the right package of training and services from F'IS together with the activities carried out by the customer himself.

The scope is enormous and dependent on the prior knowledge and available resources of the customer as well as the requirements for quality of monitoring. Some selected examples should help to clarify this:

- **“Customer A has employees with experience in the field of condition diagnosis”**

In such a case, it is sufficient to instruct the employees in handling the systems and accompany them while making the initial steps. Furthermore, F'IS acts as a team of experts that can be called in on difficult cases and support the customer in the analysis and formulation of activities.

- **“Customer B would like to build up its knowledge in the field of condition diagnosis”**

The field of condition diagnosis is a complex subject; building up knowledge will therefore take some time. For such cases, F'IS offers a two year programme, after which even customers without prior knowledge can themselves monitor the condition of their machinery. The support given by F'IS is progressively reduced in various steps and the customer's employees use their new knowledge directly in their daily work.

- **“Customer C wishes to completely outsource the area of condition diagnosis”**

F'IS offers complete packages in which the entire service is provided by F'IS. 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 customers in the wind power industry.

Services · Services relating to rolling bearings Technical consultancy

- **“Customer D is a plant manufacturer and wishes to offer condition monitoring as a service itself”**

In this case, F'IS acts as a subcontractor of mostly portable monitoring systems, a trainer of the service employees of the plant manufacturer and as an expert team that can be called into action when plant exhibits 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.

These four examples show how customised service concepts can vary. Based on individual customer requirements, F'IS prepares a concept to meet the needs and assists in its implementation.

Please direct enquiries about the services described to:
info@fis-services.com



Services · Maintenance management

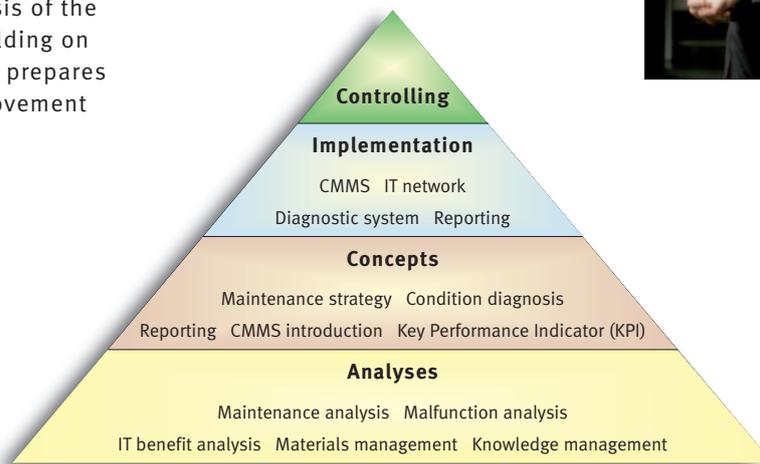
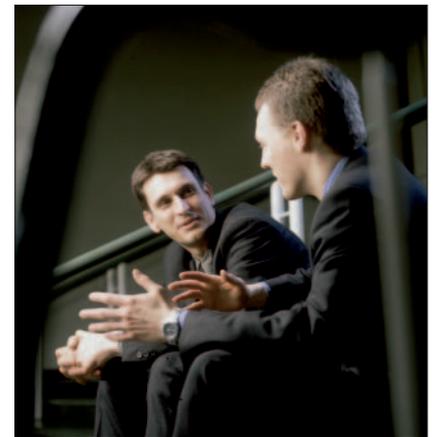
Maintenance consultancy

Maintenance consultancy

Maintenance consultancy by F'IS helps to make costs more transparent and design maintenance more effectively. The F'IS team moves beyond classical consultancy and places the emphasis on technical perspectives.

The consultancy process starts with a comprehensive analysis of the relevant processes. Building on this base, the F'IS team prepares customer-specific improvement

concepts with the aim of integrating individual solutions within an overall solution. F'IS provides support not only during the implementation phase but afterwards too in the form of an ongoing partnership.



Phases in a consultancy process

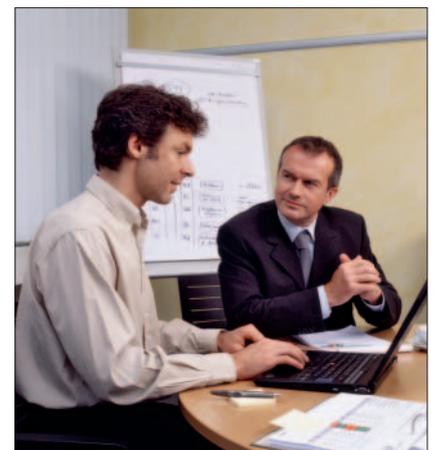
Analyses

The F'IS team holds discussions on site with employees and analyses the available documents. The analysis considers subjects including:

- business processes, costs, personnel structure, tasks/responsibilities, machine utilisation
- commercial and production measurables
- technical support for processes
- utilisation of IT and measurement systems
- maintenance strategies
- knowledge management

- KPI systems relevant to maintenance
- co-operation between departments

Thanks to their experience, the F'IS consultants can 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 by the customer, the results are presented at a management and/or plant level.



Services · Maintenance management

Maintenance consultancy

Concepts and implementation

The concepts prepared by F'IS consultants with the customer are aligned to the situation and vision 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 with the customer.



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-based maintenance (see page 84)

Introduction concept for CMMS

- Software selection
- Master data structures
- Strategy for planned maintenance and inspection tasks
- Specification and implementation of interfaces
- Uploadings of existing data

IT network

- 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

- KPIs
- Automated printed KPI reports for management
- Electronic reporting via the Internet
- Benchmarking against partner companies



Maintenance of concepts

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 F'IS consultants stand ready as a neutral partner. Maintenance controlling can be carried out through extension of the reporting system by means of systems of maintenance-relevant KPIs and benchmarking projects. It is important that maintenance controlling is continually checked in relation to expressiveness and effect on the process.

Services · Maintenance management CMMS

CMMS

In the field of Computerised Maintenance Management Systems (CMMS), F'IS experts apply their profound technical knowledge to offer analysis of customer-specific requirements. This service is independent of the software system. On this basis, the F'IS team achieves a CMMS concept optimised and tailor-made for the customer. The F'IS 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 incorporated in the IT environment of the company. This allows holistic assessment and data analyses in a complete system, so that redundant data administration and multiple data input can be avoided.



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

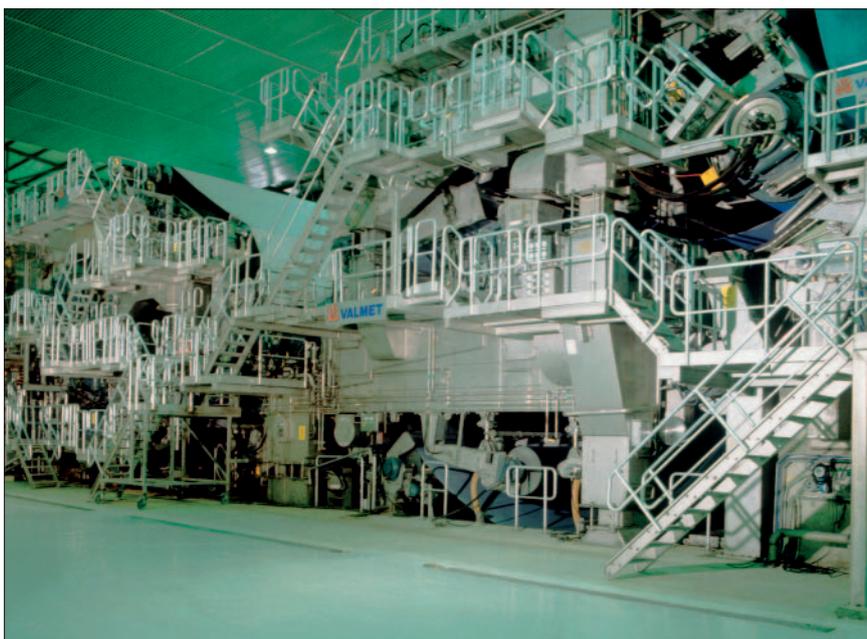
Portable solutions

With the use of electronic checklists and a handheld PC, data can be collected during an inspection. The processing and feedback of failures takes place with ongoing acquisition. The data determined and checked for consistency are transferred via a workshop PC to the CMMS database.

The portable system avoids most of manual data input. Data quality and analysis potential are increased through the use of standardised coding.

Establishment/expansion of the reporting system

The integration of reports into the CMMS gives an expressive 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 generated quickly and easily. Quality of information is improved by electronic completion of forms. The use of standardised reports conforms to the requirements of certification.



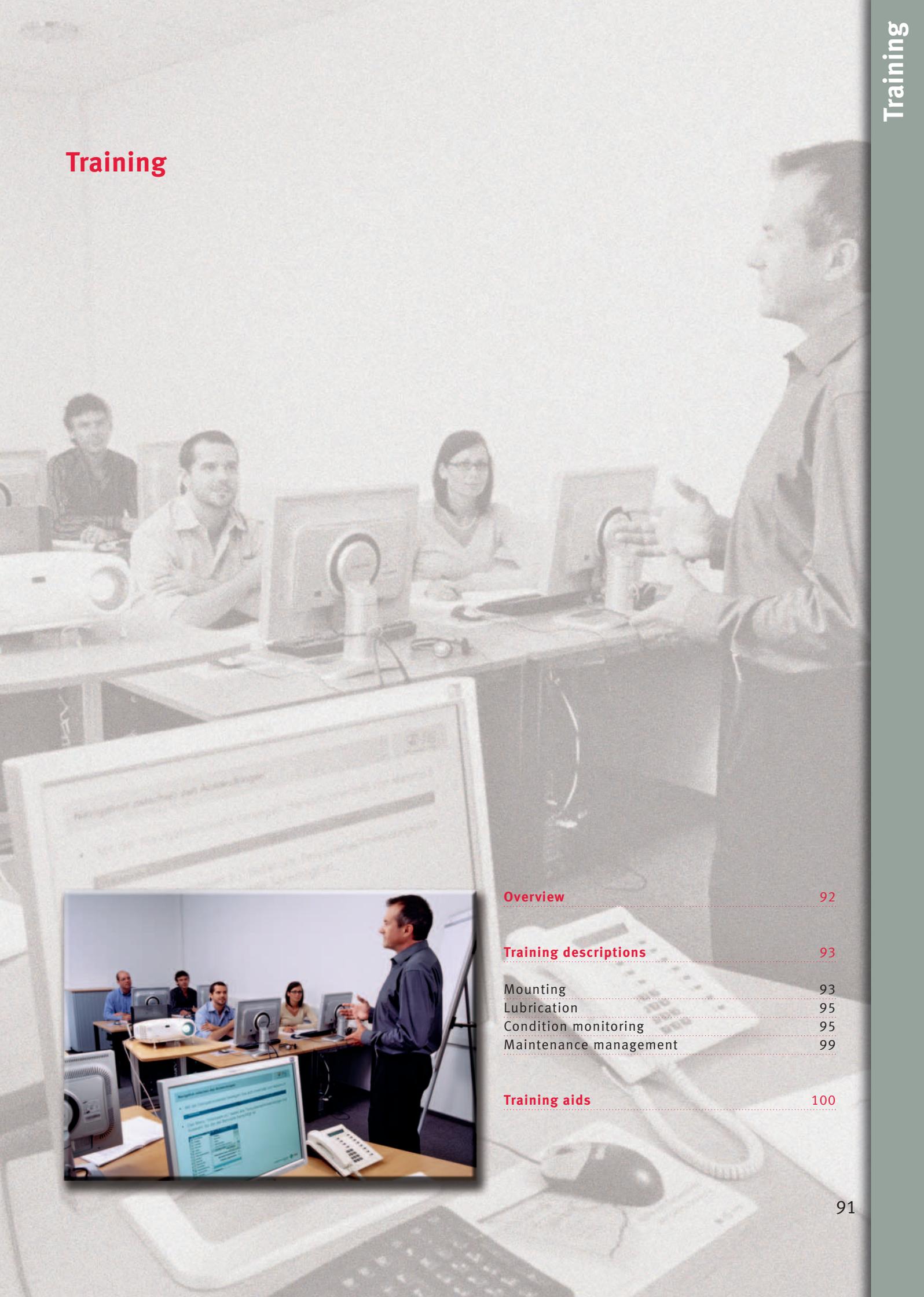
Services · Maintenance management CMMS

Other services relating to CMMS

- Changes of releases and database platforms
- CMMS modifications and expansion functions
- Data analysis and corrective data maintenance
- Implementation of automated processes
- Training of your personnel to user and administrator level

Please direct enquiries to:
info@fis-services.com

Training



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Training · Overview

In addition to the standard training in the fields of rolling bearing technology and condition monitoring that take place several times a year, F'IS also offers customer-specific training. The customer can

himself define the key content in the fields of mounting, lubrication, condition monitoring and maintenance management. The training takes place at Schaeffler Group locations.

Most of the training can, if required, also be offered directly on customer site. The current training offer and dates for the standard training can be found on the Internet at www.fis-services.com in the section "Training".

F'IS training courses		
Overview	Training format	
Training module	Standard	Customer-specific
Mounting		
Basic training: Rolling bearing technology	●	●
Basic training: Spindle bearing technology	●	●
Product training: Mounting tools		●
Rolling bearing maintenance for rail vehicle maintenance personnel	●	●
Practical training: Rolling bearing mounting		●
Lubrication		
Product training: Lubrication systems FAG Motion Guard		●
Product training: FAG Arcanol lubricants		●
Condition monitoring		
Product training: FAG Top-Laser TRUMMY2, SMARTY2 and INLINE		●
Product training: FAG Detector III Basic	●	
Product training: FAG Detector III Balancing	●	
Product training: FAG Detector III Advanced	●	
Product training: F'IS Administrator 4	●	
Product training: FAG DTECT X1 (with F'IS Administrator 4)	●	
Product training: FAG ProCheck (with F'IS Administrator 4)	●	
Product training: FAG VibroCheck: Installation (hardware)	●	
Product training: FAG VibroCheck: Application (software)	●	
Product training: FAG DTECT X1 (with F'IS Administrator 3.8)		●
Maintenance management		
User training for implemented CMMS		●
CMMS administrator training		●

More detailed information on the individual training courses can be found on the following pages.

Training · Training descriptions

Mounting

Mounting

Basic training:

Rolling bearing technology

Training content: Basic knowledge of rolling bearings and their use. Our rolling bearing experts will explain types, characteristics and designations of rolling bearings as well as rolling bearing failures and their causes. In the practical part of the training, correct mounting and dismounting of rolling bearings and various mounting and dismounting tools will be explained.

Target group: Head foremen, foremen and mounting personnel from maintenance workshops and interested employees. No special prior knowledge is required.

Training objective: The participants will learn the correct and professional handling of rolling bearings and gain basic knowledge of mounting and dismounting.

Duration: 1–2 days

Basic training:

Spindle bearing technology

Training content: Basic knowledge of spindle bearings and their use. Our spindle bearing experts will explain the types, characteristics and designations of spindle bearings. The subjects of lubrication and specific spindle bearing failures will also be discussed. In the practical part of the training, our spindle bearing experts will present the correct mounting and dismounting of spindle bearings and the use of various measurement and mounting tools.

Target group: Head foremen, foremen and mounting personnel from maintenance workshops and interested employees. No special prior knowledge is required.

Training objective: The participants will gain basic knowledge of spindle bearings and their mounting, dismounting and maintenance.

Duration: 1 day

Product training:

Mounting tools

Training content: The focus is on various tools for the correct mounting and dismounting of rolling bearings. Particular emphasis is placed on the correct use of tools in practical situations. The precise content of this customer-specific training is always agreed with the customer.

Target group: Head foremen, foremen and mounting personnel from maintenance workshops and interested employees. No special prior knowledge is required.

Training objective: The participants will learn the correct use of the mounting and dismounting tools presented.

Duration: By agreement



Training · Training descriptions

Mounting

Rolling bearing maintenance for rail vehicle maintenance personnel

Training content: Knowledge of the maintenance of wheelset bearings based on cylindrical and tapered roller bearings. Rolling bearing experts from Application Engineering - Railway will communicate current knowledge of the bearings and their applications. In the practical part of the training, experienced setting supervisors will pass on their knowledge concerning manual work for rolling bearing maintenance and show correct handling using selected demonstration items.

Target group: Head foremen, foremen and mounting personnel from workshops for rail vehicle maintenance.

Training objective: The participants will receive practical guidance on the maintenance of wheelset bearings based on simple cylindrical and tapered roller bearings.

Duration: 1,5 days



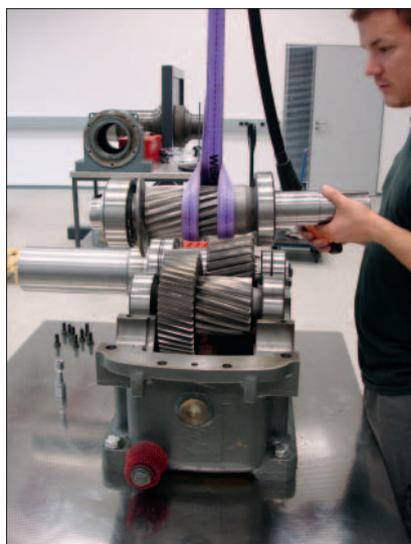
Practical training: Rolling bearing mounting

Training content: Detailed knowledge of the mounting and dismounting of rolling bearings. On various mounting platforms, common rolling bearing arrangements from the fields of steel, paper and mining as well as a gearbox can be mounted and dismounted. This involves various tools and methods for mounting and dismounting.

Target group: Head foremen, foremen and mounting personnel from maintenance workshops and interested employees. The precondition is previous attendance at the training course “Basic training: Rolling bearing technology”.

Training objective: The participants will learn the correct and professional handling of rolling bearings and gain detailed knowledge of their mounting and dismounting as well as the use of various mounting and dismounting tools.

Duration: By agreement



Training · Training descriptions

Lubrication · Condition monitoring

Lubrication

Product training:
Lubrication systems
FAG Motion Guard

Training content: Knowledge of the functionalities, possible applications and handling of the lubrication systems FAG Motion Guard. The focus is on the safe handling and general operating conditions of these systems.

Target group: Head foremen, foremen and mounting personnel from maintenance workshops and interested employees. No special prior knowledge is required.

Training objective: The participants will be able to correctly select and use the various products in the lubrication system FAG Motion Guard in order to avoid unplanned machine downtime due to incorrect lubrication.

Duration: By agreement



Product training:
FAG Arcanol lubricants

Training content: Detailed knowledge of the FAG lubricants family in relation to possible applications and handling. It will be shown how selection of the correct lubricant can improve the performance capacity and rating life of rolling bearings.

Target group: Head foremen, foremen and mounting personnel from maintenance workshops and interested employees. No special prior knowledge is required.

Training objective: The participants can select the correct lubricant for their application.

Duration: By agreement

Condition monitoring

Product training:
FAG Top-Laser
SMARTY2, TRUMMY2 and INLINE

Training content: Basic knowledge of the alignment of belt drives and shafts and the measurement of tension in belt drives. With the aid of practical examples, the functionality, application and handling of the measuring systems FAG Top-Laser SMARTY2, TRUMMY2 and INLINE are explained.

Target group: Head foremen, foremen and mounting personnel from maintenance workshops and interested employees. No special prior knowledge is required.

Training objective: The participants will be able to carry out alignment work themselves using the measuring systems.

Duration: By agreement



Training · Training descriptions

Condition monitoring

Product training: **FAG Detector III Basic**

Training content: Basic knowledge of vibration theory and vibration monitoring as well as the handling of the measuring system FAG Detector III. The course participants will receive an overview of the functionality, possible applications and configuration/handling of the measuring system.

Target group: Technicians and engineers from maintenance departments and interested employees. No special prior knowledge is required.

Training objective: The participants can prepare simple monitoring configurations, carry out measurements using FAG Detector III and detect simple machine defects by means of trend analyses as well as determine the causes on the basis of the time signal and spectrum.

Duration: 3 days

Product training: **FAG Detector III Balancing**

Training content: Knowledge of balancing by means of the FAG Detector III Balancing Kit. In addition to basic knowledge of balancing in general, special attention is paid to the balancing process with the aid of the FAG Detector III Balancing Kit. In practical exercises, the participants learn how to use the device safely and carry out balancing processes independently.

Target group: Participants who are already familiar with the FAG Detector III and would now additionally like to learn about the use of the FAG Detector III Balancing Kit. This requires previous attendance at the product training course “FAG Detector III Basic”.

Training objective: The participants will learn how to safely use the FAG Detector III during balancing operations.

Duration: 1 day

Product training: **FAG Detector III Advanced**

Training content: Detailed knowledge of vibration monitoring. Special subjects such as the symptoms of various machine defects and aspects of the condition monitoring of individual machine parts are discussed in detail and in some cases implemented in practical exercises with FAG Detector III.

Target group: Technicians and engineers from maintenance departments as well as interested employees who have already attended the course “FAG Detector III Basic” or have at least one year’s experience with FAG Detector III or similar measuring systems.

Training objective: The participants can identify symptoms of individual machine defects and determine their causes.

Duration: 2 days



Training · Training descriptions

Condition monitoring

Product training: F'IS Administrator 4

Training content: Knowledge of the installation and individual modules of the software F'IS Administrator 4. The focus is on the function of the individual modules and the use of the Data Viewer – a special analysis tool. In addition, the principles of communication technologies are presented.

Target group: Technicians and engineers from maintenance departments as well as interested employees who are planning to use one of the FAG online monitoring systems (FAG ProCheck and FAG DTECT X1). Attendance requires at least one year's practical experience with vibration monitoring devices or previous attendance at the training courses "FAG Detector III Basic" and "FAG Detector III Advanced".

Training objective: The participants will be able to install the software F'IS Administrator 4 and use the individual modules for the configuration of monitoring work and the evaluation of measurement data.

Duration: 2 days

Product training: FAG DTECT X1* (with F'IS Administrator 4)

Training content: Knowledge of the online monitoring system FAG DTECT X1 in relation to functionalities, possible applications and handling. Particular emphasis is placed on the versatile configuration options of the system. Practical exercises are used to achieve more detailed knowledge of the system.

Target group: Technicians and engineers from maintenance departments and interested employees. This requires previous attendance at the product training course "F'IS Administrator 4".

Training objective: The participants will be able to configure the monitoring system FAG DTECT X1 independently and prepare, perform and evaluate measurement processes.

Duration: 2 days

* Also usable for FAG WiPro.

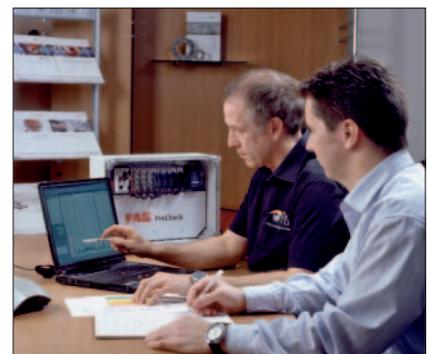
Product training: FAG ProCheck (with F'IS Administrator 4)

Training content: Knowledge of the online monitoring system FAG ProCheck. The focus is on configuration and independent preparation, implementation and evaluation of measurement processes using practical examples.

Target group: Technicians and engineers from maintenance departments and interested employees. This requires previous attendance at the product training course "F'IS Administrator 4".

Training objective: The participants will be able to configure the monitoring system FAG ProCheck independently and prepare, perform and evaluate measurement processes.

Duration: 2 days



Training · Training descriptions

Condition monitoring

Product training: FAG VibroCheck: Installation (hardware)*

Training content: Knowledge of the use of the FAG VibroCheck (VC) hardware. The focus is on the interaction between the VC hardware and software (e.g. in hardware tests, sensor tests). The participants will learn to use terminal and circuit plans so they can independently undertake expansion of the VC hardware.

Target group: Persons who are responsible for the installation and maintenance of the monitoring system FAG VibroCheck. Important preconditions are therefore PC and Windows knowledge as well as knowledge of electrical installation work.

Training objective: The participants will be able to configure the monitoring system FAG VibroCheck independently and carry out hardware and software installation.

Duration: 2 days

Product training: FAG VibroCheck: Application (software)*

Training content: Knowledge of vibration monitoring with the aid of the online monitoring system FAG VibroCheck as well as detailed knowledge of vibration analysis. The focus is on monitoring configuration and the evaluation of the recorded measurement data.

Target group: Persons who would like to perform vibration monitoring using FAG VibroCheck. Attendance requires at least one year's practical experience with vibration monitoring devices or previous attendance at the training courses "FAG Detector III Basic" and "FAG Detector III Advanced".

Training objective: The participants will be able to work independently with the online monitoring system FAG VibroCheck, visualise plants using the VC software and analyse trend data, time signals and frequency spectra. They can assess and interpret characteristic values and expert alarms and handle the alarm logbook.

Duration: 2 days

Product training: FAG DTECT X1 (with F'IS Administrator 3.8)**

Training content: Knowledge of the online monitoring system FAG DTECT X1 together with the software F'IS Administrator 3.8. The focus is on functionalities and possible applications as well as on the versatile configuration options. Practical exercises are used to achieve more detailed knowledge of the system. In addition, the principles of communication technology in the field of teleservice are presented.

Target group: Technicians and engineers from maintenance departments and interested employees. Experience in vibration monitoring is an advantage.

Training objective: The participants will be able to configure the monitoring system FAG DTECT X1 independently and prepare, perform and evaluate measurement processes.

Duration: 4 days

** Also usable for FAG WiPro.

* The training courses "FAG VibroCheck: Installation (hardware)" and "FAG VibroCheck: Application (software)" are only bookable as a single package (total duration: 4 days).



Training · Training descriptions

Maintenance management

Maintenance management

User training for implemented CMMS

Training content: This course focuses on the establishment and use of the Computerised Maintenance Management System (CMMS) implemented at the customer. The precise content is defined in consultation with the customer.

Target group: Persons who operate a CMMS in their company. No special prior knowledge is required.

Training objective: The participants will learn how to use the CMMS and will acquire sound knowledge relating to the relevant key points of the training.

Duration: By agreement

CMMS administrator training

Training content: The subjects are the support and maintenance of the CMMS implemented at the customer. The customer can select the content in accordance with his requirements from the fields of database management, Internet technology, server support and authorisation concepts.

Target group: System administrators and key users of CMMS.

Training objective: The participants will learn about independent support and maintenance of a CMMS.

Duration: By agreement



Training · Training aids

Rolling bearing mounting cabinet and mounting sets: Basic course for vocational training

There is plenty of literature available on the the correct mounting of bearings. However, there is a general lack of parts on which apprentices can practise as realistic as possible. The trainers from the Schaeffler training workshops therefore compiled a basic course. The aim of this rolling bearing course is to communicate knowledge of the selection of the correct bearing, correct mounting and dismounting and the maintenance of bearing positions. It is therefore divided into two parts. A theoretical part covers the basic knowledge of rolling bearing technology, while the practical part covers the basic skills involved in mounting and dismounting. In the theoretical part, particular attention was paid to combining

technical drawing, technical calculation and technical theory in one learning unit. The practical part uses exemplary simplified mating parts (shafts, housings) on which the mounting and dismounting of common types of bearings can be practised with the aid of mechanical or hydraulic devices.

The content is composed of smaller learning stages and does not go beyond the degree of difficulty that is currently required in vocational training.

Building on this basic course, other assemblies such as gearboxes, pumps, spindles, road vehicle wheels etc. can be prepared for training.

Handbook 1 (Theoretical part)

- Technical theory
- Technical calculation
- Technical drawing

Handbook 2 (Practical part)

- Mounting of bearings with cylindrical bore
- Mounting of bearings with tapered bore
- Hydraulic method
- Exercises on shafts and housings

Technical data

Mounting cabinet:
Dimensions 1135×710×380 mm

Mass (including contents) 94 kg
Designed for 10 mounting exercises:
on 5 shafts
on 2 housings
on 3 shafts and housings
Smallest shaft diameter: 15 mm
Largest shaft diameter: 55 mm

Ordering designation
(mounting cabinet with contents and mounting bracket):
TRAINING-CABINET-MOD-1A-D



Further demonstration models for training are always available on request. Please contact:
info@fis-services.com

Training • Training aids

Mounting set 1

Mounting set 1 is an **additional exercise** to the FAG mounting cabinet and facilitates the mounting of a self-aligning ball bearing in a housing.

Mounting set 1:

Plummer block housing

Suitable for the following exercises:

- Checking the bearing position
- Mounting of adapter sleeve and bearing
- Mounting as locating bearing
- Mounting as non-locating bearing
- Mounting as through shaft
- Mounting in housing closed on one side
- Dismounting of bearing and adapter sleeve

Ordering designation:

TRAINING-CABINET-MOD-1B



Mounting sets 2 and 3

The trainer can use the FAG mounting sets 2 and 3 – **individual exercises** from the FAG mounting cabinet – to demonstrate the mounting and dismounting of

Mounting set 2:

Shaft with housing

Suitable for the following exercises:

- Selection of fits
- Checking the bearing positions
- Mounting the bearing on the shaft
- Axial location of the bearing
- Mounting of the rotary shaft seal
- Assembly (locating bearing)
- Dismounting using extractor

Ordering designation:

TRAINING-CABINET-MOD-2



rolling bearings during teaching or have the apprentices carry these out. The shaft and housing parts can be clamped in a vice for mounting.

Mounting set 3:

Hydraulic mounting

Suitable for the following exercises:

- Mounting with the aid of pressure screws
- Mounting using a hydraulic nut
- Setting and checking the radial internal clearance
- Axial location using a locknut and tab washer
- Dismounting using an oil injector

Ordering designation:

TRAINING-CABINET-MOD-3



Training videos:

1 × 1 of rolling bearings

The film is particularly suitable for communicating initial basic knowledge of rolling bearings. It presents all types of bearings and highlights their characteristic features.

Ordering designation:

TRAINING-VIDEO-201-D

Mounting and dismounting of rolling bearings

The film explains the most important

rules of mounting in simple pictures and text. Cardinal mistakes are named in simple unambiguous terms. It is clearly shown, step by step, how various bearings are to be correctly mounted.

Ordering designation:

TRAINING-VIDEO-202-D

Hydraulic method for mounting and dismounting of large rolling bearings

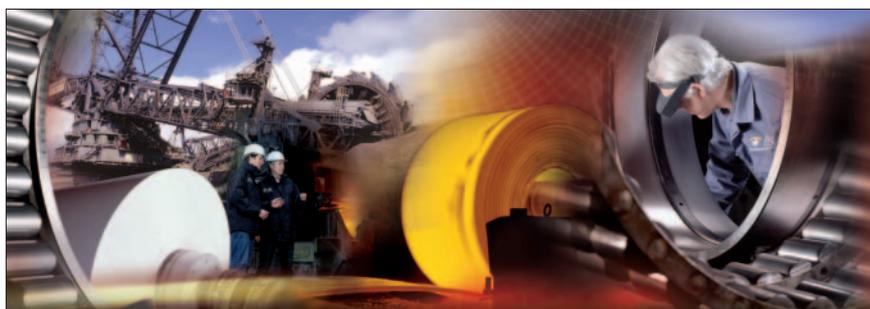
The film shows, using simulated and real scenes, all the common methods and devices in hydraulic

mounting: pumps, hydraulic nuts, special extraction devices, adapter and extraction sleeves. It is also demonstrated what must be paid attention in the case of tapered or cylindrical shaft seats, and how the radial internal clearance or axial displacement should be correctly measured so that the mounted parts are correctly seated on the shaft.

Ordering designation:

TRAINING-VIDEO-203-D

Smart Performance Program Success through Collective Competence



How can maintenance costs be reduced and plant availability increased? In order to fulfil this demanding task, the Schaeffler Group has brought the Smart Performance Program into being. This overarching concept brings together the decades of experience in the fields of services and products. As a result, it is possible to develop more comprehensive customer-specific maintenance concepts that contribute to increasing operational performance capacity and to reducing life cycle costs.

Overarching product and service portfolio

For the customer, this means: access to all rolling bearing-related products and services that are necessary for operation and maintenance.

Increasing plant availability, preventing downtime

Within the framework of the Smart Performance Program, rolling bearing and service solutions are presented that focus on the entire life cycle of machinery and plant. These are tangibly expressed in longer running times, shorter downtime and lower overall costs.

This applies irrespective of whether the customer requires help on an individual problem or a complete solution for his plant machinery.

Worldwide support

Specially trained skilled employees, the Field Service Engineers (FSE), provide the customer with direct support on site worldwide. The spectrum of services includes mounting, condition monitoring and repair as well as plant-specific advisory support and training. Due to their outstanding sector know-how, the FSE have precise knowledge of the requirements of their customers. Since the FSE work with all areas of the Schaeffler Group, plant operators and maintenance personnel can benefit from the broad knowledge of a global company – without the need to change contact persons. Numerous applications (Smart Performance Solutions) demonstrate that considerable savings can be achieved with the new Smart Performance Program.

Some examples from various sectors

Sector	Smart Performance Solution	Customer benefit
Steel and non-ferrous metals	Mounting Service at a Wire Mill reduces Downtime Costs	Cost saving 400 000 Euro
Wind energy	Condition Monitoring of Wind Turbines	Prevention of gearbox and generator replacement: cost saving > 400 000 Euro
Pulp and Paper	FAG Anti Slippage Spherical Roller Bearings for Nipco Rolls in Paper Machines	Bearing operating life increased by a factor of ten: cost saving 100 000 Euro

Further information on the Smart Performance Program and a wide selection of Smart Performance Solutions can be found on the home page www.smartperformanceprogram.com and in the publication FIS001.

Publications · Index of FAG products · Comparison of ordering designations

Power generation devices
Technical Product Information

Therm
rings
mation



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Publications

Publications		
Ordering designation	Old ordering designation (for comparison purposes only!)	Title
General		
WL 80 143	–	Competence in Maintenance
FIS001	–	Smart Performance Program
WL 80 601	–	Optimising processes in the Steel Industry
TPI 177	–	Optimising processes in the Paper Industry
Mounting		
TPI WL 80-50	–	FAG Pressure Generation Devices
TPI WL 80-54	–	FAG Heating Devices PowerTherm for mounting of rolling bearings
TPI WL 80-56	–	FAG Tools for Mounting and Dismounting of Rolling Bearings
TPI WL 80-57	–	FAG Hydraulic Nuts
TPI 180	–	FAG tools for thermal dismounting
WL 80 100	–	Mounting of rolling bearings
WL 82 102	–	Rolling Bearing damage
Lubrication		
TPI 168	WL 81 116	Arcanol – Grease tested for use in rolling bearings
WL 80 346	–	FAG Motion Guard – the intelligent lubricators
WL 81 115	–	Lubrication of rolling bearings
Condition monitoring		
TPI 182	TPI WL 80-55	FAG Alignment Tools
TPI WL 80-60	–	Condition Monitoring with FAG Products
TPI WL 80-64	–	FAG Detector III – The solution for monitoring and balancing
TPI 170	TPI WL 80-65	FAG DTECT X1 – Continuous Monitoring of Plant and Machinery
TPI WL 80-66	–	FAG WiPro – Wind Turbine Protection
TPI WL 80-67	–	FAG VibroCheck – Online monitoring system for heavy industry
TPI WL 80-68	–	FAG Easy Check · FAG Easy Check Online
TPI WL 80-69	–	FAG ProCheck – State of the art machinery monitoring for maximum availability
Rolling bearing reconditioning		
TPI WL 80-72	–	Reconditioning and Repair of Rolling Bearings
Training		
TPI WL 80-71	–	Training Courses – Rolling Bearings and Condition Monitoring
Multimedia		
CD Medias 4.2		Electronic INA/FAG rolling bearing catalogue
CD – MGSM 2.0		FAG Motion Guard SELECT MANAGER
CD – MM 1.1		FAG Mounting Manager
TRAINING-VIDEO-201-D (E)	VIDEOFILM201D (E)	1 × 1 of rolling bearings in German (English)
TRAINING-VIDEO-202-D (E)	VIDEOFILM202D (E)	Mounting and dismounting of rolling bearings in German (English)
TRAINING-VIDEO-203-D (E)	VIDEOFILM203D (E)	Hydraulic method for mounting and dismounting of large rolling bearings in German (English)

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Comparison of ordering designations

Comparison of ordering designations	
Ordering designation for Europe	Ordering designation for countries outside Europe
AGGREG-E700 AGGREG-P1000-1/P2500-2	AGGREGATE.E700 AGGREGATE.P1000/2500
ARCA-GREASE-GUN ARCA-GREASE-GUN.HOSE	ARCA.GREASE-GUN ARCA.GREASE-GUN.HOSE
ARCA-PUMP-25 (~180) ARCA-PUMP-BARREL-25-S (~BARREL-50-S, ~BARREL-180-S) ARCA-PUMP-BARREL.GUN-METER	ARCA.PUMP.25 (~180) ARCA.PUMP.25.BARREL-S (~50.BARREL-S, ~180.BARREL-S) ARCA.PUMP.BARREL-GUN-METER
ARCALUB-... ARCALUB-CLEAR-...	ARCA.LUB. ... ARCA.LUB.CLEAR
ARCALUB.ACTIVE-1M (~3M, ~6M, ~12M) ARCALUB.ACTIVE-CLEAR-1M (~3M, ~6M) ARCALUB.ACTIVE-POLAR	ARCA.LUB.ACTIVE.1M (~3M, ~6M, ~12M) ARCA.LUB.ACTIVE.CLEAR.1M (~3M, ~6M) ARCA.LUB.ACTIVE.POLAR
ARCALUB.LC60-... (~LC120-..., ~LC250-...) ARCALUB.LC120-...-KIT (~LC250-...-KIT)	ARCA.LUB.LC60 (~LC120, ~LC250) ARCA.LUB.LC120.SET (~LC250.SET)
ARCALUB-C6-250-KIT (~500-KIT) ARCALUB-C6-CONTROL-250-KIT (~500-KIT)	ARCA.LUB.C6-250.KIT (~500.KIT) ARCA.LUB.C6-CONTROL-250.KIT (~500.KIT)
ARCANOL-ANTICORROSIONOIL-400G	ARCA.ANTICORROSIONOIL.400G
ARCANOL-BIO2-... ARCANOL-FOOD2-... ARCANOL-LOAD150-... ARCANOL-LOAD220-... ARCANOL-LOAD400-... ARCANOL-LOAD1000-... ARCANOL-MULTITOP-... ARCANOL-MULTI2-... ARCANOL-MULTI3-... ARCANOL-SPEED2,6-... ARCANOL-TEMP90-... ARCANOL-TEMP110-... ARCANOL-TEMP120-... ARCANOL-TEMP200-... ARCANOL-VIB3-...	ARCA.GREASE.BIO2... ARCA.GREASE.FOOD2... ARCA.GREASE.LOAD150... ARCA.GREASE.LOAD220... ARCA.GREASE.LOAD400... ARCA.GREASE.LOAD1000... ARCA.GREASE.MULTITOP... ARCA.GREASE.MULTI2... ARCA.GREASE.MULTI3... ARCA.GREASE.SPEED2,6... ARCA.GREASE.TEMP90... ARCA.GREASE.TEMP110... ARCA.GREASE.TEMP120... ARCA.GREASE.TEMP200... ARCA.GREASE.VIB3...
ARCANOL-MOUNTINGPASTE-...	ARCA.MOUNTINGPASTE...

Comparison of ordering designations

Comparison of ordering designations	
Ordering designation for Europe	Ordering designation for countries outside Europe
BEARING-MATE250-450 (~450-650; ~650-850)	BEARING.MATE250-450 (~450-650; ~650-850)
COIL...X...-LOW..	EIM...K...
COIL...X...-MAIN...	EIM...N...
COIL.SWITCH-CABINET-...	SSK...
COIL.SWITCH-PEDAL-...	FS...
COIL.TRAFO-...	EFB...
DETECT3-KIT	FIS.DETECTORIII.KIT
DETECT3-KIT-RFID	FIS.DETECTORIII.KIT.RFID
DETECT3.BALANCE-KIT	FIS.DETECTORIII.BALANCING.KIT
EASY-CHECK	FIS.EASYCHECK.V1
EASY-CHECK-ONLINE	FIS.EASYCHECK.ONLINE.SET
FEELER-GAUGE-100 (~300)	FEELER.GAUGE100 (~300)
FITTING-TOOL-ALU-10-50	FITTING.TOOL.ALU.SET10-50
FITTING-TOOL-STEEL-10-50	FITTING.TOOL.STEEL.SET10-50
GLOVE1 (~2)	HANDSCHUH1 (~2)
HEATER10	HEATER10
HEATER20	HEATER20
HEATER35	HEATER35
HEATER150	HEATER150
HEATER300	HEATER300
HEATER600	HEATER600
HEATER1200	HEATER1200
HEATER3000	HEATER3000
HEATER-PLATE	HEATER.PLATE
HEATER-PLATE-370C	HEATER.PLATE.370C
HEATING-RING-...	HEATING.RING...
HEATING-RING.PASTE-20ML	HEATING.RING.PASTE.20ML
HYDNUT...	HYD.NUT...
HYDNUT...-HEAVY	HYD.NUT...HEAVY
HYDNUT...-INCH	HYD.NUT...INCH
INJECT1600 (~2500)	OILINJECTOR1600 (~2500)
INJECT1600.VALVE (~2500.VALVE)	OILINJECTOR...VALVE
INJECT1600-SET (~2500-SET)	OILINJECTOR....SET

Comparison of ordering designations

Comparison of ordering designations	
Ordering designation for Europe	Ordering designation for countries outside Europe
KLR...	KLR...
LASER-INLINE	LASER.INLINE
LASER-SMARTY2	LASER.SMARTY2
LASER-TRUMMY2	LASER.TRUMMY2
LASER.SHIM-SET	LASER.SHIMS.SET
LASER.SHIM..X...	LASER.SHIMS...
LOCKNUT-DOUBLEHOOK-KM..	LOCKNUT.DOUBLEHOOK.KM...
LOCKNUT-DOUBLEHOOK-KM...-KIT	LOCKNUT.DOUBLEHOOK.KM...KIT
LOCKNUT-DOUBLEHOOK-KM...-SET	LOCKNUT.DOUBLEHOOK.KM...SET
LOCKNUT-FACEPIN-...	LOCKNUT.FACE-PIN...
LOCKNUT-FLEXIHOOK-...	LOCKNUT.FLEXI-HOOK...
LOCKNUT-FLEXIPIN-...	LOCKNUT.FLEXI-PIN...
LOCKNUT-HOOK-KM...	LOCKNUT.HOOK.KM...
LOCKNUT-SOCKET-KM...	LOCKNUT.SOCKET.KM...
MGA31-...	MGA31
MGI21-...	MGI21
MGK132 (~133)	MGK132 (~133)
PULLER...	ABZIEHER...
PULLER-HYD...	PULLER.HYD...
PULLER-INTERNAL10/100-SET	PULLER.INTERNAL.SET10-100
PULLER-TRISECTION-...	PULLER.TRISECTION...
PUMP1000-...L (~1600-...L, ~2500-...L)	PUMP1000...L (~1600...L, ~2500...L)
PUMP2500-0,2L-KIT	PUMP2500.0,2L.SET
PUMP4000-0,2L	PUMP4000.0,2L
PUMP.ADAPTER-A-...(~B-...)	PUMP.ADAPTER.A....(~B....)
PUMP.HOLDER-2 (~3)	PUMP.HOLDER.2 (~3)
PUMP....MANO-G1/2	PUMP....MANO.G1/2
PUMP....MANO-DIGI	PUMP....MANO.DIGI
PUMP.NIPPLE-A-...(~B-...)	PUMP.NIPPLE.A....(~B....)
PUMP.PIPE-...	PUMP.PIPE....

Comparison of ordering designations

Comparison of ordering designations	
Ordering designation for Europe	Ordering designation for countries outside Europe
PUMP.SLEEVE-CONNECTOR-...	PUMP.SLEEVE.CONNECTOR....
SNAP-GAUGE-.../... SNAP-GAUGE.MASTER...	SNAP.GAUGE...-... SNAP.GAUGE.MASTER.DISK
SOUND-CHECK	SOUND.CHECK
TACHOMETER	TACHOMETER
TEMP-CHECK-CONTACT	TEMP.MG
TEMP-CHECK-PLUS	TEMP.CHECK.PLUS
TOOL-RAILWAY-AGGREGATE	TAROL.MOUNTING.AGGREGATE
TRAINING-CABINET-MOD-1A-D (~E, ~F, ~NL) TRAINING-CABINET-MOD-1B (~2, ~3)	MOUNTING.CABINET.D (~E, ~F, ~NL) MOUNTING.CABINET.SET3 (~SET1, ~SET2)

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Issued: 2010, March

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WL 80 250/4 EA