



Assembly and Operating Instructions



Industrial Gear Units
X..e/HM Series Agitator Gear Unit
Sizes 150 – 260



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1 General information

1.1 About this documentation

The documentation at hand is the original.

This documentation is an integral part of the product. The documentation is intended for all employees who perform work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the systems and their operation as well as persons who work on the product independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or if you require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

The following table shows the graduation and meaning of the signal words in the safety notes.

Signal word	Meaning	Consequences if not observed
▲ DANGER	Imminent danger	Death or severe injuries
▲ WARNING	Possibly dangerous situation	Death or severe injuries
▲ CAUTION	Possibly dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

1.2.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:



SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning about suspended load
	Warning of automatic restart

1.2.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous step.

This is the formal structure of an embedded safety note:

⚠ SIGNAL WORD! Type and source of danger. Possible consequence(s) if disregarded. Measure(s) to prevent danger.

1.3 Decimal separator in numerical values

In this document, a period is used to indicate the decimal separator.

Example: 30.5 kg

1.4 Product names and trademarks

The product names mentioned in this documentation are trademarks or registered trademarks of the respective titleholders.

1.5 Copyright notice

© 2024 SEW-EURODRIVE. All rights reserved. Copyright law prohibits the unauthorized reproduction, modification, distribution and use of this document – in whole or in part.

1.6 Recycling, reprocessing, reuse

SEW-EURODRIVE GmbH & Co KG strives to use as few new natural resources as possible in the production of its products. An important aspect of this is the circular economy with the recycling of materials as well as the inspection and/or reprocessing of returned components and their reuse in new products. SEW-EURODRIVE GmbH & Co KG only uses these processes if the resulting materials and components are of the same quality as new parts.

1.7 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the product.

1.8 Other applicable documentation

The following documentation should also be observed:

- X..e Series Helical and Bevel-Helical Gear Units catalog
- Order documents, e.g. dimension sheet, order confirmation, etc.
- If required, the "AC Motors" operating instructions
- If required, the operating instructions of the installed options

2 Safety notes

2.1 Preliminary information

The following general safety notes serve the purpose of preventing injury to persons and damage to property. They primarily apply to the use of products described in this documentation. If you use additional components, also observe the relevant warning and safety notes.

2.2 Duties of the user

As the user, you must ensure that the basic safety notes are observed and complied with. Make sure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it.

As the user, you must ensure that all of the work listed in the following is carried out only by qualified specialists:

- Setup and installation
- Installation and connection
- Startup
- Maintenance and repairs
- Shutdown
- Disassembly

Ensure that the persons who work on the product pay attention to the following regulations, conditions, documentation, and information:

- The national and regional regulations governing safety and the prevention of accidents
- Product safety label on the product
- All other associated project planning documents, installation and startup instructions, as well as wiring diagrams
- Do not assemble, install or operate damaged products
- All system-specific specifications and regulations

Ensure that systems in which the product is installed are equipped with additional monitoring and protection devices. Observe the applicable safety regulations and legislation governing technical work equipment and accident prevention regulations.

2.3 Target group

Specialist for mechanical work

Any mechanical work may be performed only by adequately qualified specialists. Specialists in the context of this documentation are persons who are familiar with the design, mechanical installation, troubleshooting, and maintenance of the product, and who possess the following qualifications:

- Qualifications in the field of mechanics in accordance with the national regulations
- Familiarity with this documentation

Specialist for electrotechnical work

Any electrotechnical work may be performed only by electrically skilled persons with a suitable education. Electrically skilled persons in the context of this documentation are persons who are familiar with electrical installation, startup, troubleshooting, and maintenance of the product, and who possess the following qualifications:

- Qualifications in the field of electrical engineering in accordance with the national regulations
- Familiarity with this documentation

Additional qualifications

In addition to that, these persons must be familiar with the valid safety regulations and laws, as well as with the requirements of the standards, directives, and laws specified in this documentation.

The persons must have the express authorization of the company to operate, program, parameterize, label, and ground devices, systems, and circuits in accordance with the standards of safety technology.

Instructed persons

All work in the areas of transport, storage, installation, operation and waste disposal may only be carried out by persons who are trained and instructed appropriately. These instructions must enable the persons to carry out the required activities and work steps safely and in accordance with regulations.

2.4 Designated use

The industrial gear units are gear units run by motors for industrial and commercial systems. The units may only be run at the speeds and powers shown in the technical data or on the nameplate. Implementing gear unit loads other than the permitted values or operating the gear units in areas of application other than industrial and commercial systems is only permitted after consultation with SEW-EURODRIVE.

Using these products in potentially explosive atmospheres is prohibited, unless specifically designated otherwise.

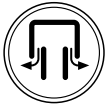
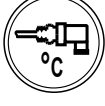
In compliance with the EC Machinery Directive 2006/42/EC, the industrial gear units are partly completed machinery for installation in machinery and systems. In the scope of the EC directive, you must not take the machinery into operation in the designated fashion until you have established that the end product complies with Machinery Directive 2006/42/EC.

2.5 Symbols on the gear unit

The symbols on the gear unit must be observed. They have the following meaning:

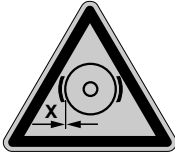
Symbols	Meaning
	Screws of strength class 10.9 must be used for foot mounting.
	Indicates the oil filling point . Also serves as proper ventilation when changing the oil.
	Indicates the oil drain .

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Symbols	Meaning
	Indicates the position of the breather . Serves to avoid mistaking the oil measuring position for the venting position.
	Used to avoid faults due to lack of understanding. Observe the information in the operating instructions.
	Indicates the magnetic oil dipstick .
	Indicates the magnetic oil drain plug .
	Indicates the position of the relubrication points and makes it easier to find the points to be lubricated. Helps prevent bearing damage.
	Indicates the water supply and is used to locate the connection option.
	Indicates the water return and is used to locate the connection option.
	Indicates the oil supply and is used to locate the connection option.
	Indicates the oil return and is used to locate the connection option.
	Indicates the position of the temperature sensor/temperature switch .
	Indicates the grease drain screw and is used to locate the grease drain option.
	Caution: Risk of burns due to hot surface.
	Caution: Removing the dipstick during operation may result in damage to the gear unit.

Symbols	Meaning
	Caution: Risk of burns due to hot gear oil.

The following gear unit labels can be removed from the gear unit after startup:

Meaning							
Brake not set at the factory.							
VORSICHT NOTICE ATTENTION PRECAUCIÓN VOORZICHTIG OSTROŻNIE   18855199 <table> <tr> <td> DE Die Bremse ist ab Werk nicht eingestellt. Mögliche Sachschäden! • Bremse vor der Inbetriebnahme gemäß Betriebsanleitung einstellen </td><td> EN The brake has not been set at the factory Potential damage to property! • Prior to startup, set the brake according to the operating instructions. </td></tr> <tr> <td> F Le frein n'est pas réglé d'usine. Risque de dommages matériels ! • Avant la mise en service, régler le frein conformément aux instructions de la notice d'exploitation. </td><td> ES El freno no viene ajustado de fábrica. ¡Posibles daños materiales! • Antes de la puesta en marcha, ajustar el freno según las instrucciones de funcionamiento. </td></tr> <tr> <td> NL De rem is niet af fabriek ingesteld. Mogelijke materiële schade! • Rem voor de inbedrijfstelling conform technische handleiding instellen. </td><td> PL Hamulec nie jest ustawiony fabrycznie. Możliwe szkody materialne! • Przed uruchomieniem należy ustawić hamulec zgodnie z wytycznymi z instrukcji obsługi. </td></tr> </table>		DE Die Bremse ist ab Werk nicht eingestellt. Mögliche Sachschäden! • Bremse vor der Inbetriebnahme gemäß Betriebsanleitung einstellen	EN The brake has not been set at the factory Potential damage to property! • Prior to startup, set the brake according to the operating instructions.	F Le frein n'est pas réglé d'usine. Risque de dommages matériels ! • Avant la mise en service, régler le frein conformément aux instructions de la notice d'exploitation.	ES El freno no viene ajustado de fábrica. ¡Posibles daños materiales! • Antes de la puesta en marcha, ajustar el freno según las instrucciones de funcionamiento.	NL De rem is niet af fabriek ingesteld. Mogelijke materiële schade! • Rem voor de inbedrijfstelling conform technische handleiding instellen.	PL Hamulec nie jest ustawiony fabrycznie. Możliwe szkody materialne! • Przed uruchomieniem należy ustawić hamulec zgodnie z wytycznymi z instrukcji obsługi.
DE Die Bremse ist ab Werk nicht eingestellt. Mögliche Sachschäden! • Bremse vor der Inbetriebnahme gemäß Betriebsanleitung einstellen	EN The brake has not been set at the factory Potential damage to property! • Prior to startup, set the brake according to the operating instructions.						
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NL De rem is niet af fabriek ingesteld. Mogelijke materiële schade! • Rem voor de inbedrijfstelling conform technische handleiding instellen.	PL Hamulec nie jest ustawiony fabrycznie. Możliwe szkody materialne! • Przed uruchomieniem należy ustawić hamulec zgodnie z wytycznymi z instrukcji obsługi.						
9007204570571147							
Coupling is delivered without grease.							
VORSICHT NOTICE ATTENTION PRECAUCIÓN VOORZICHTIG OSTROŻNIE   18977405 <table> <tr> <td> DE Kupplung wird ohne Fett geliefert. Mögliche Sachschäden! • Vor der Inbetriebnahme Kupplung mit Fett befüllen. </td><td> EN Coupling delivered without grease Possible damage to property. • Fill coupling with grease prior to startup. </td></tr> <tr> <td> F L'accouplement est livré sans graisse. Risque de dommages matériels ! • Avant la mise en service, remplir l'accouplement de graisse. </td><td> ES El acoplamiento se suministra sin grasa. ¡Posibles daños materiales! • Llenar el acoplamiento con grasa antes de la puesta en marcha. </td></tr> <tr> <td> NL Koppeling wordt zonder vet geleverd. Mogelijke materiële schade! • Koppeling vóór de inbedrijfstelling met vet vullen. </td><td> PL Sprzęgło jest dostarczane bez smaru. Możliwe szkody materialne! • Przed uruchomieniem należy napelnić sprzęgło smarem. </td></tr> </table>		DE Kupplung wird ohne Fett geliefert. Mögliche Sachschäden! • Vor der Inbetriebnahme Kupplung mit Fett befüllen.	EN Coupling delivered without grease Possible damage to property. • Fill coupling with grease prior to startup.	F L'accouplement est livré sans graisse. Risque de dommages matériels ! • Avant la mise en service, remplir l'accouplement de graisse.	ES El acoplamiento se suministra sin grasa. ¡Posibles daños materiales! • Llenar el acoplamiento con grasa antes de la puesta en marcha.	NL Koppeling wordt zonder vet geleverd. Mogelijke materiële schade! • Koppeling vóór de inbedrijfstelling met vet vullen.	PL Sprzęgło jest dostarczane bez smaru. Możliwe szkody materialne! • Przed uruchomieniem należy napelnić sprzęgło smarem.
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9007204570573323							

Meaning							
Coupling is delivered without oil.							
VORSICHT NOTICE ATTENTION PRECAUCIÓN VOORZICHTIG OSTROŻNIE   18977413 <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; vertical-align: top; padding: 5px;"> (DE) Kupplung wird ohne Öl geliefert. Mögliche Sachschäden! • Vor der Inbetriebnahme Kupplung mit Öl befüllen. </td><td style="width: 33%; vertical-align: top; padding: 5px;"> (EN) Coupling delivered without oil Possible damage to property. • Fill coupling with oil prior to startup. </td></tr> <tr> <td style="width: 33%; vertical-align: top; padding: 5px;"> (F) L'accouplement est livré sans huile. Risque de dommages matériels ! • Avant la mise en service, remplir l'accouplement d'huile. </td><td style="width: 33%; vertical-align: top; padding: 5px;"> (ES) El acoplamiento se suministra sin aceite. ¡Posibles daños materiales! • Llenar el acoplamiento con aceite antes de la puesta en marcha. </td></tr> <tr> <td style="width: 33%; vertical-align: top; padding: 5px;"> (NL) Koppeling wordt zonder olie geleverd. Mogelijke materiële schade! • Koppeling vóór de inbedrijfstelling met olie vullen. </td><td style="width: 33%; vertical-align: top; padding: 5px;"> (PL) Sprzęgło jest dostarczane bez oleju. Możliwe szkody materialne! • Przed uruchomieniem należy napełnić sprzęgło olejem. </td></tr> </table>		(DE) Kupplung wird ohne Öl geliefert. Mögliche Sachschäden! • Vor der Inbetriebnahme Kupplung mit Öl befüllen.	(EN) Coupling delivered without oil Possible damage to property. • Fill coupling with oil prior to startup.	(F) L'accouplement est livré sans huile. Risque de dommages matériels ! • Avant la mise en service, remplir l'accouplement d'huile.	(ES) El acoplamiento se suministra sin aceite. ¡Posibles daños materiales! • Llenar el acoplamiento con aceite antes de la puesta en marcha.	(NL) Koppeling wordt zonder olie geleverd. Mogelijke materiële schade! • Koppeling vóór de inbedrijfstelling met olie vullen.	(PL) Sprzęgło jest dostarczane bez oleju. Możliwe szkody materialne! • Przed uruchomieniem należy napełnić sprzęgło olejem.
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9007204571876363							
The gear unit is protected against corrosion with VCI.							
VORSICHT NOTICE ATTENTION PRECAUCIÓN VOORZICHTIG OSTROŻNIE   18977421 <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; vertical-align: top; padding: 5px;"> (DE) Getriebe ist mit VCI rostgeschützt. Nicht öffnen! Mögliche Sachschäden! • Vor der Inbetriebnahme Vorarbeiten gemäß Betriebsanleitung durchführen. • Keine offene Flamme! </td><td style="width: 33%; vertical-align: top; padding: 5px;"> (EN) Gear unit with VCI corrosion protection. Do not open! Potential damage to property! • Prior to startup, perform preliminary work according to operating instructions • No open flames! </td></tr> <tr> <td style="width: 33%; vertical-align: top; padding: 5px;"> (F) Réducteur protégé contre la corrosion avec VCI. Ne pas ouvrir Risque de dommages matériels ! • Avant la mise en service, réaliser les travaux préliminaires indiqués dans la notice d'exploitation. • Pas de flammes ouvertes ! </td><td style="width: 33%; vertical-align: top; padding: 5px;"> (ES) Reductor está protegido con VCI contra la corrosión. ¡No abrir! ¡Posibles daños materiales! • Antes de la puesta en marcha, efectuar los trabajos preparatorios según las instrucciones de funcionamiento. • No debe haber fuego abierto. </td></tr> <tr> <td style="width: 33%; vertical-align: top; padding: 5px;"> (NL) Tandwielkast is met VCI tegen corrosie beschermd. Niet openen! Mogelijke materiële schade! • Vóór de inbedrijfstelling voorbereidingen conform technische handleiding uitvoeren. • Geen open vuur! </td><td style="width: 33%; vertical-align: top; padding: 5px;"> (PL) Przekładnia zabezpieczona jest przed korozją za pomocą środka VCI. Nie otwierać! Możliwe szkody materialne! • Przed uruchomieniem należy przeprowadzić czynności przygotowawcze zgodnie z informacjami zawartymi w instrukcji obsługi! • Unikać otwartych płomieni! </td></tr> </table>		(DE) Getriebe ist mit VCI rostgeschützt. Nicht öffnen! Mögliche Sachschäden! • Vor der Inbetriebnahme Vorarbeiten gemäß Betriebsanleitung durchführen. • Keine offene Flamme!	(EN) Gear unit with VCI corrosion protection. Do not open! Potential damage to property! • Prior to startup, perform preliminary work according to operating instructions • No open flames!	(F) Réducteur protégé contre la corrosion avec VCI. Ne pas ouvrir Risque de dommages matériels ! • Avant la mise en service, réaliser les travaux préliminaires indiqués dans la notice d'exploitation. • Pas de flammes ouvertes !	(ES) Reductor está protegido con VCI contra la corrosión. ¡No abrir! ¡Posibles daños materiales! • Antes de la puesta en marcha, efectuar los trabajos preparatorios según las instrucciones de funcionamiento. • No debe haber fuego abierto.	(NL) Tandwielkast is met VCI tegen corrosie beschermd. Niet openen! Mogelijke materiële schade! • Vóór de inbedrijfstelling voorbereidingen conform technische handleiding uitvoeren. • Geen open vuur!	(PL) Przekładnia zabezpieczona jest przed korozją za pomocą środka VCI. Nie otwierać! Możliwe szkody materialne! • Przed uruchomieniem należy przeprowadzić czynności przygotowawcze zgodnie z informacjami zawartymi w instrukcji obsługi! • Unikać otwartych płomieni!
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Meaning

The gear unit is delivered without oil.

VORSICHT NOTICE ATTENTION PRECAUCIÓN VOORZICHTIG OSTROŻNIE		
 	DE Getriebe wird ohne Öl geliefert. Mögliche Sachschäden! • Vor der Inbetriebnahme Ölbefüllung gemäß Betriebsanleitung durchführen.	EN Gear unit is delivered without oil. Potential damage to property! • Prior to startup, fill in oil according to operating instructions.
	F Le réducteur ne contient pas d'huile à la livraison. Dommages matériels possibles ! • Avant la mise en service, effectuer le remplissage d'huile conformément à la notice d'exploitation.	ES El reductor se suministra sin aceite. ¡Posibles daños materiales! • Antes de la puesta en marcha, efectuar el llenado de aceite según las instrucciones de funcionamiento.
	NL Tandwielkast wordt zonder olie geleverd. Mogelijke materiële schade! • Vóór de inbedrijfstelling olie conform technische handleiding bijvullen.	PL Przekładnia dostarczana jest bez oleju. Możliwe straty rzeczowe! • Przed uruchomieniem należy wlać olej zgodnie z informacjami zawartymi w instrukcji obsługi.

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The gear unit is delivered with GearOil by SEW-EURODRIVE.

HINWEIS INFORMATION REMARQUE INFORMACIÓN INFORMATIE INFORMAJA			
	(DE) Getriebe wird mit SEW GearOil geliefert. Entfall des 1. Ölwechsels nach 500 h Betriebsstunden.	(EN) The gear unit is delivered with SEW GearOil. Elimination of the initial oil change after 500 operating hours.	
	(F) Réducteur livré avec GearOil by SEW-EURODRIVE Suppression du premier remplacement d'huile après 500 heures de fonctionnement.	(ES) El reductor se suministra con SEW GearOil. Eliminación del primer cambio de aceite después de 500 horas de funcionamiento.	
	(NL) De tandwielkast wordt geleverd met SEW GearOil. Vervallen van de eerste olieversing na 500 bedrijfsuren.	(PL) Przekładnia jest dostarczana z SEW GearOil. Brak konieczności początkowej wymiany oleju po 500 godzinach pracy.	

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2.6 Symbols on the dimension sheet

The symbols used on the dimension sheet must be observed. They have the following meaning:

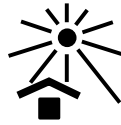
Symbols	Meaning
	Indicates the screw strength class 10.9 for foot mounting.
	Indicates the oil filling location .
	Indicates the oil drain .
	Indicates the position of the breather .
	Indicates the position of the inspection cover .
	Indicates the position of the attachment points for transport .
	Indicates the position of the oil dipstick .
	Indicates the position of the oil level glass .
	Indicates the position of the oil sight glass .
	Indicates the position of the relubrication points .
	Indicates the position of the relubrication points .
	Indicates the position of the grease outlet .
	Indicates the water supply with connection dimensions.
	Indicates the water return with connection dimensions.
	Indicates the oil supply .
	Indicates the oil return .
	Indicates the position of the magnetic screw plug .
	Indicates the position of the operator's vibration sensor with connection dimensions.
	Indicates the position of the oil heater .

2.7 Symbols on the packaging

The symbols on the packaging must be observed. They have the following meaning:



Fragile



Protect
from heat



Fasten
here



Hand hooks
prohibited



Up



Keep dry



Center of gravity

1811486091

2.8 Transport

2.8.1 General information



⚠ WARNING

Suspended loads can fall.

Severe or fatal injuries.

- Do not stand under the suspended load.
- Secure the danger zone.
- Use suitable, sufficiently rated, and undamaged handling equipment.
- Consider the gear unit dimensions, the center of gravity, and the weight that has to be moved when selecting lifting equipment or a crane (see dimension drawing). The weight to be moved is the total weight of the drive package including mount-on components (not only the weight of the gear unit).



⚠ WARNING

Lifted loads may fall over.

Severe or fatal injuries.

- Secure the gear unit against falling over during the lifting process.
- Secure the danger zone.
- Use suitable, sufficiently rated, and undamaged handling equipment.
- Consider the gear unit dimensions, the center of gravity, and the weight that has to be moved when selecting lifting equipment or a crane (see order documents). The weight to be moved is the total weight of the drive package including mount-on components (not only the weight of the gear unit).



▲ CAUTION

Risk of slipping of unsecured mount-on components, such as keys.

Potential risk of crushing due to falling parts.

- Secure the mount-on components.



▲ CAUTION

Danger due to lubricant leaking from damaged seals and the breather.

Minor injuries.

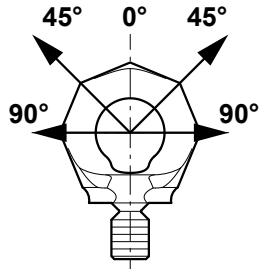
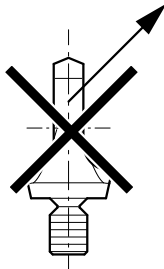
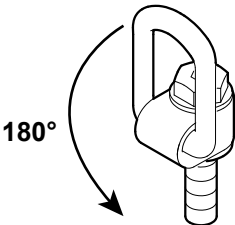
- Check the gear unit and mount-on components for leaking lubricant.
- The seals must not come in contact with cleaning agent as this may damage the seals.
- Protect the breather against damage.
- Make sure that there is not too much oil in the gear unit. If the oil level is too high and the temperature rises, lubricant may escape from the breather.

NOTICE

Improper transportation may result in damage to the gear unit.

Possible damage to property.

- Observe the following information.
- Inspect the shipment for any possible transport damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. Startup must be postponed if necessary.
- The weight of the gear unit (without oil) is indicated on the nameplate or on the dimension sheet. Comply with the loads and regulations specified there.
- If possible, transport the gear unit without oil fill. If this is not possible, note that the weight indicated on the nameplate refers only to the no-load weight of the gear unit, and replace the breather with a screw plug.
- The gear unit must be transported in a manner that prevents damage to the gear unit and mount-on components. For example, impacts against exposed shaft-ends can damage the gear unit.
- Use only the provided attachment points to transport the gear unit (see order documents). The load suspensions of the motor or mount-on components are provided for stabilization purposes only.
- Make sure that the lifting eyebolts are screwed in completely and are flush to the contact surface. Observe the following information.
- RUD lifting eyebolts and load rings may be used at the defined attachment points [1]. Observe the following table. If you use other transport screws than those described in this document, ensure that they are suitable for transporting the gear unit.
- Observe the specified angles for the slings.

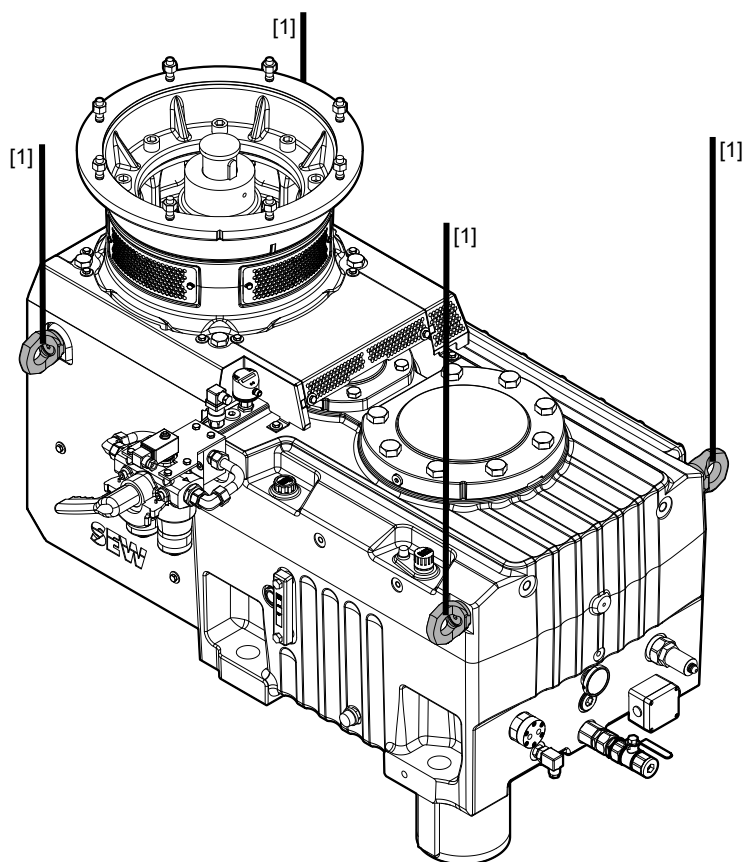
RUD lifting eyebolts		Load ring
Correct: Angle of tension force vector towards the ring plane, max. 90°	Incorrect: Tension away from the ring plane	Rotatable ring
		

Size	Thread of RUD lifting eyebolts
X150 – 170	M24
X190 – 210	M30
X220	M36
X240	M42
X260	M42

Suitable handling equipment, e.g. lifting beams for vertical traction, must be used to transport and protect the mount-on components and motor.

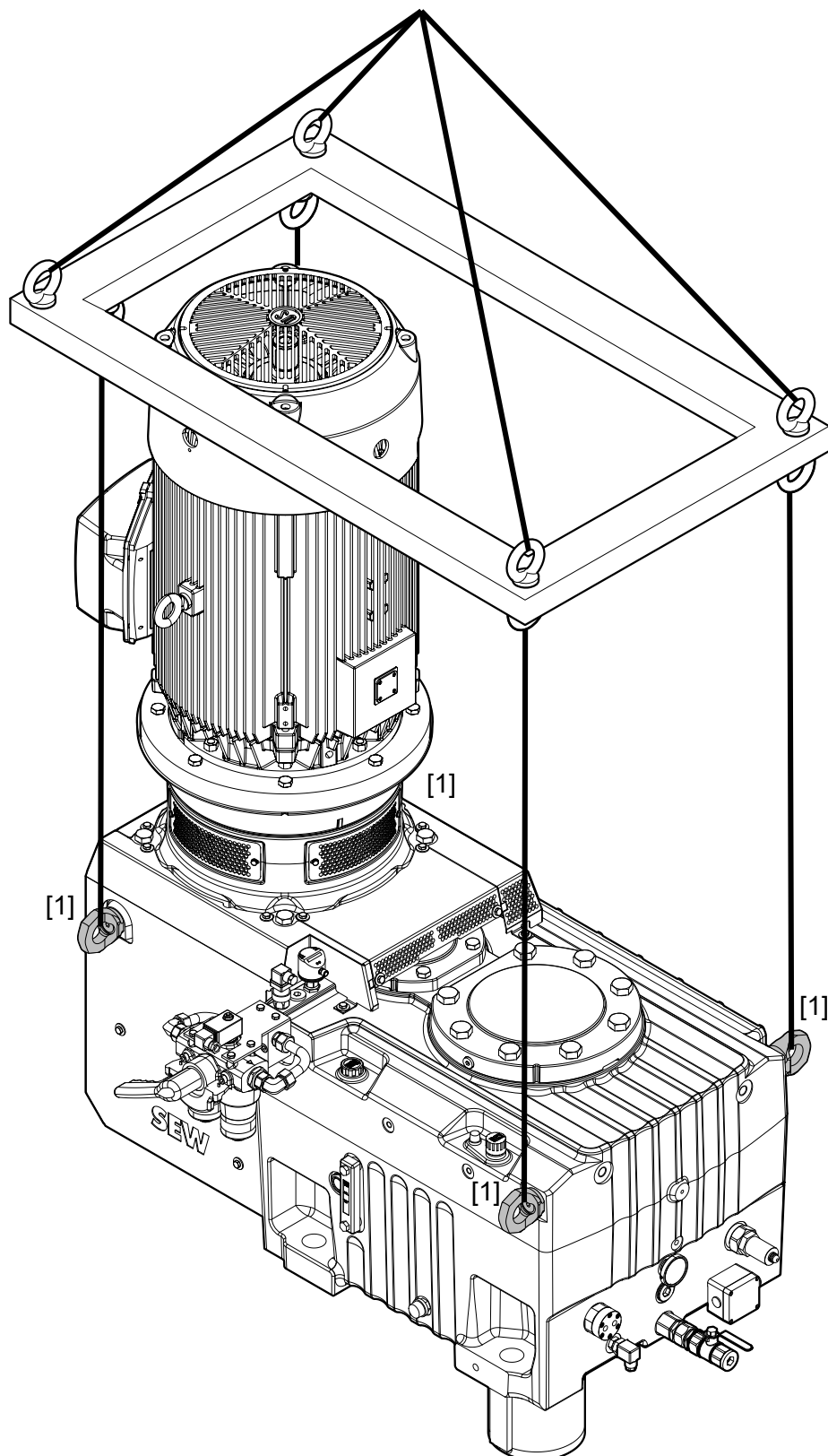
2.8.2 Size X150 – 210

Transport without
motor



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Transport with motor

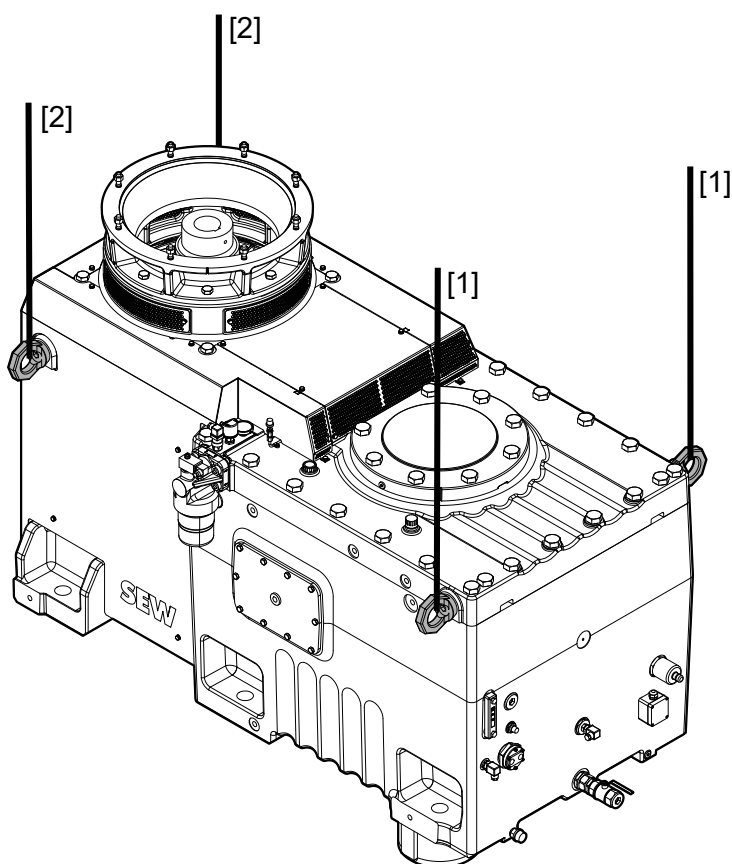


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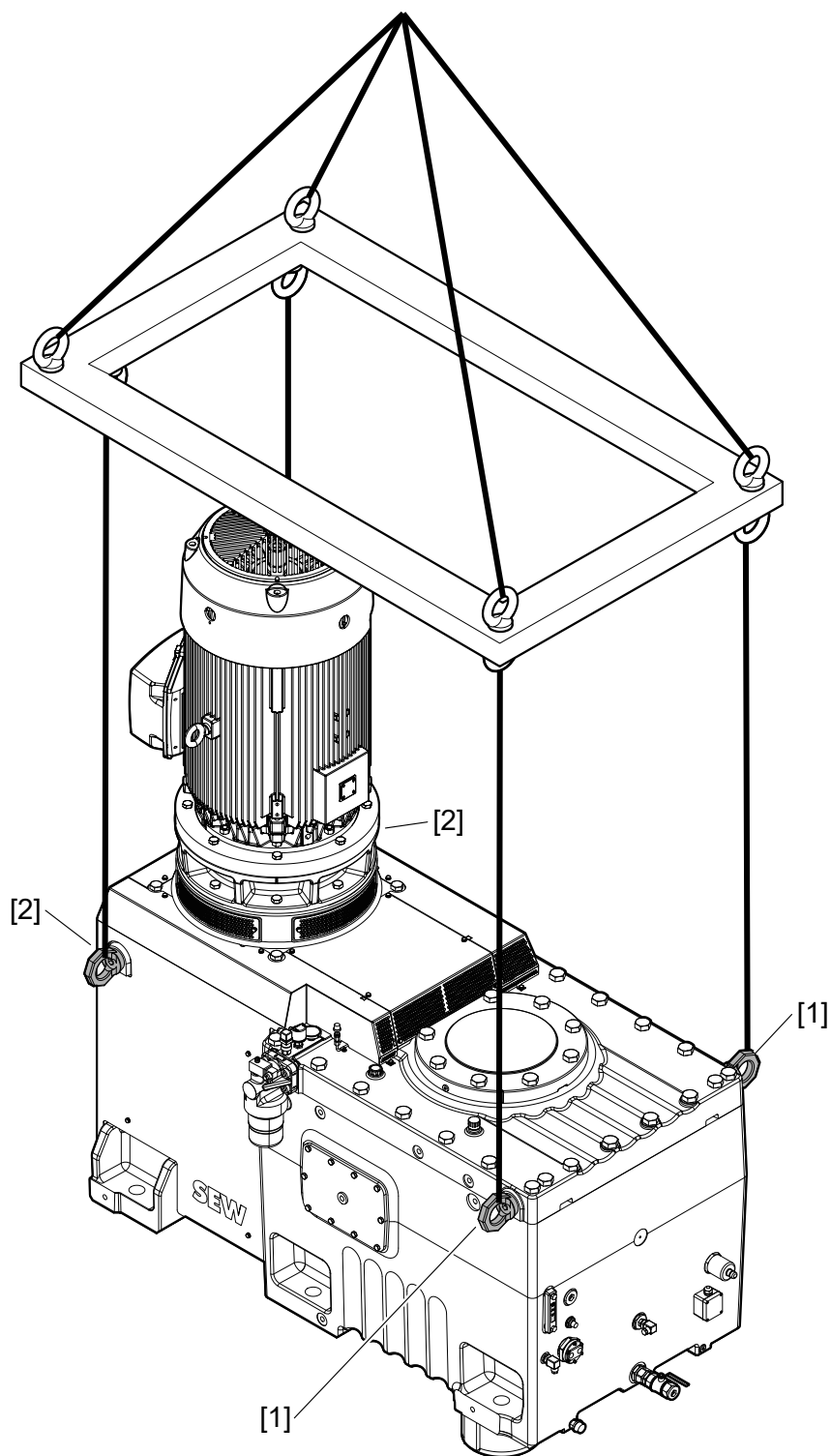
2.8.3 Size X220 – 260

Transport without
motor



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Transport with motor



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2.9 Storage and transport conditions

The gear units can be shipped with the following protection and packaging types depending on the storage and transport conditions.

2.9.1 Internal preservation

Standard preservation

After the test run, the test oil fill is drained out of the gear unit. The remaining oil film protects the gear unit against corrosion for a limited period of time. If specified in the order, the gear unit can be delivered with oil. Refer to the order documents for more information.

Long-term preservation

After the test run, the test oil fill is drained out of the gear unit and the interior space is filled with a vapor phase inhibitor. The breather is replaced by a screw plug and included in the gear unit delivery.

Preservation with VCI anti-corrosion agent is not permitted for gear units that are operated with food grade lubricants. Contact SEW-EURODRIVE in such cases.

2.9.2 Exterior preservation

The following measures are taken for exterior preservation:

- Anti-corrosion agent is applied to bare, non-painted functional surfaces of shafts, flanges, mounting and foot surfaces of the housing. The anti-corrosion agent must be removed only with a suitable solvent that does not damage the oil seal.
- Small spare parts and loose pieces, such as bolts, nuts, etc., are packed in corrosion protection plastic bags (VCI corrosion protection bags).
- Threaded holes and blind holes are covered with plastic plugs.
- If the gear unit is stored longer than 6 months, you must regularly check the protective coating of unpainted areas as well as the paint coating. Renew areas with damaged protective coating/paint.

2.9.3 Packaging

Standard packaging

The gear unit is delivered on a pallet without cover.

Use: transport by truck or rail

Long-term packaging

The gear unit is delivered in a wooden box that is also appropriate for sea transport.

Use: transport by ship and/or extended storage

2.9.4 Storage conditions

NOTICE

Improper storage may result in damage to the gear unit.

Possible damage to property.

- While in storage until startup, the gear unit must be stored in a shock-free manner to prevent damage to the rolling bearing raceways.
- Only fill gear units with oil up to the uppermost rolling element. This ensures a remaining air volume for the oil to expand in case of higher temperatures. Add VCI Anticorit to the oil and tightly seal the gear unit (replace the breather with a screw plug).
- The permissible storage temperature is -30 °C to +50 °C.

INFORMATION

The gear units are delivered without oil as standard; different protection systems are required depending on the storage period and storage conditions as shown in the following table.

Corrosion protection + packaging	Storage location	Storage duration
Standard corrosion protection + standard packaging	Under a roof and enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 60 °C, < 50% relative humidity). No sudden temperature fluctuations. Controlled ventilation with filter (free from dust and dirt). No aggressive vapors and no shocks.	The storage time is max. 6 months with intact surface protection.
Long-term corrosion protection + standard packaging	Under a roof and enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 60 °C, < 50% relative humidity). No sudden temperature fluctuations. Controlled ventilation of the storage location with filter (free from dust and dirt). No aggressive vapors and no shocks.	The storage time is max. 3 years with regular inspection and checking for intactness.
Long-term corrosion protection + long-term packaging	Under a roof, protected against rain and free from shocks.	The storage time is max. 3 years with regular inspection and checking for intactness.

INFORMATION

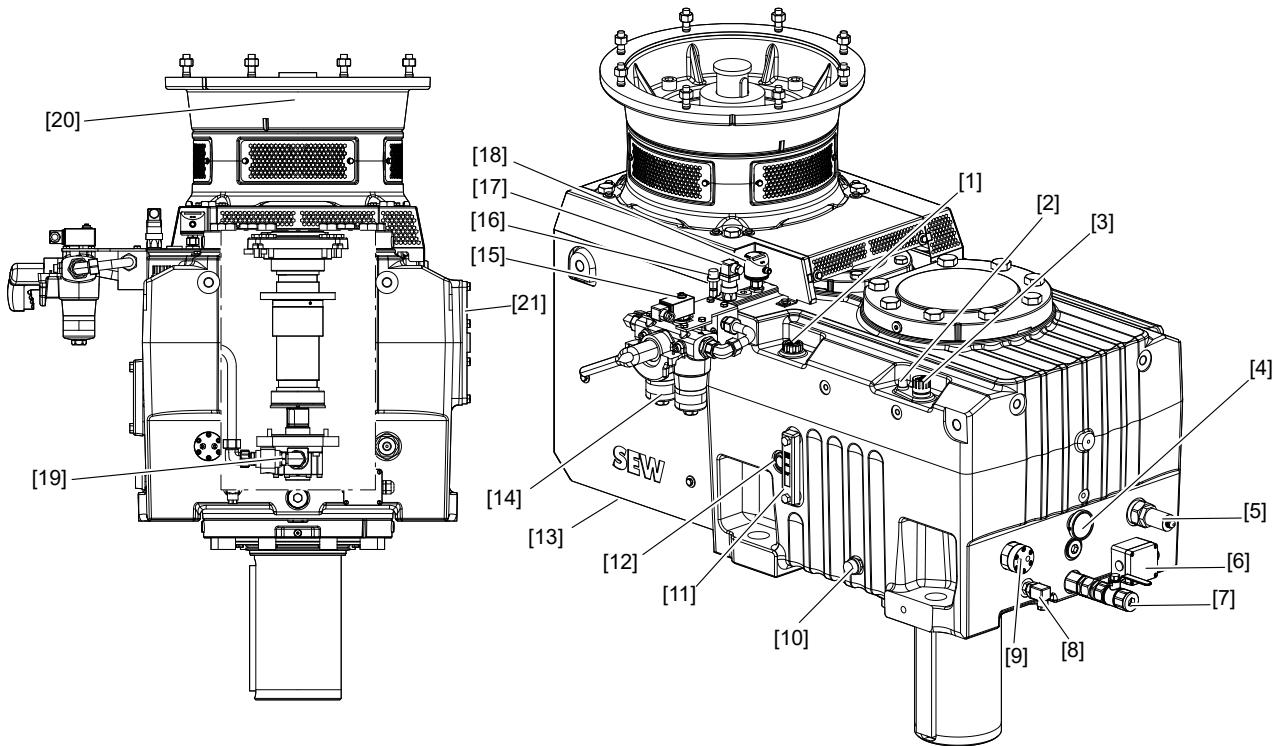
If stored in tropical zones, provide for sufficient protection against insect damage. Contact SEW-EURODRIVE in the case of differing requirements.

3 Gear unit structure

3.1 Overview of gear unit and mount-on components

The following figure shows an example of the gear unit and its mount-on components:

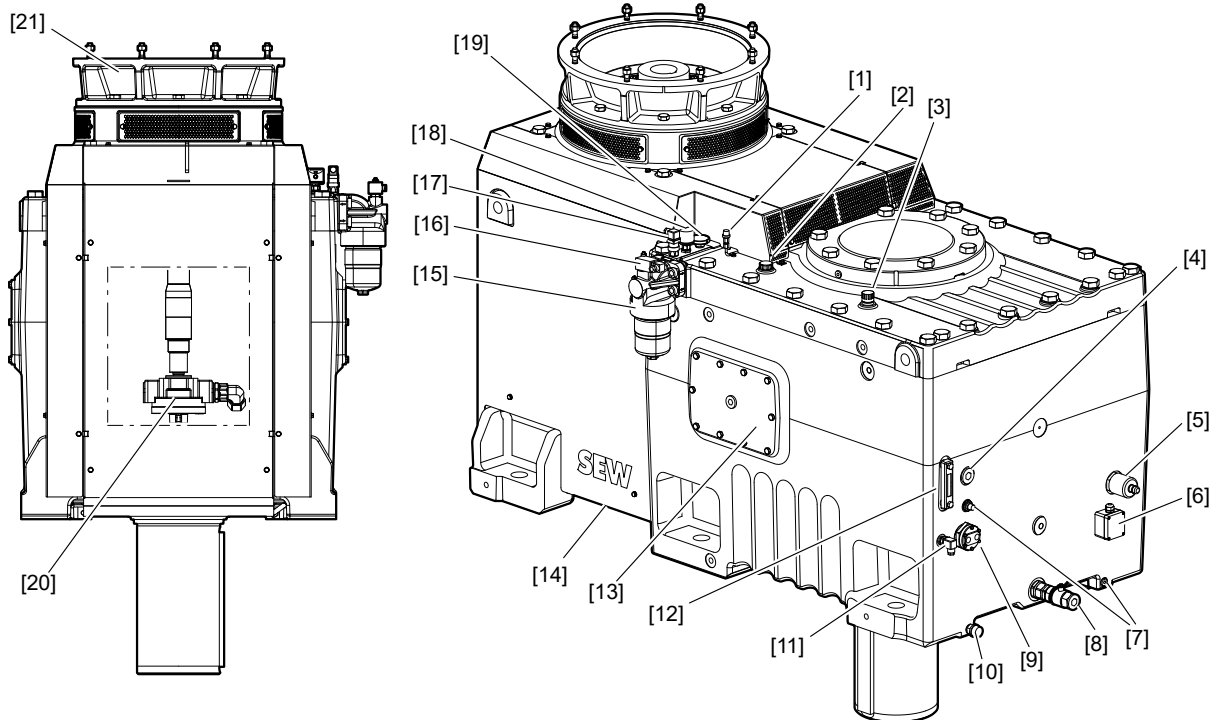
3.1.1 Sizes X150 – 210



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- [1] Oil dipstick
- [2] Lubrication point of sealing system (LSS)/drywell
- [3] Breather
- [4] Thermometer
- [5] Oil heater/water cooling cartridge
- [6] Thermostat
- [7] Oil drain valve
- [8] Pt100 temperature sensor
- [9] Oil heater/water cooling cartridge
- [10] Drywell grease outlet
- [11] Oil level glass

- [12] Oil sight glass
- [13] Magnetic screw plug
- [14] Single filter/duplex filter
- [15] Electrical/optical contamination indicator
- [16] Lubrication point (HSS sealing systems)
- [17] Pressure switch/pressure sensor
- [18] Flow switch
- [19] Shaft end pump
- [20] Motor adapter
- [21] Inspection cover

3.1.2 Sizes X220 – 260

9007239350552843

- | | |
|---|---|
| [1] Lubrication point (HSS sealing systems) | [11] Pt100 temperature sensor |
| [2] Oil dipstick | [12] Oil level glass |
| [3] Breather | [13] Inspection cover |
| [4] Oil sight glass | [14] Magnetic screw plug |
| [5] Oil heater/water cooling cartridge | [15] Single filter/duplex filter |
| [6] Thermostat | [16] Electrical/optical contamination indicator |
| [7] Lubrication point of sealing system (LSS)/drywell | [17] Pressure switch/pressure sensor |
| [8] Oil drain valve | [18] Flow switch |
| [9] Oil heater/water cooling cartridge | [19] Thermometer |
| [10] Drywell grease outlet | [20] Shaft end pump |
| | [21] Motor adapter |

3.2 Scope of delivery

3.2.1 Standard

The standard scope of the gear unit includes:

- Single-piece housing (X150 – 210) or split housing (X220 – 260)
- Foot mounting
- Output shafts with key in MD, HD, and HDr designs
- Bath lubrication or pressure lubrication with shaft end pump
- Oil filter as single filter
- Motor adapter (IEC/NEMA)
- HSS/LSS sealing systems of the X..e series (STD, DP, LAB)
- Radial or axial fan
- Centrally located surfaces for monitoring and relubrication
- Oil dipstick
- Breather (design: Desiccant breather filter /DC)
- Pressure switch

3.2.2 Optional accessories

The gear unit can be equipped with the following components as an option:

- Oil filter as duplex filter
- Flange coupling with keyway /FC-K
- Oil heater/water cooling cartridge (1x, 2x each or combined)
- Drywell
- Oil sight glass/oil level glass
- Oil drain valve
- Oil-air cooler /OAC1
- Oil-water cooler /OWC1
- Flow switch
- Manometer
- Thermometer
- Pressure sensor
- DriveRadar
- Bearing temperature monitoring

3.3 Nameplate

The following example shows the structure of the nameplate:

SEW-EURODRIVE		76646 Bruchsal/Germany	
Type	X3FSM220e/HM/B		
Nr.	01.1234567823.0001.23		
	min.	nom.	max.
i			50.03
PK1 kW	85	250	250
Fs			1.5
MK Nm	78000	78000	78000
PM kW			0
n1 rpm	500	1480	1480
Ta °C			-5...+40
n2 rpm	9.9	29.4	29.4
			1743 895 0.13
IM	M5 / F3		
Made in Germany			

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Type		Type designation
No.		Serial number
P _{K1}	kW	Operating power on the input shaft (HSS)
M _{K2}	Nm	Gear unit output torque
n ₁	min ⁻¹	Input speed (HSS)
n ₂	min ⁻¹	Output speed (LSS)
min.		Minimum operating point
nom.		Normal operating point
max.		Maximum operating point
i		Exact gear unit ratio
F _s		Service factor
P _M	kW	Nominal motor power
T _a	°C	Deviation from the standard temperature range (−20 °C to +40 °C)
Mass	kg	Gear unit weight
Greasing points		Number of greasing points
Fan		Number of mounted fans
		Oil grade and viscosity class/oil quantity
Year		Year of manufacture
IM		Mounting position and mounting surface

3.4 Type designations

3.4.1 Gear units

The following example shows the structure of the type designation:

X3FSM220e /HM /B	
X	Industrial gear unit series
3	Number of gear unit stages 3 = 3 stages 4 = 4 stages
F	Gear unit design F = Helical gear unit
S	Type of output shaft S = Solid shaft with key
M	Application M = Mixer and agitator gear units
220	Gear unit sizes 150 – 260
e	Generation X.e
HM	Housing design HM = Mixer and agitator housing
B	Gear unit mounting /B = Foot

3.4.2 Flange couplings

The following example shows the structure of the type designation.

FC580/220-K-F	
FC	Flange coupling
580	Outer flange diameter
220	Bore diameter
K	Type of shaft-hub connection - K = Keyed connection - S = Cylindrical interference fit (option) - T = Conical interference fit (option)
F	Type of centering - M = External centering - F = Internal centering

3.5 Mounting positions and standard mounting surfaces

The drive unit is designed for installation and operation in mounting position M5.

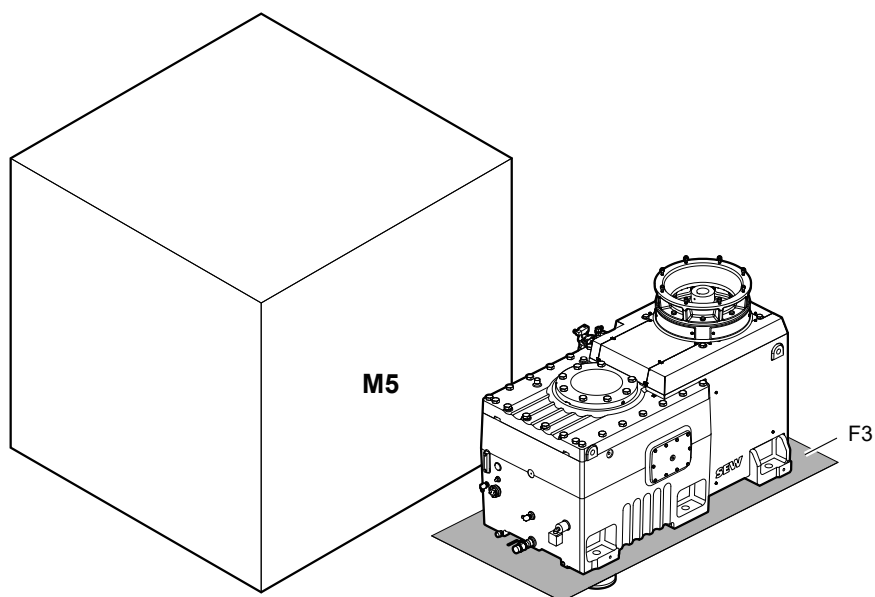
The mounting surface is defined as the surface where the gear unit is mounted.

The gear unit has a defined mounting surface F3.

INFORMATION



- The mounting position and/or mounting surface must not differ from the order.
-



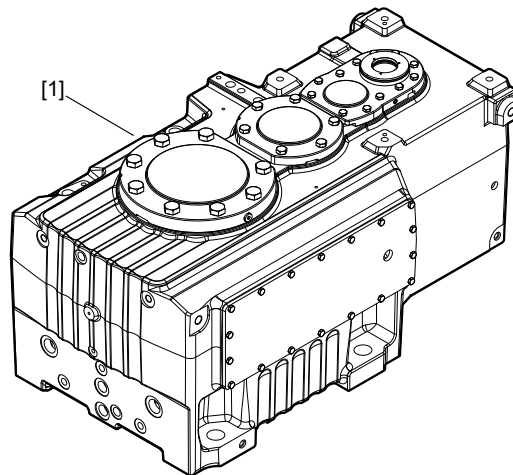
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3.6 Housing designs

The housing is suitable exclusively for operation in mounting position M5.

3.6.1 Sizes X150 – 210

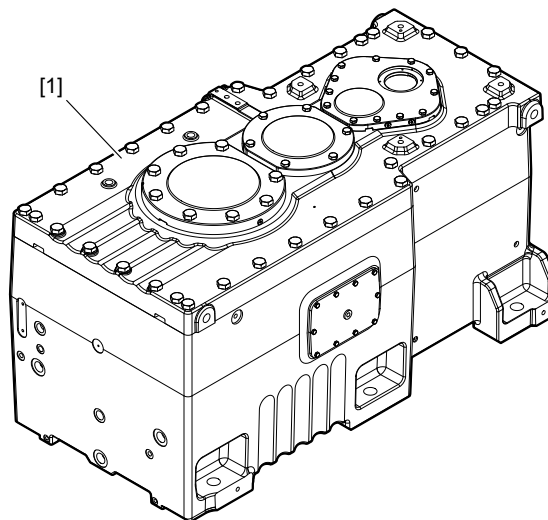
The gear unit of sizes X150 – 210 is designed as a single-piece housing.



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3.6.2 Sizes X220 – 260

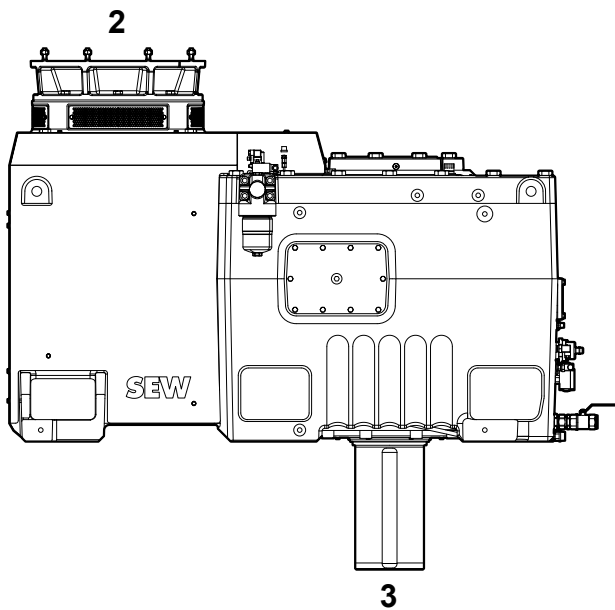
The gear unit of sizes X220 – 260 is designed as a split housing.



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3.7 Shaft positions

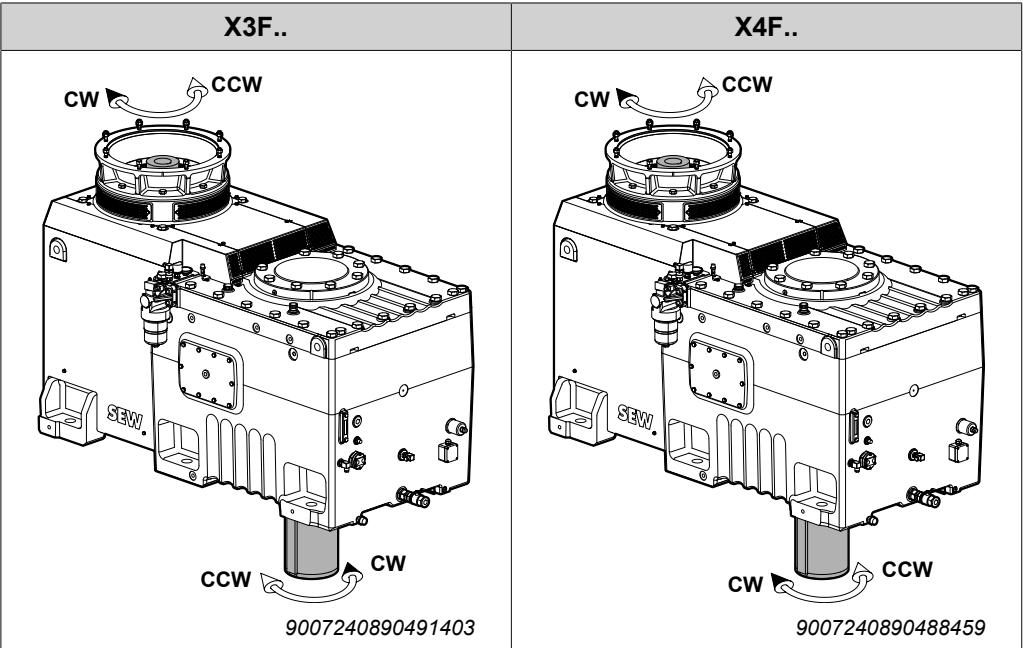
Shaft positions 2 and 3 are defined for the gear unit.



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3.8 Corresponding directions of rotation

In principle, the gear unit can be operated in both directions of rotation.
The following figure shows the direction of rotation dependencies between the input and output shafts:



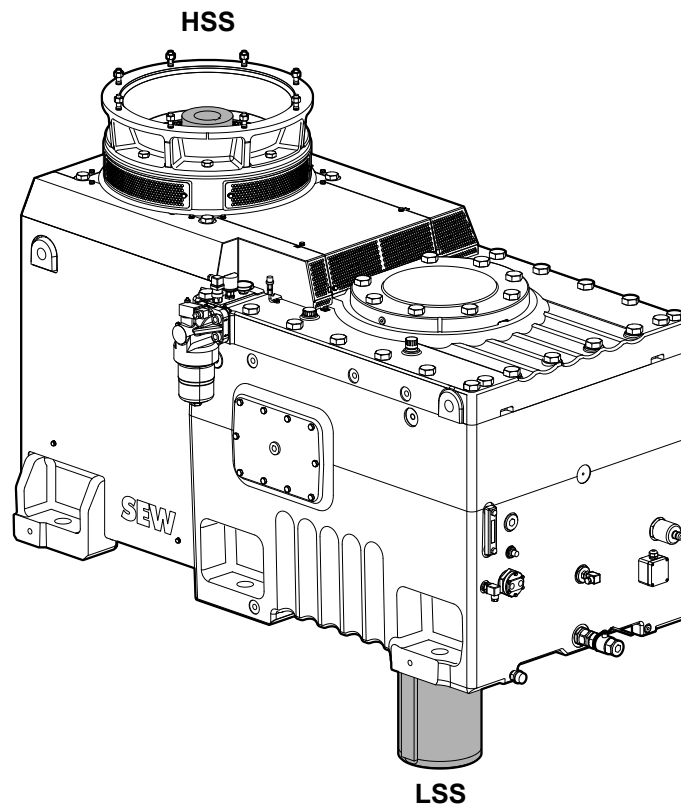
CW Clockwise
CCW Counter-clockwise

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3.9 Input and output shafts

There are two types of shafts:

- High-speed shaft (**HSS**), usually the input shaft
- Low-speed shaft (**LSS**), usually the output shaft



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3.9.1 Input shaft

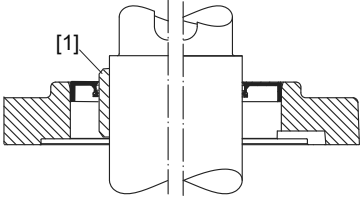
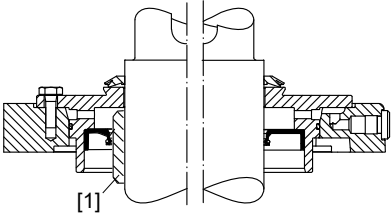
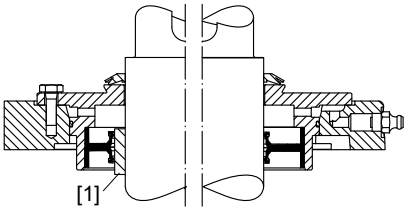
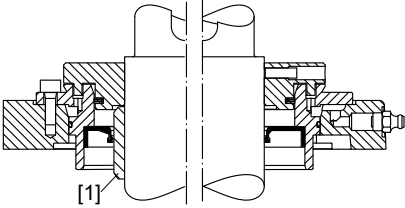
The input shaft is provided with a closed keyway according to DIN 6885/T1 and a centering bore according to DIN 332. The matching key according to DIN 6885/T1 - form A is included in the scope of delivery.

3.9.2 Output shaft in key design

The gear unit is equipped with a solid output shaft in key design according to DIN 6885/T1 and a centering bore according to DIN 332. The output shaft is dimensioned for mounting a flange coupling via a keyed connection. The scope of delivery includes a matching key according to DIN 6885/T1 – form B.

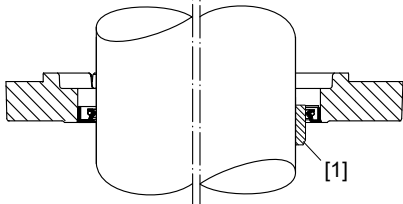
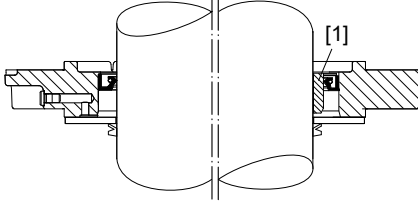
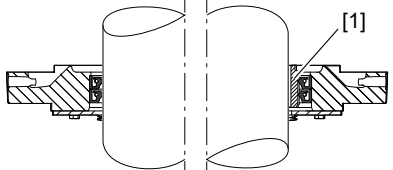
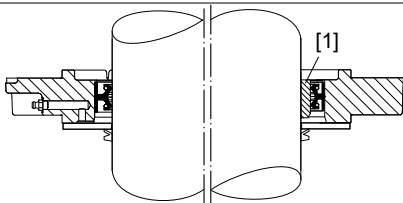
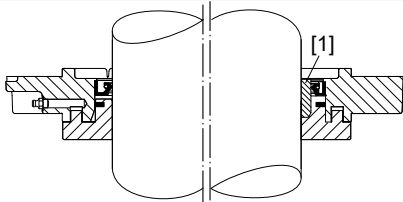
3.10 Sealing system

3.10.1 Input shaft

Designation	Property	Environment	Figure
Standard	Single oil seal with dust protection lip	Normal environment	
Dust-protected	Single oil seal with dust protection cover	Medium dust load with abrasive particles	
Dust-protected Regreasable	Double oil seal with dust protection cover	High dust load with abrasive particles	
Radial labyrinth seal (taconite) Regreasable	Single oil seal with radial labyrinth seal	Very high dust load with abrasive particles	

[1] Optional with oil seal sleeve

3.10.2 Output shaft

Designation	Property	Environment	Figure
Standard	Single oil seal with dust protection lip	Normal environment	
Dust-protected	Single oil seal with dust protection cover	Medium dust load with abrasive particles	
Dust-protected (with drywell)	Double oil seal with dust protection cover	Medium dust load with abrasive particles	
Dust-protected Regreasable	Double oil seal with dust protection cover	High dust load with abrasive particles	
Radial labyrinth seal (taconite) Regreasable	Single oil seal with radial labyrinth seal	Very high dust load with abrasive particles	

[1] Optional with oil seal sleeve

3.10.3 Position of lubrication points

The sealing systems that can be relubricated are fitted with grease nipples for the seal at the input and output end and for the bearing at the output end. Relubrication is to be performed at regular intervals. Observe chapter "Inspection and maintenance intervals" (→ 113).

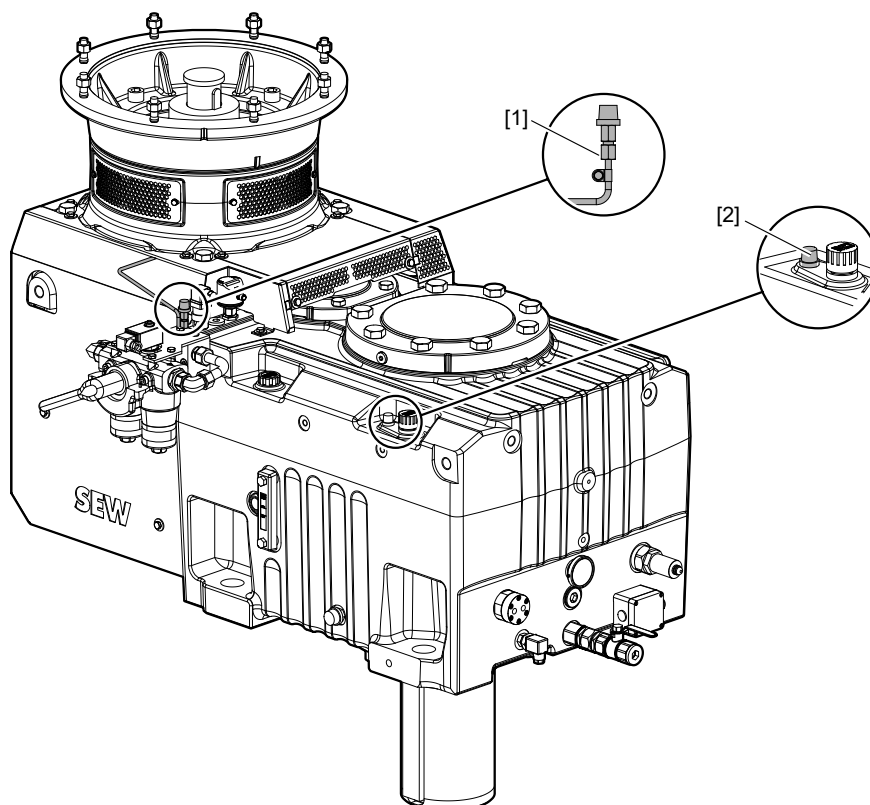
The lubrication point [1] serves to lubricate the seal at the input end.

The lubrication point [2] serves to lubricate the sealing system or the bearing at the output end (drywell).

3 Gear unit structure

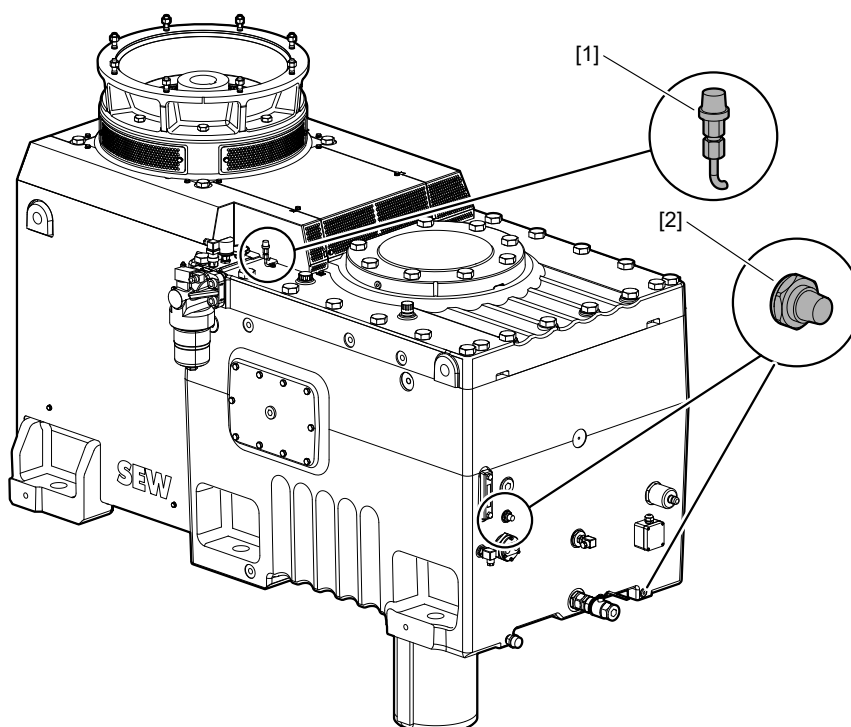
Sealing system

Sizes X150 – 210



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Sizes X220 – 260



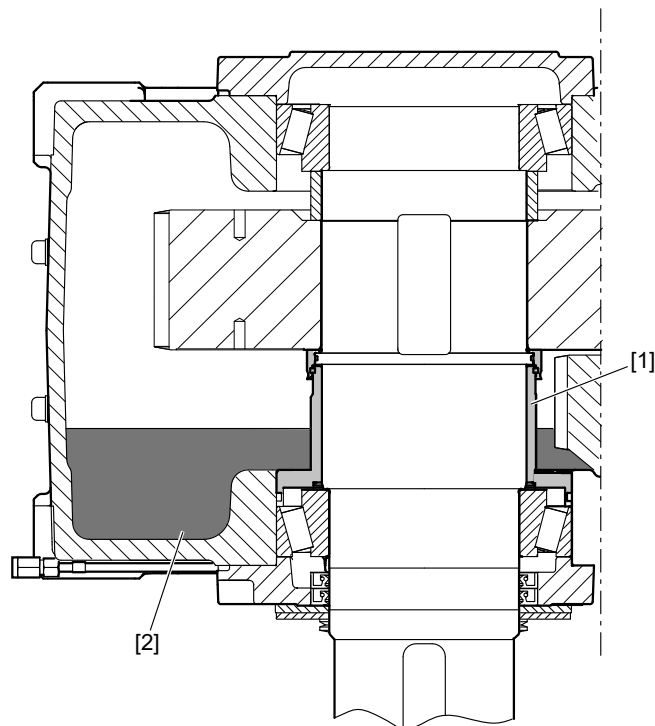
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3.11 Drywell sealing system

Vertical gear units with the output shaft pointing downwards can be equipped with a drywell sealing system in addition to the normal seal. The lower bearing of the output shaft is separated from the oil chamber by an installed pipe [1]. The bearing is lubricated with grease and must therefore be relubricated at regular intervals. The oil level is lowered below the upper end of the pipe, which means that no oil [2] can escape at this point. To ensure sufficient lubrication of the upper bearings as well as the gearing, all gear units are equipped with a drywell sealing system with pressure lubrication (shaft end pump or motor pump with filter).

For information on lubrication quantities and maintenance intervals, refer to chapter "Relubricating the bearing for Drywell sealing systems".

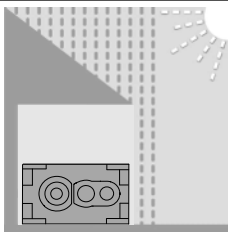
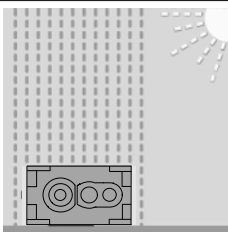


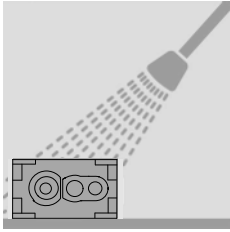
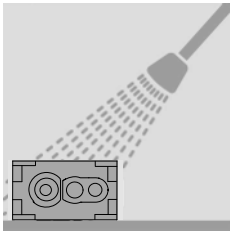
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3.12 Coating and surface protection systems

Used as surface protection under typical ambient conditions, corrosivity category DIN EN ISO 12944-2. The following tables give an overview of coating and surface protection systems.

The gear unit is equipped with the following surface protection.

OS 1 low environmental pollution	
	For environments prone to condensation and atmospheres with low humidity or contamination, such as outdoor applications under roof or with protection, unheated buildings where condensation can build up. According to corrosivity category: C2 (low)
Sample applications	• Systems in saw mills • Agitators and mixers
Condensation test ISO 6270	120 h
Salt spray test ISO 7253	–
OS 2 medium environmental pollution	
	For environments with high humidity or moderate atmospheric contamination, such as applications outdoors subject to direct weathering. According to corrosivity category: C3 (moderate)
Sample applications	• Applications in gravel plants • Cableways
Condensation test ISO 6270	120 h
Salt spray test ISO 7253	240 h

OS 3 high environmental pollution	
	Suitable for environments with high humidity and occasionally severe atmospheric and chemical contamination. Occasionally acidic or caustic wet cleaning. Also for applications in coastal areas with moderate salt exposure. Based on corrosivity category: C4 (high)
Application examples	• Port cranes • Sewage treatment plants • Mining applications
Condensation test ISO 6270	240 h
Salt spray test ISO 7253	480 h
OS 4 very high environmental pollution	
	Suitable for environments with permanent humidity or severe atmospheric or chemical contamination. Regular acidic and caustic wet cleaning also with chemical cleaning agents. Based on corrosivity category: C5 (very high)
Sample applications	• Drives in malting plants • Wet areas in the beverage industry • Conveyor belts in the food industry
Condensation test ISO 6270	360 h
Salt spray test ISO 7253	600 h

INFORMATION



- Standard top coat color RAL 7031, can deviate depending on the order, see order documents.
- Color according to RAL
- Water and hand perspiration repelling rust preventive for external preservation applied to uncoated parts, shaft ends/flanges.
- Sheet metal parts (such as protection covers) are painted in RAL 1003 as standard.
- If you need surface protection systems of a higher quality, contact SEW-EURODRIVE.

3.13 Types of lubrication

3.13.1 Pressure lubrication (sizes 150 – 260)

The gear unit is equipped with an internal shaft end pump. The oil level is low. The gearings and bearing positions that are not submerged in the oil bath are supplied with oil via lubrication lines.

Refer to the information in the chapter "Shaft end pump /SEP" (→ 42).

3.13.2 Bath lubrication (sizes X150 – 210)

The gear unit is (nearly) completely filled with oil; all gearing and bearing positions are completely or partially submerged in the oil bath. The gear unit is equipped with an oil expansion tank as standard.

Observe the information in chapter "Oil expansion tank /ET" (→ 41).

4 Design of options and accessories

4.1 Oil expansion tank /ET

Purpose of the oil expansion tank

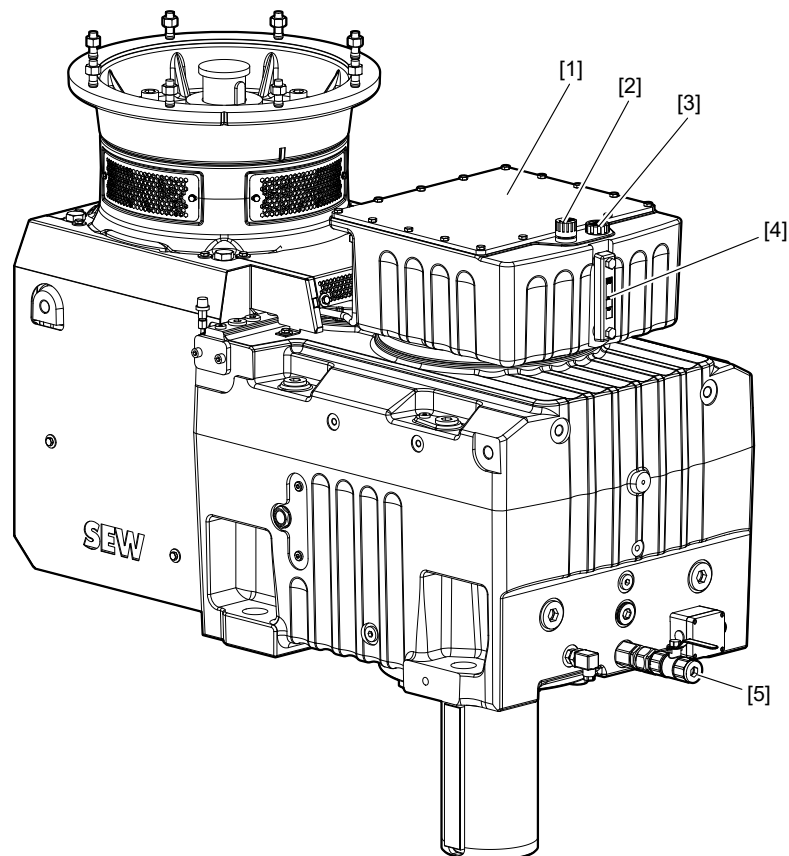
The oil expansion tank is designed to compensate for oil volume variations in the system caused by temperature fluctuations. When the gear unit temperature increases, the oil expansion tank absorbs some of the increasing oil volume and feeds it back to the gear unit as the temperature goes down, which means the gear unit is always completely filled with oil. Based on the oil level specified by SEW-EURODRIVE, the oil expansion tank is designed to compensate the oil volume changes within the permitted operating temperature range.

Exceeding the permitted temperature ranges

A temperature decrease below the permitted temperature range causes the oil expansion tank to be completely emptied and air being sucked into the gear unit. This can lead to insufficient lubrication and thus to the gear unit failure. An increase above the permitted range causes an overfilling of the oil expansion tank and oil might leak from the gear unit.

Permitted fill quantity

Any oil level below or above the level specified by SEW-EURODRIVE is permitted during operation as long as there is oil in the oil expansion tank and the oil expansion tank does not overflow.



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- [1] Oil expansion tank
- [2] Breather
- [3] Oil dipstick

- [4] Oil level glass
- [5] Oil drain

4.2 Shaft end pump /SEP

In the case of pressure lubrication, a direction-independent shaft end pump [1] supplies oil to all bearing points and gearing outside the oil sump via a pipe system.

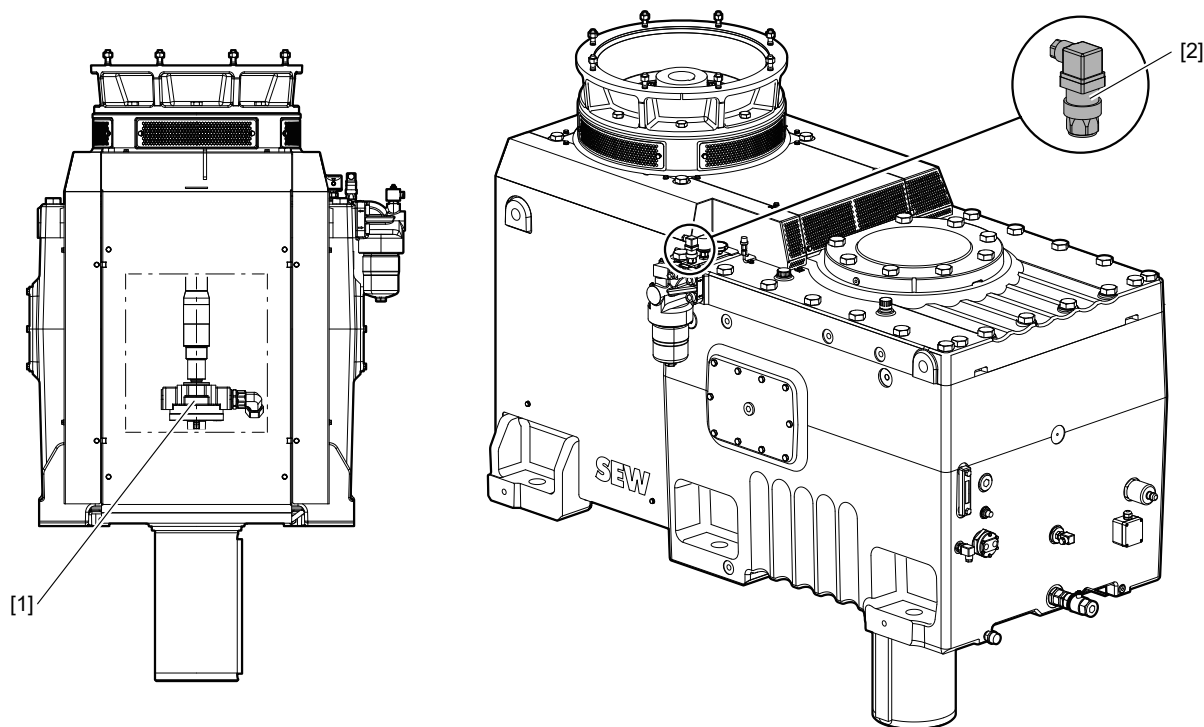
The shaft end pump [1] is mounted internally to the gear unit and is driven by the input shaft or intermediate shaft of the gear unit. This ensures high reliability of the pump function.

INFORMATION



The shaft end pump [1] is monitored via a pressure switch [2]. A minimum input speed of 100 min^{-1} is required for the correct function of the shaft end pump [1]. If you use variable input speeds (e.g. inverter-controlled drives) or if you intend to change the input speed of a gear unit equipped with a shaft end pump, it is essential that you contact SEW-EURODRIVE.

The figure shows an example of the position of the shaft end pump [1]:



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The following table shows the allocation of the gear unit size to the pump size:

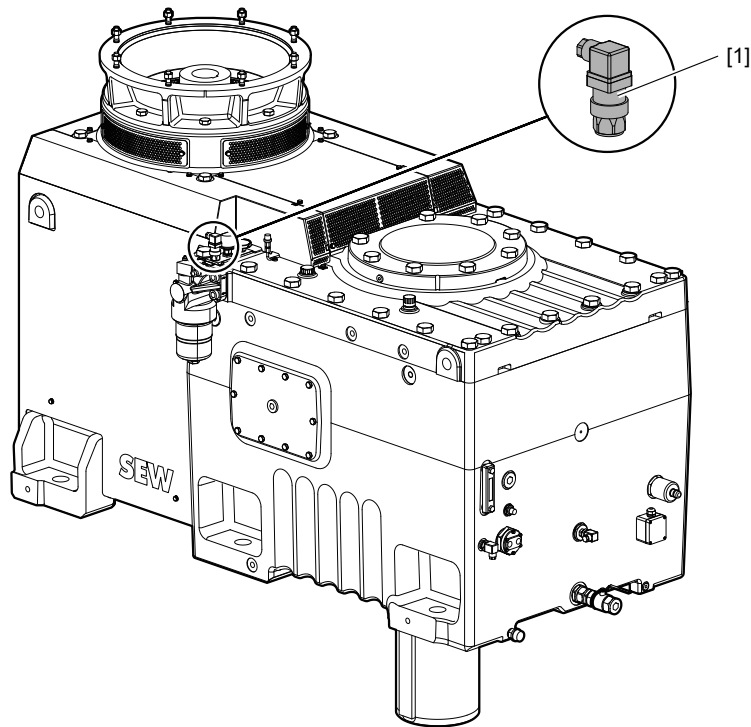
Size	Pump capacity l/min at 1500 min^{-1}
X150	10.5
X170	
X190	
X210	
X220	49
X240	
X260	

4.3 Pressure switch /PS

The pressure switch [1] signals the correct oil pressure in the pressure pipe and in this way indicates that the pressure lubrication is ready for operation. The pressure switch must be monitored by the operator.

Pressure might build up with a delay during the startup phase of the gear unit with a shaft end pump. The slow pressure build-up in this phase can lead to an error signal by the pressure switch that can be bridged. The pressure switch signal must then be bridged for **5 to a maximum of 10 seconds**.

Longer shutdown delays may result in damage to the gear unit and are not permitted.



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4.4 Oil filter

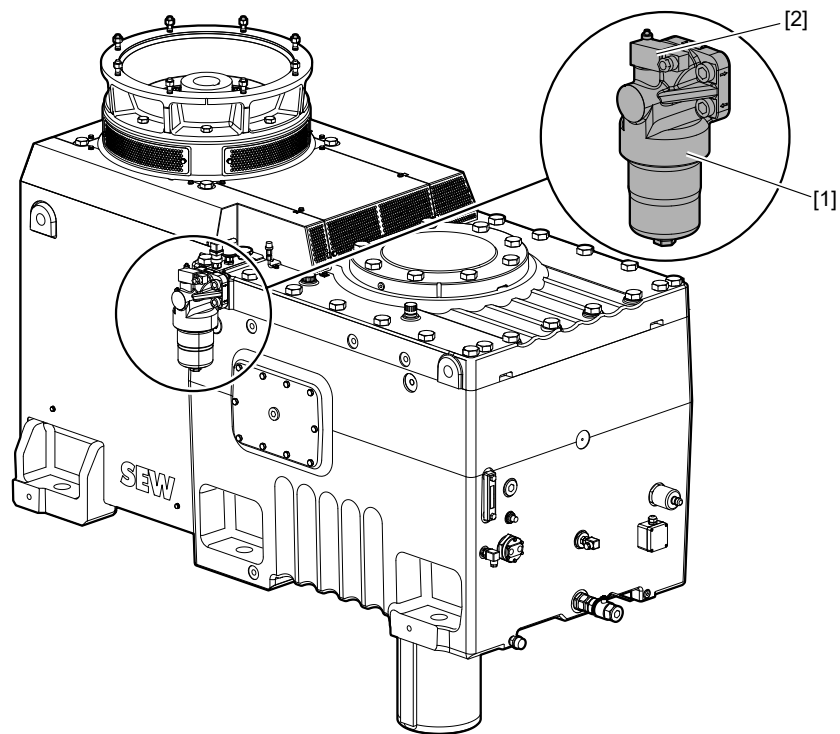
The oil filter [1] is monitored electrically/optically via an electrical/optical contamination indicator [2]. If the differential pressure exceeds the set value, the red button of the contamination indicator springs out. A warning (clean filter) must be issued to the operator via the electrical signal of the differential pressure monitoring device.

When $p > 2.2 \text{ bar}$ → **WARNING** (clean filter)

Bypass of the oil filter

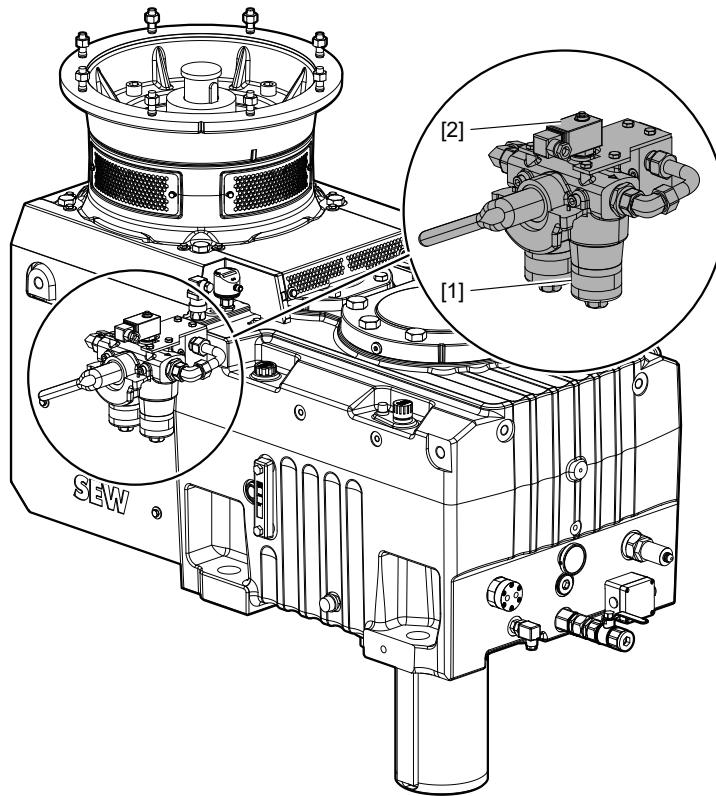
The maximum permitted pressure in the filter is limited to 3.5 bar. If the pressure in the filter system exceeds this value, a bypass provides for a direct connection to the gear unit.

4.4.1 Single filter



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4.4.2 Duplex filter



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4.5 Motor adapter /MA

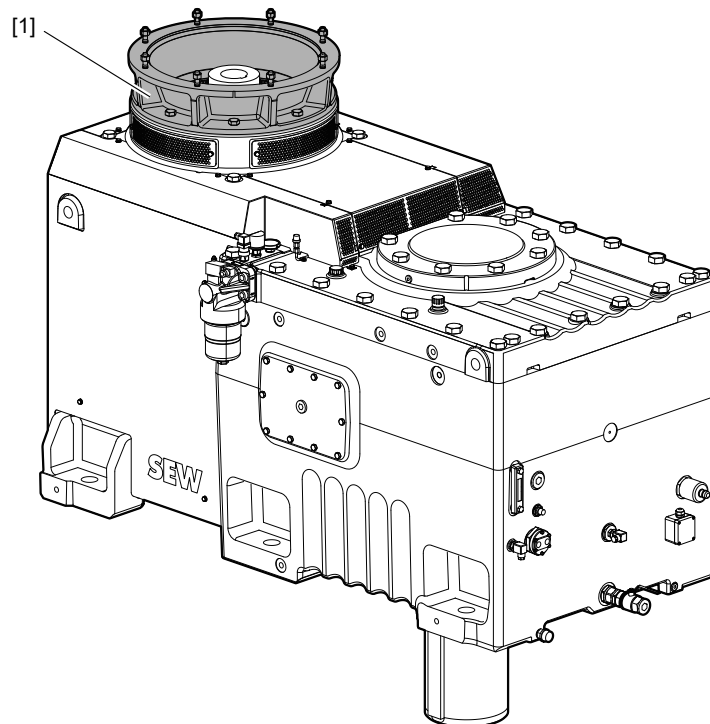
Motor adapters [1] are available for the mounting of

- IEC (B5) motors
- NEMA ("C"-face) motors

INFORMATION



- An elastic claw coupling is included in the scope of delivery.
- The bolts and nuts for installing the motor are included in the scope of delivery.
- The motor adapter can be equipped with a fan as an option.

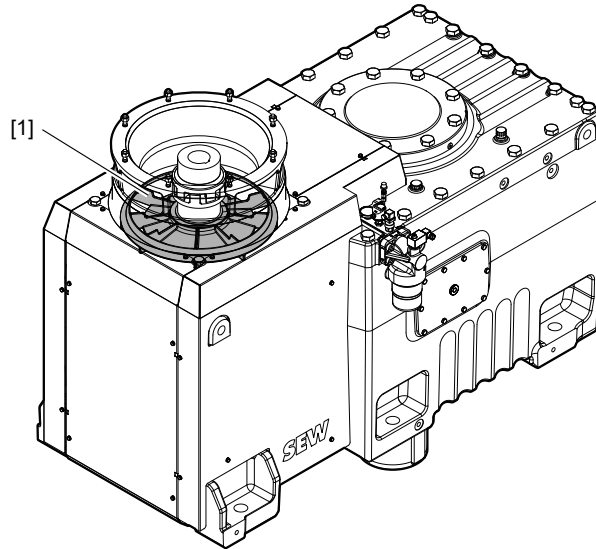


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4.6 Fan /FAN

To increase the thermal rating, a direction-independent radial fan [1] can be installed. Observe the specifications in the order documents.

Fans in ATEX design and (direction-independent) axial fans are available as options.



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4.7 Flange coupling with keyway /FC-K

NOTICE

Improper installation and mounting may result in damage to the gear unit.

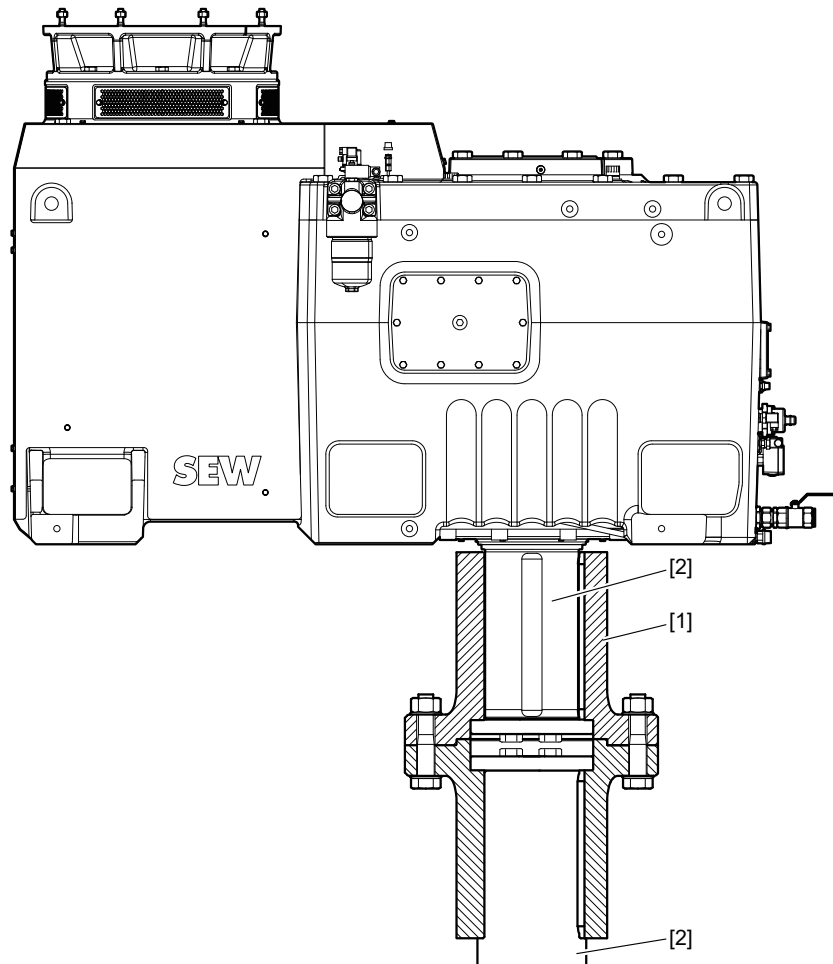
Possible damage to the gear unit.

- Gear units with flange couplings cannot be additionally secured on the floor with a rigid connection. This is why foot mounting of the gear unit or using a base frame is not permitted.

Flange couplings [1] are rigid couplings for connecting 2 shafts [2].

They are suitable for operation in both directions of rotation, but cannot compensate any shaft misalignments.

The torque between the shaft and coupling is transferred via a keyed connection, and the two coupling halves are screwed together at their flanges. For further information, refer to chapter "Flange coupling with keyed connection".



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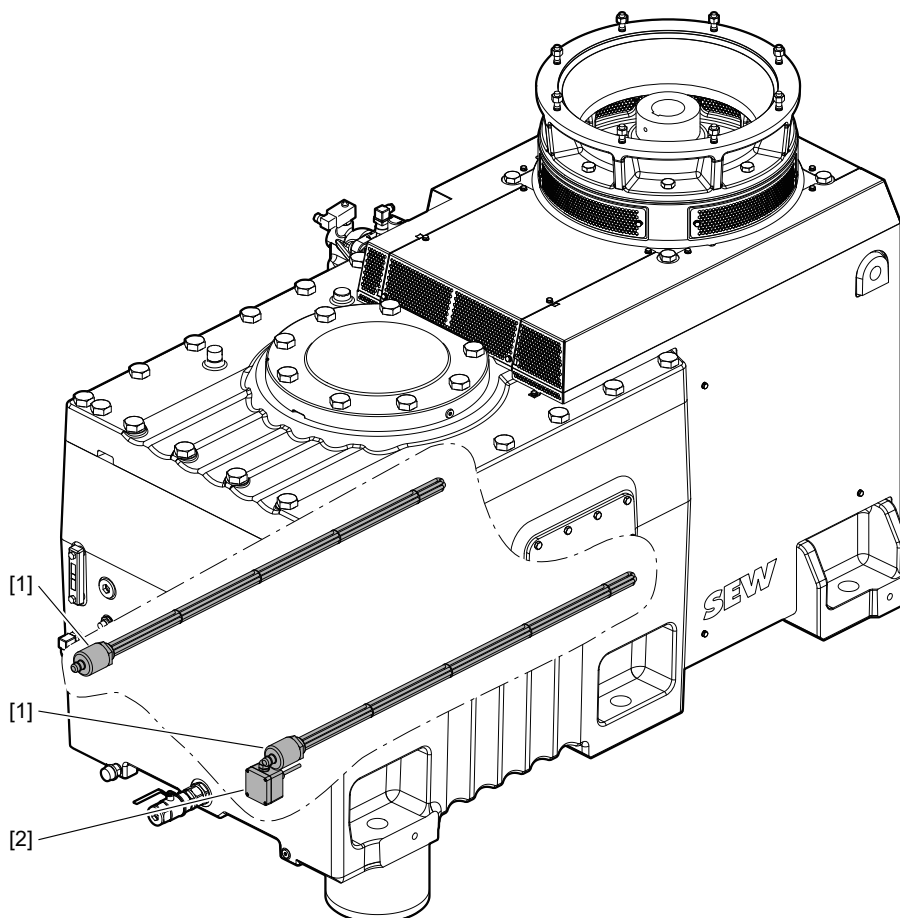
4.8 Oil heater /OH

1 or a maximum of 2 oil heaters can be installed to ensure lubrication in the event of a cold start of the gear unit at low ambient temperatures.

4.8.1 Structure

The oil heater consists of 2 main parts:

1. Heating element in the oil sump ("oil heater") with connection unit
2. Thermostat with integrated temperature sensor



40095985803

- [1] Oil heater
[2] Thermostat with integrated temperature sensor

INFORMATION



Gear units with oil heater(s) are delivered completely assembled. The oil heater(s) can also be installed later. Contact SEW-EURODRIVE.

4.9 Water cooling cartridge /CCT

The water cooling cartridge is mounted in the gear unit's oil sump and is provided with cooling water through a water connection. The customer is responsible for providing the water connection.

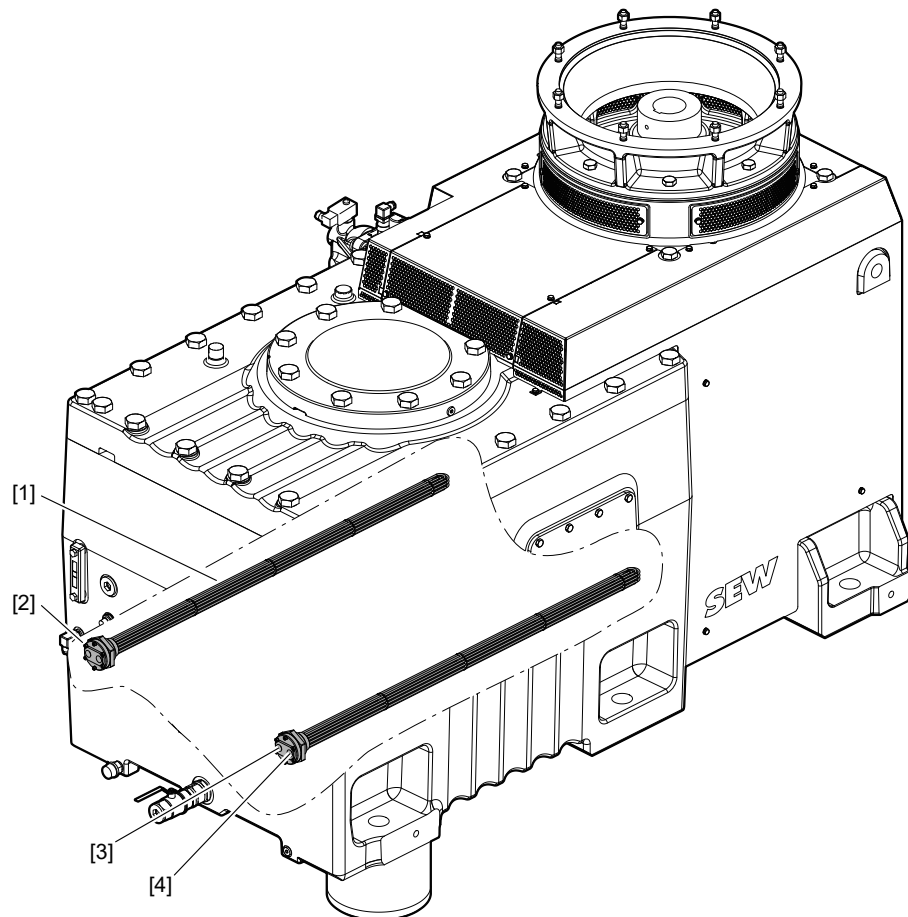
The amount of heat that can be dissipated depends on the intake temperature and the flow rate of the cooling medium that flows through the unit. See the technical specifications to determine the number of water cooling cartridges required. 1 to a maximum of 2 water cooling cartridges can be installed. Observe the data given in the technical specifications.

INFORMATION



Contact SEW-EURODRIVE if fully desalinated or demineralized water is used as cooling medium.

4.9.1 Structure



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- | | |
|--------------------------------------|------------|
| [1] Cooling pipes | [3] Return |
| [2] Tube plate with connection piece | [4] Supply |

The water cooling cartridge consists of 3 main parts:

- Cooling pipes (CuNi alloy), stainless steel optional
- Tube plate (brass)
- Connection piece (brass; gray cast iron; steel)

2 bores [3][4] with the following pipe thread are available to connect to the cooling circuit:

Size	Pipe thread
X150 – 170	G1/4
X190 – 260	G1/2

INFORMATION



The gear unit with water cooling cartridge(s) is delivered completely assembled. The water cooling cartridge(s) can also be installed later. Contact SEW-EURODRIVE.

INFORMATION



The cooling circuit must be connected in parallel for gear units with 2 water cooling cartridges. Observe chapter "Water cooling cartridge /CCT" (→ 95).

4.9.2 Technical data

Adhere to the following values in the table. Do not exceed these values. Lower values are permitted. Also observe the information in the order-specific documents.

The cooling water quantity must be dimensioned individually for each cooling cartridge.

Twice the cooling water flow rate is required when using 2 water cooling cartridges

Size	Max. cooling water volume flow l/min	Max. water pressure in bar
X150	11	6
X170	15	
X190	28	
X210	28	
X220	25	
X240		
X260		

4.10 Temperature sensor /Pt100

The Pt100 temperature sensor can be used to measure the temperature of the oil in the gear unit.

The temperature sensor is located in the oil sump of the gear unit. The exact position depends on the gear unit version and the location of the shaft.

The temperature sensor must be integrated in the operator's control system in such a way that the order-specific switching points are achieved. For more information, refer to chapter "Temperature sensor /Pt100" (→ 102).

4.11 Temperature switch /NTB

A temperature switch with preset switching temperatures is available for monitoring the gear unit's oil temperature.

For various functions, the temperature switch is also used as a limit value switch, e.g. as

- "Early warning"
- as "main alarm" for switching off the main motor.

To guarantee a long service life and functioning under all conditions, it is recommended to use a relay in the power circuit instead of a direct connection through the temperature switch.

The temperature switch is located in the gear unit's oil sump. The exact position depends on the gear unit version and the location of the shaft.

The temperature switch must be integrated in the operator's control system in such a way that the order-specific switching points are achieved. For more information, refer to chapter "Temperature switch /NTB" (→ 103).

4.12 Temperature switch /TSK

A temperature switch with 2 preset switching temperatures is available for controlling and monitoring the system function.

The temperature switch must be integrated in the operator's control system in such a way that the order-specific switching points are achieved. For more information, refer to chapter "Temperature switch /TSK".

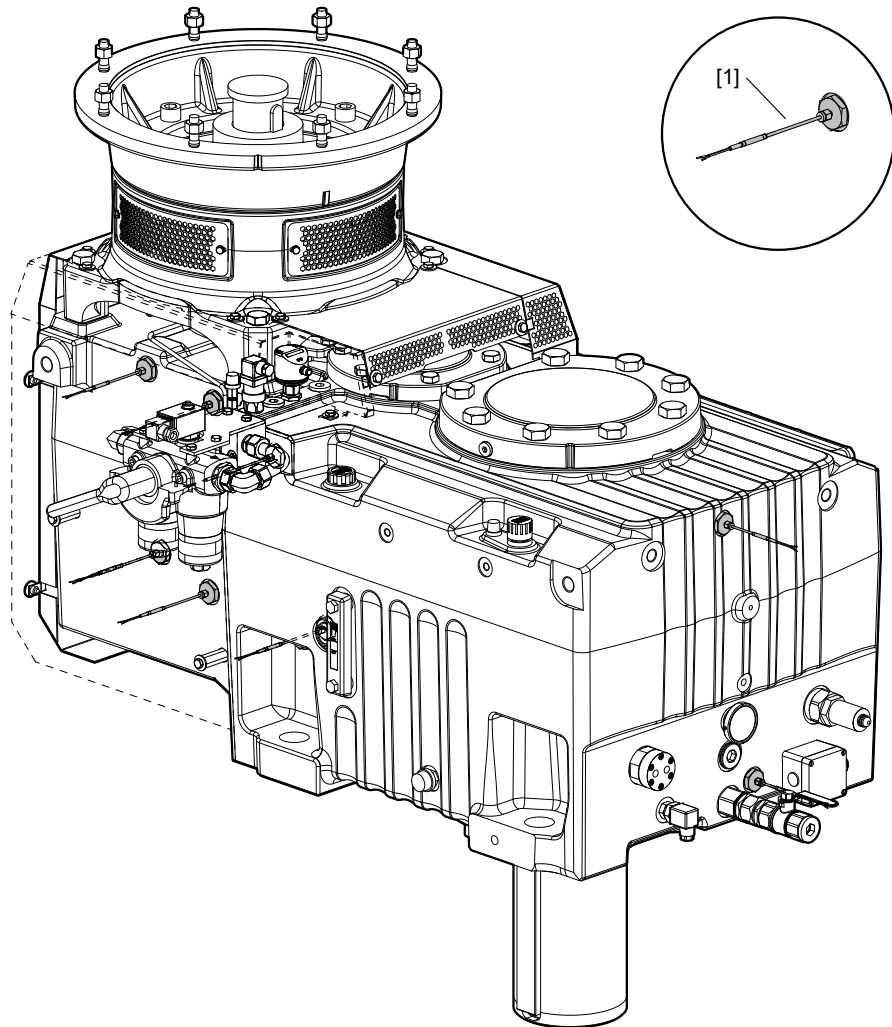
To guarantee a long service life and functioning under all conditions, it is recommended to use a relay in the power circuit instead of a direct connection through the temperature switch.

The temperature switch is located in the gear unit's oil sump. The exact position depends on the gear unit version and the location of the shaft.

4.13 Bearing temperature sensors

Temperature sensors [1] are available to monitor the bearing temperatures. These are mounted against the bearings of the gear shafts.

The temperature sensors [1] for the bearing temperatures are evaluated by the operator.



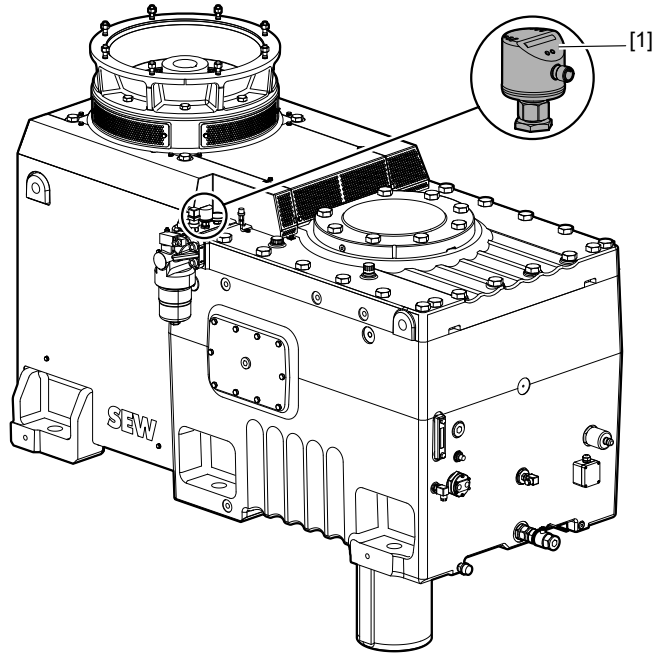
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4.14 Flow switch

The flow switch [1] monitors the oil volume flow.

If the value falls below the minimum volume flow → **STOP GEAR UNIT/WARNING**

The flow switch requires a startup delay of 10 s.

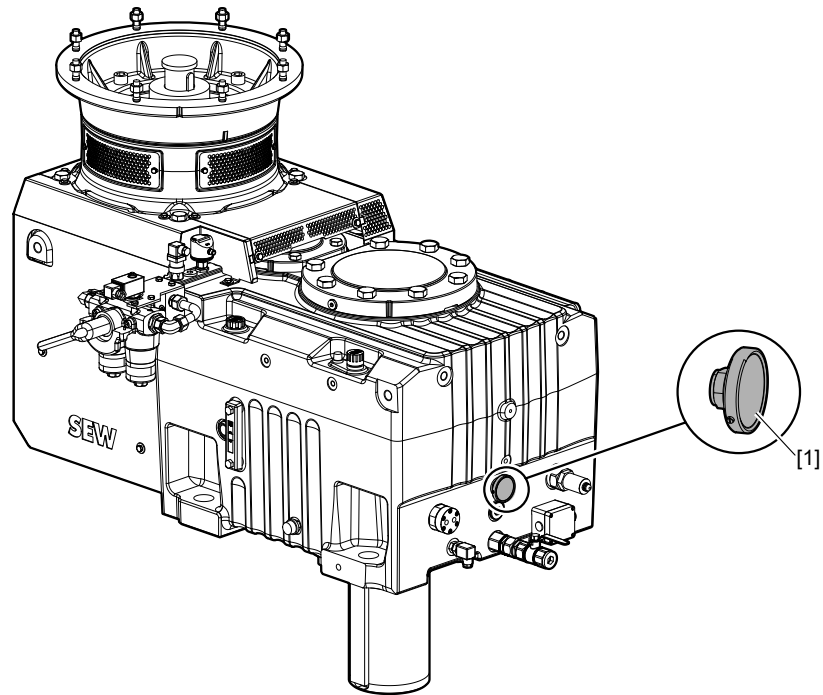


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4.15 Optical thermometer

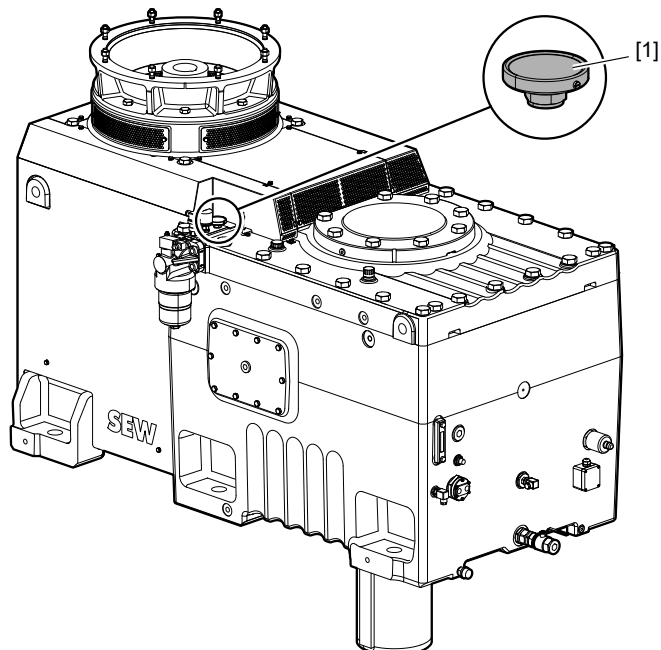
The thermometer [1] is used for optical (/visual) control of the oil temperature in the gear unit.

4.15.1 Sizes X150 – 210



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4.15.2 Sizes X220 – 260



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4.16 DriveRadar®

The DriveRadar® Industrial Gear Units enables users to plan maintenance and service work on a predictive basis and to avoid undesirable downtime.

Selected condition monitoring processes are used to record all the operationally relevant mechanical parameters of our industrial gear units on a cyclical basis. The recorded data is evaluated and interpreted using state-of-the-art analytical processes.

Continuously monitoring measurement data in this way provides complete transparency regarding the condition of industrial gear units at all times. Furthermore, the analytical processes match irregularities directly to the affected components, reveal trends and make it possible to predict when critical conditions are likely to arise. If the condition of a component changes, users are notified immediately. They are given initial recommendations and can then use our service offerings to take action in plenty of time.

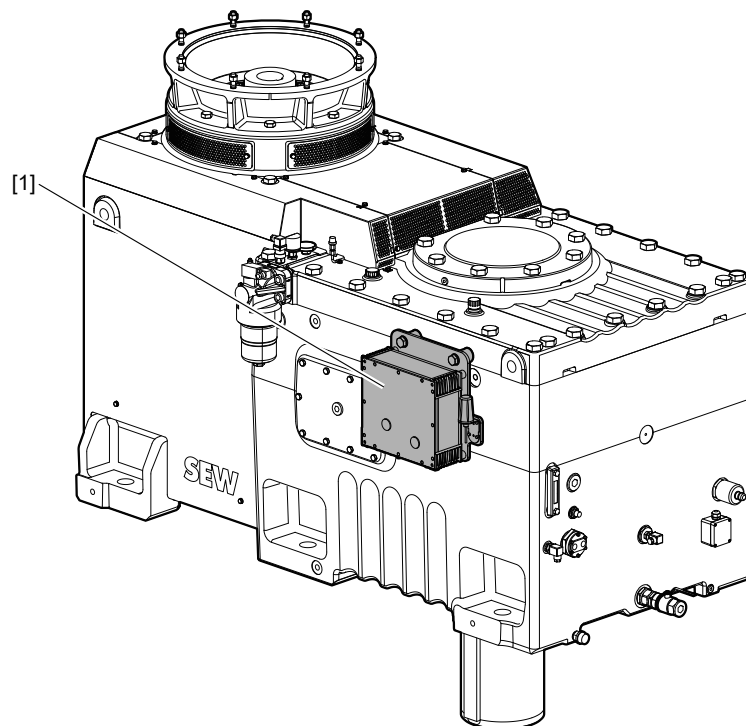
The DriveRadar® also includes an electrical oil level monitor, vibration sensors, and a Pt100 temperature sensor.

INFORMATION



For information about the structure, function, and startup, refer to the separate operating instructions.

You can find these together with the dimension sheet and further documents in the overall documentation for the gear unit.



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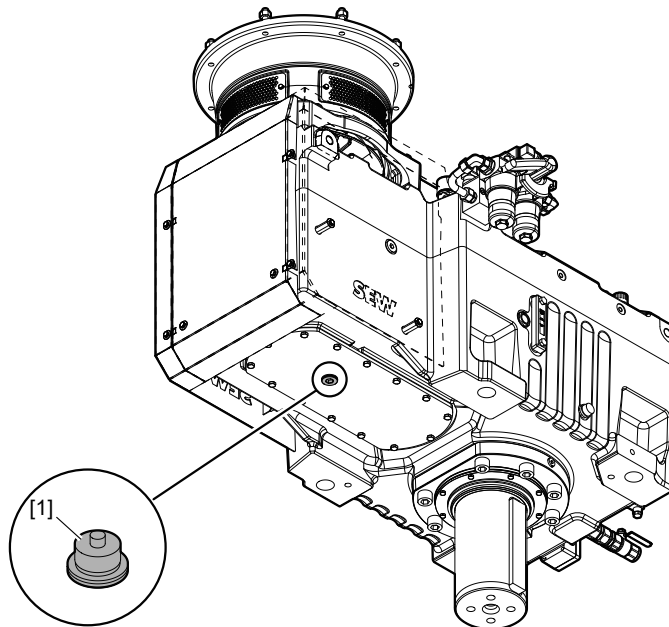
[1] DriveRadar

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4.17 Magnetic screw plug

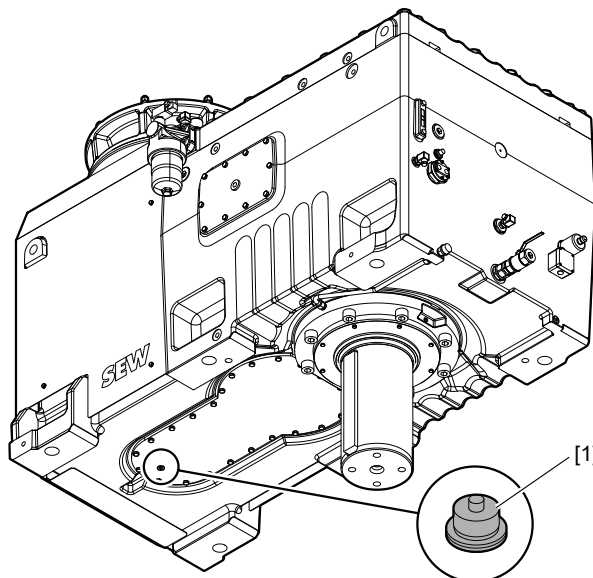
A magnetic screw plug [1] is located on the underside of the gear unit. This can be cleaned during an oil change.

4.17.1 Sizes X150 – 210



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4.17.2 Sizes X220 – 260



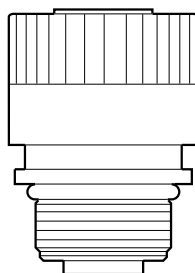
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4.18 Breather /BPG

The breather helps to prevent non-permitted pressures generated by heating or cooling during operation.

The following breathers can be used.

4.18.1 Standard

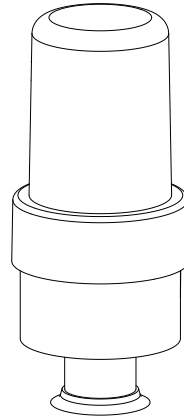


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Structure

Features	
Housing material	Polyamide
Filter inserts	Polyester filter, not exchangeable
Filter size	2 µm
Threads	3/4" or 1"

4.18.2 Desiccant breather filter /DC



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The breather has the following characteristics:

- Absorbs water moisture and humidity
- Reduces oil mist

Structure

Characteristics	
Housing material	Polycarbonate
Filter inserts	• Polyester filter: Removes air particles > 3 µm • Silica gel: Absorbs water and humidity. Saturation is indicated by the color changing from blue to pink. • Foam pad: Absorbs oil mist.
Threads	1"

Standard one-way breather filter

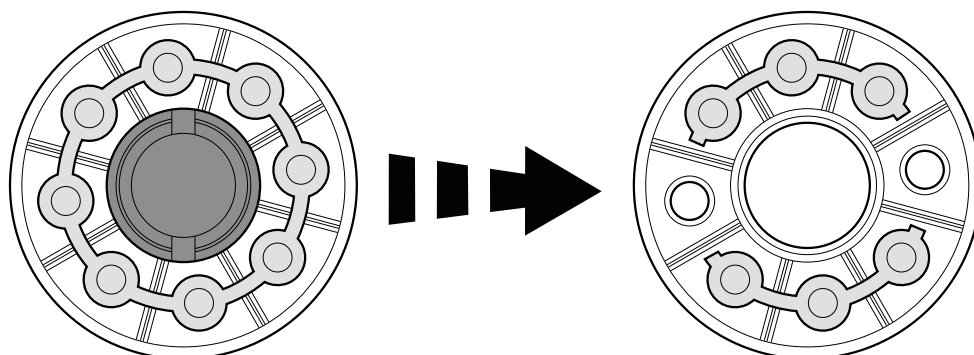
Design	DC-HG-8
Size (height × diameter in cm)	24.8 x 10.4
Filter area (cm ² per filter)	-
Amount of silica gel (kg)	0.24
Amount of remaining water (l)	0.12
Amount of retained water (l)	-
Operating temperature range (°C)	-29 to +93
Max. flow rate (l/min)	70.5
Desiccant	Silica gel
Filtering (μ absolute)	3
Connection dimension	1" NPT

DES-CASE breather filters comply with the European REACH requirements (valid as of 2007).

Usage

Before startup

Open only 2 of the air openings (offset by 180°) at the bottom of the breather filter. Remove the blue cap that protects the rising pipe. If required, attach a suitable adapter to the filter before installing the filter at the gear unit.



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4.19 Oil supply system

For information about the structure, function, startup, maintenance, etc. of the oil supply system, refer to the separate operating instructions.

You can find these together with the dimension sheet and further documents in the overall documentation for the gear unit.

The following oil supply systems can be used:

- Motor pump for pressure lubrication /ONP1
- Motor pump for pressure lubrication /ONP1L

4.20 Oil cooling system

For information about the structure, function, startup, maintenance, etc. of the oil cooling system, refer to the separate operating instructions.

You can find these together with the dimension sheet and further documents in the overall documentation for the gear unit.

The following oil cooling systems can be used:

- Oil-air cooler for splash or bath lubrication /OAC1
- Oil-air cooler for pressure lubrication /OAP1
- Oil-water cooler for splash or bath lubrication /OWC1
- Oil-water cooler for pressure lubrication /OWP1

5 Installation/assembly

5.1 Required tools/resources

The following tools/resources are needed for installation/assembly:

- Suitable, sufficiently rated, and undamaged handling equipment
- Set of wrenches and torque wrenches
- Mounting device
- Compensation elements (washers, spacing rings), if necessary
- Fasteners for input/output elements
- Assembly paste, e.g. NOCO-Paste from SEW-EURODRIVE → except for hollow-shaft gear units
- For hollow-shaft gear units:
 - 1 × end plate with 4 retaining screws
 - Aids for assembly/disassembly onto the machine shaft
- Fastening parts for the gear unit base

The tools/resources are not included in the scope of delivery.

5.2 Tolerances

INFORMATION



Refer to the dimension sheet in your order documents for the tolerances of the interfaces for gear unit connection.

5.3 Important information

Read the following information prior to installation/mounting.



▲ WARNING

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Work on the gear unit only when the machine is not in use. Secure the drive unit against unintentional power-up. Attach an information sign near the ON switch to warn that the gear unit is being worked on.



▲ WARNING

Danger due to mounting in impermissible mounting position.

Severe or fatal injuries.

- Install/mount the gear unit only in the specified mounting position on a level, vibration-damping, and torsionally rigid support structure. Do not twist housing legs and mounting flanges against each other.
- Contact SEW-EURODRIVE before mounting the gear unit in another mounting position than the one permitted.



⚠ WARNING

Danger due to freely accessible, rotating parts.

Severe or fatal injuries.

- Secure rotating components such as shafts, couplings, gears or belt drives using suitable protection covers.
- Ensure that installed protection covers are sufficiently attached.



⚠ WARNING

An operator machine that is not appropriately secured can fall down during gear unit installation or removal.

Severe or fatal injuries.

- Protect the operator's machine against unintentional movement when installing or removing the gear unit.
- Before loosening the shaft connections, make sure that the system is no longer strained (i.e. no torsional moment is active).



⚠ WARNING

Danger due to installing impermissible components.

Severe or fatal injuries.

- Do not mount any impermissible components to the gear unit.
- Mounting impermissible components may lead to material failure at the gear unit. This may cause the gear unit to fall over or down.



⚠ WARNING

Risk of burns due to hot gear unit and hot gear unit oil.

Severe injury.

- Let the gear unit cool down before you start working on it.
- Remove the oil drain plug very carefully.



⚠ CAUTION

Risk of falling or ejection of unsecured mount-on components, such as keys.

Possible injuries.

- Install appropriate protective devices.
- Secure the mount-on components.



⚠ CAUTION

Danger due to lubricant leaking from damaged seals and the breather.

Minor injuries.

- Check the gear unit and mount-on components for leaking lubricant.
- The seals must not come in contact with cleaning agent as this may damage the seals.
- Protect the breather against damage.
- Make sure that there is not too much oil in the gear unit. If the oil level is too high and the temperature rises, lubricant may escape from the breather.



⚠ CAUTION

Risk of injury due to protruding parts.

Minor injuries.

- Gear units and mount-on components must not protrude into footways.

NOTICE

Improper installation and assembly can damage the gear unit.

Possible damage to property.

- Observe the following information.

- Make sure that the customer components are designed for the load.
- The gear units are delivered without an oil fill as standard.
- Do not change the mounting position without prior consultation with SEW-EURODRIVE. The warranty will become void without prior consultation.
- The most important technical data is provided on the nameplate.
Additional data relevant for operation is available in drawings, on the order confirmation or in any order-specific documentation.
- Do not modify the gear unit or the mount-on components without prior consultation with SEW-EURODRIVE.
- Install/mount the gear unit only in the specified mounting position on a level, vibration-damping, and torsionally rigid support structure. Do not twist housing legs and mounting flanges against each other.
- Make sure that the oil level plugs and oil drain plugs, as well as the breather are freely accessible.
- When installing a filter, make sure there is sufficient height for removing the filter element and the filter hood.
- Use plastic inserts if there is a risk of electrochemical corrosion between the gear unit and the driven machine (connection between different metals such as cast iron and stainless steel). Also install the bolts with plastic washers. Always ground the gear unit housing.
- Note that only authorized personnel may assemble gear head units with motors and adapters. Contact SEW-EURODRIVE.
- Do not weld anywhere on the drive. Do not use the drive as a ground point for welding work. Welding may destroy gearing parts and bearings.

- Units installed outdoors must be protected from the sun. Suitable protection devices are required, such as covers or roofs. Avoid heat from building up. The user must ensure that foreign objects do not impair the function of the gear unit (e.g. falling objects or coverings).
- Protect the gear unit from direct cold air currents. Condensation may cause water to accumulate in the oil.
- The gear units are delivered with the ordered painting. Repair any damage to the paint work (e.g. on the breather).
- Do not modify the existing piping.
- For gear units that are filled with oil at the factory, check to verify that the breather is installed before you start up the gear unit.
- Adhere to the safety notes in the individual chapters.

5.4 Prerequisites for installation

NOTICE

Danger due to insufficiently cleaned flange surfaces.

Possible damage to property.

- Clean the output shafts and flange surfaces thoroughly to ensure they are free of anti-corrosion agents, contamination or similar. Use a commercially available solvent. Do not let the solvent come into contact with the oil seals.
-

Check that the following conditions have been met:

- The specifications on the nameplate of the motor and the electrical components match the voltage supply system.
- The drive has not been damaged during transportation or storage.
- The ambient temperature matches the information in the order documents.
- No harmful oils, acids, gases, vapors, radiation etc. in the vicinity.

5.4.1 Extended storage

Observe the following: The service life of the lubricant in the bearings is reduced if the unit is stored for ≥ 1 year (applies only to bearings with grease lubrication).

Replace the breather with a screw plug.

5.5 Installing the gear unit



⚠ WARNING

Danger due to insufficient attachment options on the part of the operator.

Severe or fatal injuries.

- Make sure that there are sufficient and suitable attachment options for the gear unit at the operator's machine before mounting the gear unit to the operator's machine.

NOTICE

An improper foundation may result in damage to the gear unit.

Possible damage to property.

- The foundation must be level and flat.
- The gear unit must not be deformed when tightening the retaining screws.
- Correctly compensate for unevenness.
- Observe the weight information on the nameplate.

Tighten the retaining screws or nuts with the prescribed tightening torque as per chapter "Tightening torques: Recommendations for gear unit mounting with foot-mounted design" (→ 68).

Use screws of strength class 10.9 as standard for foot mounting of the gear unit. If you want to use screws of a different strength class, contact SEW-EURODRIVE. Also observe the information specified on the dimension sheet.

5.5.1 Tightening torques: Recommendations for gear unit mounting with foot-mounted design

The following table shows the thread sizes and tightening torques for mounting the individual gear unit sizes.

Mount the gear unit according to the order-specific strength class of the foot screws/nuts, the mounting position, and the mounting surface using all the bores provided for the foot screw fitting.

The values given in the table for the recommended tightening torques for foot screw fittings are based on the following friction coefficients:

Friction coefficient μ_{GK} for thread and head contact surface	Strength class of the screws
0.14 – 0.24	8.8
0.09 – 0.14	10.9

Always use washers for the foot mounting screws.

If you use screw connections with different friction coefficients, you must adapt the tightening torques accordingly.

Size	Screw/nut	Tightening torque Strength class 8.8 Nm	Tightening torque Strength class 10.9 Nm
X150	M36	2760	2760
X170 – 190	M42	4410	4400
X210 – 260	M48	6650	6630

Use one of the following recommended tools to tighten the screw connections:

- Torque wrench
- Motorized torque wrench with dynamic torque measurement
- Torque-controlled, gradual hydraulic tools

INFORMATION



Do not lubricate the screw connections during installation.

5.5.2 Tightening torques: Recommendations for retaining screws of gear unit mount-on components

Observe the notes in chapter "Important information" (→ 62).

Tighten the screws of gear unit mount-on components, safety covers and other covers with the following tightening torque. Do not lubricate the screw connections during installation.

The tightening torques do not apply to mounting types such as flange coupling, torque arm, mounting flange, hollow shaft with shrink disk, etc. These can be found in the respective chapters.

Screw/nut	Tightening torque Nm Strength class 8.8
M6	12
M8	28
M10	56
M12	96
M14	153
M16	235
M18	330
M20	460
M24	795
M27	1170
M30	1590
M36	2760

5.5.3 Aligning the shaft axis



▲ WARNING

Shaft breakage and vibration if the correct alignment of the shaft axis is not observed.

Severe or fatal injuries.

- Refer to the manufacturer documentation regarding the requirements of the coupling.

The service life of the shafts, bearings and couplings depends mainly on the alignment accuracy of the shaft axes to each other.

Therefore, the aim must always be zero deviation. For example, the requirements of the couplings can also be found in the operating instructions.

5.6 Filling the gear unit with oil

The gear unit is delivered without being filled with oil at the factory as standard. Observe the following notes while filling in oil.

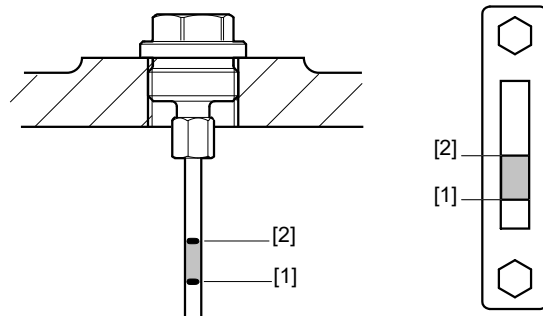
5.6.1 General information

Observe the notes in chapter "Important information" (→ 62).

Information

- Use an oil from the current lubricant table:
<https://www.sew-eurodrive.de/lubricants/>
- Fill in the oil when the gear unit is in the intended mounting position.
- Make sure the oil is fluid when filling it into the gear unit. The flowability can be improved by prior heating, e.g. by using an oil heater. SEW-EURODRIVE recommends an oil temperature of 20 °C to 40 °C for filling in oil.
- Fill the gear unit with the oil grade specified on the nameplate. The oil quantity specified on the nameplate is an approximate quantity. The markings [1] and [2] on the oil dipstick or oil level glass are the decisive indicators of the correct oil quantity to be filled in.
- Check the oil level only when the gear unit is cool and in idle state. SEW-EURODRIVE recommends checking the oil level at an oil temperature of 20 °C to 40 °C. The oil level must be between the markings [1] and [2] and should ideally be in the middle. Observe chapter "Checking the oil level" (→ 116).
- The required oil fill quantity is higher when additional attachments are mounted to the gear unit, such as an oil supply system. In this case, observe the respective "Oil Cooling System" operating instructions from SEW-EURODRIVE.
- For gear units with external supply pipes, e.g. oil cooling systems, establish the connections before filling the oil.
- Use a clean filling aid (plastic funnel or similar) for filling the oil. Avoid using galvanized filling aids.

Procedure



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1. Open the oil fill plug.
2. Fill in oil until the oil level is in the middle between marking [1] and marking [2].
3. Screw in the oil fill plug.

5.6.2 Gear units with oil expansion tank /ET

NOTICE

An oil viscosity above the permitted level of 3500 mm²/s may result in inadequate venting and an insufficient oil filling which could damage the gear unit.

Possible damage to property.

- Observe the oil viscosity during the filling process.

NOTICE

An oil temperature outside the permitted range during the filling process may cause oil deficiency or oil leakage during operation.

Possible damage to property.

- The temperature of the oil to be filled must generally be within a temperature range of 10 °C and 40 °C.

Also observe the notes in chapter "Procedure for gear units with oil expansion tank / ET".

Thus, a higher minimum filling temperature might be required depending on the selected oil type. Guide values can be found in the following table.

Minimum oil filling temperature in °C		
Viscosity class	Mineral	Synthetic
ISO VG 220	10	10
ISO VG 320	10	10
ISO VG 460	15	10
ISO VG 680	20	15

5.6.3 Gear units with shaft end pump /SEP**NOTICE**

Improper installation and mounting of the shaft end pump [1] may result in damage to the gear unit.

Possible damage to property.

- Observe the following information.
-

- Fill the gear unit with the oil type and oil quantity corresponding to the nameplate data; see chapter "Changing the oil" (→ 119).
- Before initial startup or after an oil change, fill any additional attached components (such as piping, cooler matrix, etc.) with oil on the pressure side. Doing so ensures that there is a sufficient oil supply when the entire system is started up. The oil filling holes are marked in the order dimension sheet.
- In the event of a vertical mounting position and with the shaft end pump located at the bottom, the shaft end pump must not be filled manually at initial startup.
- Check the oil level using the oil dipstick or the oil level glass. For additional information, refer to chapter "Checking the oil level" (→ 116).
- Gear units with shaft end pump are equipped as standard with a pressure switch/pressure transmitter for function monitoring. Connection must be carried out by the customer. Observe all chapters including information on the pressure switch or pressure transmitter in these operating instructions.

5.7 Gear unit filled with oil on delivery (option)

Observe the notes in chapter "Important information" (→ 62).

The gear unit can optionally be delivered with oil filled at the factory. Observe the following procedure.

NOTICE

Faulty startup may result in damage to the gear unit.

Possible damage to property.

- It is important that gear units with shaft end pump, motor pump or customer-installed cooling system are vented before taking them into operation for the first time.

INFORMATION

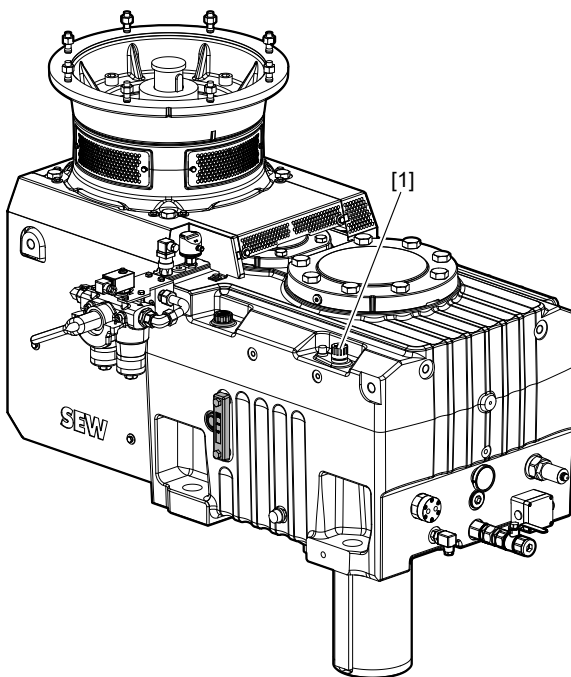


The oil level may deviate during transport, or due to other ambient conditions at the destination. For this reason, the oil fill must be checked prior to startup and corrected if necessary.

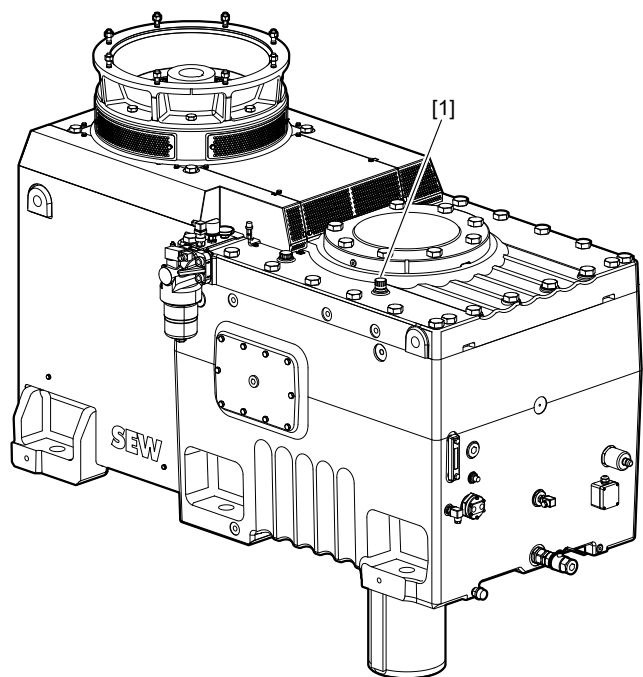
For gear units that are delivered with oil fill, the breather must be installed prior to startup. It is enclosed with the delivery.

The following figure is an example. For the position of the breather for bath or pressure lubrication, refer to the order documents.

X150 – 210



X220 – 260



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1. Remove the closing plug.
2. Insert the breather [1].
3. Check the oil level. Observe the information in chapter "Checking the oil level" (→ 116).

5.8 Gear units with solid shaft

5.8.1 Mounting input and output components

NOTICE

Improper assembly can damage the bearings, housings, or shafts.

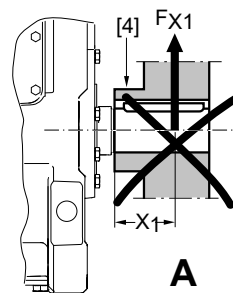
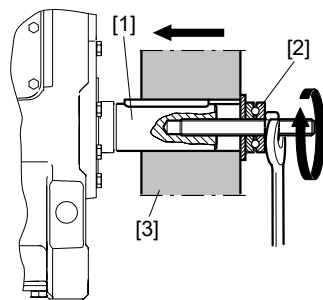
Possible damage to property.

- Mount the input and output elements only using the mounting device. Use the centering bore and the thread on the shaft end for positioning.
- Never force belt pulleys, couplings, pinions, etc. onto the shaft end by hitting them with a hammer.
- Make sure the belt of belt pulleys is tensioned correctly in accordance with the manufacturer's specifications.

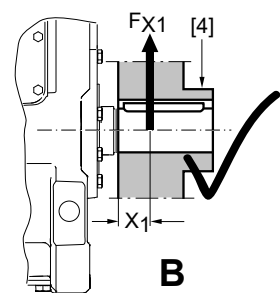
The following figure shows a mounting device for installing couplings or hubs on gear unit or motor shaft ends. You can dispense with the axial bearing on the mounting device if necessary.

Mounting is easier if you first apply assembly paste to the input and output element and/or heat it up briefly (to 80 – 100 °C).

To avoid impermissibly high overhung load: Install gear wheels or sprockets according to figure B.



A



B

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- [1] Shaft end
- [2] Thrust bearing
- [3] Coupling hub
- [4] Hub

- A unfavorable
- B correct

5.9 Flange coupling with keyed connection

5.9.1 Mounting the coupling onto the machine shaft

NOTICE

Improper mounting can damage the coupling.

Possible damage to property.

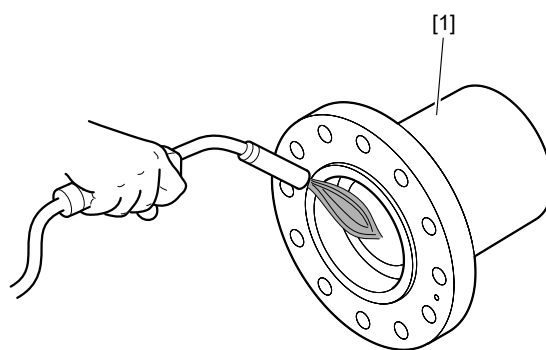
- Note that the shaft and bore must be free of grease to ensure proper functionality of the interference fit/keyed connection. Do not use any assembly paste during assembly for this reason.

1. Clean the shaft and bore of the flange coupling thoroughly and remove any grease.

2. **⚠ CAUTION!** The required assembly clearance is achieved only by heating the coupling. Risk of burns during the entire installation process. Safeguard hot parts to prevent them from being touched accidentally!

NOTICE! Radiant heat from the flange coupling half [1] can damage adjacent elements. Possible damage to property. Protect adjacent elements (e.g. oil seals) with suitable heat shields.

Heat the flange coupling half [1] to a joining temperature of 130 °C, as long as no special joining temperature is specified for the order.



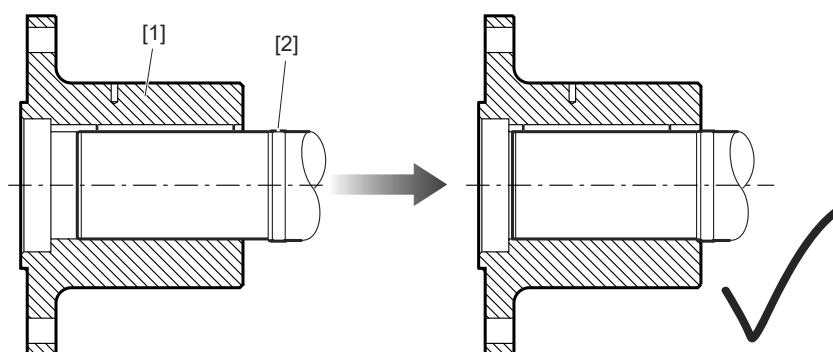
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3. Quickly push the flange coupling half [1] onto the gear shaft all the way to the shaft shoulder [2].

INFORMATION



Prepare assembly tools and plan the process carefully so that the coupling can be fitted to the shaft quickly. During the cooling process, the coupling must be secured on the shaft.



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5.9.2 Mounting the flange connection

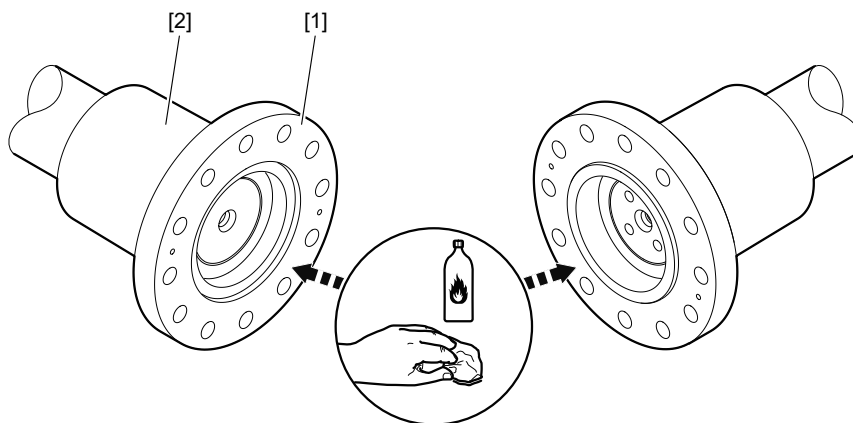
NOTICE

Improper assembly may damage the flange coupling.

Possible damage to property.

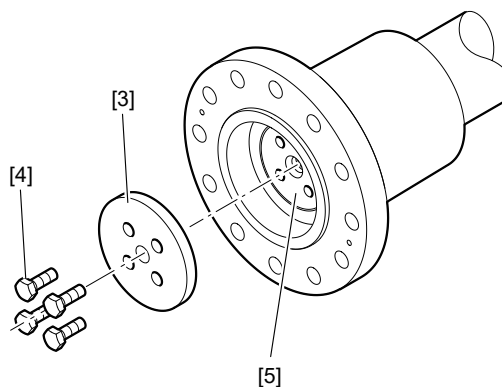
- During installation, note that the flange coupling is not able to compensate for shaft misalignment.

1. Clean the flange surfaces [1] of the flange coupling halves [2].



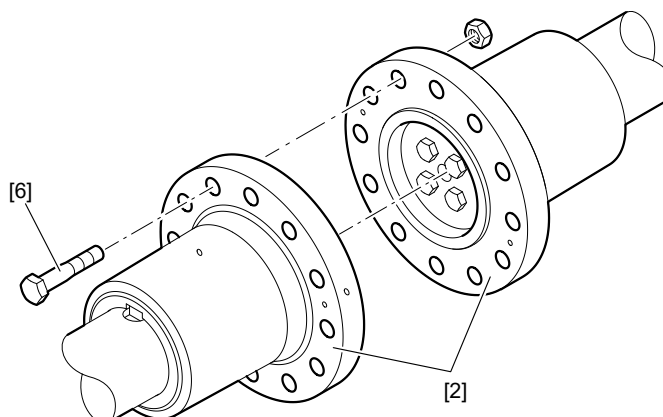
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2. Mount the end plate [3] onto the gear shaft [5] using the screws [4]. Observe the table listing the tightening torque on "page" (→ 78).



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- Align the bore patterns of the two flange coupling halves [2] and join the flange coupling.



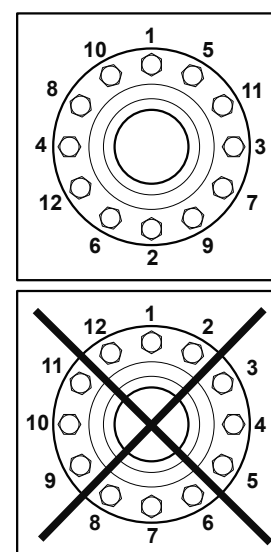
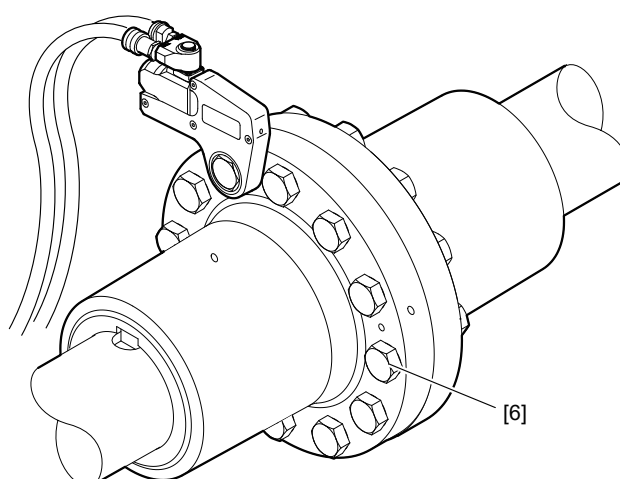
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- Mount the screws [6] and tighten them in diametrically opposite sequence. Observe the table listing the tightening torques on "page" (→ 78).

INFORMATION



The screws must not be lubricated during assembly.



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INFORMATION



The tightening torques listed in the table are based on a friction coefficient for thread and bearing surface of $\mu = 0.14$ for screws of strength class 8.8, and of $\mu = 0.11$ for screws of strength class 10.9.

If you use screws other than those included in the scope of delivery, you must adjust the tightening torques to the new friction conditions.

Use only the following tools for installation:

- Signal-generating torque wrench
- Motorized torque wrench with dynamic torque measurement
- Torque-controlled, gradual hydraulic tools

Screw size	Tightening torque in Nm Strength class	
	8.8	10.9
M16	235	285
M20	460	555
M24	795	960
M30	1597	1910
M36	2760	3320
M42	4410	5310

5.9.3 Removing the coupling from the shaft



⚠ CAUTION

Risk of jamming and crushing due to improper disassembly of heavy components.
Possible risk of injury.

- Disassemble the flange coupling properly.
- Adhere to the following disassembly instructions.

NOTICE

Improper disassembly can result in damage to the bearing of the output shaft.
Possible damage to property.

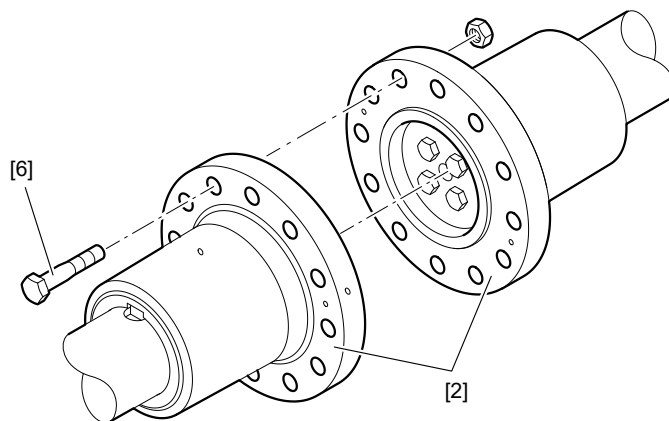
- Do not apply any tools between the coupling and the gear unit housing.

INFORMATION



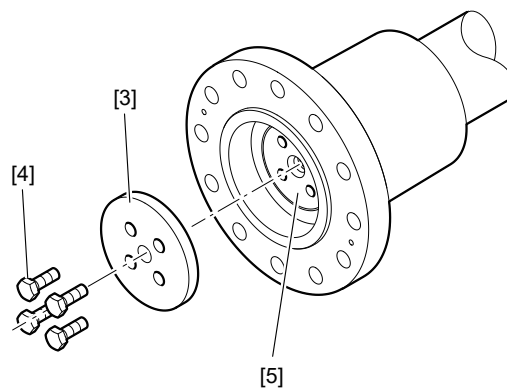
Prepare disassembly tools and plan the process carefully so that the flange coupling can be pulled off the shaft quickly.

1. Loosen the screws [6] and disconnect the flange coupling [2].



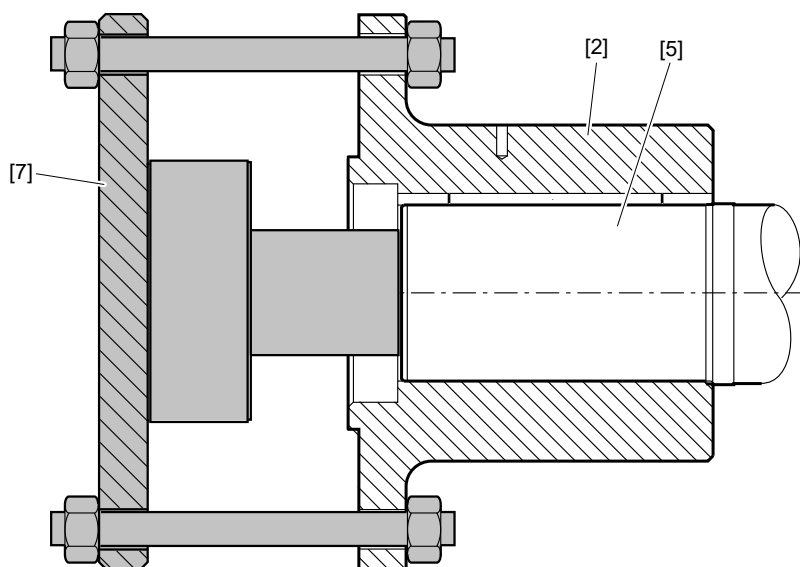
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2. Loosen the screws [4] and remove the end plate [3] from the gear shaft [5].



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3. Mount the removal fixture [7]. Remove the flange coupling half [2] from the shaft [5].



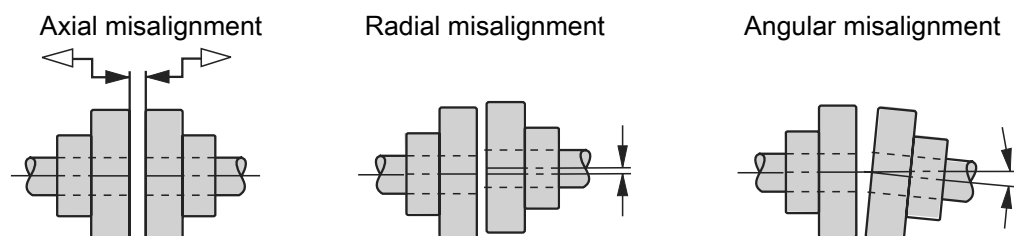
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4. After disassembly, check the condition of the shaft and flange coupling. Damaged parts must be replaced.

5.10 Aligning couplings/assembly tolerances

5.10.1 Aligning the coupling

Adjust the following misalignments when mounting couplings.



Use a laser-optical alignment system to align the coupling as accurately as possible.

5.11 Motor mounting on a gear unit

The gear unit with motor adapter must be installed in such a way that no liquids can enter the motor adapter (HSS end) and accumulate there. Otherwise there is a risk that the respective oil seal can be damaged and subsequent damage could create a potential ignition source.

An elastic claw coupling is included in the scope of delivery.

5.11.1 Maximum permitted motor weight

Two criteria are to be checked when mounting a motor onto the gear unit.

1. Maximum motor weight depends on gear unit design and mounting type
2. Maximum motor weight depends on motor adapter size

INFORMATION



The motor weight may not exceed either one of these criteria.

- Only use motors with the data that was given to SEW-EURODRIVE for dimensioning. If another motor is to be used, contact SEW-EURODRIVE before installing the motor.

5.11.2 Claw coupling

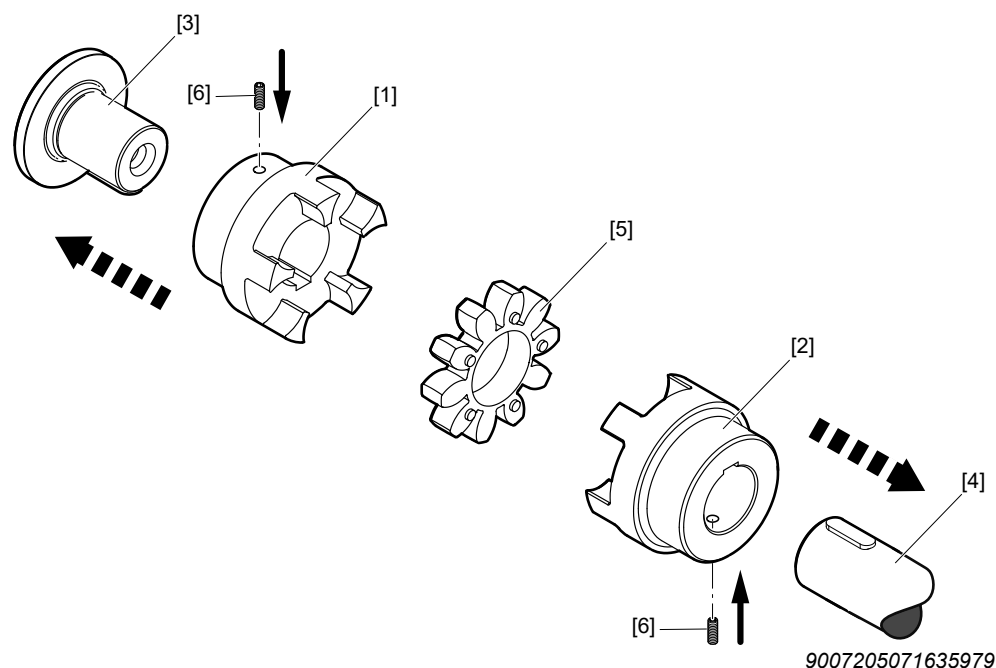
Observe the operating instructions of the respective coupling manufacturer.

You can find these together with the dimension sheet and further documents in the overall documentation for the gear unit.

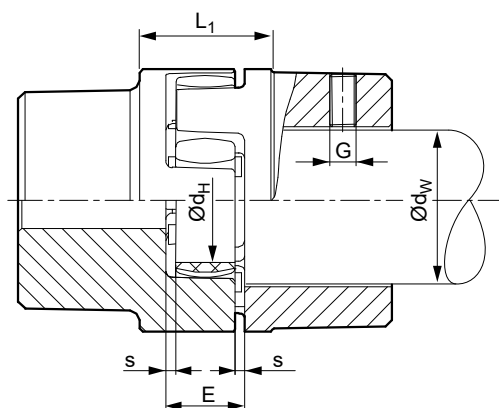
Torsionally flexible jaw-type coupling

Observe the notes in chapter "Important information" (→ 62).

Mounting the coupling



1. **NOTICE!** Improper assembly may result in damage to the hubs [1][2]. Possible damage to property. Heat the hub to about 80 °C to facilitate assembly. Mount the hubs [1][2] onto the input and output shafts [3][4].
2. Insert the spider [5] or DZ elements into the cam section of the input and output hubs [1][2].
3. **NOTICE!** Improper assembly may result in damage to the coupling. Possible damage to property. During assembly, it is essential to observe dimension E so that the spider remains axially flexible during operation. The dimension E is listed in the following table.
If the gear unit and motor have already been installed permanently, set dimension **E** by moving the hubs [1][2] axially on the input and output shafts [3][4].



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4. Secure the hubs by tightening the set screws [6].

Coupling size	Mounting dimensions			Retaining screw	
	E mm	s mm	d _H mm	G	Tightening torque Nm
14	13	1.5	10	M4	1.5
19	16	2	18	M5	2
24	18	2	27	M5	2
28	20	2.5	30	M8	10
38	24	3	38	M8	10
42	26	3	46	M8	10
48	28	3.5	51	M8	10
55	30	4	60	M10	17
65	35	4.5	68	M10	17
75	40	5	80	M10	17
90	45	5.5	100	M12	40
100	50	6	113	M12	40
110	55	6.5	127	M16	80
125	60	7	147	M16	80
140	65	7.5	165	M20	140
160	75	9	190	M20	140
180	85	10.5	220	M20	140

Displacement – Aligning the coupling

NOTICE

Improper mounting of the coupling may result in damage.

Possible damage to property.

- The shaft ends must be aligned accurately to ensure a long service life of the coupling. It is essential that you adhere to the specified displacement values, see manufacturer documentation. Exceeding these values will damage the coupling. Exact coupling alignment increases its service life.

Displacement values

The following table shows the displacement values:

Coupling size	Max. axial displacement ΔK_a in mm		Max. radial misalignment ΔK_r in mm		Angular displacement ΔK_w for $n = 1500 \text{ min}^{-1}$		Angular displacement ΔK_w for $n = 3000 \text{ min}^{-1}$	
	(-)	(+)	1500 min^{-1}	3000 min^{-1}	Degree	mm	Degree	mm
14	-0.5	1.0	0.17	0.11	1.2	0.67	1.1	0.60
19	-0.5	1.2	0.20	0.13	1.2	0.82	1.1	0.70
24	-0.5	1.4	0.22	0.15	0.9	0.85	0.8	0.75
28	-0.7	1.5	0.25	0.17	0.9	1.05	0.8	0.85
38	-0.7	1.8	0.28	0.19	1.0	1.35	0.9	1.1
42	-1.0	2.0	0.32	0.21	1.0	1.7	0.9	1.4
48	-1.0	2.1	0.36	0.25	1.1	2.0	1.0	1.6
55	-1.0	2.2	0.38	0.26	1.1	2.3	1.0	2.0
65	-1.0	2.6	0.42	0.28	1.2	2.7	1.1	2.3
75	-1.5	3.0	0.48	0.32	1.2	3.3	1.1	2.9
90	-1.5	3.4	0.5	0.34	1.2	4.3	1.1	3.8
100	-1.5	3.8	0.52	0.36	1.2	4.8	1.1	4.2
110	-2.0	4.2	0.55	0.38	1.3	5.6	1.2	5.0
125	-2.0	4.6	0.6	–	1.3	6.5	–	–
140	-2.0	5.0	0.62	–	1.2	6.6	–	–
160	-2.5	5.7	0.64	–	1.2	7.6	–	–
180	-3.0	6.4	0.68	–	1.2	9.0	–	–

5.11.3 Attaching the motor to the motor adapter

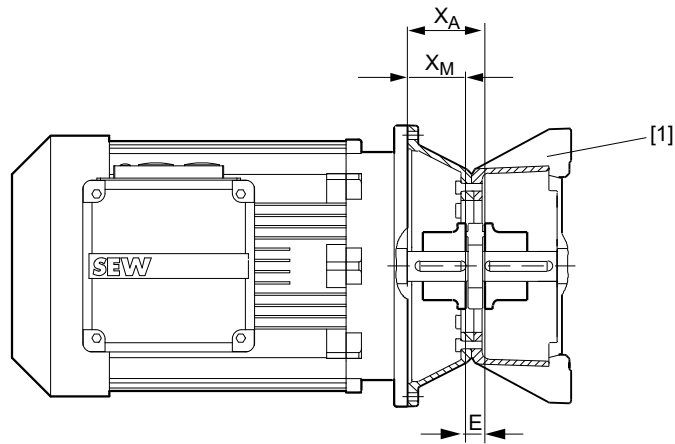
- Clean the motor shaft and flange surfaces of the motor and the motor adapter. They must be dry and free of grease.

INFORMATION



To avoid contact corrosion, SEW-EURODRIVE recommends applying NOCO® fluid to the motor shaft before mounting the coupling half.

2. Push the coupling half onto the motor shaft and position it. When doing this, observe the information in chapter "Claw coupling" (→ 81) and the figure below. The coupling size and type are indicated on the coupling.



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[1] Motor adapter

X_A Distance between the coupling and the motor adapter flange surface

E Installation dimensions

X_M Distance between the coupling and the motor flange surface

$$\rightarrow X_M = X_A - E$$

3. Secure the coupling halves using the set screw.
4. Mount the motor onto the motor adapter, making sure that the claws of the coupling engage each other.

INFORMATION



The mounting dimensions for the coupling are given in the order-specific dimension sheet.

5.11.4 Motor adapter air baffles

Observe the following information:

- Never operate the gear unit if the protective housing is not installed.
- Protect the fan guard from external damage.
- Keep the air inlet of the fan clear.

Observe the following tightening torques when installing the fan guard:

Screws/nuts	Tightening torques Strength class 8.8 Nm
M6	12
M8	28
M10	56
M12	96

5.12 Fan /FAN

Observe the following information:

- If protective devices for couplings or similar are installed on gear units equipped with a fan, sufficient clearance must be provided for the intake of cooling air.

For the required clearance, refer to the dimension drawing in the catalog or in the order documents.

- Never operate the gear unit if the protective housing is not installed.
- Protect the fan guard from external damage.
- Keep the air inlet of the fan clear.

Observe the following tightening torques when installing the fan guard:

Screws/nuts	Tightening torques Strength class 8.8 Nm
M6	12
M8	28
M10	56
M12	96

5.13 Oil heater /OH



⚠ WARNING

Danger of electric shock.

Severe or fatal injuries.

- Before you start working on the unit, de-energize the oil heater and the thermostat.
 - Secure the oil heater and thermostat against accidental activation.
-

NOTICE

Improper operation of the oil heater may result in damage to the gear unit.

Possible damage to property.

- It is important that the heating elements are completely immersed in the oil bath.
-

NOTICE

Improper changes to the mounting position of the gear unit can lead to malfunctions of the gear unit heater.

Possible damage to property.

- Do not change the mounting position without prior consultation with SEW-EURODRIVE. The warranty will become void without prior consultation.
-

5.13.1 Information on the function of the oil heater

- The heater is screwed into the gear unit housing at the factory and is controlled by a thermostat. The set limit temperature on the thermostat below which the oil must be heated is set at the factory depending on the used lubricant.
- The switching point of the oil heater thermostat is factory-set to a temperature of about 5 K above the respective limit temperature for gear unit startup, see chapter "Limit temperature for gear unit startup" (→ 108).

At this temperature, the thermostat switches off the oil heater, see chapter "Limit temperature for gear unit startup" (→ 108). Only then may the gear unit be started up. The thermostat activates the oil heater again once the temperature is approximately 5 K below the switching point.

- To prevent the oil from burning, the heating elements of the heater have a maximum surface load. This is why the heating process for cold gear unit oil can take between one and several hours. The exact duration of the heating process before the start varies depending on the gear unit size, design, mounting position, oil quantity, and ambient temperature.

This is why the thermostat must be permanently supplied with power even if the drive is at standstill for a short time.

If the drive is at standstill over a longer period and the thermostat is not energized, you have to make sure that the thermostat is energized in due time before the drive is started up.

- The thermostat and oil heater are installed in the gear unit and ready for operation. Prior to startup, wire and connect them properly to the current supply.
- Contact SEW-EURODRIVE in the event of different viscosity classes or if ambient temperatures fall below the specified limit temperature.
- During installation, check the thermostat setting according to chapter "Thermostat" (→ 88).

5.13.2 Thermostat

Electrical connection

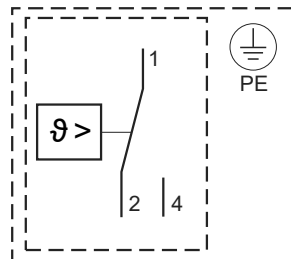
**⚠ WARNING**

Risk of injury due to electric shock.

Severe or fatal injuries.

- Disconnect the unit from the supply system if live parts can be touched during work on the unit.

The following figure shows the electrical connection.



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- Connect to the terminals (1, 2 and 4) according to wiring diagram
- Connect the protective earth to terminal "PE"

INFORMATION

- Observe the manufacturer's documentation.

Technical data

Maximum switching capacity:		
AMTHs-SW-2	Voltage	Current
		Terminal 2/4
	AC 230 + 10% $\cos\varphi = 1$ (0.6)	10 A
	DC 230 + 10%	0.25 A

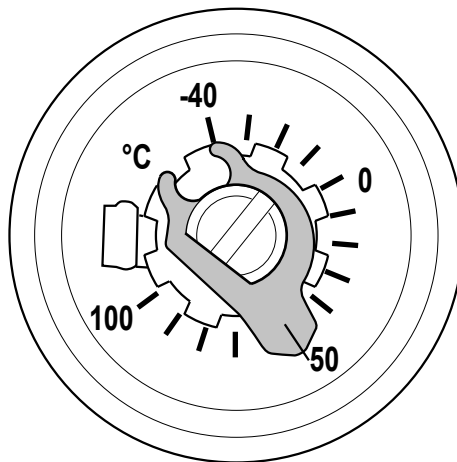
Contact reliability:

To ensure greatest possible contact reliability, the manufacturer recommends a minimum load of AC/DC 24 V, 100 mA for silver contacts.

Nominal impulse voltage:	2500 V
Overvoltage category II	(via the switching contacts 400 V)
Required fusing:	See maximum switching current

- Permitted ambient temperature: -40 °C to +80 °C
- Permitted storage temperature: min. -50° C, max. +50° C
- Scale value: -40 °C to +100 °C
- Cable bushing: M20 ×1.5 for cable cross sections 6 to 13 mm
- Degree of protection IP65 according to EN 60529

The following figure shows the possible setting range of the thermostat. The pointer is set to 50 °C as an example



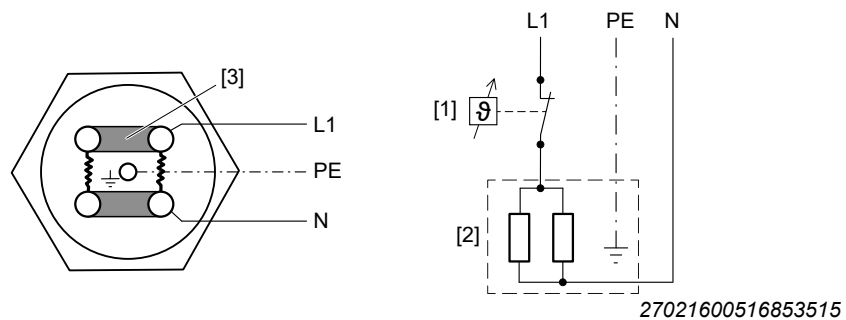
16834938379

5.13.3 Connection power and electrical connection of resistor element

The gear unit heater comes equipped with cable glands and jumpers. These are included in the delivery of the screw-in heaters and are already preassembled. The gear unit heater is connected to the current supply via terminal studs. Use suitable ring cable lugs for connecting the supply cable according to the connection thread of the terminal studs (M4).

Alternating current/1-phase/230 V/parallel connection

A heating element consists of 2 tubular heating elements. The tubular heating elements of the heater are connected in parallel. The following figure shows the connection in the connection area of the heating element:



Observe the electrical characteristic data of the control zone.

- [1] Thermostat
- [2] Heating element
- [3] Jumper

Cable bushing: 1 x PG11

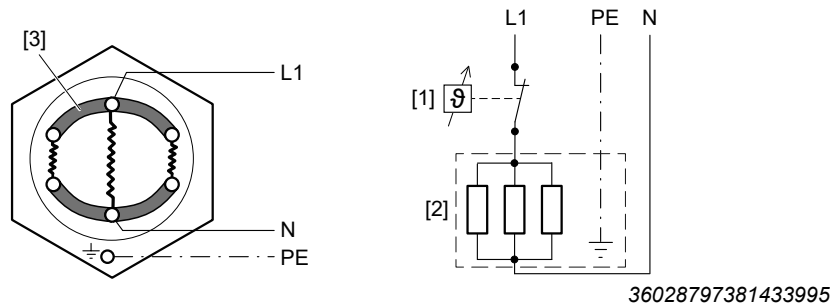
The following table shows the connected load of the heater that can be installed:

	P_{inst}	
Gear unit	1 heating element	2 heating elements
X150	1 × 0.9 kW	2 × 0.9 kW
X170	1 × 1.1 kW	2 × 1.1 kW

P_{inst} = Power of the installed heater

Alternating current/1-phase/230 V/parallel connection/ $I \leq 10$ A

A heating element consists of 3 tubular heating elements. The tubular heating elements of the heater are connected in parallel. The following figure shows the connection in the connection area of the heating element:



Observe the electrical characteristic data of the control zone.

- [1] Thermostat
- [2] Heating element
- [3] Jumper

Cable bushing: 1 x PG16

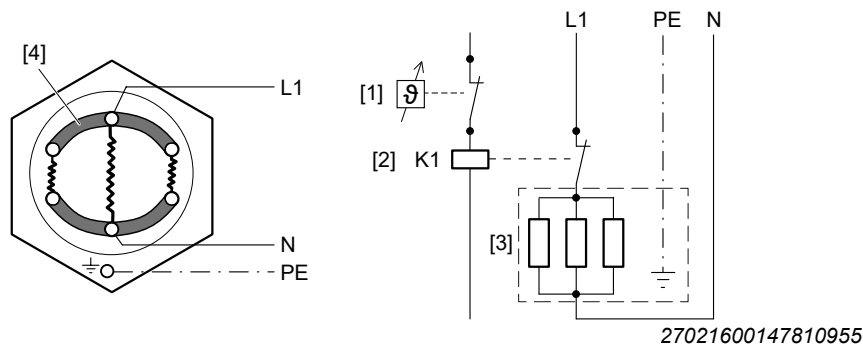
The following table shows the connected load of the heater that can be installed:

	P_{inst}	P_{inst}
Gear unit	1 heating element	2 heating elements
X190	1 × 1.6 kW	2 × 1.6 kW
X210	1 × 1.8 kW	2 × 1.8 kW
X220	1 × 1.8 kW	2 × 1.8 kW
X240	1 × 2.2 kW	2 × 2.2 kW

P_{inst} = Power of the installed heater

Alternating current/1-phase/230 V/parallel connection/ $I \geq 10$ A

A heating element consists of 3 tubular heating elements. The tubular heating elements of the heater are connected in parallel. The following figure shows the wiring ex works (as viewed into the connection space):



Observe the electrical characteristic data of the control zone.

- [1] Thermostat
- [2] Contactor (not included in the scope of delivery)
- [3] Heating element
- [4] Jumper

Cable bushing: 1 x PG16

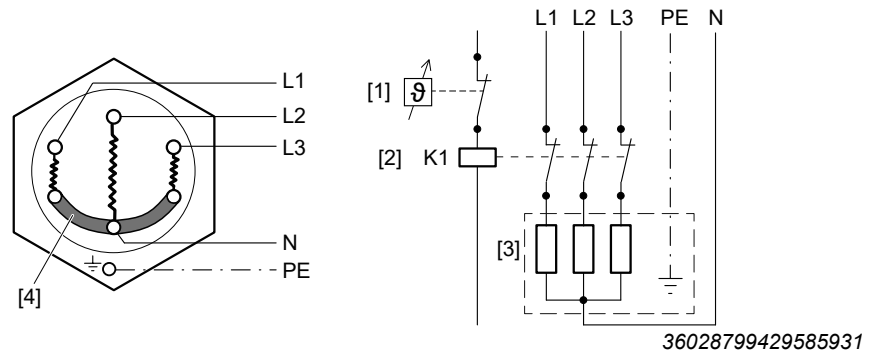
The following table shows the connected load of the heater that can be installed:

	P_{inst}	P_{inst}
Gear unit	1 heating element	2 heating elements
X220	1 × 1.8 kW	2 × 1.8 kW
X240	1 × 2.2 kW	1 × 2.2 kW

P_{inst} = Power of the installed heater

AC current/3-phase/230/400 V/star connection

A heating element consists of 3 tubular heating elements. The tubular heating elements of the heater are in star connection. The following figure shows the connection in the connection area of the heating element:



Observe the electrical characteristic data of the control zone.

- | | |
|--|---------------------|
| [1] Thermostat | [3] Heating element |
| [2] Contactor (not included in the delivery) | [4] Jumper |

Cable bushing: 1 x PG16

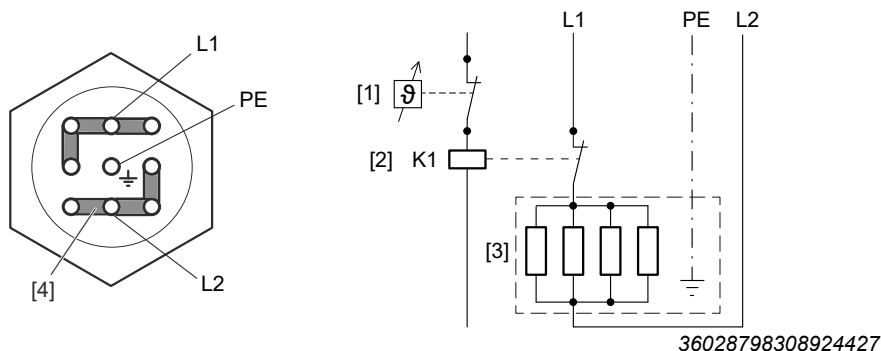
The following table shows the connected load of the heater that can be installed:

	P_{inst}	P_{inst}
Gear unit	1 heating element	2 heating elements
X190	1 × 1.6 kW	2 × 1.6 kW
X210	1 × 1.8 kW	1 × 1.8 kW
X220	1 × 1.8 kW	2 × 1.8 kW
X240	1 × 2.2 kW	1 × 2.2 kW

P_{inst} = Power of the installed heater

Alternating current/2-phase/400 V/parallel connection

A heating element consists of 4 tubular heating elements. The tubular heating elements of the heater are connected in parallel. The following figure shows the wiring ex works (as viewed into the connection space):



Observe the electrical characteristic data of the control zone.

- | | |
|--|---------------------|
| [1] Thermostat | [3] Heating element |
| [2] Contactor (not included in the delivery) | [4] Jumper |

Cable bushing: 1 x PG16

The following table shows the connected load of the heater that can be installed:

	P_{inst}	P_{inst}
Gear unit	1 heating element	2 heating elements
X260	1 × 3.8 kW	2 × 3.8 kW

P_{inst} = Power of the installed heater

5.14 Water cooling cartridge /CCT

5.14.1 Notes on connection/installation

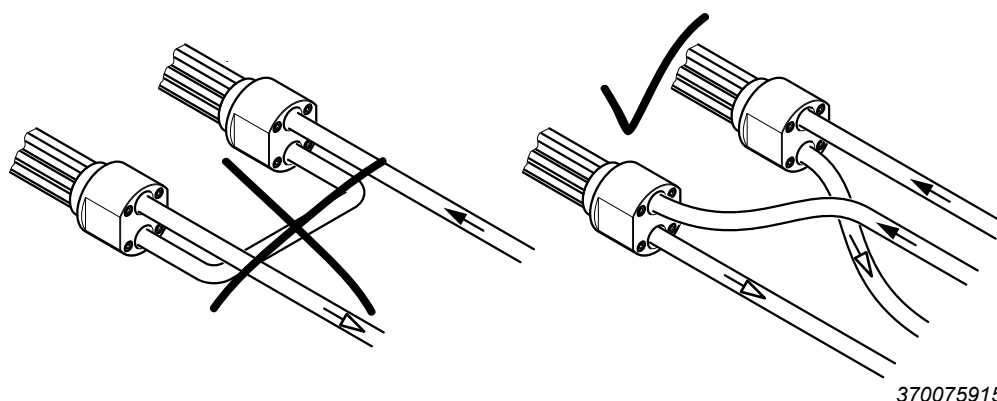
NOTICE

Improper installation of the water cooling cartridge may result in damage to the gear unit.

Possible damage to property.

• Observe the following information:

- Using thread seal tape on the pipe threads increases the resistance between the connection parts as well as the risk of cracking in the casting parts of the water cooling cartridge. Do not tighten the threads so tightly.
- The water cooling cartridges are not equipped with a water drain. In the event of repair work, install a drain on the cooling water outlet to ensure proper draining of the cooling water.
- For connecting the water cooling cartridge, use only piping and mounting parts of the same or compatible material.
- Check the water cooling cartridge for soiling and foreign objects in the pipe connection to ensure unobstructed flow of the media.
- Avoid stresses on the connection points when connecting the piping system. Support the pipes properly, if necessary.
- Install the cooling water outlet pipe in such a way that the water cooling cartridge is permanently flooded by cooling water.
- Refer to chapter "Requirements on the water quality" (→ 97) for permitted cooling media.
- Cooling water temperature and flow rate according to the order documents.
- Make sure that the cooling water pressure does not exceed 6 bar.
- In the event of frost or longer idle states, drain the cooling water from the cooling circuit. Use compressed air to remove any remaining water.
- Filtering to 100 µm is recommended.
- Connect the water cooling cartridge to the existing cooling circuit. The direction of flow is user-defined.
- For gear units with two water cooling cartridges, connect the cooling circuit in parallel, see following figure:



← Supply (cold water inflow)

→ Return (warm water outflow)

The following measures can be taken to ensure proper functioning in different systems:

- Install a safety valve in the cooling water supply pipe for protection against severe deviations in the flow rate or pressure.
- Install a filter into the cooling water supply pipe, especially if the cooling water is obtained from sources other than the municipal water supply system.
- Install an automatic throttle valve in the respective inlet to compensate for over-pressure.

5.14.2 Removal

Observe the notes in chapter "Inspection/maintenance" (→ 112).

5.14.3 Requirements on the water quality

INFORMATION



Contact SEW-EURODRIVE if fully desalinated or demineralized water is used as cooling medium.

The following requirements on the water quality are recommendations. In exceptional cases, certain concentrations of substances of content might cause unforeseen reactions.

The quality of the water as well as its substances are important factors for assessing the cooling water available for water cooling cartridges. The water quality is determined by the water hardness and the pH value of the water.

Water hardness

Water hardness is defined by the amount of hardeners (carbonates and bicarbonates) in the water. Particularly at higher temperatures, the hardeners accumulate to the surface of the water cooling cartridge and lead to a reduction in performance. In case of very hard water, these deposits must be taken into account when designing the water cooling cartridge.

The following table shows the classification of German degrees of hardness to water quality °dH:

Degree of hardness ¹⁾	Water quality
0 – 5 °dH	Very soft water
5 – 10 °dH	Soft water
10 – 20 °dH	Medium hard water
20 – 30 °dH	Hard water
> 30 °dH	Very hard water

1) 10 mg/l of hardener corresponds to 1 °dH

pH value

The water cooling cartridge partially consists of a copper and nickel alloy, to which the following applies:

- Corrosion issues when **pH value is < 6**
- The following applies to alkaline water:
→ Corrosion problems when **water hardness is < 6°dH**.

Lower values can lead to corrosion due to free carbon dioxide.

The following table describes the classification of the water quality based on the pH value:

pH value	Water quality
4.5	Strongly acidic
4.5 – 6.0	Acidic
6.0 – 6.8	Slightly acidic
7.0	Neutral
7.2 – 7.7	Slightly alkaline
7.7 – 8.2	Alkaline
8.2	Strongly alkaline

Cooling water assessment based on water substances

The following table provides an overview of the resistance of copper-nickel pipes to water content in non-drinking water.

Evaluation criterion	Approximate concentration mg/l	Evaluation CuNi10Fe1Mn
pH value	< 6	0
	6 to 9	+
	> 9	0
Chloride	to 1000	+
	> 1000	+ (< 25000 mg/l)
Sulfate	Up to 70	+
	70 to 300	+
	> 300	+ (< 25000 mg/l)
Nitrate	Up to 100	+
	> 100	0
Free (aggressive) carbon dioxide	Up to 20	+
	20 to 50	0
	> 50	–
Oxygen	Up to 2	+
	> 2	+
Ammonium	Up to 2	+
	2 to 20	+
	> 20	–
Iron (dissolved)	Up to 10	0
	> 10	–
Manganese (dissolved)	Up to 1	0
	> 1	–
Free chlorine	Up to 5	Permanently < 0.5 mg/l
	> 5	Intermittently < 3.0 mg/l
Sulfide		0
Ammonia		+ (< 15 mg/l)

+ = Usually good resistance

0 = Corrosion problems can occur, particularly if multiple factors are valued at 0

– = Use is not recommended

Types of cooling water/characteristics

As standard, water cooling cartridges are made of copper nickel pipes. Observe the following special features.

Industrial water

Industrial water is usually untreated water (not drinking water), which is often strongly contaminated. A water analysis is required to assess the use.

For industrial water, water cooling cartridges made of copper, brass and steel have a good resistance. Contact SEW-EURODRIVE.

Stream water and river water

Stream and river water is usually untreated water (not drinking water), which is often strongly contaminated. A water analysis is required to assess the use.

For stream and river water, water cooling cartridges made of stainless steel and titanium have a good resistance. Contact SEW-EURODRIVE.

Cast iron parts must be protected against corrosion by a suitable coating.

Salt water

For salt water, water cooling cartridges made of stainless steel and titanium have a good resistance. Contact SEW-EURODRIVE.

Brackish water

Brackish water is usually a mixture of sea and river water.

For brackish water, water cooling cartridges made of stainless steel and titanium have a good resistance. Contact SEW-EURODRIVE.

5.15 Electrical connection

Observe country-specific regulations for the electrical connection.

With the standard design, connect the following components:

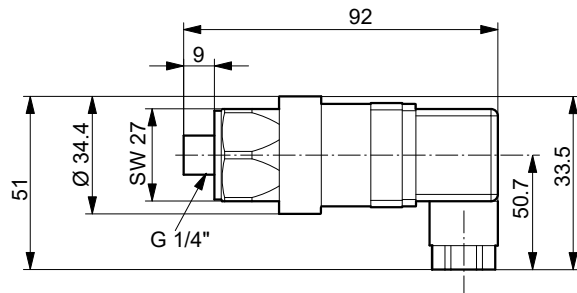
- Pressure switch/pressure sensor
- Pt100 temperature sensor
- Electrical/optical contamination indicator of the oil filter

Observe the following information.

- The shaft end pump always runs during operation of the gear unit.
- Integrate the pressure switch/pressure sensor in the operator's control system in such a way that a warning signal is issued when the pressure drops below 0.5 bar
- Integrate the Pt100 temperature sensor in the operator's control system in such a way that the following switchings points are realized:
 - At $T > \text{"maximum oil temperature"}$ → **GEAR UNIT OFF**
 - At $T < \text{"maximum oil temperature"}$ → **GEAR UNIT ON**
- The contamination indicator of the oil filter indicates when a dirty filter element needs to be replaced.
- If a temperature monitoring device is used, it must be integrated in the circuit in a way that a warning signal is issued or the main drive is switched off if the "maximum oil temperature" is reached.

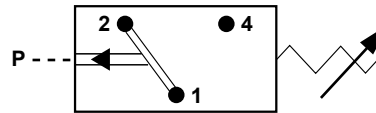
5.16 Pressure switch

5.16.1 Dimensions



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5.16.2 Electrical connection



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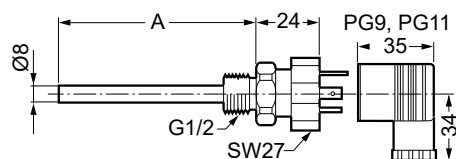
- [1] [2] NC contact
[1] [4] NO contact

5.16.3 Technical data

- Switching pressure: 0.5 ± 0.2 bar
- Maximum switching capacity: 4 A – AC 250 V; 4 A – DC 24 V
- Plug connector: DIN EN 175301-803
- The tightening torque for the retaining screw on the back of the plug connector for electrical connection is 0.25 Nm.

5.17 Temperature sensor /Pt100

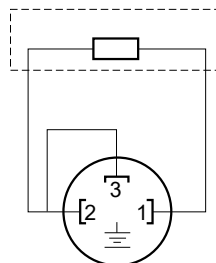
5.17.1 Dimensions



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A in mm
50
150

5.17.2 Electrical connection



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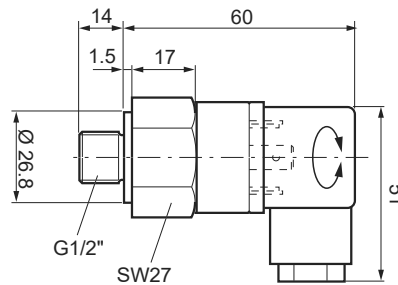
[1] [2] Resistor element connection

5.17.3 Technical data

- Design with thermowell and changeable measuring insert
- Sensor tolerance $K \pm (0.3 + 0.005 \times T)$, (corresponds to DIN IEC 751 class B)
T = Oil temperature in °C
- Plug connector: DIN EN 175301-803 PG9 (IP65)
- The tightening torque for the retaining screw in the back of the plug connector for electrical connection is 0.25 Nm.

5.18 Temperature switch /NTB

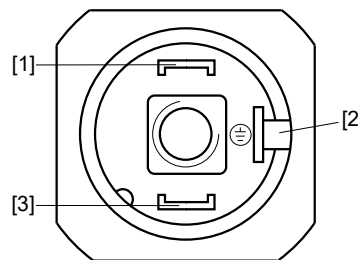
5.18.1 Dimensions



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5.18.2 Electrical connection

To guarantee a long service life and trouble-free functioning, we recommend that you use a relay in the power circuit instead of a direct connection through the temperature switch.



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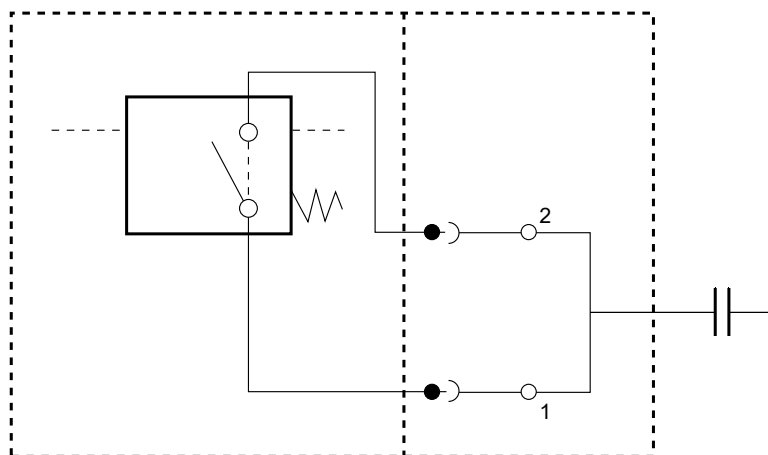
- [1] [3] NC contact
[2] Grounding terminal 6.3 × 0.8

5.18.3 Technical data

- Trip temperature: 70 °C, 80 °C, 90 °C, 100 °C ± 5 °C
- Contact capacity: 10 A – AC 240 V
- Plug connector: DIN EN 175301-803 PG9 (IP65)
- The tightening torque for the retaining screw in the back of the plug connector for electrical connection is 0.25 Nm.

5.19 Electrical/optical contamination indicator of the oil filter

5.19.1 Electrical connection



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5.19.2 Technical data

Max. voltage	AC 250 V / DC 200 V
Max. switching current	1.0 A
Max. switching capacity	70 W
Degree of protection	IP 65 in plugged and secured condition
Contact type	NO contact / NC contact

6 Startup

6.1 Important information

Read the following information prior to startup.



⚠ WARNING

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Work on the gear unit only when the machine is not in use. Secure the drive unit against unintentional power-up. Attach an information sign near the ON switch to warn that the gear unit is being worked on.



⚠ WARNING

Danger due to freely accessible, rotating parts.

Severe or fatal injuries.

- Secure rotating components such as shafts, couplings, gears or belt drives using suitable protection covers.
- Ensure that installed protection covers are sufficiently attached.



⚠ CAUTION

Danger due to unsecured mount-on components, e.g. keys.

Possible injury to persons due to falling parts.

- Install appropriate protective devices.
- Secure the mount-on components.



⚠ CAUTION

Danger due to lubricant leaking from damaged seals and the breather.

Minor injuries.

- Check the gear unit and mount-on components for leaking lubricant.
- The seals must not come in contact with cleaning agent as this may damage the seals.
- Protect the breather against damage.
- Make sure that there is not too much oil in the gear unit. If the oil level is too high and the temperature rises, lubricant may escape from the breather.

NOTICE

Improper startup may result in damage to the gear unit.

Possible damage to property.

- Observe the following notes.

- Fill the gear unit with the oil grade specified on the nameplate. The oil quantity specified on the nameplate is an approximate quantity. The required oil quantity depends on the markings on the oil dipstick, oil level glass or oil sight glass. For additional information, refer to chapter "Checking the oil level" (→ 116) and chapter "Changing the oil" (→ 119).

When additional attachments, e.g. an oil supply system, are mounted to the gear unit, the oil fill quantity is higher. In this case, observe the respective "Oil supply system" operating instructions from SEW-EURODRIVE.

Check the oil level again after the first few operating hours, see chapter "Checking the oil level" (→ 116).

- The most important technical data is noted on the nameplate. Additional data relevant for operation is available in drawings, the order confirmation or the order-specific documentation.
- After installing the gear unit, check to verify that all retaining screws are tight.
- Make sure that the alignment has not changed after tightening the mounting elements.
- Secure the existing oil drain valves against unintended opening.
- Prior to startup, make sure the monitoring devices (pressure switch, temperature switch, maintenance indicator, etc.) are fully operational.
- When using an oil level glass or oil sight glass, protect it against damage.
- If the gear unit is equipped with a fan on the input shaft, check for free air intake.
- Gear units with pressure lubrication may only be taken into operation when the pressure switch is connected.
- It is essential that there is no open fire or risk of sparks when working on the gear unit.
- Make sure that the gear unit is grounded properly. Electrical mount-on components, such as motor, frequency inverter etc., must be grounded separately.
- Protect the gear unit from falling objects.
- When operated in areas with low ambient temperatures, be sure that the gear unit is not below the "limit temperature for gear unit startup". A sufficient heating time must be observed.
- For gear units with long-term protection: Replace the screw plug at the location indicated on the gear unit with a breather (position → see order documents).
- Remove transport protection prior to startup.
- Observe the safety notes in the individual chapters!

6.2 Shaft end pump /SEP

NOTICE

Improper startup of gear units with pressure lubrication may result in damage to the gear unit.

Possible damage to property.

- Do not start up the gear unit if the pressure switch/pressure transmitter is not connected.
- It is essential that the gear unit is sufficiently lubricated from the very beginning! Contact SEW-EURODRIVE if the pump does not build up pressure within 20 seconds after the gear unit has been started up.
- A minimum speed of $\geq 100 \text{ min}^{-1}$ is required for proper operation of the shaft end pump. If you use variable input speeds (e.g. inverter-controlled drives) or if you intend to change the input speed of a gear unit equipped with a shaft end pump, it is essential that you contact SEW-EURODRIVE.
- An oil heater is mandatory when operating gear units with shaft end pump at low ambient temperatures. For detailed information, refer to chapters "Limit temperature for gear unit startup and gear unit shutdown" and "Permitted lubricants" (→ 132).
- Observe the information in chapter "Gear units with shaft end pump / SEP" (→ 72).
- The shaft end pump always starts up together with the gear unit → max. start viscosity 5000 cSt.

6.3 Water cooling cartridge /CCT

NOTICE

Risk of power loss due to contamination.

Possible damage to property.

- A loss of power can be caused by scale deposits on the inside of the pipe. Proceed as described in chapter "Cleaning the water cooling cartridge / CCT" (→ 130).

After having installed the water cooling cartridge in the system, it can be taken into operation and operated without taking further preparatory measures.

Perform the following checks:

- Check the connection points for leaks.
- If necessary, check the valves, fittings, and filters for unrestricted flow and proper functioning.
- Observe the required temperature specifications of the cooling media given in your order documents.

6.4 Flow switch (optional equipment)

Observe the following procedure:

1. Connect the flow switch.
2. Start up the oil pump.
3. Perform the high-flow adjustment and observe the notes in the manufacturer documentation (see attachment).
4. Set the switch-off point of the flow switch to LED 4 or 5 and observe the notes in the manufacturer documentation.
5. Integrate the switching point into the controller in such a way that the gear unit is switched off if the set switching point (see point 4) is not reached.

6.5 Limit temperature for gear unit startup

The minimum permitted ambient temperature/oil temperature for gear unit startup depends on the viscosity of the oil used and the lubrication type of the gear unit.

Before startup, the oil may have to be heated to the specified "starting temperature" by an oil heater. Observe the lubricant table in chapter "Permitted lubricants" (→  132).

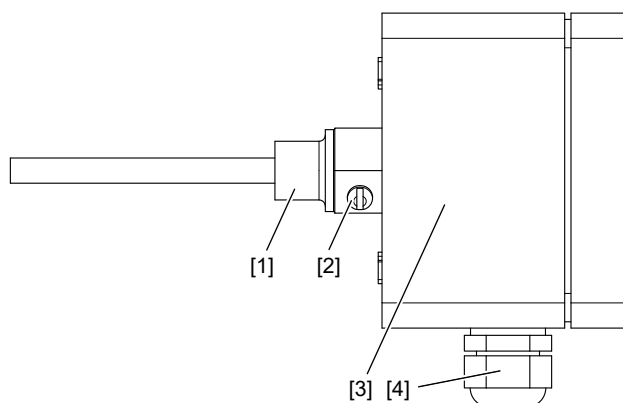
6.6 Oil heater /OH

6.6.1 Positioning the thermostat

The required position of the thermostat may vary depending on the installation space.

Proceed as follows to position the thermostat:

1. Open the clamping screws [2].
2. **NOTICE!** Observe the position of the cable gland. Possible damage to property. Mount it in such a way that no moisture can enter. Turn the thermostat to the required position.
3. Tighten the clamping screws [2].



2338432139

- [1] Threaded jacket
- [2] Clamping screw
- [3] Thermostat
- [4] Cable gland

A threaded jacket prevents oil from leaking. The sensor of the thermostat is inserted in the threaded jacket and attached via the 2 clamping screws.

INFORMATION



Observe the manufacturer's documentation.

6.7 Gear unit preservation/gear unit shutdown

If the gear unit is shut down for a longer period of time, additional preservation measures are required. Observe the installation location, ambient conditions and lubricant condition of the gear unit. Depending on this, preservation may be required within just a few weeks of downtime.

For gear units with water cooling, interrupt the cooling water supply and drain the water from the cooling circuit. For oil supply systems, contact SEW-EURODRIVE.

6.7.1 Internal conservation

- **With new or hardly used gear units:**

- SEW-EURODRIVE recommends the VCI preservation method for internal preservation of the gear unit.
- Apply the required amount of VCI anti-corrosion agent to the inside of the gear unit (e.g. FUCHS Anticorit VCI UNI O-40, www.fuchs.com). The quantity depends on the available internal volume of the gear unit. Filled oil can usually remain in the drive.

Corrosion protection with VCI anti-corrosion agent is not permitted for gear units that are operated with food grade lubricants. Contact SEW-EURODRIVE in such cases.

- Replace the breather with a screw plug and close the gear unit so that it is air tight. Mount a new breather prior to startup.

- **After longer gear unit operation:**

- The oil might be contaminated (e.g. oil sludge, water, ...) after long periods of operation. Therefore, drain the oil and thoroughly rinse the inside of the gear unit with new oil prior to preservation. Observe the information in chapter "Changing the oil" (→ 119) in the corresponding operating instructions. The inside of the gear unit can then be protected again corrosion as described above.

For gear units, internal corrosion protection can also be performed by using the oil type indicated on the nameplate. In this case, the gear unit must be completely filled with clean oil. Replace the breather with a screw plug and fill in the oil from the highest point of the gear unit. To ensure sufficient corrosion protection, all the gearing components and bearing points must be completely covered in oil.

For X2F160 – 320 gear units with contactless sealing system, press grease into the seal of the input shaft.

Then seal the input shaft airtight with adhesive tape. Make sure that the gear unit is stored in mounting position M1. To ensure permanent corrosion protection, fill the inside of the gear unit with the required amount of VCI anti-corrosion agent. Corrosion protection with VCI anti-corrosion agent is not permitted for gear units that are operated with food grade lubricants. Contact SEW-EURODRIVE in such cases.

Before startup, mount a new breather. Observe the oil type and oil quantity according to the nameplate.

6.7.2 External corrosion protection

- Clean the surfaces to be preserved.
- Grease the shaft near the dust lip to separate the sealing lip of the oil seal and the anti-corrosion agent.
- Preservation the exterior of shaft ends and unpainted surfaces with a wax-based protective coating (e.g. Hölterol MF 1424 from Herm. Hölterhoff, www.hoelterhoff.de).



INFORMATION

Consult the respective supplier regarding the compatibility with the oil that is used and the duration of corrosion protection for your particular gear unit design.

Observe the information in chapter "Storage and transport conditions" (→ 23) in the corresponding operating instructions. This chapter provides information on the possible storage periods in conjunction with adequate packaging – depending on the storage location.

7 Inspection/maintenance

7.1 Preliminary work regarding inspection and maintenance

Observe the following notes before starting inspection/maintenance work.



⚠ WARNING

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Work on the gear unit only when the machine is not in use. Secure the drive unit against unintentional power-up. Attach an information sign near the ON switch to warn that the gear unit is being worked on.



⚠ WARNING

An operator machine that is not appropriately secured can fall down during gear unit installation or removal.

Severe or fatal injuries.

- Protect the operator's machine against unintentional movement when installing or removing the gear unit.
- Before loosening the shaft connections, make sure that the system is no longer strained.



⚠ WARNING

Danger due to using impermissible gear unit oil.

Severe or fatal injuries.

- Only use food-grade oils when the gear unit is used in the food industry.



⚠ WARNING

Risk of burns due to hot gear unit and hot gear unit oil.

Severe injuries.

- Let the gear unit cool down before you start working on it.
- Remove the oil drain plug very carefully.



⚠ CAUTION

Danger due to lubricant leaking from damaged seals and the breather.

Minor injuries.

- Check the gear unit and mount-on components for leaking lubricant.
- The seals must not come in contact with cleaning agent as this may damage the seals.
- Protect the breather against damage.
- Make sure that there is not too much oil in the gear unit. If the oil level is too high and the temperature rises, lubricant may escape from the breather.



⚠ CAUTION

Danger due to leakage of lubricant.

Injuries.

- Remove any dripping oil immediately with oil binding agent.

NOTICE

Filling in the wrong oil may result in significantly different lubricant characteristics.

Possible damage to property.

- Do not mix oils of different types and from different manufacturers.

NOTICE

Improper maintenance may result in damage to the gear unit.

Possible damage to property.

- Observe the following notes.

- Strict adherence to the inspection and maintenance intervals is absolutely necessary to ensure safe working conditions.
- For motors, also observe the maintenance notes in the accompanying manufacturer's documentation.
- Use only original spare parts according to the delivered spare and wearing parts lists.
- If you remove the gear unit cover, you must apply new sealing compound to the sealing surface. Otherwise, the sealing properties of the gear unit may be impaired. Consult SEW-EURODRIVE in this case.
- Prevent foreign particles from entering into the gear unit during maintenance and inspection work.
- Never clean the gear unit using a high-pressure cleaning device. Water might enter the gear unit and the seals might be damaged.
- Replace any damaged seals.
- The gear unit must be cleaned in such a way that liquids cannot enter the motor adapter (HSS end) or the mounting flange (LSS end) and accumulate there.
- Perform a safety check and functional check following all maintenance and repair work.
- For third-party parts, such as cooling systems, observe the separate inspection and maintenance intervals of the manufacturer's documentation.
- Strictly observe the safety notes in the individual chapters.

7.2 Inspection and maintenance intervals

Adhere to the following inspection and maintenance intervals:

Time interval	What should I do?
Daily	- Check the housing temperature: - Mineral oil: max. 90 °C - Synthetic oil: max. 100 °C - Check the gear unit noise.
Monthly	- Check the gear unit for signs of leakage. - Check the oil level.
After 500 operating hours¹⁾	First oil change after initial startup
Every 6 months	Check all the screw fittings and piping for leakage.
Every 3000 operating hours, at least every 6 months	- Check the oil consistency. - Fill regreasable sealing systems with grease. In dusty environments, regrease every 3 months. - Refill sealing grease of the lower bearing on the output shaft with drywell sealing systems. In dusty environments, regrease every 3 months.
Depending on the operating conditions, at least every 12 months	- Check whether the retaining screws are tightly secured. - Check whether the gear unit surface is free of dust and dirt to ensure optimal cooling of the gear unit. - Check the breather. Replace if necessary. It is recommended to replace the breather once a year. Observe chapter "Breather /BPG". - Check the alignment of the input and output shaft. - Check the condition and tightness of all rubber tubes (aging effects). - Clean the oil filter. If required, replace the filter element. - Check the condition of the water cooling cartridge /CCT. Perform the work together with the oil change.
Depending on the operating conditions (see figure on the next page)	Change the oil. Observe the specifications of the oil manufacturer.
Varies (depending on external factors)	- Check the installed hose pipes. - Clean the gear unit housing surface and the fan. - Touch up or renew the surface/corrosion protection paint. - Check the built-in cooler (such as the water cooling cover /CCT and the water cooling cartridge /CCV) for deposits. - Check the oil heater /OH (at same time as the oil change): - Check whether all connection cables and terminals are securely fixed and free from corrosion. - Clean encrusted heating elements. Replace if necessary.

1) Note that under certain conditions you can forgo the first oil change after 500 operating hours. For detailed information, refer to the order documents. If you have any questions, contact SEW-EURODRIVE.

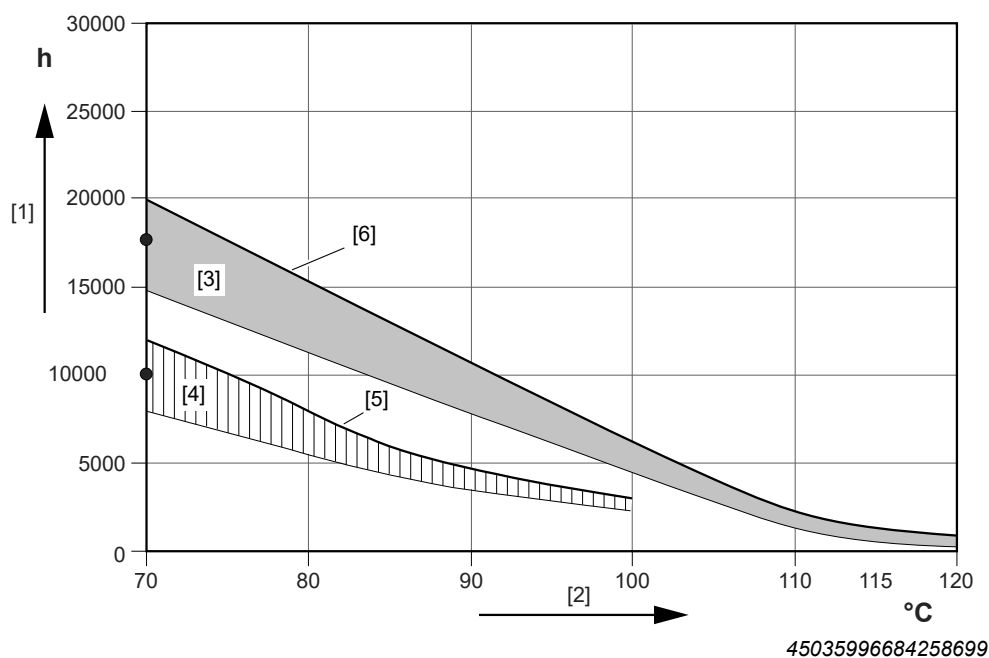
7.3 Lubricant change intervals

It might be necessary to change the oil more frequently when using special designs or under more severe/aggressive ambient conditions.

INFORMATION



Mineral CLP lubricants and synthetic polyalphaolefin-based (PAO) lubricants are used for lubrication. The synthetic lubricant CLP HC (according to DIN 51502) shown in the following figure corresponds to the PAO oils:



- [1] Operating hours
- [2] Sustained oil bath temperature – average value per oil type at 70 °C
- [3] CLP HC/CLP HC NSF H1
- [4] CLP (CC)/E
- [5] SEW GearOil Base
- [6] SEW GearOil Synth

INFORMATION



SEW-EURODRIVE recommends that the gear unit oil is analyzed regularly (see chapter "Checking the oil consistency" (→ 118)) to optimize the lubricant change intervals.

7.4 Checking the oil level

7.4.1 General information

Note the following when checking the oil level:

NOTICE

Improper check of the oil level may result in damage to the gear unit.

Possible damage to property.

- Check the oil level only when the gear unit has cooled down in idle state. SEW-EURODRIVE recommends checking the oil level at an oil temperature of 20 °C to 40 °C. The oil level must be in the middle between the markings [1] and [2] at the oil dipstick or oil level glass.
- For gear units in fixed and variable pivoted mounting position, observe the notes on the following pages.
- When the gear unit is equipped with an oil dipstick and an oil sight glass, the oil level on the oil dipstick is decisive. The oil level on the oil sight glass is only an approximate value.
- Elements for checking the oil level, oil drain, and oil fill openings are indicated on the gear unit by symbols.
- Check the oil level again after the first few operating hours when the gear unit is at standstill.

INFORMATION



Refer to the dimension sheet and the order documents for further information on checking the oil level.

7.4.2 Standard procedure

Video instructions

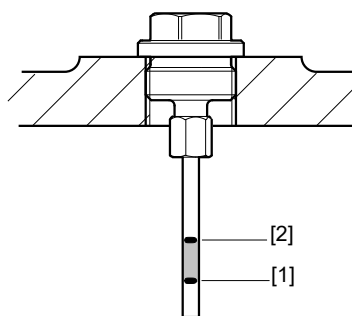
Deutsch



English



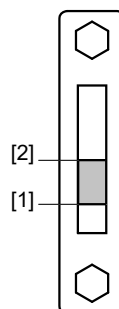
Oil dipstick



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1. Clean the area around the oil dipstick. Unscrew the oil dipstick and remove it.
2. Clean the oil dipstick with a clean cloth and screw it back into the gear unit hand-tight to the stop.
3. Remove the oil dipstick and check the oil level. The oil level must be between the markings [1] and [2].
4. If the oil level is too low, proceed as follows:
 - Open the oil fill plug.
 - Fill in oil of the same oil grade until the oil level is in the middle between marking [1] and marking [2].
5. If you filled in too much oil, proceed as follows:
 - Adjust the oil level. The oil level must be between the markings [1] and [2].
6. Screw in the oil fill plug.
7. Screw in the oil dipstick.

Oil level glass

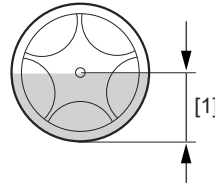


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1. The oil level must be in the middle between marking [1] and marking [2].
2. If the oil level is too low, proceed as follows:
 - Open the oil fill plug.
 - Fill in oil of the same oil grade until the oil level is in the middle between marking [1] and marking [2].
3. If you filled in too much oil, proceed as follows:
 - Adjust the oil level. The oil level must be between the markings [1] and [2].
4. Screw in the oil fill plug.

7.4.3 Oil sight glass

The oil sight glass only shows the approximate oil level. Use the oil dipstick to read the exact oil level.



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7.5 Checking the oil consistency



INFORMATION

A detailed and reliable examination of the oil consistency is not possible with the naked eye. If you are unsure whether the oil is in good condition or whether an oil change is required, we recommend performing a laboratory analysis of the oil.

SEW-EURODRIVE offers a laboratory analysis in which the oil is checked for wear, water and contamination. Furthermore, the viscosity, acid value and additive content of the oil is checked. For this purpose, contact SEW-EURODRIVE.

Proceed as follows to check the oil consistency:

1. **▲ WARNING!** Risk of burns due to hot gear unit and hot gear unit oil. Severe injuries.
Allow the gear unit to cool down below 50 °C before you start working on it.
2. Start the gear unit for a short time for the oil to mix with suspended particles.
3. Determine the oil drain and place a clean and dry container underneath.
4. Slowly open the oil drain and drain some oil.
5. Close the oil drain valve.
6. Check the oil consistency:
 - Check the drained oil for appearance, color, and contamination.
 - If the oil sample is severely contaminated, e.g. water, cloudiness, change in color, dirt, consult a specialist to find out the cause.

7.6 Changing the oil

7.6.1 Information

Observe the following information when changing the oil:

NOTICE

An improper oil change may result in damage to the gear unit.

Possible damage to property.

- Observe the following information.

- Do not use polyglycol oil.
- Perform the oil change immediately after you have switched off the gear unit to prevent solids from settling. If possible, you should drain the oil while it is still warm. Avoid oil temperatures well above 50 °C.
- Always fill the gear unit with the same oil grade that was used before. Mixing oils of different grades and/or manufacturers is not permitted. In particular, synthetic oils must not be mixed with mineral oils or other synthetic oils. Flush the gear unit with the new oil grade thoroughly when switching from mineral oil to synthetic oil and/or from synthetic oil of a certain basis to synthetic oil of a different basis.

For information regarding the approved oils from the various lubricant manufacturers, refer to the "Lubricant overview".

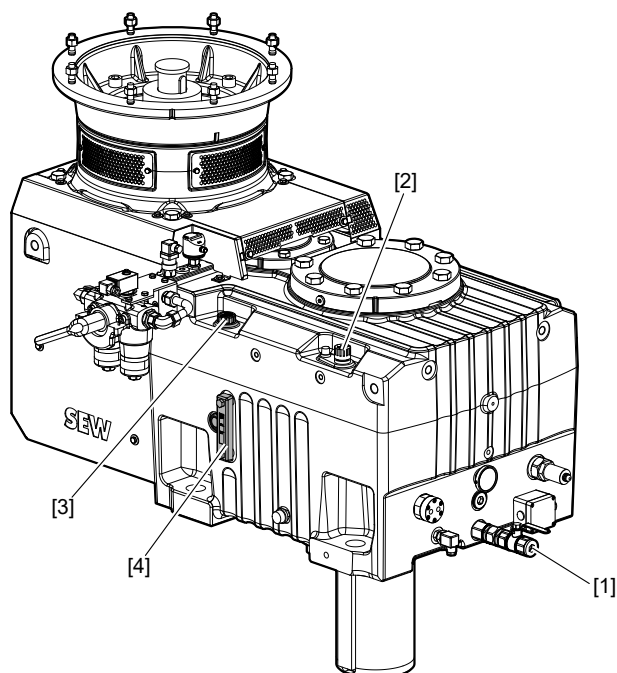
- The oil grade and oil viscosity are listed on the nameplate of the gear unit. The oil quantity specified on the nameplate is an approximate quantity. The mark on the oil dipstick or the oil level glass is the decisive indicator of the correct oil quantity.

When additional attachments, e.g. an oil supply system, are mounted to the gear unit, the oil fill quantity is higher. Observe the operating instructions of the oil supply system.

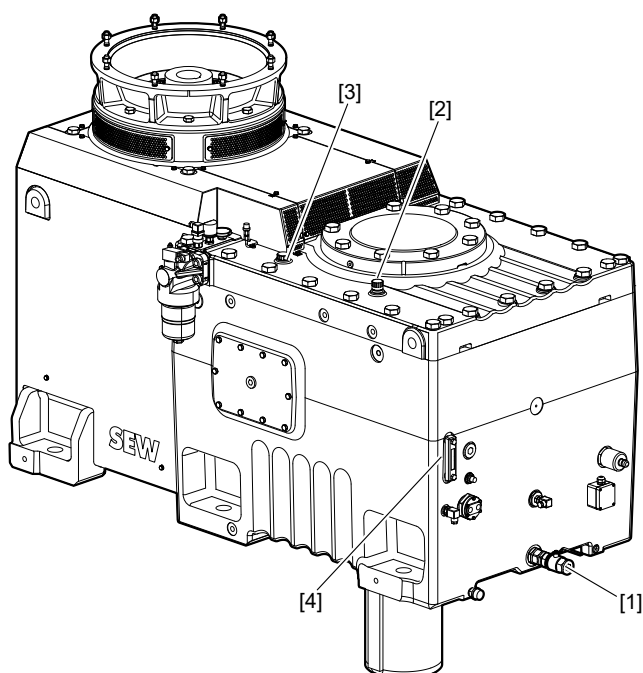
- When changing the oil, flush the interior of the gear unit thoroughly with oil to remove oil sludge, abrasive wear, and oil residues. Use the same oil grade that is used for operating the gear unit. Fill in the fresh oil only after all residues have been removed.
- For the position of the oil level plug, oil drain plug and breather, refer to the order documents.
- An oil level above the max. marking might indicate that foreign liquids (e.g. water) have entered. An oil level below the min. marking might indicate a leakage. Ascertain and eliminate the cause before filling in new oil.
- If required, empty accessories, e.g. filters and pipes.
- Replace any damaged gaskets of the oil drain plug.
- If present, clean the magnetic oil drain plug and the oil dipstick with magnet tip.
- Elements for checking the oil level, the oil drain, and oil fill openings are indicated on the gear unit by safety symbols.
- Use a filling filter (max. filter mesh 25 µm) to fill the oil into the gear unit.
- Remove any leaking oil immediately with an oil binding agent. Dispose of the used oil in accordance with the applicable regulations.

7.6.2 Procedure

X150 – 210



X220 – 260



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1. **▲ WARNING!** Risk of burns due to hot gear unit and hot gear unit oil. Severe injuries.
Allow the gear unit to cool down below 50 °C before you start working on it.
2. Place a suitable container underneath the oil drain [1].
3. Remove the breather [2].
4. Only open the oil drain [1] with caution. Drain all the oil into the container.
5. Clean the magnetic oil drain plugs, if applicable.
6. Close the oil drain [1].
7. Pour in new oil of the same grade through the oil fill opening [2].
 - The oil quantity specified on the nameplate is an approximate quantity. The marks on the oil dipstick [3] or the oil level glass [4] are the decisive indicators of the correct oil quantity, see chapter "Checking the oil level" (→ 116).
 - Use a clean filling aid without zinc coating (plastic funnel or similar).
8. If present, screw the breather [2] and the oil dipstick [3] back into place.
9. **▲ CAUTION!** Danger due to leakage of lubricant. Possible risk of slipping.
Immediately remove any oil that has escaped with oil binder.

7.7 Checking and cleaning the breather

NOTICE

Improper cleaning of the breather may damage the gear unit.

Possible damage to property.

- Prevent foreign particles from entering into the gear unit when performing the following work.

Observe the notes in chapter "Preliminary work regarding inspection and maintenance" (→ 112).

1. Remove any deposits near the breather.
2. If the breather is clogged, replace it.

7.8 Replacing the desiccant breather filter

The service life of the filters usually is 12 months, after that time the filters must be replaced. In case the filters are operated in a highly contaminated environment, the service life of the filters can be limited to 2 months or less. The color of the granulate indicates whether a filter needs to be replaced or whether it can still be used.

Color/color transition	Distribution of color gradient	Meaning	Action
Blue → pink	Filter top → filter bottom	Moisture in the gear unit	Determine the cause
Entirely pink or white	Entire filter	Filter capacity exhausted	Replace the filter

Once the capacity of the filter is exhausted, the desiccant breather filters change their color from blue to pink, proceeding from the bottom of the filter to the top.

If the main part of the breather valve has changed its color to pink (or white after a longer time), the breather filter must be replaced by a new one.

If the color changes from top to bottom, this indicates that a large amount of moisture is in the gear unit.

7.8.1 Disposal

If the desiccant breather filter must be replaced, it is likely to contain oil vapor. The filter must be disposed of in accordance with the corresponding regulations.

7.9 Filling up the sealing grease on the input shaft

⚠ WARNING

Risk of crushing due to rotating parts.

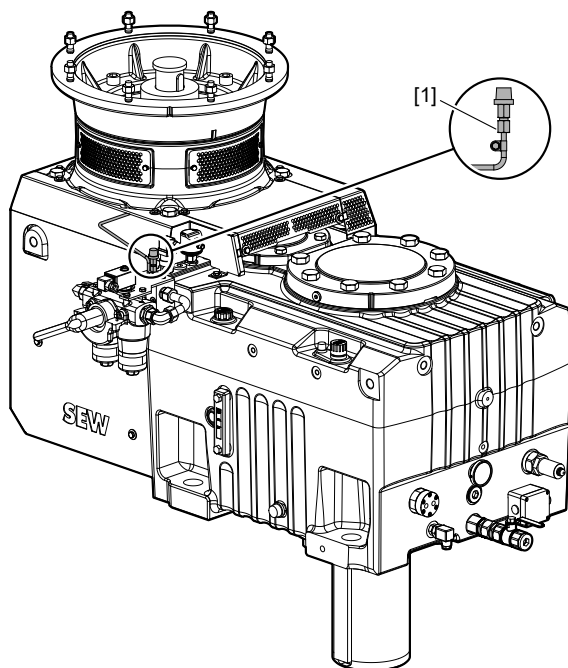
Severe or fatal injuries.

- Make sure to provide for sufficient safety measures for relubrication.

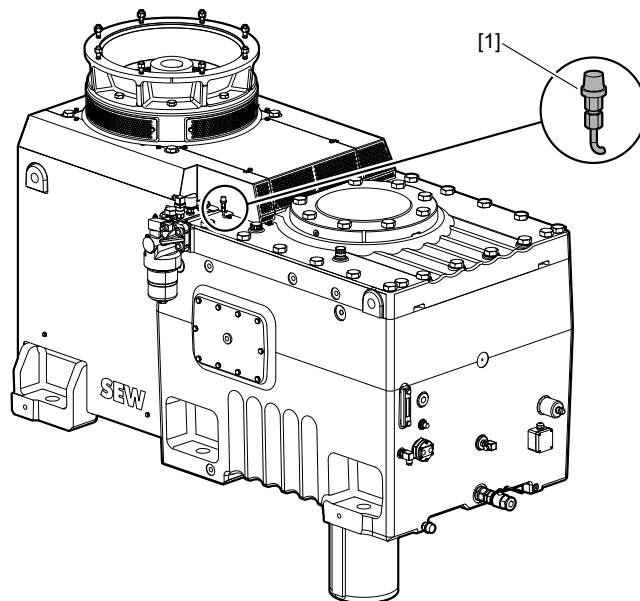


Observe the notes in chapter "Preliminary work regarding inspection and maintenance" (→ 112).

X150 – 210



X220 – 260



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1. Remove the protection cap.
2. Use moderate pressure to force about 30 g of grease into the lubrication point [1] until new grease leaks out of the sealing gap. This forces old grease out of the sealing gap together with dirt and sand. For the lubricants to be used, refer to chapter "Sealing greases" (→ 140).
3. Attach the protection cap.

INFORMATION



Immediately remove the old grease that has leaked out.

7.10 Filling up the sealing grease on the output shaft (not with the drywell sealing system)

7.10.1 Information



▲ WARNING

Risk of crushing due to rotating parts.

Severe or fatal injuries.

- Make sure to provide for sufficient safety measures for relubrication.



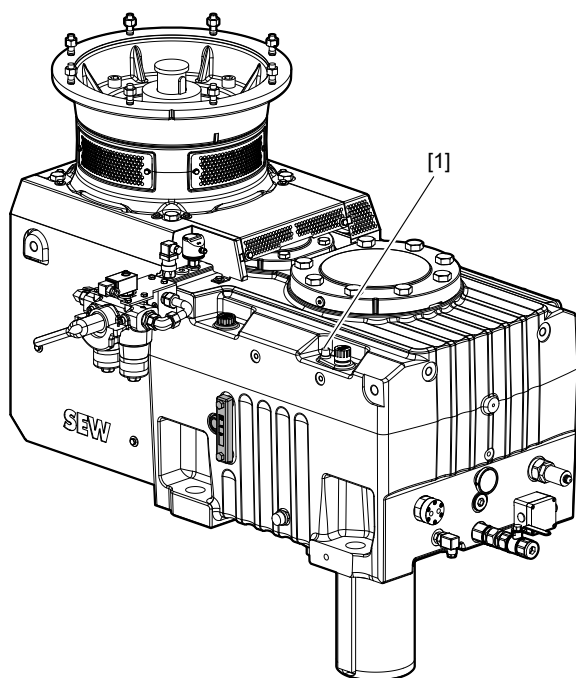
INFORMATION

- Slowly turn the shaft when relubricating the bearing to ensure better distribution of the grease.
- Immediately remove the old grease that has leaked out.

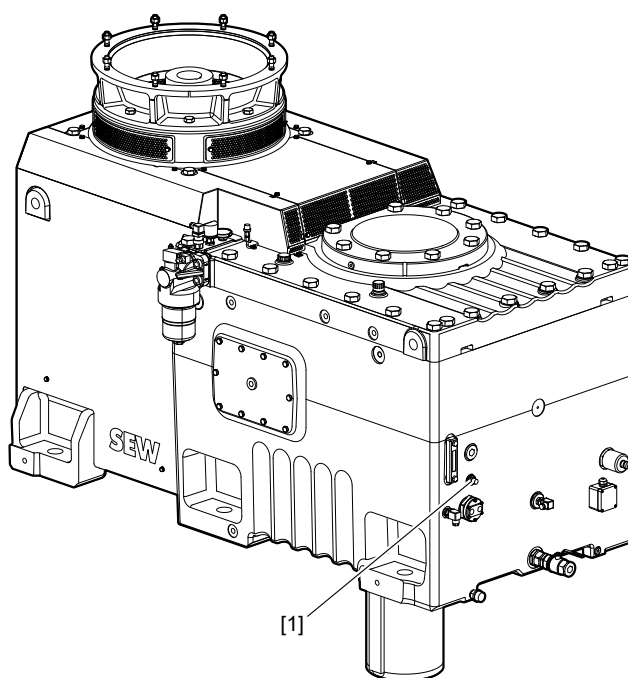
Observe the notes in chapter "Preliminary work regarding inspection and maintenance" (→ 112).

7.10.2 Procedure

X150 – 210



X220 – 260



48304836747

1. Remove the protection cap [1].
2. Use moderate pressure to force grease into the lubrication point [1] until new grease leaks out of the sealing gap. This forces old grease out of the sealing gap together with dirt and sand. For the lubricants to be used, refer to chapter "Sealing greases" (→ 140).
3. Attach the protection cap [1].

7.11 Filling up the sealing grease on the output shaft with the drywell sealing system

7.11.1 Information



▲ WARNING

Risk of crushing due to rotating parts.

Severe or fatal injuries.

- Make sure to provide for sufficient safety measures for relubrication.

NOTICE

Excessive press-in pressure can cause grease to leak between the sealing lip of the oil seal and the shaft. The sealing lip can be damaged or slip.

Possible damage to property.

- Make sure that the grease drain is open and the excess used grease can escape.

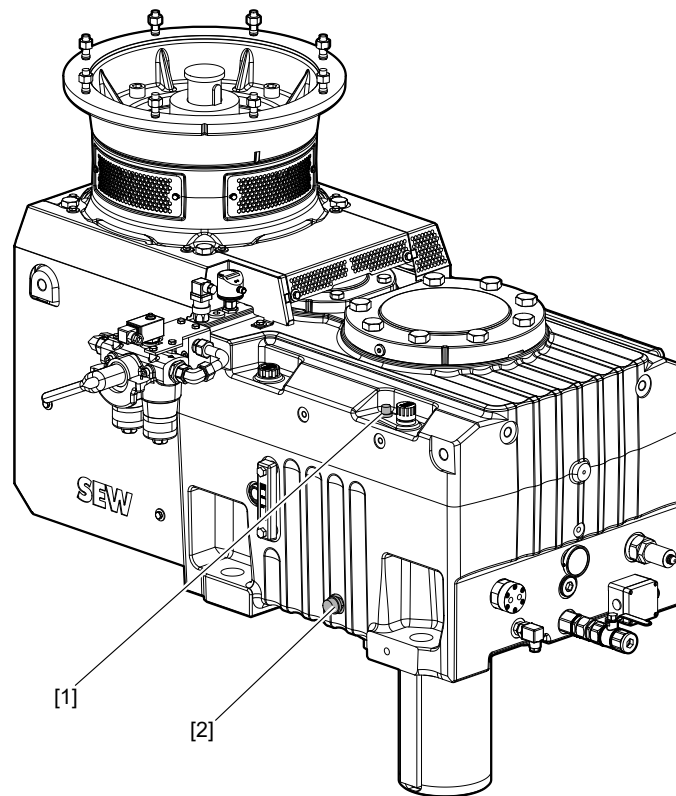


INFORMATION

- Slowly turn the shaft when relubricating the bearing to ensure better distribution of the grease.
- Immediately remove the old grease that has leaked out.

Observe the notes in chapter "Preliminary work regarding inspection and maintenance" (→ 112).

7.11.2 Sizes X150 – 210



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1. Remove the protection cap [2] to allow the excess old grease to escape.
2. Remove the protection cap [1]. Apply moderate pressure to refill the following amount of grease at the grease nipple [1]. For the lubricants to be used, refer to chapter "Sealing greases" (→ 140).

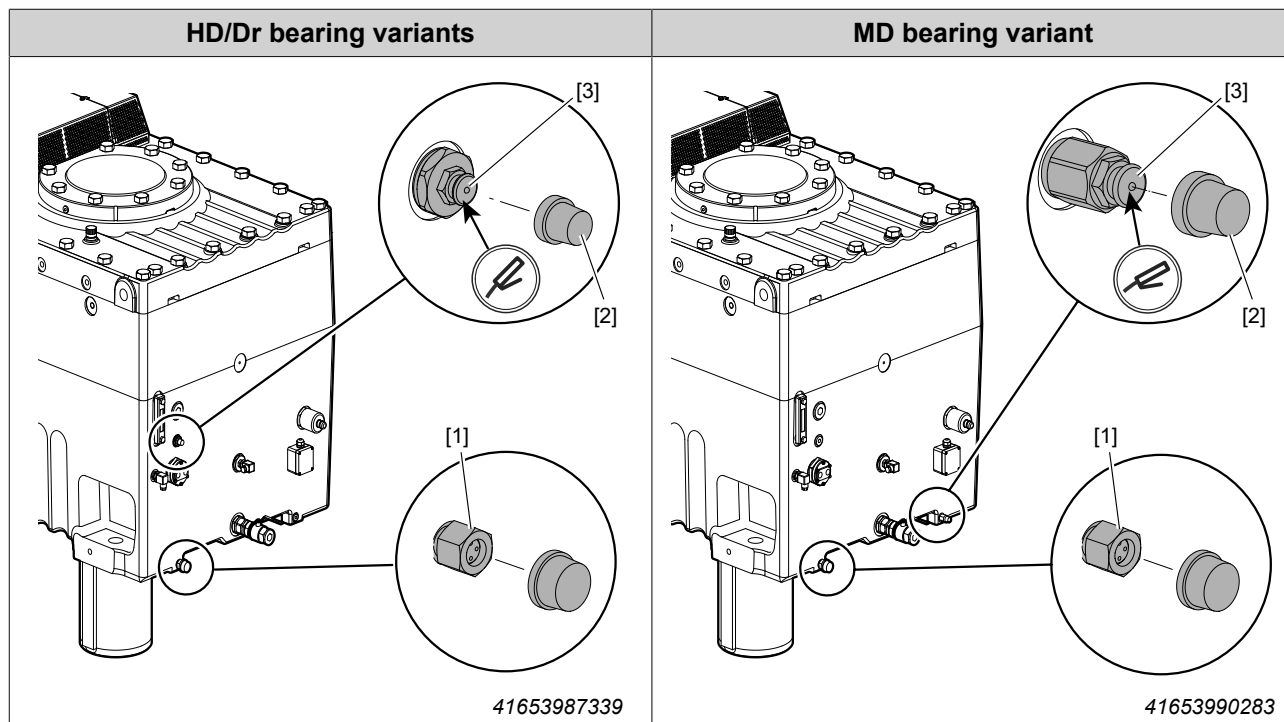
Size	Amount of grease in g
X150	180
X170	220
X190	400
X210	500

3. Place the protection cap [1] on the grease nipple [1].
4. Attach the protection cap [2].

7 Inspection/maintenance

Filling up the sealing grease on the output shaft with the drywell sealing system

7.11.3 Sizes X220 – 260



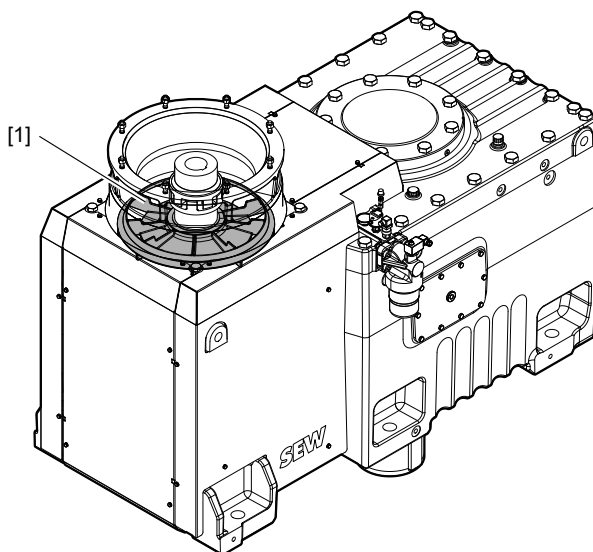
1. Remove the protection cap [1] to allow the excess old grease to escape.
2. Remove the protection cap [2]. Apply moderate pressure to refill the following amount of grease at the grease nipple [3]. For the lubricants to be used, refer to chapter "Sealing greases" (→ 140).

Size	Amount of grease in g
X220	600
X240	900
X260	900

3. Place the protection cap [2] on the grease nipple [3].
4. Attach the protection cap [1].

7.12 Cleaning the fan /FAN

Observe the notes in chapter "Preliminary work regarding inspection and maintenance" (→ 112).



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1. Remove the protective grid [1].
2. Remove any dirt from the fan wheel, fan guard, and protective grid using a hard brush, for example.
3. Before restarting the fan, make sure that the protective grid [1] is mounted properly. The fan must not touch the protective grid.

7.13 Cleaning the oil heater /OH



⚠ WARNING

Danger of electric shock.

Severe or fatal injuries.

- De-energize the oil heater before you start working on the unit.
- Secure the oil heater against unintended power-up.

1. Remove the cabling of the heating element.
2. Before disassembling the heating element, drain the oil (→ 119).
3. **NOTICE!** Improper cleaning may damage the heating elements. Possible damage to property.
Clean the tubular heating elements with solvent. Replace the defective heating elements.
4. Screw the heating element out of the gear unit housing.
5. Apply LOCTITE® 577 to the 2 threads of the heating element.
6. Fasten the heating element by applying torque only to the head of the hex screw.
7. Close the oil drain valve.
8. Fill new oil of the same type as the old oil through the oil filling hole (if you want to change the oil type, contact SEW-EURODRIVE Service).
 - Fill in the oil quantity according to the information on the nameplate. The oil quantity specified on the nameplate is a guide value.
 - Use a clean filling aid (plastic funnel or similar). Avoid using galvanized filling aids.
 - Check to see that the oil level is correct, refer to chapter "Checking the oil level".
9. Connect the heating element.

7.14 Filling the shaft end pump with oil /SEP

Observe the procedure described in chapter "Gear units with shaft end pump /SEP".

For detailed information, refer to the manufacturer's documentation.

7.15 Oil filter

**⚠ WARNING**

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Work on the gear unit only when the machine is not in use. Secure the drive unit against unintentional power-up. Attach an information sign near the ON switch to warn that the gear unit is being worked on.

**⚠ WARNING**

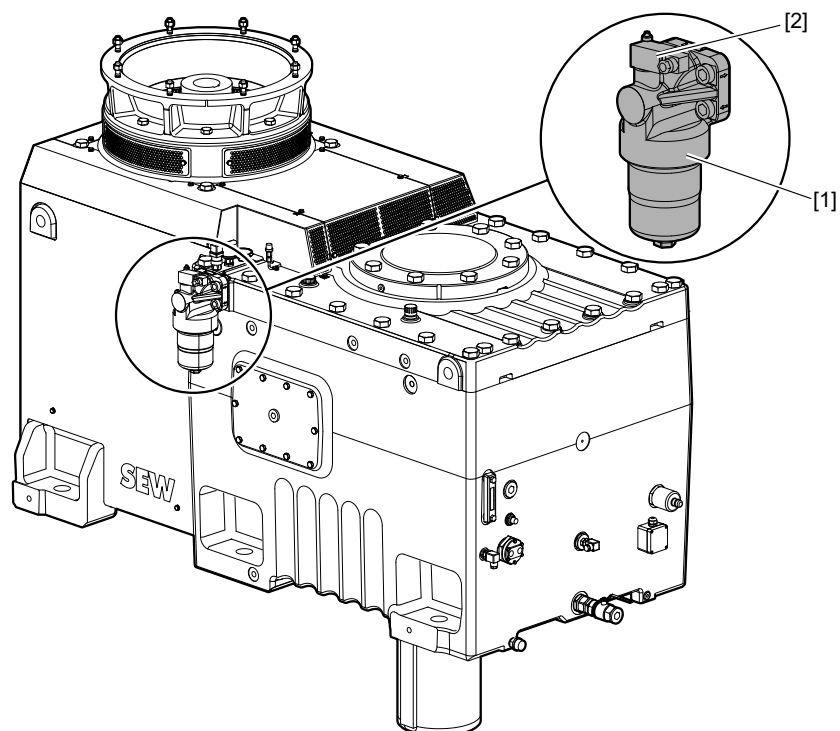
Risk of burns due to hot gear unit oil.

Severe injuries.

- Allow the gear unit and the oil cooling system to cool down before you start working on them.
- Maintenance and repair work on the oil circuit must not be performed while it is under pressure.
- Be careful when opening the screw plugs, oil drain plug, and oil drain valve.

**INFORMATION**

Observe the operating instructions of the oil filter manufacturer.



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- [1] Single filter/duplex filter
[2] Contamination indicator

7.16 Cleaning the water cooling cartridge /CCT

INFORMATION



Do not carry out any repair work on the pipe bundle of the water cooling cartridge unless in case of an emergency. Contact SEW-EURODRIVE to do so. Analyze and report failure symptoms.

7.16.1 Maintenance intervals

The service life of the water cooling cartridge depends to a large degree on the quality of the media and their substances. The operator is responsible for specifying the maintenance intervals. Use the performance parameters and power rating determined during operation to define the maintenance intervals.

Specify the maintenance intervals in such a way that a power loss of the water cooling cartridge does not pose a hazard to the operation of the system.

7.16.2 Information before you start

NOTICE

Risk of destroying components of the water cooling cartridge.

Possible damage to property.

- To prevent damage resulting from improper handling of the water cooling cartridge, always contact SEW-EURODRIVE before you use other comparably aggressive cleaning agents.

NOTICE

Risk of contamination of the medium.

Possible damage to property.

- Experience has shown that the cleaning agent cannot be removed without residue. For this reason, when selecting cleaning agents, make sure they are compatible to cleaning agents and the medium.

NOTICE

Risk of damage to components of the water cooling cartridge.

Possible damage to property.

- Properly vent the water cooling cartridge and the connected systems before taking them into operation again.

7.16.3 Procedure

1. Let the components cool down before you start working on the unit.
2. Depressurize the water cooling cartridge and the connected system pipes. Shut them off with the corresponding valve.
3. Completely drain the gear unit oil prior to disassembly.

4. **NOTICE!** Risk of contamination due to drained media. Possible environmental damage.
When draining the media, they must not get into the soil or the sewer system. They must be collected and disposed of in secured containers in accordance with the applicable environmental regulations.
5. Disconnect the cooling water supply and return from the water cooling cartridge. Drain all the cooling medium.
6. Only loosen the water cooling cartridge via the hexagon on the tube bottom and remove it.
7. **NOTICE!** The sealing surfaces must not be damaged. Possible damage to property.
Damage to the sealing surfaces can result in leakage.
8. Remove the flat gasket. Remove any gasket residues from the sealing surfaces.
9. Clean the water cooling cartridge.
NOTICE! Risk of corrosion due to scratches. Possible damage to property.
Use a brush with soft bristles for cleaning the inside.
The following measures are recommended for cleaning:
 - A mixture of 50% hydrochloric acid with inhibitors and 50% water can be used to remove lime deposits on the inside of the pipe.
 - The inner cleaning of the tube bundle can be done with a brush at a Ø of the pipes of > 5 mm. Make sure that you use a brush with soft bristles so that the surface of the pipe walls is not scratched.
 - Contact SEW-EURODRIVE if you plan to remove scale deposits using other cleaning agents.
 - After cleaning, make sure all cleaning agents have been removed completely from the pipes before taking the water cooling cartridge into operation again.
10. Coat 2 threads with LOCTITE® 577 and screw the water cooling cartridge only via the hexagon to the tube bottom.
11. Re-connect the water cooling inflow and return pipes to the water cooling cartridge.
12. Pour in new oil of the same grade through the oil fill opening.
 - The oil quantity specified on the nameplate is an approximate quantity. The mark on the oil dipstick or the oil level glass is the decisive indicator of the correct oil quantity, see chapter "Checking the oil level" (→ 116).
 - Use a clean filling aid without zinc coating (plastic funnel or similar).
13. Before restarting the system, vent the pipes.
14. Check the tightness.

8 Permitted lubricants

This chapter describes the permitted lubricants and the permitted temperatures for industrial gear units from SEW-EURODRIVE.

8.1 Lubricant selection

Note the following when selecting the lubricants.

NOTICE

Improper lubricant selection can damage the gear unit.

Possible damage to property.

- The oil viscosity and type (mineral/synthetic) to be used are determined by SEW-EURODRIVE specifically for each order. This information is noted in the order confirmation and on the gear unit's nameplate. If other lubricants are used in the gear units and/or in other temperature ranges than those recommended, the right to claim under warranty will become invalid. Exceptions are application-specific approvals that have to be confirmed by SEW-EURODRIVE in written form. This lubricant recommendation in the lubricant table does not imply approval in the sense of a guarantee for the quality of the lubricant supplied by the respective supplier. Lubricant manufacturers are responsible for the quality of their own products.
- Oils of the same viscosity class from different manufacturers do not have the same characteristics. In particular, the minimum permitted oil bath temperatures are manufacturer-specific. These temperatures are specified in the lubricant tables.
- The minimum permitted oil bath temperatures depend on the lubrication type used. These temperatures are specified in the lubricant tables. The values correspond to the maximum permitted viscosity of the individual lubricants.
- Do not mix different synthetic lubricants and do not mix synthetic lubricants with mineral lubricants.
- Check the compatibility of the greases and oils used.

The values specified in the lubricant tables apply as of the time of printing of this document. The data of the lubricants is subject to dynamic change by the lubricant manufacturers. For the latest information on lubricants, refer to:

https://www.sew-eurodrive.de/products/gear_units/standard_gear_units/accessories_and_options/lubricants/lubricants.html

8.2 Structure of the tables and abbreviations

				SEW EURODRIVE
[2]			-20 -5 +5	+65
		VG 150 ¹⁾	SEW GearOil Base 150 E1	
			SEW070040013	
[1]			-15 0 +10	+75
		VG 220	SEW GearOil Base 220 E1	
			SEW070040013	
			-10 +5 +15	+85
		VG 320	SEW GearOil Base 320 E1	
			SEW070040013	

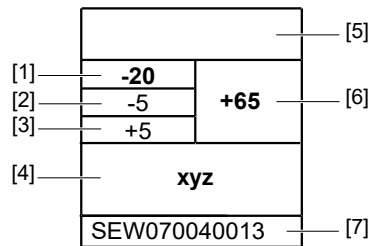
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- [1] Lubricant type
- [2] Viscosity class

Abbreviations

Icons	Designation
CLP	= Mineral oil
CLP HC	= Synthetic polyalphaolefin (PAO)
E	= Ester-based oil
	= Mineral lubricant
	= Synthetic lubricant
	= Lubricant for the food industry (NSF H1 -compliant)
	= Biodegradable oil (lubricant for agriculture, forestry, and water management)
1)	= Lubricants may only be used if service factor $F_s \geq 1.3$

8.3 Explanation of the various lubricants



18014416413363467

- [1] Lowest cold start temperature in °C for splash lubrication¹⁾
- [2] Lowest cold start temperature in °C for drives with pumps up to a max. oil viscosity of 5000 cSt¹⁾
- [3] Lowest cold start temperature in °C for drives with pumps up to a max. oil viscosity of 2000 cSt¹⁾
- [4] Trade name
- [5] Manufacturer
- [6] Highest oil bath temperature in °C²⁾
- [7] Approvals

1) In case of lower temperatures, the oil must be heated to the specified minimum temperature, for example, by using an oil heater. For the maximum permitted oil viscosity per pump type, refer to chapter "Explanations on the oil supply system / oil cooling systems and oil viscosity".

2) Service life is significantly reduced when exceeded. Observe chapter "Lubricant change intervals".

8.4 Explanations on the oil supply system / oil cooling systems and oil viscosity

Adhere to the following oil viscosity: For up-to-date information about the lubricants, visit:

www.sew-eurodrive.de/lubricants

Pressure lubrication	Oil viscosity
Motor pump for pressure lubrication /ONP1	5000 cSt.
Motor pump for pressure lubrication /ONP1L	5000 cSt.
Motor pump incl. air cooler for pressure lubrication /OAP1	5000 cSt.
Shaft end pump /SEP	5000 cSt.
Motor pump incl. water cooler for pressure lubrication /OWP1	5000 cSt.

8.5 Lubricant compatibility with oil seal

Approval	Explanation
SEW07004__13:	A lubricant especially recommended with regard to compatibility with the approved oil seals. The lubricant exceeds the state-of-the-art requirements regarding elastomer compatibility.

Permitted application temperature range of the oil seals

In the low temperature range, oil seals can withstand shaft deflections (e.g. through overhung load) only to a limited extent. Especially avoid or limit pulsating or changing radial displacements of the shaft. Contact SEW-EURODRIVE, if required.

Oil seal material class	Permitted oil sump temperature
NBR	-40 °C to +80 °C
FKM	-25 °C to +115 °C
FKM-PSS	-25 °C to +115 °C

Limitations of use of oil seals with the specific lubricant are described in the following table:

Material class			Manufacturer		Material	
S	1	NBR	1	Freudenberg		72 NBR 902
			2	Trelleborg		4NV11
	2	FKM	1	Freudenberg	1	75 FKM 585
					2	75 FKM 170055
			2	Trelleborg	1	VCBVR

Examples:

S11: Only the elastomer 72NBR902 from Freudenberg meets the requirements of the approval in conjunction with the specific lubricant.

S2: Only the elastomer FKM meets the requirements of the approval in conjunction with the specific lubricant.

8.6 Lubricant tables

This lubricant table is valid when the document is published. Refer to www.sew-eurodrive.de/lubricants for the latest version of the table.

[1]	[2]	SEW EURODRIVE	Castrol	FUCHS	Mobil®	KLÜBER LUBRICATION	SINOPEC	TOTAL
CLP	VG 150	SEW GearOil Base 150 E1 / US1 / CN1 / BR1 SEW070040013	Optigear BM 150 -20 -5 +5 +65 Alpha SP 150	Renolin CLP 150 Plus -20 -5 +5 +65 Renolin HighGear 150	Mobilgear 600 XP 150 -20 -5 +5 +65 SEW070030013	Klüberoil GEM 1-150 N -20 -5 +5 +65	AP-SGO 150 -20 -5 +5 +65 SEW070030013	
	VG 220	SEW GearOil Base 220 E1 / US1 / CN1 / BR1 SEW070040013	Optigear BM 220 -15 0 +10 +75 Alpha SP 220	Renolin CLP 220 Plus -15 0 +10 +75 Renolin HighGear 220	Mobilgear 600 XP 220 -15 0 +10 +75 SEW070030013	Klüberoil GEM 1-220 N -15 0 +10 +75	AP-SGO 220 -15 0 +10 +75 SEW070030013	Carter EP 220 -15 0 +10 +75
	VG 320	SEW GearOil Base 320 E1 / US1 / CN1 / BR1 SEW070040013	Optigear BM 320 -10 +5 +15 +85 Alpha SP 320	Renolin CLP 320 Plus -10 +5 +15 +85 Renolin HighGear 320	Mobilgear 600 XP 320 -10 +5 +15 +85 SEW070030013	Klüberoil GEM 1-320 N -10 +5 +15 +85	AP-SGO 320 -10 +5 +15 +85 SEW070030013	Carter EP 320 -10 +5 +15 +85
	VG 460	SEW GearOil Base 460 E1 / US1 / CN1 / BR1 SEW070040013	Optigear BM 460 -5 +10 +20 +90 Alpha SP 460	Renolin CLP 460 Plus -5 +10 +20 +90 Renolin HighGear 460	Mobilgear 600 XP 460 -5 +10 +20 +90 SEW070030013	Klüberoil GEM 1-460 N -5 +10 +20 +90	AP-SGO 460 -5 +10 +20 +90 SEW070030013	Carter EP 460 -5 +10 +20 +90
	VG 680	SEW GearOil Base 680 E1 / US1 / CN1 / BR1 SEW070040013	Optigear BM 680 0 +15 +25 +90 Alpha SP 680	Renolin CLP 680 Plus 0 +15 +25 +90 Renolin HighGear 680	Mobilgear 600 XP 680 0 +15 +25 +90 SEW070030013	Klüberoil GEM 1-680 N 0 +15 +25 +90	AP-SGO 460 -5 +10 +20 +90 SEW070030013	Carter EP 680 0 +15 +25 +90
	VG 1000		Optigear BM 1000 +5 +20 +30 +90		SEW070030013			

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This lubricant table is valid when the document is published. Refer to www.sew-eurodrive.de/lubricants for the latest version of the table.

[1]	[2]							
	VG 32 ¹⁾				-40 -30 -25 +30 SHC 624			
	VG 68 ¹⁾			-35 -20 -10 +50 Renolin Unisyn CLP 68	-40 -25 -15 +50 SHC 626	-35 -20 -10 +50 Klübersynth GEM 4-68 N		
	VG 150 ¹⁾	-35 -15 -5 +75 GearOil Synth 150 E1	-25 -10 0 +70 AlphaSyn EP 150	-30 -10 0 +70 Optigear Synthetic X 150	-30 -10 0 +75 SHC 629	-25 -10 0 70 Klübersynth GEM 4-150 N	-35 -15 -5 +75 Carter SH 150	
	VG 220	-30 -10 0 +85 GearOil Synth 220 E1	-25 -5 +5 +80 AlphaSyn EP 220	-25 -5 +5 +80 Optigear Synthetic X 220	-25 -5 0 +85 SHC 630	-25 -5 +5 +80 Klübersynth GEM 4-220 N	-25 -5 +5 +80 Carter SH 220	
	VG 320	-25 -5 +5 +100 GearOil Synth 320 E1	-20 0 +10 +90 AlphaSyn EP 320	-20 0 +10 +90 Optigear Synthetic X 320	-20 0 +10 +95 SHC 632	-20 0 +10 +95 Klübersynth GEM 4-320 N	-20 0 +10 +90 Carter SH 320	
	VG 460	-20 0 +15 +110 GearOil Synth 460 E1	-15 +5 +15 +100 AlphaSyn EP 460	-15 +5 +15 +100 Optigear Synthetic X 460	-15 +5 +15 +105 SHC 634	-15 +5 +20 +105 Klübersynth GEM 4-460 N	-15 +5 +15 +100 Carter SH 460	
	VG 680	-15 +5 +20 +110 GearOil Synth 680 E1		-10 +10 +25 +110 Optigear Synthetic X 680	-10 +10 +25 +110 SHC 636	-10 +10 +25 +110 Klübersynth GEM 4-680 N	-10 +10 +25 +110 Carter SH 680	
	VG 1000	SEW 070040313			-10 +15 +30 +110 SHC 639	-10 +15 +30 +110 SHC Gear 1000	0 +20 +30 +110 Klübersynth EG4-1000	

CLP HC

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This lubricant table is valid when the document is published. Refer to www.sew-eurodrive.de/lubricants for the latest version of the table.

[1]	[2]	[3]	SEW EURODRIVE	bremner & leguit	Castrol	FUCHS	KLÜBER LUBRICATION
		VG 68 ¹⁾		-35 -20 -10 +45 Cassida Fluid HF 68	-40 -25 -15 +45 Optileb HY 68	-35 -20 -10 +45 Cassida Fluid HF 68	-35 -20 -10 +45 Klüberoil 4UH1-68 N
	CLP HC ₂ NSF H1	VG 220 ¹⁾	-30 -5 0 +80 SEW GearOil Synth 220 H1 E1 SEW 070040313	-20 -5 +5 +75 Cassida Fluid GL 220	-25 -5 +5 +75 Optileb GT 220 SEW 0700403113	-20 -5 +5 +75 Cassida Fluid GL 220	-25 -5 +5 +75 Klüberoil 4UH1-220 N
		VG 460 ¹⁾	-20 0 +15 +100 SEW GearOil Synth 460 H1 E1 SEW 070040313	-15 +5 +20 +90 Cassida Fluid GL 460	-15 +5 +20 +95 Optileb GT 460 SEW 070040313	-15 +5 +20 +90 Cassida Fluid GL 460	-15 +5 +15 +95 Klüberoil 4UH1-460 N
		VG 680 ¹⁾		-10 +10 +25 +105 Cassida Fluid GL 680		-10 +10 +25 +105 Cassida Fluid GL 680	-10 +10 +25 +105 Klüberoil 4UH1-680 N
		VG 320				-20 0 +10 +8a5 Plantogear 320 S	-20 0 +10 +85 Klüberbio EG2-320
	E	VG 460				-15 +5 +15 +95 Plantogear 460 S	-15 +5 +15 +95 Klüberoil 4UH1-460 N

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1) Lubricants may only be used

if the service factor F_s and peak load factor $F_F \geq 1.6$.

The peak output torque M_{K2per} is limited as follows: $F_F \geq 1.6 \rightarrow M_{K2per} \leq 1.25 \times M_{N2}$ (nominal torque) $\rightarrow$

$M_{K2per} \leq 2 \times M_{N2} / F_F = 2 / 1.6 \times M_{N2}$.

In case of deviations, contact SEW-EURODRIVE.

2) NSF-H1 registered oils for the food processing industry cannot be combined with the gear unit option "Extended storage" (a VCI anti-corrosion agent is added).

NOTICE:

Also observe the thermal application limits of the oil seal materials, see chapter "Lubricant compatibility with oil seal" ($\rightarrow$ 135).

8.7 Lubricant fill quantities

The specified lubricant fill quantities are guide values. Also observe the information provided on the nameplate or in the technical specification.

The mark on the oil dipstick or the oil level glass is the decisive indicator of the correct oil quantity!

The following table shows the lubricant fill quantities:

Size	Pressure lubrication Oil quantity [ltr.]	Bath lubrication Oil quantity [ltr.]
X150	63	177
X170	88	242
X190	122	345
X210	166	444
X220	370	—
X240	565	—
X260	625	—

8.8 Sealing greases/rolling bearing greases

INFORMATION



- Do not mix permitted greases from different areas of application.
- If users want to use a grease that is not listed, it is their responsibility to ensure that the grease is suitable for the intended application.

The table shows the greases recommended by SEW-EURODRIVE with the "lower operating temperature".

The permitted operating temperature of the lubricant used must be taken into account for the lower and upper operating temperature. For further information, refer to chapter "Lubricant table" (→ 136).

Area of application	Manufacturer	Grease	Lower service temperature
Standard	SEW-EURODRIVE	SEW Grease HL 2 E1¹⁾	-40 °C
	Fuchs	Renolit CX TOM 15 OEM	-40 °C
	BP	Energrease LS EP-2	-30 °C
	Castrol	Longtime PD 2/ Tribol GR 100-1 PD	-35 °C
		Spheerol EPL 2	-20 °C
	Klüber	Centoplex EP 2	-20 °C
		Petamo GHY 133 N	-40 °C
	Mobil	Mobilux EP 2	-20 °C
	Shell	Gadus S2 V220 2	-20 °C
	Total	Multis EP 2	-20 °C
	SEW	SEW Grease HL 2 H1 E1¹⁾	-40 °C
	Bremer & Leguil	Cassida Grease GTS2	-40 °C
	Fuchs	Plantogel 2 S¹⁾	-40 °C

1) Use the greases used at the factory if possible.

9 Malfunctions/remedy

9.1 Troubleshooting information

Read the following information before you proceed with troubleshooting:



⚠ WARNING

Risk of crushing if the drive starts up unintentionally.

Severe or fatal injuries.

- Work on the gear unit only when the machine is not in use. Secure the drive unit against unintentional power-up. Attach an information sign near the ON switch to warn that the gear unit is being worked on.



⚠ WARNING

Risk of burns due to hot gear unit and hot gear unit oil.

Severe injury.

- Let the gear unit cool down before you start working on it.
- Remove the oil drain plug very carefully.

NOTICE

Improper handling of the gear unit and the motor may lead to damage.

Possible damage to property.

- Only qualified personnel are permitted to separate the drive and motor and to carry out repair work on drives by SEW-EURODRIVE.
- Contact SEW-EURODRIVE.

9.2 Possible malfunctions/remedy

Fault	Possible cause	Measure
Unusual noise in the area where the gear unit is mounted	Gear unit mounting has loosened	- Tighten retaining screws and nuts to the specified torque - Replace the damaged/defective retaining screws or nuts
Operating temperature too high	- Too much oil - Oil too old - The oil is heavily contaminated - Ambient temperature too high - Gear units with fan: Air intake opening/gear unit housing contaminated	- Check oil level; correct if necessary - Check when the oil was last changed; change the oil, if necessary - Analyze the oil to determine the cause; take measures, if necessary; change the oil - Protect from external heat sources (e.g. provide shade) - Check air intake openings, clean them if necessary; clean the gear unit housing
Temperature at bearing points too high	- Not enough oil - Oil too old - Bearing damaged	- Check oil level; correct if necessary - Check when the oil was last changed; change the oil if necessary - Check the bearing and replace it if necessary. Contact SEW-EURODRIVE
Oil leaking - From cover plate - From inspection cover - From bearing cover - From mounting flange	- Seal not tight at: - Cover plate - Inspection cover - Bearing cover - Mounting flange	Tighten the bolts on the respective cover. Observe the gear unit. Contact SEW-EURODRIVE if oil is still leaking
Oil leaking ¹⁾ From oil seal	- Too much oil - Venting sealed - Oil seal damaged/worn	- Check the oil level and correct, if necessary - Check the breather and replace if necessary - Check the oil seals and replace if necessary
Oil leaking At the gear unit breather	- Too much oil - Drive not installed in proper mounting position - Frequent cold starts (oil foaming) and/or high oil level	- Check oil level, correct if necessary - Install gear unit breather correctly and adjust the oil level - Install oil expansion tank
Oil leaking - From the screw plug - From the oil drain valve	- Gasket not tight - Fittings loosened	- Retighten screw - Retighten the fitting and screw. Secure screw fitting with Loctite®.

Fault	Possible cause	Measure
Grease leaking • on the output shaft	- Sealing lip of the oil seal turned up - Oil seal damaged/worn	Check oil seals; replace if necessary
No oil pump suction	- Not enough oil in the gear unit - Wrong oil grade in the gear unit	- Check oil level in the gear unit - Check oil grade (in particular when temperatures are low)
Delivery rate of oil pump not sufficient	- Oil circulation clogged - Wrong oil grade - Wrong motor speed	- Open valves and plugs - Check oil grade (in particular when temperatures are low) - Check speed of the main motor
Oil pump very loud	- Negative pressure at pump suction side too high - Gear unit too cold	Heat up the gear unit
Oil pump delivers froth	Not enough oil in the gear unit	- Check oil level in gear unit - Check screw fittings for leaks
Pressure switch not switching	- Pressure switch connected incorrectly - Pressure switch defective - Oil pump defective	- Check the connection - Replace pressure switch - Contact SEW-EURODRIVE
Gear unit does not reach cold start temperature	- Thermostat set incorrectly - Oil heater faulty or connected incorrectly - Heat dissipation too great due to unfavorable climatic conditions	- Check the setting of the thermostat - Check the oil heater is connected and working correctly and replace it if necessary. - Prevent the gear unit from cooling off during the warm-up phase.

1) During the run-in phase (24-hour runtime), it is normal for (small amounts of) oil/grease to leak from the oil seal (see also DIN 3761).

9.3 Service

Please have the following information available if you require customer service assistance:

- Complete nameplate data
- Type and extent of the failure
- Time the failure occurred and any accompanying circumstances
- Assumed cause
- Video and audio recordings, if possible

9.4 Waste disposal

Dispose of the product and all parts separately in accordance with their material structure and the national regulations. Put the product through a recycling process or contact a specialist waste disposal company. If possible, divide the product into the following categories:

- Iron, steel or cast iron
- Stainless steel
- Aluminum
- Copper
- Plastics

The following materials are hazardous to health and the environment. These materials must be collected and disposed of separately:

- Oil and grease

Collect used oil and grease separately according to type. Ensure that the used oil is not mixed with solvent. Dispose of used oil and grease correctly.

10 **Supplier documentation**

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RICKMEIER.[®]
PUMPENTECHNOLOGIE

Installation and maintenance instructions

Gear pump

R4,0; R4,5; R6,0 FL-Z-UNI-...

Translation of the original instructions



Attachment pump for pipework

Plug-in pump for installation



Attachment pump without pipework

BA3-6NNN-112 • 11 • EN

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An example configuration is shown on the title page. The delivered product may be different than the one shown.

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1 About these instructions

1.1 Availability

These instructions will provide you with important information about the safe and correct handling of the gear pump – hereinafter also referred to as "product".

These instructions and the supplier documentation must always be available at the operating site of the product. Each person who works with or on the product must read and apply these instructions.

These instructions are intended for operators, technical personnel or trained and instructed persons as well as electrical and hydraulic system construction specialists.

1.2 Area of application

These instructions will provide you with information about the following topics:

- Transport and storage
- Assembly/dismantling
- Installation
- Commissioning
- Operation and handling
- Maintenance and troubleshooting

1.3 Other applicable documents

Document	Contents
Delivery note	Specifications about the scope of delivery, weight, etc.
Declaration of Incorporation	Standards conformity in terms of the EC Machinery Directive 2006/42/EC, Attachment II, No. 1B
Dimensional drawing ¹⁾	Technical data, operating conditions Connection and installation dimensions

¹⁾ Can be reordered, if needed.

1.4 Symbols used

Various symbols for special text locations are used in these instructions.

Symbol	Meaning
⇄	Handling information for safety instructions
→	Cross-reference
–	List
1., 2.	Multi-step handling instruction



Note

You can find special information about the proper and efficient use of the product here.

The symbols for the safety instructions are explained in the "For your safety" chapter.
(→ For your safety [page 6])

1.5 Abbreviations used

Various abbreviations are used in these instructions.

Abbreviation	Meaning
ISO	International Organization for Standardization

2 For your safety

You will find safety-related information at various points in these instructions. The measures described to prevent danger must be taken.

- (→ Product-specific safety instructions [page 9])
- (→ General information about material damage [page 11])
- (→ context of the instructions in which the danger is also described)

2.1 About this chapter

The product is designed and manufactured in accordance with the state of the art and standard safety technology. During use, however, dangers to life and limb of the user or other persons, as well as damage to the machine, other material assets or the environment can occur.
Therefore, only utilize the product in a technically flawless state and in accordance with its intended use, keeping safety and potential dangers in mind and in compliance with these instructions!
Malfunctions that impair the safety must be rectified immediately!



Note
Please supplement these instructions with additional instructions that are required due to existing national, local, and system-specific conditions, regulations for accident prevention and for environmental protection.

If there is any uncertainty, consult RICKMEIER GmbH and provide the data on the nameplate!
For storage, transport, commissioning, operation, maintenance and servicing, the applicable national, local and system-specific regulations must be observed.

2.2 Identification of information about safety and material damage

2.2.1 Explanation of the information about safety

The following signal words and symbols for warnings are used in these instructions. If there are multiple hazards, the warning for the highest level is used.



⚠ DANGER
Dangerous electrical voltage!
DANGER in combination with this symbol indicates an immediately imminent dangerous situation in conjunction with electrical voltage, which if not observed, will lead to death or severe injury.


⚠ WARNING

The situation which is being warned about is stated here!

WARNING indicates a potentially dangerous situation, which if not observed, will lead to death or severe injury.


⚠ CAUTION

Special risk due to heat!

CAUTION in combination with this symbol indicates a potentially dangerous situation, which if not observed, can lead to burns.


⚠ CAUTION

The situation which requires caution is stated here!

CAUTION indicates a potentially dangerous situation, which if not observed, will lead to mild or light injuries.

2.2.2 Explanation of the information about material damage

The following symbols for information about material and environmental damage are used in these instructions.


ATTENTION

Material damage!

You can find special information, as well as requirements and prohibitions about preventing damage to the machine / system and for the prevention of environmental damage here.

2.3 Intended use

The product is designed exclusively to be installed in a machine / system or assembled into a machine / system with other components. The product is only allowed to be commissioned after it has been installed in the machine / system for which it has been designed and the required safety of the complete system is established according to the machinery directive. During the project planning, the principles of the machinery directive of the EU or comparable, locally valid regulations outside the EU are to be observed.

The product is only allowed to be utilized for the conveyance of lubricating operating media – referred to below as "medium". It is exclusively allowed to be used within the scope of the operational limits agreed by the contract.

→ see order acceptance resp. technical documentation

The stipulation of intended use also includes the observance of these instructions and compliance with the inspection and maintenance conditions.

2.4 Improper use

All other uses than those described above shall be deemed to be a non-designated use.

RICKMEIER GmbH shall not be held liable for damages resulting from any non-designated use.

The operator alone carries the risk.

Non-designated use can lead to damage. If the use deviates from contractually agreed limits of use, this must be cleared with RICKMEIER GmbH, otherwise all warranty claims will be rendered null and void.

A non-designated use also includes:

- not observing the limits of use with regard to pressure, temperature, medium, and speed
- limit value for solid particles in medium exceeded
- limit value for gas constituents (undissolved gas) in medium exceeded
- parallel operation of two gear pumps without the protection of non-return valves
- incorrect direction of rotation

2.5 Personnel qualifications

Assembly, commissioning, operation, maintenance, and servicing may only be carried out by persons fulfil the following conditions:

- Legally required minimum age!
- They must have carefully read and understood these instructions and all additionally valid documents.
- They must be technically qualified for the planned work and must be authorised by their employer.
- EC Directive 89/655/EEC **Minimum safety and health requirements for the use of work equipment by workers at work** or comparable locally valid directives outside of the EU must be complied with.

2.6 General safety information

- Only utilise the product in a technically flawless state and in accordance with its intended use, keeping safety and potential dangers in mind and in compliance with these instructions!
- Comply with the relevant accident prevention regulations as well as the other generally recognised safety engineering and occupational-medical rules.
- Ensure that the documentation is present at the operating site of the machine and that the documentation is complete and legible.
- Store the documentation in a manner that makes it accessible to the personnel at all times.
- Comply with the technical data and environmental conditions in accordance with the documentation.
- Have the safety data sheet of the medium to hand. Observe the safety instructions contained therein.
- Refrain from any operation which places the personnel or uninvolved third parties at risk.
- Shut down the product immediately in the event of a safety-related malfunction. The malfunction is only allowed to be rectified by the responsible personnel.
- Protect hot, cold and moving machine parts from contact by customer-provided measures if these parts can lead to dangers or hazards. The contact protection is only allowed to be removed during operation.
- After all work, mount the safety equipment onto the machine/system again in accordance with the regulations.



Note

Information that has been directly attached (for example, **name plate, direction of rotation arrow, direction of flow arrow, fluid connection identification**) must always be observed. These must always be kept in fully legible condition.

2.7 Product-specific safety instructions



DANGER

Electrical voltage!

Danger of death resp. serious risk of injury by electric shock, material damage

- ⇒ Disconnect the relevant machines / system parts from the mains (zero potential) and secure these against unintended reactivation before any work is performed.
- ⇒ Electrical components may only be connected by an authorised qualified technician.



WARNING

Manipulated and/or non-functioning safety and protective equipment!

Serious risk of injury

- ⇒ Switch off the machine / system immediately (EM-OFF switch)!
- ⇒ Make sure that the malfunction or manipulation is immediately rectified by qualified personnel.

Potential equalization missing!

Serious risk of injury

- ⇒ Include the product in the potential equalization of the machine / system.

Pressurised components of the machine / system!

Serious risk of injury when working on unsecured machine / system, material damage

- ⇒ Switch off the machine / system and secure it from unintended reactivation.
- ⇒ Only release line connections, connectors and components after the machine / system has been depressurised. Observe the instructions of the operating company.

Escaping oil mist!

Risk of explosion, risk of fire, risk of injury, environmental pollution

- ⇒ Depressurise the relevant machines / system parts and repair the leaking location.
- ⇒ Only perform welding work when the machine / system is in the depressurised state.
- ⇒ Keep open fire and sources of ignition away from the product.



CAUTION

Hot components or hot surfaces!

Risk of burns

During operation and depending on the operating parameters the housing can reach temperatures >50 °C.

- ⇒ Allow the machine / system to cool down to ambient temperature before you touch it.
- ⇒ Protect yourself by wearing heat-resistant, protective clothing (e.g. protective gloves).

Escaping hot medium!

Risk of burns

- ⇒ Before all work, allow the medium to cool down to ambient temperature.
- ⇒ Protect yourself by wearing heat-resistant, protective clothing (e.g. protective gloves).
- ⇒ Observe the safety regulations when handling hazardous media.

**CAUTION****High noise level during operation!**

Danger of hearing damage, deafness

The noise level depends on the operating conditions (e.g. pressure, temperature) and the installation conditions. Under normal operating conditions, the sound pressure level may reach more than 70 dB(A).

- ⇒ Always wear hearing protection in the vicinity of the machine / system.

High noise level in the case of impermissible operating states!

Danger of hearing damage

Increased or unusual noise levels may occur in impermissible operating states (e.g. speed too high, inlet pressure too low, limit value for air in the medium exceeded) or if components are defective.

- ⇒ Have service staff identify and remedy the cause of the malfunction.

Escaping jet of oil due to a leak on the machine / system!

Risk of injury

- ⇒ Switch off the machine / system immediately.
- ⇒ Repair the leaking location.
- ⇒ Observe the safety regulations when handling hazardous media.

Contact with poisonous or caustic medium!

Risk of injury (e.g. eye injuries, skin damage, poisoning from inhaling)

- ⇒ Prevent contact with the medium.
- ⇒ Wear your personal protective equipment (e.g. protective glasses, protective gloves, suitable work clothing, safety boots) for all activities.
- ⇒ Observe the safety regulations when handling hazardous media.

Tilting risk during transport and setup!

Risk of injury

- ⇒ Secure the product against toppling over, sliding away and falling down when you are working on it.

Danger of slipping due to oily surfaces!

Risk of injury

Secure and mark the danger area.

- ⇒ Use oil binding agents to bind the escaping oil.
- ⇒ Have oil binding agents already available before filling, topping up or before the oil change.
- ⇒ Remove and dispose of the contaminated oil binding agent properly.
- ⇒ Wear your personal protective equipment (e.g. safety boots) for all activities.

2.8 General information about material damage

ATTENTION

Improper handling!

Device damage

- ⇒ Do not mechanically load the product in a prohibited manner.
- ⇒ Never use the product as a handle or step.
- ⇒ Do not place any objects on the product.
- ⇒ Never bang on the driving gear shaft of the gear pump.
- ⇒ Do not damage the sealing surfaces (e.g. suction and pressure connection).

Dry running of the gear pump!

Device damage

- ⇒ Ensure that there is sufficient lubrication of the gear parts.
- ⇒ Set all shut-off devices, which are installed in the pressure or suction line, properly and secure them from unintentional operation.

Contamination of the medium!

Premature wear and malfunctions

- ⇒ Make sure that the inside of the product and the pipes are free of foreign particles (e.g. welding beads, grinding dust).
- ⇒ Seal off the connections during welding work.
- ⇒ Make sure that all hydraulic connections are tight.
- ⇒ Make sure that all seals and fastening closures are correctly installed and free of damage.
- ⇒ Filter the medium during filling with a suitable filter system to minimise foreign particles and the proportion of water in the machine / system.

Escaping or spilling of medium!

Environmental pollution

- ⇒ Collect escaping medium (e.g. drip pan under the product).
- ⇒ Use oil binding agents to bind the escaping oil.
- ⇒ Observe the information in the safety data sheet and the nationally applicable laws and regulations.

Incorrect disposal of the product, the medium and the packaging material!

Environmental pollution

- ⇒ Dispose of the product, the medium and the packaging material in accordance with the nationally applicable laws and regulations.
- ⇒ Dispose of the medium in accordance with the specifications in the safety data sheet.



2.9 Potential equalization

The product must be included in the potential equalization of the entire system.

2.10 Personal protective equipment

The personal protective equipment lies in the scope of responsibility of the operating company. Observe the safety regulations and conditions of your country.

All parts of the personal protective equipment must be intact.

2.11 Alterations or modifications

Conversions or modifications are not permitted. For unauthorized conversions or modifications, the Declaration of Incorporation, which RICKMEIER GmbH submitted for this product, shall lose its validity and all warranty claims will be rendered null and void.

2.12 Replacement parts

Due to the specific design of the gear pump, no replacement parts are provided, but only complete gear pumps.

When ordering replacement parts, always specify the data on the name plate.

3 Technical data

3.1 Operational limits

The product is exclusively allowed to be used within the framework of the operational limits agreed by the contract.

→ see order acceptance resp. technical documentation

The medium must have lubricating properties to ensure a long service life and maximum operating safety. The medium should always be free of hard solid particles.



ATTENTION

Operation of the gear pump outside the permissible operational limits!

Device damage

Due to the possible high oil viscosities up to 100000 mm²/s, the speed of the gear pump must be limited dependent on viscosity and time; that is, a high speed is permitted only at a low viscosity and/or a high viscosity is permitted only at a low speed.

⇒ The medium must **always** be flowable.

⇒ The plant operator must avoid continuous operation in the cavitation area (high speed, high viscosity); short-term operation (e.g., during the start-up procedure) is possible without permanent damage to the gear pump.

⇒ The plant operator must avoid continuous operation with a pump outlet pressure <1 bar.

Consideration must be given also to the following:

Property	Value
Ambient temperature (min.)	-40 °C
Ambient temperature (max.)	80 °C
Kinematic viscosity (min.)	5 mm ² /s
Kinematic viscosity (max.)	100000 mm ² /s
Degree of contamination (according to ISO 4406:1999, max.)	21/19/17
Gas content (undissolved, max.)	10 Vol.-%



Note

Please observe that undissolved gas in the medium can lead to increased noise emissions.

3.2 Sound pressure level

The sound pressure level reference values measured on the test stand by RICKMEIER GmbH are applicable for gear pumps during cavitation-free operation.

Measurement condition	Value
Kinematic viscosity	30...50 mm ² /s
Outlet pressure	5 bar
Distance to gear pump	1 m
Speed of the drive	1500 rpm

Tab. 1: Measurement conditions



Sound pressure level	Gear pump			
	R4.0/35	R4.0/45	R4.0/54	R4.0/78
	68 dB(A)	68 dB(A)	68 dB(A)	72 dB(A)

Tab. 2: Series R4.0/... FL-Z-UNI-...: Sound pressure level $L_{pa} + 3$ dB(A)

Sound pressure level	Gear pump			
	R4.5/35	R4.5/45	R4.5/54	R4.5/63
	70 dB(A)	70 dB(A)	70 dB(A)	70 dB(A)

Tab. 3: Series R4.5/... FL-Z-UNI-...: Sound pressure level $L_{pa} + 3$ dB(A)

Sound pressure level	Gear pump			
	R6.0/80	R6.0/100	R6.0/125	R6.0/160
	76 dB(A)	76 dB(A)	76 dB(A)	76 dB(A)

Tab. 4: Series R6.0/... FL-Z-UNI-...: Sound pressure level $L_{pa} + 3$ dB(A)

3.3 Dimensions and weights

3.3.1 Dimensions

You can find information on dimensions and the location of the centre of gravity in the following documents:

- Dimensions: Delivery note
- Centre of gravity: Dimensional drawing¹⁾

¹⁾ Can be reordered, if needed.

3.3.2 Weights



Note

The weight of the product varies depending on the specific structural design. You will find information about the weight on the delivery note or on the name plate.

4 Description

4.1 Scope of supply

- The following components are included in the scope of supply:
- Product according to order
 - Caps and transport coverings for the hydraulic connections
 - Instructions with all necessary information on the delivered product
 - Declaration of Incorporation within the scope of the EC Machinery Directive 2006/42/EC, Annex II, No. 1B

4.2 Name plate

The product can be identified using the name plate. The following example shows a name plate of this series.

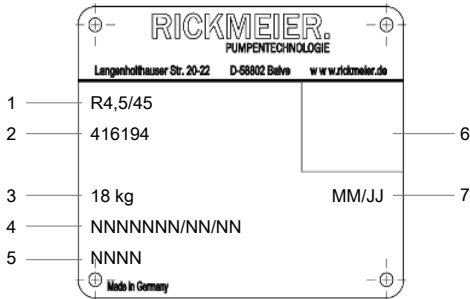


Fig. 1: Name plate

1 Name	2 Identification number
3 Weight	4 Number of the order / Number of the order item / Consecutive number of the item
5 Customer material number	6 Area for Data Matrix Code
7 Delivery date (month/year)	

4.3 Functioning principle

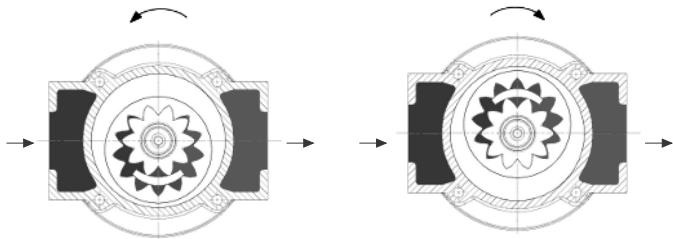


Fig. 2: Internal gear pump delivery principle

Gear pumps are rotary displacement pumps. When the gear shafts turn, the medium enclosed in the space between the teeth is transported from the suction to the pressure side. Then the medium is displaced toward the pressure side by the intermeshing teeth. The transport of the medium results in a pressure drop on the suction side of the gear pump. The medium compensates for this pressure drop by flowing in, thereby maintaining the feed process.

This process is the same for both gaseous and liquid media. As a result, the gear pump is capable of priming the suction pipe itself until it is completely filled with liquid medium.

4.4 Design

The product essentially consists of the components shown in the following.

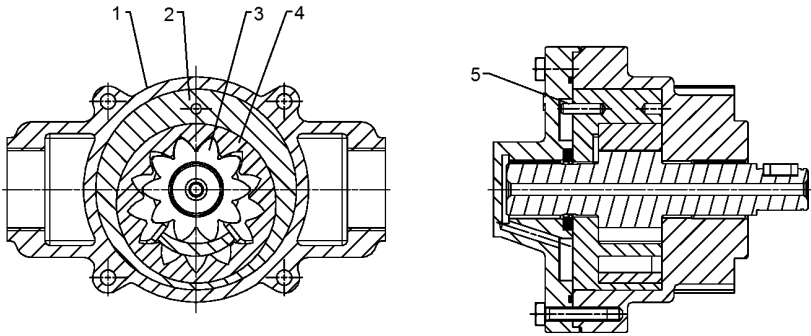


Fig. 3: Cross-section of the gear pump

1 External casing with pipe connections	2 Gear casing
3 Driving gear shaft	4 Annulus
5 Stop pin	

Depending on the structural variant, the following loose parts may be included in the scope of supply (not shown):

- O-rings
 - Screws
 - Clutch
- see order acceptance resp. technical documentation

4.5 General design information

Type	– Internal gear pump
Materials	→ See the order acceptance and/or technical documentation
Mounting type	– Flange mounting
Shaft end of driving gear shaft	– Cylindrical, with fitted key – Cylindrical with factory-mounted clutch
Suction and pressure connection	– Pipe thread – Connection to oil channel → Type, position and dimensions, see dimensional drawing ¹⁾
Pressure relief valve	– Without
Shaft seal	– Without
Direction of rotation	– UNI, i.e., clockwise and anticlockwise with constant direction of flow
Installation location	– Horizontal

¹⁾ Can be reordered, if needed.

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4.6 Functional description

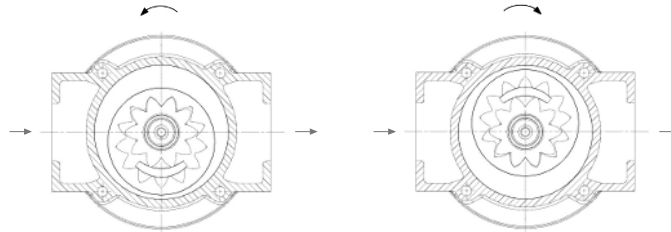


Fig. 4: Functional description of the internal gear pump

The gear casing is hydraulically connected to the external casing through suction and pressure openings. It can be rotated in the external casing and fundamentally take two positions rotated by 180°. The positions are limited by a stop pin.

The driving gear shaft drives the annulus. Depending on the direction of rotation of the driving gear shaft, the gear casing is driven so that the channels inside are congruent with the suction and pressure connections in the external casing and enable delivery.

If the direction of rotation of the driving gear shaft reverses, the gear casing is driven in the opposite direction. The suction and pressure side of the gear casing connect with the connections on the opposite side of the external housing. The consequence is that the medium flows internally through these same external connections of the gear pump despite the changed direction of rotation of the flow gears; that is, the direction of flow remains the same.

The external O-ring prevents the ingestion of air and the discharge of the medium.

4.6.1 External pressure relief valve

The gear pump must be secured using an external pressure relief valve.

→ For the maximum permissible pressures, see the order acceptance and/or the technical documentation.

5 Transport and storage

5.1 Delivery

Proceed as follows at delivery:

1. Check to make sure that the delivery is correct and complete against the delivery note/order.
(→ Scope of supply [page 15])
2. Check the delivery for transport damage.
3. Document any transport damage (e.g., by taking photos of the damage).



Note

Transport damages can only be handled through the transport insurance when the damages have been confirmed by the shipping company.

5.2 In-house transport



Note

The product should be transported in the original packaging until installation to prevent soiling and damage.

(→ Dimensions and weights [page 14])

5.3 Manual transport

The product with a weight of ≤ 10 kg can be transported briefly by hand.

(→ Dimensions and weights [page 14])



CAUTION

Carrying the product by hand!

Risk of injury, material damage

- ⇒ Make sure you are wearing your personal protective equipment (e.g. protective gloves) for all activities.
- ⇒ Carefully set down the product so that it is not damaged.

Proceed the transport as follows:

1. Remove the packaging.
2. Check the product for transport damage and completeness.
3. Lift the product out of the packaging.
4. Transport the product to the place of installation.
5. Place the product on a suitable work surface and secure against tilting or slipping (e.g. support devices, are not included in the scope of supply of RICKMEIER GmbH).
6. Dispose of the packing material in compliance with the applicable legal regulations.
(→ Disposal [page 29])

5.4 Transport to the place of installation



WARNING

Falling load!

Serious risk of injury due to suspended loads

- ⇒ The load is heavy. Transport the pump only using suitable lifting gear with several people.
(→ Dimensions and weights [page 14])
- ⇒ Never step under a suspended load. There is a risk that lifting equipment and lifting tackle are damaged.
- ⇒ Only use transport eyebolts or lifting points provided at the factory.



WARNING

Swinging, slipping or tipping of the load!

People can be crushed by loads that are swinging or being put down

- ⇒ Observe the centre of gravity to prevent the load from tilting.
- ⇒ Secure the load against swinging, slipping or tilting.
- ⇒ Make sure you are wearing your personal protective equipment (e.g. protective gloves, safety boots) for all activities.

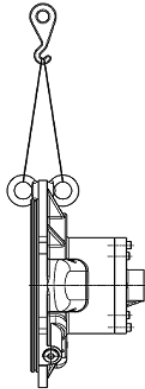


Fig. 5: Lifting of the load

Proceed as follows when transporting the gear pump:

1. Remove the packaging.
2. Check the product for transport damage and completeness.
3. **WARNING! Serious risk of injury due to falling loads! Lifting tackle must not be knotted or laid along sharp edges, as this could cause damage.**
Attach the lifting tackle as shown in the figure.
4. Lift the product out of the packaging.
5. Transport the product to the place of installation.
6. Place the product on a suitable work surface and secure against tilting or slipping (e.g. support devices, are not included in the scope of supply of RICKMEIER GmbH).
7. Dispose of the packing material in compliance with the applicable legal regulations.
(→ Disposal [page 29])

5.5 Storage

Observe the following storage regulations:

- storage location: dry, dust-free, and free of vibrations
- storage temperature: between -25°C and 40°C
- relative humidity (coated parts): ≤ 70%
- relative humidity (uncoated parts): ≤ 40%
- maximum storage period: 24 months



Note

Use the original packaging to prevent contamination and damage. Ensure that the coating applied at the factory is not damaged (corrosion protection).
If your storage conditions will differ, please consult with RICKMEIER GmbH.

5.6 Preservation

The product is coated inside with test oil left from the test run and is therefore preserved. Renewed preservation is only permitted in consultation with RICKMEIER GmbH.

The external coating on the product is a base coat designed for protection against corrosion only during transport and storage. Do not damage the coating.

→ see order acceptance resp. technical documentation

6 Installation

6.1 Preparation

Prepare for installation as follows:

1. Check the ambient conditions.
→ see order acceptance and/or technical documentation
2. Ensure that there is sufficient space for installation, operation and maintenance.
3. Remove the transport covering.



Note

If an **additional pump unit** is installed into the lubrication system, check valves must be installed into the pressure lines to prevent a reverse flow in the pressure lines.
In addition, the pressure side of the gear pump should be **permanently bled** into the gear sump/tank to simplify safe suction. Permanent bleeding has possibly already been integrated into the gear pump depending on design.



Note

Please consult RICKMEIER GmbH if the gear pump is to be driven by a drive pinion.

6.2 Installation

6.2.1 Attachment pump for pipework

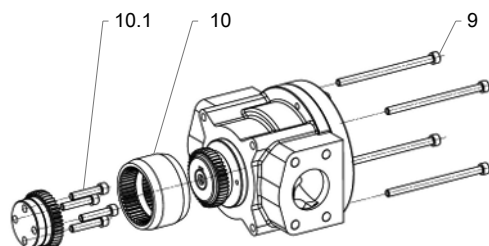
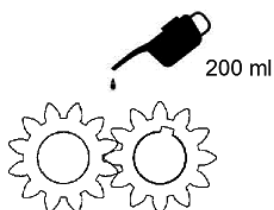


Fig. 6: Installation of the attachment pump

9 Cheese-head screw	10 Clutch
10.1 Cheese-head screw	

Carry out the installation as follows:

1. Assemble the customer-side clutch half
(loose part - if included in the scope of supply).
→ For more information, see the operating instructions of the clutch
→ For the tightening torques, see the technical documentation
2. Fill medium into the suction channel.



3. Rotate the driving gear shaft by hand 3-4 times so that the toothing is covered. Catch any emerging medium in a container.
4. Turn the driving gear shaft manually in both directions until the stop pin strikes the end cover audibly. The switching function of the gear pump has now been checked.
5. Move the product into the specified position.
6. Fix the product in place using the screws included loosely in the delivery.
(loose part - if included in the scope of supply)
→ For the tightening torques, see the technical documentation

6.2.2 Plug-in pump for installation

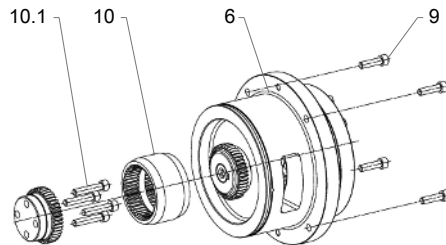
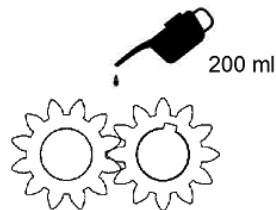


Fig. 7: Installation of the plug-in pump

6 O-ring	9 Cheese-head screw
10 Clutch	10.1 Cheese-head screw

Carry out the installation as follows:

1. Clean the external housing with a clean, non-fibrous cloth.
2. Assemble the customer-side clutch half
(loose part - if included in the scope of supply).
→ For more information, see the operating instructions of the clutch
→ For the tightening torques, see the technical documentation
3. Fill medium into the suction channel.



4. Rotate the driving gear shaft by hand 3-4 times so that the toothing is covered. Catch any emerging medium in a container.
5. Turn the driving gear shaft manually in both directions until the stop pin strikes the end cover audibly. The switching function of the gear pump has now been checked.
6. Push the loosely enclosed O-ring onto the external housing.
7. Move the product into the specified position.
8. Fix the product in place using the screws included loosely in the delivery.
(loose part - if included in the scope of supply)
→ For the tightening torques, see the technical documentation

6.2.3 Attachment pump without pipework

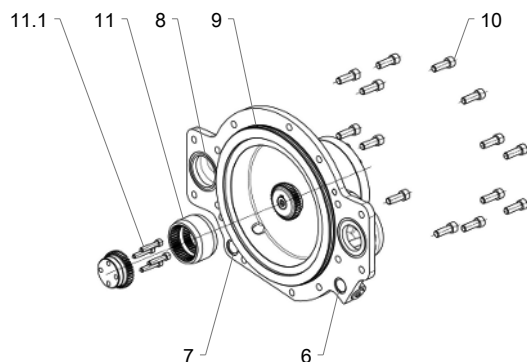
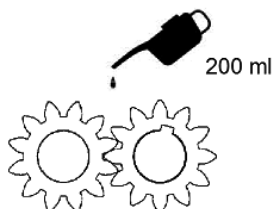


Fig. 8: Installation of the attachment pump

6 O-ring (bearing oil check point)	7 O-ring (bearing oil return)
8 O-ring (suction and pressure connection)	9 O-ring
10 Cheese-head screw	11 Clutch
11.1 Cheese-head screw	

Carry out the installation as follows:

1. Clean the external housing with a clean, non-fibrous cloth.
2. Clean the O-ring groove with a clean, non-fibrous cloth.
3. Assemble the customer-side clutch half
(loose part - if included in the scope of supply).
→ For more information, see the operating instructions of the clutch
→ For the tightening torques, see the technical documentation
4. Fill medium into the suction channel.



5. Rotate the driving gear shaft by hand 3-4 times so that the toothing is covered. Catch any emerging medium in a container.
6. Turn the driving gear shaft manually in both directions until the stop pin strikes the end cover audibly. The switching function of the gear pump has now been checked.
7. Push the loosely enclosed O-ring onto the external housing.
8. Insert the loosely enclosed O-rings into the O-ring grooves.
9. Move the product into the specified position.
10. Fix the product in place using the screws included loosely in the delivery.
(loose part - if included in the scope of supply)
→ For the tightening torques, see the technical documentation



6.3 Planning and connection of pipes

6.3.1 Suction pipe design, NPSHR value



ATTENTION

Check valve in the suction line!

Material damage

⇒ A check valve must not be installed in the suction line.

For correct operation the static pressure immediately on entry to the gear pump must not be below the value specified in the technical documentation under any operating conditions. Deviations are only permitted for brief periods in the starting state and or if agreed upon expressly with RICKMEIER GmbH when ordering.

→ see order acceptance resp. technical documentation

It is advisable to calculate or measure the lowest possible static pressure at the pump inlet during operation. When doing so, all hydraulic resistance in the planned suction pipe must be taken into account. This is particularly important if a coarse strainer, which may become partially blocked over time, is to be installed in the suction line.

The required NPSHR value of the gear pump frequently used for comparison with the NPSHA value of a system can be obtained from RICKMEIER GmbH if provided.



Note

For the **use of a coarse strainer**, we recommend monitoring the pump inlet pressure with a pressure measuring device as close to the gear pump as possible and that the filter is serviced regularly.



Note

The **suction pipe must be absolutely leak-tight** so that no air can be aspirated.

6.3.2 Connection of pipes



ATTENTION

Contaminants in the pipeline!

Device damage

The interior of the product and the pipeline must be free of foreign particles. Any residue will lead to failures (pressure drop).

Impurities resulting from welding (e.g. welding beads, grinding dust) must not get into the product or the pipeline.

⇒ Seal off the connections during welding work.



ATTENTION

Tension due to excessive forces and torque in the case of installation in the pipeline!

Device damage

- ⇒ Always install pipework without twisting/torsion.
(→ Permitted forces and torques at pipe connections [page 25])
- ⇒ Counter the screwed connections during tightening.

Proceed as follows when connecting the pipe:

1. Remove any screwed plugs, flange covers or transport covering, where present.
2. Check the connections of the product and pipes.
The connections and the corresponding mating surfaces must not show any signs of damage. They must be free from paint residues and impurities. Keep everything as clean as possible!
3. The connections must be sealed in accordance with the operating conditions (medium, pressure, temperature).
4. All connections must match accurately.
5. For connections with inner threads, use only screw-in parts with precisely matching threads.
6. Coat threads with oil.
7. Counterhold the threaded coupling at the wrench opening.
8. Centre the seals between the flanges.
9. Connect the piping system.



Note

Lay the suction and pressure lines in the form of a siphon to prevent the gear pump from emptying.

6.3.3 Permitted forces and torques at pipe connections

No forces and torques (e.g. due to twisting, heat expansion) are allowed to have an effect on the gear pump.

6.4 Clutch alignment



ATTENTION

Faulty clutch alignment!

Material damage

- ⇒ When aligning the gear pump in relation to the drive, check the displacement values of the shaft ends. The measured displacement values must not exceed the permissible deviations of the clutch.
- For more information, see the operating instructions of the clutch
- ⇒ Use a clutch free of axial and radial forces.

The clutch must be fitted with ISO fit H7 on the driving gear shaft of the gear pump, unless otherwise specified. The clutch must not be driven on with hammer blows, as the gear pump can be damaged in the process.

6.5 Direction of rotation and flow



ATTENTION

Reversal of the direction of rotation!

Material damage

⇒ The plant owner must ensure that, at the point of reversal, both the suction and pressure lines are depressurised.

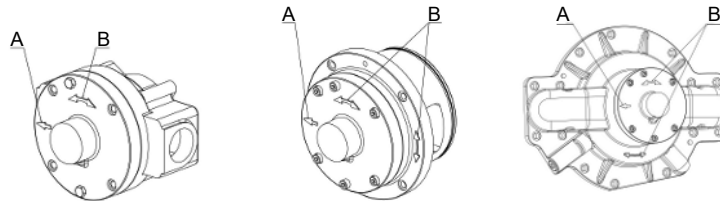


Fig. 9: Direction of rotation and flow

A Direction of flow arrow

B Direction of rotation arrow

The direction of rotation of the gear pump is random and indicated by the direction of rotation arrow on the gear pump.

The direction of flow of the gear pump is constant and indicated by the direction of rotation arrow on the end cover of the gear pump.



Note

Incorrect installation of the gear pump will lead to a plant failure!

7 Commissioning

7.1 Dry running



ATTENTION

Dry running of the gear pump!

Device damage

⇒ Fill the gear pump with the medium before commissioning.
 ⇒ Fill the suction and feed line with medium.



Note

Dry running is **not permitted** and must be prevented by the operating company.

7.2 Requirements

The following requirements must be fulfilled before commissioning:

- The gear pump has been filled with medium.
- The suction line has been filled with medium.
- The product is correctly set up, secured and connected.
- All connections are attached to the pipes torsion-free.
- The pipes are free from impurities.
- All safety equipment is installed and has been tested for correct functioning.



Note

In case of difficult suction conditions, install the gear pump in such a way that residual oil is still in the gear pump. Only in this way can a resumption of the suction function be guaranteed after long downtimes.

7.3 Initial commissioning



ATTENTION

Initial commissioning or restarting without any medium or with insufficient medium in the gear pump!

Device damage

⇒ Make sure that the gear pump and the suction or feed line are filled with the medium during initial commissioning or when restarting a machine/system.



ATTENTION

Overheating of the gear pump!

Device damage

⇒ Open all suction- and pressure-side shut-off devices completely before the commissioning.



ATTENTION

Drip leaks!

Environmental damage

- ⇒ Observe the safety regulations when handling hazardous media.
- ⇒ Collect escaping medium and dispose of it in an environmentally appropriate manner.

Proceed as follows during commissioning:

1. Fully open shut-off devices that are installed in the pressure line and/or suction line.
2. Switch on the drive.
3. Run the gear pump for several minutes without load to bleed the pipes completely.
4. Check whether the medium is leaking at the suction and pressure connections of the gear pump.
5. Switch off the drive in the event of leakage.
6. Seal the pipe fittings by tightening strongly.



7. Seal the flange connections by tightening.
8. Make sure shut-off devices installed in the pressure line and/or suction line are adjusted accordingly and secured to prevent them from being operated unintentionally.

7.4 Restarting after standstill

(→ Initial commissioning [page 27])

8 Operation

The product is only allowed to be operated with the permitted data. RICKMEIER GmbH therefore recommends that you perform the following regular inspections during the operation of the machine / system or the product.

→ see order acceptance resp. technical documentation

Monitor the operation as follows:

- After some time, check the medium in the tank for bubbles or the formation of foam on the surface. Bubbles or the formation of foam can indicate an ingestion of air.
- Pay attention for any signs of change of the running noise characteristics. A significant increase in the running noise can indicate an ingestion of air. If the opening of the suction pipe is too close under the surface of the medium, air can be ingested due to swirls.
- Monitor the contamination of the medium, as otherwise there will be a resultant increase in the wear of the gear pump.
- Monitor the operating conditions (e.g. pressure, temperature, speed), as a change in the operating conditions can lead to increased wear on or damage to the gear pump.

9 Maintenance / Servicing

There are currently no intervals defined for preventative maintenance or for the replacement of the gear pump. This is usually determined on a case-by-case basis under appropriate product observation.

10 Dismantling



⚠ CAUTION

Leakage of toxic or corrosive medium!

Risk of injury, environmental damage

- ⇒ Observe the safety regulations when handling hazardous media.
- ⇒ Have this disassembly work carried out by qualified personnel only.
- ⇒ Collect escaping medium safely and dispose of it in an environmentally appropriate manner.



⚠ CAUTION

Danger due to hot or cold parts/surfaces or hot medium!

Risk of burns

- ⇒ Before disassembly, allow the system/machine to cool down to ambient temperature.
- ⇒ Before disassembly, allow the medium to cool down to ambient temperature.
- ⇒ Wear heat-resistant gloves in case of contact with hot surfaces.

Proceed as follows for dismantling:

1. Switch off the drive and secure it from being switched on again.
2. When the gear pump is driven by an electric motor, an **authorized electrician** must disconnect the drive from the electrical supply.
3. In case of operation at high temperatures the medium must be left to cool to ambient temperature before dismantling.
4. The product must be secured with suitable lifting equipment (e.g. crane or hoist) if required.
5. Block the suction line and pressure line. Do not loosen or release lines, connections and components until the gear pump is no longer under pressure (depressurised).
6. Loosen the connections in the following order:
 1. Pressure connection
 2. Suction connection
 Catch the medium in a separate container.
7. Loosen and remove the fastening bolts between the external casing of the gear pump and the gearbox. Remove the gear pump.
8. Close the connections of the product and the relevant mating surfaces with an oil-tight seal.

11 Disposal

The disposal must be performed by a specialist company with corresponding qualification. This specialist company must ensure that:

- The components must be separated according to material types.
- The working materials used must be sorted and separated according to their properties.

12 Malfunctions / Causes / Remedies

The following table contains directions for remedying any potentially occurring faults or malfunctions and determining their possible causes.

If malfunctions occur that are not listed here or if these malfunctions are not permitted to be rectified by the operating company or the maintenance personnel, the manufacturer must be informed of this. It can be helpful to rectify these malfunctions by providing a detailed description.



Note

Please always provide the data on the name plate.

Service address:

RICKMEIER GmbH
 Langenholthauser Straße 20-22
 D-58802 Balve
 Tel: +49 (0) 23 75 / 9 27-0
 Fax: +49 (0) 23 75 / 9 27-26
kontakt@rickmeier.de
www.rickmeier.de

12.1 Malfunction: Gear pump has no suction

Possible causes	Remedy
Gear pump not sufficiently filled with medium (dry running)	– Fill gear pump with medium (→ Initial commissioning [page 27])
Suction line or seals leak	– Inspect suction line for leaks – Check gear pump seals on suction and pressure ends, replace if necessary
Stop pin dirty	– Dismantle and clean gear pump, replace defective parts
Stop pin shorn off	– Replace gear pump
Pressure drop in suction line too high	– Check cross-section of suction line, increase, if necessary – Shorten suction line – Increase suction side fluid level – If the coarse strainer is installed: clean it, if necessary install filter with larger mesh size
External pressure relief valve dirty or damaged	– Remove external pressure relief valve, clean, replace defective parts
Air in the system / air inclusions / gas bubbles in medium	– Check pipes for leaks – Bleed system – Terminate return line below oil level of tank
Gear pump does not vent	– Check pipes for leaks – Bleed system – Terminate return line below oil level of tank

12.2 Malfunction: Delivery volume too low or outlet pressure too low

Possible causes	Remedy
Suction line or seals leak	– Inspect suction line for leaks – Check gear pump seals on suction and pressure ends, replace if necessary
Pressure drop in suction line too high	– Check cross-section of suction line, increase, if necessary – Shorten suction line – Increase suction side fluid level – If the coarse strainer is installed: clean it, if necessary install filter with larger mesh size
External pressure relief valve dirty or damaged	– Remove external pressure relief valve, clean, replace defective parts
Air in the system / air inclusions / gas bubbles in medium	– Check pipes for leaks – Bleed system – Terminate return line below oil level of tank
Viscosity of the medium too high	– Increase temperature of the medium – Reduce speed
Viscosity of the medium too low	– Reduce temperature of the medium – Increase speed
Size of gear pump too small	– Install larger gear pump

12.3 Malfunction: Outlet pressure too high

Possible causes	Remedy
External pressure relief valve dirty or damaged	– Remove external pressure relief valve, clean, replace defective parts
Maximum approved speed exceeded	– Reduce speed → See the order acceptance and/or technical documentation
Viscosity of the medium too high	– Increase temperature of the medium – Reduce speed

12.4 Malfunction: Gear pump does not start, stops suddenly or has stalled

Possible causes	Remedy
Gear pump not sufficiently filled with medium (dry running)	– Fill gear pump with medium → Initial commissioning [page 27])
Foreign bodies in gear pump	– Replace gear pump
Viscosity of the medium too high	– Increase temperature of the medium – Reduce speed
Viscosity of the medium too low	– Reduce temperature of the medium – Increase speed
Friction bearings overloaded by excessive differential pressure	– Check value of differential pressure → See the order acceptance and/or technical documentation
Friction bearing overloaded by excessively low viscosity	– Reduce temperature of the medium – Increase speed

	– Use higher-viscosity medium
Gear pump distorted	– Remove gear pump, check pipes

12.5 Malfunction: Noise

Possible causes	Remedy
Suction line or seals leak	– Inspect suction line for leaks – Check gear pump seals on suction and pressure ends, replace if necessary
Pressure drop in suction line too high	– Check cross-section of suction line, increase, if necessary – Shorten suction line – Increase suction side fluid level – If the coarse strainer is installed: clean it, if necessary install filter with larger mesh size
Unpressurised pumping of thin media	– Load gear pump with 1-2 bar
Maximum approved speed exceeded	– Reduce speed → See the order acceptance and/or technical documentation
Air in the system / air inclusions / gas bubbles in medium	– Check pipes for leaks – Bleed system – Terminate return line below oil level of tank
Viscosity of the medium too high	– Increase temperature of the medium – Reduce speed
Viscosity of the medium too low	– Reduce temperature of the medium – Increase speed

12.6 Malfunction: Pressure fluctuations

Possible causes	Remedy
Pressure drop in suction line too high	– Check cross-section of suction line, increase, if necessary – Shorten suction line – Increase suction side fluid level – If the coarse strainer is installed: clean it, if necessary install filter with larger mesh size
Air in the system / air inclusions / gas bubbles in medium	– Check pipes for leaks – Bleed system – Terminate return line below oil level of tank
Viscosity of the medium too low	– Reduce temperature of the medium – Increase speed

12.7 Malfunction: External pressure relief valve is noisy

Possible causes	Remedy
Opening pressure of external pressure relief valve not correct	– Set the opening pressure approx. 0.5 to 1 bar above the value of the operating pressure → See plant documentation
Air in the system / air inclusions / gas bubbles in medium	– Check pipes for leaks – Bleed system

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- Terminate return line below oil level of tank
- Check seals, screwed connections

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MAHLE Industrialfiltration is now Filtration Group. For more information, visit industrial.filtrationgroup.com

Medium Pressure Filter Pi 340

Nominal pressure 250/315/350 bar (3560/4480/4980 psi), nominal size up to 450
(also available with filter elements acc. to DIN 24550)

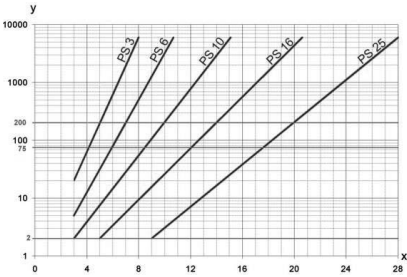
1. Features

High performance filters for modern hydraulic systems

- Designed for control block mounting
- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Worldwide distribution



3. Separation grade characteristics



y = beta-value
x = particle size [µm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

4. Filter performance data

tested according to ISO 16889 (multipass test)

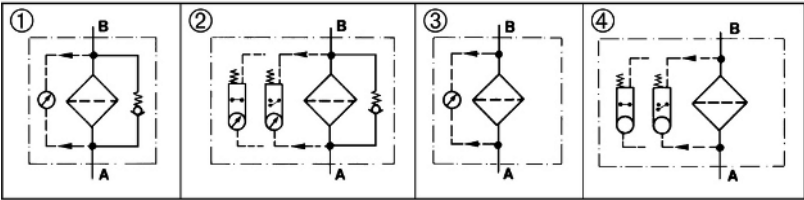
PS elements with max. Δ p 20 bar			PS vst elements with max. Δ p 210 bar		
PS	3	$\beta_{5(C)} \geq 200$	PS vst	3	$\beta_{5(C)} \geq 200$
PS	6	$\beta_{7(C)} \geq 200$	PS vst	6	$\beta_{7(C)} \geq 200$
PS	10	$\beta_{10(C)} \geq 200$	PS vst	10	$\beta_{10(C)} \geq 200$
PS	25	$\beta_{20(C)} \geq 200$	PS vst	25	$\beta_{20(C)} \geq 200$
values guaranteed up to 10 bar differential pressure			values guaranteed up to 20 bar differential pressure		

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

Norm	Designation
DIN ISO 2941	Hydraulic fluid power filter elements; verification of collapse/burst resistance
DIN ISO 2942	Hydraulic fluid power filter elements; verification of fabrication integrity
DIN ISO 2943	Hydraulic fluid power filter elements; verification of material compatibility with fluids
DIN ISO 3723	Hydraulic fluid power filter elements; method for end load test
DIN ISO 3724	Hydraulic fluid power filter elements; verification flow fatigue characteristics
ISO 3968	Hydraulic fluid power filters; evaluation of pressure drop versus flow characteristics
ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters; multipass method for evaluation filtration performance of a filter element

6. Symbols



7. Order numbers

Example for ordering filters:

1. Filtergehäuse	2. Filterelement
V = 80 l/min and electrical maintenance indicator Type: Pi 3408-015 Order number: 77874415	PS vst 3 Type: Pi 2208 PS vst 3 Order number: 77680200

7.1 Housing design						
Nominal size NG [l/min]	Order number	Type	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
50	77874324	Pi 3405-012				
	77874332	Pi 3405-013				
	77874340	Pi 3405-014				
	77874357	Pi 3405-015				
80	77874381	Pi 3408-012				
	78274136	Pi 3408-013				
	77874407	Pi 3408-014				
	77874415	Pi 3408-015				
110	77874449	Pi 3411-012				
	77874456	Pi 3411-013				
	77874464	Pi 3411-014				
	77874472	Pi 3411-015				
150	77921919	Pi 3415-012				
	77921927	Pi 3415-013				
	77921935	Pi 3415-014				
	77921943	Pi 3415-015				
300	77921968	Pi 3430-012				
	77921976	Pi 3430-013				
	77921984	Pi 3430-014				
	77921992	Pi 3430-015				
450	77922008	Pi 3445-012				
	77922016	Pi 3445-013				
	77922024	Pi 3445-014				
	77922032	Pi 3445-015				

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.

7.2 Filter elements (a wider range of element types is available on request)					
Nominal size NG [l/min]	Order number	Type	Filter material	max. Δp [bar]	Filter surface [cm²]
50	77680135	Pi 2105 PS 3	PS 3	20	590
	77943509	Pi 5105 PS 6	PS 6		590
	77680325	Pi 3105 PS 10	PS 10		590
	77680440	Pi 4105 PS 25	PS 25		590
	77680192	Pi 2205 PS vst 3	PS vst 3	210	425
	77943533	Pi 5205 PS vst 6	PS vst 6		425
	77680382	Pi 3205 PS vst 10	PS vst 10		425
	77680507	Pi 4205 PS vst 25	PS vst 25		425
80	77680143	Pi 2108 PS 3	PS 3	20	1150
	77943517	Pi 5108 PS 6	PS 6		1150
	77680341	Pi 3108 PS 10	PS 10		1150
	77680457	Pi 4108 PS 25	PS 25		1150
	77680200	Pi 2208 PS vst 3	PS vst 3	210	850
	77943541	Pi 5208 PS vst 6	PS vst 6		850
	77681190	Pi 3208 PS vst 10	PS vst 10		850
	77680515	Pi 4208 PS vst 25	PS vst 25		850
110	77680150	Pi 2111 PS 3	PS 3	20	1700
	77943525	Pi 5111 PS 6	PS 6		1700
	77680333	Pi 3111 PS 10	PS 10		1700
	77680465	Pi 4111 PS 25	PS 25		1700
	77680218	Pi 2211 PS vst 3	PS vst 3	210	1275
	77943558	Pi 5211 PS vst 6	PS vst 6		1275
	77680390	Pi 3211 PS vst 10	PS vst 10		1275
	77680523	Pi 4211 PS vst 25	PS vst 25		1275
150	77680168	Pi 2115 PS 3	PS 3	20	2425
	77955099	Pi 5115 PS 6	PS 6		2425
	77680358	Pi 3115 PS 10	PS 10		2425
	77680473	Pi 4115 PS 25	PS 25		2425
	77680226	Pi 2215 PS vst 3	PS vst 3	210	2010
	77955123	Pi 5215 PS vst 6	PS vst 6		2010
	77680408	Pi 3215 PS vst 10	PS vst 10		2010
	77680531	Pi 4215 PS vst 25	PS vst 25		2010
300	77680176	Pi 2130 PS 3	PS 3	20	4620
	77955107	Pi 5130 PS 6	PS 6		4620
	77680366	Pi 3130 PS 10	PS 10		4620
	77680481	Pi 4130 PS 25	PS 25		4620
	77680234	Pi 2230 PS vst 3	PS vst 3	210	3800
	77955131	Pi 5230 PS vst 6	PS vst 6		3800
	77680416	Pi 3230 PS vst 10	PS vst 10		3800
	77680549	Pi 4230 PS vst 25	PS vst 25		3800
450	77680184	Pi 2145 PS 3	PS 3	20	6865
	77955115	Pi 5145 PS 6	PS 6		6865
	77680374	Pi 3145 PS 10	PS 10		6865
	77680499	Pi 4145 PS 25	PS 25		6865
	77680242	Pi 2245 PS vst 3	PS vst 3	210	5600
	77955149	Pi 5245 PS vst 6	PS vst 6		5600
	77680424	Pi 3245 PS vst 10	PS vst 10		5600
	77680556	Pi 4245 PS vst 25	PS vst 25		5600

Medium Pressure Filter Pi 340 up to NG 450

5

31557104/EN – 04/2024

8. Technical specifications

Design:	flange filter
Nominal pressure: Pi 3405-3411	350 bar (4980 psi)
Pi 3415-3445 without bypass	315 bar (4480 psi)
Pi 3415-3445 with bypass	250 bar (3560 psi)
Test pressure: Pi 3405-3411	450 bar (6400 psi)
Pi 3415-3445 without bypass	410 bar (5830 psi)
Pi 3415-3445 with bypass	325 bar (4620 psi)
Temperature range:	-10 °C to +120 °C
	(other temperature ranges on request)
Bypass setting:	$\Delta p \ 7 \text{ bar} \pm 10 \%$
Filter head material:	GGG
Filter housing material:	St
Sealing material:	NBR/PTFE
Maintenance indicator setting:	$\Delta p \ 5 \text{ bar} \pm 10 \%$
Electrical data of maintenance indicator:	
Maximum voltage:	250 V AC/200 V DC
Maximum current:	1 A
Contact load:	70 W
Type of protection:	IP 65 in inserted and secured status
Contact:	normally open/closed
Cable sleeve:	M20x1.5

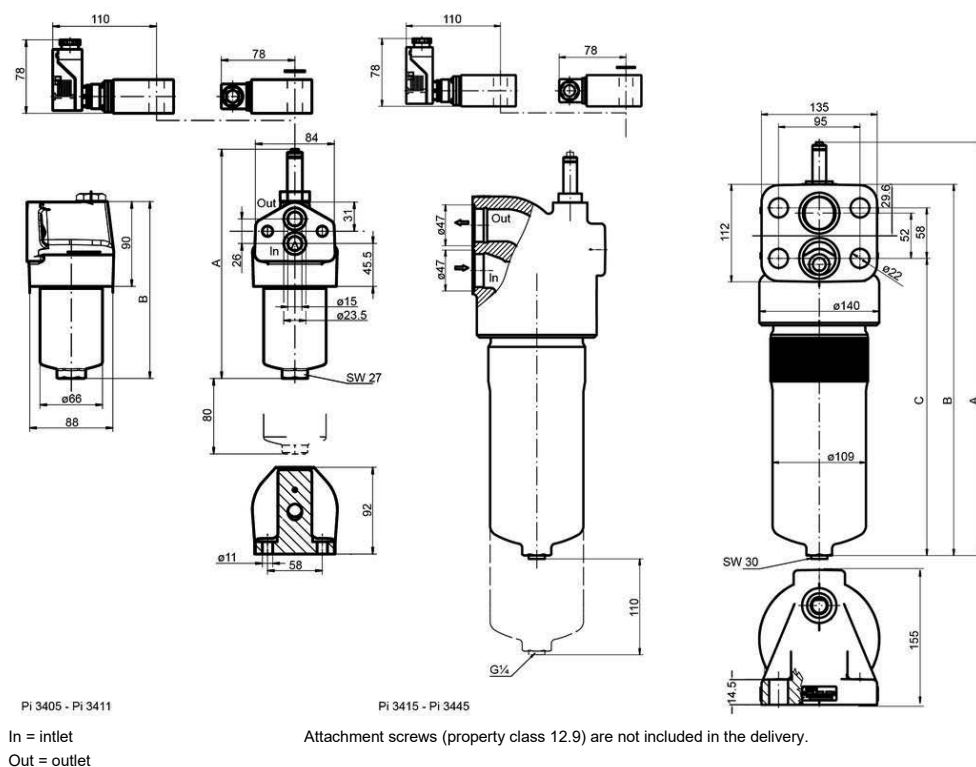
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By the inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance data sheet.

We draw attention to the fact that all values indicated are average values and do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend you to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

9. Dimensions



Medium Pressure Filter Pi 340 up to NG 450

All dimensions in mm.

Type	A	B	C	Weight [kg]
Pi 3405	241	188	-	3.7
Pi 3408	320	265	-	4.7
Pi 3411	395	342	-	5.5
Pi 3415	360	305	227	14.4
Pi 3430	474	419	341	17.3
Pi 3445	590	535	457	19.4

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards. The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical connection is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa.

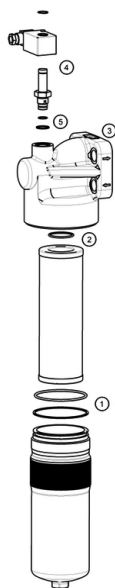
10.3 When should the filter element be replaced?

- Filters equipped with visual and electrical maintenance indicator:
During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
- Filters without maintenance indicator:
The filter element should be replaced after the trial run or flushing of the system. Afterwards follow instructions of the manufacturer.
- Please always ensure that you have original Filtration Group spare elements in stock: Disposable elements (PS) cannot be cleaned.

10.4 Element replacement

- Stop system and relieve filter from pressure.
- Filter sizes 300 and 450: empty the filter housing by removing the drain plug.
- Unscrew the filter housing by turning counter-clockwise. Clean the housing using a suitable cleaning solvent.
- Remove element by pulling down carefully.
- Check o-ring, spigot and o-ring in the element locator for damage. Replace, if necessary.
- Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
To ensure no contamination occurs during the exchange of the element first open the plastic bag and push the element over the spigot in the filter head. Now remove plastic bag.
- Lightly lubricate the threads of the filter housing a little bit and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 60 Nm, for NG 150 to 450 = 100 Nm.
- Check seals of vent drain plug - if necessary, please replace. Torque drain plug 30 Nm.

11. Spare parts list



Order numbers for spare parts		
Position	Type	Order number
① bis ②	Seal kit for filter	
	Pi 3405 - Pi 3411	
	NBR	77850381
	FPM	77850399
	EPDM	77850407
	Pi 3415 - Pi 3445	
	NBR	77936206
	FPM	77936214
	EPDM	77936222
④	Maintenance indicator	
	Visual 5 bar PiS 3093/5	77669914
	Electrical 5 bar PiS 3092/5	77669864
	Electrical upper section only	77536550
	Seal kit for maintenance indicator	
⑤	NBR	77760275
	FPM	77760283
	EPDM	77760291

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78356750.04/2021

Medium Pressure Filter Pi 340 up to NG 450



MAHLE Industrialfiltration is now Filtration Group. For more information, visit industrial.filtrationgroup.com

Duplex Filter Pi 210/Pi 212*

Nominal pressure 32/63 bar (460/900 psi), nominal size up to 600
* Direction of flow from right to left

1. Features

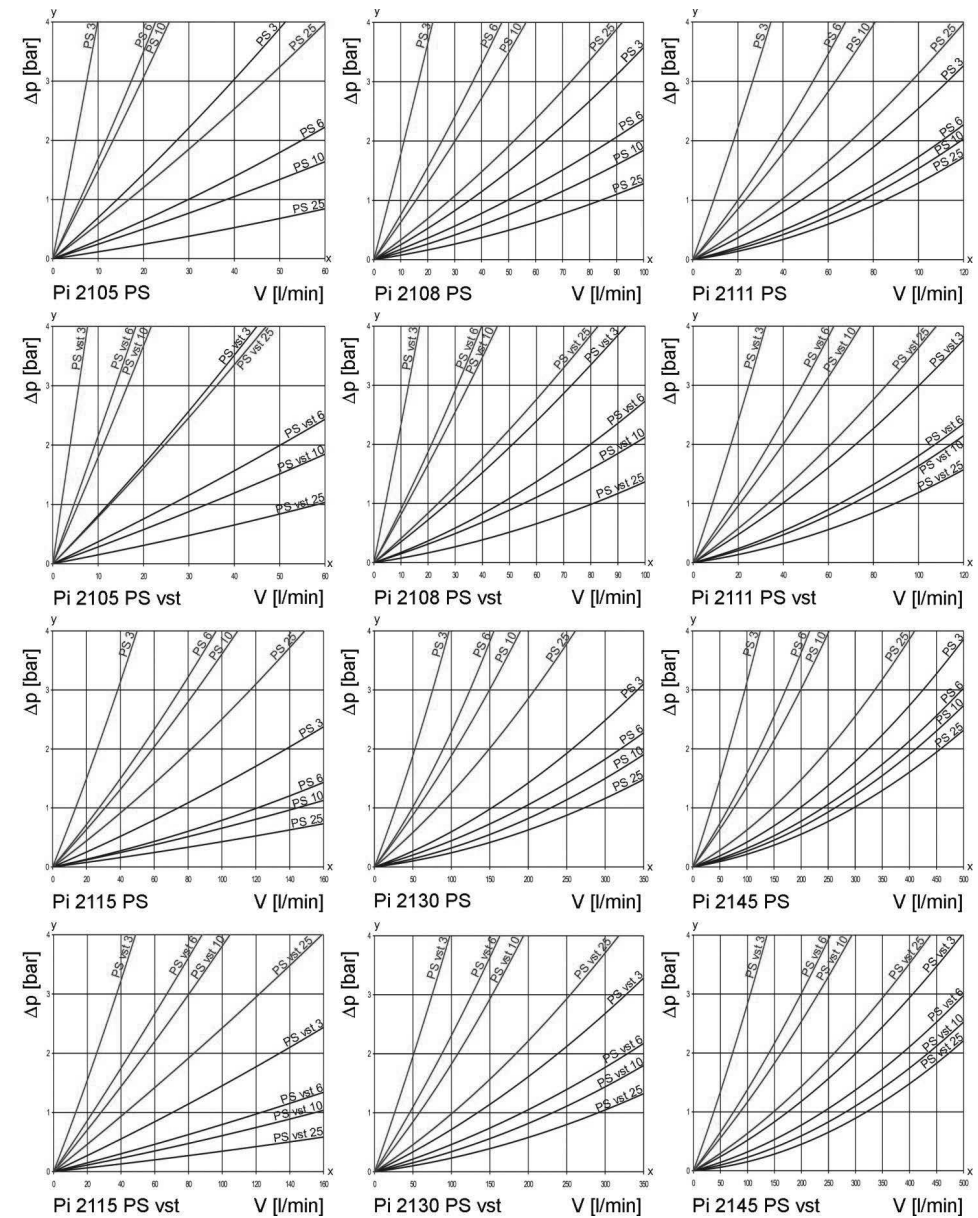
High performance filters for modern hydraulic systems

- Modular system
- Compact design
- Minimal pressure drop through optimal flow design
- Visual/electrical/electronic maintenance indicator
- Threaded connections
- Change over valve on upstream side
- Ergonomic switch-over handle with safety lock and pressure compensation
- User-optimized one-hand-operation
- Equipped with highly efficient glass fibre PS filter elements
- Beta rated elements according to ISO 16889 multipass test
- Elements with high differential pressure stability and dirt holding capacity
- Other connections on request
- Worldwide distribution

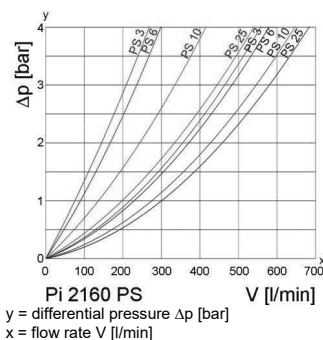


2. Flow rate/pressure drop curve complete filter

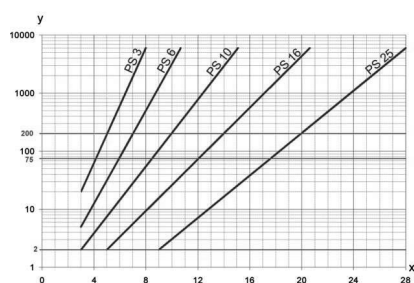
190 mm²/s
33 mm²/s



y = differential pressure Δp [bar]
x = flow rate V [l/min]
Pressure drop curves Pi 2105/Pi 2108/Pi 2111 correspond to Pi 21205/Pi 21208/Pi 21211 respectively.



3. Separation grade characteristics



y = beta-value
x = particle size [μm]

determined by multipass tests (ISO 16889)
calibration according to ISO 11171 (NIST)

5. Quality assurance

Filtration Group filters and filter elements are produced according to the following international standards:

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ISO 10771.1	Fatigue pressure testing of metal containing envelopes in hydraulic fluid applications
ISO 16889	Hydraulic fluid power filters-multipass method for evaluation filtration performance of a filter element

4. Filter performance data

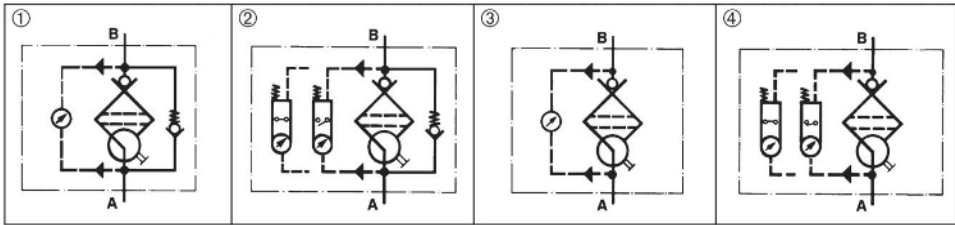
tested according to ISO 16889 (multipass test)

PS elements with max. Δp 20 bar		PS vst elements with max. Δp 210 bar		
PS	3 $\beta_{5/C}$	≥ 200	3 $\beta_{5/C}$	≥ 200
PS	6 $\beta_{7/C}$	≥ 200	6 $\beta_{7/C}$	≥ 200
PS	10 $\beta_{10/C}$	≥ 200	10 $\beta_{10/C}$	≥ 200
PS	25 $\beta_{20/C}$	≥ 200	25 $\beta_{20/C}$	≥ 200

values guaranteed up to
10 bar differential pressure

values guaranteed up to
20 bar differential pressure

6. Symbols



7. Order numbers

Example for ordering filters:	
1. Housing design	2. Filter element
V = 80 l/min and visual/electrical indicator Type: Pi 2108-069 Order number: 77810286	PS vst 3 Type: Pi 2208 PS vst 3 Order number: 77680200

7.1 Housing design						
Nominal size NG [l/min]	Order number	Type	① with bypass valve and visual indicator	② with bypass valve and electrical indicator	③ with visual indicator	④ with electrical indicator
50	77810211	Pi 2105-057				
	77810229	Pi 2105-058				
	77810237	Pi 2105-068				
	77810245	Pi 2105-069				
80	77810252	Pi 2108-057				
	77810260	Pi 2108-058				
	77810278	Pi 2108-068				
	77810286	Pi 2108-069				
110	78204083	Pi 2111-057				
	78204091	Pi 2111-058				
	78204109	Pi 2111-068				
	78204117	Pi 2111-069				
150	77774573	Pi 2115-057				
	77774565	Pi 2115-058				
	77774557	Pi 2115-068				
	77774540	Pi 2115-069				
300	77774532	Pi 2130-057				
	77774524	Pi 2130-058				
	77774516	Pi 2130-068				
	77774508	Pi 2130-069				
450	77774490	Pi 2145-057				
	77774482	Pi 2145-058				
	77774474	Pi 2145-068				
	77774466	Pi 2145-069				
600	70574769	Pi 2160-057				
	70574768	Pi 2160-058				
	70574767	Pi 2160-068				
	70574766	Pi 2160-069				

When filter with non bypass configuration is selected, the collapse pressure of the element must not be exceeded.
Housing versions Pi 212 on request.

7.2 Filter elements *					
Nominal size NG [l/min]	Order number	Type	Filter material	max. Δp [bar]	Filter surface [cm²]
50	77680135	Pi 2105 PS 3	PS 3	20	590
	77943509	Pi 5105 PS 6	PS 6		590
	77680325	Pi 3105 PS 10	PS 10		590
	77680440	Pi 4105 PS 25	PS 25		590
	77680192	Pi 2205 PS vst 3	PS vst 3	210	425
	77943533	Pi 5205 PS vst 6	PS vst 6		425
	77680382	Pi 3205 PS vst 10	PS vst 10		425
	77680507	Pi 4205 PS vst 25	PS vst 25		425
80	77680143	Pi 2108 PS 3	PS 3	20	1150
	77943517	Pi 5108 PS 6	PS 6		1150
	77680341	Pi 3108 PS 10	PS 10		1150
	77680457	Pi 4108 PS 25	PS 25		1150
	77680200	Pi 2208 PS vst 3	PS vst 3	210	850
	77943541	Pi 5208 PS vst 6	PS vst 6		850
	77681190	Pi 3208 PS vst 10	PS vst 10		850
	77680515	Pi 4208 PS vst 25	PS vst 25		850
110	77680150	Pi 2111 PS 3	PS 3	20	1700
	77943525	Pi 5111 PS 6	PS 6		1700
	77680333	Pi 3111 PS 10	PS 10		1700
	77680465	Pi 4111 PS 25	PS 25		1700
	77680218	Pi 2211 PS vst 3	PS vst 3	210	1275
	77943558	Pi 5211 PS vst 6	PS vst 6		1275
	77680390	Pi 3211 PS vst 10	PS vst 10		1275
	77680523	Pi 4211 PS vst 25	PS vst 25		1275
150	77680168	Pi 2115 PS 3	PS 3	20	2425
	77955099	Pi 5115 PS 6	PS 6		2425
	77680358	Pi 3115 PS 10	PS 10		2425
	77680473	Pi 4115 PS 25	PS 25		2425
	77680226	Pi 2215 PS vst 3	PS vst 3	210	2010
	77955123	Pi 5215 PS vst 6	PS vst 6		2010
	77680408	Pi 3215 PS vst 10	PS vst 10		2010
	77680531	Pi 4215 PS vst 25	PS vst 25		2010
300	77680176	Pi 2130 PS 3	PS 3	20	4620
	77955107	Pi 5130 PS 6	PS 6		4620
	77680366	Pi 3130 PS 10	PS 10		4620
	77680481	Pi 4130 PS 25	PS 25		4620
	77680234	Pi 2230 PS vst 3	PS vst 3	210	3800
	77955131	Pi 5230 PS vst 6	PS vst 6		3800
	77680416	Pi 3230 PS vst 10	PS vst 10		3800
	77680549	Pi 4230 PS vst 25	PS vst 25		3800
450	77680184	Pi 2145 PS 3	PS 3	20	6865
	77955115	Pi 5145 PS 6	PS 6		6865
	77680374	Pi 3145 PS 10	PS 10		6865
	77680499	Pi 4145 PS 25	PS 25		6865
	77680242	Pi 2245 PS vst 3	PS vst 3	210	5600
	77955149	Pi 5245 PS vst 6	PS vst 6		5600
	77680424	Pi 3245 PS vst 10	PS vst 10		5600
	77680556	Pi 4245 PS vst 25	PS vst 25		5600

* a wider range of element types is available on request

7.2 Filter elements *					
Nominal size NG [l/min]	Order number	Type	Filter material	max. Δp [bar]	Filter surface [cm ²]
600	70346506	Pi 2160 PS 3	PS 3	20	9398
	76114318	Pi 5160 PS 6	PS 6		9398
	79393380	Pi 3160 PS 10	PS 10		9398
	79748047	Pi 4160 PS 25	PS 25		9398

* a wider range of element types is available on request

8. Technical specifications

Design: line mounting filter

Nominal pressure:

Pi 2105 - Pi 2111

Pi 21205 - Pi 21211

Pi 2115 - Pi 2160

10[^]7 load changes

63 bar (900 psi)

10[^]7 load changes

25 bar (360 psi)

2x 10[^]6 load changes

32 bar (460 psi)

Test pressure:

Pi 2105 - Pi 2111

Pi 21205 - Pi 21211

Pi 2115 - Pi 2160

95 bar (1370 psi)

48 bar (690 psi)

Temperature range:

-10 °C to +120 °C

survival temperature -40 °C

(other temperature ranges on request)

Bypass setting:

Δp 3.5 bar $\pm$ 10 %

Filter head material:

GAL

Filter housing material:

AL/St

Sealing material:

NBR/AL

Maintenance indicator setting

Δp 2.2 bar $\pm$ 10 %

Electrical data of maintenance indicator:

Max. voltage:

250 V AC/200 V DC

Max. current:

1 A

Contact load:

70 W

Type of protection:

IP 65 in inserted and
secured status

Contact:

normally open/closed

Cable connection:

M20x1.5

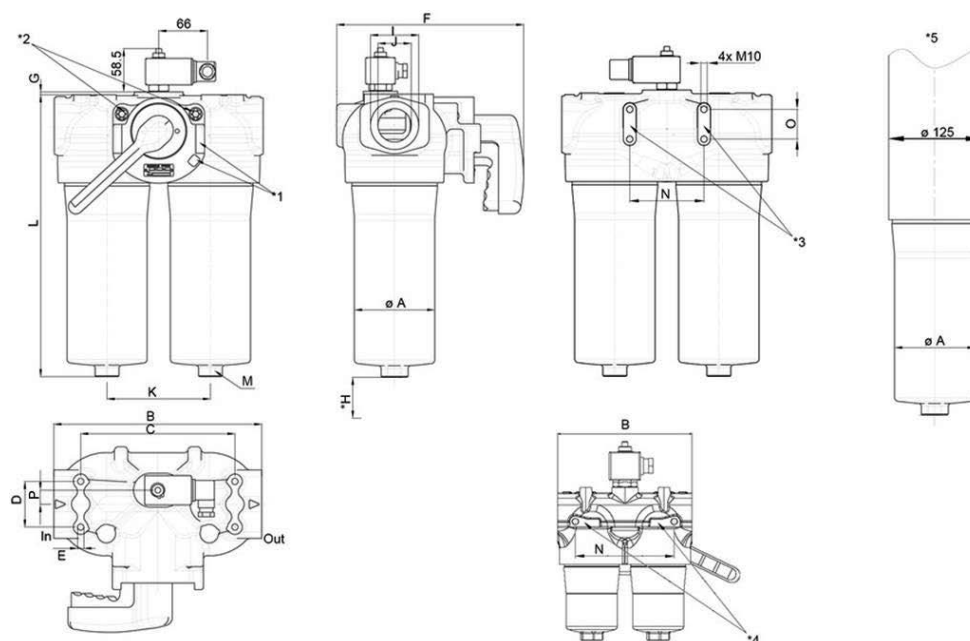
The switching function can be changed by turning the electric upper part by 180° (normally closed contact or normally open contact). The state on delivery is a normally closed contact. By inductivity in the direct current circuit the use of suitable protection circuit should be considered. Further maintenance indicator details and designs are available in the maintenance indicator data sheet.

We draw attention to the fact that all values indicated are average values which do not always occur in specific cases of application. Our products are continually being further developed. Values, dimensions and weights can change as a result of this. Our specialized department will be pleased to offer you advice.

We recommend to contact us concerning applications of our filters in areas governed by the EU Directive 94/9 EC (ATEX 95). The standard version can be used for liquids based on mineral oil (corresponding to the fluids in Group 2 of Directive 97/23 EC Article 9). If you consider to use other fluids please contact us for additional support.

Subject to technical alteration without prior notice.

9. Dimensions



In Inlet

Out	Outlet
-----	--------

*H Minimum clearance required for element change

*1 Lever locking and arresting

*2 Venting screws

*3 Optional fixing for NG 150 to 600
(WB version)

*4 Optional fixing for NG 50 to 110
(WB version)

*5 Housing version for NG 600

All dimensions except "J" in mm

Air dimensions except J in mm																	
Type	A	B	C	D	E	F	G	H	I	J*	K	L**	M SW	N	O	P	Wt. kg
Pi 2105	66	172	100	52	M8x16	189	-	80	47	G1	85	203	27	128	-	16	2.60
Pi 2108	66	172	100	52	M8x16	189	-	80	47	G1	85	261	27	128	-	16	2.90
Pi 2111	66	172	100	52	M8x16	189	-	80	47	G1	85	351	27	128	-	16	3.30
Pi 2115	109	283	210	62	M10x20	252	4	110	65	G1 ^{1/2}	140	264	32	100	40	19	8.50
Pi 2130	109	283	210	62	M10x20	252	4	110	65	G1 ^{1/2}	140	385	32	100	40	19	9.50
Pi 2145	109	283	210	62	M10x20	252	4	110	65	G1 ^{1/2}	140	497	32	100	40	19	17.25
Pi 2160	109	283	210	62	M10x20	252	4	110	65	G1 ^{1/2}	140	636	32	100	40	19	15.50

* SAE flange connections (3000 psi), NPT and SAE connections on request

** Not shown drain screw at NG 450 and NG 600 is part of dimension "L"

Dimensions Pi 21205/Pi 21208/Pi 21211 on request.

10. Installation, operating and maintenance instructions

10.1 Filter installation

When installing the filter make sure that sufficient space is available to remove filter element and filter housing. Preferably the filter should be installed with the filter housing pointing downwards. The maintenance indicator must be visible.

10.2 Connecting the electrical maintenance indicator

The electrical indicator is connected via a 2-pole appliance plug according to DIN EN 175301-803 with poles marked 1 and 2. The electrical section can be inverted to change from normally open position to normally closed position or vice versa. The state on delivery is a normally closed contact.

10.3 When should the filter element be replaced?

1. During cold starts, the indicator may give a warning signal. Press the red button of the visual indicator once again only after operating temperature has been reached. If the red button immediately pops up again and/or the electrical signal has not switched off after reaching operating temperature, the filter element must be replaced after the end of the shift.
2. Please always ensure that you have original Filtration Group spare elements cleaned.

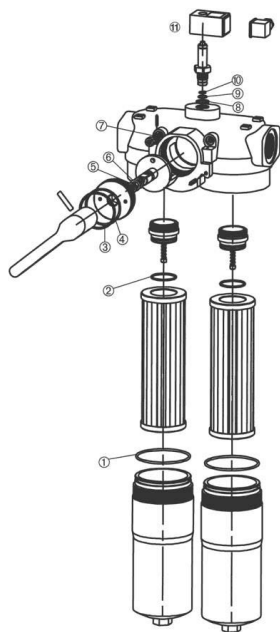
10.4 Element replacement

Note: Elements may only be replaced by people who are familiar with the function of the filter. When replacing elements, appropriate safety clothing (protective goggles, gloves, safety shoes) must be worn.

Note: The maintenance indicator monitors the filter side in operation, which is identified by the position of the switching lever catch. The change-over transfer valve must be switched prior filter servicing. Now the signal of the maintenance indicators cancelled and the red button can be repressed again.

1. Operate and hold pressure equalizing lever located behind switching lever. Pull catch knob and swivel switching lever. Engage the catch on the clear filter side. Place through or drip pan underneath to collect leaving oil..
2. Loosen vent screw of the filter side not in use by 2-3 turns; max. until contact is made with the safety stop.
3. Unscrew filter housing by rotating same counter-clockwise and clean with a suitable medium.
Warning: The shift lever may not, from now until the screwing back in of the filter housing (7.), be activated under any circumstances!
4. Remove the filter element by gently moving it back and forth downwards.
5. Check O-ring on the filter house for damage. Replace, if necessary.
6. Make sure that the order number on the spare element corresponds to the order number of the filter name-plate.
7. Lightly lubricate the threads of the filter housing and screw into the filter head. Maximum tightening torque for NG 50 to 110 = 30 Nm, for NG 150 to 600 = 50 Nm.
8. To refill the filter chamber, operate only the pressure equalizing lever (leave the switching lever arrested in its catch) long enough for the medium to emerge bubble-free from the vent bore.
9. Tighten vent screw. Check filter for leaks by operating the pressure equalizing lever once again.

11. Spare parts list



Order number for spare parts		
Position	Type	Order number
① - ⑦	Seal kit for housing	
	Pi 2105 - Pi 2111	
	Pi 21205 - Pi 21211	
	NBR	79761271
	FPM	79761289
	EPDM	79761297
	Pi 2115 - Pi 2160	
⑧ - ⑩	NBR	79761230
	FPM	79761248
	EPDM	79761255
	Seal kit for maintenance indicator	
⑪	NBR	77760309
	FPM	77760317
	EPDM	77760325
Maintenance indicator		
	Visual PIS 3098/2.2	77669971
	Electrical PIS 3097/2.2	77669948
	Electrical upper section only	77536550

Filtration Group GmbH
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Phone +49 7941 6466-0
Fax +49 7941 6466-429
industrial.sales@filtrationgroup.com
industrial.filtrationgroup.com
78356552.08/2020
Duplex Filter Pi 210/Pi 212 up to NG 600

Temperature

Bimetal thermometer For industrial applications Models A52, R52

WIKA data sheet TM 52.01



for further approvals
see page 6

Applications

- A wide range of applications in machine building, vessel, piping and apparatus construction
- Heating technology

Special features

- Scale ranges from -30 ... +500 °C
- Large choice of nominal sizes from 25 ... 160 mm
- Case and stem from stainless steel
- 5 different connection designs



Fig. left: model A52.100, back mount

Fig. right: model R52.100, lower mount

Description

The model A52, R52 bimetal thermometers are the entry-level model among process thermometers. The target markets of this thermometer are air-conditioning and machine building.

Model 52 is manufactured in accordance with EN 13190 and already offers a stainless steel case and accuracy class 1 for nominal sizes > 60 mm.

Especially noteworthy is the large number of stem lengths and nominal sizes. This enables the individual adaptation to the target applications.

WIKA data sheet TM 52.01 · 02/2019

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Specifications

Measuring element

Bimetal coil

Nominal size in mm

25, 33, 40, 50, 63, 80, 100, 160

Connection designs

- S Standard (male threaded connection)
- 1 Plain stem (without thread)
- 2 Male nut ¹⁾
- 3 Union nut ¹⁾
- 4 Compression fitting (sliding on stem) ¹⁾

other connection designs on request

Model overview

Model	NS	Design
A52.025	25	Back mount (axial)
A52.033	33	
A52.040	40	
A52.050	50	
A52.063	63	
A52.080	80	
A52.100	100	
A52.160	160	
R52.063	63	Lower mount (radial)
R52.080	80	
R52.100	100	
R52.160	160	

Unit (scale range)

°C

Option: °F, °C/°F (dual scale)

Accuracy class

NS 25, 33: ±5 % of scale range
 NS 40, 50: 2 per EN 13190
 NS 63, 80, 100, 160: 1 per EN 13190

Working range

Continuous loading: Measuring range per EN 13190
 Short time (24 h max.): Scale range per EN 13190

Case, bezel ring, stem, process connection and spacer

Stainless steel

Elbow behind the case

Aluminium, only with lower mount version

Dial

Aluminium, white, black lettering

Pointer

NS 25, 33, 40: Aluminium, black
 NS 50, 63, 80, 100, 160: Aluminium, black, adjustable pointer

Window

Instrument glass
 NS 33: polycarbonate

Permissible operating pressure at the stem

NS 25, 33, 40, 50: max. 6 bar, static
 NS 63, 80, 100, 160: max. 25 bar, static

Ingress protection

NS 25, 33, 40: IP54 per IEC/EN 60529
 NS 50, 63, 80, 100, 160: IP43 per IEC/EN 60529

1) Not for NS 25, 33, 40, 50

Scale ranges, measuring ranges ²⁾, error limit (EN 13190)
Scale graduation per WIKA standard

Scale range in °C	Measuring range in °C	Scale spacing in °C		Error limit ±°C	
		up to NS 63	from NS 80	up to NS 50	from NS 63
-30 ... +50	-20 ... +40	1	1	2	1
-20 ... +60	-10 ... +50	1	1	2	1
0 ... 60	10 ... 50	1	1	2	1
0 ... 80	10 ... 70	1	1	2	1
0 ... 100	10 ... 90	2	1	2	1
0 ... 120	10 ... 110	2	1	4	2
0 ... 160	20 ... 140	2	2	4	2
0 ... 200 ³⁾	20 ... 180	5	2	4	2
0 ... 250 ³⁾	30 ... 220	5	2	5	2.5
0 ... 300 ⁴⁾	30 ... 270	5	2	-	5
0 ... 400 ⁴⁾	50 ... 350	5	5	-	5
0 ... 500 ⁴⁾	50 ... 450	5	5	-	5

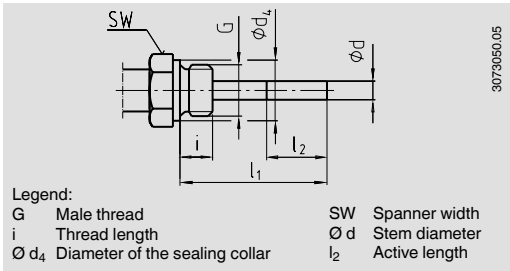
2) The limits of the measuring range are indicated on the dial by two triangular marks.
Only within this range is the stated error limit valid per EN 13190.
3) Not for NS 33
4) Not for NS 25 to NS 50

other scale ranges on request

Connection designs

Standard design (male thread connection)
Standard insertion length l₁ = 63, 100, 160, 200, 250 mm

Nominal size	Process connection		Dimensions in mm		
	G	i	SW	Ø d ₄	Ø d
25, 33	M8 x 1.25	8	12	-	4
	G ½ B	8	12	-	4
	G ¼ B	8	17	-	4
40, 50	M8 x 1.25	8	12	-	4
	G ½ B	8	17	-	4
	G ¼ B	8	17	-	4
	G ½ B	12	22	-	4
63, 80, 100, 160	G ¼ B	12	19	18	6 or 8
	G ½ B	14	27	26	6 or 8
	M18 x 1.5	12	24	23	6 or 8
	½ NPT	19	22	-	6 or 8

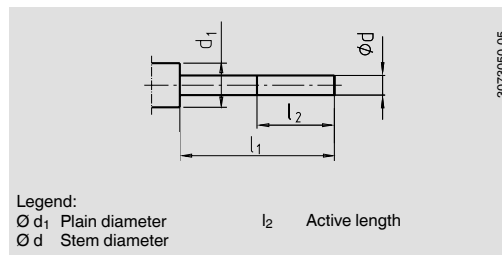


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Design 1, plain stem (without thread)

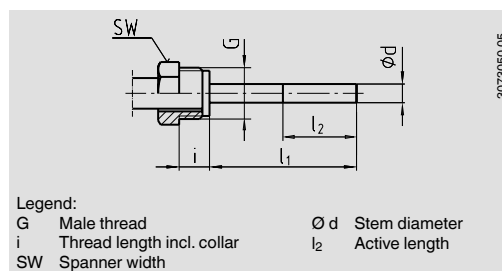
Standard insertion length $l_1 = 45, 63, 100, 140, 160, 200, 240, 290$ mm

Nominal size	Dimensions in mm	
NS	d_1	$\varnothing d$
25, 33	8	4
40, 50	12	4
63, 80, 100, 160	18	6 or 8

**Design 2, male nut**

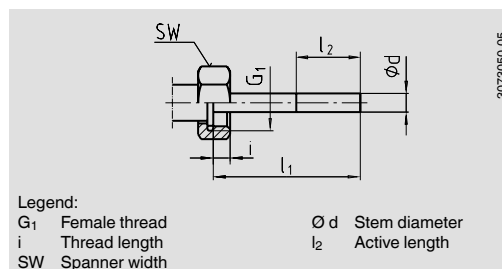
Standard insertion length $l_1 = 80, 140, 180, 230$ mm

Nominal size	Process connection		Dimensions in mm	
NS	G	i	SW	$\varnothing d$
63, 80, 100, 160	G ½ B	20	27	6 or 8
	M18 x 1.5	17	22	6 or 8

**Design 3, union nut**

Standard insertion length $l_1 = 89, 126, 186, 226, 276$ mm

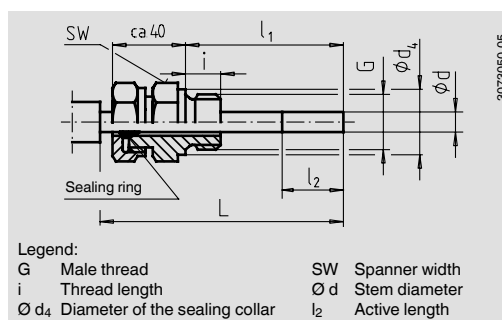
Nominal size	Process connection		Dimensions in mm	
NS	G	i	SW	$\varnothing d$
63, 80, 100, 160	G ½	8.5	27	6 or 8
	G ¾	9.5	32	6 or 8

**Design 4, compression fitting (sliding on stem)**

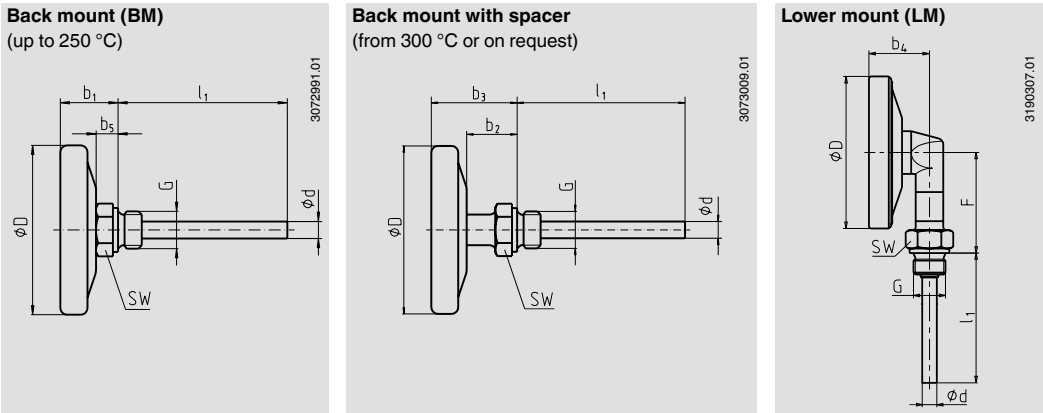
Insertion length $l_1 =$ variable

Length $L = l_1 + 40$ mm

Nominal size	Process connection		Dimensions in mm		
NS	G	i	SW	$\varnothing d_4$	$\varnothing d$
63, 80, 100, 160	G ¼ B	8	22	18	6 or 8
	G ½ B	14	27	26	6 or 8
	M18 x 1.5	12	24	23	6 or 8
	½ NPT	19	22	-	6 or 8
	G ¾ B	16	32	32	6 or 8
	¾ NPT	20	30	-	6 or 8



Dimensions in mm



NS	Dimensions in mm							Weight in kg		
	b ₁	b ₂	b ₃	b ₄	b ₅	Ø D	F	R	RD	U
25	16	-	-	-	6	25	-	0.035	-	-
33	16	-	-	-	6	33	-	0.040	-	-
40	21	-	-	-	8	40	-	0.050	-	-
50	21	-	-	-	8	50	-	0.060	-	-
63	29	30 ¹⁾	46	34	13	63	47	0.160	0.200	0.220
80	30	30 ¹⁾	47	36	13	80	56	0.200	0.240	0.270
100	35	30 ¹⁾	52	40	13	100	66	0.250	0.290	0.330
160	39	30 ¹⁾	57	42,5	13	160	96	0.450	0.490	0.560

1) from 300 °C or on request
R Back mount (BM)
RD Back mount with spacer
U Lower mount (LM)

Thermowell

In principle, the operation of a mechanical thermometer without a thermowell with low process-side loading (low pressure, low viscosity and low flow velocities) is possible.

However, in order to enable exchanging the thermometer during operation (e.g. instrument replacement or calibration) and to ensure a better protection of the instrument and also the plant and the environment, it is advisable to use a thermowell from the extensive WIKA thermowell portfolio.

For further information on the calculation of the thermowell, see Technical information IN 00.15.

Approvals

Logo	Description	Country
	GOST (option) Metrology, measurement technology	Russia
	KazInMetr (option) Metrology, measurement technology	Kazakhstan
-	MTSCHS (option) Permission for commissioning	Kazakhstan
	BelGIM (option) Metrology, measurement technology	Belarus
	UkrSEPRO (option) Metrology, measurement technology	Ukraine
	Uzstandard (option) Metrology, measurement technology	Uzbekistan
-	CRN (option) Safety (e.g. electr. safety, overpressure, ...)	Canada

Certificates (option)

2.2 test report

Approvals and certificates, see website

Ordering information

Model / Connection design / Scale range / Process connection / Stem diameter, material / Insertion length / Options

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The specifications given in this document represent the state of engineering at the time of publishing.
We reserve the right to make modifications to the specifications and materials.

02/2019 EN

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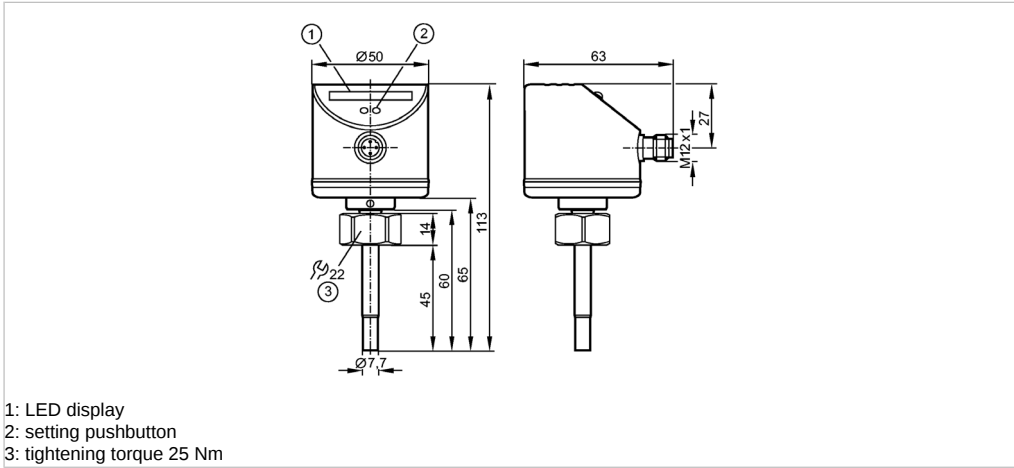
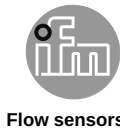


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efector300®

SI5000
SID10ABBPKG/US-100

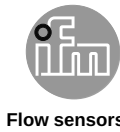


CEULUSLISTED	
Product characteristics	
Flow monitor	
Compact type for adapter	
Process connection: internal thread M18 x 1.5 for adapter	
Probe length: 45 mm	
Setting range: 3...300 cm/s (liquids)	
Application	
Application	liquids and gases
Pressure rating [bar]	30
Medium temperature [°C]	-25...80
Electrical data	
Electrical design	DC PNP
Operating voltage [V]	19...36 DC
Current consumption [mA]	< 60
Protection class	III
Reverse polarity protection	yes
Outputs	
Output function	normally open / closed programmable
Current rating [mA]	250
Voltage drop [V]	< 2.5
Short-circuit protection	pulsed
Overload protection	yes
Measuring / setting range	
Liquids	
Setting range [cm/s]	3...300
Greatest sensitivity [cm/s]	3...100
Gases	
Setting range [cm/s]	200...3000
Greatest sensitivity [cm/s]	200...800

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efector300[®]

SI5000
SID10ABBFPKG/US-100



Accuracy / deviations		
Switch point accuracy	[cm/s]	± 2...± 10 *)
Hysteresis	[cm/s]	2...5 *)
Repeatability	[cm/s]	1...5 *)
Temperature drift	[cm/s x 1/K]	0.1 **)
Max. temperature gradient of medium	[K/min]	300
Reaction times		
Power-on delay time	[s]	10
Response time	[s]	1...10
Software / programming		
Adjustment of the switch point		pushbuttons
Environment		
Ambient temperature	[°C]	-25...80
Storage temperature	[°C]	-25...100
Protection		IP 67
Tests / approvals		
EMC	EN 61000-4-2 ESD: EN 61000-4-3 HF radiated: EN 61000-4-4 Burst: EN 61000-4-6 HF conducted:	4 kV CD / 8 kV AD 10 V/m 2 kV 10 V
Shock resistance	DIN IEC 68-2-27:	50 g (11 ms)
Vibration resistance	DIN EN 60068-2-6	20 g (55...2000 Hz)
MTTF	[Years]	298
Mechanical data		
Process connection		internal thread M18 x 1.5 for adapter
Materials (wetted parts)		stainless steel 316L / 1.4404; O-ring: FKM 8 x 1.5 gr 80° Shore A
Housing materials		stainless steel 316L / 1.4404; stainless steel / 301 / 1.4310; PC (polycarbonate); PBT-GF 20; EPDM/X
Probe length L	[mm]	45
Weight	[kg]	0.235
Displays / operating elements		
Function display	LED	10 LEDs, three-colour
Electrical connection		
Connection		M12 connector
Wiring 2 1 3 4		
Remarks		
Remarks	*) for water; 5...100 cm/s; 25°C (factory setting) **) for water; 5...100 cm/s; 10...70°C	
Pack quantity	[piece]	1

31557104/EN – 04/2024

efector300

SI5000
SID10ABBFPKG/US-100



Flow sensors

ifm electronic gmbh • Friedrichstraße 1 • 45128 Essen — We reserve the right to make technical alterations without prior notice. — GB — SI5000 — 09.07.2013

31557104/EN – 04/2024

Pressure

Bourdon tube pressure gauge, copper alloy Stainless steel case, liquid filling, NS 50, 63 and 100 Model 213.53

WIKA data sheet PM 02.12

for further approvals see
page 3

Applications

- For measuring points with high dynamic pressure loads and vibrations
- For gaseous and liquid media that are not highly viscous or crystallising and will not attack copper alloy parts
- Hydraulics
- Compressors, shipbuilding

Special features

- Vibration and shock-resistant
- Especially robust design
- Type approval for the shipbuilding industry
- Scale ranges up to 0 ... 1,000 bar



Bourdon tube pressure gauge, model 213.53.100,
lower mount

Description

The liquid-filled model 213.53 Bourdon tube pressure gauge is constructed with a case from stainless steel and wetted parts from copper alloy.

The model 213.53 meets the requirements of the international industry standard EN 837-1 for Bourdon tube pressure gauges.

Due to the liquid filling in the case, the pressure element and movement are efficiently damped. Therefore, these instruments are particularly suited to measuring points with high dynamic loads, such as fast load cycles or vibrations.

The cases of the model 213.53 are available in nominal sizes of 50, 63 and 100 mm and fulfil IP65 ingress protection. With an accuracy of up to class 1.0, this pressure gauge is suitable for a wide range of applications in industry.

For mounting in control panels, the pressure gauges with a back mount process connection can be fitted with a mounting flange or with a triangular bezel and mounting bracket.

WIKA data sheet PM 02.12 · 07/2019

Page 1 of 4

Data sheets showing similar products:
Stainless steel case, liquid filling, NS 40, 80 and 100; model 113.53; see data sheet PM 01.08



Specifications

Design

EN 837-1

Nominal size in mm

50, 63, 100

Accuracy class

NS 50, 63: 1.6

NS 100: 1.0

Scale ranges

NS 50: 0 ... 1 to 0 ... 1,000 bar

NS 63, 100: 0 ... 0.6 to 0 ... 1,000 bar

Pressure limitation

NS 50, 63: Steady: 3/4 x full scale value

Fluctuating: 2/3 x full scale value

Short time: Full scale value

NS 100: Steady: Full scale value

Fluctuating: 0.9 x full scale value

Short time: 1.3 x full scale value

Permissible temperature

Ambient: -20 ... +60 °C

Medium: +60 °C maximum

Temperature effect

When the temperature of the measuring system deviates from the reference temperature (+20 °C): max. $\pm 0.4 \text{ } \%/10 \text{ } ^\circ\text{K}$ of the span

Ingress protection per IEC/EN 60529

IP65

Process connection

Copper alloy

Lower mount or back mount

NS 50, 63: G 1/4 B (male), SW 14

NS 100: G 1/2 B (male), SW 22

Pressure element

NS 50:

Copper alloy, C-type or helical type

NS 63:

≤ 400 bar: Copper alloy, C-type or helical type

> 400 bar: ≥ 400 bar: Stainless steel 316L, helical type

NS 100:

< 100 bar: Copper alloy, C-type

≥ 100 bar: Stainless steel 316L, helical type

Movement

Copper alloy

Dial

NS 50, 63: Plastic ABS, white, with pointer stop pin

NS 100: Aluminium, white, black lettering

Pointer

NS 50, 63: Plastic, black

NS 100: Aluminium, black

Case

Stainless steel, natural finish

Sealing towards process connection with O-ring

With all scale ranges, the filling plug can be vented for internal pressure compensation.

Position of blow-out device

NS 50: Case back, at 12 o'clock

NS 63, 100: Case circumference, at 12 o'clock

Window

Plastic, crystal-clear

Ring

Crimped triangular bezel, stainless steel, glossy finish

Filling liquid

Glycerine

Options

- Other process connection
- Sealings (model 910.17, see data sheet AC 09.08)
- Measuring system and movement from stainless steel (model 233.53)
- NS 100: Zero point adjustment (in front)
- Increased medium temperature with special soft solder
 - NS 50, 63: 100 °C
 - NS 100: 150 °C
- Extended ambient temperature range -40 ... +60 °C with silicone oil filling
- Panel mounting flange, stainless steel, for back mount connection
- Surface mounting flange, stainless steel (only NS 63, 100)
- Mounting clamp, for back mount

Approvals

Logo	Description	Country
	EU declaration of conformity Pressure equipment directive PS > 200 bar, module A, pressure accessory	European Union
	GOST (option) Metrology, measurement technology	Russia
	KazInMetr (option) Metrology, measurement technology	Kazakhstan
-	MTSCHS (option) Permission for commissioning	Kazakhstan
	BeIGIM (option) Metrology, measurement technology	Belarus
	UkrSEPRO (option) Metrology, measurement technology	Ukraine
	Uzstandard (option) Metrology, measurement technology	Uzbekistan
-	CPA Metrology, measurement technology	China
	GL Ships, shipbuilding (e.g. offshore)	International
-	CRN Safety (e.g. electr. safety, overpressure, ...)	Canada

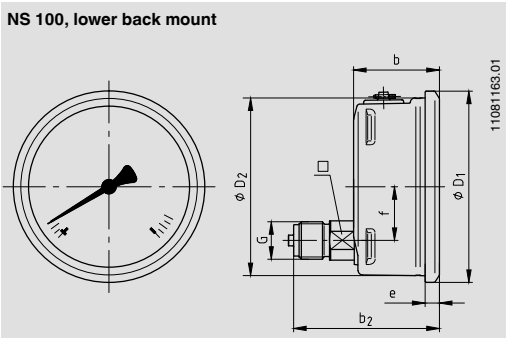
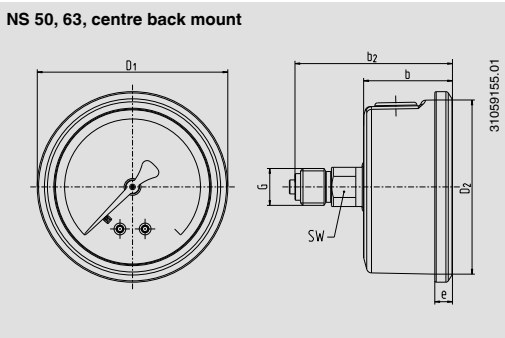
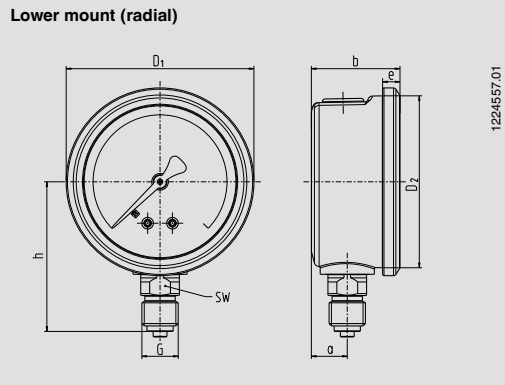
Certificates (option)

- 2.2 test report per EN 10204 (e.g. state-of-the-art manufacturing, material proof, indication accuracy)
- 3.1 inspection certificate per EN 10204 (e.g. indication accuracy)

Approvals and certificates, see website

Dimensions in mm

Standard version



NS	Dimensions in mm										Weight in kg
	a	b ±0.5	b2 ±0.5	D1	D2	e	f	G	h ±1	SW	
50	12	30	55	55	50	5.5	-	G ¼ B	48	14	0.15
63	13	32	56	68	62	6.5	-	G ¼ B	54	14	0.21
100	15.5	48	81.5	107	100	8	30	G ½ B	87	22	0.80

Process connection per EN 837-1 / 7.3

Ordering information

Model / Nominal size / Scale range / Process connection / Connection location / Options

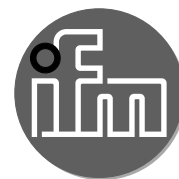
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The specifications given in this document represent the state of engineering at the time of publishing.
We reserve the right to make modifications to the specifications and materials.

WIKAI data sheet PM 02.12 - 07/2019

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Operating instructions
Electronic pressure sensor
for industrial applications

PT54xx/PU54xx

UK

10 / 2021

11421203 / 00



31557104/EN – 04/2024

Contents

1 Preliminary note.....2

2 Safety instructions3

3 Functions and features4

 3.1 Applications4

4 Functions5

5 Installation.....5

6 Electrical connection.....6

7 Technical data.....7

1 Preliminary note

Symbols used

- ▶ Instructions
- Cross-reference
-  Important note
Non-compliance can result in malfunction or interference.
-  Information
Supplementary note.



CAUTION

Warning of personal injury.
Slight reversible injuries may result.

2

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2 Safety instructions

- The device described is a subcomponent for integration into a system.
 - The manufacturer is responsible for the safety of the system.
 - The system manufacturer undertakes to perform a risk assessment and to create a documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the manufacturer of the system.
- Read this document before setting up the product and keep it during the entire service life.
- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.
- Only use the product for its intended purpose (→ Functions and features).
- Only use the product for permissible media (→ Technical data).
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, programming, configuration, operation and maintenance of the product must be carried out by personnel qualified and authorised for the respective activity.
- Protect units and cables against damage.

UK



CAUTION

For high medium temperatures, parts of the unit may heat up.

> Risk of burns

► Do not touch the unit

► Protect the housing against contact with flammable substances and unintentional contact.

3 Functions and features

The pressure sensor detects the system pressure and converts it into an analogue output signal.

3.1 Applications

- Type of pressure: relative pressure



Information on pressure rating and bursting pressure → data sheet.



Avoid static and dynamic overpressure exceeding the specified overload pressure by taking appropriate measures.

The indicated bursting pressure must not be exceeded.

Even if the bursting pressure is exceeded only for a short time, the unit may be destroyed. ATTENTION: Risk of injury!



For units with a final value of the measuring range of 600 bar the limits of the pressure cycles across the lifetime apply. (→ Technical data).



Pressure Equipment Directive (PED):

Units with a final value of the measuring range of 6...400 bar comply with the Pressure Equipment Directive and are designed and manufactured for group 2 fluids in accordance with the sound engineering practice.

Use of group 1 fluids on request!



The units are vacuum resistant.



Pressure Equipment Directive (PED):

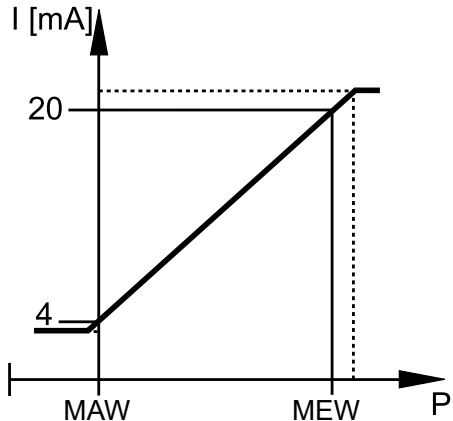
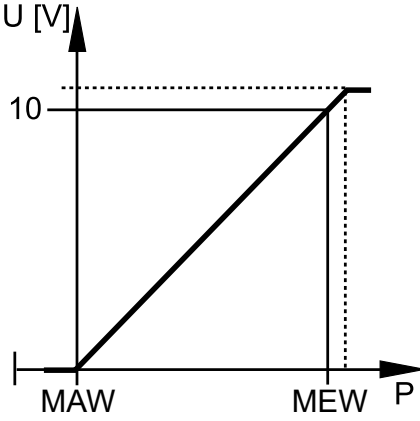
The units with a final value of the measuring range of 600 bar comply with the Pressure Equipment Directive. They are designed for group 2 fluids and manufactured and tested according to Module A.

Use of group 1 fluids on request!



If the cable length exceeds 30 m or if used outside buildings, there is a risk of overvoltage pulses from external sources. We recommend to use the unit in protected operating environments and to limit overvoltage pulses to max. 500 V.

4 Functions

Current output 4...20 mA (PT54xx)	Voltage output 0...10 V (PU54xx)
	
P = system pressure, MAW = Initial value of the measuring range, MEW = final value of the measuring range	
In the measuring range the output signal is between 4 and 20 mA. If the system pressure is above or below the measuring range, the analogue output behaves, without achieving the accuracy, as follows: • System pressure above the measuring range: 20...25 mA. • System pressure below the measuring range: 4...3 mA.	In the measuring range the output signal is between 0 and 10 V. If the system pressure is above the measuring range, the analogue output behaves, without achieving the accuracy, as follows: • System pressure above the measuring range: 10...11.5 V.

UK

5 Installation



Before installing and removing the unit: make sure that no pressure is applied to the system.

- ▶ Insert the unit in a G ¼ process connection.
- ▶ Tighten firmly. Recommended tightening torque:

Pressure range in bar	Tightening torque in Nm
6...400	25...35
600	30...50
Depends on lubrication, seal and pressure load!	

5

6 Electrical connection

- !

The unit must be connected by a qualified electrician.

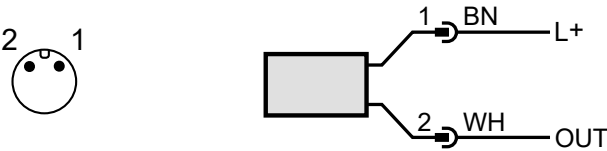
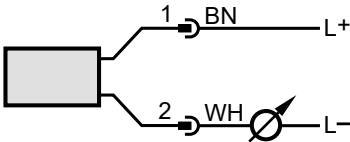
The national and international regulations for the installation of electrical equipment must be adhered to.

Voltage supply to EN 50178, SELV, PELV.
- !

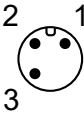
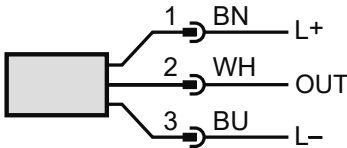
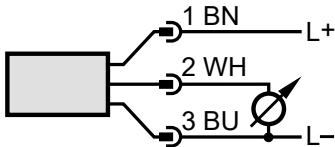
For marine applications (if approval available for the device), additional surge protection is required.

- ▶ Disconnect power.
- ▶ Connect the unit as follows:

PT54xx (4...20 mA analogue)

Core colours		
BN	brown	
WH	white	
		OUT: analogue output 4...20 mA Colours to DIN EN 60947-5-2
Example circuit		
		

PU54xx (0...10 V analogue)

Core colours			
BN	brown		
WH	white		
BU	blue		
		OUT: analogue output 0...10 V Colours to DIN EN 60947-5-2	
Example circuit			
			

UK

7 Technical data

 Directive 97/23/EC (pressure equipment directive) stipulates that the following technical data must be provided for units with a final value of the measuring range of 600 bar.

PT5460	
Operating voltage [V].....	8.5...36 DC
Analogue output	4...20 mA
PU5460	
Operating voltage [V].....	16...36 DC
Analogue output	0...10 V
Medium temperature [°C]	-40...90
Ambient temperature [°C]	-40...90
Storage temperature [°C].....	-40...100
Pressure cycles (min.) across lifetime	60 million for 1.2 x nominal pressure
Shock resistance [g]	50 (DIN EN 60068-2-27, 11 ms)
Vibration resistance [g]	20 (DIN EN 60068-2-6, 10...2000 Hz)

More information at www.ifm.com

PT5403

Seite 1 von 3

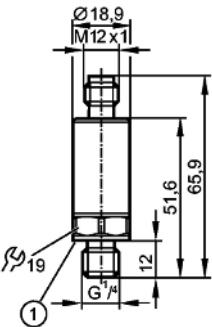
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PT5403

PT-025-SEG14-A-ZVG/US/ /W



Pressure sensors



1: Process connection sealing FKM / DIN 3869



Product characteristics

Electronic pressure sensor

for industrial applications

Process connection: G ¼ A (according to DIN EN ISO 1179-2)

Analog output

Measuring range: 0...25 bar

Application

Application	Type of pressure: relative pressure Group 2 fluids according to the Pressure Equipment Directive (PED), group 1 fluids on request
Pressure rating [bar]	65 (static)
Bursting pressure min. [bar]	600
Vacuum resistance [mbar]	-1000
Medium temperature [°C]	-40...90

Electrical data

Electrical design	DC
Operating voltage [V]	8.5...36 DC
Insulation resistance [MΩ]	> 100 (500 V DC)
Protection class	III
Reverse polarity protection	yes

Outputs

Output	Analog output
Output function	4...20 mA analog
Short-circuit proof	yes
Overload protection	yes
Analog output	4...20 mA
Max. load [Ω]	(Ub - 8.5 V) / 21.5 mA; 720 at Ub = 24 V

Measuring / setting range

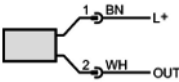
Measuring range [bar]	0...25
-----------------------	--------

Accuracy / deviations

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17.11.2016

31557104/EN – 04/2024

Accuracy / deviations (in % of the span)		
Characteristics deviation *)		< ± 0.5
Linearity		< ± 0.1 (BFSL) / < ± 0.2 (LS)
Hysteresis		< ± 0.2
Repeatability **)		< ± 0.05
Long-term stability ***)		< ± 0.1
Temperature coefficients (TEMPCO) in the temperature range -40...90° C (in % of the span per 10 K)		
Greatest TEMPCO of the zero point + span		< 0.1 (-25...90 °C) / < 0.2 (-40...-25 °C)
Reaction times		
Step response time analogue output	[ms]	1
Environment		
Ambient temperature	[°C]	-40...90
Storage temperature	[°C]	-40...100
Protection		IP 67 / IP 69K
Tests / approvals		
Pressure equipment directive		sound engineering practice
EMC	DIN EN 61000-6-2	
	DIN EN 61000-6-3	
Shock resistance	DIN EN 60068-2-27	50 g (11 ms)
Vibration resistance	DIN EN 60068-2-6	20 g (10...2000 Hz)
MTTF	[Years]	686
Mechanical data		
Process connection		G ¼ A (according to DIN EN ISO 1179-2)
Process connection sealing		FKM (to DIN 3869)
Materials (wetted parts)		1.4542 (17-4 PH / 630) ²
Housing materials		1.4542 (17-4 PH / 630) ² ; stainless steel (316L / 1.4404); PEI
Min. pressure cycles		60 millions in the course of the lifetime (at 1.2 times the nominal pressure)
Tightening torque	[Nm]	25...35 (recommended tightening torque ¹)
Restrictor element integrated		no
Weight	[kg]	0.056
Electrical connection		
Connection		M12 connector
Wiring		
Core colors BN brown WH white 		
 OUT: 4...20 mA The following pin connection is available on request: pin 1: L+, pin 3: OUT Colours to DIN EN 60947-5-2		
Remarks		
Remarks	*) incl. drift when overtightened, zero point and span error, non-linearity, hysteresis **) with temperature fluctuations < 10 K ***) in% of the span / 6 months	

PT5403

Seite 3 von 3

		¹⁾ Depends on lubrication, seal and pressure rating ²⁾ Characteristics similar to stainless steel (e.g. 304/1.4301) but higher strength. BFSL = Best Fit Straight Line / LS = Limit Value Setting
Pack quantity	[piece]	1
ifm efector, inc. • 1100 Atwater Drive • Malvern • PA 19355 — We reserve the right to make technical alterations without prior notice. — US — PT5403-01 — 07.09.2015		

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31557104/EN – 04/2024

Temperature

Cable thermocouple Mineral-insulated cable (MI cable) Model TC40

WIKA data sheet TE 65.40



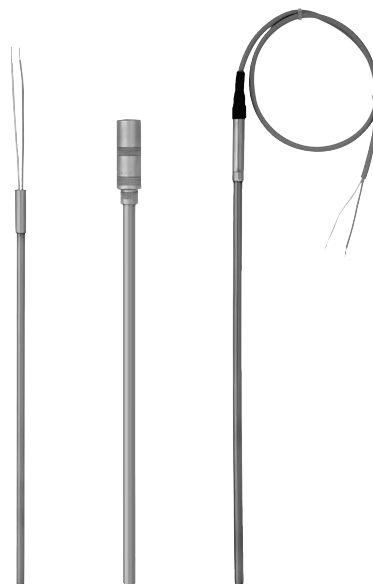
for further approvals
see page 2

Applications

- For direct installation into the process
- Machine building
- Motors
- Bearings
- Pipes and vessels

Special features

- Sensor ranges from -40 ... +1,260 °C [-40 ... +2,300 °F]
- For insertion or screw-in with optional process connection
- Cable from fibreglass, PFA/PTFE, silicone and other cable sheath materials
- Versions with/without connector or connection housing (option)
- Explosion-protected versions (option)



Cable thermocouple, model TC40

Description

Cable thermocouples are particularly suited to those applications in which the metal probe tip is mounted directly into bored holes (e.g. in machine components) or directly into the process for any application with no chemically aggressive media or abrasion.

A large number of different explosion protection approvals are available for the TC40.

For mounting into a thermowell, a spring-loaded compression fitting should be provided, since only this can press the measuring tip into the bottom of the thermowell. Otherwise a potentially critical force could be exerted on the measuring tip.

In the standard version the cable probes are manufactured without process connections. Fastening elements such as threaded connections, compression fittings, etc. are possible as options.

WIKA data sheet TE 65.40 · 08/2020

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Explosion protection (option)

The permissible power, $P_{\max}$, as well as the permissible ambient temperature, for the respective category can be seen on the EC-type examination certificate and the certificate for hazardous areas or the operating instructions.

The internal inductance ($L_i = 1 \mu\text{H/m}$) and capacitance ($C_i = 200 \text{ pF/m}$) for cable probes should be taken into account when connecting to an intrinsically safe voltage supply.

Attention:

The transmitter, built into an optional connection housing, has its own certificate for hazardous areas. The permissible ambient temperature ranges of the built-in transmitters can be taken from the corresponding transmitter operating instructions and approvals.

Approvals (explosion protection, further approvals)

Logo	Description	Country
	EU declaration of conformity ■ EMC directive ¹⁾ EN 61326 emission (group 1, class B) and immunity (industrial application) ■ RoHS directive ■ ATEX directive (option) Hazardous areas - Ex i Zone 0 gas II 1G Ex ia IIC T1 ... T6 Ga Zone 1 mounting to zone 0 gas II 1/2G Ex ia IIC T1 ... T6 Ga/Gb Zone 1 gas II 2G Ex ia IIC T1 ... T6 Gb Zone 20 dust II 1D Ex ia IIC T125 ... T65 °C Da Zone 21 mounting to zone 20 dust II 1/2D Ex ia IIC T125 ... T65 °C Da/Db Zone 21 dust II 2D Ex ia IIC T125 ... T65 °C Db - Ex e ²⁾ Zone 1 gas ³⁾ II 2G Ex eb IIC T1 ... T6 Gb Zone 2 gas II 3G Ex ec IIC T1 ... T6 Gc X Zone 21 dust ³⁾ II 2D Ex tb IIC TX °C Db Zone 22 dust II 3D Ex tc IIC TX °C Dc X - Ex n ²⁾ Zone 2 gas II 3G Ex nA IIC T1 ... T6 Gc X Zone 22 dust II 3D Ex tc IIC TX °C Dc X	European Union
	IECEx (option) - in combination with ATEX Hazardous areas - Ex i Zone 0 gas Ex ia IIC T1 ... T6 Ga Zone 1 mounting to zone 0 gas Ex ia IIC T1 ... T6 Ga/Gb Zone 1 gas Ex ia IIC T1 ... T6 Gb Zone 20 dust Ex ia IIC T125 ... T65 °C Da Zone 21 mounting to zone 20 dust Ex ia IIC T125 ... T65 °C Da/Db Zone 21 dust Ex ia IIC T125 ... T65 °C Db - Ex e ⁴⁾ Zone 1 gas ³⁾ Ex eb IIC T1...T6 Gb Zone 2 gas Ex ec IIC T1...T6 Gc Zone 21 dust ³⁾ Ex tb IIC TX °C Db Zone 22 dust Ex tc IIC TX °C Dc - Ex n ⁴⁾ Zone 2 gas Ex nA IIC T1...T6 Gc Zone 22 dust Ex tc IIC TX °C Dc	International
	EAC (option) Hazardous areas - Ex i Zone 0 gas 0 Ex ia IIC T6 ... T1 Ga X Zone 1 gas 1 Ex ia IIC T6 ... T1 Gb X Zone 20 dust Ex ia IIC T80...T440 °C Da X Zone 21 dust Ex ia IIC T80...T440 °C Db X	Eurasian Economic Community

1) Only for built-in transmitter

2) Only with connection head, model BSZ, BSZ-H, 1/4000, 5/6000 or 7/8000 (see "Connection head")

3) Only for insulated thermocouples

4) Only with connection head, model 1/4000, 5/6000 or 7/8000 (see "Connection head")

Logo	Description	Country
	INMETRO (option) Hazardous areas - Ex i Zone 0 gas Ex ia IIC T3 ... T6 Ga Zone 1 mounting to zone 0 gas Ex ia IIC T3 ... T6 Ga/Gb Zone 1 gas Ex ia IIC T3 ... T6 Gb Zone 20 dust Ex ia IIIC T125 ... T65 °C Da Zone 21 mounting to zone 20 dust Ex ia IIIC T125 ... T65 °C Da/Db Zone 21 dust Ex ia IIIC T125 ... T65 °C Db	Brazil
	NEPSI (option) Hazardous areas - Ex i Zone 0 gas Ex ia IIC T1 ~ T6 Ga Zone 1 mounting to zone 0 gas Ex ia IIC T1 ~ T6 Ga/Gb Zone 1 gas Ex ia IIC T1 ~ T6 Gb - Ex n ⁴⁾ Zone 2 gas Ex nA IIC T1 ~ T6 Gc	China
	KCs - KOSHA (option) Hazardous areas - Ex i Zone 0 gas Ex ia IIC T4 ... T6 Zone 1 gas Ex ib IIC T4 ... T6	South Korea
-	PESO (option) Hazardous areas - Ex i Zone 0 gas Ex ia IIC T1 ... T6 Ga Zone 1 mounting to zone 0 gas Ex ia IIC T1 ... T6 Ga/Gb Zone 1 gas Ex ia IIC T1 ... T6 Gb	India
	GOST (option) Metrology, measurement technology	Russia
	KazInMetr (option) Metrology, measurement technology	Kazakhstan
-	MTSCHS (option) Permission for commissioning	Kazakhstan
	BelGIM (option) Metrology, measurement technology	Belarus
	UkrSEPRO (option) Metrology, measurement technology	Ukraine
	Uzstandard (option) Metrology, measurement technology	Uzbekistan

Manufacturer's information and certificates

Logo	Description
	SIL 2 Functional safety (only in conjunction with model T32 temperature transmitter)

4) Only with connection head, model 1/4000, 5/6000 or 7/8000 (see "Connection head")

Instruments marked with "ia" may also be used in areas only requiring instruments marked with "ib" or "ic".
If an instrument with "ia" marking has been used in an area with requirements in accordance with "ib" or "ic", it can no longer be operated in areas with requirements in accordance with "ia" afterwards.

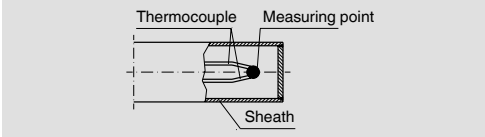
Approvals and certificates, see website

Sensor

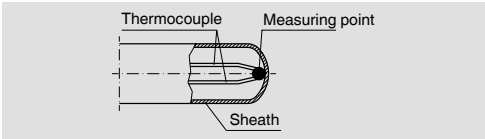
Thermocouple per IEC 60584-1 or ASTM E230
Types K, J, E, N, T (single or dual thermocouple)

Measuring location

- Ungrounded (standard)



- Welded to the bottom (grounded)



Sensor types

Type	Validity limits of the class accuracy					
	IEC 60584-1				ASTM E230	
	Class 2		Class 1		Standard / special	
K	-40 ... +1,200 °C	[-40 ... +2,192 °F]	-40 ... +1,000 °C	[-40 ... +1,832 °F]	0 ... 1,260 °C	[0 ... 2,300 °F]
J	-40 ... +750 °C	[-40 ... +1,382 °F]	-40 ... +750 °C	[-40 ... +1,382 °F]	0 ... 760 °C	[0 ... 1,400 °F]
E	-40 ... +900 °C	[-40 ... +1,652 °F]	-40 ... +800 °C	[-40 ... +1,472 °F]	0 ... 870 °C	[0 ... 1,598 °F]
N	-40 ... +1,200 °C	[-40 ... +2,192 °F]	-40 ... +1,000 °C	[-40 ... +1,832 °F]	0 ... 1,260 °C	[0 ... 2,300 °F]
T	-40 ... +350 °C	[-40 ... +662 °F]	-40 ... +350 °C	[-40 ... +662 °F]	0 ... 370 °C	[0 ... 698 °F]

The table shows the temperature ranges listed in the respective standards, in which the tolerance values (class accuracies) are valid.

The actual operating temperature of the thermometer is limited both by the maximum permissible working temperature and the diameter of the thermocouple and the sheathed cable, as well as by the maximum permissible working temperature of the sheath material.

For detailed specifications for thermocouples, see IEC 60584-1 or ASTM E230 and Technical information IN 00.23 at www.wika.com.

Tolerance value

For the tolerance value of thermocouples, a cold junction temperature of 0 °C has been taken as the basis.

Minimum and maximum operating temperature

Process temperature

The process temperature is the temperature which prevails in the area between the probe tip and the process connection. This generally corresponds to the temperatures for which the thermocouple has been defined in accordance with IEC 60584-1 standard.

- Sheath material Ni alloy: Alloy 600
 - up to 1,200 °C (air)
 - standard material for applications which require specific corrosion-resistant properties under exposure to high temperatures, resistant to induced stress corrosion cracking and pitting corrosion in media containing chloride
 - resistant to corrosion caused by aqueous ammonia in all temperatures and concentrations
 - highly resistant to halogens, chlorine, hydrogen chloride
- Sheath material stainless steel
 - up to 850 °C (air)
 - good resistance against aggressive media and also against vapour and combustion gases in chemical media

Short insertion lengths and specific components can limit the operating temperature of the thermometer (e.g. PTFE ferrules on a compression fitting).

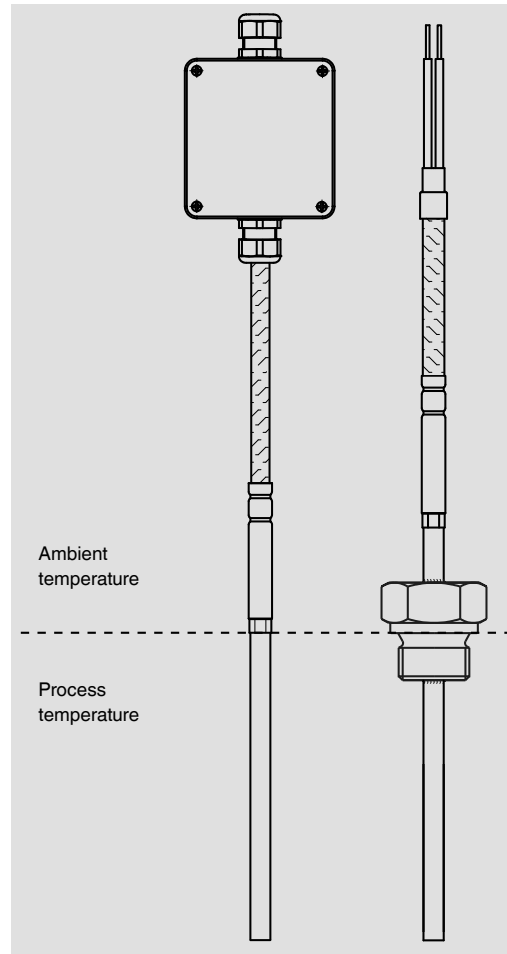
Ambient temperature

The area of the transition from MI cable to connection cable (see page 13) and all subsequent components are located in the region of ambient temperature.

If the ambient temperature is higher than the permissible temperature at the cable, connector or transition, the metal parts of the probe must be long enough so that the transition is located outside of the hot zone. At any point on the connection cable, the maximum temperature that may be attained is that for which the connection cable is specified. The probe itself can – within the validity limits of its class accuracy – be loaded higher.

It is important to ensure that the lowest of the maximum permissible ambient temperatures for connection cables, materials used such as sealing compounds in the transition sleeve or a fitted connector or case is not exceeded.

- Maximum temperature at connection housing: 85 °C
 - Maximum temperature at connector: 85 °C
 - Maximum temperature of the sealing compound at the transition: 250 °C
 - Maximum temperature of vibration-resistant versions: 200 °C
 - In an optional approval minimum and maximum temperature specified
- Other variants on request



For information on the maximum permissible operating temperatures for the connection cable see page 14.

General design of the TC40

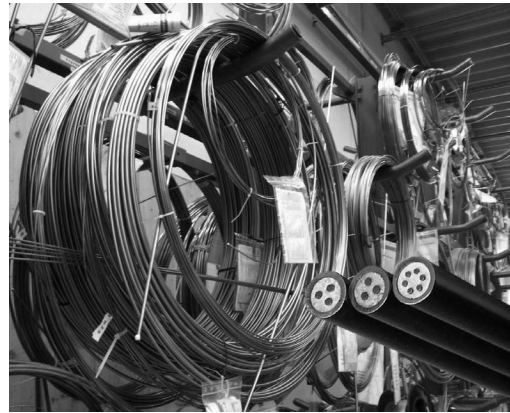
In sheathed thermocouples the flexible part of the probe consists of a mineral-insulated cable (MI cable). It features a metal outer sheath, which contains the insulated internal leads, embedded within a high-density ceramic compound.

Due to their flexibility and the small possible diameters, sheathed thermocouples can also be used in locations that are not easily accessible, since, with the exception of the probe tip and the transition sleeve of the connection cable, the sheath can be bent to a radius of five times the diameter of the cable.

Please note:

The flexibility of the sheathed thermocouple must be considered, especially when the flow rates are relatively high.

For temperature measurement in a solid body, the diameter of the bore into which the probe should be inserted, should be no more than 1 mm larger than the probe diameter. Each air gap acts as an insulation layer.



Mineral-insulated cable (MI cable)

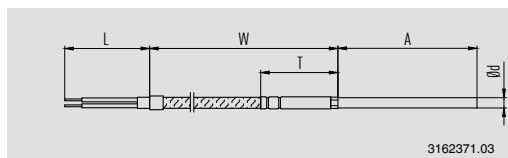


Sensor in the probe tip

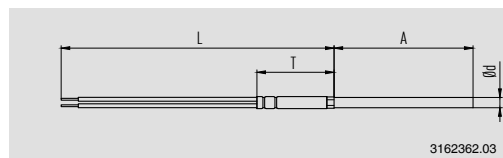
Versions

■ With connection cable

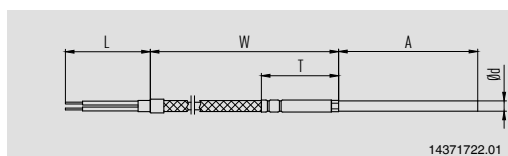
Standard version



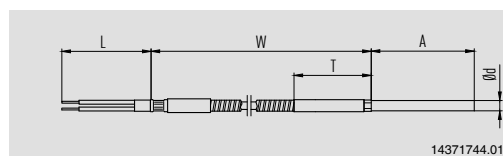
Single wires



Connection cable with stainless steel braid

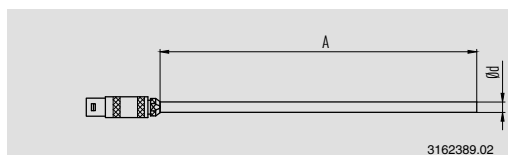


Connection cable with protective metal armouring

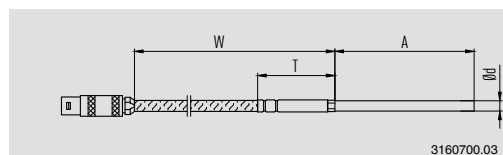


■ With connector

Fitted on the MI cable

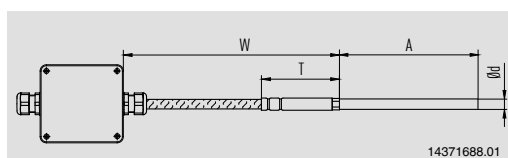


Fitted at the cable end



For all ignition protection types except Ex i, gas applies:
Position of the connector is only permitted outside the hazardous area.

■ With connection housing, fitted at the cable end

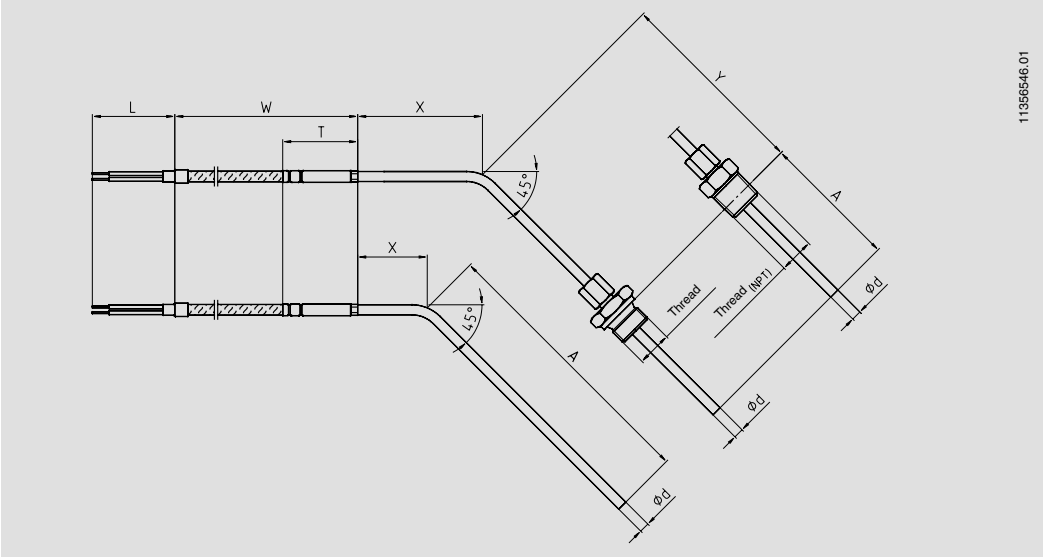
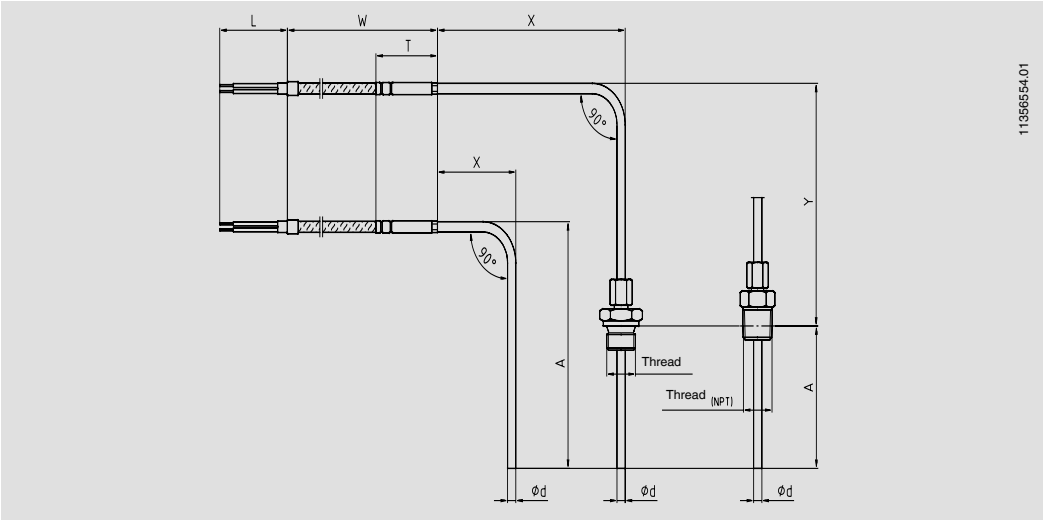


Angled probes

TC40 cable thermocouples can be delivered in a pre-formed shape. In this case, the position of the bend is defined by a further dimension.

Using a fixed threaded connection is not recommended, as the angled probe would need to be screwed into the process with a wide sweeping movement.

- Legend:
- X Distance of the bend to the end of the tube
 - A Insertion length of the probe (section which is built into the process)
 - Y Distance from the centre of the bend to the dimensioning plane of the threaded connection (only if a threaded connection is used)



Process connection

TC40 cable thermocouples can be fitted with optional process connections.

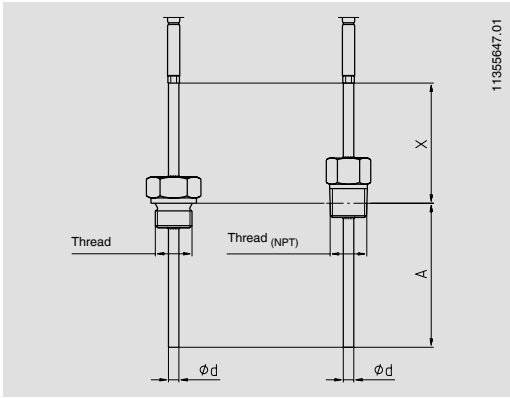
To minimise heat dissipation errors via the threaded connection, the insertion length, A, should be at least 25 mm long.

Please note:

- For parallel threads (e.g. G ½) the dimensioning always refers to the sealing collar of the threaded connection nearest the process
- For tapered threads (e.g. NPT) the measurement plane is located approx. in the centre of the thread

Legend:

- X Position of the threaded connection (independent of the type of connection)
- A Insertion length in the process



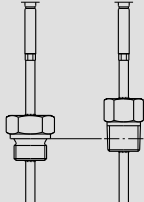
International designs

- Without process connection
Smooth probe for insertion

Design	Illustration	Material process connection	Thread size	Diameter sheathed cable	Material sheathed cable
Without process connection		-	-	■ 1.5 mm ■ 2mm ■ 3 mm ■ 4.5 mm ■ 6 mm ■ 8 mm ■ 1/16 in/0.063 in [1.59 mm] ■ 1/8 in/0.125 in [3.17 mm] ■ 3/16 in/0.188 in [4.75 mm] ■ 1/4 in/0.250 in [6.35 mm] ■ 3/8 in/0.375 in [9.53 mm]	■ Alloy 600 ■ Stainless steel 1.4571 ■ Stainless steel 316L

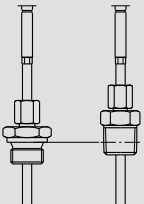
- Fixed threaded connection, thread
 - Version to mount the probe into a threaded coupling with a female thread
 - Probe must be rotated in order to screw it into the process
 - Therefore, first fit the version mechanically and then connect it electrically

Design	Illustration	Material process connection	Thread size	Diameter sheathed cable	Material sheathed cable
Fixed threaded connection, thread		■ Stainless steel 1.4571 ■ Stainless steel 316L	■ G 1/8 B ■ 1/8 NPT ■ M8 x 1.0	■ 1.5 mm ■ 2 mm ■ 3 mm ■ 1/16 in/0.063 in [1.59 mm] ■ 1/8 in/0.125 in [3.17 mm]	■ Alloy 600 ■ Stainless steel 1.4571 ■ Stainless steel 316L

Design	Illustration	Material process connection	Thread size	Diameter sheathed cable	Material sheathed cable
Fixed threaded connection, thread		- Stainless steel 1.4571 - Stainless steel 316L	- G 1/4 B - G 3/8 B 1/4 NPT 3/8 NPT - M10 x 1.0	3 mm 4.5 mm 6 mm 1/8 in/0.125 in [3.17 mm] 3/16 in/0.188 in [4.75 mm] 1/4 in/0.250 in [6.35 mm]	- Alloy 600 - Stainless steel 1.4571 - Stainless steel 316L
			- G 1/2 B - G 3/4 B 1/2 NPT 3/4 NPT - M12 x 1.5 - M14 x 1.5 - M16 x 1.5 - M18 x 1.5 - M20 x 1.5	3 mm 4.5 mm 6 mm 8 mm 1/8 in/0.125 in [3.17 mm] 3/16 in/0.188 in [4.75 mm] 1/4 in/0.250 in [6.35 mm] 3/8 in/0.375 in [9.53 mm]	- Alloy 600 - Stainless steel 1.4571 - Stainless steel 316L

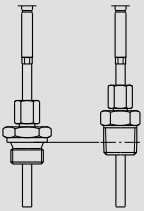
■ **Compression fitting with stainless steel ferrule**

- Simple adjustment at the mounting point to the desired insertion length
- Compression fitting can be slid along the probe (only before the first tightening)
- After loosening, sliding along the sheathed cable is no longer possible
- Dimensions A and X describe the condition at time of supply
- Smallest possible length X of approx. 50 mm (due to the length of the compression fitting)
- Max. temperature at the process connection: 500 °C (unpressurised)
- Max. pressure loading: 20 bar (at max. 150 °C, Ø 6 mm)

Design	Illustration	Material process connection	Thread size	Diameter sheathed cable	Material sheathed cable
Compression fitting with stainless steel ferrule		- Stainless steel 1.4571 - Stainless steel 316L	- G 1/8 B 1/8 NPT - M8 x 1.0	3 mm 1/8 in/0.125 in [3.17 mm]	- Alloy 600 - Stainless steel 1.4571 - Stainless steel 316L
			- G 1/4 B - G 3/8 B 1/4 NPT 3/8 NPT - M10 x 1.0	3 mm 4.5 mm 6 mm 1/8 in/0.125 in [3.17 mm] 3/16 in/0.188 in [4.75 mm] 1/4 in/0.250 in [6.35 mm]	- Alloy 600 - Stainless steel 1.4571 - Stainless steel 316L
			- G 1/2 B - G 3/4 B 1/2 NPT 3/4 NPT - M12 x 1.5 - M14 x 1.5 - M16 x 1.5 - M18 x 1.5 - M20 x 1.5	3 mm 4.5 mm 6 mm 8 mm 1/8 in/0.125 in [3.17 mm] 3/16 in/0.188 in [4.75 mm] 1/4 in/0.250 in [6.35 mm] 3/8 in/0.375 in [9.53 mm]	- Alloy 600 - Stainless steel 1.4571 - Stainless steel 316L

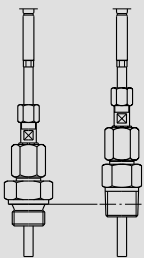
■ Compression fitting with PTFE ferrule

- Basic construction as for the version with stainless steel ferrule
- Ferrules can be set several times
- After loosening, sliding along the sheath is still possible
- Max. temperature at process connection: 150 °C
- For use without pressure

Design	Illustration	Material process connection	Thread size	Diameter sheathed cable	Material sheathed cable
Compression fitting with PTFE ferrule		■ Stainless steel 1.4571 ■ Stainless steel 316L	■ G 1/8 B ■ 1/8 NPT ■ M8 x 1.0	■ 1.5 mm ■ 2 mm ■ 3 mm ■ 1/16 in/0.063 in [1.59 mm] ■ 1/8 in/0.125 in [3.17 mm]	■ Alloy 600 ■ Stainless steel 1.4571 ■ Stainless steel 316L
			■ G 1/4 B ■ G 3/8 B ■ 1/4 NPT ■ 3/8 NPT ■ M10 x 1.0	■ 3 mm ■ 4.5 mm ■ 6 mm ■ 1/8 in/0.125 in [3.17 mm] ■ 3/16 in/0.188 in [4.75 mm] ■ 1/4 in/0.250 in [6.35 mm]	■ Alloy 600 ■ Stainless steel 1.4571 ■ Stainless steel 316L
			■ G 1/2 B ■ G 3/4 B ■ 1/2 NPT ■ 3/4 NPT ■ M12 x 1.5 ■ M14 x 1.5 ■ M16 x 1.5 ■ M18 x 1.5 ■ M20 x 1.5	■ 3 mm ■ 4.5 mm ■ 6 mm ■ 8 mm ■ 1/8 in/0.125 in [3.17 mm] ■ 3/16 in/0.188 in [4.75 mm] ■ 1/4 in/0.250 in [6.35 mm] ■ 3/8 in/0.375 in [9.53 mm]	■ Alloy 600 ■ Stainless steel 1.4571 ■ Stainless steel 316L

■ Spring-loaded compression fitting with stainless steel ferrule

- Easy adjustment to the desired insertion length at the mounting point, while at the same time maintaining the spring pre-tension
- Compression fitting can be slid along the probe (only before the first tightening)
- After loosening, sliding along the sheathed cable is no longer possible
- Dimensions A and X describe the condition at time of supply
- Smallest possible length X of approx. 100 mm (due to the length of the compression fitting)
- Max. temperature at process connection: 150 °C
- For use without pressure
- Hydraulic oil-tight versions on request

Design	Illustration	Material process connection	Thread size	Diameter sheathed cable	Material sheathed cable
Spring-loaded compression fitting with stainless steel ferrule		■ Stainless steel 1.4571 ■ Stainless steel 316L	■ G 1/4 B ■ G 3/8 B ■ G 1/2 B ■ G 3/4 B ■ 1/4 NPT ■ 3/8 NPT ■ 1/2 NPT ■ 3/4 NPT ■ M10 x 1.0 ■ M12 x 1.5 ■ M14 x 1.5 ■ M16 x 1.5 ■ M18 x 1.5 ■ M20 x 1.5	6 mm	■ Alloy 600 ■ Stainless steel 1.4571 ■ Stainless steel 316L

US design

Design	Illustration	Material process connection	Thread size	Diameter sheathed cable	Material sheathed cable
Spring-loaded threaded connection (standard)		Stainless steel 316L	■ 1/4 NPT ■ 3/8 NPT ■ 1/2 NPT ■ 3/4 NPT	■ 6 mm ■ 1/4 in/0.250 in [6.35 mm] ■ 1/8 in/0.125 in [3.17 mm]	■ Alloy 600 ■ Stainless steel 316L
Spring-loaded threaded connection with O-ring sealing (rated to 100 psi at 86 °C, hydrostatic testing in H ₂ O)		Stainless steel 316L	■ 1/4 NPT ■ 3/8 NPT ■ 1/2 NPT ■ 3/4 NPT	1/4 in/0.250 in [6.35 mm]	■ Alloy 600 ■ Stainless steel 316L
Fixed fitting/double threaded hex bushing (welded)		Stainless steel 316L	■ 1/2 NPT ■ 3/4 NPT	1/4 in/0.250 in [6.35 mm]	■ Alloy 600 ■ Stainless steel 316L

Transition

Standard version

The junction between the metal part of the probe and the connection lead or stranded wire should not be immersed within the process and must not be bent. Compression fittings should not be attached to the transition sleeve.

The dimensions of the transition sleeve are dependent upon the probe diameter, on the construction of the connection cable and its number of inner conductors - depending on the connection method. Also, operation with ambient temperatures $< -40^{\circ}\text{C}$ has an influence on the dimensions of the transition sleeve.

Transition sleeve with the same diameter as the probe

Optionally, a transition sleeve can also be selected that has the same diameter as the metal probe. This makes it possible to slide on cable glands or compression fittings from both ends of the probe. The transition is hardly visible.

The operating limits of the transition sleeve do not change, however, i.e. it must still remain outside the process and should not be loaded with a compression fitting.

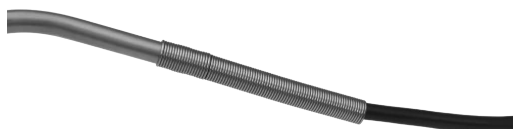
Standard diameter transition sleeve and probe

- 6 mm
- 8 mm
- 1/4 in

Bend protection

A bend protection (spring or shrink hose) is used to protect the transition point from rigid probe to flexible connection lead. This should always be used when a relative movement between the connection lead and the thermometer mounting is expected.

For designs to Ex n or Ex e, the use of bend protection is mandatory.



Bend protection spring



Shrink hose

Both versions should be considered to be technically equivalent with respect to their function as bend protection.

Connection cable, jacket

Cable jacket	Application range ¹⁾
PTFE	-60 ... +250 °C
PTFE, shielded (see standard versions below)	-60 ... +250 °C
Single wires, PTFE	-60 ... +250 °C
Stainless steel braid over PTFE	-60 ... +250 °C
Silicone	-60 ... +200 °C
Silicone, shielded (see standard versions below)	-60 ... +200 °C
PVC	-20 ... +100 °C
Fibreglass	-50 ... +400 °C
Stainless steel braid over fibreglass	-50 ... +400 °C
Protective metal armouring over PTFE	-60 ... +250 °C
Protective metal armouring over PFA	-50 ... +250 °C
Protective metal armouring with PTFE sheath over PTFE	-60 ... +250 °C
Protective metal armouring with PVC sheath over PVC	-20 ... +100 °C
Protective metal armouring with PE sheath over PFA	-50 ... +250 °C

Colour code of cable

Sensor type	Standard	Thermocouple cable, compensating cable		
		Outer sheath	Positive	Negative
K	IEC 60584-3	Green	Green	White
J	IEC 60584-3	Black	Black	White
E	IEC 60584-3	Violet	Violet	White
T	IEC 60584-3	Brown	Brown	White
N	IEC 60584-3	Pink	Pink	White

Sensor type	Standard	Thermocouple cable			Compensating cable		
		Outer sheath	Positive	Negative	Outer sheath	Positive	Negative
K	ASTM E230	Brown	Yellow	Red	Yellow	Yellow	Red
J	ASTM E230	Brown	White	Red	Black	White	Red
E	ASTM E230	Brown	Violet	Red	Violet	Violet	Red
T	ASTM E230	Brown	Blue	Red	Blue	Blue	Red
N	ASTM E230	Brown	Orange	Red	Orange	Orange	Red

For further information on colour coding, see Technical information IN 00.23 at www.wika.com.

Standard cable lengths

Metric lengths	Imperial lengths
■ 1,000 mm	■ 24 in
■ 2,000 mm	■ 36 in
■ 3,000 mm	■ 72 in
■ 5,000 mm	■ 144 in

Other cable lengths are possible

Standard versions of the shield electrical connection

- Shield not connected at the sensor, stripped lead at the end of the cable
 - Shield connected at the sensor, stripped lead at the end of the cable
 - Shield not connected at the sensor, connected at the housing
 - Shield connected at the sensor, connected at the case
 - Shield not connected at the sensor, connected at the connector
 - Shield connected at the sensor, connected at the connector
 - Shield connected at the sensor, not connected at the connector
- Other versions on request

1) Minimum/Maximum temperatures valid for stationary cable. The actual operating temperature (process temperature) of the thermometer can deviate.

Design of the lead ends

Version	Illustration
Flying leads ¹⁾	
End splices	
Spade lugs (fork design)	

Cord grip

Thread size	Material	Illustration
Without	-	
M16 x 1.5	Plastic	
M20 x 1.5	Plastic	
1/2 NPT	Plastic	
1/2 NPT	Metal	
3/4 NPT	Metal	

1) Not permissible with Ex e or Ex n

Connection housing (option)

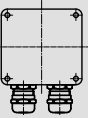
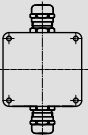
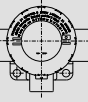
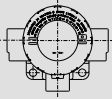
Illustration	Model	Material	Cable entry thread size	Cover	Surface	Other
	Field case	Plastic (ABS)	■ M12 x 1.5 ■ 1/2 NPT ■ M16 x 1.5	Flat cover with 4 plug screws	Grey	■ 82 x 80 x 55 mm (L x W x H) ■ Inputs on one side
	Field case	Aluminium	■ M12 x 1.5 ■ 1/2 NPT ■ M16 x 1.5	Flat cover with 4 plug screws	Natural finish	■ 80 x 75 x 57 mm (L x W x H) ■ Inputs on one side
	Field case	Plastic (ABS)	■ M12 x 1.5 ■ 1/2 NPT ■ M16 x 1.5	Flat cover with 4 plug screws	Grey	■ 82 x 80 x 55 mm (L x W x H) ■ Inputs opposite each other
	Field case	Aluminium	■ M12 x 1.5 ■ 1/2 NPT ■ M16 x 1.5	Flat cover with 4 plug screws	Natural finish	■ 80 x 75 x 57 mm (L x W x H) ■ Inputs opposite each other
	1/4000	Aluminium	■ M20 x 1.5 ■ 1/2 NPT ■ 3/4 NPT	Screw-on lid	Blue, painted ¹⁾	-
	1/4000	Stainless steel	■ M20 x 1.5 ■ 1/2 NPT ■ 3/4 NPT	Screw-on lid	Natural finish	-
	7/8000	Aluminium	■ M20 x 1.5 ■ 1/2 NPT ■ 3/4 NPT	Screw-on lid	Blue, painted ¹⁾	-
	7/8000	Stainless steel	■ M20 x 1.5 ■ 1/2 NPT ■ 3/4 NPT	Screw-on lid	Natural finish	-
	7/8000	Aluminium	■ M20 x 1.5 ■ 1/2 NPT ■ 3/4 NPT	Screw-on lid, with digital temperature display, model DIH50-B	Blue, painted ¹⁾	-
	7/8000	Stainless steel	■ M20 x 1.5 ■ 1/2 NPT ■ 3/4 NPT	Screw-on lid, with digital temperature display, model DIH50-B	Natural finish	-
	5/6000	Aluminium	■ 2 x M20 x 1.5 ■ 2 x 1/2 NPT ■ 2 x 3/4 NPT	Screw-on lid	Blue, painted ¹⁾	-
	5/6000	Stainless steel	■ 2 x M20 x 1.5 ■ 2 x 1/2 NPT ■ 2 x 3/4 NPT	Screw-on lid	Natural finish	-
	5/6000	Aluminium	■ 2 x M20 x 1.5 ■ 2 x 1/2 NPT ■ 2 x 3/4 NPT	Screw-on lid, with digital temperature display, model DIH50-B	Blue, painted ¹⁾	-
	5/6000	Stainless steel	■ 2 x M20 x 1.5 ■ 2 x 1/2 NPT ■ 2 x 3/4 NPT	Screw-on lid, with digital temperature display, model DIH50-B	Natural finish	-

Illustration	Model	Material	Cable entry thread size	Cover	Surface	Other
	Field transmitter TIF50 ²⁾	Aluminium	■ 2 x M20 x 1.5 ■ 2 x 1/2 NPT ■ 2 x 3/4 NPT	-	-	-
	Field transmitter TIF50 ²⁾	Stainless steel	■ 2 x M20 x 1.5 ■ 2 x 1/2 NPT ■ 2 x 3/4 NPT	-	-	-
	Field transmitter TIF52 ²⁾	Aluminium	■ 2 x M20 x 1.5 ■ 2 x 1/2 NPT ■ 2 x 3/4 NPT	-	-	-
	Field transmitter TIF52 ²⁾	Stainless steel	■ 2 x M20 x 1.5 ■ 2 x 1/2 NPT ■ 2 x 3/4 NPT	-	-	-
	KN4-A ²⁾	Aluminium	■ M20 x 1.5 ■ 1/2 NPT ■ 3/4 NPT	Screw-on lid	Blue, painted ¹⁾	-
	KN4-P ²⁾	Polypropylene	■ M20 x 1.5 ■ 1/2 NPT ■ 3/4 NPT	Screw-on lid	White	-
	BSZ ³⁾	Aluminium	■ M20 x 1.5 ■ 1/2 NPT	Spherical, hinged cover with plug screw	Blue, painted ¹⁾	-
	BSZ-H ³⁾	Aluminium	■ M20 x 1.5 ■ 1/2 NPT	High hinged cover with plug screw	Blue, painted ¹⁾	-

1) RAL 5022

2) Not permissible with Ex e or Ex n

3) Not permissible with IECEx (Ex e or Ex n) and NEPSI (Ex n)

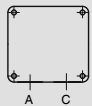
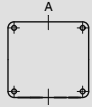
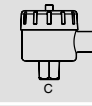
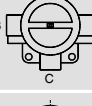
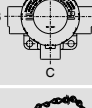
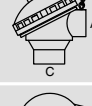
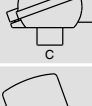
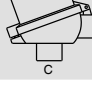
Model	Explosion protection							
	Without	Ex i (gas) Zone 0, 1, 2	Ex i (dust) Zone 20, 21, 22	Ex eb (gas) Zone 1	Ex tb (dust) Zone 21	Ex ec (gas) Zone 2	Ex nA (gas) Zone 2	Ex tc (dust) Zone 22
Field case, plastic (ABS)	x	-	-	-	-	-	-	-
Field case, aluminium	x	x	x	x	x	x	x	x
1/4000	x	x	x	x	x	x	x	x
7/8000	x	x	x	x	x	x	x	x
7/8000 / DIH50 ²⁾	x	x	x	-	-	-	-	-
5/6000	x	x	x	x	x	x	x	x
TIF50	x	x	x	-	-	-	-	-
TIF52	x	x	x	-	-	-	-	-
KN4-A	x	x	-	-	-	-	-	-
KN4-P ¹⁾	x	-	-	-	-	-	-	-
BSZ	x	x	x	x ³⁾	x ³⁾	x ³⁾	x ³⁾	x ³⁾
BSZ-H	x	x	x	x ³⁾	x ³⁾	x ³⁾	x ³⁾	x ³⁾

1) On request

2) LC display DIH50

3) Only ATEX, no IECEx, no NEPSI

Position of the probe input
The standard probe input is located at position C.
Another position for the probe input is possible as an option.

Illustration	Connection housing
	Field case with inputs on either side
	Field case with inputs on opposite sides
	Connection housing 1/4000
	Connection housing 7/8000
	Connection housing 7/8000 with DIH50
	Connection housing 5/6000
	Connection housing 5/6000 with DIH50-B
	Field transmitter TIF50/TIF52
	Connection head KN4-A
	Connection head BSZ
	Connection head BSZ-H

Cable entry

Cable entry	Colour	Ingress protection (max.) IEC/EN 60529	Cable entry thread size	Min./max. ambient temperature
 Standard cable entry ¹⁾	Natural finish	IP65	■ M20 x 1.5 ■ ½ NPT	-40 ... +80 °C
 Plastic cable gland (cable Ø 6 ... 10 mm) ¹⁾	Black or grey	IP66 ²⁾	■ M20 x 1.5 ■ ½ NPT	-40 ... +80 °C
 Plastic cable gland (cable Ø 6 ... 10 mm), Ex e ¹⁾	Light blue or black	IP66 ²⁾	■ M20 x 1.5 ■ ½ NPT	-20 ... +80 °C Option: -40 ... +70 °C
 Nickel-plated brass cable gland (cable Ø 6 ... 12 mm)	Natural finish	IP66 ²⁾	■ M20 x 1.5 ■ ½ NPT	-60 ³⁾ / -40 ... +80 °C
 Nickel-plated brass cable gland (cable Ø 6 ... 12 mm), Ex e	Natural finish	IP66 ²⁾	■ M20 x 1.5 ■ ½ NPT	-60 ³⁾ / -40 ... +80 °C
 Stainless steel cable gland (cable Ø 7 ... 12 mm)	Natural finish	IP66 ²⁾	■ M20 x 1.5 ■ ½ NPT	-60 ³⁾ / -40 ... +80 °C
 Stainless steel cable gland (cable Ø 7 ... 12 mm), Ex e	Natural finish	IP66 ²⁾	■ M20 x 1.5 ■ ½ NPT	-60 ³⁾ / -40 ... +80 °C
 Plain threaded	-	IP00	■ M20 x 1.5 ■ ½ NPT	-
 2 x plain threaded ⁴⁾	-	IP00	■ 2 x M20 x 1.5 ■ 2 x ½ NPT	-
 Junction box M12 x 1 (4-pin) ⁵⁾	-	IP65	M20 x 1.5	-40 ... +80 °C
 Sealing plugs for shipping	Transparent	-	■ M20 x 1.5 ■ ½ NPT	-40 ... +80 °C

The figures show examples of connection heads.

1) Not available for BVS connection head

2) Only for BSZ-H connection head

3) Not available for ½ NPT thread size cable entry

4) Special version on request (only available with selected approvals), other temperatures on request

5) Ignition protection types, describing temporary or permanent immersion, on request

Cable entry	Explosion protection							
	Without	Ex i (gas) Zone 0, 1, 2	Ex i (dust) Zone 20, 21, 22	Ex eb (gas) Zone 1	Ex tb (dust) Zone 21	Ex ec (gas) Zone 2, 21, 22	Ex nA (gas) Zone 2	Ex tc (dust) Zone 22
Standard cable entry ¹⁾	x	x	-	-	-	-	-	-
Plastic cable gland ¹⁾	x	x	-	-	-	-	-	-
Plastic cable gland (light blue), Ex e ¹⁾	x	x	x	-	-	-	-	-
Plastic cable gland (black), Ex e ¹⁾	x	x	x	x	x	x	x	x
Brass cable gland, nickel-plated	x	x	x	-	-	-	-	-
Brass cable gland, nickel-plated, Ex e	x	x	x	x	x	x	x	x
Stainless steel cable gland	x	x	x	-	-	-	-	-
Stainless steel cable gland, Ex e	x	x	x	x	x	x	x	x
Plain threaded	x	x	x ⁵⁾	x ⁵⁾	x ⁵⁾	x ⁵⁾	x ⁵⁾	x ⁵⁾
2 x plain threaded ²⁾	x	x	x ⁵⁾	x ⁵⁾	x ⁵⁾	x ⁵⁾	x ⁵⁾	x ⁵⁾
Junction box M12 x 1 (4-pin) ³⁾	x	x ⁴⁾	x ⁴⁾	-	-	-	-	-
Sealing plugs for shipping	Not applicable, transport protection							

- ¹⁾ Not available for BVS connection head
²⁾ Only for BSZ-H connection head
³⁾ Not available for ½ NPT thread size cable entry
⁴⁾ With appropriate mating connector connected
⁵⁾ Suitable cable gland required for operation

Transmitter built into the connection housing (option)

A transmitter can be mounted in an optional connection housing.

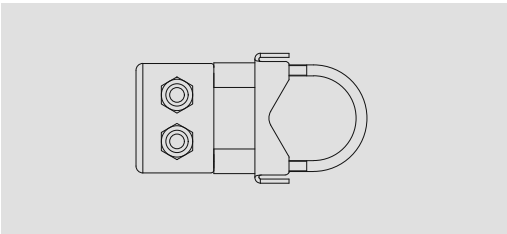


Output signal 4 ... 20 mA and HART® protocol		
Transmitter (selectable versions)	Model T16	Model T32
Data sheet	TE 16.01	TE 32.04
Output		
■ 4 ... 20 mA	x	x
■ HART® protocol	-	x
Explosion protection	Optional	Optional

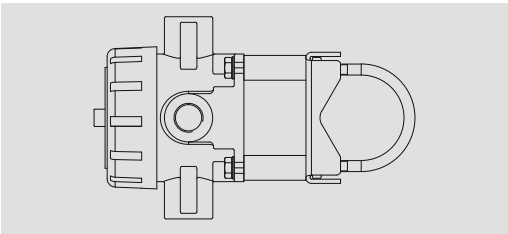
For detailed specifications on the explosion protection of the transmitter, see respective transmitter data sheet.

Accessories, connection housing

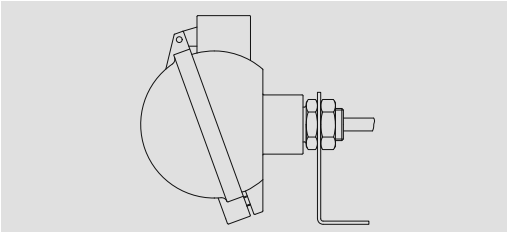
Pipe mounting kit, stainless steel (for field case)



Pipe mounting kit, stainless steel (for 5/6000, DIH50/DIH52, TIF50/TIF52)



Fixing bracket (for wall mounting) 92 x 60 x 50 mm, stainless steel (for connection head models BSZ and BSZ-H)



Connector (option)

Cable thermocouples can be supplied with connectors fitted.
The following options are available:

Illustration	Model
	Lemos connector (male)
	Binder/Amphenol screw/plug-in connector (male)
	Harting connector (male)
	Binder screw/plug-in connector, M12 x 1 (male)
	Thermo connector (male)

The figures are not to scale.

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Ingress protection per IEC/EN 60529

Degrees of protection against solid foreign bodies (defined by the 1st index number)

First index number	Degree of protection / Short description	Test parameters
5	Dust-protected	per IEC/EN 60529
6	Dust-tight	per IEC/EN 60529

Degrees of protection against water (defined by the 2nd index number)

Second index number	Degree of protection / Short description	Test parameters
4	Protected against splash water	per IEC/EN 60529
5	Protected against water jets	per IEC/EN 60529
6	Protected against strong water jets	per IEC/EN 60529
7	Protected against the effects of temporary immersion in water	per IEC/EN 60529
8	Protected against the effects of permanent immersion in water	as agreed upon

Model TC40 is available in the following IP degrees of protection:

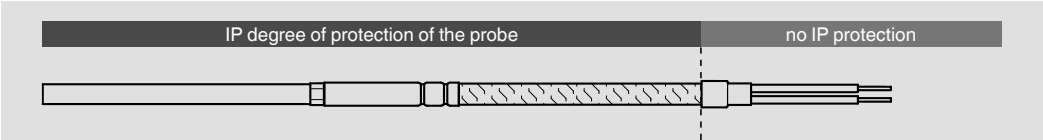
- IP40
- IP50
- IP54 (standard)
- IP65
- IP67

The specified degrees of protection apply under the following conditions:

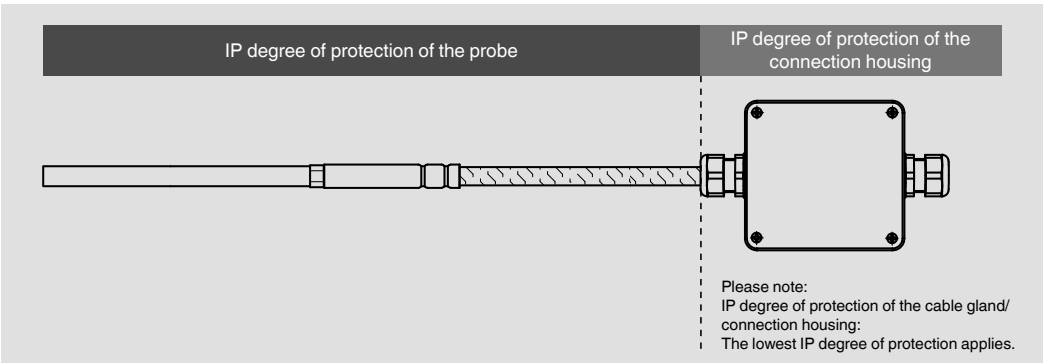
- Use of a suitable cable gland
- Use of a cable cross-section appropriate for the gland or select the appropriate cable gland for the available cable
- Adhere to the tightening torques for all threaded connections

Classification of the IP protection zones of the probe

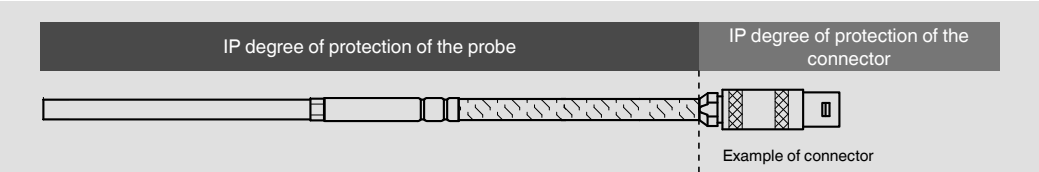
- Version with connection cable



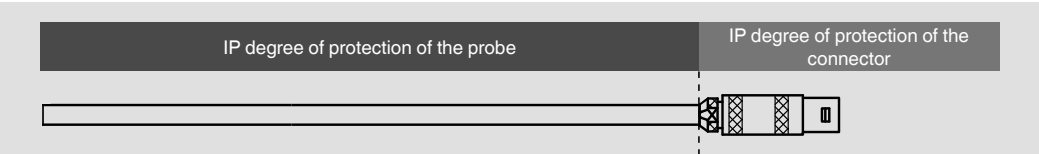
- Version with connection housing, fitted at the cable end



Version with connector, fitted at the cable end



Version with connector, fitted at the MI cable



IP ingress protection types of the connection housing

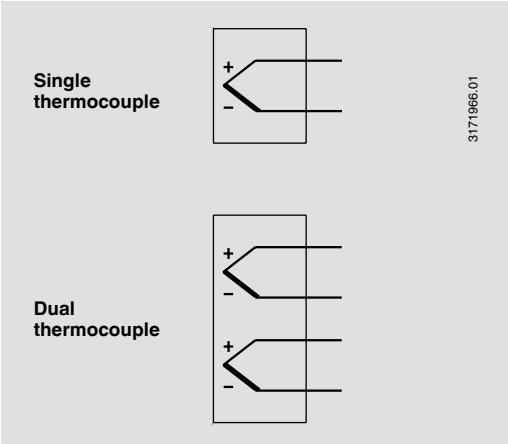
Connection housing	Version	IP ingress protection
Field case	Plastic (ABS) / aluminium	IP65
Connection head	KN4-A	IP65
	KN4-P	
	BSZ	
	BSZ-H	
	1/4000	IP66
	5/6000	
	5/6000 with DIH50	
	7/8000	
	7/8000 with DIH50	IP66
Field transmitter	TIF50/TIF52	

IP ingress protection types of the connector

Connector	Version	IP ingress protection
Binder	Series 680	IP40
	Series 692	
	Series 423	
Amphenol	C16-3	IP40
Lemosa	Size 0 S	IP50
	Size 1 S	
	Size 2 S	
	Size 1 E	IP65
Harting	7D	IP65
	8D	
	8U	
M12 x 1	4-pin	IP65
Thermo connector	2-pin, standard/miniature	IP00
	3-pin, standard/miniature	

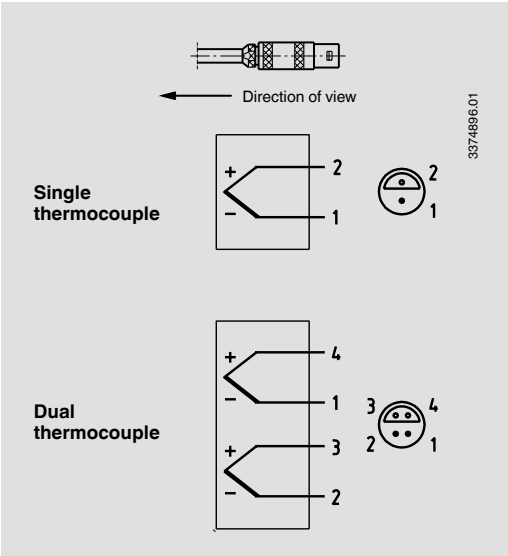
Electrical connection

Without connector



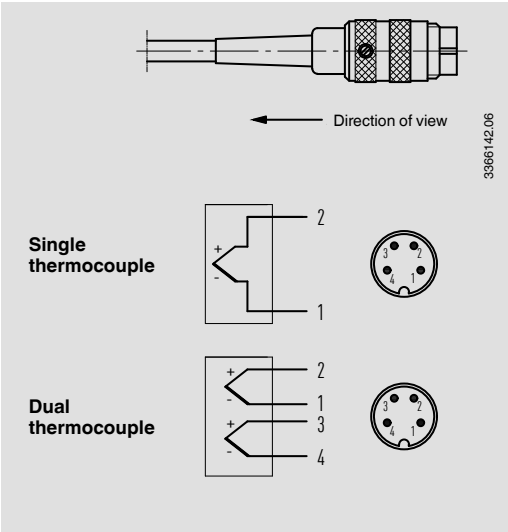
Lemosa connector

max. permissible temperature range: -55 ... +250 °C

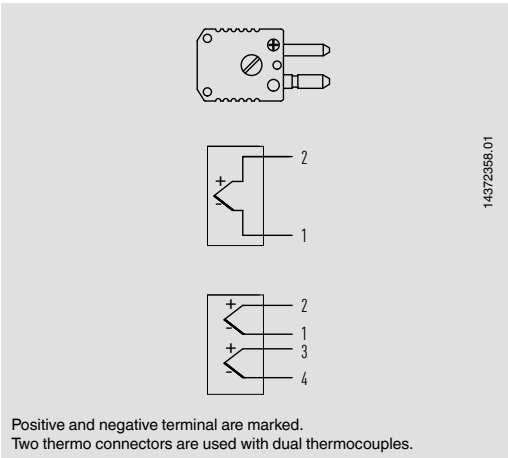


Screw/plug-in connector (Amphenol, Binder)
Series 680, series 423 (shielded)

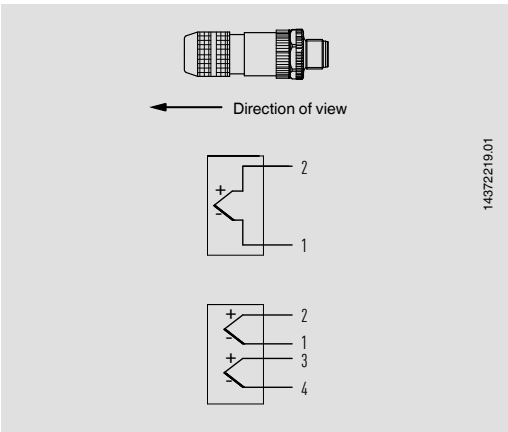
max. permissible temperature range: -40 ... +85 °C



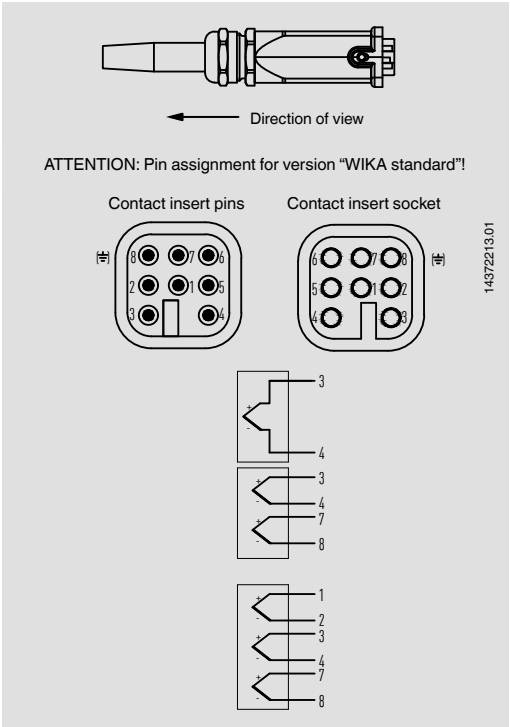
Thermo connector (male)



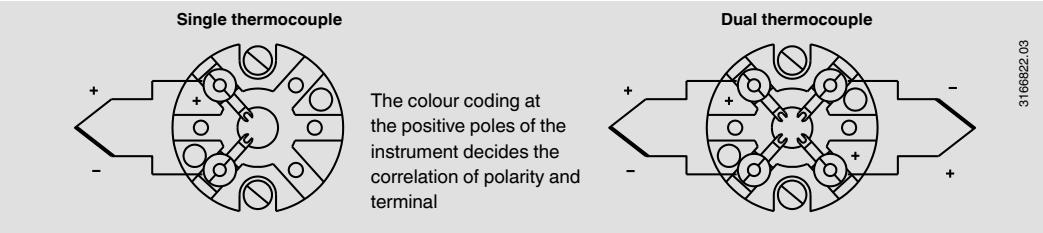
Binder screw/plug-in connector (male), M12 x 1 (series 713)



Harting connector

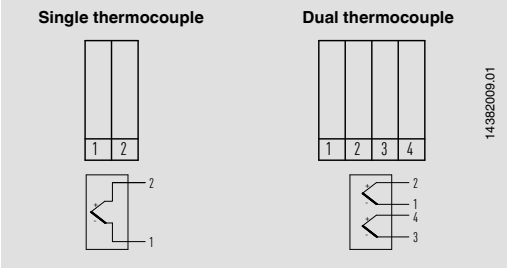


Standard terminal block



For the electrical connections of built-in temperature transmitters see the corresponding data sheets or operating instructions.

Rack-mounting terminals



Operating conditions

Mechanical requirements

Version	
Standard	max. 50 g peak-to-peak, 10 ... 500 Hz

The information on vibration resistance refers to the probe tip.

Storage temperature

-40 ... +80 °C
Other storage temperatures on request

Shipping information

Model TC40 thermocouple in “straight” version, with lengths > 1,100 mm is wound and delivered in coils.

Certificates (option)

Certification type	Measurement accuracy	Material certificate
2.2 test report	x	x
3.1 inspection certificate	x	x
DKD/DAkkS calibration certificate	x	-

The different certifications can be combined with each other.

The minimum length (metal part of the probe or the length of the probe below the process connection) for carrying out a measurement accuracy test 3.1 or DKD/DAkkS is 100 mm.

Ordering information

Model / Explosion protection / Probe version / Threaded connection version / Thread size / Materials / Probe diameter / Measuring element / Connection method / Temperature range / Connection cable, jacket / Lead ends version / Certificates / Options

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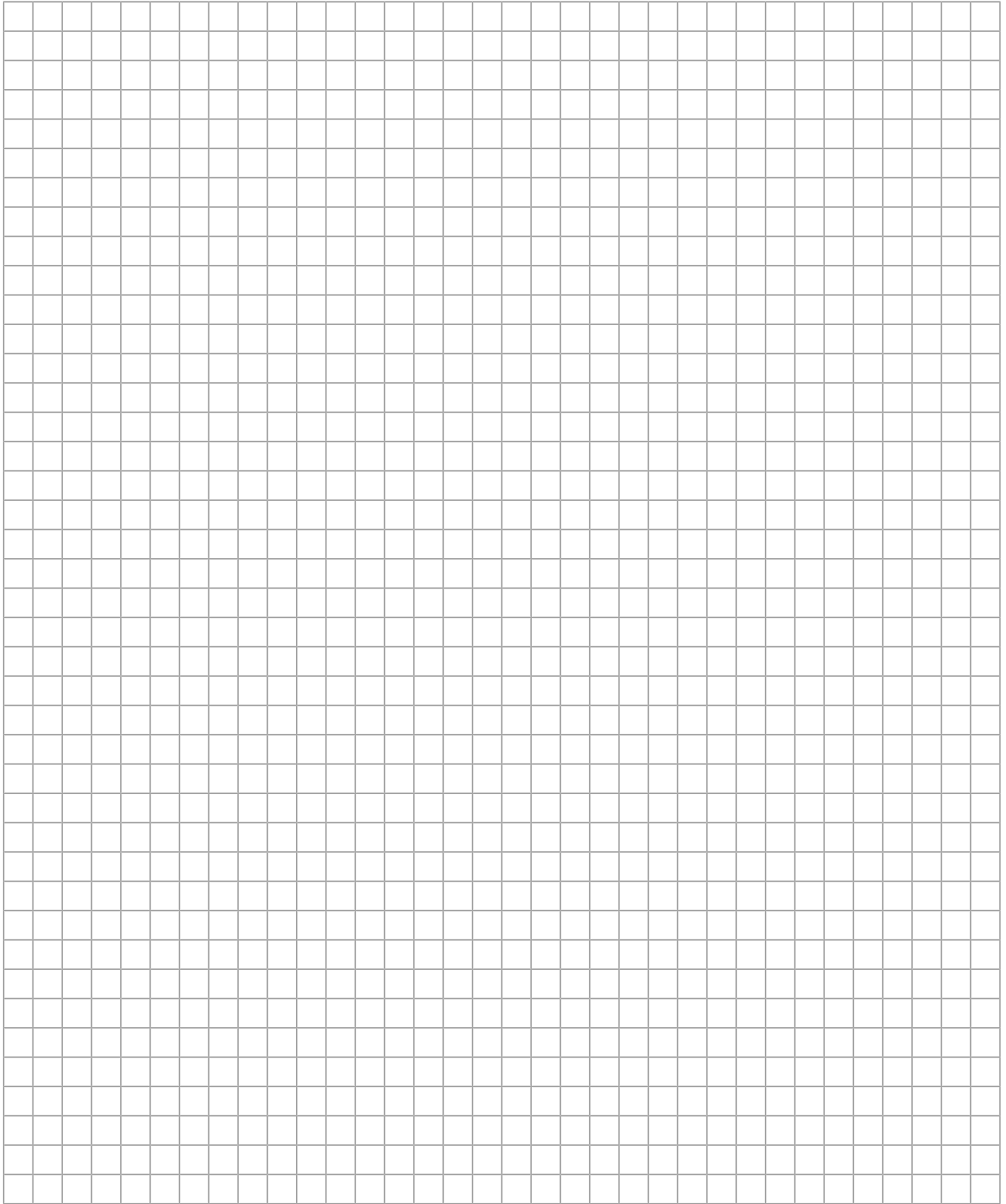
<https://www.sew-eurodrive.de/contacts-worldwide>

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