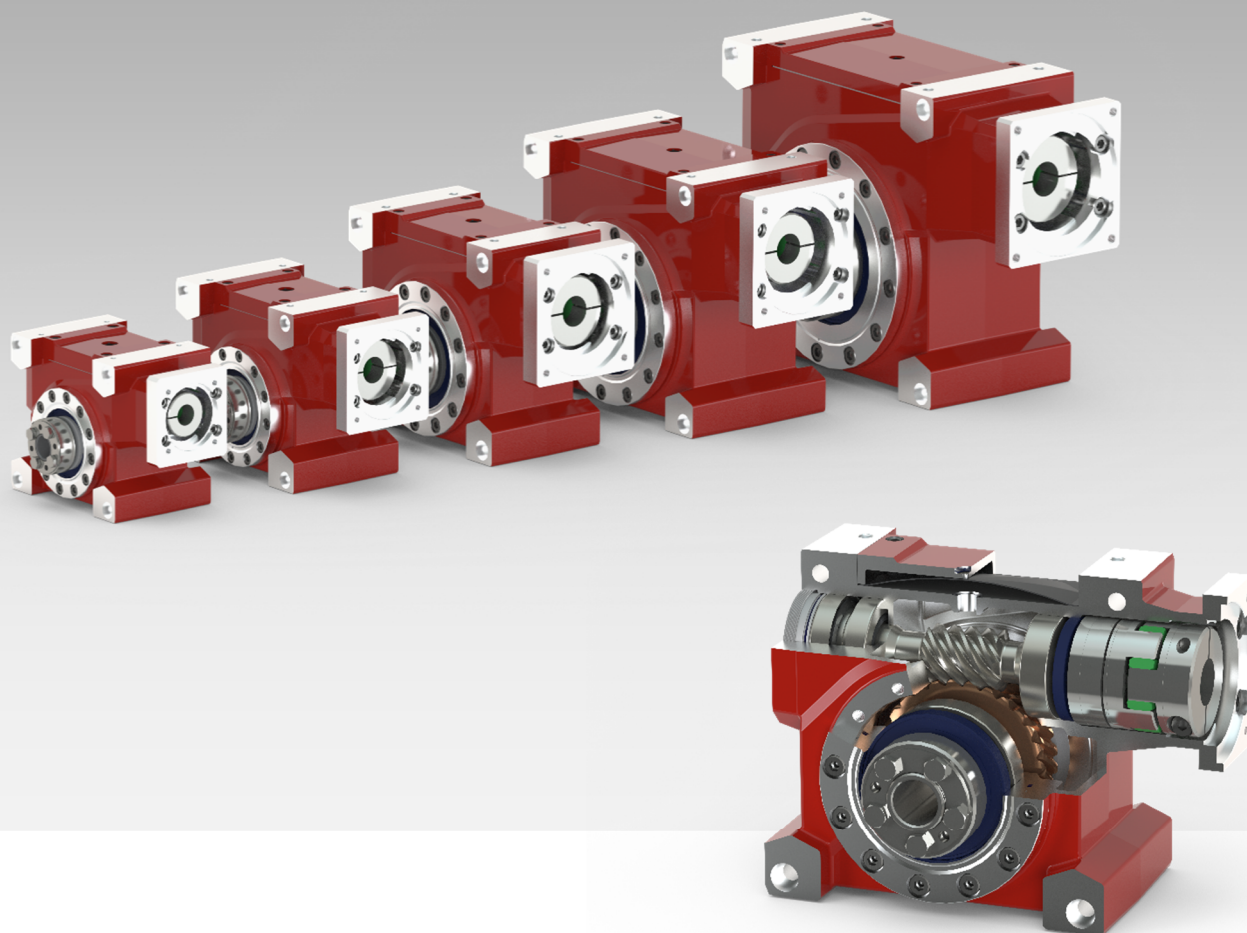


ZAE



OPERATING MANUAL

ZAE SERVO-DRIVE



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1 Introduction	6
1.1 Contents of the document	6
1.2 Applicable documents.....	6
1.3 Typographical conventions	6
2 Safety	7
2.1 Use and restrictions on use.....	7
2.2 Personnel qualification.....	7
2.3 Safety-relevant service	7
2.4 Personal protective equipment.....	7
2.5 Hazards.....	8
2.5.1 Hazards during transport and lifting	8
2.5.2 Hazards during operation	8
2.5.3 Risks of installation and service work.....	8
2.6 Operation in potentially explosive atmospheres.....	9
3 Design and function	11
3.1 Overview	11
3.2 Material.....	11
3.3 Gear oil	11
3.4 Hermetic pressure compensation of the gear unit	11
3.5 Type plates.....	12
3.6 Explosion-proof operating material marking.....	13
3.7 Type code	13
3.7.1 Structure of type code.....	13
3.7.2 Version (description)	13
3.7.3 Design and gear sides	14
3.8. Dimensions.....	15
3.8.1 Dimensions of the servo motor	16
3.8.2 Housing holes with thread	18
3.9 Weights.....	18
4 Shipping, transport and storage.....	19
4.1 Shipping	19
4.2 Transport	19
4.3 Storage	20
5 Installation	21
5.1 Place of installation	21
5.2 Notes on installation.....	21
5.3 Installing the gear unit	21
5.4 Mounting the hollow shaft	22
5.4.1 Hollow shaft with keyway connection	22
5.4.2 Hollow shaft with shrink disk connection.....	22
5.5 Mounting the motor coupling from ZAE	23

5.6 Mounting the motor	24
5.7 Mounting upstream or downstream gear units	24
5.8 Painting.....	24
6 Commissioning	25
6.1 Checking hermetic pressure compensation	25
6.2 Test run	25
7 Fault table.....	26
8 Service.....	27
8.1 Servicing schedule	27
8.2 Service work.....	27
8.2.1 Performing a visual inspection	27
8.2.2 Check shaft-hub connections and couplings.....	28
8.2.3 Check surface temperature.....	28
8.2.4 Readjusting backlash.....	28
9 Recycling.....	29
10 Appendix	30
10.1 Tightening torques	30
10.2 Design for forces and output.....	30
10.2.1 Basis of calculation	30
10.2.2 Technical information	31
10.2.3 External forces	32
10.2.4 Thermal limits	33
10.3 Tables for coupling assembly	34
10.4 Lubricant table	37
10.5 Oil quantities	37
10.6 Exploded drawing.....	38
10.7 Declarations of conformity	39

1 Introduction

Read this operating manual carefully before commissioning and before working on the gear unit. It is essential to observe the safety and warning notices in this document.
If you require information that is not described in this operating manual, contact ZAE Service.

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1.1 Contents of the document

This operating manual describes the assembly, commissioning, operation and service for the ZAE SERVO-DRIVE (Type Z).

Gear unit	Sizes
ZAE SERVO-DRIVE (Type Z)	040 - 100



The operating manual also applies to type Z gear units approved and marked for potentially explosive atmospheres.

1.2 Applicable documents

Alongside the operating manual, you must observe the following documents:

- design data for the gear unit,
- safety data sheet for the gear oil.

1.3 Typographical conventions

In this operating manual, warning notices are identified by a signal word.
They are grouped into levels by the severity of the consequences:

⚠ DANGER	The consequences are death or serious injury.
⚠ WARNING	The consequences could be death or serious injury.
⚠ CAUTION	The consequences could be minor injury.
NOTICE	The consequences could be property damage.



In this operating manual, the symbol to the left identifies information that is important for explosion protection.

2 Safety

2.1 Use and restrictions on use

The gear unit is intended for use as part of a drive system in machines and plants. The machine or plant must not be commissioned until it has been verified that it can be safely operated with the gear unit.

The machine or plant in which the gear unit is installed must fulfil the relevant regulations. All applicable occupational health and safety requirements must be fulfilled. In particular, Machinery Directive 2006/42/EC must be observed in its scope.

WARNING! The gear unit must be used in accordance with the design data of ZAE and this operating manual. Make sure that the nominal loads specified by ZAE are not exceeded in operation. If the gear unit is not used in accordance with the design data and operating manual, this may result in injury to persons.

Do not modify the gear unit. The hermetic pressure compensation element may only be removed or modified after consultation with ZAE. Do not drill any additional holes into the gear unit. Do not commission a damaged gear unit. If failure of the gear unit could lead to risks for individuals, suitable protective measures must be provided.

The gear unit was developed in accordance with the requirements for intermittent operation (S3 in accordance with DIN EN 60034-1). In the event of continuous operation, verification (S1 in accordance with DIN EN 60034-1) is required. Continuous operation is defined based on the duty cycle. A duty cycle of more than 30% or longer than 20 minutes is considered continuous operation.

Depending on the size, the gear unit is designed for maximum revolutions of 3,600 – 8,000 rpm at the worm shaft. A speed ratio from driving the hollow shaft is not permitted without the written agreement of ZAE.

The gear unit is not designed to be self-locking. To secure the gear unit against breaking out of standstill under load at the output shaft, a correctly dimensioned holding brake must be provided.



The gear unit must only be operated in potentially explosive atmospheres if it is marked for them, see Figure 3.2: "Type plate for use in potentially explosive atmospheres".

2.2 Personnel qualification

Qualified staff

Only qualified staff may carry out work around transport, storage, installation and commissioning and service. Qualified staff are persons with training and experience that enables them to recognise and avoid possible hazards.

2.3 Safety-relevant service

Follow the servicing schedule in this operating manual to ensure your personal safety and to keep the gear unit in an appropriate operating condition.

2.4 Personal protective equipment

Suitable protective equipment must be provided for personnel for work on the gear unit. This consists of:

- protective work clothing,
- safety shoes,
- protective gloves,
- safety glasses.

2.5 Hazards

2.5.1 Hazards during transport and lifting

Persons can be severely injured if the gear unit falls to the ground or it swings back and forth. Therefore, comply with the following instructions.

- Cordon off a wide space around the danger area. Ensure there is sufficient room to evade swinging loads.
- Never walk beneath suspended loads.
- Use adequately dimensioned transport equipment that is suitable for the application. You will find information on the weight of the gear unit in the order documents and in Chapter 3.7 of this operating manual.
- The gear unit is equipped with threaded holes into which eyebolts can be screwed. Lift the gear unit only at the eyebolts provided. The eyebolts must be screwed in completely. Only pull vertically on the eyebolts, never transversely or obliquely. Only use the eyebolts to lift the gear unit without other components. The eyebolts are not designed to bear the weight of the gear unit with attached parts. When lifting a geared motor, use the eyebolts on the gear unit and the motor at the same time. If the motor does not have a suitable hole for an eyebolt, secure the motor properly in another manner, e.g. with a strap.

2.5.2 Hazards during operation

Risk of being pulled into rotating parts

There is a risk of being pulled into rotating parts. In addition to the shafts, this applies to drive and output elements like belt drives, chain drives, shrink disks and couplings.

All rotating parts must be secured against unintentional contact. Also take precautions against possible machine lag.

Burns on hot surfaces

Parts of the gear unit could become so hot that there is a risk of burns. Provide contact protection if there is a risk of persons touching the gear unit during and shortly after operation. Touch the gear unit after operation only if wearing protective gloves or let the gear unit cool down before working on it.

Protective covers

The protective covers must not be removed during operation.

2.5.3 Risks of installation and service work

Risk of accidents from slippery surfaces

Leaking gear oil can lead to slippery surfaces.

The gear unit can be slippery due to an oil surface and slide out of your hands.

If gear oil is spilled, there is a risk of slipping on the pool of oil.

- For this reason, check for leaked gear oil regularly and absorb spilled gear oil immediately with a binding agent.

Risk from substances

The chemical substances that are used with the gear unit may be poisonous.

If the substances gets in your eyes, this can harm them. Contact with cleaning agents, lubricants and adhesives can lead to skin irritation.

When opening screw plugs or the pressure compensation lid on the gear unit, oil mist can escape.

- When working with chemical substances, wear chemical-proof protective gloves and work clothing. Wash your hands after working.
- Wear safety glasses if chemicals can splash.
- If a chemical gets in your eye, immediately rinse it with lots of cold water. In case of problems, consult a physician.
- Observe the safety data sheets of the chemicals. Keep the safety data sheets available near the gear unit.

2.6 Operation in potentially explosive atmospheres



The gear unit fulfils the explosion protection requirements in Directive 2014/34/EU for the category listed on the type plate. It is intended for use in potentially explosive atmospheres in accordance with the information on the type plate, see Chapter 3.4.

The gear unit may only be operated with components that are intended for use in potentially explosive atmospheres. During operation, no mixtures of atmospheres with gases, vapours, mists and dusts may be present. The gear unit is not approved for hybrid mixtures. Also observe the following notes to ensure continuously adequate explosion protection.

Limits of use

- The gear unit must be properly dimensioned. Observe the information on the drive dimensions and rated parameters in this operating manual and on the SERVO-DRIVE (Type Z) information documents. Overloads can lead to part breakage. This can also cause sparks. Contact ZAE Service if there are open questions about the design of the gear unit.
- Explosion protection extends exclusively to the areas that correspond to the marking on the type plate: the device category and type of explosive atmosphere. Make sure that the gear unit type and all technical data of the gear unit agree with the project planning information of the plant or machine. Conscientiously check all information on the type plate before the gear unit is installed. If there are multiple operating points, the maximum drive output, torque or speed cannot be exceeded at any operating point.
- Drive and output elements may only introduce the maximum permissible forces in the gear unit. The permissible values are in the appendix of this operating manual, see Chapter 10.3.3. When in doubt, contact ZAE.
- The gear unit housing may not be exposed to extreme loads like blows and impact. Damage to the housing could lead to loss of oil.

Attachments and equipment

- Equipment attached to the gear unit, like couplings, pulleys, cooling systems, pumps, sensors, etc. and drive motors must also be suitable for use in the area with a potentially explosive atmosphere. Its marking for potentially explosive atmospheres must agree with the project planning information of the plant or machine.
- For use with the gear units in device category 2D, the motor must at least have protection class IP6x.

Gear oil

- If an unsuitable gear oil is used, this may lead to an impermissible temperature increase. For this reason, only use synthetic gear oils in accordance with the information on the type plate. You will find the lubricant table in the appendix of this operating manual, see Chapter 10.4.

Installation and commissioning

- Installation errors lead to tension and impermissibly high loads. This creates higher surface temperatures. Observe the instructions on installation and assembly in this operating manual. Avoid the misalignment of shafts, sprockets and pulleys. Secure sprockets and pulleys axially.
- Observe the correct tension for belts and chains. Extra loads resulting from unbalanced hubs are impermissible. Avoid contact with upright parts and make sure that the gap dimensions in areas exposed to dust are sufficiently wide (>3 mm).
- Before commissioning, complete all the checks specified in this operating manual in order to detect errors that could lead to the risk of explosion in time. Conduct a test run, check for impermissible temperature and unusual noises, see Chapter 6.2.
- Do not commission the gear unit if you find irregularities during the checks. Consult ZAE Service.
- The housing of the gear unit must be earthed in order to conduct electrostatic charges away and thus avoid arcing. Check the earthing before commissioning.

Operating conditions

- When gear units are exposed to direct sunlight or comparable irradiation, or if the gear unit is operated at a standard elevation of over 1,000 m, the output must be reduced in accordance with this operating manual. Contact ZAE Service for more information.
- Do not place any inflammable objects on the gear unit.

Service work

- Do not carry out any work, including transport, storage, installation, electrical connection, commissioning and service, in an explosive atmosphere.
- Conscientiously carry out all the service work specified in this operating manual in order to avoid the risk of explosion from malfunctions and damage. If irregularities are detected in operation, shut down the drive and consult ZAE Service.
- Dust and soiling deposits lead to increased temperatures. Dust can also deposit in covers that are not dust-proof. Remove deposits regularly in accordance with the information in this operating manual.

Protection against electrostatic charging

- Non-conductive coatings can become electrostatically charged. Discharge can create sparks. In the standard version, the gear unit is neither primed nor painted. Before painting it, make sure that the paint is suitable for use in potentially explosive atmospheres. The layer thickness may be no more than 0.2 mm.
- To prevent electrostatic discharge, belts must be produced from a conductive material.
- Only clean the surfaces of the gear unit with a cloth moistened with water to inhibit electrostatic charging.

3 Design and function

3.1 Overview

The ZAE SERVO-DRIVE gear unit from ZAE is a worm gear with a technical design suitable for highly dynamic applications and those driven by a servo motor. Illustrations of the gear unit design are available as exploded views in the appendix, see Chapter 10.6.

3.2 Material

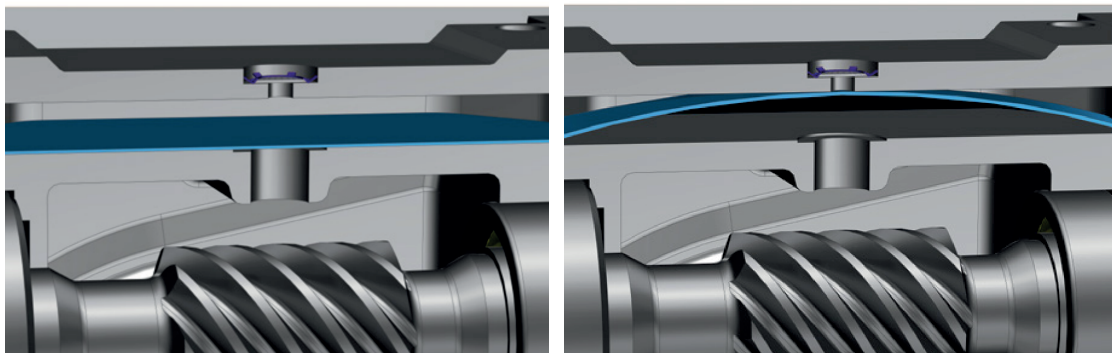
The housing components of the gear unit are made of high-quality, corrosion-resistant cast aluminium. The hollow shafts at the output are made of Q & T steel (C45 for a hollow shaft with keyway; 42CrMo4 with shrink disk seat). The worm gear is made of alloy case-hardened steel and is tempered and ground. The worm gear rim is made of high-quality bronze with outstanding sliding properties. The bronze rim is connected to the hollow shaft using the electron beam welding method. This creates a high-strength, clearance-free connection between the components. Unless otherwise listed in the order documents, the gear unit is shipped without primer and without paint.

3.3 Gear oil

The gear unit is filled with very high-quality, synthetic gear lubricant that is designed for the service life of the gear unit. Neither an oil change nor topping up gear oil is necessary as long as there are no gear oil leaks. When in doubt, contact ZAE Service.

3.4 Hermetic pressure compensation of the gear unit

The gear unit features hermetic pressure compensation for reducing the internal pressure at operating temperature. When the internal temperature rises, the air in the gear unit expands, which in turn leads to increasing internal pressure. This causes a flexible membrane to bulge and create more internal volume, which significantly reduces the increase in internal pressure. With this feature, a vent filter is no longer necessary. The position of the hermetic pressure compensation element is independent of the operating position. A change in the operating position has no effect on the function of the hermetic pressure compensation.



The hermetic pressure compensation of the gear unit contributes to keeping the permissible temperatures of the gear unit surface below the limit. The prerequisite for this is compliance with the permissible conditions of use.

3.5 Type plates



Figure 3.1: Type plate

1	Contact data of manufacturer
2	Customer ID number
3	Size and version (see Chapter 3.5)
4	Serial number
5	Gear unit ratio
6	Type of gear oil
7	QR code with type plate data



Figure 3.2: Type plate for use in potentially explosive atmospheres

1	Contact data of manufacturer
2	Customer ID number
3	Size and version (see Chapter 3.5)
4	Serial number
5	Gear unit ratio
6	Type of gear oil
7	Explosion-proof operating material marking

3.6 Explosion-proof operating material marking

Examples:

II 2G Ex h IIC T4 Gb

II 2D Ex h IIIC T135°C Db

Code	Meaning
II	Device group II (not mining)
2G/2D	Device category 2: High level of safety in gas atmosphere/ dust atmosphere
Ex h	Ignition protection constructional safety
IIC/IIIC	Explosion group (IIC: e.g. Hydrogen, acetylene; IIIC: conductive dusts)
T4/T135°C	Temperature class (surface temperature max. 135 °C)
Gb/Db	Device protection level: High level of safety in gas atmosphere/ dust atmosphere

3.7 Type code

3.7.1 Structure of type code

Example:

Z040 - 05 - DOO - 16.0:1 - 130/165/M05/24x50-N

Z040	Size
05	Gear arrangement (output)
D	Bearing concept
O	Gear tooth clearance
O	Version
16.0:1	Gear ratio
130/165/M05/24x50	Dimensions of flange for motor attachment
N	Coupling variant (for motor)

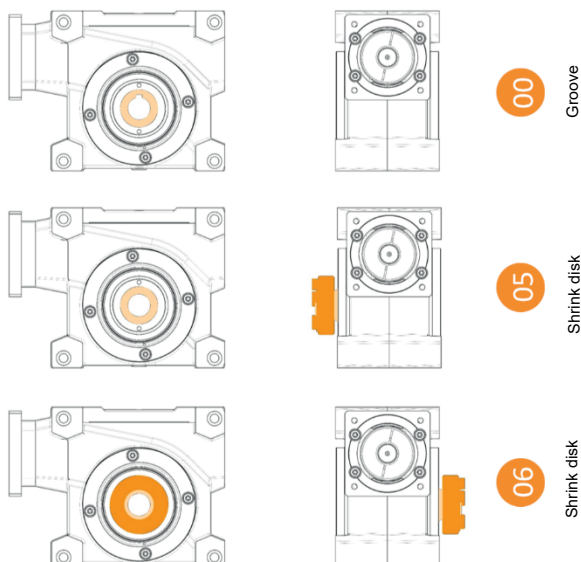
3.7.2 Version (description)

Size:

040, 050, 063, 080, 100 (centre spacing)

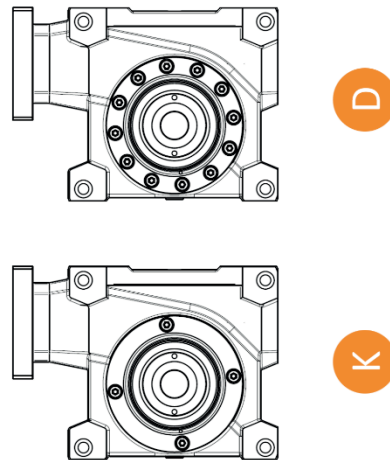
Gear arrangement (output):

- 05 Hollow shaft without groove,
Shrink disk on side 5
- 06 Hollow shaft without groove,
Shrink disk on side 6
- 00 Hollow shaft with groove



Bearing concept

D Optimised for dynamic operation
K Optimised for continuous operation



Gear tooth clearance

O Standard circumferential backlash
A Reduced circumferential backlash

Version

O Standard in acc. with catalogue
X Special version

Gear ratio

4.0:1, 6.4:1, 10.0:1, 16.0:1, 27.0:1, 39.0:1

Dimensions of flange for motor attachment $\emptyset$ centring / $\emptyset$ bolt circle / thread / motor shaft D x L

Coupling variant (for motor)

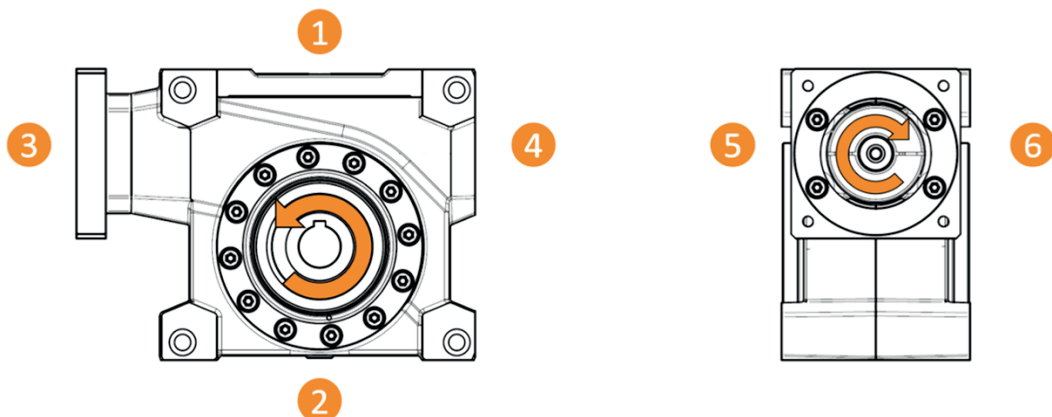
G For smooth motor shaft without keyway
N For motor shaft with keyway

3.7.3 Design and gear sides

There are two bearing concepts: the D variant for dynamic and K for continuous operation. For the D variant, taper roller bearings are used to ensure high stiffness. High loads from external forces or dynamic operation can be absorbed by the taper roller bearings. The housing lids are screwed to the housing with 12 screws. The K variant is designed for continuous operation. Ball bearings are installed for energy-efficient operation here. For this variant, the housing lids are screwed to the housing with 4 screws.

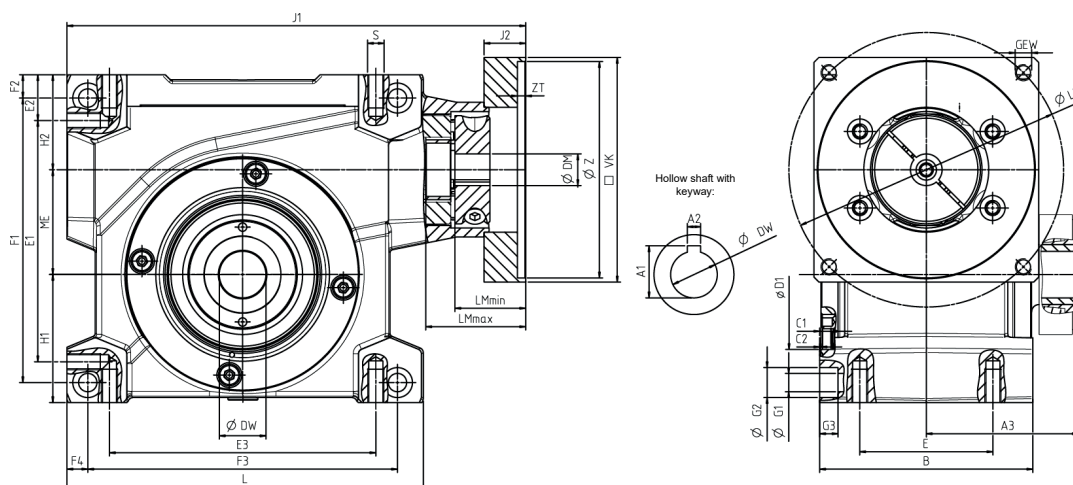
The six sides of the gear unit are numbered 1 to 6 for purposes of identification.

The assignment of the sides is visible in the following: The figure also has arrows that show the dependency of the directions of rotation to each other.



3.8. Dimensions

The geometric dimensions of the gear unit are available on the dimension sheet and the values in the table.



Size	040	050	063	080	100
QU	40	50	63	80	100
L	157	177	214	252	309
B	110	122	128	160	172
H1	56	61	77	90	112
H2	45	51	57	62	75
DW H6 ¹⁾	20	25	28	36	48
A1 ²⁾	22.8	28.3	31.3	39.3	51.8
A2 ²⁾	6	8	8	10	14
A3 ³⁾	76.5	84.5	91.25	109	118
D1 H8	62	68	90	110	125
C1	6	6	5.75	6	6
C2	1	1	0.75	1	1
E*	75	85	80	120	135 ⁴⁾
E1	102	121	145	185	232
E2	19	20	27.5	23	28
E3	108	120	160	195	250
S	M6x12	M8x16	M10x20	M10x20	M12x24
F1	122	142	171	209	262
F2	9.5	10	14	12	13
F3	135	152	186	226	280
F4	9.5	11	12.5	11.5	13
G1	9	9	11	11	14
G2	15	15	18	18	20
G3	10	10	11	11	13

All dimensions in mm

1) Recommended fit for machine shaft: h6

2) Only for arrangement 00

3) Only for arrangement 05/06

4) On the side opposite the motor: 120

Dimensions **VK**, **Z**, **ZT**, **LK**, **GEW**, **DM**, **LM**, **J1** and **J2** depend on the motor (see following Chapter 3.6.1).

Instead of the through holes on side 5 and 6, the housing can be designed with threaded holes. The dimensions are available in Chapter 3.6.2.

3.8.1 Dimensions of the servo motor

The gear unit can be connected to a servo motor by means of an intermediate flange on the drive side. The intermediate flange can be ordered with a wide range of connection dimensions in order to ensure the greatest possible flexibility when selecting the servo motor. The following contains a list of the connection dimensions of the intermediate flange depending on the gear unit size. Gear units with other connection dimensions can be designed as special variants in consultation with ZAE.

Size 040	VK	Z H8	ZT	LK	GEW	DM	LM	J1	J2
Flange dimension	80	40	4	63	M5	9	20	196	12
	72	50	5	70	M5	14	31	199	15
	80	60	4	75	M5	11	23	199	15
						14	30		
	80	60	4	75	M6	14	30	199	15
	86	70	4	90	M6	14	30	199	15
						19	40		
	85	80	4	100	M6	14	30	199	15
						19	40		
	100	95	4	115	M8	19	40	199	15
	115	110	4	130	M8	19	40	224	40
						24	50		

Size 050	VK	Z H8	ZT	LK	GEW	DM	LM	J1	J2
Flange dimension	80	50	10	70	M5	14	31	237	15
	95	60	4	75	M5	11	23	232	10
						14	30		
	95	60	8	75	M6	14	30	234	12
	95	80	4	100	M6	14	30	237	15
						19	40		
	105	95	4	115	M8	19	40	237	15
						24	50		
	115	110	4	130	M8	19	40	237	15
						24	50		
	135	130	4	165	M10	24	50	242	20
						28	58		
						28	60		
	135	130	5	165	M10	32	58	257	35
						32	60		
	185	180	5	215	M12	28	58	247	25
						28	60		
	185	180	5	215	M12	32	58	262	40
						32	60		

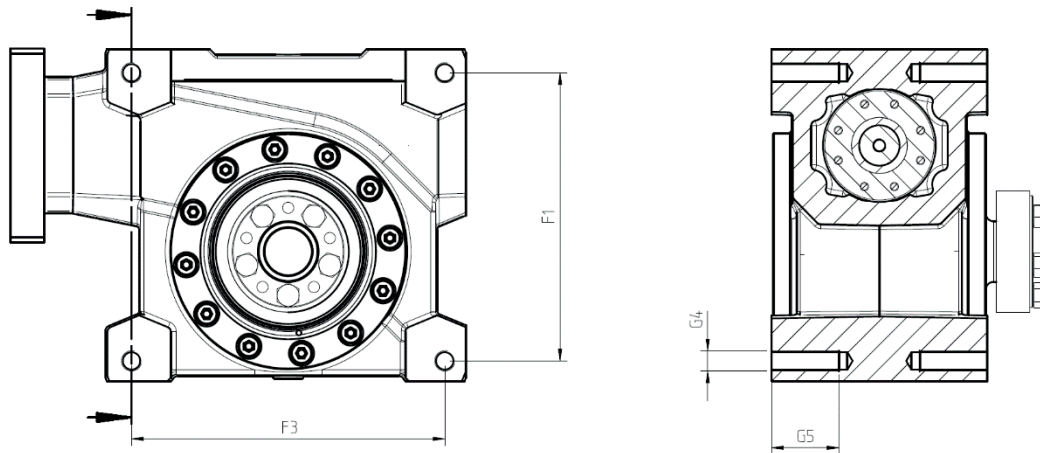
Size 063	VK	Z H8	ZT	LK	GEW	DM	LM	J1	J2
Flange dimension	105	80	4	100	M6	19	40	265.5	15
	105	95	4	115	M8	19	40	265.5	15
	115	110	5	130	M8	24	50	270.5	20
	130	110	4	145	M8	22	58	275.5	25
	180	114.3	5	200	M12	35	80	313	62.5
	135	130	5	165	M10	24	50	275.5	25
						28	58		
						28	60		
						32	58		
						32	60		
	185	180	5	215	M12	28	58	275.5	25
						28	60		
						32	58		
						32	60		
	185	180	5	215	M12	38	80	313	62.5

Size 080	VK	Z H8	ZT	LK	GEW	DM	LM	J1	J2
Flange dimension	120	80	4	100	M6	19	40	307.5	15
	120	95	4	115	M8	19	40	307.5	15
						24	50		
	120	110	5	130	M8	19	40	312.5	20
						24	50		
	130	110	7	145	M8	22	58	312.5	20
	180	114.3	5	200	M12	35	80	349	56.5
	135	130	5	165	M10	24	50	312.5	20
						28	58		
						28	60		
						32	58		
						32	60		
	185	180	5	215	M12	24	50	317.5	25
						28	58		
						28	60		
						32	58		
						32	60		
	185	180	5	215	M12	38	80	352.5	60

Size 100	VK	Z H8	ZT	LK	GEW	DM	LM	J1	J2
Flange dimension	125	110	4	130	M8	24	50	396	20
	130	110	7	145	M8	22	58	396	20
	180	114.3	5	200	M12	35	80	401	25
	135	130	5	165	M10	24	50	396	20
						28	58		
						28	60		
						32	58		
						32	60		
	185	180	5	215	M12	28	58	401	25
						28	60		
						32	58		
						32	60		
						38	80		
	260	250	6	300	M16	48	110	452	76

3.8.2 Housing holes with thread

On gear unit sides 5 and 6, through holes are present for screw attachment of the gear unit. Instead of the through holes, threaded holes can be selected. The thread dimensions are illustrated in the following.



Sizes	040	050	063	080	100
F1	122	142	171	209	262
F3	135	152	186	226	280
G4	M10	M10	M12	M12	M12
G5	35	35	40	40	40

3.9 Weights

In the following table, the total weight of the gear unit is listed for each size. The weight varies depending on the gear ratio, arrangement and motor flange.

Size	040	050	063	080	100
Weight [kg]	5.6 - 6.8	8.5 - 11.2	14.9 - 18.3	22.5 - 27.1	36.7 - 47

4 Shipping, transport and storage

4.1 Shipping

The gear unit is filled with gear oil and then shipped unless otherwise specified in the order documents. The motor-side half of the coupling and polymer rim of the clearance-free servo coupling are included unassembled in the shipment.

Check the shipment immediately upon receipt for transport damage and completeness.

Promptly report damage to the carrier. Damaged gear units must not be commissioned. To clarify the further procedure, contact ZAE Service.

4.2 Transport

To transport the gear unit, use adequately dimensioned transportation that is suitable for the application. A truss or similar aids make fastening and transport easier.

You will find information on the weight of the gear unit in the order documents and in the appendix of this operating manual, see Chapter 3.7.

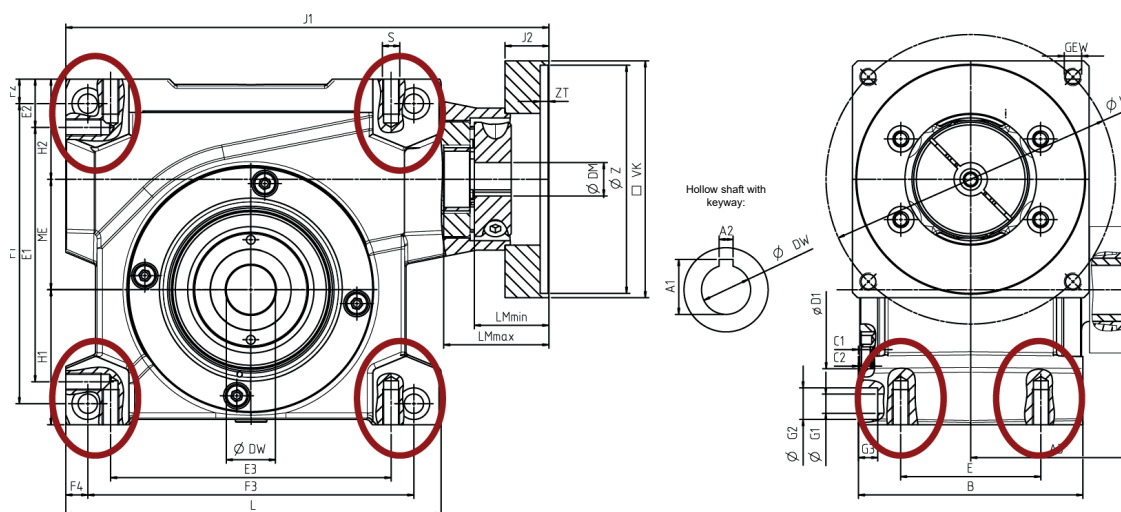
⚠ WARNING

Danger from falling loads

Severe crushing.

- Cordon off a wide space around the danger area.
- Ensure there is sufficient room to evade swinging loads.
- Never walk beneath suspended loads.
- Observe the centre of gravity of the gear unit.

The gear units are equipped with threaded holes. Eyebolts for fastening the gear unit can be screwed in there.



The eyebolts must be screwed in completely. Lift the gear unit only at the eyebolts provided. Only pull vertically on the eyebolts, never transversely or obliquely.

Only use the eyebolts to lift the gear unit without other components.

The eyebolts are not designed to bear the weight of the gear unit with attached parts. When lifting a gear unit with motor, use the eyebolts on the gear unit and the motor at the same time. If the motor does not have a suitable hole for an eyebolt, secure the motor properly in another manner, e.g. with a strap.

Impacts or blows onto free shaft ends lead to damage inside the gear unit. Transport the gear unit carefully.

4.3 Storage

If the gear unit is first placed into temporary storage, the storage area should be dry and not subject to extensive temperature fluctuations.

The storage area should meet the following conditions:

- dry, relative humidity less than 60%,
- temperature without extensive fluctuations in the 10°C bis 40°C range,
- no direct exposure to sunlight, no direct UV light,
- no aggressive, corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity, etc.) in the environment,
- no shocks or vibrations.

Set the gear unit down as follows in the storage area:

- secured against falling,
- bare gear unit shafts lightly oiled.

Turn the shafts of the gear unit regularly to prevent the shaft seal rings from sticking. After a storage period of five years, the gear oil should be changed.

5 Installation

5.1 Place of installation

- Maximum ambient temperature 40°C, minimum -10°C. For ambient temperatures outside this range, please contact ZAE.
- Maximum standard elevation 1,000 m. For operation at more than 1,000 m above standard elevation zero, the gear unit cannot be operated at the specified maximum output. When in doubt, contact ZAE.
- The environment is free of aggressive or corrosive substances.
- Adequate circulation of cooling air is taken into consideration. The space around the gear unit must enable free air circulation.
- Hole with filter for pressure compensation is not covered.

5.2 Notes on installation

To avoid damage on installation and during operation, pay attention to the following points:



- No welding work on the gear unit: welding work on the gear unit is impermissible. The gear unit must not be used as an earthing point for welding work, as the bearings or the gear toothing will otherwise be damaged.
- Attach the gear unit housing without tension
Make sure that all fasteners on the gear unit are mounted tension-free.
- Do not damage the gear unit housing
During installation, make sure that the housing wall is not damaged during positioning and alignment.



- Install fastening screws completely
Make sure that all screws are mounted completely and tightened to the specified torques on the flange or fastening side. A table containing the tightening torques is available in the appendix, see Chapter 10.1.



- Earthing the gear unit
During assembly, make sure that the gear unit is earthed properly to conduct electrostatic charges away.
- Secure moving parts with covers
Use covers to secure moving parts. This prevents sparks and injuries.

Note:

The gear unit is filled with a quantity of lubricant that is independent of the operating position.

5.3 Installing the gear unit

Observe the following chapters depending on the variant and version of the gear unit.



- The foundation or flange to which the gear unit is to be fastened is torsionally rigid and level.
- The gear unit can be mounted directly on the machine to be driven with the help of the through holes and threaded holes in the housing.
- On gear units with a hollow shaft, no additional forces may be introduced into the machine shaft during assembly. The gear unit must be mounted tension-free.
- Careful alignment of the shafts ensures the operating safety of the gear unit and supports low-noise operation. If the shafts were not aligned correctly, temperature increases, bearing damage and shaft damage can occur. In an explosive atmosphere, this can lead to explosions.
- Secure the fasteners properly so that they cannot come loose during the operating period.

5.4 Mounting the hollow shaft

The hollow shaft can be mounted on the machine shaft with a keyway or a shrink disk. Tooth flanks and roller bearings can be damaged due to impacts on shafts during assembly. Use a suitable pull-on device to mount components on the input and output shafts.

5.4.1 Hollow shaft with keyway connection

- Lubricate keyway shafts before assembly in order to prevent fretting corrosion and the premature failure of the connection. A suitable lubricant can be procured from ZAE.
- No additional forces may be introduced into the machine shaft due to assembly. The gear unit must be mounted tension-free. Bearing damage can otherwise occur.
- Avoid excessive clearance or impermissible alignment errors when installing a positive shaft-hub connection (i.e. with keyways). Otherwise damage due to impact stress, fretting corrosion or additional forces can occur. This would result in the failure of the connection.

5.4.2 Hollow shaft with shrink disk connection

NOTICE

Do not tighten tensioning screws too early

If the tensioning screws of a shrink disk are tightened before the shaft has been installed, the hollow shaft can be deformed.

– Do not tighten the tensioning screws until the shaft has been installed.

- Be sure to adhere to tolerances and surface qualities for shrink disk connections.
- Make sure that the mounting surfaces are grease-free prior to assembly.
- Tighten the screws of the shrink disks using the specified tightening torque and in the correct manner. The tightening torques for the screws of the shrink disk are listed in Chapter 10.1.
- Requirements for the plug-in shaft:

○ Fit underneath shrink disk:	h6
○ Fit surface:	min. Rz10
○ Yield point:	Rp0.2 >350 N/mm ²

Note:

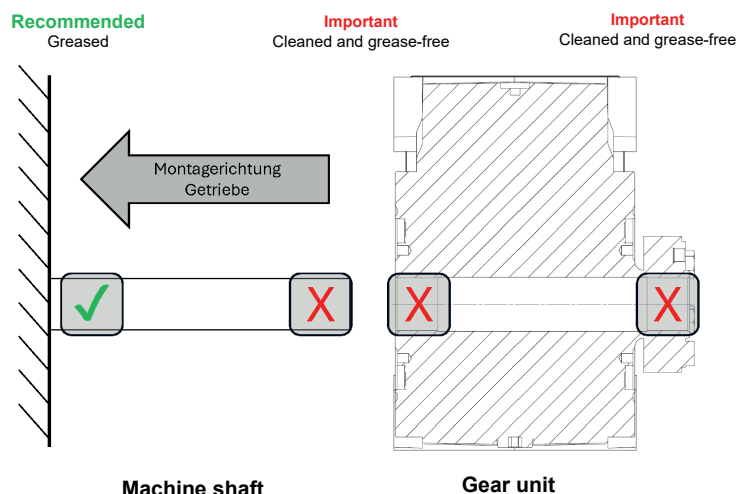
To minimize damage from microfriction to the machine shaft in the hollow shaft, a lubricant is recommended, see the following figure.

The recommended lubricant is listed in the lubricant table in Chapter 10.5.

Important!

Make sure that the machine shaft is lubricated at the right place and DO NOT lubricate the hollow shaft.

This prevents contamination of the clamping range of the shrink disk on the machine shaft by grease.



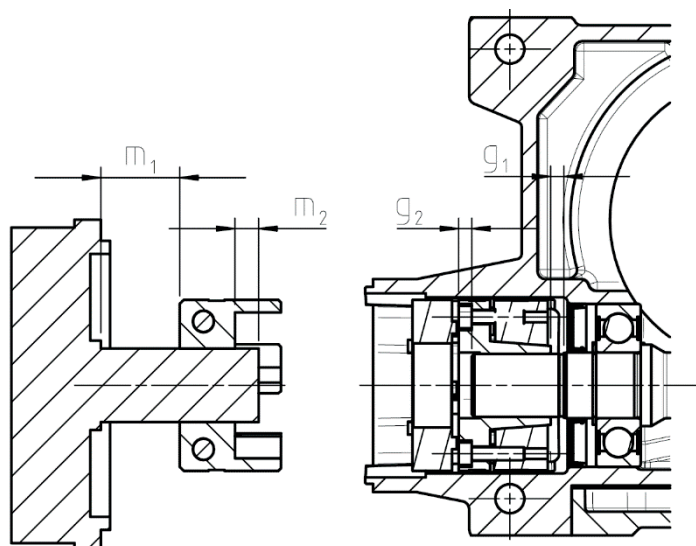
Even a single torque overload of a shrink disk connection can severely reduce the torque that can be transmitted.

Additional axial and bending stresses also reduce the loadability of the connection. Significant heat input can occur in case of slipping.

Ensure that the permissible torques and forces are not exceeded.

5.5 Mounting the motor coupling from ZAE

- Servo couplings
The servo couplings must be secured using screws tightened to the specified tightening torques, see appendix, Chapter 10.1.
- Position of the motor coupling
For optimal torque transmission, the coupling halves must mesh completely. This requires the correct positioning of the motor-side coupling half on the motor shaft. Observe dimensions m_1 and m_2 in the following figure.



If the motor-side coupling half is mounted too far in the direction of the motor shaft end, impermissible forces from tensioning the parts could occur after the motor is mounted. This in turn could lead to impermissibly high temperatures during operation. In an explosive atmosphere, this can lead to explosions.

It is essential to observe the dimensions in Chapter 10.3 for the correct positioning of the coupling depending on the size, flange thickness and motor shaft.

5.6 Mounting the motor

Motors to be mounted on a gear unit must have reduced concentricity deviations and axial run-outs in accordance with DIN SPEC 42955 - R. This prevents damage to bearings, shafts and couplings.

5.7 Mounting upstream or downstream gear units

Upstream or downstream gear units must reveal have reduced concentricity deviations and axial run-outs in accordance with DIN SPEC 42955 - R. Mount the gear unit shafts aligned and tension-free. Tighten fasteners to the specified tightening torque. Secure the fasteners to prevent unintentional loosening.

5.8 Painting

In the standard version, the gear unit is neither primed nor painted. In a special version, ZAE can paint the gear unit or gear unit parts.

DANGER



Unsuitable paintwork for the potentially explosive area

Risk of explosion due to electrostatic charging with excessive layer thicknesses.

- Paintwork after the fact must have the same properties as paintwork by ZAE. The layer thickness may be no more than 0.2 mm.

When painting the gear unit after the fact, the shaft seal rings, rubber elements, pressure compensation element, type plate, stickers and motor coupling parts must not come into contact with paints or solvents, as these parts could otherwise be damaged or become illegible. When in doubt, contact ZAE.

6 Commissioning

6.1 Checking hermetic pressure compensation

! DANGER



Do not cover the pressure compensation hole

Make sure that the sieve over the hole on the pressure compensation lid that is above the hermetic pressure compensation is unobstructed and not contaminated. If the air in the pressure compensation volume cannot freely escape, impermissibly high internal pressure may build up in the gear unit.

6.2 Test run



Before final commissioning, the machine or plant should undergo a test run.

A test run is mandatory for gear units that are installed in potentially explosive areas.

The test run should take place over a period of at least four hours under real operating conditions. During the test run, check the gear unit for permissible temperatures, leaks and unusual noises.

Check temperatures

The surface temperature of gear units must not exceed 80°C at an ambient temperature of 20°C.

Check leak tightness at shafts

Check all dynamic sealing points between the shaft surfaces and the sealing edges immediately after commissioning for leak tightness and cleanliness.

Check noises at bearings

Faulty installation of the gear unit can lead to significant additional forces in the roller bearings for which the bearing points are not designed. As a result of these additional forces, the bearings can fail prematurely.

Pay attention to noises and high temperatures. They can indicate stressed bearings.

7 Fault table

If you notice any faults during operation, first attempt to identify the type of fault and to remedy it using the overview below. If this involves a fault that you cannot remedy yourself, contact ZAE Service. During the warranty period, the gear units may only be opened with the express permission of ZAE. Otherwise, any warranty entitlements are voided.

⚠ CAUTION

Slippery surfaces due to leaks

Escaped gear oil causes slippery surfaces and floors. Slipping off surfaces or slipping on floors can lead to injuries.

- Immediately remove escaped gear oil.

Fault	Possible cause	Solution
Oil is leaking: • at the drive-side shaft seal ring • at the output-side shaft seal ring • from the housing cover	Shaft seal ring defective or shaft damaged	Contact ZAE Service
	O-ring on housing cover leaks	
	Temporary leak at seal rings from excessive grease	Remove escaping grease and observe the gear unit. If lubricant continues to leak, contact ZAE Service
Oil is leaking: • at the pressure compensation hole • at the pressure compensation lid	Damaged membrane	Contact ZAE Service
	Damaged sealing edge at the pressure compensation lid	
	Damaged sealing surface	
Unusual, regular running noises	Meshing, grinding noise: bearing damage	Contact ZAE Service
	Knocking noise: irregularity in gear toothing	
Unusual, irregular running noises	Foreign substances in oil	Shut down drive, contact ZAE Service
Unusually high housing temperatures	Insufficient oil	Contact ZAE Service
	Gear toothing or bearing defective	
	Toothings set too close	
Output shaft is not rotating although motor is running or drive shaft is being rotated.	Shaft-hub connection or gear toothing broken	Send gear unit for repair
	Drive-side coupling clamping set or output-side shrink disk is not fastened properly, shaft slips through	A slipping shrink disk connection can lead to fretting and damage to the contact surfaces, which in turn can significantly reduce the transmittable torque. The contact surfaces must be examined for damage and the parts must be repaired if necessary. Please contact ZAE Service.
Backlash between drive and output too high	Drive-side coupling half incorrectly mounted on the motor shaft.	Coupling half correctly mounted on the motor shaft (see Chapter 5.5)
	Toothings wear from gear unit use	To readjust the gear unit backlash, please contact ZAE Service.
	Backlash setting of toothing not correct	

8 Service

To ensure that the gear unit runs reliably, it must be regularly inspected, cleaned and serviced after commissioning. These measures ensure the operational capability of your machine or system, prevent unexpected faults and minimise the risk of accidents. The service intervals are highly dependent on the operating conditions. A gear unit that only occasionally performs positioning tasks in a clean environment at room temperature requires less effort than a gear unit that is used in three-shift operation in a dirty environment and at high temperatures. To increase certainty with regard to this point, the gear unit can be equipped with sensors to continuously monitor its current status, including current consumption, torques, temperatures and vibrations. During the warranty period, ZAE gear units may only be opened with the express permission of ZAE, otherwise all claims under the warranty become void.

8.1 Servicing schedule

Intervall	Work	See...
Regularly, after 1,000 hours of operation at the latest*	Visual inspection	Chapter 8.2.1
	Check shaft-hub connection	Chapter 8.2.2
	Check surface temperature of the housing	Chapter 8.2.3
	Check whether or not unusual running noises are audible that indicate toothing or bearing damage	Chapter 7

*Hours of operation

As described in the introduction, the conditions of use and driving profiles of servo gear units vary greatly. With reference to the recommended maintenance interval, hours of operation is the cumulative run-time during which the gear unit was operated.

8.2 Service work

8.2.1 Performing a visual inspection

The drive must be regularly subjected to a visual inspection.

Pay attention to the following when doing so:

- soiling,
- condition of housings, covers and fasteners,
- condition of the shaft,
- condition and function of the hermetic pressure compensation,
- leaks at shaft seal rings and seals,
- bearing noises,
- toothing noises,
- oil leaks.

Soiling



Dust and layers of dirt on the housing surface may interfere with heat dissipation and thus cause non-permissible temperature build-up. Dust in gaps produces frictional heat that can lead to ignition. In the potentially explosive area, clean the surfaces of the gear unit using a cloth moistened with water only in order to prevent electrostatic charging. Dust, dirt and water in the lubricant can severely impair the lubrication of the moving parts. Make sure that no dust, dirt or water enters the interior of the gear unit. The sealing points and hermetic pressure compensation can also be damaged as a result of soiling. Therefore, avoid excessive dust and dirt deposits at sealing points or the pressure compensation element. A defective sealing point or a defective pressure compensation must be appraised and repaired by qualified personnel. When cleaning the gear unit, do not point a strong cleaning jet at the seals or the pressure compensation element.

Condition of housings, covers and fasteners

The housing wall can crack from overloading the gear unit. The cover and fastener on the housing can also come loose.

- Pay attention to damage (such as cracks) in the housing wall through regular inspections.
- Pay attention to discolouration. This can indicate increased temperature. Measure the temperature if necessary, see Chapter 8.2.3.
- Make sure that the housing cover is firmly mounted and that none of its fastening screws have come loose.

Condition of the shaft

Pay attention to any cracks in a shaft due to an overload.

Condition and function of the hermetic pressure compensation

Make sure that the hole for hermetic pressure compensation is free from deposits and soiling in order to ensure the correct functioning of the pressure equalising membrane. Make sure that there are no visible oil leaks at this spot and on the sides of the pressure compensation lid.

Leaks at shaft seal rings and seals

Make sure that the sealing points at shafts are clean and undamaged. Seals can be damaged due to mechanical, thermal or chemical influences or the loosening of fasteners such as screws or locking rings and therefore stop functioning. Gear oil can escape. Carry out regular inspections to ensure that leaks are detected and eliminated in good time. In the event of significant loss, the cause of the leak must be rectified and the must be oil changed.

Bearing noises

Unusual noises and high temperatures can indicate stressed bearings. The bearings can fail prematurely as a result of these additional forces. Pay attention to bearing noises during regular inspections.

Toothing noises

Unusual noises or vibrations on the gear unit could indicate damage. In the event, you should contact ZAE Service.

8.2.2 Check shaft-hub connections and couplings

Positive shaft-hub connection

Regularly check the lubrication of the part and re-grease if necessary. Regularly check the component for impermissible clearance and damage, as well as transmittable torques.

Motor coupling

Check the motor coupling for damage and increased clearance.

8.2.3 Check surface temperature

The surface temperature of the gear unit must be checked regularly during operation. If the temperature exceeds 80°C, the gear unit must be taken out of operation.

8.2.4 Readjusting backlash

The gear unit is designed such that the centre spacing of the toothed parts varies and therefore the backlash can be set. On the one hand, this enables very low backlash toothing to be realised.

In turn, this makes it possible to readjust backlash caused by wear. Qualified personnel must carry out readjustment, as incorrect settings can lead to high risks. Otherwise all warranties are void. Please contact ZAE Service.

Readjusting the toothing backlash is therefore impermissible without the express agreement of ZAE.

9 Recycling

After reaching the end of their service life, the gear units from ZAE should be disassembled and the sorted components sent for material recycling. Please comply with the national guidelines for disposal. ZAE will assist its customers in disposal, if so desired.

The following components contain the main recyclable materials:

- Housing and motor flange (aluminium)
- Screw, roller bearings, screw-on lid and shrink disk (steel)
- The hollow shaft (steel) and worm gear (bronze) are welded together and should be brought to recycling for mixed used metal
- Lubricants (petrochemical raw materials)

Seal materials are special waste products that cannot be recycled.

However, they can be disposed of properly by ZAE on request.

10 Appendix

10.1 Tightening torques

The following table contains the tightening torques recommended by ZAE for aluminium screws with a strength class of 8.8 or higher. For full loadability, the screw depth into the material should be no less than 2x the rated diameter of the screw thread.

The screws of the coupling and shrink disk are exceptions to this. These tightening torques are listed in the tables below.

General screws, screw into aluminium

Thread	Tightening torque [Nm]
M5	4.8
M6	8.3
M8	20
M10	40
M12	69

Screws on the Rotex GS motor-side coupling hub

Size Gear unit	Motor shaft	Size Coupling	Coupling hub - Type	Size Screw	Tightening torque [Nm]
040	Ø9	GS 14	Compact	M4	2.9
	All except Ø9	GS 19	Compact	M6	10
050	All	GS 24	Compact	M6	10
063	All except Ø38	GS 28	Compact	M8	25
	Ø38	GS 28	Clamping ring hub light	M6	10
080	All except Ø38	GS 28	Compact	M8	25
	Ø38	GS 28	Clamping ring hub light	M5	6
100	All except Ø48	GS 38	Compact	M10	49
	Ø48	GS 38	Clamping ring hub light	M6	10

Screws on output-side shrink disk for gear arrangement 05 and 06

Gear unit size	Screw size	Strength class	Tightening torque [Nm]
040	M6	12.9	14 Nm
050	M6	12.9	14 Nm
063	M8	12.9	35 Nm
080	M8	12.9	35 Nm
100	M8	12.9	35 Nm

10.2 Design for forces and output

ZAE SERVO-DRIVE gear units are designed for multifaceted requirements. As described in 3.5.2, the different gear unit variants are optimised for special applications. The basic design of the gear unit and the technical information on maximum torques and forces are described in the following subchapters.

10.2.1 Basis of calculation

The toothing and roller bearings of the gear unit are design for a minimum service life of 12,000 hours in continuous operation (S1 operation in accordance with DIN EN 60034-1).

In dynamic operation, a trapezium speed profile is the basis of the design in which acceleration torques only result from the start up and braking of masses. In this dynamic application, the minimum service life of the toothing and roller bearings in the gear unit is designed for 20,000 hours, under the assumption of a of 30% duty cycle.

For the EMERGENCY STOP torques listed, an occurrence with a quality reduction of the toothing to quality 9 must be taken into account. **The motor coupling is not included in the information on the EMERGENCY STOP torque and must be included in addition.**

10.2.2 Technical information

Size 040

Gear ratio	[-]	4.0	6.4	10.0	16.0	27.0	39.0
Max. acceleration torque	[Nm]	59	79	84	81	89	73
S1 nominal torque ¹⁾	[Nm]	59	78	87	84	95	73
Torsional backlash constant torque	[Nm]	37	48	52	53	61	43
EMERGENCY STOP torque ²⁾	[Nm]	179	195	212	203	238	164
Max. drive speed	[rpm]	8,000					
Torsional backlash – standard	[arcmin]	<6					
Torsional backlash – low backlash	[arcmin]	<3					
Torsional stiffness ³⁾	[Nm/arcmin]	6.2	6.4	6.8	7.3	7.3	7.3
Rated efficiency (S1 operation)	[%]	95	94	91	86	80	72
Mass moment of inertia ⁴⁾	[kgcm ²]	0.8	0.6	0.5	0.5	0.5	0.4

Size 050

Gear ratio	[-]	4.0	6.4	10.0	16.0	27.0	39.0
Max. acceleration torque	[Nm]	166	164	176	171	187	158
S1 nominal torque ¹⁾	[Nm]	120	130	168	177	186	159
Torsional backlash constant torque	[Nm]	110	120	129	125	137	115
EMERGENCY STOP torque ²⁾	[Nm]	357	374	420	399	471	315
Max. drive speed	[rpm]	7000					
Torsional backlash – standard	[arcmin]	<6					
Torsional backlash – low backlash	[arcmin]	<3					
Torsional stiffness ³⁾	[Nm/arcmin]	12	14	16	19	19	19
Rated efficiency (S1 operation)	[%]	96	95	92	88	81	76
Mass moment of inertia ⁴⁾	[kgcm ²]	2.5	2.0	1.8	1.7	1.7	1.6

Size 063

Gear ratio	[-]	4.0	6.4	10.0	16.0	27.0	39.0
Max. acceleration torque	[Nm]	336	355	374	368	399	338
S1 nominal torque ¹⁾	[Nm]	193	235	272 ^T	285 ^T	301 ^T	323 ^T
Torsional backlash constant torque	[Nm]	257	265	279	274	297	247
EMERGENCY STOP torque ²⁾	[Nm]	951	999	1100	1073	1100	788
Max. drive speed	[rpm]	5500					
Torsional backlash – standard	[arcmin]	<6					
Torsional backlash – low backlash	[arcmin]	<2					
Torsional stiffness ³⁾	[Nm/arcmin]	30	34	39	47	47	47
Rated efficiency (S1 operation)	[%]	96	96	93	90	84	79
Mass moment of inertia ⁴⁾	[kgcm ²]	6.4	5.0	4.5	4.3	4.3	4.1

Size 080

Gear ratio	[-]	4.0	6.4	10.0	16.0	27.0	39.0
Max. acceleration torque	[Nm]	708	707	758	740	810	676
S1 nominal torque ¹⁾	[Nm]	291 ^T	359 ^T	454 ^T	455 ^T	457 ^T	454 ^T
Torsional backlash constant torque	[Nm]	520	517	555	541	592	495
EMERGENCY STOP torque ²⁾	[Nm]	1395	1464	1641	1567	1800	1305
Max. drive speed	[rpm]	4500					
Torsional backlash – standard	[arcmin]	<6					
Torsional backlash – low backlash	[arcmin]	<2					
Torsional stiffness ³⁾	[Nm/arcmin]	46	56	71	96	96	96
Rated efficiency (S1 operation)	[%]	97	96	95	92	87	82
Mass moment of inertia ⁴⁾	[kgcm ²]	12.4	8.4	6.8	6.2	6.0	5.6

Size 100

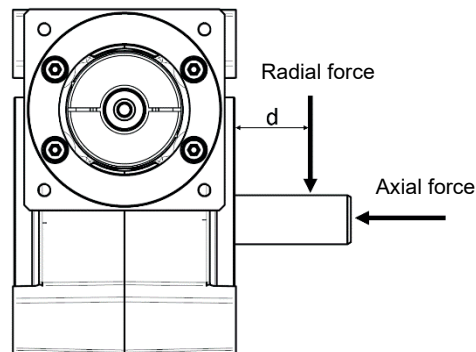
Gear ratio	[-]	4.0	6.4	10.0	16.0	27.0	39.0
Max. acceleration torque	[Nm]	1475	1480	1690	1545	1680	1410
S1 nominal torque¹⁾	[Nm]	415 ^T	578 ^T	589 ^T	609 ^T	533 ^T	587 ^T
Torsional backlash constant torque	[Nm]	1083	1085	1443	1130	1230	1030
EMERGENCY STOP torque²⁾	[Nm]	2580	3000	3000	3000	3000	3000
Max. drive speed	[rpm]	3600					
Torsional backlash – standard	[arcmin]	<6					
Torsional backlash – low backlash	[arcmin]	<2					
Torsional stiffness³⁾	[Nm/arcmin]	88	105	129	170	170	170
Rated efficiency (S1 operation)	[%]	97	96	94	91	84	80
Mass moment of inertia⁴⁾	[kgcm²]	36.5	25.0	20.7	18.7	18.3	17.3

The data in the table are for reference only. Please contact ZAE for the exact values for your application.

- 1) For continuous operation at 1,500 rpm, the motor connection must be checked
 - 2) EMERGENCY STOP torque does not include the perm. torque of the motor coupling
 - 3) Torsional stiffness without consideration of the output connection
 - 4) Depends on the shaft diameter of the motor and the gear arrangement (output), reduced to the drive
- T) Thermal limit – a higher torque is mechanically possible.

10.2.3 External forces

The following is a list of the maximum permissible external forces on the output shaft. As shown in the following figure, "d" describes the distance between the radial force on a plug-in shaft and the contact surface of the hollow shaft of the gear unit. The design is based on this distance. The forces listed apply if either an axial force or a radial force is applied. For deviating loads or a combination of axial and radial force, please contact ZAE.



Permissible radial and axial forces, variant "D"

Size	040	050	063	080	100
Radial force [kN]	9.1	9.3	14.8	14.2	14.0
Axial force [kN]	10.5	8.2	13.2	10.2	10.2
Distance d [mm]	30	38	47	60	75

Permissible radial and axial forces, variant "K"

Size	040	050	063	080	100
Radial force [kN]	1.4	0.6	2.84	4	1.2
Axial force [kN]	1.35	0.55	2.9	4.5	1.3
Distance d [mm]	15	20	30	45	60

10.2.4 Thermal limits

Particularly for continuous operation of the gear unit (S1 operation in accordance with DIN EN 60034-1, definition see Chapter 2.1), a thermal review is necessary. The thermal rating of the gear unit is designed for a maximum oil temperature of 90°C. At this temperature, the maximum temperature on the housing surface is approx. 80°C. In test bench trials at ZAE, the heat output capacity of the gear unit at this oil temperature and an ambient temperature of 20°C was determined. The efficiency of the gear unit was used to determine the thermal limit. The maximum output torques are defined in Chapter 10.2.2. A "T" next to the output torque indicated that the heat output capacity is the limited variable. With external cooling or other appropriate measures, a higher output torque is possible.

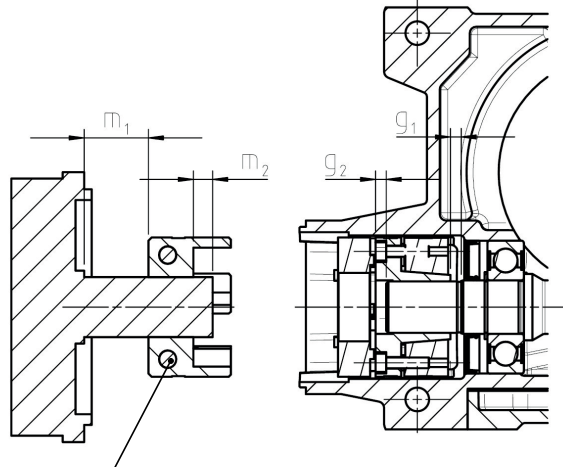
10.3 Tables for coupling assembly

It is essential to observe the following tables when mounting the motor-side coupling hub. The correct positioning of the coupling hub is the prerequisite for optimal torque transmission and decisive for preventing the jamming and tensioning of components. The following figure shows a schematic depiction of the coupling hub mounted on the motor shaft.

Note on m_2 and g_2 :

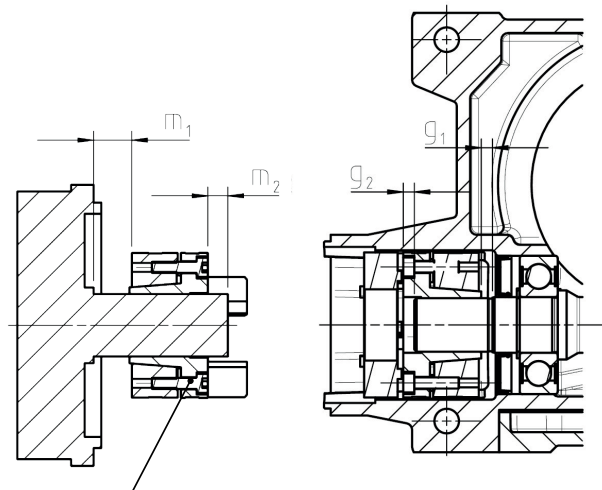
Positive value: Shaft in front, like here m_2

Negative value: Hub in front, like here g_2



Screw tightening torque, see table
Tightening torque applies for both screws

A * next to a motor shaft dimension means that motor-side, a clamping ring hub with smooth motor shaft without key is used. The screws are located axial to the motor shaft, see following figure.



Screw tightening torque, see table
Tightening torque applies for both screws

Size 040

Motor shaft	Flange thickness	Coupling	Tightening torque	Dimension			
				m ₁	m ₂	g ₁	g ₂
Ø 9 x 20	12	Rotex GS14	2.9	11.5	-1	11.5	-5
Ø 11 x 23	15	Rotex GS19	10	6	0	3	-3
Ø 14 x 30	15	Rotex GS19	10	9	4	0	0
Ø 14 x 31	15	Rotex GS19	10	9	5	0	0
Ø 19 x 40	15	Rotex GS19	10	9	14	0	0
Ø 19 x 40	40	Rotex GS19	10	27	-4	7	-7
Ø 24 x 50	40	Rotex GS19	10	33	0	1	-1
Ø 24 x 50	45	Rotex GS19	10	33	0	6	-6

Size 050

Motor shaft	Flange thickness	Coupling	Tightening torque	Dimension			
				m ₁	m ₂	g ₁	g ₂
Ø 11 x 23	10	Rotex GS24	10	8	-3	8	8
Ø 14 x 30	10	Rotex GS24	10	12	0	4	-4
Ø 14 x 30	12	Rotex GS24	10	12	0	6	-6
Ø 14 x 30	15	Rotex GS24	10	13	-1	8	-8
Ø 14 x 31	15	Rotex GS24	10	13	0	8	-8
Ø 19 x 40	15	Rotex GS24	10	21	1	0	0
Ø 24 x 50	15	Rotex GS24	10	21	11	0	0
Ø 24 x 50	20	Rotex GS24	10	26	6	0	0
Ø 28 x 58	20	Rotex GS24	10	26	14	0	0
Ø 28 x 58	25	Rotex GS24	10	31	9	0	0
Ø 28 x 60	20	Rotex GS24	10	26	16	0	0
Ø 28 x 60	25	Rotex GS24	10	31	11	0	0
Ø 32 x 58	35	Rotex GS24	10	40	0	1	-1
Ø 32 x 58	40	Rotex GS24	10	40	0	6	-6
Ø 32 x 60	35	Rotex GS24	10	41	1	0	0
Ø 32 x 60	40	Rotex GS24	10	42	0	4	-4

Size 063

Motor shaft	Flange thickness	Coupling	Tightening torque	Dimension			
				m ₁	m ₂	g ₁	g ₂
Ø 19 x 40	15	Rotex GS28	25	11.5	7.5	0	0
Ø 22 x 58	25	Rotex GS28	25	21.5	15.5	0	0
Ø 24 x 50	20	Rotex GS28	25	16.5	12.5	0	0
Ø 28 x 58	25	Rotex GS28	25	21.5	15.5	0	0
Ø 28 x 60	25	Rotex GS28	25	21.5	17.5	0	0
Ø 32 x 58	25	Rotex GS28	25	21.5	17.5	0	0
Ø 32 x 60	25	Rotex GS28	25	21.5	17.5	0	0
Ø 35 x 80	62.5	Rotex GS28	25	59	0	0	0
Ø 38 x 80*	62.5	Rotex GS28	6	45	0	0	0

*) A clamping ring hub with an axial screw connection is used here

Size 080

Motor shaft	Flange thick- ness	Coupling	Tightening torque	Dimension			
				m ₁	m ₂	g ₁	g ₂
Ø 19 x 40	15	Rotex GS28	25	16.5	2.5	0	0
Ø 19 x 40	20	Rotex GS28	25	19	0	2.5	-2.5
Ø 22 x 58	20	Rotex GS28	25	21.5	15.5	0	0
Ø 24 x 50	15	Rotex GS28	25	16.5	12.5	0	0
Ø 24 x 50	20	Rotex GS28	25	21.5	7.5	0	0
Ø 24 x 50	25	Rotex GS28	25	26.5	2.5	0	0
Ø 28 x 58	20	Rotex GS28	25	21.5	15.5	0	0
Ø 28 x 58	25	Rotex GS28	25	26.5	10.5	0	0
Ø 28 x 60	20	Rotex GS28	25	21.5	17.5	0	0
Ø 28 x 60	25	Rotex GS28	25	26.5	12.5	0	0
Ø 32 x 58	20	Rotex GS28	25	21.5	15.5	0	0
Ø 32 x 58	25	Rotex GS28	25	26.5	10.5	0	0
Ø 32 x 60	20	Rotex GS28	25	21.5	17.5	0	0
Ø 32 x 60	25	Rotex GS28	25	26.5	12.5	0	0
Ø 35 x 80	56.5	Rotex GS28	25	58	1	0	0
Ø 38 x 80*	60	Rotex GS28	6	47.5	-2.5	0	0

*) A clamping ring hub with an axial screw connection is used here

Size 100

Motor shaft	Flange thick- ness	Coupling	Tightening torque	Dimension			
				m ₁	m ₂	g ₁	g ₂
Ø 22 x 58	20	Rotex GS38	49	28	4	0	0
Ø 24 x 50	20	Rotex GS38	49	24	0	4	-4
Ø 24 x 50	25	Rotex GS38	49	24	0	9	-9
Ø 28 x 58	20	Rotex GS38	49	28	4	9	-9
Ø 28 x 58	25	Rotex GS38	49	32	0	1	-1
Ø 28 x 60	20	Rotex GS38	49	28	6	0	0
Ø 28 x 60	25	Rotex GS38	49	33	1	0	0
Ø 32 x 58	20	Rotex GS38	49	28	4	0	0
Ø 32 x 58	25	Rotex GS38	49	32	0	1	-1
Ø 32 x 60	20	Rotex GS38	49	28	6	0	0
Ø 32 x 60	25	Rotex GS38	49	33	1	0	0
Ø 35 x 80	25	Rotex GS38	49	33	21	0	0
Ø 38 x 80	25	Rotex GS38	49	33	21	0	0
Ø 48 x 110*	76	Rotex GS38	10	65	0	0	0

*) A clamping ring hub with an axial screw connection is used here

10.4 Lubricant table

Lubricants based on different substances or from different manufacturers must not be mixed. The base oils, additives and thickeners may be incompatible with one another and seriously deteriorate the properties of the lubricant.

As standard, only H1 lubricants (NSF-registered products for the food industry) are used for the gear unit.

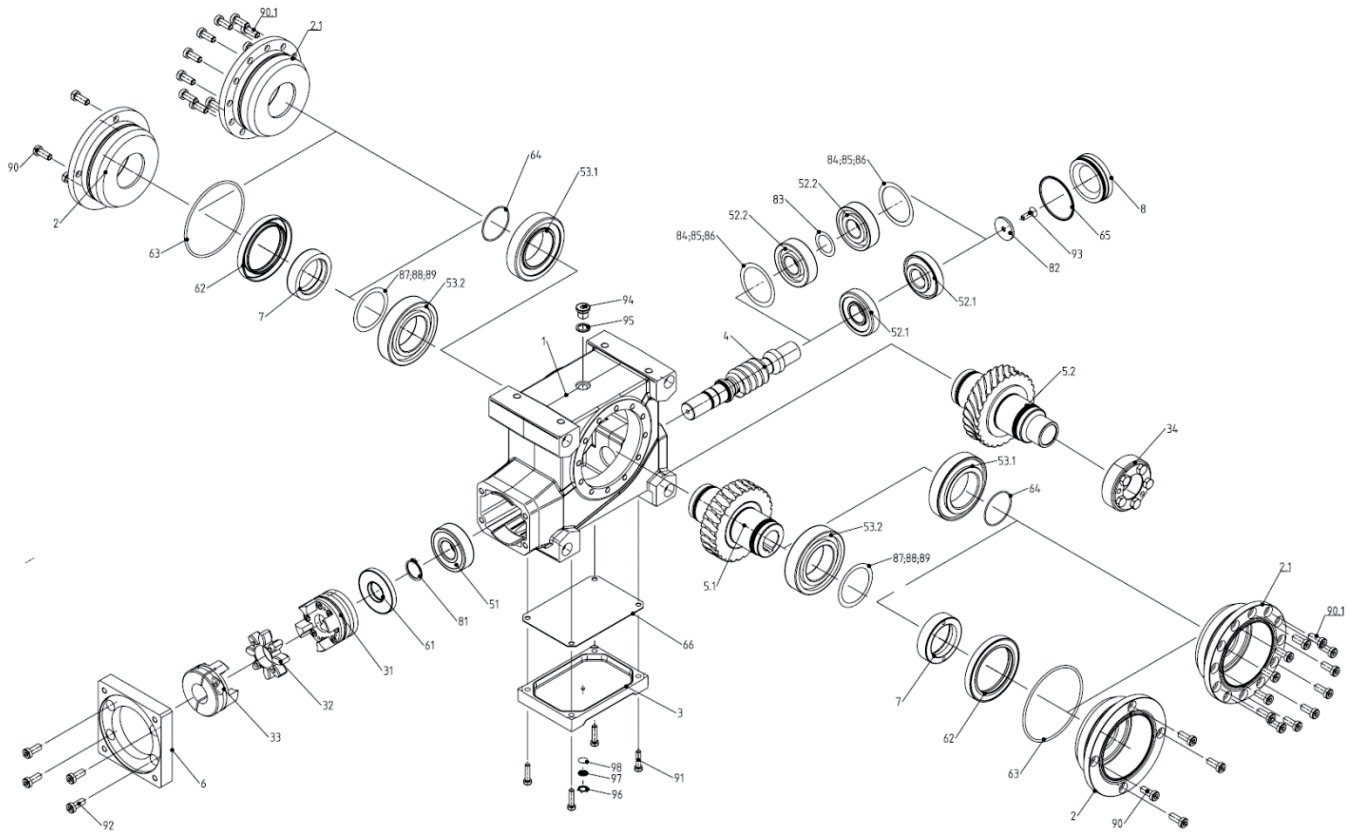
Lubricant type	Quality/ ISOVG	Castrol	Fuchs	Klüber	Mobil
H1 lubricants (NSF-registered products for the food industry)					
Gear oil (Gear wheels)	CLP PG 220	Optileb GT 1800/220	Cassida WG 220	Klübersynth UH1 6-220	Mobil Glygoyle 220
	CLP PG 460	Optileb GT 1800/460	Cassida WG 460	Klübersynth UH1 6-460	Mobil Glygoyle 460
Lubricating grease (Roller bearings + radial shaft seal rings)		Optileb GR UF 1	Cassida Grease EPS 1	Klübersynth UH1 14-222	Mobilgrease FM 222
Lubricating grease (Plug-in shaft)				Klüberpaste UH1 84-201	

10.5 Oil quantities

The oil quantities listed apply for all transmissions of the respective size. The required oil quantity does not differentiate by operating position.

Size	040	050	063	080	100
Oil quantity in [dm ³]	0.25	0.35	0.7	1.25	2.15

10.6 Exploded drawing



1	Housing	63	O-ring
2	Housing cover – for bearing concept "K"	64	O-ring
2.1	Housing cover – for bearing concept "D"	65	O-ring
3	Pressure compensation lid	66	Pressure compensation membrane
4	Worm shaft	81	Lock ring
5.1	Worm gear, complete - with keyway	82	Countersunk washer
5.2	Worm gear, complete - without keyway	83	Adjusting washer(s)
6	Intermediate flange	84	Adjusting washer(s)
7	Shaft nut	85	Adjusting washer(s)
8	Screw cover	86	Support washer
31	Coupling hub (gear unit-side)	89	Support washer
32	Sprocket for jaw-clutch coupling	90	Cylinder screw
33	Coupling hub (motor-side)	90.1	Cylinder screw
51	Grooved ball bearing	92	Cylinder screw
52.1	Bevel self-aligning bearing	93	Countersunk screw
52.2	Angular contact ball bearing	94	Seal plug
53.1	Bevel self-aligning bearing	95	Seal ring
53.2	Grooved ball bearing	96	Serrated ring
61	Radial shaft seal ring	97	Filter disc
62	Radial shaft seal ring	98	Filter membrane

10.7 Declarations of conformity

EU-Konformitätserklärung

Declaration of Conformity

(im Sinne der Richtlinie 2014/34/EU, Anhang X)

(according to EU Directive 2014/34/EU, Appendix X)

ZAE – AntriebsSysteme

**erklärt in alleiniger Verantwortung, dass die Getriebe des Typs
ZAE Servo-Drive in Standardausführung der Kategorie 2G und 2D
(EPL Gb und Db), auf die sich diese Erklärung bezieht, mit der**

declares in solo responsibility that the ZAE gear units of the type
ZAE Servo-Drive in category 2G and 2D
(EPL Gb and Db), that are subject to this declaration, are meeting the
requirements set forth in

Richtlinie 2014/34/EU

Directive 2014/34/EU

übereinstimmen.

Angewandte Normen:

Applicable standard:

**DIN EN 1127-1:2019,
DIN EN IEC 60079-0:2019 DIN EN 60529:2014,
DIN EN ISO 80079-36:2016, DIN EN ISO 80079-37:2016**
DIN EN 1127-1:2019,
DIN EN IEC 60079-0:2019 DIN EN 60529:2014,
DIN EN ISO 80079-36:2016, DIN EN ISO 80079-37:2016

**ZAE – AntriebsSysteme GmbH & Co KG hinterlegt die gemäß 2014/34/EU Anhang VIII
geforderten Unterlagen bei benannter Stelle (IBExU ATEX 152/03):**

ZAE – AntriebsSysteme GmbH & Co KG will archive the required documents according to
2014/34/EU, Appendix VIII at the following location (IBExU ATEX 152/03):

**IBExU Institut für Sicherheitstechnik GmbH (NB 0637), Fuchsmühlenweg 7, D-09599
Freiberg**

Unterzeichnet für und im Namen von ZAE-AntriebsSysteme GmbH & Co KG, Leunastraße 46,
22761 Hamburg

Hamburg, 27.02.2025



Dr. Arne Dethlefs
Geschäftsführer



ppa. Kaj Sellschopp
Leiter Entwicklung + Konstruktion



i.V. Emre Haldiz
Leiter Qualitätsmanagement

EU-Konformitätserklärung

Declaration of Conformity

(im Sinne der Richtlinie 2014/34/EU, Anhang X)

(according to EU Directive 2014/34/EU, Appendix X)

ZAE – AntriebsSysteme

**erklärt in alleiniger Verantwortung, dass die Getriebe des Typs
ZAE Servo-Drive in Standardausführung der Kategorie 3G und 3D
(EPL Gc und Dc), auf die sich diese Erklärung bezieht, mit der**

declares in solo responsibility that the ZAE gear units of the type
ZAE Servo-Drive in category 3G and 3D
(EPL Gc and Dc), that are subject to this declaration, are meeting the
requirements set forth in

Richtlinie 2014/34/EU

Directive 2014/34/EU

übereinstimmen.

Angewandte Normen:

Applicable standard:

**DIN EN 1127-1:2019,
DIN EN IEC 60079-0:2019 DIN EN 60529:2014,
DIN EN ISO 80079-36:2016, DIN EN ISO 80079-37:2016**
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