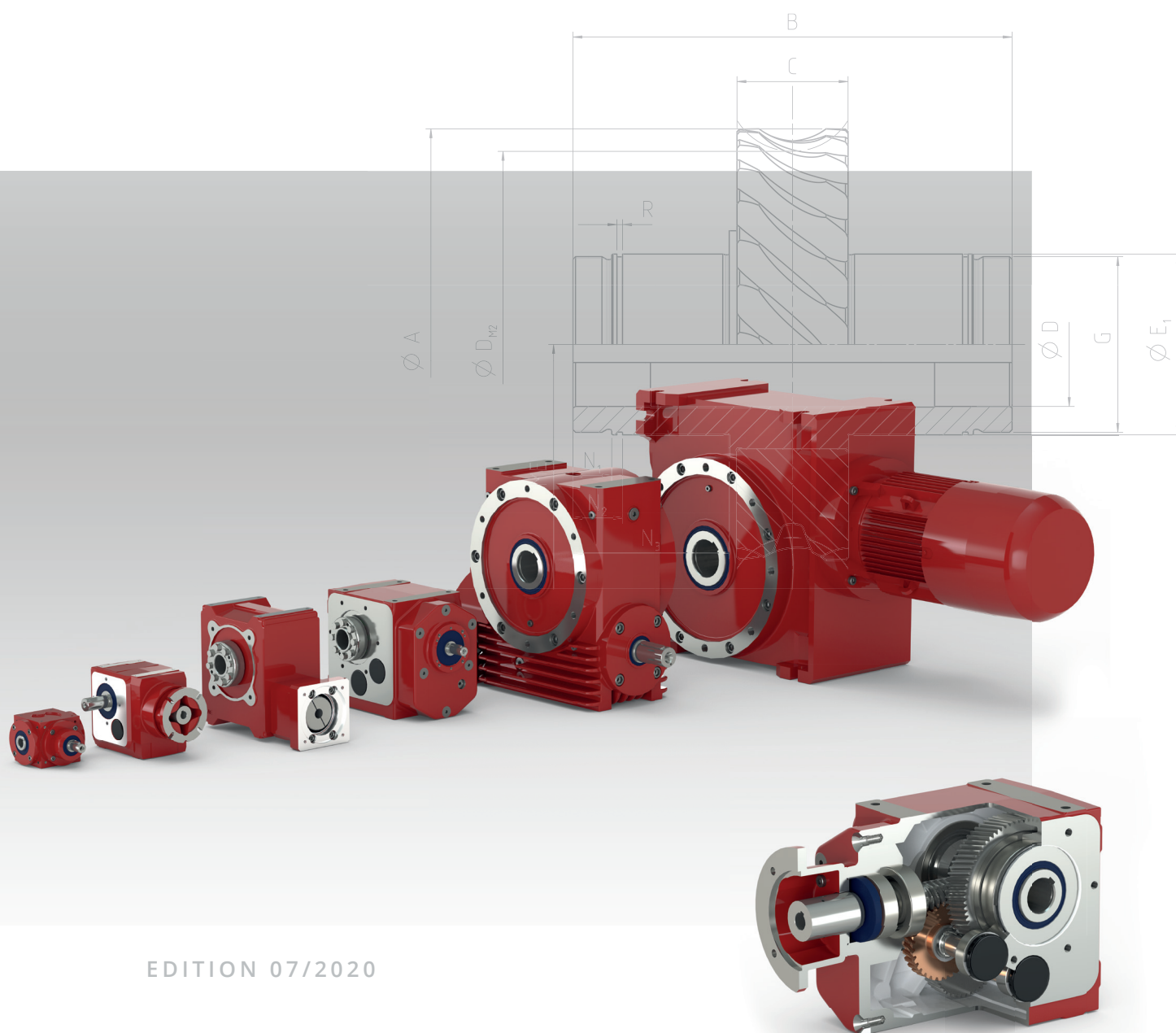




ANTRIEBSSYSTEME

ZAE OPERATING INSTRUCTIONS

GEARBOXES AND GEARED MOTORS



EDITION 07/2020

Table of contents

1. Introduction	2
2. Scope and application of the gear units and geared motors	2
3. Basic descriptions of the gear units and geared motors with drawings of replacement parts and parts list	2
3.1 Worm gear Units and worm gear motors	2
3.2 Bevel helical gear units and bevel helical geared motors	8
3.3 Worm helical gear units and worm helical geared motors	10
3.4 Helical worm gears and helical worm gear motors	14
3.5 Bevel gear units and bevel geared motors	16
4. Condition on delivery and warranty	17
5. Transportation and storage	18
6. Installation and commissioning	18
6.1 Gear units and geared motors with projecting shaft ends	18
6.2 Hollow shaft gear units and geared motors	18
6.3 Installing couplings or other components	19
6.4 Commissioning worm gear units and variants	19
6.5 Commissioning bevel gear units and variants	19
6.6 Electrical connections	20
6.7 Mounting and commissioning in hazardous areas	20
7. Operation	24
7.1 Lubrication of worm gear units and variants	24
7.1.1 Lubricant amounts	25
7.1.2 Mounting positions for vent filters and oil fittings	27
7.2 Lubrication of bevel gear units and variants	32
7.2.1 Lubricant amounts	33
7.2.2 Mounting positions for vent filters and oil fittings	34
7.3 Lubricants and manufacturers	36
7.4 Troubleshooting	37
7.5 Operation in hazardous areas	38
8. Inspection and maintenance	41
8.1 General information	41
8.2 Inspection and maintenance in hazardous areas	42
9. Electric motors	45
9.1 Brake motors	45
9.2 Three-phase motors	47
9.3 Use in hazardous areas	47
10. Recycling	48
11. Declaration of conformity	49

1. Introduction

This operator's manual contains information on assembly, commissioning, and operation as well as inspection and maintenance of ZAE gear units and geared motors.

The information in this manual applies to gear units and geared motors in normal operation as well as to applications in potentially explosive atmospheres. Gear units and geared motors of categories 3G and 3D, group II, and categories 2G and 2D, group II, in conformity with Directive 2014/34/EU are considered in this manual.

2. Scope and application of the gear units and geared motors

ZAE standard gear units include worm gear units, worm helical gear units, helical worm gear units, and bevel gear units as both gear unit and geared motor variants. These standard products meet the maximum requirements for categories 2G and 2D, group II, in conformity with Directive 2014/34/EU:

Worm gear unit types E, M, and S	Sizes 040 to 400
Double worm gear unit types D and DM	Sizes 050 to 400
Bevel helical gear unit types E, M, and S	Sizes 222 to 523
Worm helical gear unit types E and M	Sizes 012 to 513
Helical worm gear unit types GE and GM	Sizes 050 to 200
Bevel gear unit types W, MW, and SW	Sizes 088 to 260
Worm gear set types SO and MO	Sizes 040 to 630
Worm gear set types SR and MR	Sizes 100 to 630
Worm gear set types SH and MH	Sizes 100 to 630



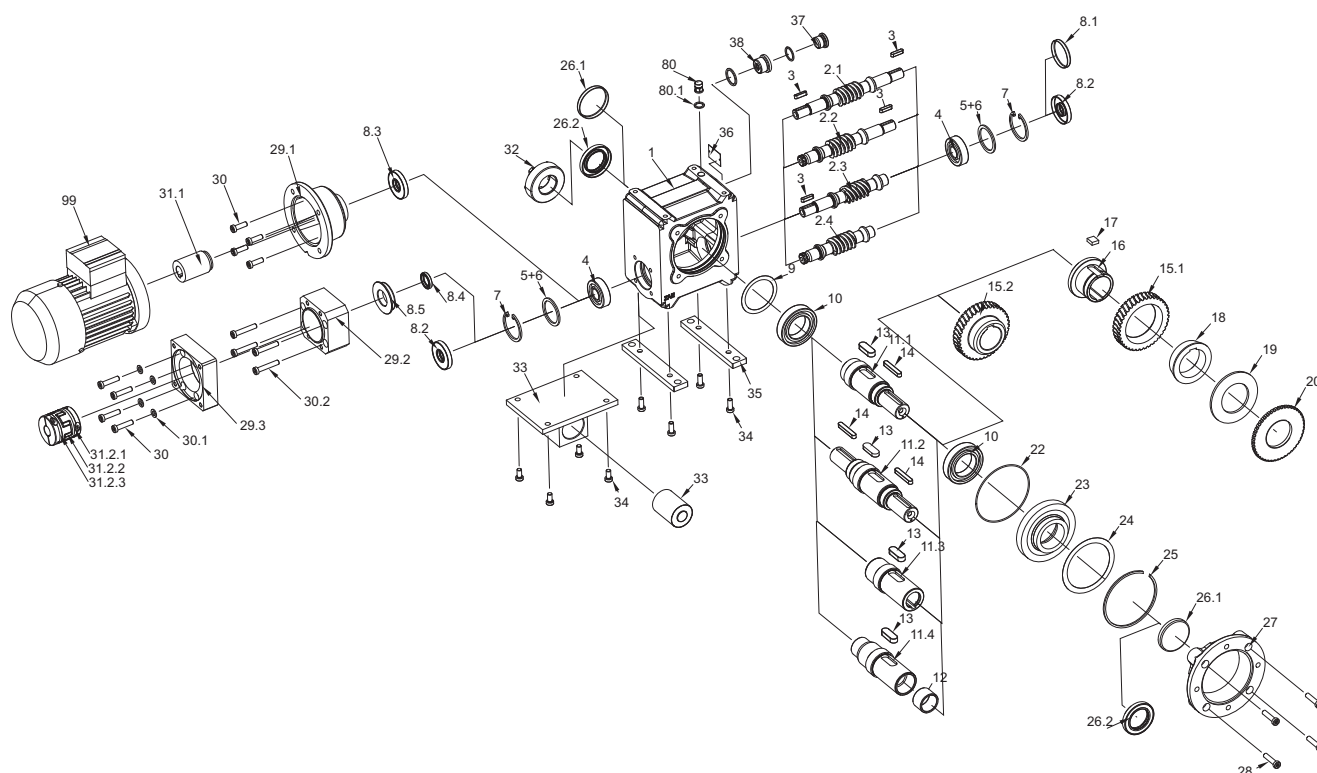
If these devices are used in potentially explosive gas and dust atmospheres instead of under normal operating conditions, be sure to observe the additional safety instructions and regulations marked with the Ex symbol!

3. Basic descriptions of the gear units and geared motors with drawings of replacement parts and parts list

3.1 Worm gear Units and worm gear motors

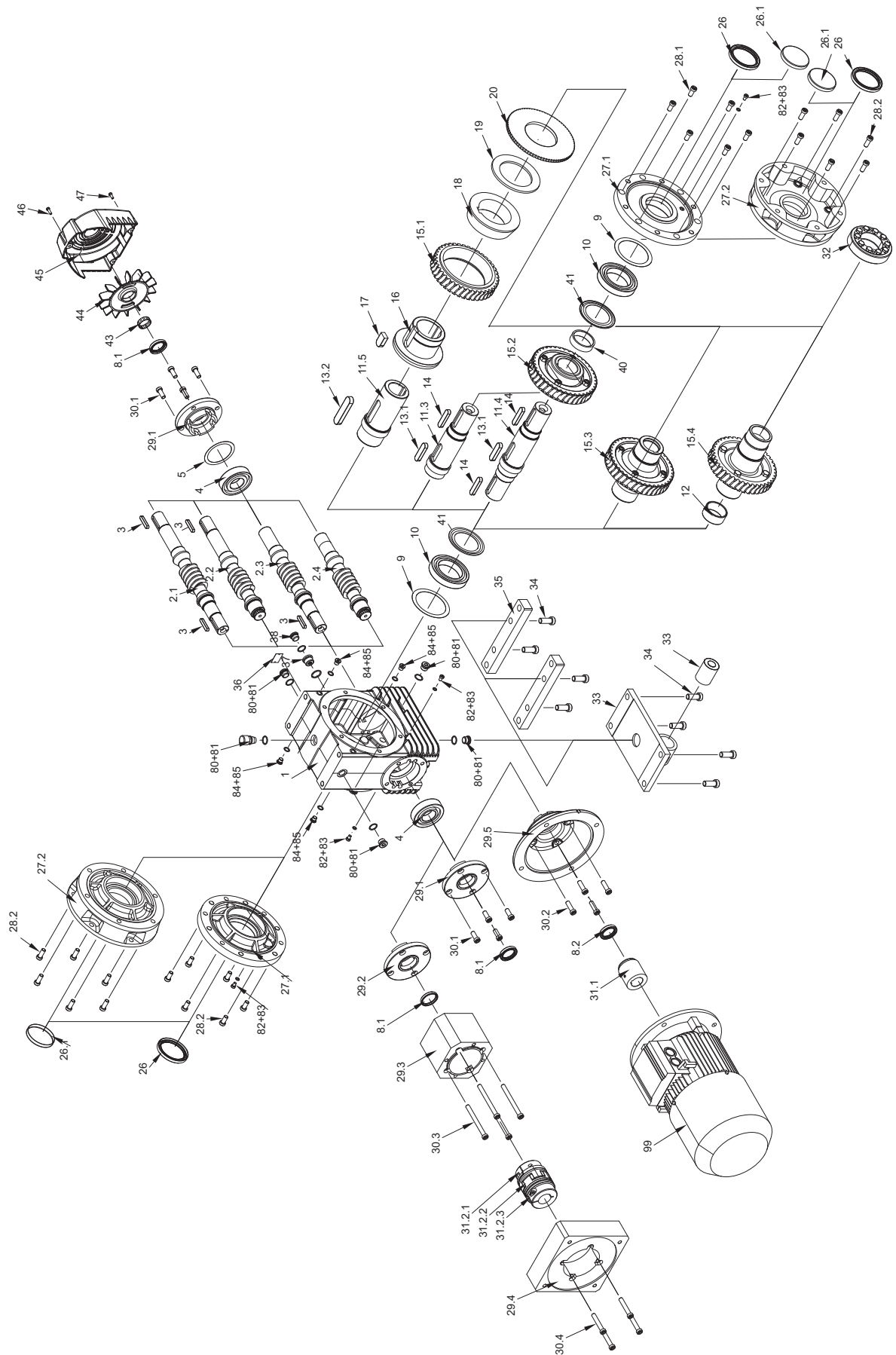
These are single-stage worm gear units/worm gear motors with differing designs based on their respective center distances.

Types E, M, and S 040–080



1	Gear unit housing	20	Adjusting ring
2.1	Double-sided worm	22	O-ring
2.2	Double-sided motor worm	23	Housing cover
2.3	Single-sided worm	24	Set of shim rings
2.4	Single-sided motor worm	25	Snap ring
3	Key	26.1	Shaft cap
4	Angular contact ball bearing	26.2	Radial shaft seal
5	Set of shim rings	27	F flange housing
6	Support washer	28	Cheese head screw
7	Retaining ring	29.1	Yoke and motor flange
8.1	Shaft cap	29.2	Servo yoke
8.2	Radial shaft seal	29.3	Yoke and motor flange
8.3	Radial shaft seal	30	Cheese head screw
8.4	Radial shaft seal	30.1	Lock washer
8.5	Seal ring holder	30.2	Cheese head screw
9	Set of shim rings	31.1	Coupling
10	Grooved ball bearing	31.2	KTR Rotex GS
11.1	Single-sided wheel shaft	31.2.1	Coupling hub
11.2	Double-sided wheel shaft	31.2.2	Ring gear
11.3	Hollow shaft	31.2.3	Coupling hub
11.4	Hollow shaft for locking ring version	32	HSD locking ring
12	Sliding bushing for locking ring version	33	Torque support + bushing
13	Key	34	Cheese head screw
14	Key	35	Gear mounting base
15.1	Worm gear for friction clutch	36	Warning sign
15.2	Worm gear	37	Threaded plug + seal ring
16	Coupling hub	38	Threaded plug + seal ring
17	Key	80	Threaded plug/vent plug
18	Cone ring	80.1	Seal ring
19	Conical spring washer	99	Motor

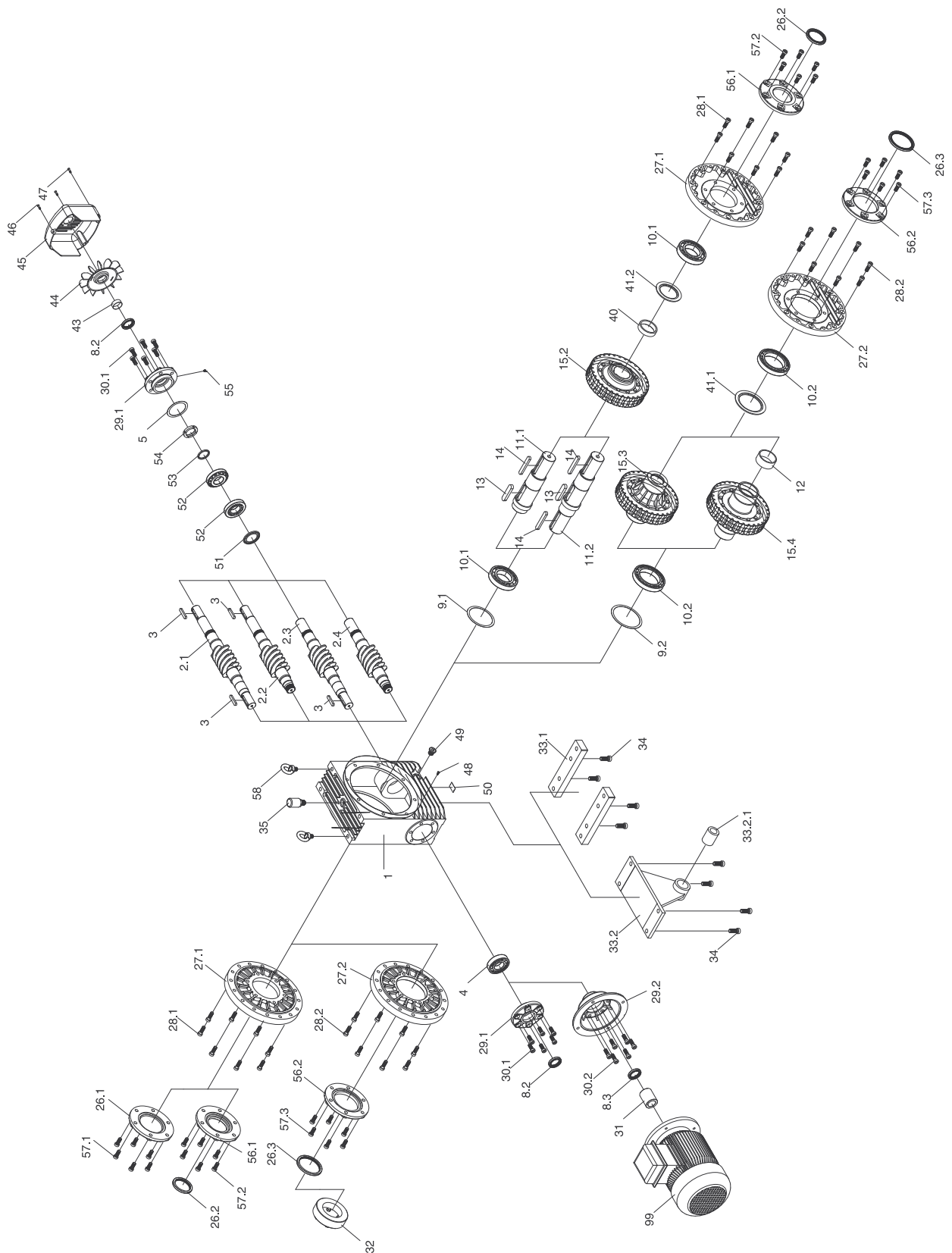
Types E, M, and S 100–200



Types E, M, and S 100–200

1	Gear unit housing	29.2	Yoke and motor flange
2.1	Double-sided worm	29.3	Servomotor yoke
2.2	Double-sided motor worm	29.4	Intermediate flange
2.3	Single-sided worm	29.5	Motor yoke
2.4	Single-sided motor worm	30.1	Cheese head screw
3	Key	30.2	Cheese head screw
4	Angular contact ball bearing	30.3	Cheese head screw
5	Set of shim rings	30.4	Cheese head screw
8.1	Radial shaft seal	31.1	Coupling
8.2	Radial shaft seal	31.2	KTR Rotex GS
9	Set of shim rings	31.2.1	Coupling hub
10	Grooved ball bearing	31.2.2	Ring gear
11.3	Single-sided wheel shaft	31.2.3	Coupling hub
11.4	Double-sided wheel shaft	32	HSD locking ring
11.5	Hollow shaft friction clutch	33	Torque support + MEGI bushing
12	Sliding bushing for locking ring version	34	Cheese head screw
13.1	Key	35	Gear mounting base
13.2	Key	36	Warning sign
14	Key	37	Threaded plug + seal ring
15.1	Worm gear for friction clutch	38	Threaded plug + seal ring
15.2	Worm gear	40	Spacer ring
15.3	Worm gear with hollow hub	41	Nilos ring
15.4	Worm gear with hollow hub + HSD	43	Tolerance ring
16	Coupling hub	44	Fan
17	Key	45	Fan shroud
18	Cone ring	46	Cheese head screw
19	Conical spring washer	47	Cheese head screw
20	Adjusting ring	80	Threaded plug/vent plug
26	Radial shaft seal	81	Seal ring
26.1	Shaft cap	82	Cheese head screw
27.1	Housing C flange	83	Seal ring
27.2	Housing F flange	84	Threaded plug
28.1	Cheese head screw	85	Seal ring
28.2	Cheese head screw	99	Motor
29.1	Annular cap		

Types E and M 250, 315, 400

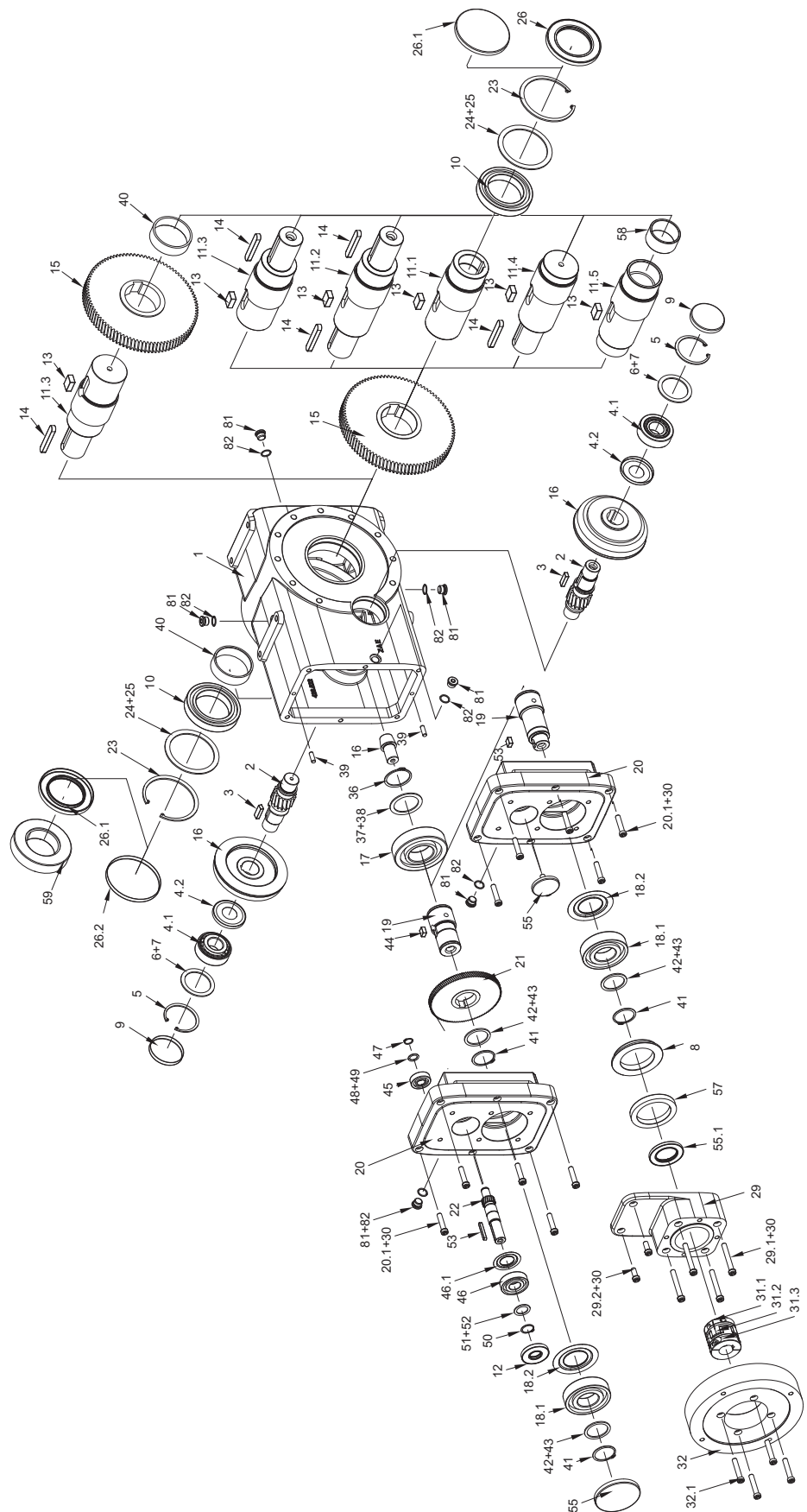


Types E and M 250, 315, 400

1	Gear unit housing	30.1	Cheese head screw
2.1	Double-sided worm shaft	30.2	Cheese head screw
2.2	Double-sided motor worm shaft	31	Coupling assembly
2.3	Single-sided worm shaft	32	Locking ring
2.4	Single-sided motor worm shaft	33.1	Gear mounting bases
3	Key	33.2	Torque support
4	Grooved ball bearing	33.2.1	MEGI bushing
5	Set of shim rings	34	Cheese head screw
8.2	Radial shaft seal	35	Vent filter
8.3	Radial shaft seal	40	Spacer ring
9.1	Set of shim rings	41.1	Nilos ring
9.2	Set of shim rings	41.2	Nilos ring
10.1	Grooved ball bearing	43	Tolerance ring
10.2	Grooved ball bearing	44	Fan
11.1	Single-sided wheel shaft	45	Fan shroud
11.2	Double-sided wheel shaft	46	Cheese head screw
12	Sliding bushing for locking ring	47	Cheese head screw
13	Key	48	Cheese head screw
14	Key	49	Threaded plug
15.2	Worm gear	50	Warning sign
15.3	Worm gear with hollow shaft	51	Nilos ring
15.4	Worm gear with hollow shaft for locking ring	52	Tapered roller bearing
26.1	Shaft cap	53	Spacer ring
26.2	Radial shaft seal for solid output shaft	54	Groove nut with retaining washer
26.3	Radial shaft seal for hollow output shaft	55	Grease fitting
27.1	Housing flange for wheel shaft	56.1	Annular cap for wheel shaft
27.2	Housing flange for hollow shaft	56.2	Annular cap for hollow shaft
28.1	Cheese head screw	57.1-3	Cheese head screws
28.2	Cheese head screw	58	Eyebolt
29.1	Annular cap	99	Motor
29.2	Motor yoke		

3.2 Bevel helical gear units and bevel helical geared motors

Types E, M, and S 222–523



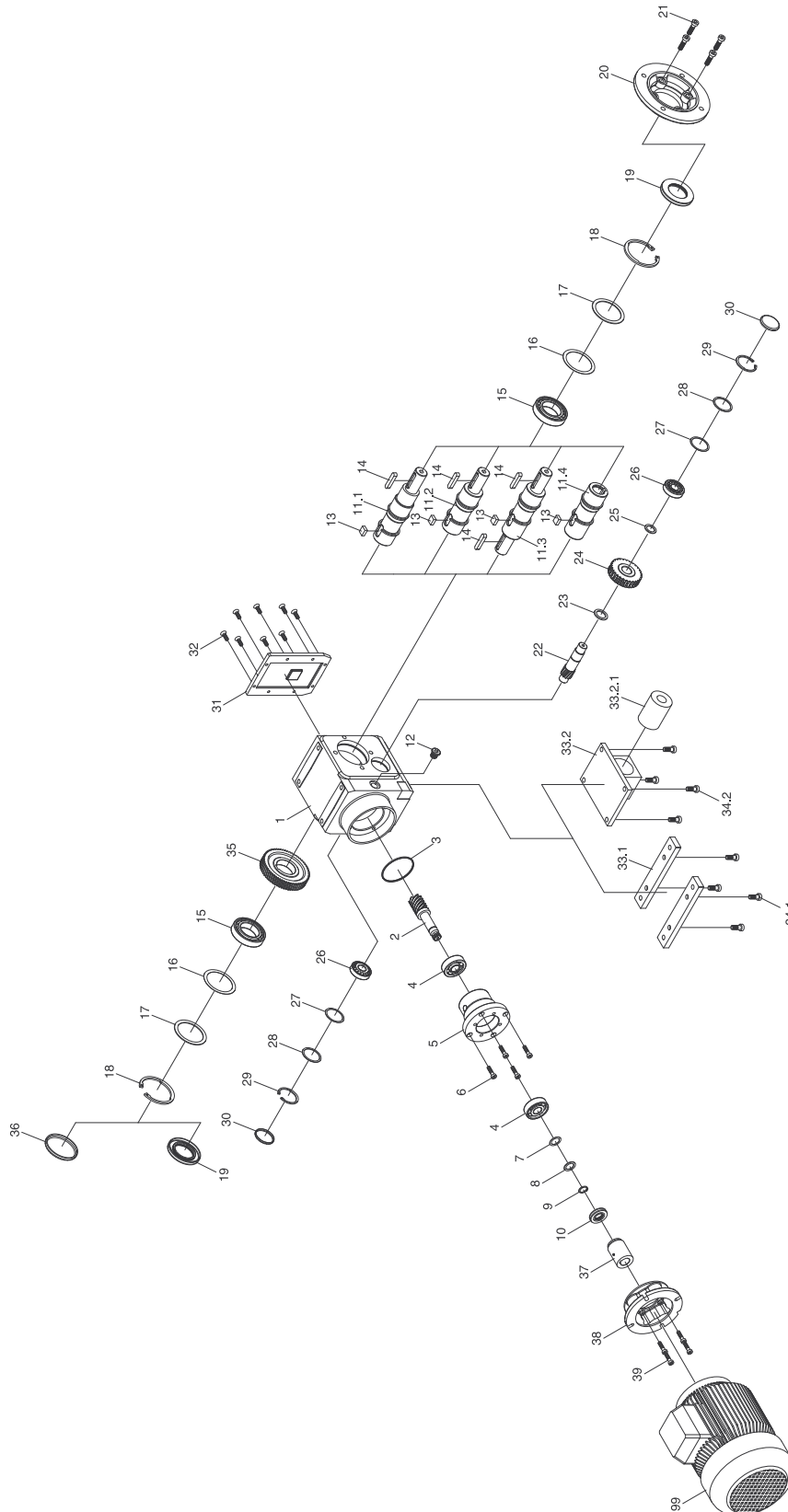
Types E, M, and S 222–523

1	Housing	30	Lock washer
2	Pinion shaft	30.1	Lock washer
3	Key	31	Coupling
4.1	Tapered roller bearing	32	Intermediate flange
4.2	Nilos ring	33	Torque support
5	Retaining ring	34	Cheese head screw
6	Support washer	35	Gear mounting base
7	Set of shim rings	36	Retaining ring
8	Annular cap	37	Support washer
9	Shaft cap	38	Set of shim rings
10	Grooved ball bearing	39	Cylindrical pin
11.1	Hollow shaft	40	Bushing 522/523 only
11.2	Double-sided wheel shaft	41	Retaining ring
11.3	Single-sided wheel shaft	42	Support washer
11.4	Single-sided wheel shaft	43	Set of shim rings
11.5	Hollow shaft with locking ring	44	Key
12	Radial shaft seal/shaft cap	45	Angular contact ball bearing
13	Key	46.1	Angular contact ball bearing
14	Key	46.2	Nilos ring
15	Cylindrical gear	47	Retaining ring
16	Bevel gear set	48	Support washer
17	Angular contact ball bearing	49	Set of shim rings
18.1	Angular contact ball bearing	50	Retaining ring
18.2	Nilos ring	51	Support washer
19	Pinion shaft	52	Set of shim rings
20	Housing cover	53	Key
20.1	Cheese head screw	54	Cylindrical pin
21	Cylindrical gear	55.1	Radial shaft seal
22	Pinion shaft	55.2	Shaft cap
23	Retaining ring	56	Support washer size 2 only
24	Support washer	57	Seal ring holder E522 only
25	Set of shim rings	58	Bushing for locking ring version
26.1	Radial shaft seal	59	Locking ring
26.2	Shaft cap		
27	Flange		
28	Cheese head screw	81	Threaded plug/vent plug
29	Yoke	82	Seal ring
29.1	Cheese head screw		
29.2	Cheese head screw		

3.3 Worm helical gear units and worm helical geared motors

These are two- or three-stage gear units/geared motors each consisting of a worm gear stage and one or two downstream cylindrical gear stages in series.

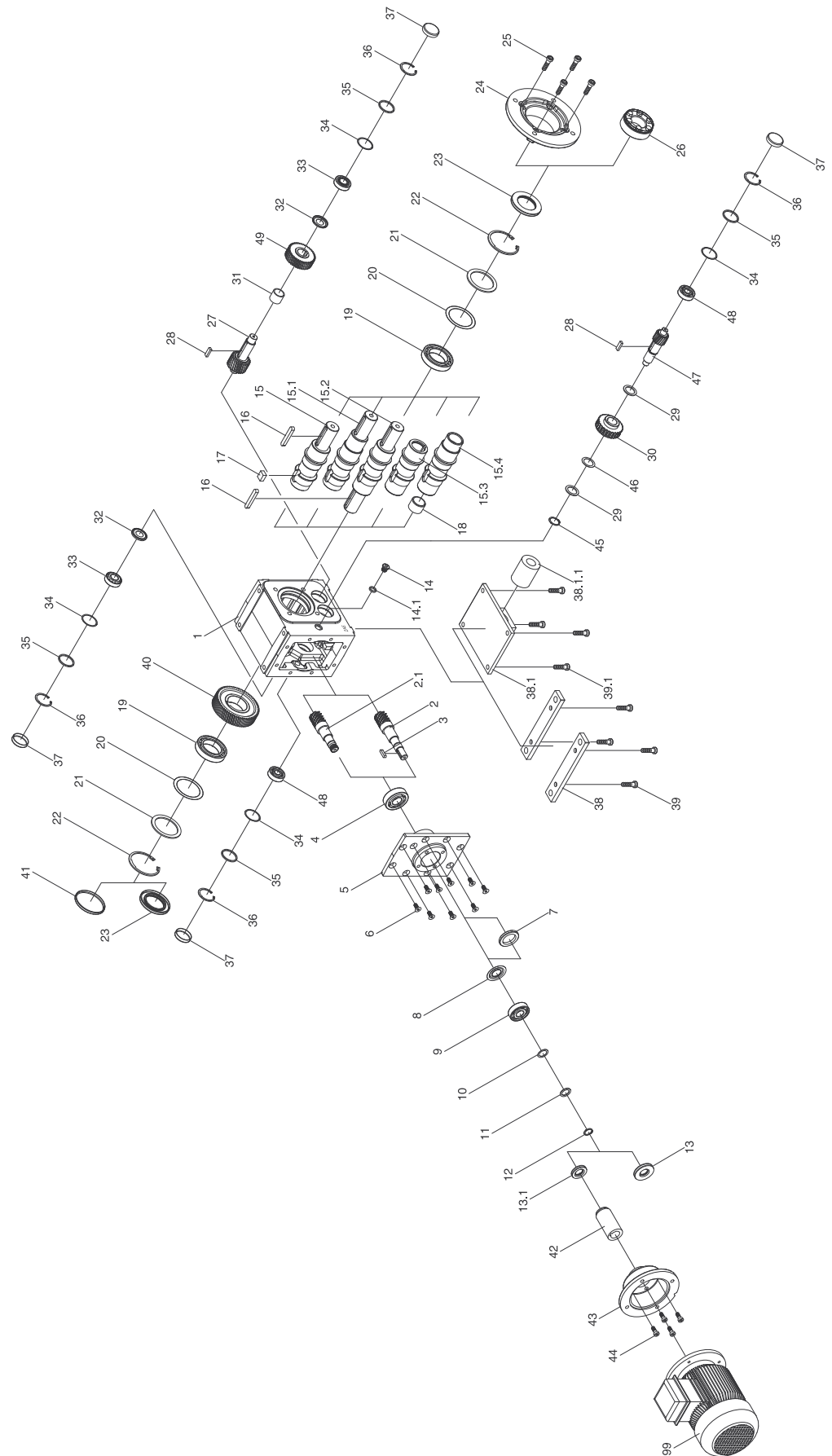
Type M 012



Type M 012

1	Gear unit housing	21	Cheese head screw
2	Motor worm shaft	22	Pinion shaft
3	O-ring	23	Support washer
4	Angular contact ball bearing	24	Worm gear
5	Bearing neck	25	Support washer
6	Cheese head screw	26	Tapered roller bearing
7	Set of shim rings	27	Set of shim rings
8	Support washer	28	Support washer
9	Retaining ring	29	Retaining ring
10	Radial shaft seal	30	Shaft cap
11.1	Single-sided wheel shaft	31	Shaft cap
11.2	Single-sided wheel shaft	32	Countersunk screw
11.3	Double-sided wheel shaft	33.1	Gear mounting base
11.4	Hollow shaft	33.2	Torque support
12	Threaded plug	33.2.1	MEGI bushing
13	Key	34.1	Cheese head screw
14	Key	34.2	Cheese head screw
15	Grooved ball bearing	35	Cylindrical gear
16	Set of shim rings	36	Shaft cap
17	Support washer	37	Coupling assembly
18	Retaining ring	38	Motor yoke
19	Radial shaft seal	39	Cheese head screw
20	Housing flange	99	Motor

Types E, M 112–513



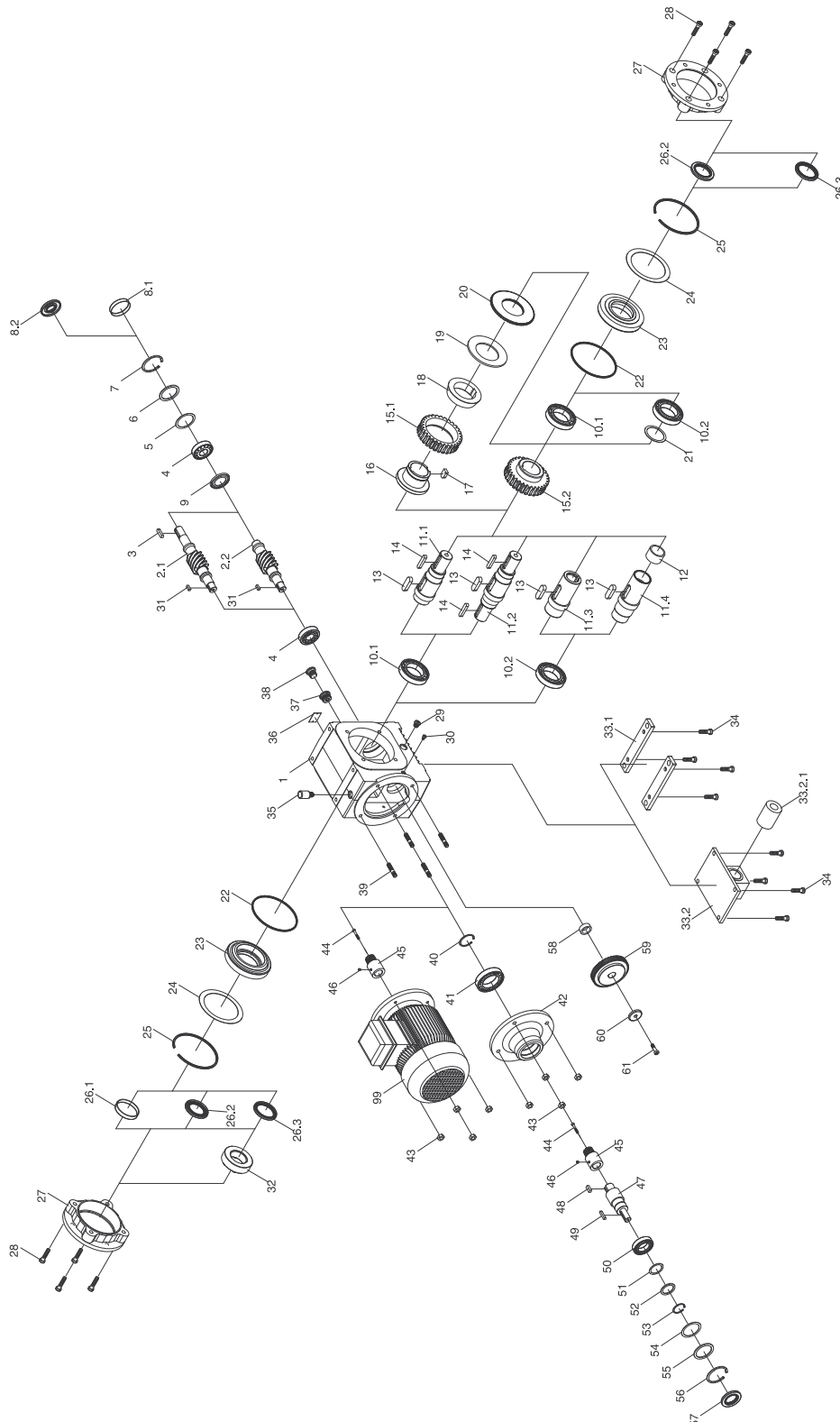
Types E, M 112–513

1	Gear unit housing	25	Cheese head screw
2	Worm shaft	26	Frictional shaft-hub locking device
2.1	Motor worm shaft	27	Pinion shaft
3	Key	28	Key
4	Angular contact ball bearing	29	Support washer
5	Housing cover	30	Worm gear
6	Countersunk screw	31	Bushing
7	Spacer ring	32	Nilos ring
8	Nilos ring	33	Tapered roller bearing
9	Angular contact ball bearing	34	Set of shim rings
10	Set of shim rings	35	Support washer
11	Support washer	36	Retaining ring
12	Retaining ring	37	Shaft cap
13	Radial shaft seal	38	Gear mounting base
13.1	Radial shaft seal	38.1	Torque support
14	Threaded plug	38.1.1	MEGI bushing
15	Single-sided wheel shaft	39	Cheese head screw
15.1	Single-sided wheel shaft	39.1	Cheese head screw
15.2	Double-sided wheel shaft	40	Cylindrical gear
15.3	Hollow shaft	41	Shaft cap
15.4	Hollow shaft	42	Coupling assembly
16	Key	43	Motor yoke
17	Key	44	Cheese head screw
18	Bushing	45	Retaining ring
19	Grooved ball bearing	46	Set of shim rings
19.1	Grooved ball bearing	47	Pinion shaft
20	Set of shim rings	48	Grooved ball bearing
21	Support washer	48.1	Grooved ball bearing
22	Retaining ring	49	Cylindrical gear
23	Radial shaft seal	99	Motor
24	Housing flange		

3.4 Helical worm gears and helical worm gear motors

These are two-stage gear units/geared motors each consisting of a cylindrical gear stage and a downstream worm gear stage in series.

Types GE and GM 050–200



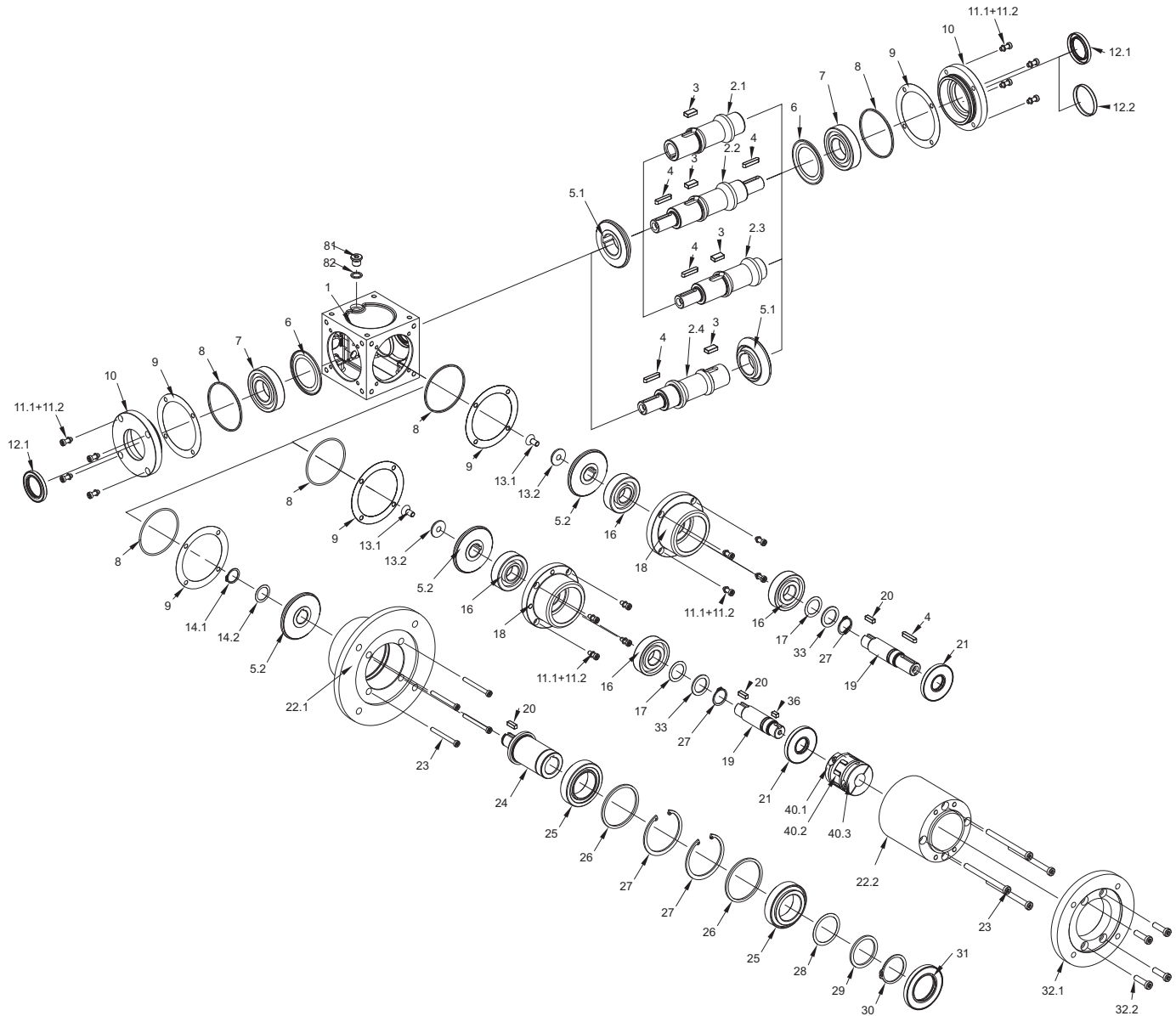
Types GE and GM 050–200

1	Gear unit housing	29	Threaded plug
2.1	Double-sided worm shaft	30	Cheese head screw
2.2	Single-sided worm shaft	31	Key
3	Key	32	Locking ring
4	Tapered roller bearing	33.1	Gear mounting bases
5	Set of shim rings	33.2	Torque support
6	Support washer	33.2.1	MEGI bushing
7	Retaining ring	34	Cheese head screw
8.1	Shaft cap	35	Vent filter
8.2	Radial shaft seal	36	Warning sign
9	Nilos ring	37	Threaded plug
10.1	Grooved ball bearing	38	Threaded plug
10.2	Grooved ball bearing	39	Stud bolt
11.1	Single-sided wheel shaft	40	Retaining ring
11.2	Double-sided wheel shaft	41	Grooved ball bearing
11.3	Hollow shaft	42	Bearing neck
11.4	Hollow shaft for locking ring	43	Hex nut
12	Sliding bushing for locking ring	44	Cheese head screw
13	Key	45	Pinion
14	Key	46	Threaded pin
15.1	Worm gear for friction clutch	47	Pinion shaft
15.2	Worm gear	48	Key
16	Coupling hub	49	Key
17	Key	50	Grooved ball bearing
18	Cone ring	51	Set of shim rings
19	Conical spring washer	52	Support washer
20	Adjusting ring	53	Retaining ring
21	Shim ring	54	Set of shim rings
22	O-ring	55	Support washer
23	Housing cover	56	Retaining ring
24	Set of shim rings	57	Radial shaft seal
25	Snap ring	58	Bushing
26.1	Shaft cap	59	Cylindrical gear
26.2	Radial shaft seal	60	Countersunk washer
26.3	Radial shaft seal	61	Cheese head screw
27	F flange housing	99	Motor
28	Cheese head screw		

3.5 Bevel gear units and bevel geared motors

These are single-stage bevel gear units/bevel geared motors.

Types W and MW 088–260



1	Housing	18	Bearing neck
2.1	Hollow shaft	19	Pinion shaft
2.2	Double-sided wheel shaft	20	Key
2.3	Single-sided wheel shaft	21	Radial shaft seal
2.4	Single-sided wheel shaft	22.1	Yoke (V design)
3	Key	22.2	Yoke
4	Key	23	Cheese head screw
5.1	Bevel gear	24	Pinion shaft
5.2	Bevel pinion	25	Tapered roller bearing
6	Nilos ring	26	Support washer
7	Deep groove ball bearing/tapered roller bearing	27	Retaining ring
8	O-ring	28	Set of shim rings
9	Set of shim rings	29	Support washer
10	Annular cap	30	Retaining ring
11.1	Cheese head screw	31	Radial shaft seal
11.2	Lock washer	32.1	Intermediate flange
12.1	Radial shaft seal	32.2	Cheese head screw
12.2	Shaft cap	33	Support washer
13.1	Countersunk screw	40.1	Coupling hub
13.2	Countersunk washer	40.2	Ring gear
14.1	Retaining ring	40.3	Coupling hub
14.2	Set of shim rings	81	Threaded plug/vent plug
16	Angular contact ball bearing/tapered roller bearing	82	Seal ring

4. Condition on delivery and warranty

Before being shipped, all ZAE gear units, ZAE geared motors, and worm gear sets undergo a final inspection and are checked to ensure that order requirements have been met. The gear units and geared motors are shipped with an epoxy resin-based primer coating in RAL 7035 (bright gray) and filled with oil unless otherwise stated.

The vent filter and the coupling (only for types M and DM without motor) are supplied as loose parts in separate packaging.

The individually shipped gear sets are coated with a corrosion inhibitor before being packaged.



During the warranty period, ZAE gear units may only be opened with our express permission; otherwise the warranty will be invalidated.



All instructions pertaining to use of the gear units and the geared motors in potentially explosive gas and dust atmospheres (see 6.7, 7.5, 8.2, and 9.3) must also be followed to ensure safe operation in a normal environment as well as compliance with the warranty.



5. Transportation and storage

Please check the shipment immediately upon receipt for any damage and to ensure that all ordered parts have been received. Should any damage come to your notice, a damage claim must be completed in the presence of the forwarder. Please contact Customer Care as soon as possible after completing the damage claim to determine what steps to follow (see the last page for the appropriate phone number).

If the gear unit or the geared motor is initially placed in temporary storage, the building used for storage should be dry and not subject to wide fluctuations in temperature to prevent condensation and any resulting corrosion.

6. Installation and commissioning



Any work on gear units or geared motors must be carried out by authorized trained personnel only.

If any questions or problems arise during installation, we request that you contact our Customer Care (see the last page for the appropriate phone number).

Be sure to ensure that during installation of the ZAE gear units and geared motors, the existing oil fittings, e.g., vents, control screw, and drain, are easily accessible. Provision must also be made for sufficient circulation of cool air. The gear unit must be installed in the position specified in the order because only then is unhindered lubrication and air venting during operation ensured.

As specified in statutory regulations, the user must ensure that all rotating parts are safeguarded to prevent accidental contact with them.

6.1 Gear units and geared motors with projecting shaft ends

During installation of a ZAE drive with a projecting shaft end, the gear unit is to be placed with the machine to be driven on an appropriate base or foundation. Flange-mounted gear units can be attached directly to the machine to be driven.



In the interest of safe and quiet operation, the shafts must be very carefully aligned. There should be no stresses on the housing or shafts. Use of flexible couplings to compensate for small amounts of misalignment is recommended.

6.2 Hollow shaft gear units and geared motors

ZAE drives with hollow shafts can be placed directly on the shafts of the machines to be driven. Axial fastening should be accomplished using an end washer and a screw if no frictional shaft-hub locking device is used.



Care should be taken to ensure that the mounting surface lies at right angles to the axle of the machine to be driven. Otherwise the unit bearing will be overloaded and could break down prematurely. The reactive force corresponding to the output torque can be compensated for by a ZAE torque bracket. In order for additional bending stresses to be avoided, the torque bracket must always be situated on the machine side of the gear unit.

Mounting the gear unit directly to the base plate with the machine shaft also mounted near the gear unit should be avoided under all circumstances.

For frictional shaft-hub locking devices, never tighten the clamp bolts before the shaft has been installed because otherwise the hollow shaft may become warped.

6.3 Installing couplings or other components

Installation of couplings, sprockets, gear wheels, or pulleys, etc. should be performed while the components are warm or with the help of the thread centering device and a screw. Ensure that there is axial support.

Before mounting, apply roller bearing grease to the gear tooth system of the ZAE motor coupling.



Never hammer supplementary parts onto the shafts because this may damage tooth profiles, roller bearings, and/or retaining rings.

6.4 Commissioning worm gear units and variants

Unless otherwise indicated in the order confirmation, ZAE worm gear units and variants as well as ZAE geared motors are filled with synthetic lubricant at the factory. If delivery of a gear unit without filling at the factory is requested, the unit should be filled using an oil grade matching the grade specified on the rating plate. When mineral oils are used, reduced performance should be taken into account. We ask that we be consulted before other oil grades are used. The correct oil level has been reached as soon as oil starts dripping out of the hole for the oil filler plug (E and M 100 to 400; GM 063 to 200; and E/ M 012 to 513).

For the correct lubricant amounts, please see the lubricant selection chart in Section 7.3.



On all gear units that have been filled with lubricant at the factory, first replace the threaded plug with the enclosed vent filter, which should be uncontaminated. A stopped-up vent causes internal pressure to increase and can possibly lead to leaks. For gear units delivered without oil fill ports, the vent filter is already installed. Unit size 040 is delivered for all mounting positions in an enclosed version without a vent filter.

6.5 Commissioning bevel gear units and variants

Unless indicated otherwise in the confirmation of order, all ZAE bevel gear units are filled with synthetic lubricant at the factory. If delivery of a gear unit without filling at the factory is requested, the unit should be filled using an oil grade matching the grade specified on the rating plate. Unit sizes 110 to 260 are equipped with oil filler plugs for checking the oil level.

For the necessary lubricant amounts, please see the lubricant selection chart in Section 7.3.



On all gear units that have been filled with lubricant at the factory, first replace the threaded plug with the enclosed vent filter, which should be uncontaminated. A stopped-up vent causes internal pressure to increase and can possibly lead to leaks. For gear units delivered without oil fill ports, the vent filter is already installed.

6.6 Electrical connections



Electrical connection and maintenance work on electrical drives may only be performed by a qualified electrician in compliance with the applicable accident prevention and installation regulations. Unintentional switching on of the power supply while working on operational live parts should be avoided by adopting appropriate preventive measures.



Equipotential bonding must be provided in all cases. Available supply voltage and frequency must agree with the information given on the ZAE geared motor rating plate. Circuit diagrams for both a motor connection as well as the brake can be found in the terminal box.

6.7 Mounting and commissioning in hazardous areas



Housing and fastening

The gear unit fasteners in the housing as well as the gear mounting bases, mounting flanges, and torque brackets (mostly with rubber compensating elements) must be designed to absorb the external forces with sufficient safety during operation under rated operating conditions. Ensure that the gear unit is mounted without stressing and according to the usual tightening torques for shaft screws (see table) to ensure that it will not loosen during operation.

Screw	Tightening Torque [Nm]
M5	4.8
M6	8.3
M8	20
M10	40
M12	69
M16	170
M20	340
M24	590
M30	1200

During installation, check the housing wall and oil filler/level plug for damage and ensure that grounding has been performed properly for electrostatic discharge.



Lubrication

Before commissioning, make sure there is sufficient lubricant in the gear unit. Operation without lubricant will lead to complete failure of the gear unit. The amount of oil to use depends on the mounting position. If the mounting position is modified, an adjustment of the amount of oil used must be made according to the description given in Chapter 7. Never mix oil grades. If the desired oil grade is not available, perform a complete oil change using an alternative oil grade as specified in the table given in Section 7.3.



Venting

The vents are designed to keep the internal pressure of the housing within the permissible range. This function contributes to keeping the surface temperature from exceeding 135 °C under permissible operating conditions. Valves and filters made of steel are used as vents.

The position of the vent is specified and depends on the mounting position. Changing the mounting position may cause the function of the vent to be impeded and lead to damage.

Leaving out a vent that has been designated as part of the design can only take place after the specific conditions of operation have been clarified and ZAE consulted.

During installation of a unit, care should be taken to ensure that the vent is not damaged and its function is not impeded by dust or dirt. Faulty vents can lead to an increase in internal pressure in the housing and thus to increased temperature, which can result in damage.

For gear units/geared motors delivered with oil fill ports, the vent is sealed when delivered. Prior to commissioning, the threaded screw must be removed and replaced by the vent, which is included as a separately packaged loose part.



Sealing points

Check all dynamic sealing points between the shaft surfaces and the sealing edges immediately after commissioning to ensure that they exhibit tight seals and are clean.



Bearings

Due to installation errors, roller bearings may be subjected to considerable additional forces that the bearing points are not designed to withstand. The bearings could fail prematurely due to these additional forces.

Therefore, ensure proper shaft alignment for all shaft connections. Unusual noises and high temperatures may be indicative of bearings subjected to stresses.



Shafts and connections

Gear shafts may be subjected to additional bending, radial, and axial forces due to faulty installation. The shafts could break. Therefore, be sure that installation is completed as specified.

For form-fit shaft-hub connections, care should be taken to ensure that the connections do not have too much play and are not too far out of alignment. Damage may result from impact forces, friction corrosion, or additional forces that cause the connection to fail. Spline shafts and key shafts are to be greased prior to installation to reduce corrosion-induced wear and premature failure.

It is of vital importance that requirements regarding tolerances, surface qualities, and grease-free joints be met for frictional shaft-hub connections. An appropriate glue must be used for glued-shrink-fit connections.

ZAE is responsible for proper assembly of the connections inside the gear unit; please ensure that the connections on the outside of the gear unit are also assembled properly.



ZAE motor couplings and servo couplings

During installation of ZAE motor couplings, care should be taken to ensure that there is not too much play and no impermissible axial or radial misalignment. Damage may result from impact forces, friction corrosion, or additional forces that cause the coupling to fail.

In addition, ensure that the teeth on the ZAE couplings have been lubricated with the appropriate grease prior to installation. The ZAE couplings must be secured axially on the motor shaft by stud bolts. The servo couplings must be secured by clamping screws tightened to the specified tightening torques.

Rotex GS Servo Coupling				
Size	19	24	28	38
Tightening Torque [Nm]	10	10	25	49



Friction clutches

Gear units with friction clutches are supplied with preset slip torques from the factory. The slip torque setting may subsequently be adjusted. Constant slipping must be prevented by disabling mechanisms (also see 7.5).



Locking rings and frictional shaft-hub locking devices

Narrow, open gaps < 3 mm are to be avoided in areas exposed to dust. It is of vital importance that requirements regarding tolerances, surface qualities, and grease-free mounting surfaces be met for frictional locking rings and frictional shaft-hub locking devices. The screws of the locking ring or the frictional shaft-hub locking device must be properly tightened to the specified torque value. Locking ring parts or frictional shaft-hub locking devices should not come into contact with stationary parts.



Motors and brake motors

A mounted electric motor must be added by the manufacturer for categories 2G and 2D and include a declaration of conformity and an EC type-examination certificate.

Damage to bearings, shafts, and couplings should be prevented through motors exhibiting reduced radial and axial runout in accordance with DIN 42955 - R. Mounting must be performed according to the mounting guidelines. Provision must be made for equipotential bonding (grounding).



Brakes

A mounted electric brake must be added by the manufacturer for categories 2G and 2D and include a declaration of conformity and EC type-examination certificate.

The brake and other attachments must be dimensioned adequately to ensure that excessive mechanical and thermal loads can be ruled out during operation under rated operating conditions. Uninterrupted brake disk dragging must be ruled out by the operator.



Couplings used by the operator

Electrical couplings must be added by the manufacturer for categories 2G and 2D and include a declaration of conformity and EC type-examination certificate.

Mechanical couplings must be delivered with a declaration of conformity.

The operator must ensure that no contact with stationary parts will occur and that the gap dimensions in areas exposed to dust are sufficiently wide (> 3 mm). Coupling hubs must be secured axially; shaft alignment errors must be avoided. The couplings must be mounted in accordance with manufacturer instructions.



Traction gears

Traction gears (chain, flat-, round-, and V-belt drives, and timing belt drives) must be delivered with the corresponding declaration of conformity for categories 2G and 2D and require a CE marking.

To prevent electrostatic discharge, belts must be manufactured using conductive material. Ensure that no contact with stationary parts will occur and that the gap dimensions in areas exposed to dust are sufficiently wide (> 3 mm). Sprockets and belt pulleys must be secured axially. Shaft forces may not exceed the permissible force for the gear unit. Shaft, sprocket, and belt pulley misalignment must be avoided.

The traction gear units must be mounted in compliance with manufacturer instructions.



Upstream and downstream gear units

Gear units mounted upstream or downstream of the ZAE gear unit must be delivered with the appropriate declaration of conformity for categories 2G and 2D and bear the CE marking.

The shafts must meet the same radial and axial runout requirements as those applicable to electric motors. The fastening connections must be tightened using the required torque and secured against unintentional loosening. The joint fasteners must be tightened to the specified torques and secured to prevent unintentional loosening. The gear units must be mounted in accordance with manufacturer instructions.



Gear wheels

Gear wheels attached to gear shafts must be dimensioned to ensure a sufficient degree of safety. Material and manufacturing quality must comply with requirements. The operator must ensure that there is sufficient lubrication.

In addition, it must be ensured that no contact with stationary parts will occur and that the gap dimensions in areas exposed to dust are sufficiently wide (> 3 mm). Gear wheels must be secured axially. Shaft forces may not exceed the permissible amount. Shaft and gear wheel misalignment must be avoided.



Fans

The standard fans with fan shrouds and fan blades designed for use with ZAE worm gear units are not permitted for use in hazardous areas due to the materials used. Fans used in hazardous areas must meet special requirements in accordance with DIN EN 14986. These requirements are met by ZAE through special designs for these applications.

For gear units with fans, ensure that the fan blades cannot strike any objects and thereby potentially cause frictional heat generation or sparking.



Before final commissioning in a hazardous area, a trial run of the machine/unit must be performed, regardless of the circumstances, to check for compliance with permissible temperatures, the presence of leaks, or any unusual noises. This trial run should last at least four hours under real-life operating conditions.

7. Operation

7.1 Lubrication of worm gear units and variants

Because the efficiency and the service life of worm gear units depend to a very high degree on the quality of oil used, ZAE recommends that only the oil grades specified on the gear unit rating plate or in the lubricant selection charts be used. Never use mineral oil when changing the oil in a ZAE gear unit designed for operation with synthetic lubricants.

When switching to a different lubricant, ZAE recommends rinsing the gear unit with the new lubricant prior to filling.

Synthetic lubricants should not be mixed with mineral oil lubricants. Also, not all synthetic lubricants can be mixed with other types of synthetic lubricant. Be sure to maintain cleanliness during filling; use a filter or a fine filter screen where required. The correct oil level has been reached as soon as oil starts dripping out of the hole for the oil filler plug (E and M 100 to 400; GM 063 to 200; and E/M 012 to 513). Please refer to the immersion depths (oil levels) for worm gear sets on Page 26.. For lubricant amounts, please see the lubricant selection chart in Section 7.3.

Higher ambient temperatures are taken into account through the operating temperature factor (fT). Gear unit types D and DM have separate lubricating chambers; different oil viscosities can be used starting from unit size 100. The use of lithium soap grease is recommended for lubricating of toothed couplings and roller bearings. Mixing different types of soap is not permissible.

ZAE gear units that use synthetic lubricants can be used under normal operating conditions over long periods without requiring an oil change – an oil change is recommended after approx. 15,000 service hours or after five years at the latest. The synthetic oils listed in the lubricant selection chart afford high output, reduce friction, have a very good viscosity-temperature profile, and offer excellent protection against wear. They are also very resistant to aging. Synthetic gear unit oils can be used at temperatures ranging from -30 °C to +140 °C. Special-grade seal rings are required for extreme conditions.

Mineral oils have lower performance capabilities. An oil change is recommended after approx. 3000 to 4000 service hours. Gear unit friction and wear are measurably higher for these oils than for synthetic lubricants. The maximum temperature may not exceed 90 °C.

The gear unit should be checked at lengthy intervals for oil loss. If the oil has to be topped up, one of the synthetic lubricants specified on the rating plate should be used. The required oil viscosity varies depending on speed. This applies equally to polyglycols, polyalphaolefins, ester oils, and mineral oils:

Worm Shaft Speed (min ⁻¹)		Oil Viscosity (ISO VG)
From	To	
1500	3000	220
300	1500	460
	300	680

7.1.1 Lubricant amounts

Lubricant amounts in liters (dm³)

Worm gear unit types E and M and servo gear unit type S

Size	Mounting Position			
	1	2	3 + 4	5 + 6
040	0.2	0.25	0.2	0.2
050	0.3	0.6	0.45	0.45
063	0.6	1.1	0.7	0.8
080	1.0	2.1	1.4	1.6
100	1.6	4.2	3.4	2.8
125	2.6	7.0	5.0	4.1
140	2.9	7.8	5.2	4.8
160	4.3	15.0	9.5	8.4
175	5.9	16.1	11.0	10.0
200	8.0	28.0	18.0	16.0
250	14.0	44.0	28.0	22.0
315	19.0	–	–	45.0
400	20	150	85	85

Worm helical gear unit types E and M

Size	Mounting Position				
	1	2	3	4	5 + 6
012	0.85	0.85	0.85	0.85	1.1
112/113	1.4	2.0	1.9	1.6	2.4
212/213	3.5	3.8	3.6	3.8	4.1
312/313	5.2	6.0	5.2	5.2	8.0
512/513	17.0	19.0	19.0	18.0	25.0

Duplex worm gear unit types D and DM

Here, the amounts for the first and second stages must be added together.

Helical worm gear unit types GE and GM

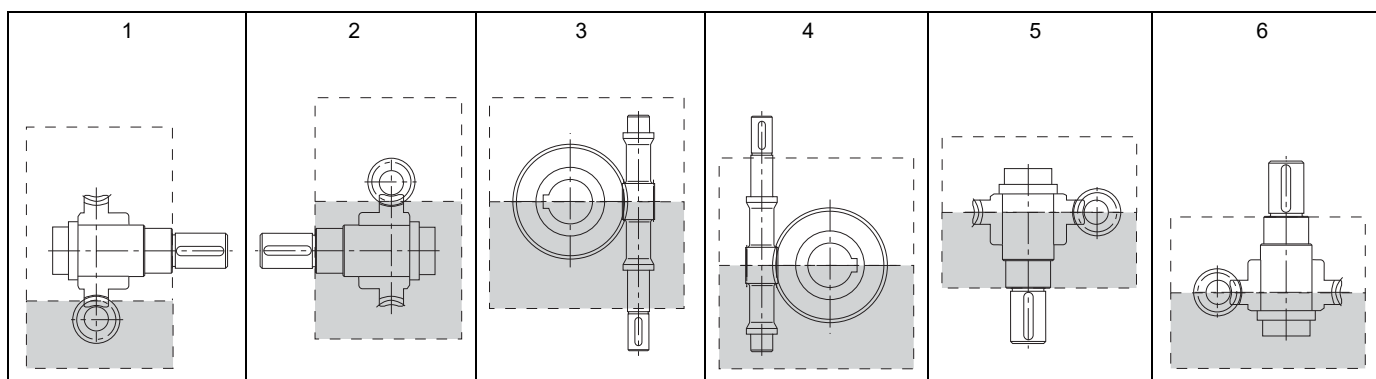
Size	Mounting Position				
	1	2	3	4	5 + 6
050	0.5	1.0	1.0	1.0	0.8
063	0.8	1.5	1.5	1.8	1.2
080	1.3	2.5	2.5	3.2	2.0
100	2.5	5.5	5.5	6.9	3.75
125	4.3	8.2	8.2	8.9	5.5
200	11.2	31.5	25.5	35.5	21.5

The lubricant amounts specified apply to the mounting positions and ratios for which the greatest amounts of oil are required. The oil level screw (oil filler plug) is the measuring point in all cases; the correct oil level must be checked using the oil level screw.

Oil level for worm gear sets

The following table contains the recommended oil levels for immersion lubrication. Be sure that there is sufficient lubrication of the bearings lying above the oil level.

Oil level in the unit during immersion lubrication:



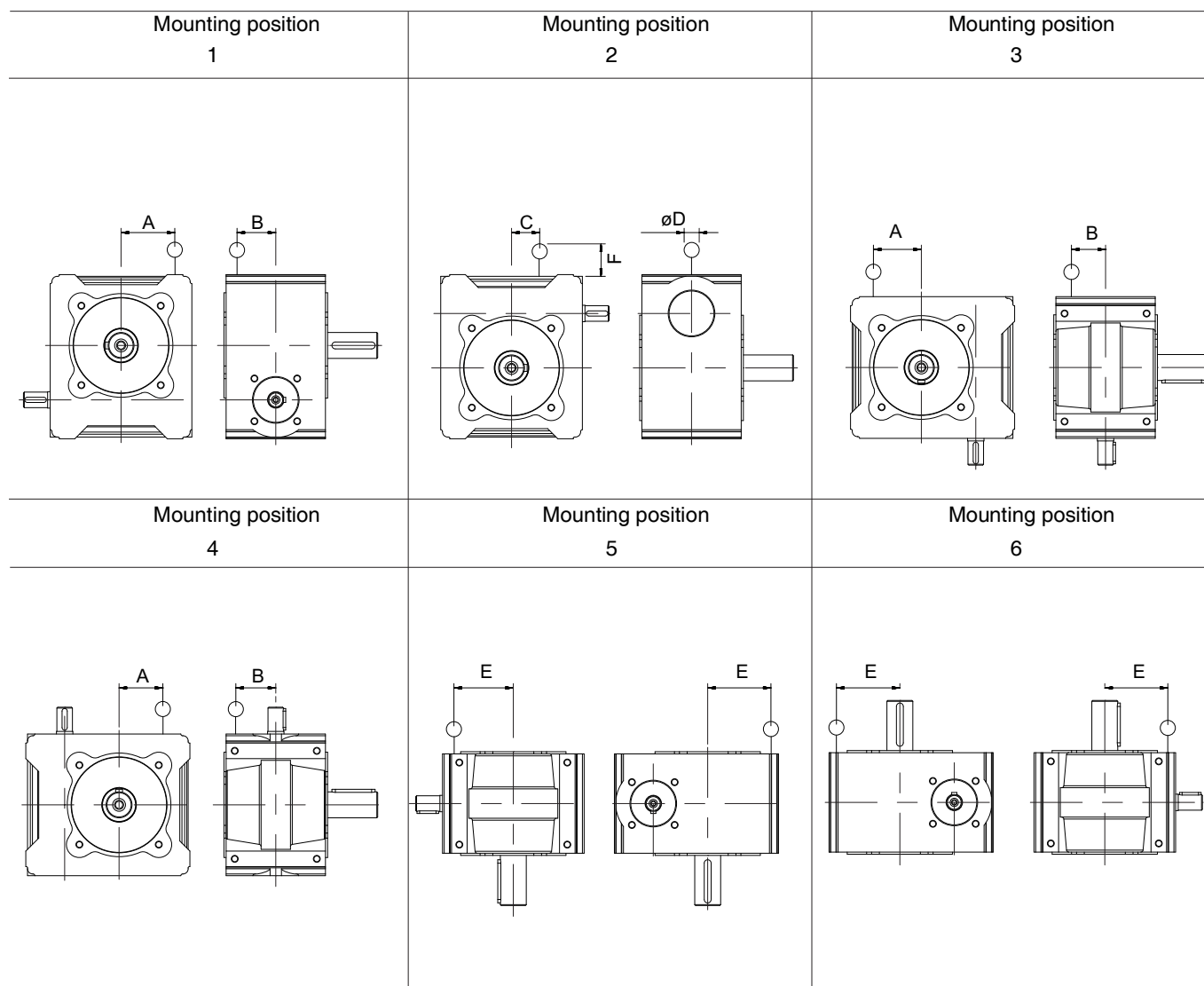
Minimum required oil amount

To prevent premature aging due to contamination and heating of the unit oil, amounts should not fall below the following oil levels during immersion lubrication:

Gear Set Size	Minimum Amount of Oil in Gear Unit dm ³	Gear Set Size	Minimum Amount of Oil in Gear Unit dm ³
040	0.2	125	2.5
050	0.3	160	4.25
063	0.5	200	7.6
080	0.9	250	13.0
100	1.5	315	19.0

7.1.2 Mounting positions for vent filters and oil fittings

Worm gear units and worm gear motors E/M/S 40–80

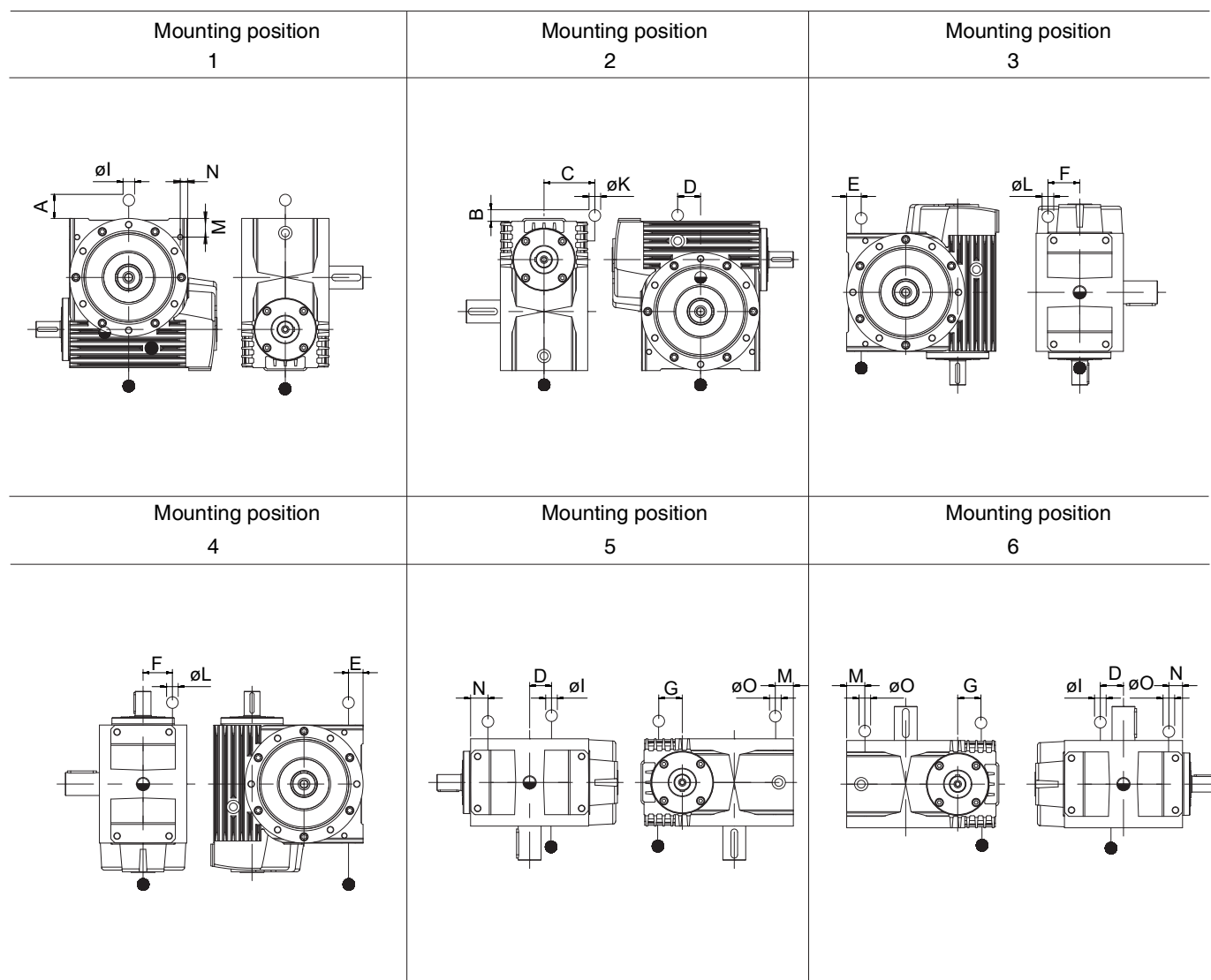


Size	A	B	C	D	E	F
040	–	–	–	–	–	–
050	50	20	33	22	58	25
063	62.5	27.5	37	22	67	25
080	77.5	32.5	57	22	82	25

Size 040 without vent

○ = vent filter

Worm gear units and worm gear motors E/M 100–400

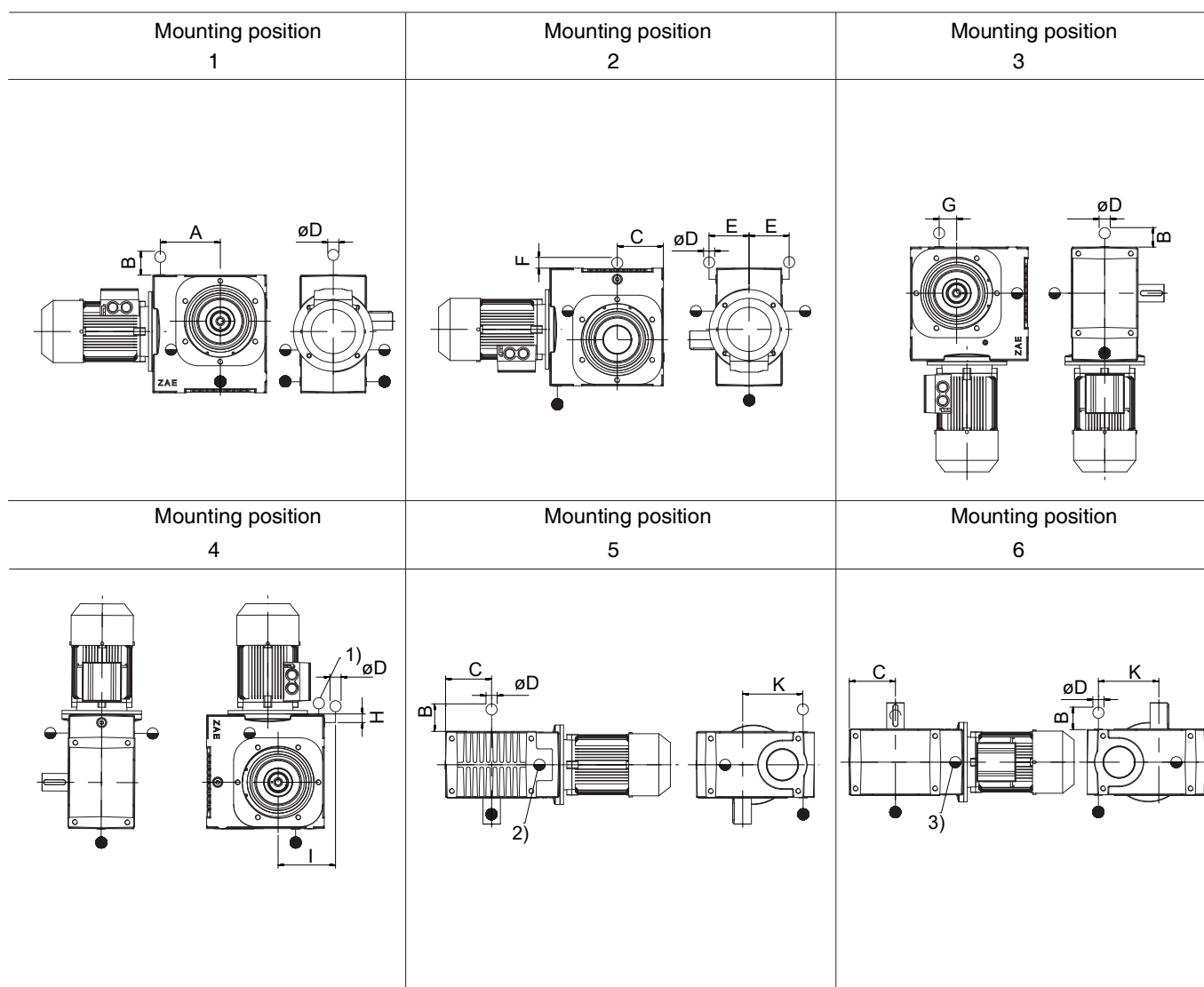


Size	A	B	C	D	E	F	G	I	K	L	M	N	O	P	R	S
100	32	40	110	50	33	52	60	28	28	28	43	14	22	26	5.5	2.5
125	30	37	140	55	35	55	67	45	28	28	45	18	22	32	6.0	2.0
140	17	40	136	55	38	38	45	28	28	28	50	21	22	–	–	–
160	39	42	130	70	60	68	85	45	45	28	55	20	22	39	7.0	2.0
175	39	41	143	95	60	–	78	45	45	45	58	22	14	39	7.0	2.0
200	39	41	150	80	110	84	109	45	45	28	65	25	22	39	7.0	2.0
250	39	35	160	125	100	90	113	45	45	45	–	–	–	39	–	–
315	39	–	–	135	–	–	118	45	–	–	–	–	–	39	4.0	–
400	22	–	–	–	–	–	–	45	–	–	–	–	–	–	–	–

- = vent filter
- = oil drain
- ◐ = oil level screw (oil filler plug)

1) 1)= across from output side/on mounting side

Helical worm gear motors GM 050–200



Size	A	B	C	D	E	F	G	H	I	K
050	98	23	70	20	62	6	25	10	80	78
063	105	23	82	20	69.5	6	35	10	92	93
080	126.5	23	102	20	79.5	7	42.5	5	111.25	124
100	155	30	123	28	112	18	33	27	140	142
125	188.5	30	145	28	122	21	55	30	161	190
200	260	25	225	28	145	–	130	5	260	301

○ = vent filter

● = oil drain

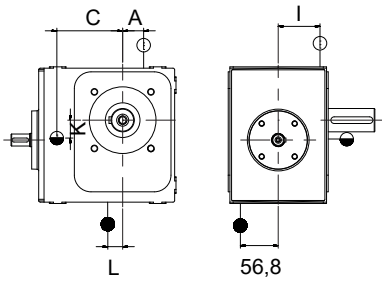
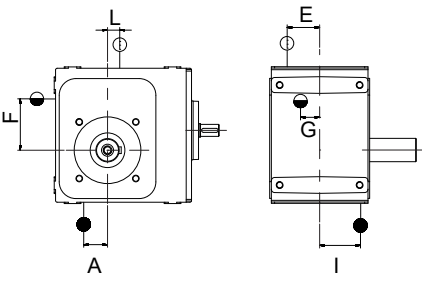
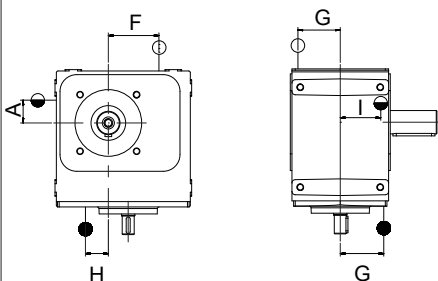
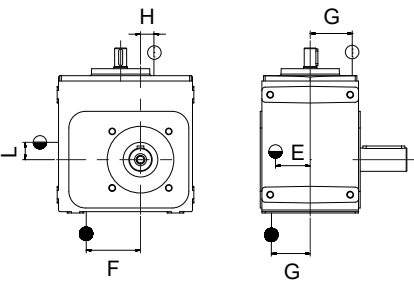
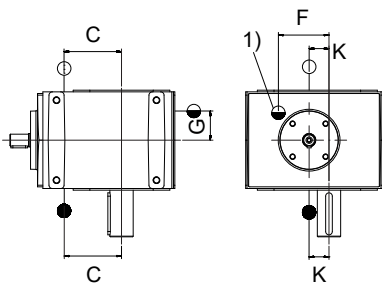
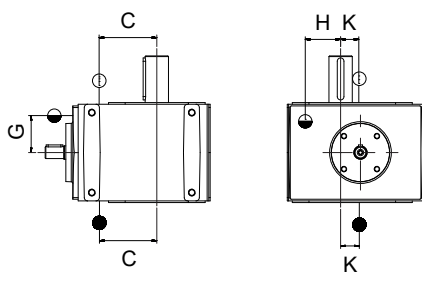

● = oil level screw (oil filler plug)

1) = vent on S. 3 possible with custom design

2) = possible on S. 1 with custom design

3) = either on S. 2 or S. 4

Worm helical gear units and worm helical geared motors E/M 112/113–212/213

Mounting position 1	Mounting position 2	Mounting position 3
		
Mounting position 4	Mounting position 5	Mounting position 6
		
Vent filter:		
		

Size	A	B	C	D	E	F	G	H	I	K	L
112/113	15	25	88	22	40.5	70	36.5	35	55	25	25
212/213	-17.5	25	146.5	22	50	72	40	-85	65	25	77.5

Size 012 without vent

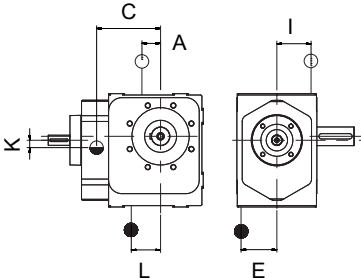
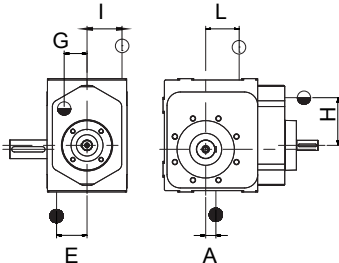
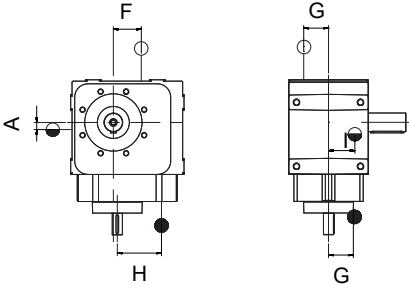
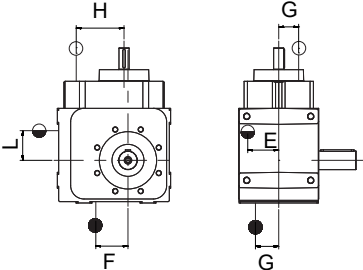
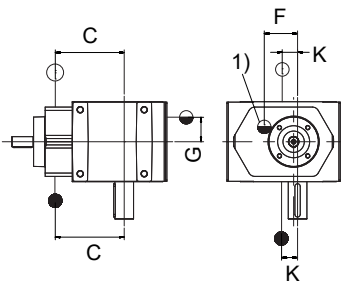
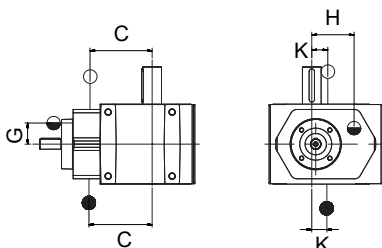

1) = across from drive side

○ = vent filter

● = oil drain

◐ = oil level screw (oil filler plug)

Worm helical gear units and worm helical geared motors E/M 312/313–512/513

Mounting position 1	Mounting position 2	Mounting position 3
		
Mounting position 4	Mounting position 5	Mounting position 6
		
Vent filter: 		

Size	A	B	C	D	E	F	G	H	I	K	L
312/313	20	32	153	28	80	65	55	95	80	30	75
512/513	20	32	225	28	82.5	110	77.5	115	115	50	90

- 1) = across from drive side
○ = vent filter
● = oil drain
◐ = oil level screw (oil filler plug)

7.2 Lubrication of bevel gear units and variants

Lubrication instructions must be precisely followed. Performing maintenance on a regular basis will ensure the highest degree of operational safety and result in a long service life for your gear unit. Never use mineral oil when changing the oil in a ZAE gear unit designed for operation with synthetic lubricants. The same thing applies to the reverse case.

Synthetic lubricants should not be mixed with mineral oil lubricants. Also, not all synthetic lubricants can be mixed with other types of synthetic lubricant. Be sure to maintain cleanliness during filling; use a filter or a fine filter screen where required. The correct oil level has been reached as soon as oil starts dripping out of the hole for the oil filler plug (W and MW 110 to 260; E and M 222 to 523).

ZAE gear units that use synthetic lubricants can be used under normal operating conditions over long periods without requiring an oil change – an oil change is recommended after approx. 15,000 service hours or after five years at the latest. The synthetic oils listed in the lubricant selection chart afford high output, reduce friction, have a very good viscosity-temperature profile, and offer excellent protection against wear. They are also very resistant to aging. Synthetic gear unit oils can be used at temperatures ranging from -30 °C to +140 °C. Special-grade seal rings are required for extreme conditions.

Mineral oils have lower performance capabilities. An oil change is recommended after approx. 3000 to 4000 service hours. Gear unit friction and wear are measurably higher for these oils than for synthetic lubricants. The maximum temperature may not exceed 90 °C.

The gear unit should be checked at lengthy intervals for oil loss. If the oil has to be topped up, one of the synthetic lubricants specified on the rating plate should be used. The required oil viscosity varies depending on speed. This applies equally to polyglycols, polyalphaolefins, ester oils, and mineral oils:

Speed of High-Speed Shaft in min ⁻¹		Gear Unit Size and ISO VG Lubricant Viscosity					
From	To	088	110	136	156	199	260
2000	3000	100					
1500	2000						
1000	1500	220					
750	1000						
500	750						
250	500						
To	250						

Bevel helical gear unit types E/M/S 222–523 are usually filled with ISO VG 220 lubricants.

7.2.1 Lubricant amounts

Bevel gear units and bevel geared motor types W, MW, and SW

Gear Size	088	110	136	156	199	260
Approx. Filling Amount (in Liters)	0.15	0.3	0.55	0.75	2.2	4.5

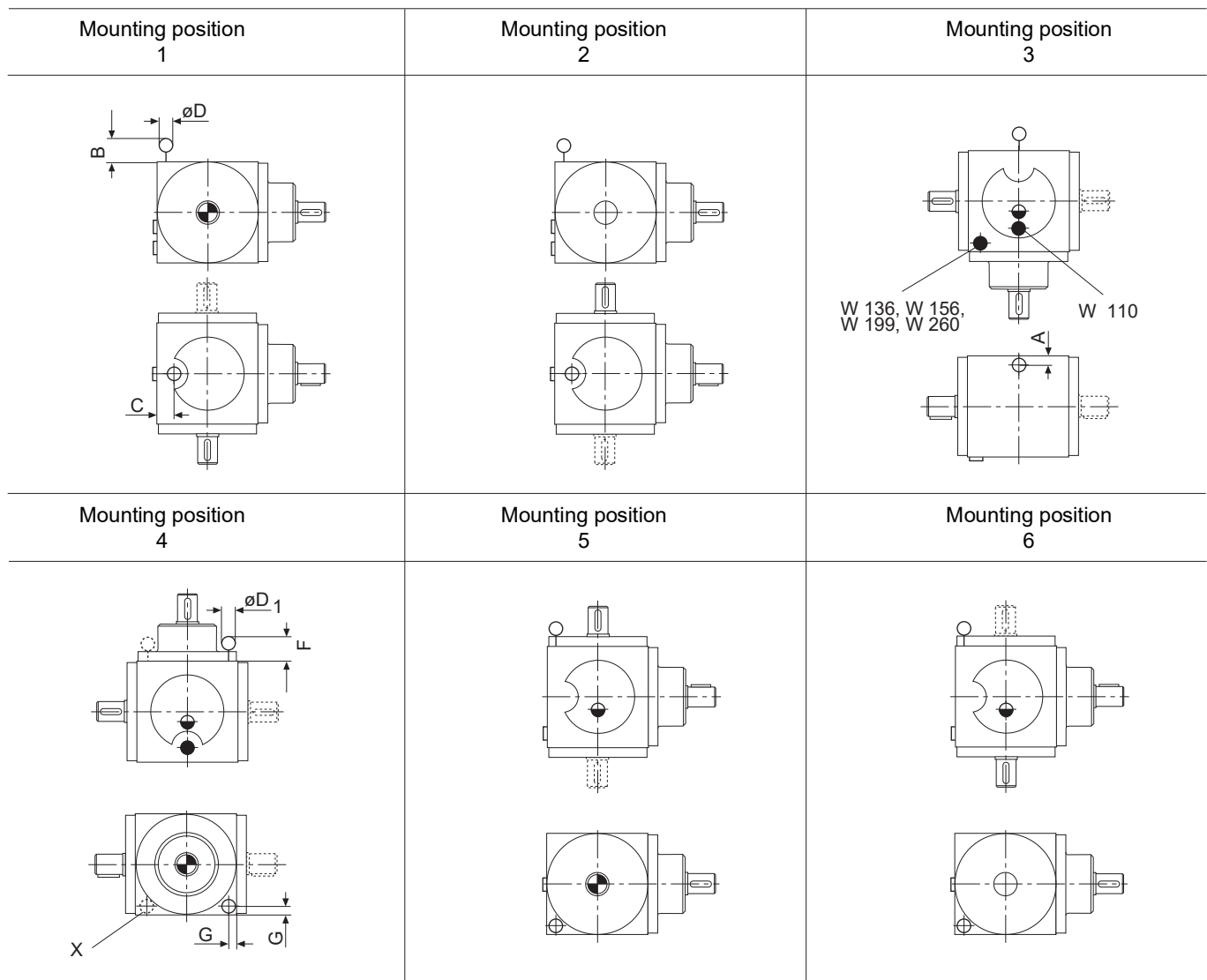
The lubricant amounts specified apply to the mounting positions and ratios for which the greatest amounts of oil are required. The oil level screw (oil filler plug) is the measuring point in all cases; the correct oil level must be checked using the oil level screw.

Bevel helical gear unit types E, M, and S

Size	Mounting Position					
	1	2	3	4	5	6
222	2.1	2.4	2.9	3.5	2.4	1.8
322	4.5	5.3	5.8	8.4	5.3	4.4
422	7.2	8.0	8.9	12.1	8.5	8.2
522	13.5	15.6	17.5	23.9	15.4	13.4
223	2.0	2.3	2.7	3.3	2.3	1.7
323	4.3	5.0	5.5	8.0	5.0	4.2
423	6.9	7.6	8.5	11.5	8.1	7.8
523	12.9	14.9	16.7	22.8	14.7	12.8

7.2.2 Mounting positions for vent filters and oil fittings

Bevel gear units and bevel geared motor types W, MW, and SW 110–260



Size	A	B	C	D	D ₁	F	G
110	20	19.5	20	22	13.2	23	11
136	25	26	25	28	13.2	22	15.5
156	26	26	26	28	22	24.5	17
199	28	26	28	28	28	35.5	20
260	28	26	28	28	28	35.5	25

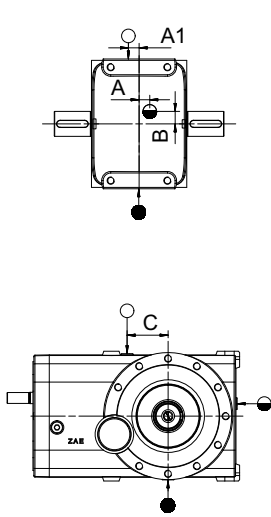
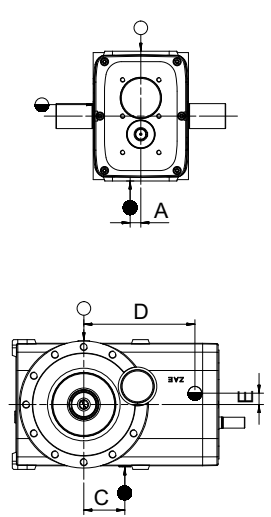
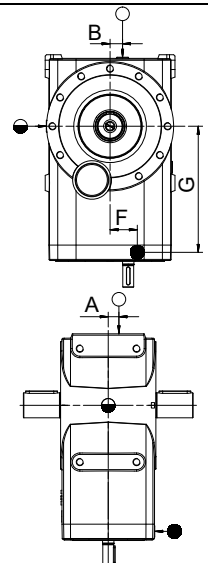
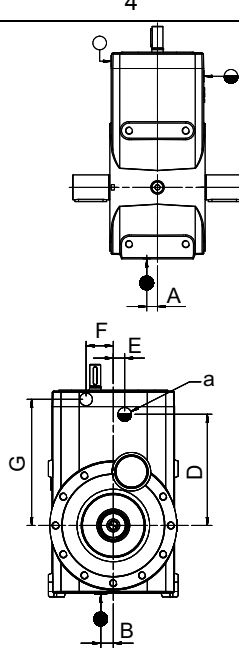
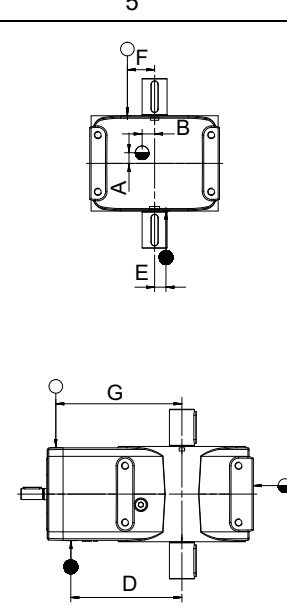
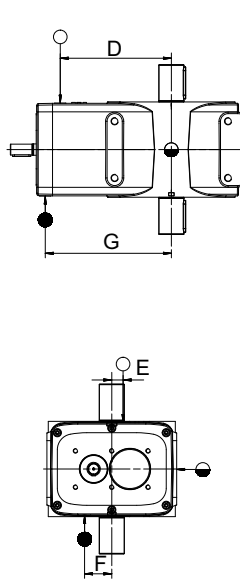
○ = vent filter

● = oil drain

◐ = oil level screw (oil filler plug)

X = position of vent filter for design type 0002

Bevel helical gear units and bevel helical geared motors E/M/S 222–523

Mounting position 1	Mounting position 2	Mounting position 3
		
Mounting position 4	Mounting position 5	Mounting position 6
		

Size	A	B	C	D	D ₁	F	G
110	20	19.5	20	22	13.2	23	11
136	25	26	25	28	13.2	22	15.5
156	26	26	26	28	22	24.5	17
199	28	26	28	28	28	35.5	20
260	28	26	28	28	28	35.5	25

○ = vent filter







● = oil drain

◐ = oil level screw (oil filler plug)

X = position of vent filter for design type 0002

a = on the back

7.3 Lubricants and manufacturers

Lubricant type	Quality/ ISO VG						
H2 lubricants (standard industrial lubricants)							
Mineral oils	CLP 100	Alpha SP 100	Optigear 1100/100	Renolin CLP 100	Klüberoil GEM 1-100 N	Mobilgear 600 XP 100	Omala S2 G 100
	CLP 220	Alpha SP 220	Optigear 1100/220	Renolin CLP 220	Klüberoil GEM 1-220 N	Mobilgear 600 XP 100	Omala S2 G 220
	CLP 460	Alpha SP 460	Optigear 1100/460	Renolin CLP 460	Klüberoil GEM 1-460 N	Mobilgear 600 XP 100	Omala S2 G 460
	CLP 680	Alpha SP 680	Optigear 1100/680	Renolin CLP 680	Klüberoil GEM 1-680 N	Mobilgear 600 XP 100	Omala S2 G 680
Poly-α-olefins	CLP HC 100	-	-	Renolin Unisyn CLP 100	Klübersynth GEM 4-100 N	-	Omala S4 GX 100
	CLP HC 220	Alphasyn EP 220	Optigear Synthetic PD 220	Renolin Unisyn CLP 220	Klübersynth GEM 4-100 N	Mobil SHC Gear 220	Omala S4 GX 220
	CLP HC 460	Alphasyn EP 460	Optigear Synthetic PD 460	Renolin Unisyn CLP 460	Klübersynth GEM 4-100 N	Mobil SHC Gear 460	Omala S4 GX 460
	CLP HC 680	Alphasyn EP 680	Optigear Synthetic PD 680	Renolin Unisyn CLP 680	Klübersynth GEM 4-100 N	Mobil SHC Gear 680	Omala S4 GX 680
Esters	CLP E 100	-	-	-	Klüberbio CA 2-100	-	-
	CLP E 220	Performance Bio GE 220 ESS	-	Plantogear 220 S	Klübersynth GEM 2-220	-	Naturelle Gear Fluid EP 220
	CLP E 460	-	-	Plantogear 460 S	Klüberbio CA 2-460	-	Naturelle Gear Fluid EP 460
	CLP E 680	-	-	-	-	-	-
Polyglycols	CLP PG 100	-	Optigear Synthetic 800/100	Renolin PG 100	Klübersynth GH 6-100	Glygoyle 100	-
	CLP PG 220	Alphasyn PG 220	Optigear Synthetic 800/220	Renolin PG 220	Klübersynth GH 6-220	Glygoyle 220	Omala S4 WE 220
	CLP PG 460	Alphasyn PG 460	Optigear Synthetic 800/460	Renolin PG 460	Klübersynth GH 6-460	Glygoyle 460	Omala S4 WE 460
	CLP PG 680	Alphasyn PG 680	Optigear Synthetic 800/680	Renolin PG 680	Klübersynth GH 6-680	Glygoyle 680	Omala S4 WE 680
Greases (roller bearings + radial shaft seals)		Spheerol EPL 2	Tribol GR 100-2 PD	RENOLIT LZR 2 H	CENTOPLEX 2 EP	Mobilgrease XHP 222	Gadus S2 V220 2
H1 lubricants (NSF-registered products for the food industry)							
Poly-α-olefins	CLP HC 100	-	Optileb GT 100	Cassida HF 100	Klüberoil 4 UH1-100 N	-	-
	CLP HC 220	-	Optileb GT 220	Cassida HF 220	Klüberoil 4 UH1-220 N	Mobil SHC Cibus 220	-
	CLP HC 460	-	Optileb GT 460	Cassida HF 460	Klüberoil 4 UH1-460 N	Mobil SHC Cibus 460	-
	CLP HC 680	-	Optileb GT 680	Cassida HF 680	Klüberoil 4 UH1-680 N	Mobil SHC Cibus 680	-

Polyglycols	CLP PG 100	-	-	-	Klübersynth UH1 6-100	-	-
	CLP PG 220	-	Optileb GT 1800/220	Cassida WG 220	Klübersynth UH1 6-220	Glygoyle 220	-
	CLP PG 460	-	Optileb GT 1800/460	Cassida WG 460	Klübersynth UH1 6-460	Glygoyle 460	-
	CLP PG 680	-	Optileb GT 1800/680	Cassida WG 680	Klübersynth UH1 6-680	Glygoyle 680	-
Greases (roller bearings + radial shaft seals)		-	Optileb GR UF 2	-	Klübersynth UH1 14-222	Mobilgrease FM 222	-

Due to limited space, not all products are listed in the table. Lubricants from other manufacturers such as Total, Lubcon, or Bechem or alternative products from the listed manufacturers can be requested from ZAE-AntriebsSysteme or the respective lubricant producers. If in doubt about use of alternative products in ZAE gear units, please consult ZAE-AntriebsSysteme to avoid problems.

7.4 Troubleshooting

If you detect any malfunctions during operation, please try to determine what types of malfunctions are present and remedy them with the help of the following guide. If you are not able to eliminate the malfunction, please contact Customer Care (see back cover).

Symptom	Possible cause	Remedy
Oil is leaking: <ul style="list-style-type: none"> On the drive side of the shaft seal ring On the output side of the shaft seal ring On the gear unit cap On the motor flange On the motor shaft seal ring 	A Shaft seal ring defective or shaft damaged B O-ring on gear unit cap leaking C Surface seal damaged D Gear unit not bled	A + B Call Customer Care C Tighten screws on gear unit cap and observe gear unit If oil continues to leak: call Customer Care D Vent gear unit
Oil is leaking from the air bleed valve	A Too much oil in gear unit B Drive inserted in wrong mounting position/air bleed valve in wrong position C Frequent cold start (oil foams)	A Correct the amount of oil (see 7) B Mount air bleed valve correctly (see designs) and correct oil level C Check oil viscosity and oil level
Unusual, constant running noise	A Meshing/grinding noise: bearing damage B Knocking noise: irregularity in gear toothing	A + B Check oil, change bearing, call Customer Care
Unusual, irregular running noise	Foreign substances in oil	Check oil, shut down gear unit, call Customer Care
Unusually high housing temperatures	A Insufficient oil B Gear tooth system or bearing defective	A Check oil level/correct B Call Customer Care
Output shaft is not rotating even though motor is running or drive shaft is being rotated	Shaft-hub connection or gear tooth system broken	Send in gear unit/gear unit motor for repair

See the back cover of the manual for customer care contact details

7.5 Operation in hazardous areas



Gear unit housing, gear mounting bases, and mounting flange

The components are designed so that internal and external forces occurring during operation under rated operating conditions can be absorbed with a sufficient level of safety. Unit thermal performance has been designed so that surface temperatures do not exceed 135 °C under permissible operating conditions at a maximum ambient temperature of 40 °C.

The thermal limits as well as the maximum circumferential speeds of toothed wheels and shafts under radial shaft seals are taken into account in the specified performance data. This serves to prevent damage due to thermal overloading and insufficient lubrication.

Our ZAE catalog contains design guidelines, including rated data T2perm. and operating factors (fOM, fSF, fT, fON), which must be observed by the operator. Be sure that there is no excessive loading and that any damages (e.g., cracks) in the housing wall are detected in a timely manner by conducting regular inspections. Additional holes drilled in the housing wall at a later time must be appropriately secured. Also make sure that no fasteners come loose or are damaged on the cover locks during operation.



Torque supports

The torque supports are designed so that external forces occurring during operation under rated operating conditions can be absorbed with a sufficient level of safety; their surfaces reach the maximum housing temperature.

Make sure that no overloading occurs, the fasteners remain tight during operation, and the compensation bushings perform their compensating function.



Static seals

The seals can be damaged due to mechanical, thermal, or chemical factors or due to loosening of mounting elements such as screws and retaining rings and therefore stop working; lubricant may leak out.

If lubricant is lost due to improper use or overloading, excessive temperatures will occur and moving parts in the gear unit will be damaged.



Dynamic seals

All seals (radial shaft seals) are mounted in accordance with manufacturer instructions. The designated operating conditions also comply with manufacturer instructions. Guidelines for sealing edge overtemperature are given by the manufacturer and state that for shaft speeds of up to 3000 min⁻¹, the overtemperature of the sealing edge with respect to the oil sump will not exceed 40 K if the housing is vented and the seal ring is sufficiently lubricated. Dynamic seals are wear parts for which there is currently no definitive information on service life available.

During operation the sealing point/surface (radial shaft seal/shaft surface) can become damaged internally and externally due to the effects of force, acids, basic solutions, solvents, certain oils, and UV rays as well as dust and dirt. Excessively high temperatures and corrosion during operation can also cause damage to the sealing points (surfaces).

During operation be sure to check that sealing points/surfaces are clean and free of damage.



Vents

The vents are designed to keep the internal pressure of the housing within the permissible range. This function contributes to keeping the surface temperature from exceeding 135 °C under permissible operating conditions. Leaving out a vent that has been designated as part of the design can only take place after the specific conditions of operation have been clarified and ZAE consulted.



Bearings

All roller bearings must have oil or lifetime grease lubrication. Additional loading can be avoided through following of all roller bearing manufacturer instructions and optimal bearing arrangement and adjustment. The calculated service life for these conditions is at least 8000 hours for all gear units. After that, the bearings must be inspected and may need to be replaced.

The surface temperatures in the bearing regions cannot exceed 135 °C under the permissible service conditions at an ambient temperature of 40 °C. In addition, the bearings on the fast-running drive side are cooled by the oil.

Continuous or intermittent torsional load spikes can lead to premature failure of a roller bearing. Lateral forces introduced via shafts from the outside by wheels, friction rollers, gear wheels, or pulleys may also damage the bearings. Take measures to ensure that the gear unit is not exposed to loads in excess of the allowable loads specified by the manufacturer.

Dust and dirt from the outside or inside can also damage the roller bearings.



Shafts and shaft-hub connections

No additional heat is generated by the shaft-hub connection. The shafts are designed for long-term operation under the rated conditions. Failure of the material used to make the shaft is not to be expected under the permissible service load conditions.

The operator must ensure that no overloads, torsional load spikes, or additional radial loads (e.g., from attached wheels, friction rollers, gear wheels, or pulleys) exceeding allowable levels occur.

The form-fit shaft-hub connections (keys, spline shafts, fitting screws, and locating pins) are designed for long-term operation under the rated conditions. Care should be taken to ensure that the spline and key shafts are sufficiently lubricated and that overloads due to periodic or constant torsional load spikes, resulting in excessive shear and compressive stresses, are avoided.

The interference-fit shaft-hub connections (longitudinal and transverse press-fit connections, glue shrink-fit connections) are designed for long-term operation under the rated conditions.

A single instance of torsional overloading of an interference-fit shaft-hub connection can dramatically reduce the transmittable torque. Additional axial and bending loads also reduce the resistance of the connection.

It must be ensured that permissible torque values and forces are not exceeded.



ZAE motor couplings and servo couplings

The ZAE coupling includes both form-fit and interference-fit connections and is durably designed. If required, the interference-fit connection can be secured by pins.

Intermittent or continuous torsional load spikes may lead to the failure of a ZAE motor coupling due to excessive shear and compressive stresses. Be sure to avoid overloading due to impermissibly high torques.

The servo couplings used by ZAE have type-examination certification for use in categories 2G and 2D.



Friction clutches

No additional heat is generated by the friction clutch as long as it is not permanently applied. Only if the set torque is exceeded do relative movements occur, generating additional heat.

Constant slipping must be prevented when a friction clutch is used. This can be achieved through temperature and slip monitoring and appropriate shutoff mechanisms.

Repeated occurrence of torque overload or constant torque overload of a friction coupling can reduce the transmittable torque.

Ensure that the permissible torque values are not exceeded and that the coupling is correctly set.



Locking rings and frictional shaft-hub locking devices

No additional heat is generated by the locking rings or frictional shaft-hub locking devices. The connections are durably designed for long-term operation under rated conditions. Constant slipping can result in considerable heat buildup. The locking ring parts should not come into contact with stationary parts. Narrow, open gaps must be prevented in dusty areas. Locking rings must be covered using suitable design measures.

A single instance of torsional overloading of a frictional locking ring or a frictional shaft-hub locking device can dramatically reduce the transmittable torque. Additional axial and bending loads also reduce the resistance of the connection.

Ensure that the permissible torque values and forces are not exceeded.



Gear wheels

The calculated service life under rated torque conditions is at least 12,000 hours. After that, the gear sets must be checked and, if necessary, replaced.

Failure of the gear wheel material is not to be expected under the permissible service load conditions.

Intermittent or continuous torsional load spikes may lead to failure of tooth flank faces or roots. If no break occurs during overloading, at least a temperature rise is to be expected.

Be sure to avoid overloading, especially due to impermissibly high torques.



Lubricants

Gear units for use in potentially explosive atmospheres may only be filled with synthetic polyglycol-based oils. The flash point is generally above 250 °C for the recommended lubricants. Certain types of lubricant are recommended and the lubricant amounts specified for this type of application.

The recommended lubricants are equally appropriate for lubricating gear tooth systems, roller bearings, and seals. Lubricants undergo an aging process and become increasingly contaminated over the course of their service lives. This degrades the lubricant properties. For this reason, lubricants can only be used for a limited period and must be changed at given intervals. The maximum

useful life depends on the type of lubricant and the service demands made on the lubricant; however, it is at least 15,000 service hours. The lubricant must be changed after this period or after five years at the latest.

The type of lubricant used plays a decisive role in temperature and wear behavior.

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

When adding lubricant, only use the lubricant stated on the rating plate. When switching to a new lubricant during an oil change, first rinse the gear unit housing with the new lubricant.

It is the responsibility of the operator to use an appropriate lubricant. Recommendations can be found in Section 7.3.

8. Inspection and maintenance

8.1 General information

A ZAE gear unit will run reliably for many years under rated operating conditions. After commissioning, the gear unit should still be checked, cleaned, and serviced at regular intervals.

The intervals for inspection and maintenance are highly dependent on the application: a drive that is only required for occasional positioning tasks in a clean environment at room temperature requires less effort than a drive being used at high temperatures in three-shift operations involving a dirty environment.

Inspection and maintenance intervals will normally be the same as the intervals specified by the manufacturer for the entire machine or unit. In some applications, sensors are deployed on the drives to continuously monitor the condition (current consumption, torque values, temperatures, and vibrations).

In any case, a drive should be checked and maintained on a regular basis. The following checks should be made in the process:

- Contamination
- Condition of housing, covers, and fasteners
- Condition and function of vents
- Seal ring and cover leaks
- Bearing noise
- Gear tooth system noise
- Shaft-hub connections and couplings
- Temperature on the housing surface
- Oil dripping and oil level
- Overall condition of lubricant (oil samples)
- Motor noise and current consumption
- Recommended oil change intervals

These measures ensure the operational capability of your machine or assembly unit, prevent unexpected malfunctions, and minimize the risk of accidents.

8.2 Inspection and maintenance in hazardous areas



Gear unit housing

Perform regular checks to ensure that the fasteners on the gear housing and the cover locks are not loose or damaged and that any cracks in the housing wall resulting from overloading or extreme shocks are detected in a timely manner. In addition, care should be exercised that the oil level screw is not exposed to force and that any damage is detected in a timely manner because failure to detect this may lead to loss of oil.

Dust and layers of dirt on the housing surface may interfere with heat dissipation and thus cause impermissible temperature buildup.

Ensure that surfaces are checked and cleaned at regular intervals.

The ingress of dust and dirt into the housing will impair the lubricating performance and lead to damage of the moving parts; this will lead to wear and an increase in temperature.

Take appropriate measures to ensure that no dust or dirt enters the housing during maintenance work or cleaning. If contamination is suspected, at least the lubricant should be changed, the temperature checked, and a check for gear unit noise made. If a large quantity of foreign substances enters the gear unit, the unit must be cleaned or replaced by a qualified specialist.

There should be no oil leaking out of the housing during normal operation. If improper operation or overloading causes there to be loss of lubricant, this will cause overheating and damage to moving parts.

Monitor and inspect the housing on a regular basis to detect and stop any lubricant leaks. If a significant loss of lubricant is suspected, the cause of the leak should be eliminated, the specified lubricant added, the temperature checked, and gear unit noise checked.



Gear mounting bases, mounting flanges, and torque supports

Ensure that no overloading of the gear mounting bases, the mounting flanges, or the torque supports (or their compensating bushings) occurs and that any part damage is detected in a timely manner by performing inspections on a regular basis.



Seals

The elastomeric materials of the seal rings are not resistant to some gear unit oils and greases. These oils and greases should not be used; otherwise damage to the elastomer will result.

Only lubricants specified on the rating plate or given in the manufacturer specifications may be used.

Take appropriate measures and perform regular checks to ensure that sealing points keep functioning (cleanliness of the sealing point, no insufficient lubrication due to loss of oil) and that any lubricant leaks are detected in a timely manner. If a significant loss of lubricant is suspected, the cause of the leak should be eliminated, the specified lubricant added, the temperature checked, and gear unit noise checked.

Lubricants may only be added by specialized personnel.



Vents

The effects of force, excessive lubrication or the wrong type of lubricant, or dust and dirt may impair the vent function, causing the internal housing pressure to increase and the temperature to rise accordingly.

Ensure that the vent is free of damage and operational and perform regular checks for contamination and any lubricant leakage. If a significant loss of lubricant is suspected, the cause of the leak should be eliminated, the specified lubricant added, the temperature checked, and gear unit noise checked.



Bearings

Ensure that the loads on the gear unit comply with the permissible loads specified by the manufacturer. Performing regular checks of temperature, noise, and lubrication will prevent sudden failure. Replacement is recommended after the service life has been reached. Roller bearing repairs may only be performed by specialized personnel.



Gear shafts

The gear shafts may not be subjected to overloading conditions. Be sure that any cracks in the shaft resulting from overloading are detected in a timely manner by performing regular inspections.



Shaft-hub connections

Overloading due to impermissibly high torque values is to be avoided for all shaft-hub connections (form-fit and interference-fit connections). In addition, make certain that form-fit connections are sufficiently greased and that a check is regularly made of the greasing. Shaft-hub connections must be regularly checked for unacceptable play and to determine transmittable torque values.



ZAE motor couplings

Ensure that overloading resulting from impermissibly high torque values is avoided and perform regular checks of the greasing completed during installation.

ZAE motor couplings must be regularly checked for unacceptable play and damages and to ensure reliable torque transmission.



Friction clutches

Friction couplings must be checked on a regular basis to determine transmittable torque values. Any existing slip or temperature monitoring system must also be checked regularly to ensure proper function.



Gear wheels

Ensure that the maximum loads on the gear unit comply with the permissible loads specified by the manufacturer. Performing regular checks of temperature, noise, and lubrication will prevent sudden failure. Replacement is recommended after the service life has been reached. Repairs may only be performed by specialized personnel.

Only lubricants specified on the rating plate or given in the manufacturer specifications may be used. Lubricants may only be changed and/or added by specialized personnel.



Lubricants

Only lubricants specified on the rating plate or given in the manufacturer specifications may be used. Ensure that the amount is adequate. Regular inspection of the lubricant amount and the sealing points is recommended.

Lubricants may only be changed and/or added by specialized personnel. Please see 7. for recommended change intervals.

Dust, dirt, and water in the lubricant can severely impair the lubrication of the moving parts.

Make sure that no excessive dust or dirt deposits collect at sealing points or vents. There should be no ingress of dust, dirt, or water into the gear unit. When cleaning the unit, make sure not to point any high-velocity cleaning jets directly at seals or vents. The operator must perform regular checks to ensure that sealing points and vents remain free of damage. A defective sealing point or vent must be assessed and repaired or replaced by qualified personnel.

Perform inspections on a regular basis to ensure that any lubricant leakage is detected and eliminated in a timely manner. If a significant loss of lubricant is detected, the specified lubricant should be added, the temperature checked, and gear unit noise checked.

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

When switching to a new lubricant during an oil change, first rinse the gear unit housing with the new lubricant.



Fans

Check and clean the gear unit fans on a regular basis because dust and dirt deposits in a fan reduce its cooling performance and may lead to unacceptable heat buildup due to friction.

9. Electric motors

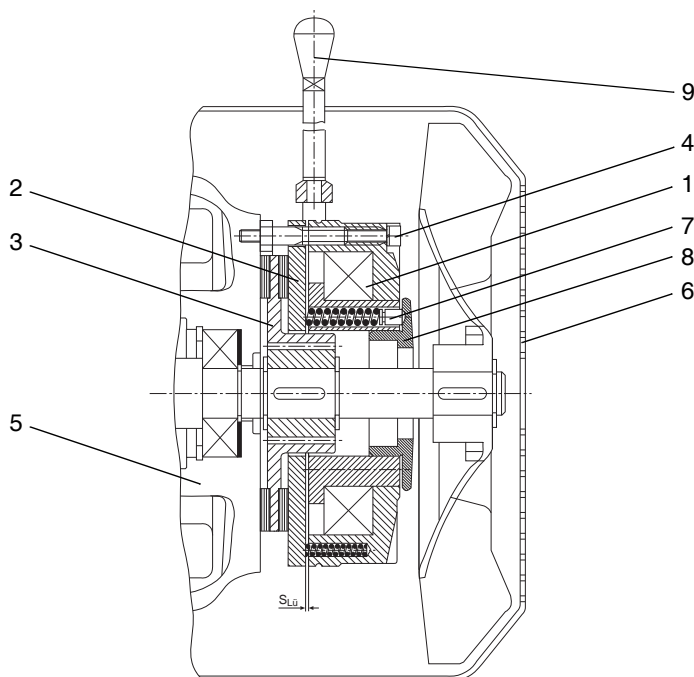
9.1 Brake motors

Brake motors are equipped with spring-applied brakes (mounted between motor end shield and fan blade) underneath the fan shroud. When the motor is started the brake is supplied with DC voltage via an appropriate rectifier.

The spring-applied brake is an electromagnetic power off brake consisting of a magnet (1), an armature disk (2), and a brake rotor (3). It is fastened with screws (4) to the end shield (5) and enclosed in a fan shroud (6). The motor end shield serves as a braking surface. In a current-free condition, the compression springs (7) press the armature disk (2) against the brake rotor (3) and the brake rotor against the motor end shield (5). Braking torque is produced on both friction surfaces by a frictional clamping force. When the motor is started the magnet coil is excited and the magnet (1) attracts the armature disk (2) with a magnetic force that opposes the spring force. The brake rotor (3) is released. Braking torque can be reduced by a maximum of 40% by means of the adjustment ring (8).

Manual release knob

The manual release knob is used to release the brakes manually and is available as an accessory.



- | | | |
|-----------------|--------------|-----------------------|
| 1 Magnet | 4 Screws | 7 Compression spring |
| 2 Armature disk | 5 End shield | 8 Self-aligning ring |
| 3 Brake rotor | 6 Fan shroud | 9 Manual release knob |

Braking voltage assignment

Braking voltage is normally designed to match the motor delta voltage (i.e., motor 230/400 V

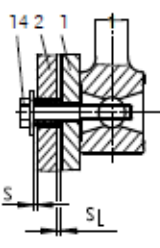
$\Delta / \text{Y} = \text{brake coil control } 230 \text{ V AC}$).

For motors that use star-delta starting and on pole-changing motors, the braking voltage is designed according to the phase voltage of the main power supply from the grid.

$$\left(\text{Phase voltage} = \frac{\text{Nominal voltage}}{\sqrt{3}} \right)$$

Air gap

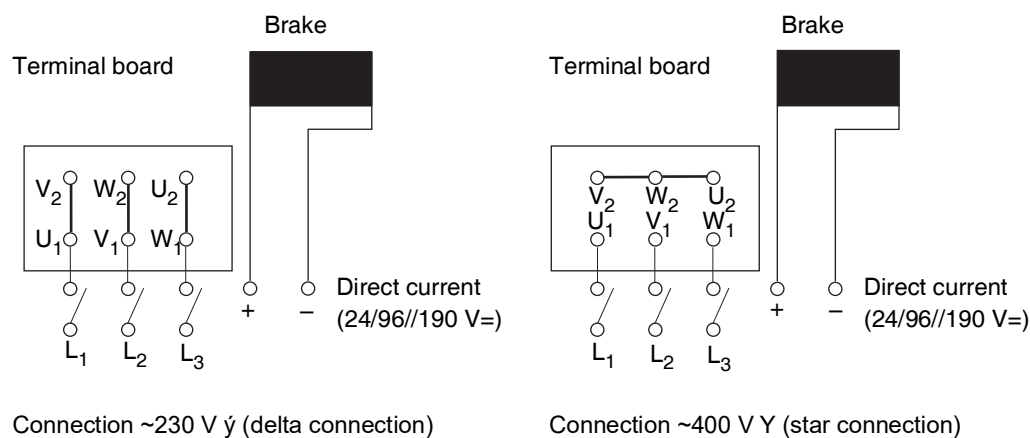
The air gap G_a should be checked from time to time. Wear on the surfaces of the rotor subjected to friction depends upon the masses to be braked, the rotational speeds, and the frequency of switching. Upon reaching $G_{a \text{ max.}}$ (see table), adjust the air gap to G_a .

Typ		$s_L \text{ (mm)}$	$s + 0.1 \text{ (mm)}$	$s + s_L \text{ (mm)}$
BFK458-06		0.2	1	1.2
BFK458-08				
BFK458-10				
BFK458-12				
BFK458-14				
BFK458-16				
BFK458-18				
BFK458-20		0.3	1.5	1.8
BFK458-25		0.4	2	2.4
		0.5	2.5	3

Special seals to prevent ingress of dust, dirt, and moisture

For operation under extreme conditions of dust, airborne fibres, dirt, and water as well as intermittent operation in connection with frost, an enclosed brake version is available (optionally on request).

Wiring diagrams

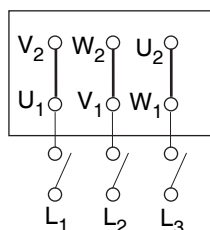


9.2 Three-phase motors

Motors complying with IEC standards as well as custom-built motors can be delivered as three-phase motors. The data specified on the rating plate must be heeded during electrical connection work.

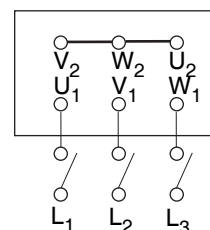
Wiring diagrams

Terminal board



Connection ~230 V Δ (delta connection)

Terminal board



Connection ~400 V Y (star connection)

9.3 Use in hazardous areas



Geared motors and geared brake motors

When geared motors for use in potentially explosive atmospheres of category 2 G/D are supplied, a category 2 G/D gear unit will have a motor intended for operation in a category 2 G/D atmosphere mounted with an EC type examination. Reduced radial runout, axial runout, and coaxiality tolerances as per DIN 42955 – R should be used. The appropriate operating manual is enclosed. The gear unit and the motor each receive a rating plate indicating designation for category 2G/D.

If a motor is being replaced, the user must ensure that the replacement motor is also designed for 2G/D category applications (EC type examination), has the appropriate marking (including documentation), and complies with the reduced radial runout, axial runout, and coaxiality tolerances set out in DIN 42955 – R.



Gear units without motors

In cases where a gear unit without a motor is ordered for category 2G/D, as the user, you are responsible for ensuring that the motor is in compliance with category 2 G/D applications (designated for category 2G/D and EC type examination including documentation and reduced radial runout, axial runout, and coaxiality tolerances set out in DIN 42955 – R).



If, as the user, you choose to mount the motor on the gear unit yourself, be sure that the motor shaft axle and the input shaft of the gear unit are in alignment.

10. Recycling

End-of-life ZAE drives should be disassembled and the parts sorted and sent to the appropriate recycling facilities. ZAE can assist its customers in disposal, if so desired.

The following components contain the main recyclable materials:

- Housing parts (steel, cast iron, and aluminium)
- Gear wheels (steel and bronze)
- Motors (steel, cast iron, aluminium, copper, rare earths)
- Lubricants (petrochemical raw materials)

Seal materials are special waste products that cannot be recycled. If so desired, ZAE can assume the task of proper disposal of these materials.

11. Declaration of conformity

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 ZAE Schneckengetriebe, ZAE Schnecken-Stirnradgetriebe, ZAE Stirnrad-Schneckengetriebe, ZAE Kegelradgetriebe und ZAE Kegel-Stirnradgetriebe jeweils 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 worm gear units, ZAE worm helical gear units, ZAE helical worm gear units, ZAE bevel gear units and ZAE bevel helical gear units each type standard 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: DIN EN 1127-1:2019,
DIN EN IEC 60079-0:2018 DIN EN 60529:2014,
DIN EN ISO 80079-36:2016, DIN EN ISO 80079-37:2016**

Applicable standard: DIN EN 1127-1:2019,
DIN EN IEC 60079-0:2018 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):

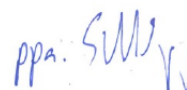
ZAE – AntriebsSysteme GmbH & Co KG will archive the required documents according to 2014/34/EU, Appendix VIII at the following location (IBExU ATEX 152/03):

**IBExU Institut für Sicherheitstechnik GmbH, Fuchsmühlenweg 7,
D-09599 Freiberg**

Hamburg, den 02.03.2020



ppa. Markus Riester
Manager, Quality Assurance



ppa. Kaj Sellschopp
Manager, Development & Construction

Declaration of conformity

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 ZAE Schneckengetriebe, ZAE Schnecken-Stirnradgetriebe, ZAE Stirnrad-Schneckengetriebe, ZAE Kegelradgetriebe und ZAE Kegel-Stirnradgetriebe jeweils 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 worm gear units, ZAE worm helical gear units, ZAE helical worm gear units, ZAE bevel gear units and ZAE bevel helical gear units each type standard 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: DIN EN 1127-1:2019,
DIN EN IEC 60079-0:2018 DIN EN 60529:2014,
DIN EN ISO 80079-36:2016, DIN EN ISO 80079-37:2016**

Applicable standard: DIN EN 1127-1:2019,
DIN EN IEC 60079-0:2018 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, Fuchsmühlenweg 7,
D-09599 Freiberg**

Hamburg, den 02.03.2020



ppa. Markus Riester
Manager, Quality Assurance



ppa. Kaj Sellschopp
Manager, Development & Construction

Declaration of conformity

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 ZAE Schneckengetriebemotoren, ZAE Schnecken-Stirnradgetriebemotoren, ZAE Stirnrad-Schneckengetriebemotoren, ZAE Kegelradgetriebemotoren und ZAE Kegel-Stirnradgetriebemotoren jeweils 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 worm gear motors, ZAE worm helical gear motors, ZAE helical worm gear motors, ZAE bevel gear motors and ZAE bevel helical gear motors each type standard 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: DIN EN 1127-1:2019,
DIN EN IEC 60079-0:2018 DIN EN 60529:2014,
DIN EN ISO 80079-36:2016, DIN EN ISO 80079-37:2016**

Applicable standard: DIN EN 1127-1:2019,
DIN EN IEC 60079-0:2018 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, Fuchsmühlenweg 7,
D-09599 Freiberg**

Hamburg, den 02.03.2020



ppa. Markus Riester
Manager, Quality Assurance



ppa. Kaj Sellschopp
Manager, Development & Construction

Declaration of conformity

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 ZAE Schneckengetriebemotoren, ZAE Schnecken-Stirnradgetriebemotoren, ZAE Stirnrad-Schneckengetriebemotoren, ZAE Kegelradgetriebemotoren und ZAE Kegel-Stirnradgetriebemotoren jeweils 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 worm gear motors, ZAE worm helical gear motors, ZAE helical worm gear motors, ZAE bevel gear motors and ZAE bevel helical gear motors each type standard 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: DIN EN 1127-1:2019,
DIN EN IEC 60079-0:2018 DIN EN 60529:2014,
DIN EN ISO 80079-36:2016, DIN EN ISO 80079-37:2016**

Applicable standard: DIN EN 1127-1:2019,
DIN EN IEC 60079-0:2018 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, Fuchsmühlenweg 7,
D-09599 Freiberg**

Hamburg, den 02.03.2020

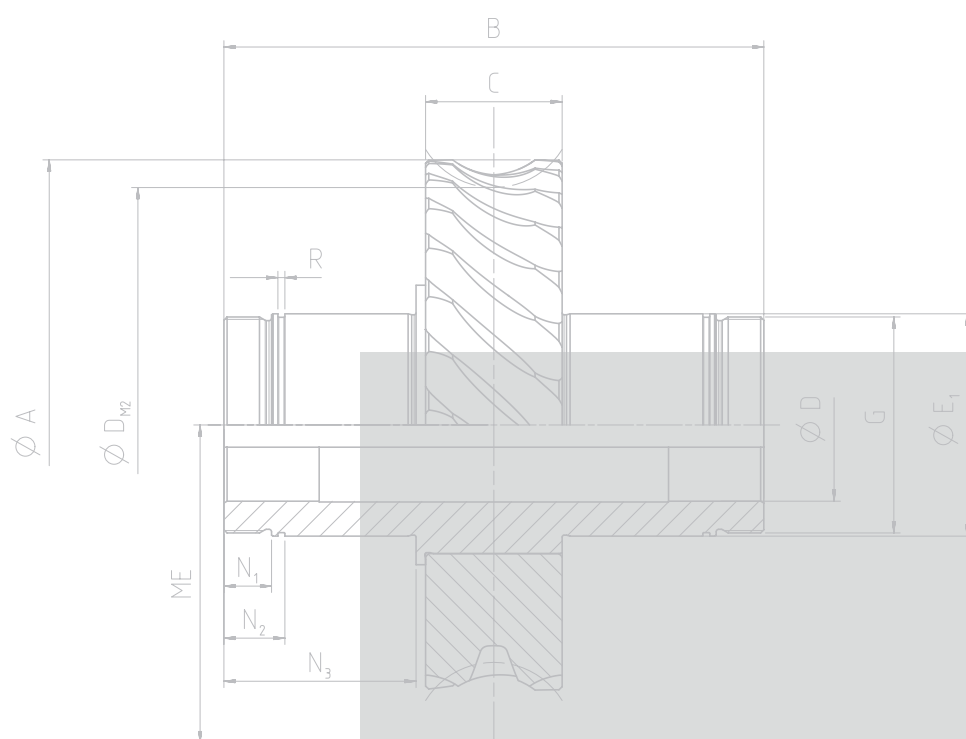


ppa. Markus Riester
Manager, Quality Assurance



ppa. Kaj Sellschopp
Manager, Development & Construction

Notes:



ANTRIEBSSYSTEME

ZAE-AntriebsSysteme GmbH & Co KG

Schützenstraße 105
D-22761 Hamburg

Tel. +49 (0) 40 853 93 03
Fax. +49 (0) 40 853 93 232

E-Mail info@zae.de
Web www.zae.de