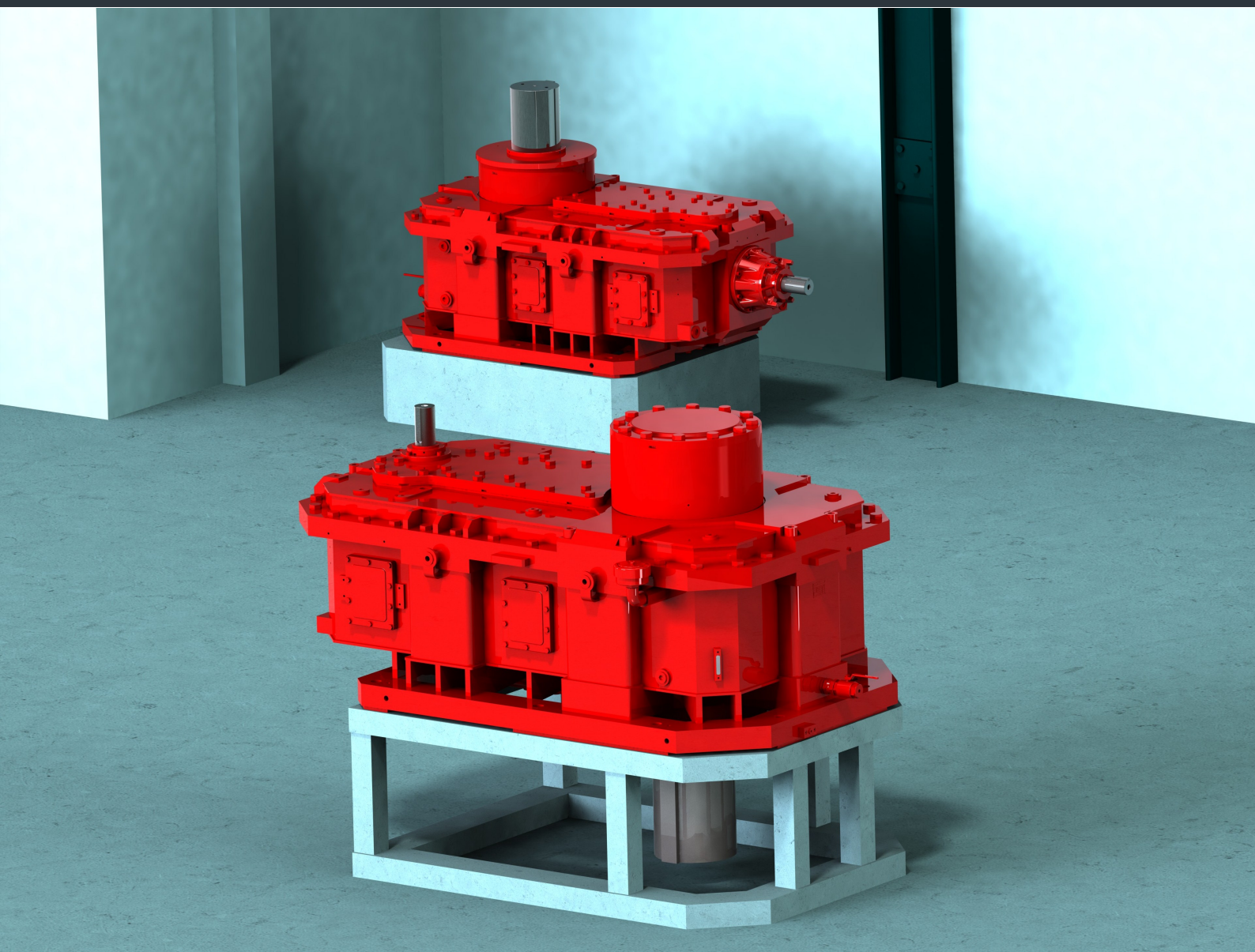
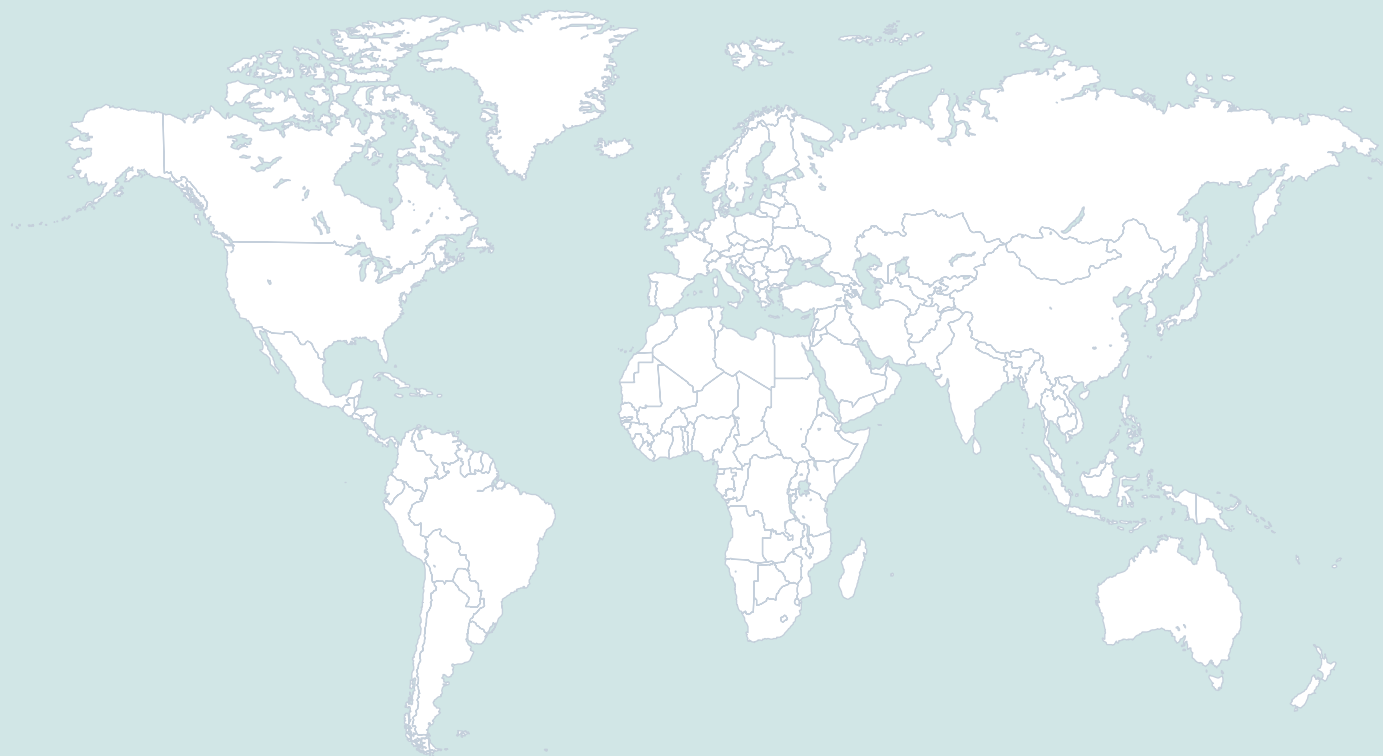


Installation and Operating Instructions



Industrial Gear Units
Helical and Bevel-Helical Gear Units
ML..V..N Series
Vertical mounting position
Torque classes from 150 kNm - 823 kNm





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1. Important Notes

Safety and warning instructions

Always follow the safety and warning instructions in this operating instruction !



Electrical hazard

Possible consequences: Severe or fatal injuries.



Hazard

Possible consequences: Severe or fatal injuries.



Hazardous situation

Possible consequences: Slight or minor injuries.



Harmful situation

Possible consequences: Damage to the drive and the environment.



Important information about explosion protection.



Tips and useful information.

A requirement of fault-free operation and fulfillment of any rights to claim under guarantee is that you adhere to the information in the operating instructions. Consequently, read the operating instructions before you start working with the gear unit!

The operating instructions contain important information about servicing; as a result, they should be kept in the vicinity of the gear unit.



- It is essential to contact **SEW-EURODRIVE** regarding a subsequent change of mounting position!
- The industrial gear units of the **ML..V..N** series are delivered without oil fill. Refer to the information on the nameplate!
- Refer to the instructions in the sections "Mechanical Installation" and "Startup"!

Waste disposal



Follow the current instructions:

- Housing parts, gears, shafts and anti-friction bearings of the gear units must be disposed of as steel scrap. The same applies to gray cast iron castings unless there are separate collection arrangements.
- Collect waste oil and dispose of it correctly.



2. Safety Notes

Preliminary remarks

The following safety notes are primarily concerned with the use of industrial gear units of the ML..V..N series. If using gear motors, also refer to the safety notes for motors in the corresponding operating instructions.

Also observe the supplementary safety notes in the individual sections of these operating instructions.

General information

During and after operation, industrial gear units and motors have live and moving parts and their surfaces may be hot.

All work related to transport, storage, setting up/mounting, connection, startup, maintenance and repair may only be performed by trained personnel observing

- the corresponding detailed operating instruction(s) and wiring diagrams,
- the warning and safety signs on the industrial gear unit,
- the specific regulations and requirements for the system and
- national/regional regulations governing safety and the prevention of accidents.

Severe injuries and damage to property may result from

- incorrect use,
- incorrect installation or operation,
- removal of required protective covers or the housing when this is not permitted.



Designated use

Industrial gear units are intended for industrial systems. They correspond to the applicable standards and regulations. The technical data and the information about permitted conditions are provided on the nameplate and in the documentation.

It is essential to observe all specified information!

Transport

Inspect the delivery for any damage in transit as soon as you receive the delivery. Inform the transport company immediately. It may be necessary to preclude startup.

Startup/operation

Check that the direction of rotation is correct in **decoupled** status (also listen for unusual grinding noises as the shaft rotates).

Secure the shaft keys for test mode without drive components. Do not render monitoring and protection equipment inoperative even for test mode.

Switch off the main motor if in doubt whenever changes occur in relation to normal operation (e.g. increased temperature, noise, vibration). Determine the cause; contact SEW-EURODRIVE if necessary.

Inspection/maintenance

Refer to the instructions in Sec. "Inspection and Maintenance."



Safety Notes

Transport of industrial gear units

2.1 Transport of industrial gear units

Transport eyebolts

Lifting point [1] on the main gear unit. They are designed for the weight of the industrial gear unit.

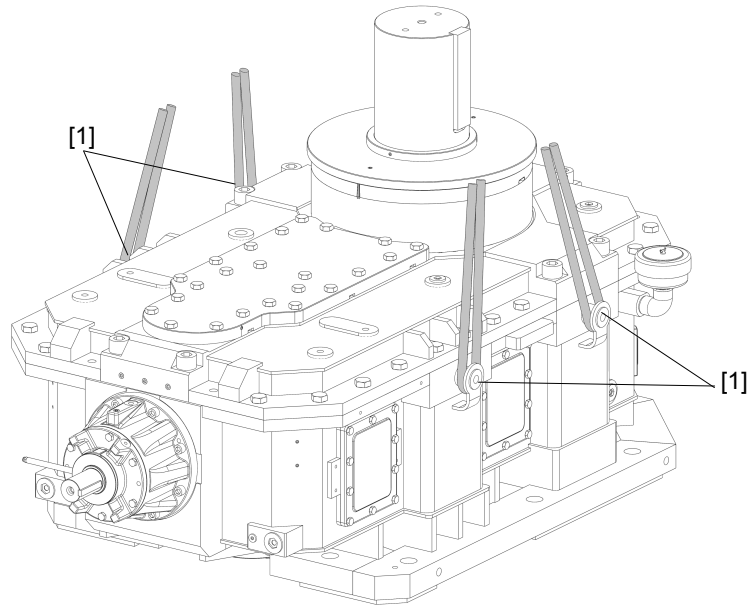


Figure 1: Positions of transport lifting points



- The main gear unit must be lifted using lifting ropes or chains on the four lifting points on the main gear unit. The weight of the gear unit is indicated on the nameplate or the dimension sheet. The loads and regulations specified on the nameplate must always be observed.
- The length of the lifting chains or ropes must be dimensioned in such a way that the angle between the chains or ropes does not exceed 45°.
- Eyebolts on the motor, auxiliary gear unit or primary gear unit must not be used for transport!
- Use suitable, sufficiently rated handling equipment if necessary. Before startup, remove securing devices used for transport.



2.2 Corrosion protection and storage conditions

Overview

Industrial gear units of the ML..V..N series are delivered without oil fill. Observe the corrosion protection required for the various storage periods listed in the following table:

Storage period	Storage conditions	
	Outdoors, under roof	Indoors (dry, warm air, heated if required)
6 months	Standard protection	Standard protection
12 months	Consult with SEW-EURODRIVE	Standard protection
24 months	Long-term protection	Long-term protection
36 months	Consult with SEW-EURODRIVE	Long-term protection
Sea transport, storage in areas close to the sea	Consult with SEW-EURODRIVE	Long-term protection

Standard protection

- The gear unit is delivered on a pallet without cover.
- Protection of the inside of the gear unit: Gear units of the ML..V..N series undergo a test run with protection oil.
- Oil seals and seal surfaces are protected through bearing grease.
- SEW-EURODRIVE applies a protective coating to unpainted surfaces, including spare parts. Before assembly or before other equipment is mounted to such surfaces, the protective coating must be removed. To do so, clean the surface with solvent.
- Small spare parts and loose pieces, such as screws, nuts, etc., are supplied in corrosion protected plastic bags (VCI corrosion protection bag).
- Threaded holes and blind holes are covered by plastic plugs.
- The corrosion protection is not intended for long-term storage or for humid conditions. The operator is responsible for keeping the gear unit in corrosion-free condition.
- The breather plug (Position → Sec. "Symbols and mounting positions") is delivered in a separate bag and has to be mounted before start-up.

**Long-term protection**

- The gear unit is packaged in a seaworthy plywood box and is delivered on a pallet. This way, the gear unit is protected from humidity and shock. SEW-EURODRIVE recommends a seaworthy package if the gear unit will be stored for an extended period of time or if protection against salty air is required.
- Protection of the inside of the gear unit apart from standard protection: A solvent in the form of a vapor phase inhibitor (VPI = Vapor Phase Inhibitor) is sprayed through the oil filling hole (recommended value: 0.5 liters in a 10 % solvent per m³). Inhibitors are volatile, fixed substances that saturate the ambient air with their vapor in closed rooms. If the inside of the gear unit is subjected to such an atmosphere, then an invisible VPI film forms on the components inside the gear unit. This film serves as corrosion protection. After this protection treatment, the solvent vapors (methanol, ethanol) should have evaporated before closing the gear unit. The breather plug (Position → Sec. "Symbols and mounting positions") is replaced with a screw plug. The screw plug must be screwed into the gear unit again before startup. Repeat the long-term protection treatment after 24 or 36 months (→ Overview of corrosion protection conditions).



- **Never open the gear unit near open flames, sparks and hot objects because the solvent vapors might be ignited.**
- **Take preventive measures to protect people from solvent vapors. It is absolutely crucial that open flames are avoided when the solvent is applied and when the solvent evaporates.**
- SEW-EURODRIVE applies a protective coating to unpainted surfaces, including spare parts. Before assembly or before other equipment is mounted to such surfaces, the protective coating must be removed. To do so, clean the surface with solvent.
- Small spare parts and loose pieces, such as screws and nuts are supplied in corrosion protected plastic bags (VCI corrosion protection bag).
- Threaded holes and blind holes are covered by plastic plugs.



3. Gear Unit Design



The following illustrations serve to explain the general design. Their only purpose is to facilitate the assignment of components to the spare parts lists. Discrepancies are possible depending on gear unit size and version!

3.1 Main components of the ML..V..N series

Main components of ML..PV..N series

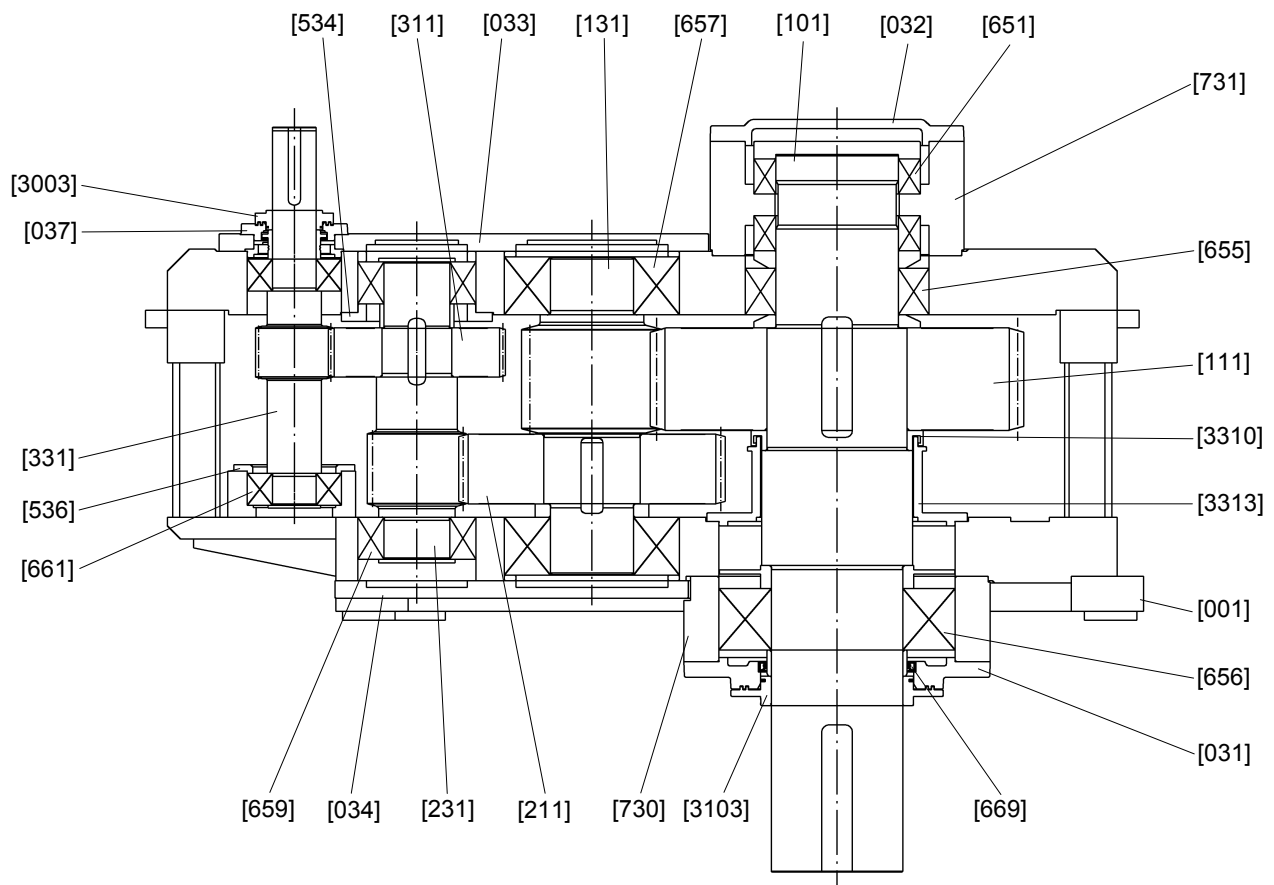


Figure 2: Basic design of the ML..PV..N series

[001] Housing	[031] Cover	[032] Cover	[033] Cover
[034] Cover	[037] Cover	[101] LSS shaft	[111] Gear wheel
[131] Pinion shaft	[211] Gear wheel	[231] Pinion shaft	[311] Gear wheel
[331] Pinion shaft	[651] Bearing	[655] Bearing	[656] Bearing
[657] Bearing	[659] Bearing	[661] Bearing	[534] Bushing
[536] Bushing	[669] Seal	[730] Bearing housing	[731] Bearing housing
[3003] Oil flinger	[3103] Oil flinger	[3310] Oil flinger	[3313] Sleeve



Gear Unit Design

Basic design of the ML..V..N series

Main components of ML..RV..N series

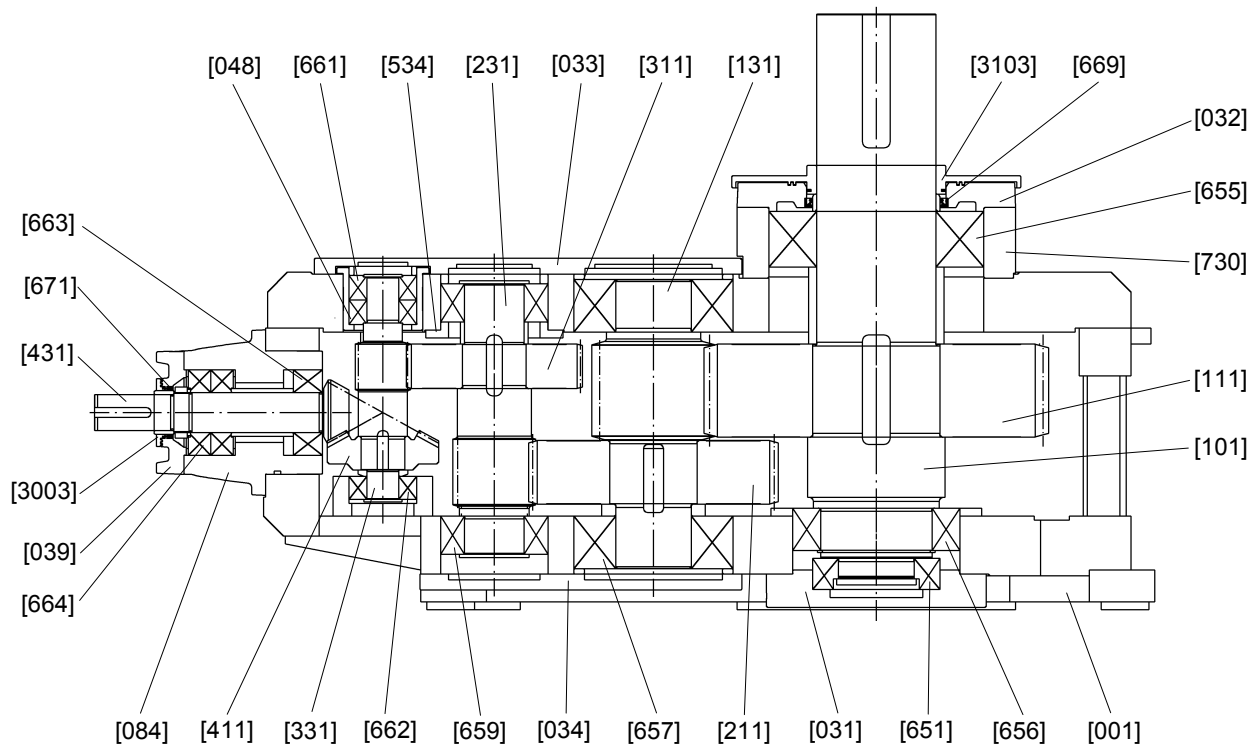


Figure 3: Basic design of the ML..RV..N series

[001] Housing	[031] Cover	[032] Cover	[033] Cover
[034] Cover	[039] Cover	[048] Bearing housing	[084] B.Cover
[101] LSS shaft	[111] Gear wheel	[131] Pinion shaft	[211] Gear wheel
[231] Pinion shaft	[311] Gear wheel	[331] Pinion shaft	[411] Bevel wheel
[431] Bevel pinion	[534] Bushing	[651] Bearing	[655] Bearing
[656] Bearing	[657] Bearing	[659] Bearing	[661] Bearing
[662] Bearing	[663] Bearing	[664] Bearing	[669] Seal
[671] Seal	[730] Bearing housing	[3003] Oil flinger	[3103] Oil flinger

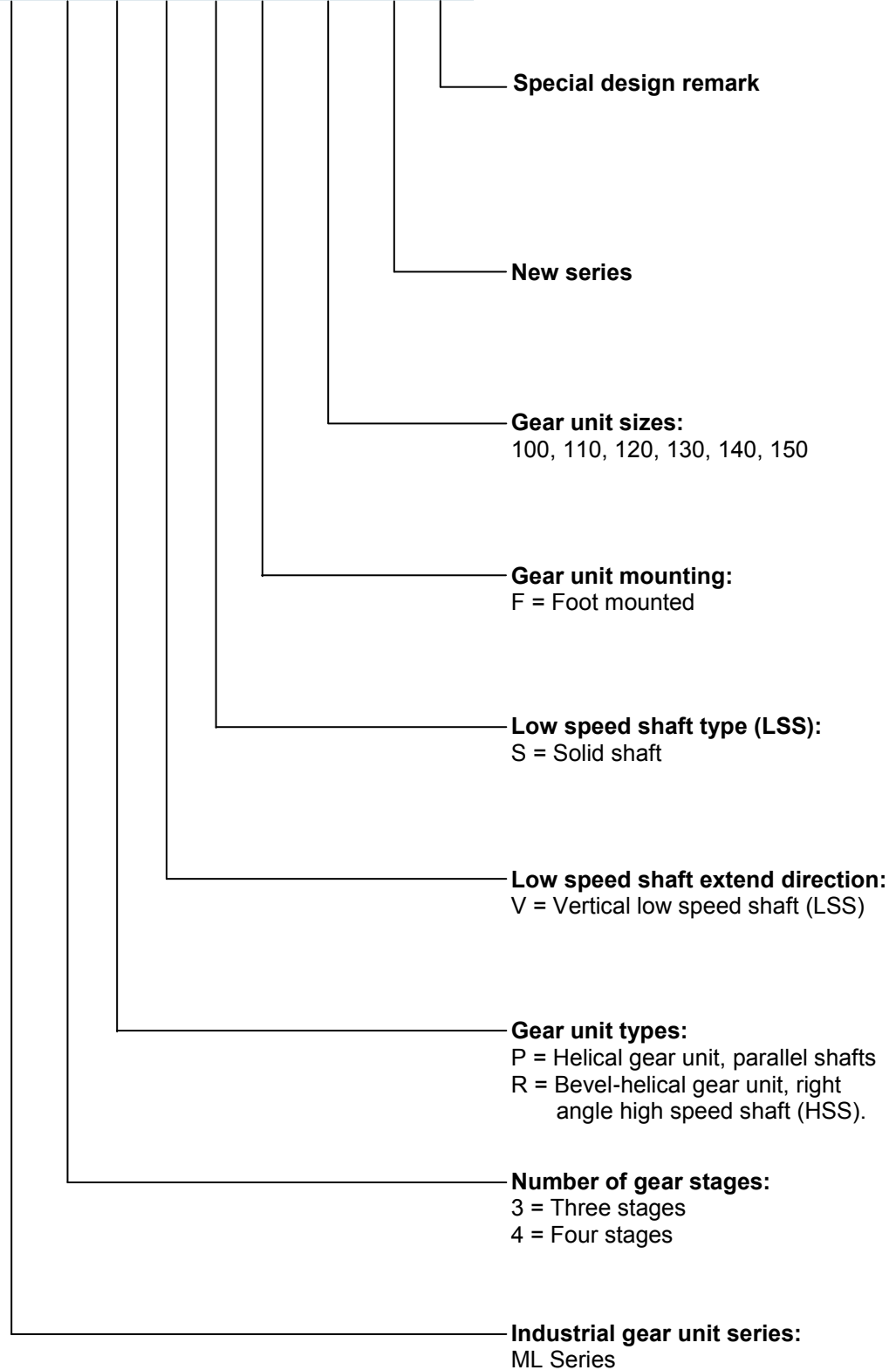


3.2 Unit designation / nameplate

3.2.1 Unit designation

The designation of the gear unit is set up as follows:

ML 3 R V S F 120 N /..





Gear Unit Design

Unit designation / nameplate

3.2.2 Nameplate

Example: Nameplate of the ML..V..N series industrial gear unit, SEW-EURODRIVE.

SEW-EURODRIVE		76646 Bruchsal/Germany	
Type	ML4PVSF120N		
Nr.	25.2000022410.0001-0003.13.75		
PK1	kW	75	i 291.65
MK2	Nm	133000	Fs 2.40
n1	rpm	1480	PM kW 75
n2	rpm	5.1	°C -20/40
IM	Standard		
Made by	SEW	Weight kg	8170 Year 2013
	ISO VG 320	Miner Oil	≈ 190 L

Figure 4: Nameplate

Type		Unit designation
Nr.		Serial number
PK1	[kW]	Operating power on the input shaft (HSS)
MK2	[Nm]	Gear unit output torque
n 1	[rpm]	Input speed (HSS)
n 2	[rpm]	Output speed (LSS)
i		Exact gear unit reduction ratio
Fs		Service factor
PM	[kW]	Motor power
°C	[°C]	Ambient temperature
Weight	[kg]	Weight of the gear unit
Year		Year of manufacture
IM		Mounting position
		Oil grade and viscosity class / oil quantity



3.3 Mounting positions, shaft positions and directions of rotation



The shaft positions (0, 2, 3, 4) and directions of rotation shown in the following figures apply to output shafts (LSS) of the types **solid shaft**. For other shaft positions, contact SEW-EURODRIVE.

3.3.1 Mounting positions, shaft positions

The standard mounting position is horizontal foot mounting.
The following mounting positions and shaft positions (0, 2, 3, 4) are possible:

**Mounting position,
Shaft positions
ML.PV..N series**

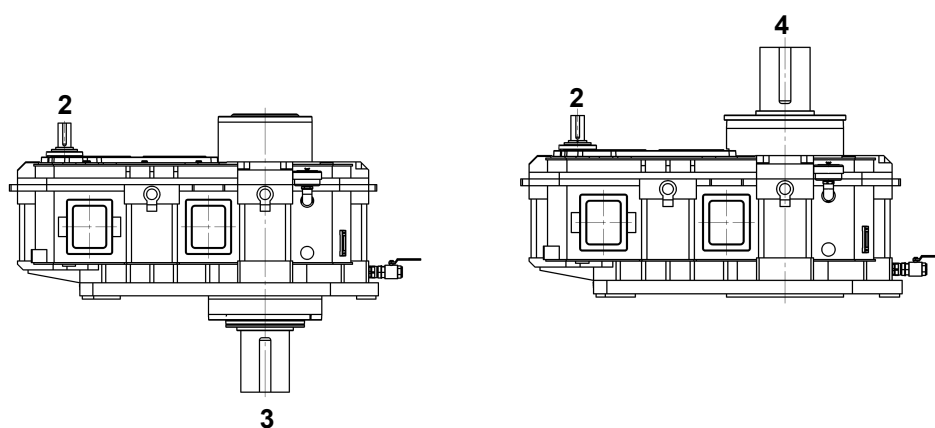


Figure 5: Mounting position and shaft positions of ML..PV..N series

**Mounting position,
Shaft positions
ML.RV..N series**

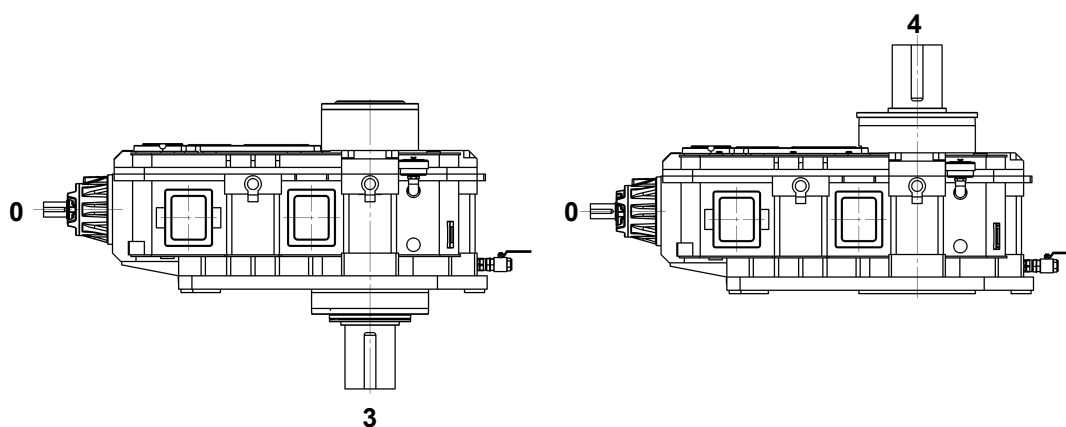


Figure 6: Mounting position and shaft positions of ML..RV..N series



Gear Unit Design

Mounting positions, shaft positions and directions of rotation

3.3.2 Directions of rotation

The directions of rotation of the output shaft

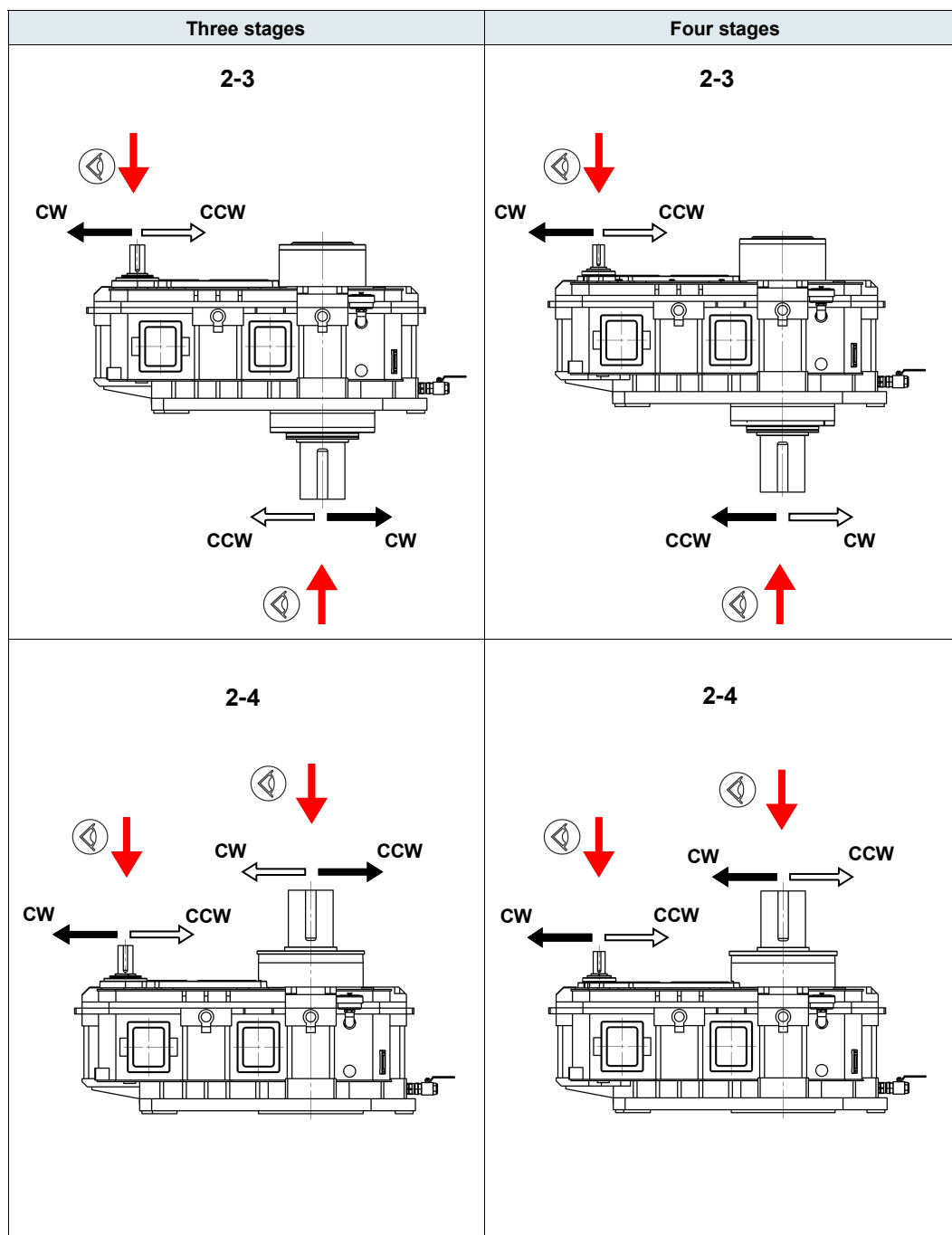
The directions of rotation of the output shaft (LSS) are defined as follows:

Direction of rotation	Gear unit version	
	ML..PV..N ML..RV..N	ML..PV..N ML..RV..N
	Shaft position 23 / 03	Shaft position 24 / 04
Clockwise (CW)		
Counterclockwise (CCW)		



**Shaft positions
and
corresponding
directions of
rotation of
ML..PV..N
industrial gear
units**

The following figures show shaft positions and corresponding directions of rotation for industrial gear units of the ML..PV..N series.



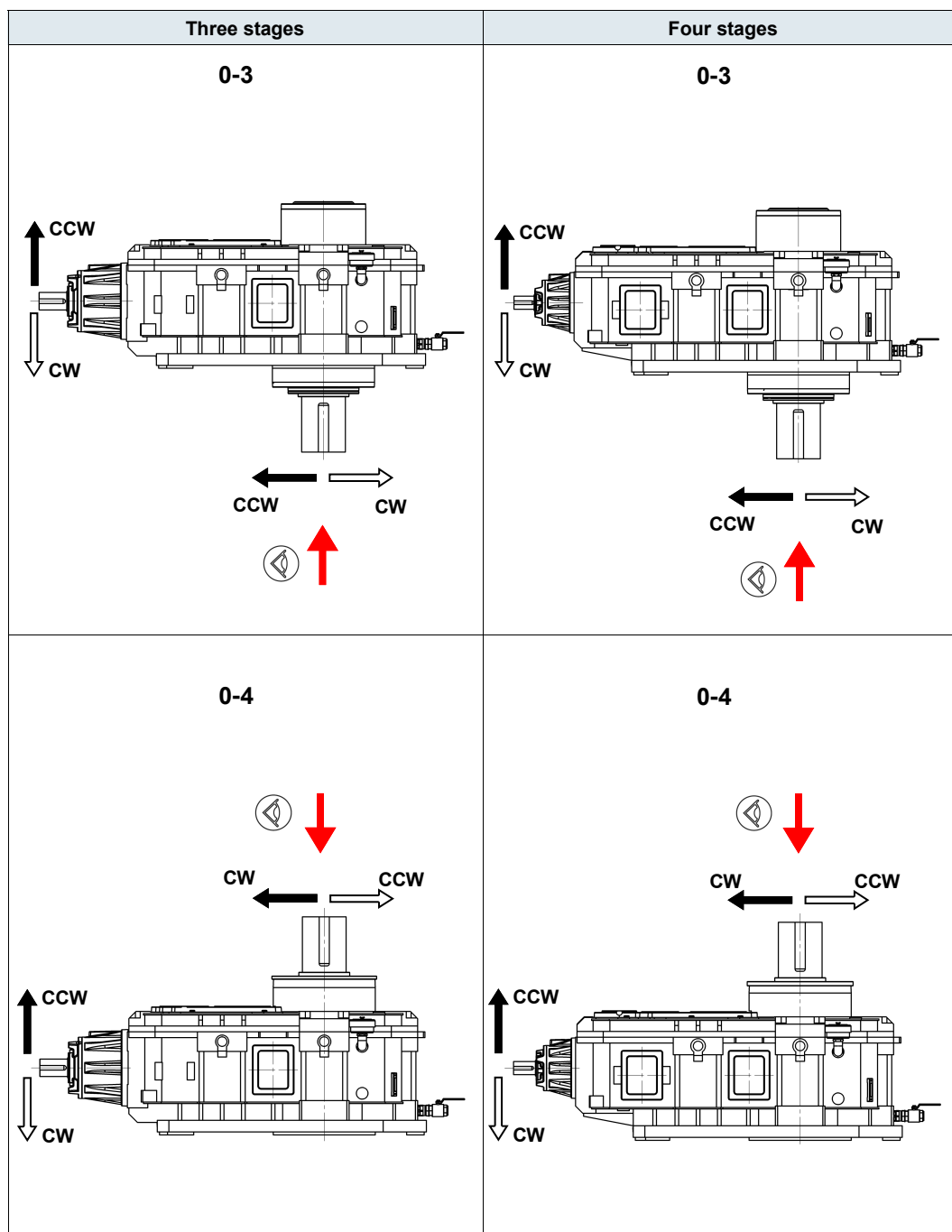


Gear Unit Design

Mounting positions, shaft positions and directions of rotation

**Shaft positions
and
corresponding
directions of
rotation of
ML..RV..N
industrial gear
units**

The following figures show shaft positions and corresponding directions of rotation for industrial gear units of the ML..RV..N series





3.4 Lubrication of industrial gear units

For ML..V..N series gear units in horizontal design, the lubrication types "pressure lubrication" is recommended.

Pressure lubrication

Pressure lubrication is the only option lubrication method for ML..V..N series gear units **disregarding the mounting position.**

With pressure lubrication, the oil level is low. The gearing components and bearings not submerged in the oil bath are lubricated through a shaft end pump (→ Sec. "Shaft end pump"), or, through a motor pump (→ Sec. "Motor pump").







A pressure lubrication system with cooler is used when the thermal rating of the basic gear unit is not sufficient. A cooler is used in operating environments where a fan can not be used or is not sufficient.



3.5 Symbols and Mounting Positions

3.5.1 Symbols used

The following table shows which symbols are used in the subsequent figures and what they mean.

Symbol	Meaning
	Breather plug
	Visual inspection opening
	Oil filling plug
	Oil drain plug / Oil drain valve
	Oil level glass
	Lifting attachment



The positions of the elements are exemplary and cover most of the cases. For exact positions, please refer to the corresponding dimension drawing.



3.5.2 Symbols and mounting positions of ML..V..N series gear units

**Horizontal
mounting
position ML..PV..N**

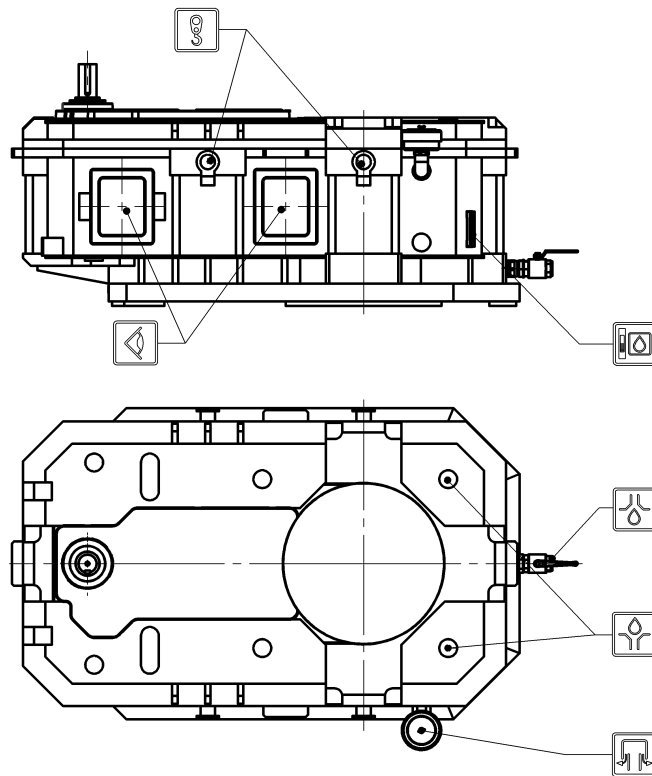


Figure 7: Symbols and mounting positions of ML..PV..N series gear units

**Horizontal
mounting
position ML..RV..N**

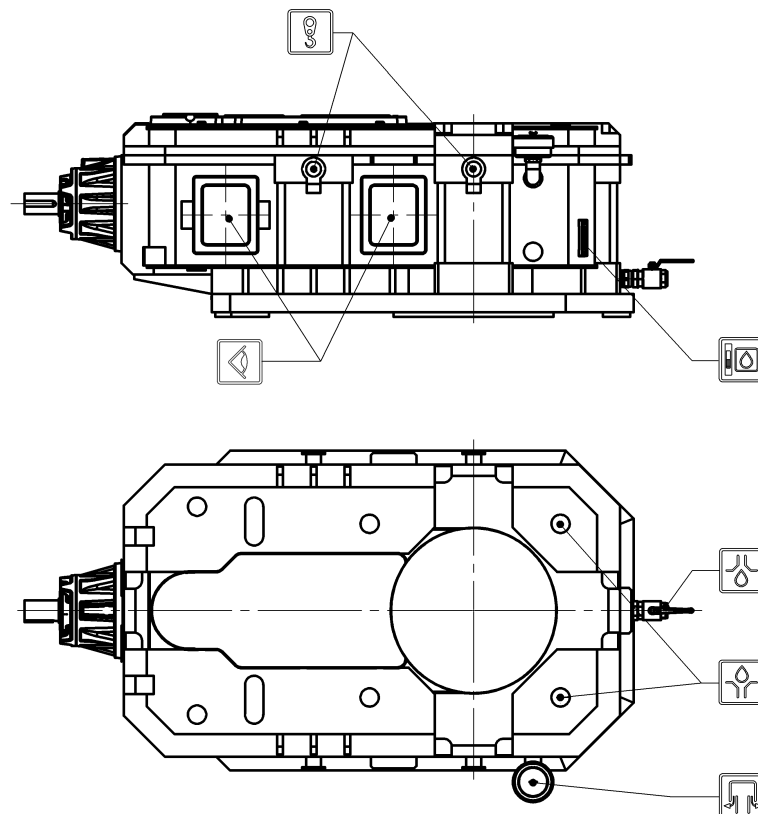


Figure 8: Symbols and mounting positions of ML..RV..N series gear units



4. Mechanical Installation

4.1 Required tools / resources

Not included in the scope of delivery:

- Wrench set
- Torque wrench (for shrink discs)
- Mounting device
- Shims and spacing rings if necessary
- Fasteners for input and output elements
- Lubricant (e.g. NOCO® fluid from SEW-EURODRIVE)
- Securing components according to Sec. "Gear unit foundation"

Installation tolerances

Shaft end
<p>Diametric tolerance in accordance with DIN 748</p> <ul style="list-style-type: none"> • ISO k6 for solid shafts with $\Phi \leq 50$ mm • ISO m6 for solid shafts with $\Phi > 50$ mm • Center hole in accordance with DIN 332, shape DS..

4.2 Before you begin

The drive may only be installed if

- the data on the nameplate of the motor match the supply voltage
- the drive is not damaged (no damage resulting from transport or storage) and
- the following requirements have been properly met:
 - **with standard gear units:**
ambient temperature according to the lubricant table in Sec. "Lubricants" (see standard), no oil, acid, gas, vapors, radiation, etc.
 - **with special versions:**
drive configured in accordance with the ambient conditions (→ order documents)

4.3 Preliminary work

Output shafts and flange surfaces must be completely free of anti-corrosion agents, contamination or other impurities (use a commercially available solvent). Do not let the solvent get in contact with the sealing lips of the oil seals: danger of damage to the material!



4.4 Gear unit foundation

Foundation for foot-mounted gear units

To ensure quick and successful mounting, the type of foundation should be correctly selected and the mounting carefully planned in advance. Foundation drawings with all necessary construction and dimension details should be available.

SEW-EURODRIVE recommends foundation methods shown in the following figures. A customer's own foundation method must be equally adequate.

When mounting a gear unit onto steel framework, special attention should be paid to the rigidity of this framework to prevent destructive vibrations and oscillations. The foundation must be dimensioned according to weight and torque of the gear unit by taking into account the forces acting on the gear unit.

Example :

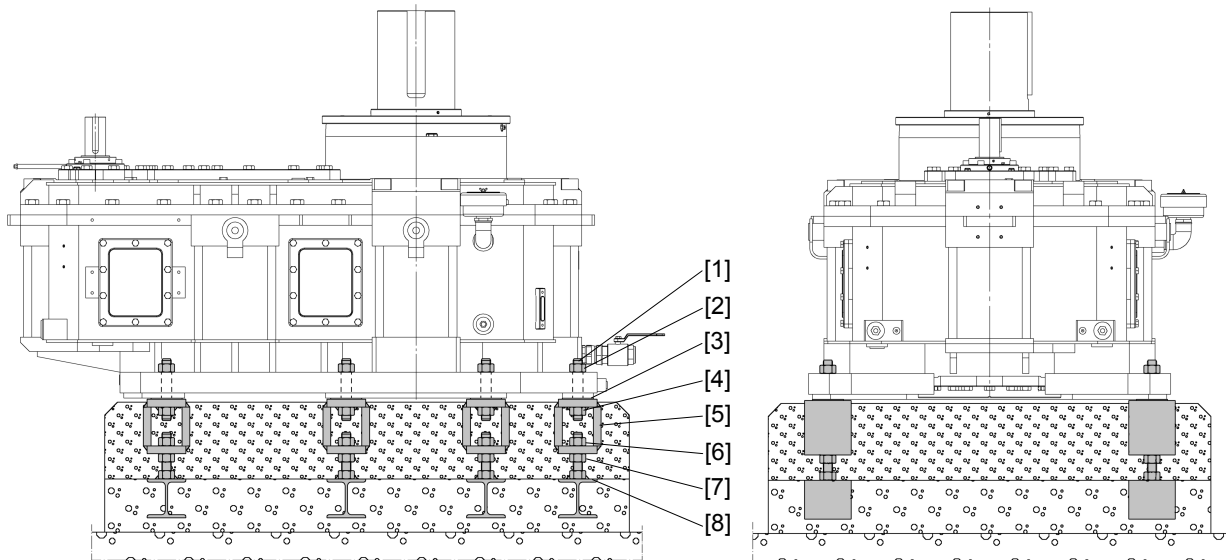


Figure 9: Reinforced concrete foundation for ML..V..N

- [1] Hex head screw or stud
- [2] Hex nut if [1] is a stud or an upside-down screw
- [3] Shims (about 3 mm space for shims)
- [4] Hex nut

- [5] Foundation bracket
- [6] Hex nut
- [7] Hex nut and foundation screw
- [8] Supporting girder



To the vertical downward output shaft, the space must be ensure to avoid the foundation interference with shaft end and all accessories of gear units.



Mechanical Installation

Mounting of solid shaft gear units

Tightening torques

Gear unit size ML..V..N	Screw / Nut	Tightening torque screw / nut [Nm]
100	M42	4070
110		
120	M48	6140
130		
140		
150	M56	9840

4.5 Mounting of solid shaft gear units



Before mounting the gear unit, check the foundation dimensions with those in the corresponding drawings in Sec. "Gear unit foundation."

Mount the gear unit in the following order:

1. Mount the components according to Sec. "Gear unit foundation". The shims [1] (→ Figure 10) facilitate later adjustment and, if necessary, to mount a replacement gear unit.
2. Secure the gear unit at the selected positions on the supporting girders using three foundation screws. Position the foundation screws at maximum possible distance (two screws on one side of the gear unit and one on the other side). Align the gear unit as follows:
 - vertically by lifting, lowering or tilting the unit using the nuts of the foundation screws
 - horizontally by tapping the foundation screws slightly into the required direction
3. After having aligned the gear unit, tighten the three nuts of the foundation screws used for alignment. Carefully insert the fourth foundation screw into the supporting girder and tighten it securely. When doing so, make sure that the position of the gear unit does not change. If necessary, realign the gear unit.
4. Tack-weld the ends of the foundation screws to the supporting girders (at least three welding spots per foundation screw). Tack-weld the foundation screws alternately in both directions (starting from the middle) on each side of the center line of the gear unit. This way, misalignment caused by the welding process is avoided. After having tack-welded all screws, they must be welded all the way round in the above mentioned order. Adjust the nuts on the foundation screws to ensure that the welded foundation screws do not twist the gear unit housing.
5. After having tack-welded the nuts of the retaining screws of the gear unit, check the mounting and carry out grouting.
6. When the grouting concrete has set, check the mounting a last time and adjust, if necessary.



Mounting accuracy when aligning

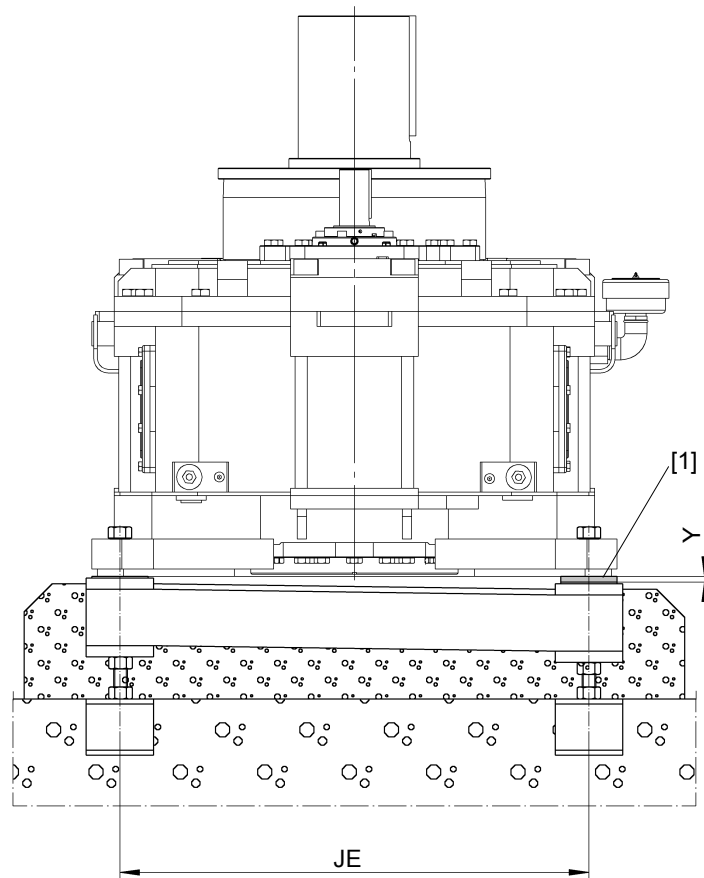


Figure 10: Mounting accuracy when aligning

When aligning the gear unit, make sure that the mounting tolerances for the evenness of the foundation are not exceeded (values y_{\max} in below table). If necessary, use shims [1] to align the gear unit on the foundation plate.

JE [mm]	y_{\max} [mm]
< 400	0.035
400...799	0.06
800...1200	0.09
1200...1600	0.125
1600...2000	0.15

**4.6 Mounting a motor with motor adapter**

Motor adapters [1] are available for mounting IEC motors of sizes 225 to 400 to industrial gear units of the ML..V..N series.

For assembly clearance between motor shaft end and shaft end of the gear unit, please refer to chapter "5.2 Mounting of couplings" or to a separate coupling manual.

The clearance can be checked by opening the inspection cover of the motor adapter.

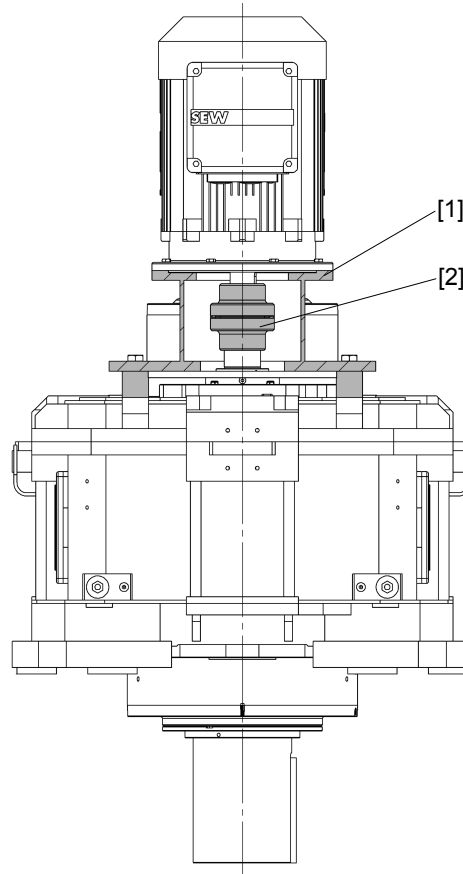


Figure 11: Mounting a motor with motor adapter



For mounting couplings [2], refer to the notes in Sec. "Mounting of couplings."



5. Mechanical Installation Options

5.1 Important installation instructions



Disconnect the motor from the power supply before starting work and secure it against unintentional restart!

Important installation notes



- Only use a mounting device for installing input and output elements. Use the center bore and the thread on the shaft end for positioning purposes.
- **Never mount couplings, pinions, etc. onto the shaft end by hitting them with a hammer (damage to bearings, housing and the shaft!).**
- **Observe correct tension of the belt for belt pulleys (in accordance with manufacturer's specifications).**
- Power transmission elements should be balanced after insertion and must not give



Note:

Installation is easier if you first apply lubricant to the output element or heat it up briefly (to 80 °C - 100 °C).

Adjust the following misalignments when mounting couplings:

- a) Axial misalignment (maximum and minimum clearance)
- b) Offset misalignment (concentric running fault)
- c) Angular misalignment

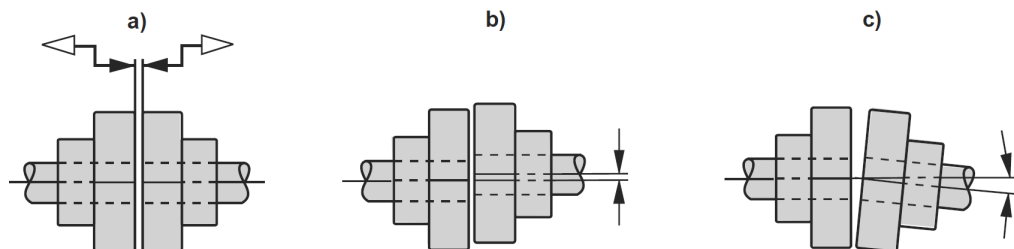


Figure 12: Clearance and misalignment when mounting the coupling



Input and output elements such as couplings must be equipped with a protection cover!



Mechanical Installation Options

Important installation instructions



The following methods for measuring angular and axial misalignment are important for complying with the mounting tolerances specified in Sec. "Mounting of couplings"!

Measuring of angular misalignment with a feeler gauge

The following figure shows the measurement for angular misalignment (α) using a feeler gauge. When using this method, an accurate result is only achieved when the deviation of the coupling faces is eliminated by turning both coupling halves by 180° and the average value is then calculated from the difference ($a_1 - a_2$).

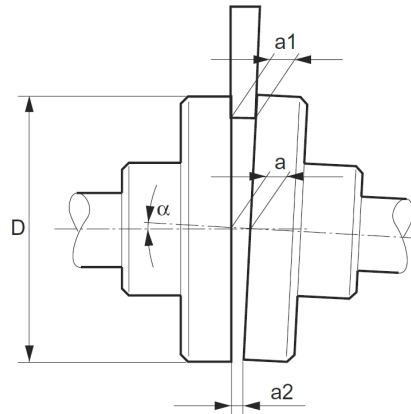


Figure 13: Measuring angular misalignment using a feeler gauge

Measuring of angular misalignment using a micrometer dial

The following figure shows the measurement for angular misalignment using a micrometer dial. This measuring method provides the same result as described under "Measuring angular offset with a feeler gauge" if the **coupling halves are rotated together**, for instance with one coupling pin, so that the needle of the micrometer dial does not move noticeably on the measuring surface.

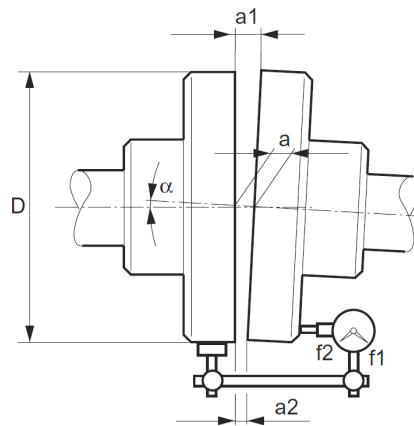


Figure 14: Measuring angular misalignment using a micrometer dial

A prerequisite for this measuring method is that there is no axial play in the shaft bearings when the shafts rotate. If this condition is not fulfilled, the axial play between the faces of the coupling halves must be eliminated. As an alternative, you can use two micrometer dials positioned on the opposite sides of the coupling (to calculate the difference of the two micrometer dials when rotating the coupling).



Measuring of offset misalignment using straight-edge and micrometer dial

The following figure shows the measurement for offset misalignment using a straight-edge. Permissible values for eccentricity are usually so small that the best measurement results can be achieved with a micrometer dial. If you **rotate one coupling half** together with the micrometer dial and divide the deviation by two, the micrometer dial will indicate the deviation and as a result the misalignment (dimension "b"), which includes the offset misalignment of the other coupling half.

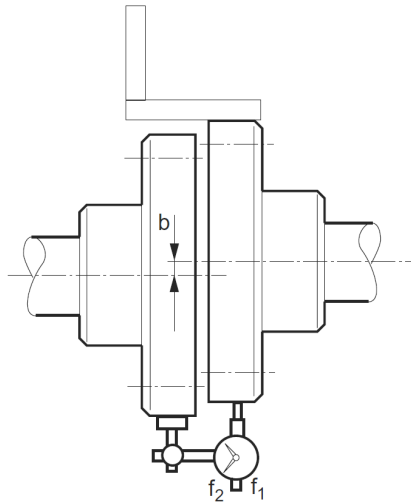


Figure 15: Measuring offset misalignment using straight-edge and micrometer dial

Measuring of offset misalignment using a micrometer dial

The following figure shows the measurement for offset misalignment using a **more accurate measuring method**. The **coupling halves are rotated together** without the tip of the micrometer dial moving on the measuring surface. The offset misalignment is obtained by dividing the deviation indicated on the micrometer dial (dimension "b").

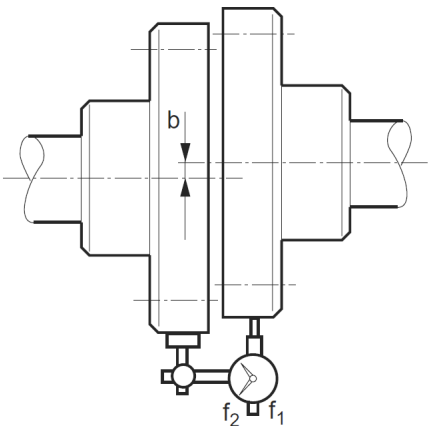


Figure 16: Measuring offset misalignment using a micrometer dial

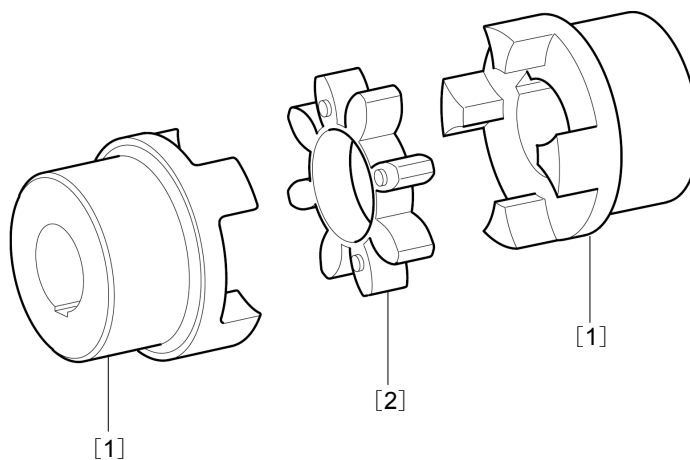
**5.2 Mounting of couplings****ROTEX coupling**

Figure 17: Design of the ROTEX coupling

[1] Coupling hub

[2] Ring gear

The low-maintenance, elastic ROTEX coupling is capable of compensating radial and angular misalignment. Careful and exact alignment of the shaft ensures long service life of the coupling.



Mounting the
coupling halves
onto the shaft

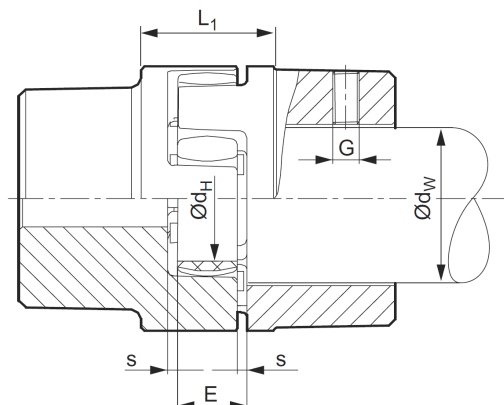


Figure 18: Mounting dimensions of the ROTEX coupling

Coupling size	Mounting dimensions						Locking screw	
	E [mm]	s [mm]	dH [mm]	dW [mm]	L1(Alu/GG/GGG) [mm]	L1(steel) [mm]	G	Tightening torque [Nm]
14	13	1.5	10	7	-	-	M4	2.4
19	16	2	18	12	26	-	M5	4.8
24	18	2	27	20	30	-	M5	4.8
28	20	2.5	30	22	34	-	M6	8.3
38	24	3	38	28	40	60	M8	20
42	26	3	46	36	46	70	M8	20
48	28	3.5	51	40	50	76	M8	20
55	30	4	60	48	56	86	M10	40
65	35	4.5	68	55	63	91	M10	40
75	40	5	80	65	72	104	M10	40
90	45	5.5	100	80	83	121	M12	69
100	50	6	113	95	92	-	M12	69
110	55	6.5	127	100	103	-	M16	195
125	60	7	147	120	116	-	M16	195
140	65	7.5	165	135	127	-	M20	201
160	75	9	190	160	145	-	M20	201
180	85	10.5	220	185	163	-	M20	201



The shaft distance must be strictly observed (dimension E) to ensure axial play of the coupling.



Mechanical Installation Options

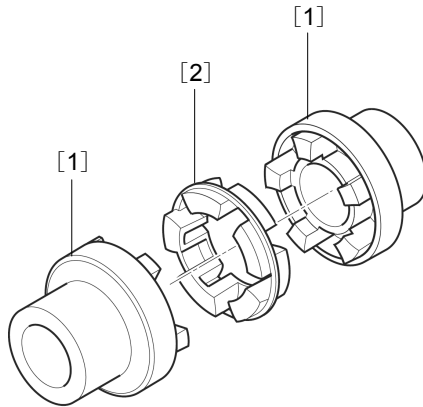
Mounting of couplings

Nor-Mex coupling, types G and E

The low-maintenance Nor-Mex couplings types G and E are torsionally flexible couplings capable of compensating axial, angular, and radial shaft misalignments.

Torque is transmitted via an elastic element with high damping properties, which is also oil and heat resistant. The couplings can be used for either direction of rotation and can be mounted in any position. The design of the Nor-Mex coupling type G allows to replace the elastic element [5] without movement of the shafts.

Nor-Mex E



Nor-Mex G

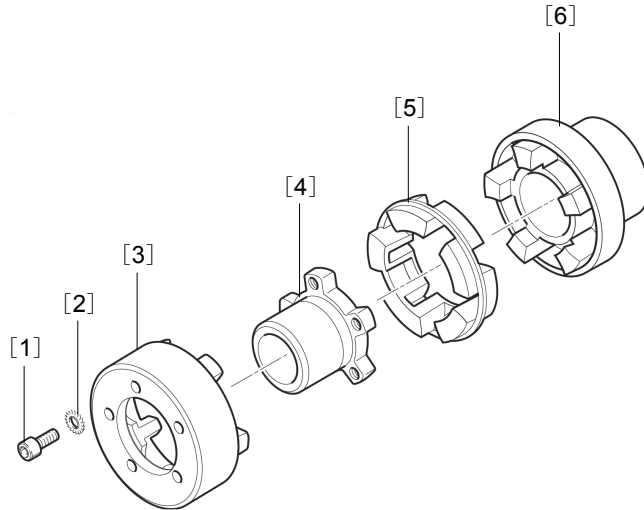


Figure 19: Design of the Nor-Mex E / Nor-Mex G coupling

- [1] Coupling hub
- [2] Elastic element

- [1] Socket head screw
- [2] Washer
- [3] Claw ring
- [4] Flange hub
- [5] Elastic element
- [6] Coupling hub



Mounting instructions, mounting dimensions for Nor-Mex G couplings

After having mounted the coupling halves, ensure that the recommended play (dimension S2 for type G, dimension S1 for type E) and the overall length (dimension LG for type G and dimension LE for type E) corresponds with the dimensions given in the following tables. Accurate alignment of the coupling (→ Sec. 'Mounting tolerances') ensures long service life.

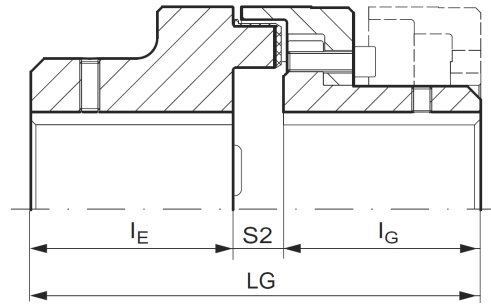


Figure 20: Mounting dimensions of the Nor-Mex G coupling

Nor-Mex G Coupling size	Mounting dimensions				Weight [kg]
	l_E [mm]	l_G [mm]	LG [mm]	Permitted tolerance S2 [mm]	
82	40	40	92	12±1	1.85
97	50	49	113	14±1	3.8
112	60	58	133	15±1	5
128	70	68	154	16±1	7.9
148	80	78	176	18±1	12.3
168	90	87	198	21±1.5	18.3
194	100	97	221	24±1.5	26.7
214	110	107	243	26±2	35.5
240	120	117	267	30±2	45.6
265	140	137	310	33±2.5	65.7
295	150	147	334	37±2.5	83.9
330	160	156	356	40±2.5	125.5
370	180	176	399	43±2.5	177.2
415	200	196	441	45±2.5	249.2
480	220	220	485	45±2.5	352.9
575	240	240	525	45±2.5	517.2



Mechanical Installation Options

Mounting of couplings

Mounting dimensions of the Nor-Mex E coupling

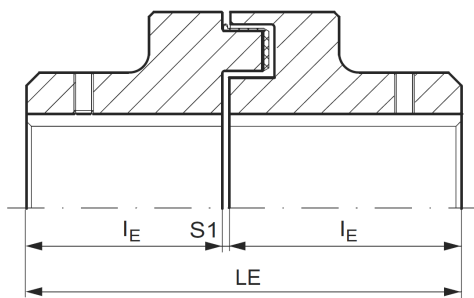


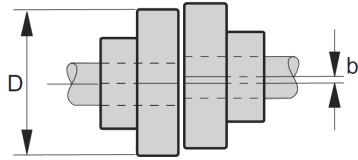
Figure 21: Mounting dimensions of the Nor-Mex E coupling

Nor-Mex E Coupling size	Mounting dimensions			Weight [kg]
	l_E [mm]	LE [mm]	Permitted tolerance S1 [mm]	
67	30	62.5	2.5 ± 0.5	0.93
82	40	83	3 ± 1	1.76
97	50	103	3 ± 1	3.46
112	60	123.5	3.5 ± 1	5
128	70	143.5	3.5 ± 1	7.9
148	80	163.5	3.5 ± 1.5	12.3
168	90	183.5	3.5 ± 1.5	18.4
194	100	203.5	3.5 ± 1.5	26.3
214	110	224	4 ± 2	35.7
240	120	244	4 ± 2	45.7
265	140	285.5	5.5 ± 2.5	66.3
295	150	308	8 ± 2.5	84.8
330	160	328	8 ± 2.5	121.3
370	180	368	8 ± 2.5	169.5
415	200	408	8 ± 2.5	237
480	220	448	8 ± 2.5	320
575	240	488	8 ± 2.5	457



Mounting tolerances

Offset misalignment



Angular misalignment

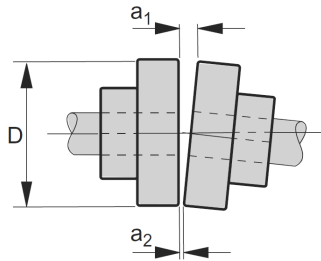


Figure 22: Mounting tolerances



The mounting tolerances specified in the following table apply to elastic Nor-Mex and ROTEX couplings.

Outside diameter D [mm]	Mounting tolerances [mm]					
	$n < 500 \text{ min}^{-1}$		$n: 500 - 1500 \text{ min}^{-1}$		$n > 1500 \text{ min}^{-1}$	
	$a_1 - a_2$	b	$a_1 - a_2$	b	$a_1 - a_2$	b
≤ 100	0.05	0.05	0.04	0.04	0.03	0.03
$100 < D \leq 200$	0.06	0.06	0.05	0.05	0.04	0.04
$200 < D \leq 400$	0.12	0.10	0.10	0.08	0.08	0.06
$400 < D \leq 800$	0.20	0.16	0.16	0.12	0.12	0.10

$a_1 - a_2$ = max. angular misalignment
b = max. offset misalignment



Mechanical Installation Options

Mounting of couplings

Mounting of torsionally rigid GM, GMD, and GMX couplings

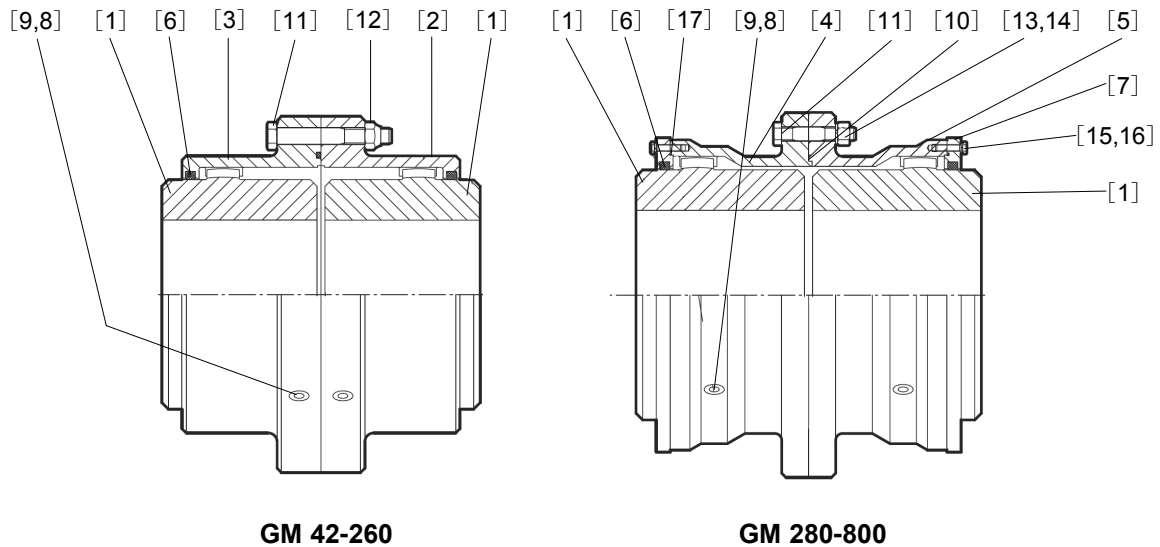


Figure 23: Design of the GM coupling

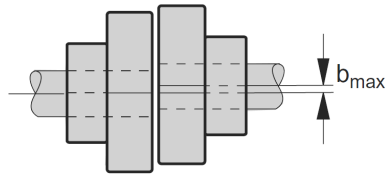
[1] Coupling hub	[10] Gasket
[2] Sleeve	[11] Bolt
[3] Sleeve	[12] Self-locking nut
[4] Sleeve (male)	[13] Washer
[5] Sleeve (female)	[14] Nut
[6] Seal or O-ring	[15] Bolts
[7] Cover	[16] Washer
[8] Grease nipple	
[9] Grease nipple	

- Before mounting the coupling, thoroughly clean the individual parts of the coupling, in particular the toothing.
- Grease the O-rings [6] slightly and place them into the corresponding grooves in the sleeve [2, 3].
- Grease the toothing of the sleeves [2, 3] and push the sleeves onto the shaft ends without damaging the O-rings [6].
- Slide the coupling hubs [1] onto the shaft. Move hubs to be flush with the shaft end.
- Align the machine to be coupled and check the shaft distance (dimension "a" → Sec. "Shaft distance, tightening torque").
- Align both axes and check the permitted values using a dial indicator. The mounting tolerances (→ Sec. "Mounting tolerances") depend on the coupling torque.
- Before you screw on the sleeves [2, 3], have the coupling hugs [1] cool off and grease the toothing.
- Insert the gasket [10] and tighten the sleeve halves to the specified tightening torque (→ Sec. "Shaft distance, tightening torque"). Grease the gasket slightly to facilitate mounting.
- It is important that the grease nipples [9] on the two sleeve halves [4, 5] are positioned at an angle of 90° towards each other after having tightened the sleeves.



Mounting tolerances

Offset misalignment



Angular misalignment

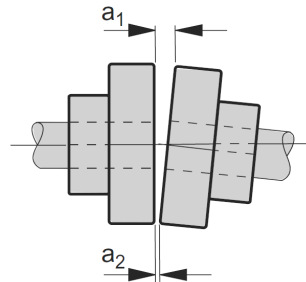


Figure 24: Mounting tolerances of the GM coupling

Coupling type	Mounting tolerances [mm]									
	n < 250 min ⁻¹		n: 250 - 500 min ⁻¹		n: 500 - 1000 min ⁻¹		n: 1000 - 2000 min ⁻¹		n: 2000 - 4000 min ⁻¹	
	a ₁ - a ₂	b _{max}	a ₁ - a ₂	b _{max}	a ₁ - a ₂	b _{max}	a ₁ - a ₂	b _{max}	a ₁ - a ₂	b _{max}
GM42 ... 90	0.25	0.25	0.25	0.25	0.25	0.25	0.2	0.15	0.1	0.08
GM100 ... 185	0.6	0.5	0.6	0.5	0.35	0.25	0.2	0.15	0.1	0.08
GM205 ... 345	1	0.9	0.75	0.5	0.35	0.25	0.2	0.15	-	-
GM370 ... 460	2	1.5	1.1	0.8	0.5	0.4	0.25	0.2	-	-
GM500 ... 550	2.2	1.5	1.1	0.8	0.5	0.4	0.25	0.2	-	-

a₁ - a₂ = max. angular misalignment
b_{max} = max. offset misalignment

Shaft distance, tightening torque

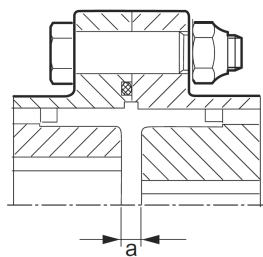


Figure 25: Shaft distance "a"

Coupling type	42	55	70	90	100	125	145	165	185	205	230	260	280
Shaft distance a [mm]	61	61	62	82	82	82	102	103	103	123	123	123	163
Tightening torque screw [Nm]	8	20	68	108	108	230	230	230	325	325	325	375	375



5.3 Mounting of V-belt drive

A V-belt drive is used for drive the gear unit. The standard scope of delivery comprises motor bracket, belt pulleys, V-belts and protective cover for the V-belt. As an alternative. The drive can be supplied as completely mounted unit with motor.

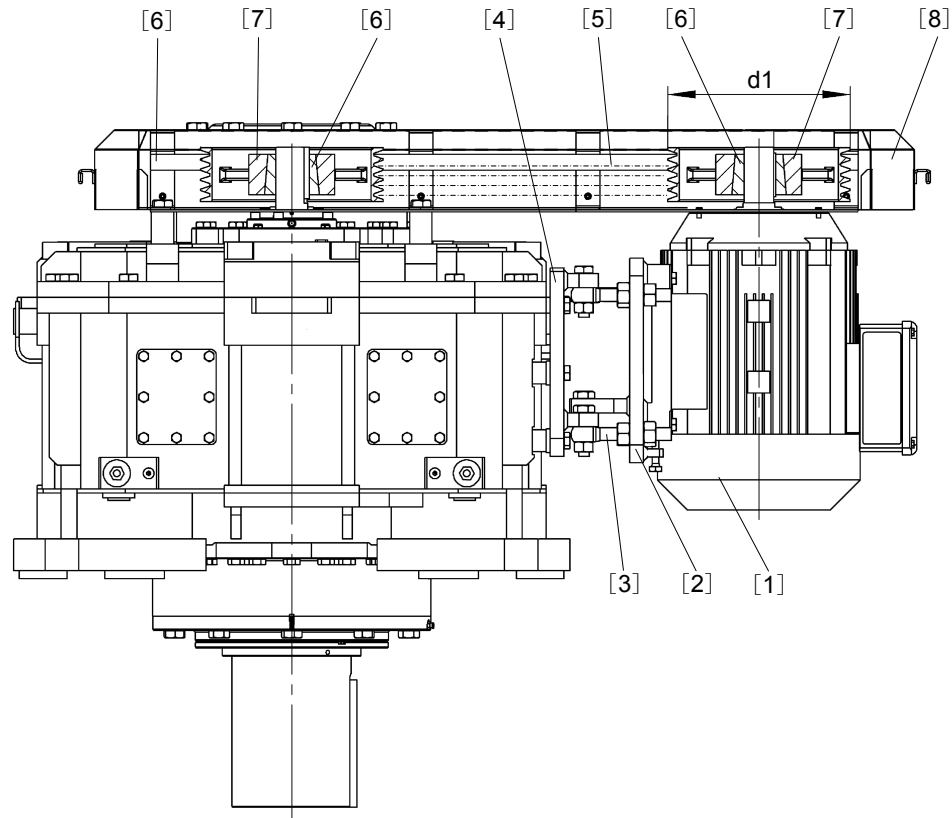


Figure 26: Complete V-belt drive

- | | |
|-----------------------|----------------------|
| [1] Motor | [6] Taper bushing |
| [2] [4] Motor bracket | [7] Belt pulleys |
| [3] Eye bolt | [8] Belt guard cover |
| [5] V-belt | |

Installation

- Mount the motor bracket on the gear housing.
- Mount the motor on the motor bracket (mounting screws are not included in the scope of delivery).
- Clean and degrease the shafts, the taper bushings and the belt pulleys.
- Install the back plate of the belt guard using the provided fixtures. Take into account the room required for applying and tightening the belt, as well as the desired direction in which the cover will be open.
- Mount the belt pulleys with the taper bushings on the gear unit and motor shaft. Apply some grease to the screw to the taper bushings and fill the remaining boreholes with grease. Tighten the locking screws of taper bushings evenly. While tightening the screws, apply some light strokes to the hub in order to make the connection fit properly.



- Position the belt pulleys as close to the shaft shoulder as possible. If the respective rim widths differ, you will have to take this into account accordingly for the positioning. Check the alignment of the belt pulleys before and after you have tightened the taper bushings using a straightedge or a suitable alignment tool.

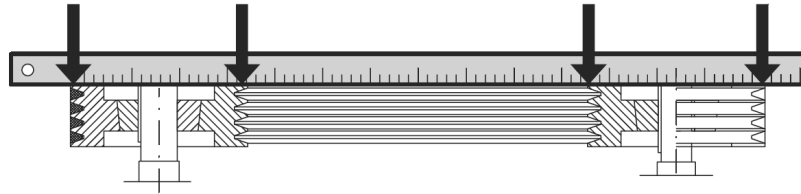


Figure 27: Alignment check of belt pulley

- Apply the V-belts to the belt pulleys and then tighten them by adjusting the motor bracket via the threaded rods.



Never apply force to mount the V-belt:

- Mounting using a screw driver or similar will damage the V-belt externally and internally.
- Be careful not to get your fingers between the disk and the toothed belt when adjusting and turning the toothed belt.
- The maximum permissible error is 1 mm per 1000 mm span of the V-belt. This way, maximum power transmission is ensured and excessive loads on the gear and motor shafts can be prevented.
- Check belt tension of the belts using a suitable measuring device.**
 - Measure the length of the V-belt span (= free V-belt length)
 - Measure the perpendicular force causing a 16 mm sag per 1000 mm of the belt. Compare the measured values with those listed in Sec. "V-belt tightening."
- Tighten the lock screws for the motor rack.
- Mount the belt guard cover using the screw.
- Check the tension of the belt after about 24 hours of operation in order to compensate the initial tension of the V-belt. Do also check the taper bushings and the respective locking screws.

V-belt tightening

V-belt profile	Φd1 [mm]	Force required to offset the V-belt by 16 mm per 1000 mm span length [N]
SPB	112 - 224	45 - 65
	236 - 315	65 - 85
SPC	224 - 355	85 - 115
	375 - 560	115 - 150

Limitations

The following limitations for the use of V-belt drives shall apply:

- V-belt speed:
The V-belt speed determined by the manufacturer of cast-iron V-belt pulleys is:
 $v_{max} = 35 \text{ m/s}$
- Usually, a V-belt drive does not require extra inspection if the ambient temperature does not exceed 70 °C. V-belt drives used at temperatures exceeding 70 °C should be checked regularly at least every 1500 hours.



5.4 Oil heater

Purpose and basic design

Oil heating is required to ensure lubrication at startup when the ambient temperature is low (e.g. cold start of the gear unit).

- The oil heater consists of 3 basic parts (→ Figure 28)
 1. Resistor element in the oil bath ("Oil heater") with terminal box
 2. Temperature sensor
 3. Thermostat

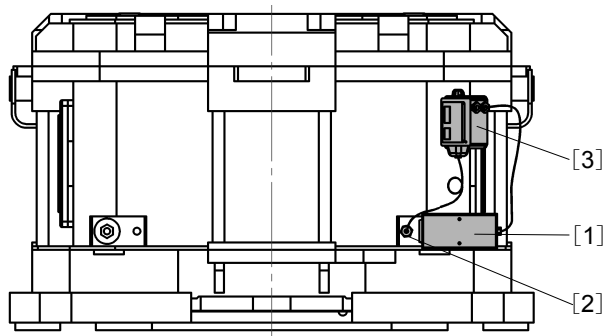


Figure 28: Oil heater ML..V..N gear units

- [1] Oil heater
- [2] Temperature sensor
- [3] Thermostat

Activation / deactivation behaviour

The oil heater

- is activated when the factory set temperature is reached. This temperature setpoint depends on the following:
 - for pressure lubricated units: on the temperature at which the oil viscosity is maximal 2000 cSt

ISO VG	Setpoint for pressure lubrication [°C]		
	460	320	220
Mineral oil	+20	+15	+10
Synthetic oil	+15	+10	+5

- is deactivated when the set temperature is exceeded by 8 °C to 10 °C.



Oil heater

The thermostat and the oil heater are normally installed to the gear unit and are ready to operate but without electrical connections. Therefore, the following has to be done before startup:

1. Connect the resistor element ("Oil heater") with the power supply
2. Connect the thermostat with the power supply



It is essential that you check the following points before activating the oil heater:

- Check for correct electrical connection according to the ambient conditions (→ Sec. "Electrical connection")
- Check for correct oil grade and oil volume of the gear unit (→ Nameplate)

There is a potential danger of explosion if the oil heater is not connected correctly or is operated above the oil surface!

Technical data resistor element

ML3PVSF..N / ML4PVSF..N / ML3RVSF..N / ML4RVSF..N			
Size	Heater code	Power [W]	Voltage [V]
100	ACOE391	2000	400Y/230Δ
110	ACOE401	2330	400Y/230Δ
120	ACOE402	3000	400Y/230Δ
130	ACOE402	3000	400Y/230Δ
140	ACOE391 + ACOE391	2000 + 2000	400Y/230Δ
150	ACOE402 + ACOE402	3000 + 3000	400Y/230Δ

Electrical connection resistor element

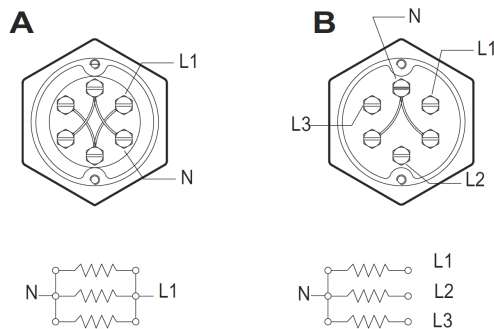


Figure 29: Electrical connection options for the oil heater (A: single-phase / B: three-phase)



Basic design thermostat

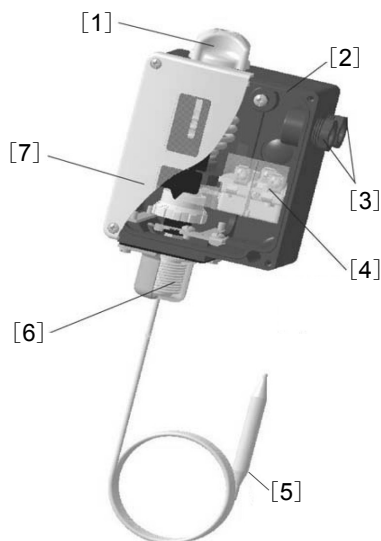


Figure 30: Basic design thermostat

- [1] Setting range knob
 [2] IP66 enclosure (units with external reset IP54)
 [3] 2 x PG 13.5 cable diameter 6 mm → 14 mm
 [4] SPDT contact system. Exchangeable

- [5] Capillary tube length up to 10 m
 [6] Stainless steel bellows
 [7] Polyamide cover

	RT thermostats
Ambient temperature	-50 °C to 70 °C
Contact system	<p>[1] Line [2] SPDT</p>
Contact load	<p>Alternating current: AC-1: 10 A, 400 V AC-3: 4 A, 400 V AC-15: 3 A, 400 V</p>
Contact material: AgCdO	<p>Direct current: DC-13: 12 W, 230 V</p>
Cable entry	2 PG 13.5 for 6 - 14 mm diameter cable
Enclosure	IP66 acc. to IEC 529 and EN 60529. Units with external reset IP54. Thermostat housing is made of bakelite acc. to DIN 53470, the cover is made of polyamid.

In the following cases, a contactor must be used:

- a 3-phase voltage supply is used
- 2 heating rods are used (e.g. ML..V..140N)
- current ratings exceed nominal values of the thermostat



Adjusting the setpoint

The setpoint is normally set at the factory. For adjustments, the following process has to be followed:

The range is set by using the setting knob [1] while at the same time reading the main scale [2]. Tools must be used to set thermostats equipped with a seal cap. The differential is set by the differential disc [3]

The size of the obtained differential can be established by comparing the set main scale value and the scale value on the differential disc with the help of the nomogram for the thermostat concerned.

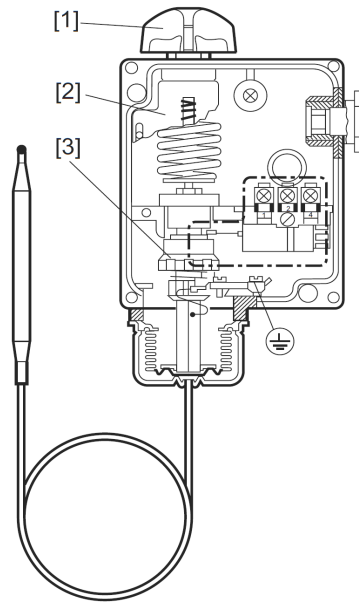


Figure 31: Design thermostat

- [1] Setting knob
- [2] Main scale
- [3] Differential setting disc

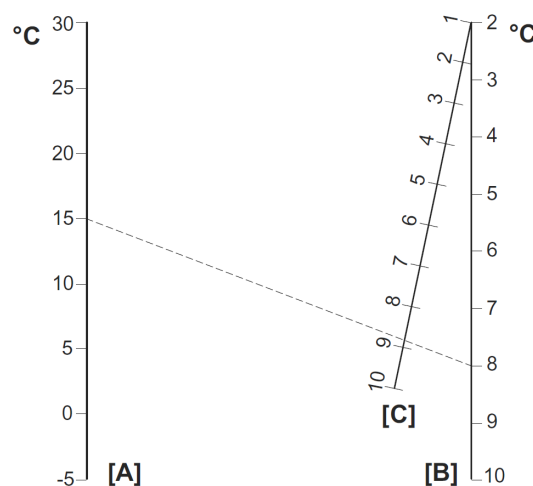


Figure 32: Nomogram for obtained differential

- [A] Range setting
- [B] Obtained differential
- [C] Differential setting



Mechanical Installation Options

Temperature sensor PT100

5.5 Temperature sensor PT100

The temperature sensor PT100 can be used to measure the temperature of the oil in the gear unit.

Dimensions

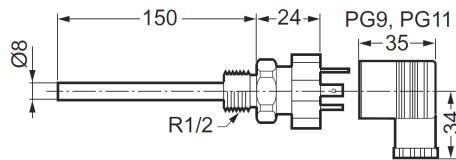


Figure 33: Temperature sensor PT100

Electrical connection

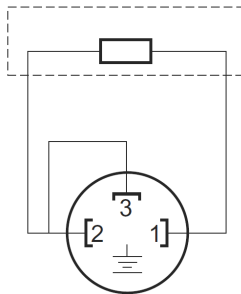


Figure 34: Electrical connection temperature sensor PT100

Technical data

- Sensor tolerance $\pm (0.3 + 0.005 \times t)$, (corresponds to DIN IEC 751 class B),
t = oil temperature
- Plug connector DIN 43650 PG9 (IP65)
- The tightening torque for the retaining screw in the back of the plug connector for electrical connection is 25 Nm.



5.6 SPM adapter

SPM adapters are available for measuring the shock pulses of the gear unit bearings. Shock pulses are measured using shock pulse sensors attached to the SPM adapter.

Nipple 32000 g = M8
and cover 81025 L = 24, 113, 202, 291

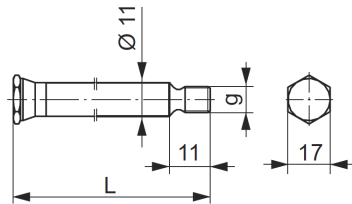


Figure 35: SPM adapter

Sensor to be g = M8
wired 40000 and L = 17, 106, 195, 284
fitting 13008

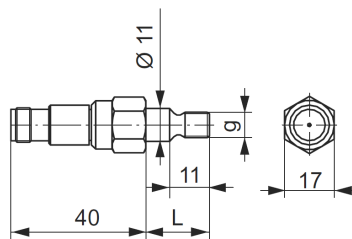


Figure 36: SPM adapter



Mechanical Installation Options

SPM adapter

Mounting of shock pulse sensor

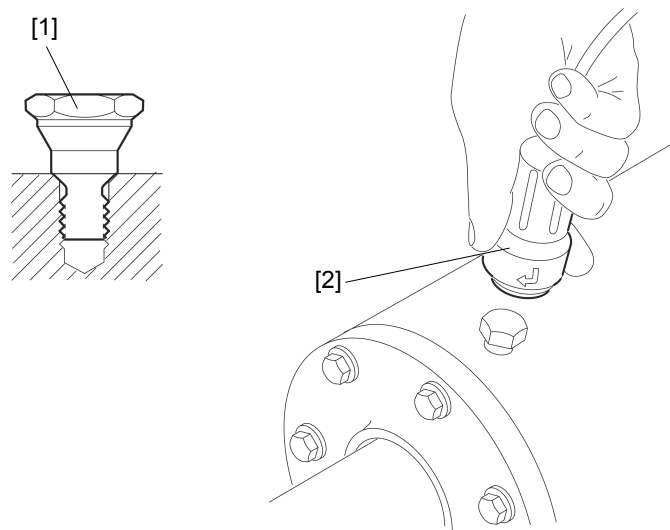


Figure 37: Mounting the shock pulse sensor onto the SPM adapter

[1] SPM adapter

[2] Pulse sensor

- Remove the protection cap of the SPM adapter [1]. Ensure that the SPM adapter [1] is tightened correctly and securely (tightening torque: 15 Nm).
- Mount the shock pulse sensor [2] onto the SPM adapter [1].



5.7 Fan

A fan can be mounted if the projected thermal power of the gear unit is exceeded. The direction of rotation of the gear unit does not influence the operation of the fan.

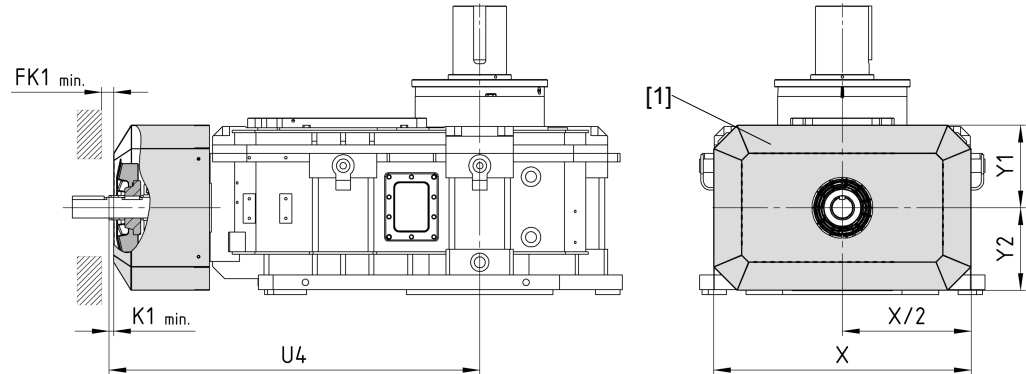


Figure 38: Fan

[1] Fan on the HSS

ML3RVSF..N						
Size	Dimensions [mm]					
	U4	X	Y1	Y2	FK1 _{min}	K1 _{min}
100	1520	1056	370	335	20	15
110	1690	1145	390	405	20	15
120	1900	1286	425	440	20	15



Make sure that air intake vents are not blocked or covered!



Mechanical Installation Options

Thermostatic water valve

5.8 Thermostatic water valve

General

The thermostatic water valve is used to regulate the water flow into cooler (lubrication unit) or cooling coil of the gear unit.

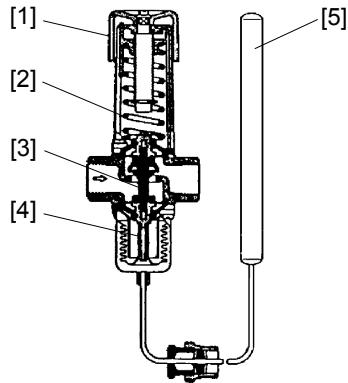


Figure 39: Thermostatic water valve

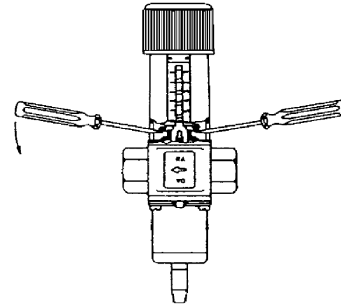


Figure 40: Forced opening of valve

- [1] Knob
- [2] Spring retainer
- [3] Spindle
- [4] Pressure stem
- [5] Sensor

Mounting

After mounting, rinse out the pipeline to remove any impurities and dirt. Rinsing is carried out by means of forced opening of the valve. Insert two screwdrivers in through the two holes in the setting unit of the valve. Press the spring retainer upwards and the valve will open to flow (See Figure 40).

Adjustment

Using the adjustment knob, the valve can be set so that the desired temperature is obtained at the sensor. The temperature is controlled with a thermometer of the lubrication unit.

Turning the knob in an anticlockwise direction raises the temperature while turning it in a clockwise direction lowers the temperature. Install the capillary tube without sharp bends. Relieve the capillary tube at the ends. Relief is especially important where vibrations can occur.

Technical data

Maximum working pressure *)	10 bar
Minimum working pressure *)	2 bar
Maximum differential pressure	7 bar
Maximum water temperature *)	25°C (40°C)



*) when using the water valve for lubrication unit or cooling coil.



6. Pressure Lubrication



For gear units equipped with a separate lubrication system (sometimes in connection with a cooling system) refer also to the separate manual.

6.1 Shaft end pump

The maintenance-free shaft end pump is suited for operation in both directions of rotation.

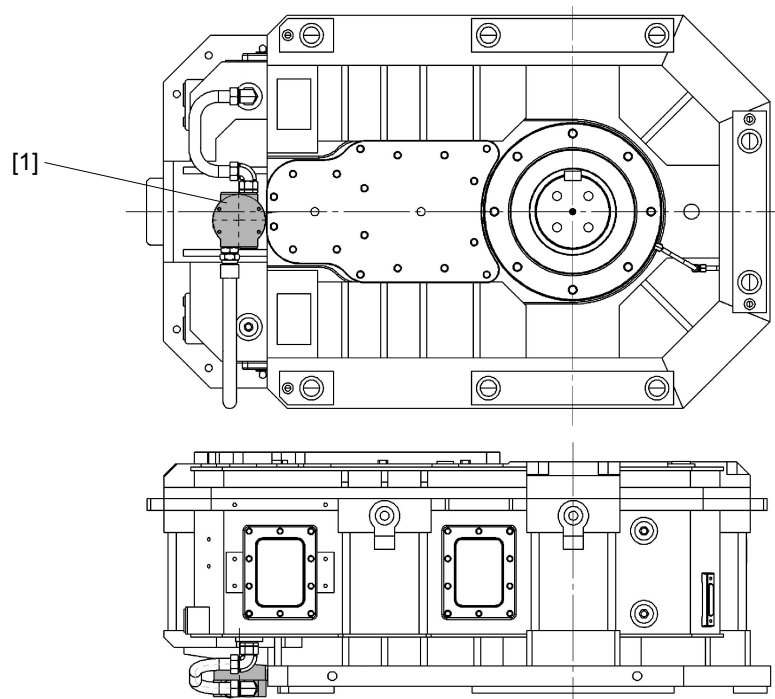


Figure 41: Shaft end pump for ML..V..N gear units



For operation with variable input speed, it is essential to consult SEW-EURODRIVE.

Shaft end pump comprising:

- Coupling between shaft and gear wheel pump
- Gear wheel pump



For a detailed description, please refer to the separate manual.



Pressure Lubrication

Shaft end pump

Pump suction

The intake and delivery pipe or tube is connected disregarding the direction of rotation of the output shaft and must not be altered. If the shaft end pump does not build up pressure within 10 seconds after the gear unit has been started (→ Flow monitoring via oil sight glass on the gear unit), do the following:

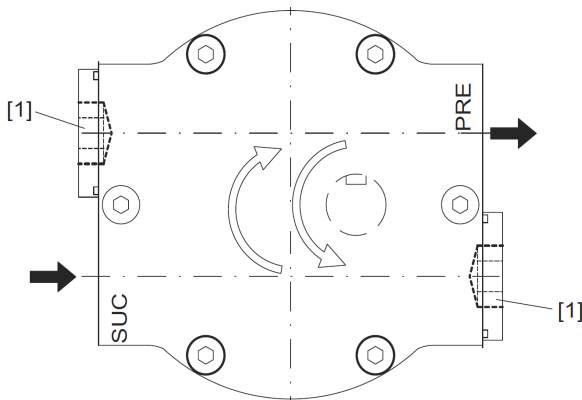


Figure 42: Shaft end pump

[1] Plug connector
[SUC] Suction line
[PRE] Pressure line

- Loosen the plug-in connection [1] next to the intake pipe / intake tube on the valve housing. Fill the suction line [SUC] and the pump with oil.
- Turn the pump so that the gear pump is lubricated with oil.
- Make sure that the pump can create a vacuum in the suction line [SUC] so the oil flow can start.



- **It is essential that the gear unit is sufficiently lubricated from the very beginning!**
- **Do not change the diameter of the tube / pipe connection!**
- **Do not open the pressure line [PRE]!**



6.2 Motor pump

The MHP motor pump [1] is suited for operation in both directions of rotation.

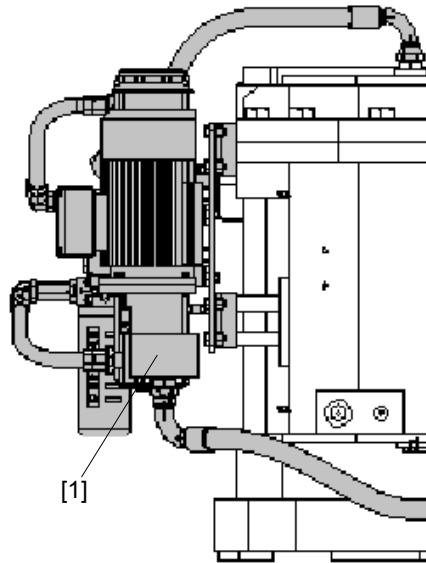


Figure 43: Motor pump

MHP motor pump comprising:

- AC motor
- Coupling between AC motor and gear wheel pump
- Motor flange
- Gear wheel pump

AC motor:

Supply voltage: 220-240 V / 380-420 V, 50 Hz



Consult SEW-EURODRIVE in case of deviating supply voltages and/or 60 Hz operation. For a detailed description, please refer to the separate manual.

Other standard equipment and optional instruments are also available. Consult SEW-EURODRIVE.

6.3 External cooling system

For gear units supplied with an oil/water or oil/air cooling system, please refer to the separate manual.



Pressure Lubrication

Customer supplied external cooling and lubrication systems

6.4 Customer supplied external cooling and lubrication systems

General

If the customer orders a gear unit for which SEW-EURODRIVE recommends a pressure lubrication or/and an additional cooling system, this chapter provides some guidelines for selecting the components.

First, define

- the required oil volume Q_P the motor pump has to provide
- the required cooling capacity P_L of the oil/water or oil/air cooler



If the gear unit is ordered for a customer-supplied pressure lubrication system, the gear unit must not be taken into operation without the pressure lubrication system.



The required oil flow, oil pressure and oil temperature for pressure lubrication with or without cooler, please consult SEW-EURODRIVE

We recommend to use the following additional components and instrumentation:

- Oil filter with a minimum filtration degree of 25 μm
- Control switch to check operation of the motor pump, for example using a **pressure switch**
- If cooler is used: Control of oil temperature in the return line of the cooler, for example using a **thermo switch** or a **visual thermometer**

Typical setup pressure lubrication

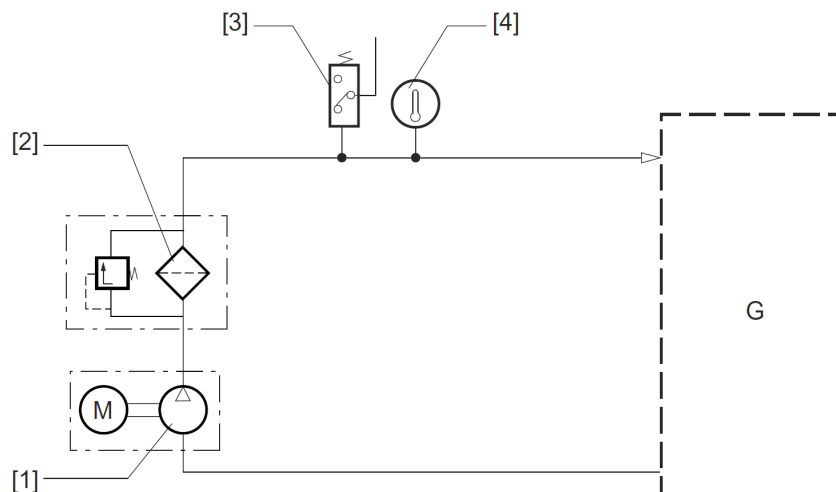
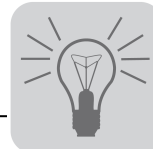


Figure 44: Pressure lubrication

- [1] Motor pump
- [2] Filter
- [3] Pressure switch
- [4] Visual thermometer
- [G] Gear unit



Typical setup pressure lubri- cation with oil/water

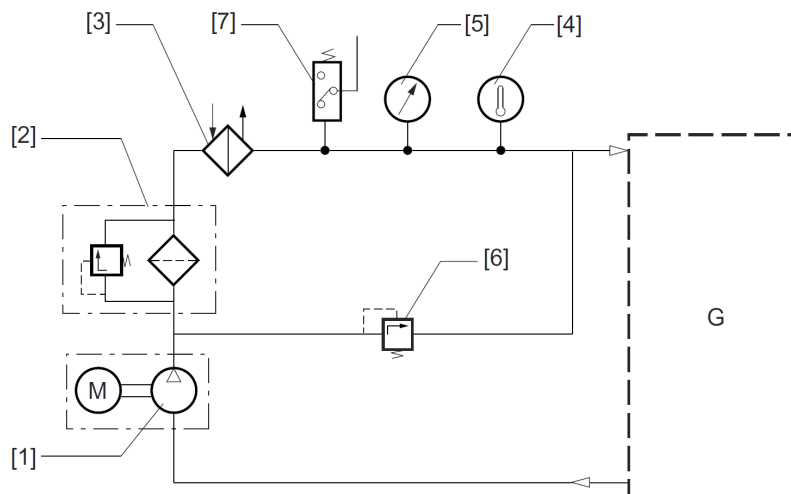


Figure 45: Pressure lubrication with oil/water cooler

- | | |
|----------------------|---------------------------|
| [1] Motor pump | [5] Pressure gauge |
| [2] Filter | [6] Pressure relief valve |
| [3] Oil/water cooler | [7] Pressure switch |
| [4] Thermometer | [G] Gear unit |

Typical setup pressure lubri- cation with oil/air

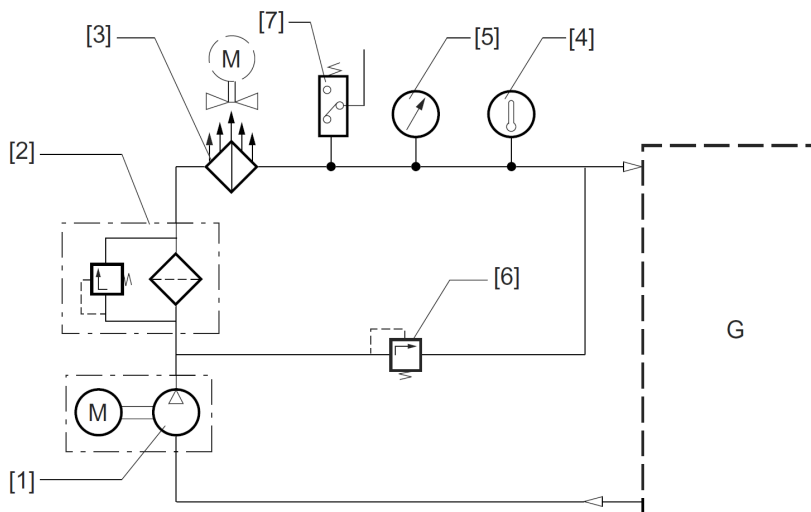


Figure 46: Pressure lubrication with oil/air cooler

- | | |
|-------------------------|---------------------|
| [1] Pump | [5] Thermometer |
| [2] Filter | [6] Pressure gauge |
| [3] Oil cooler | [7] Pressure switch |
| [4] Thermo switch 50 °C | [G] Gear unit |



7. Startup

7.1 Startup of ML..V..N gear units

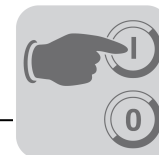


- It is essential to adhere to the safety notes in Sec. "Safety Notes."
- It is absolutely necessary to avoid open flames or sparking when working with the gear unit!
- Take preventive measures to protect people from the solvent vapors generated by the vapor phase inhibitor!
- Before startup, check for correct oil level! For lubricant fill quantities, refer to Sec. "Lubricants."
- For gear units with long-term protection: Replace the screw plug on the location indicated by the breather plug (Position → Sec. "Mounting Positions").

Before startup



- **For gear units with long-term protection:** Remove the gear unit from the seaworthy protection box.
- Remove the corrosion protection agent from the gear unit parts. Make sure gaskets, sealing surfaces and sealing lips are not damaged by mechanical abrasion, etc.
- Before filling the gear unit with the correct oil grade and volume, drain the remaining amount of protection oil. To do so, unscrew the oil drain plug and drain the remaining protection oil. Thread the oil drain plug back in place.
- Remove the oil filling plug (Position → Sec. "Symbols and mounting positions "). Use a funnel to fill the oil (filter mesh max. 25 µm). Fill the gear unit with the correct oil grade and volume (→ Sec. "Nameplate"). Guidelines for selecting the correct oil type (→ Sec. "10 Lubricants"). Decisive is the oil type mentioned on the nameplate. The oil volume specified on the nameplate of the gear unit is a reference value. The oil level glass is the decisive indicator of the correct oil level. After having filled the oil, replace the oil filling plug.
- Make sure that rotating shafts as well as couplings are equipped with suitable protective covers.
- If the gear unit has a motor pump, check for proper functioning of the pressure lubricating system. Make sure that monitoring devices are connected properly.
- After an extended period of storage (max. two years), have the gear unit operate without load with the correct oil fill (→ Sec. "Nameplate"). This way, the correct functioning of the lubricating system and particularly the oil pump is ensured.
- If the gear unit is equipped with a fan on the input shaft, check for free air intake within the specified angle (→ Sec. "Fan").



Running-in period

SEW-EURODRIVE recommends running-in the gear unit as first startup phase. Increase load and revolutions in two to three steps up to maximum level. The running-in phase takes about 10 hours.

Check the following points during the running-in phase:

- Verify the power values specified on the nameplate because their frequency may be a decisive factor for the service life of the gear unit.
- Does the gear unit run smoothly?
- Are there vibrations or unusual running noise?
- Are there signs of oil leakages on the gear unit?



For further information and troubleshooting, refer to Sec. "Malfunctions."

7.2 Taking ML..V..N gear units out of operation



Disconnect the drive from voltage supply and secure it to prevent unintentional restart!

If the gear unit is not operated for a longer period of time, you must activate it at regular intervals every two to three (2 to 3) weeks.

If the gear unit is not operated for a period **longer than six (6) months**, additional corrosion protection is required:

- **Corrosion protection for the inside of gear units with oil pressure lubrication:**
Contact SEW-EURODRIVE in this case!
- **Surface corrosion protection:**
Apply a wax-based protective coating onto shaft ends and unpainted surfaces as corrosion protection. Grease the sealing lips of the oil seal to protect them from preservative agents.



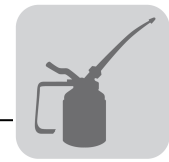
For taking the gear unit back into operation, refer → Sec. "Startup."



8. Inspection and Maintenance

8.1 Inspection and maintenance intervals

Interval	What to do?
<ul style="list-style-type: none"> Daily 	<ul style="list-style-type: none"> Check the housing temperature: <ul style="list-style-type: none"> – with mineral oil: max 90 °C – with synthetic oil: max. 100 °C Check gear unit noise Check the gear unit for signs of leakage
<ul style="list-style-type: none"> After 500 - 800 hours of operation 	<ul style="list-style-type: none"> First oil change after initial startup
<ul style="list-style-type: none"> After 500 hours of operation 	<ul style="list-style-type: none"> Check the oil level, refill oil (→ Sec. "Nameplate") if necessary
<ul style="list-style-type: none"> Every 3000 hours of operation, at least every 6 months 	<ul style="list-style-type: none"> Check the oil: If the gear unit is operated outdoors or in humid conditions, check the water content of the oil. The water content must not exceed 0.03 % (300 ppm). Regrease labyrinth seals. Option for gear unit. Standard gear unit supplied without grease nipple. Use about 30 g grease per grease nipple. Clean the breather plug
<ul style="list-style-type: none"> Depending on the operating conditions, at the latest every 12 months 	<ul style="list-style-type: none"> Change the mineral oil (→ Sec. "Inspection and maintenance of the gear unit") Check whether retaining screws are tightly secured Check contamination and condition of the oil/air cooling system Check the condition of the oil/water cooling system Clean oil filter, replace filter element if necessary
<ul style="list-style-type: none"> Depending on the operating conditions, at the latest every 3 years 	<ul style="list-style-type: none"> Change synthetic oil (→ Sec. "Inspection and maintenance of the gear unit")
<ul style="list-style-type: none"> Varying (depending on external factors) 	<ul style="list-style-type: none"> Repair or renew the surface/anticorrosion coating Clean the gearcase surface and fan Check the oil heater: <ul style="list-style-type: none"> – Are all connection cables and terminals tightened securely and free from corrosion? – Clean incrustated elements (such as the heating element) and replace, if required (→ Sec. "Inspection and maintenance of the gear unit")



8.2 Lubricant change intervals

Change the oil more frequently when operating the industrial gear unit under more severe/aggressive environmental conditions!



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

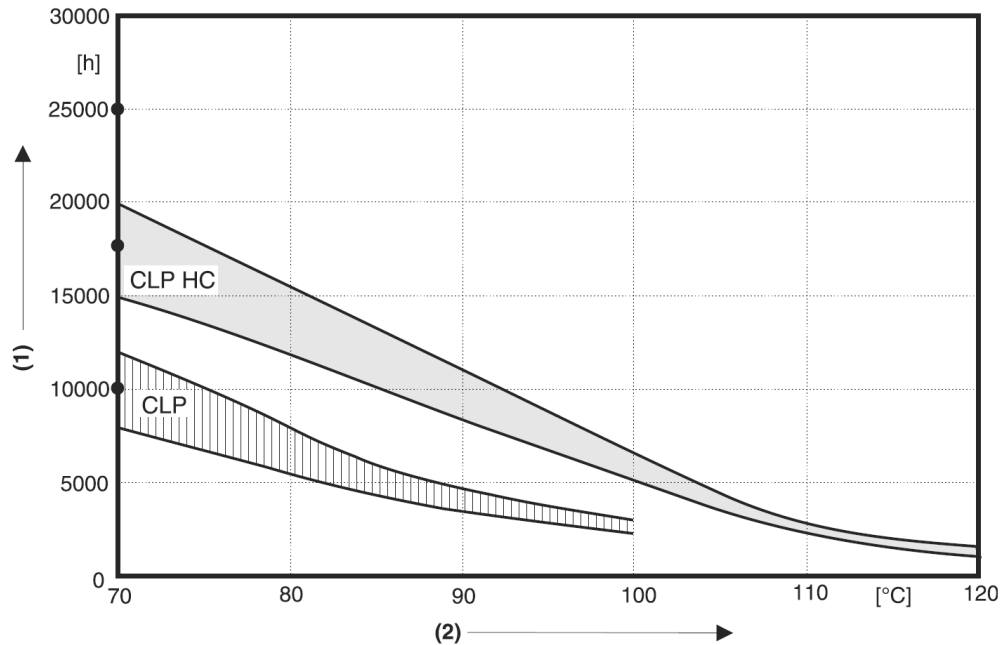


Figure 47: Lubricant change intervals for ML..V..N gear units under normal ambient conditions

- (1) Hours of operation
- (2) Sustained oil bath temperature
 - Average value per oil type at 70 °C

8.3 Grease change intervals

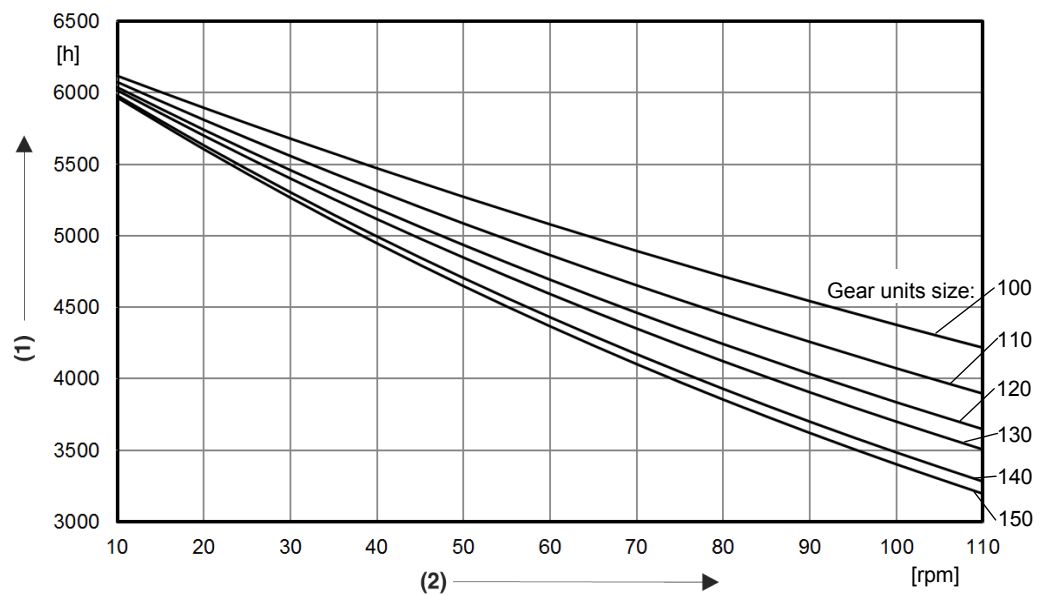


Figure 48: Grease change intervals for ML..V..N gear units under normal ambient conditions

- (1) Hours of operation
- (2) Rotation speed of LSS



Inspection and Maintenance

Inspection and maintenance of the gear unit

8.4 Inspection and maintenance of the gear unit



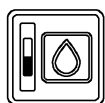
- Do not mix different synthetic lubricants and do not mix synthetic with mineral lubricants!
- For positions of the oil level plug, the drain plug, the breather plug and the oil sight glass, refer to Sec. "Mounting Positions."

Checking the oil level



1. Disconnect the motor from voltage supply and secure it to prevent unintentional restart!

Wait until the gear unit has cooled off – Danger of burns!



2. For gear units with oil level glass: Visually check correct oil level (= middle of oil sight glass)



3. For gear units with oil dipstick (option):
 - Unscrew the oil dipstick and remove it. Clean the dipstick and re-insert it into the gear unit (do **not** screw in tightly!).
 - Remove dipstick again and check oil level. Correct if necessary: the oil level is correct when it is between the oil level mark (= maximum oil level) and the end of the dipstick (= minimum oil level)

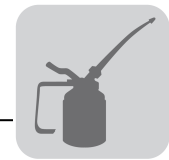
Checking the oil



1. Disconnect the motor from voltage supply and secure it to prevent unintentional restart!

Wait until the gear unit has cooled off – Danger of burns!

2. Remove some oil from the oil drain plug
3. Check the oil consistency
 - Viscosity
 - If you can see that the oil is heavily contaminated, we recommend to change the oil disregarding the service intervals specified in Sec. "Service and maintenance intervals."



Changing the oil When changing the oil, clean the gearcase thoroughly to remove oil residues and abrasion. Use the same oil grade as for the operation of the gear unit.



1. **Disconnect the motor from voltage supply and secure it to prevent unintentional restart!**

Wait until the gear unit has cooled off – Danger of burns! If your gear unit is equipped with an oil expansion tank, let the gear unit cool off until it reaches ambient temperature. The reason is that there might still be oil in the oil expansion tank which might leak through the oil filling hole!

Note: The gear unit must still be warm because the high viscosity of cold oil will make it more difficult to drain the oil correctly.

2. Place a container under the oil drain plug.
3. Remove oil filling plug, breather plug and oil drain plugs.
4. Drain the oil completely.
5. Reinstall the oil drain plugs.
6. Use a funnel to fill the oil (filter mesh max. 25 µm). Fill new oil of the same type as the old oil via the oil filling plug (if you want to change the oil type, contact our customer service first).
 - Fill the oil according to the volume specified on the nameplate (→ Sec. "Nameplate"). The oil volume specified on the nameplate is an approximate value. **The marks on the oil level glass (option: oil dipstick) are decisive for the oil level.**
 - Check whether the oil level is correct using the oil dipstick.
7. Reinstall the oil filling plug.
8. Mount the breather plug.
9. Clean the oil filter, replace the filter element if necessary (when using an external oil/air or oil/water cooling system).



If you remove the housing cover, you must apply new sealing compound to the sealing surface. Else, the tightness of the gear unit is not guaranteed! Contact SEW-EURODRIVE in this case!

Cleaning the oil heater

Incrustation on the oil heater caused by oil must be removed. Remove the oil heater for this purpose.



The oil heater must be deactivated before draining the oil. The reason is that the hot oil heater might ignite the evaporating oil



Inspection and Maintenance

Inspection and maintenance of the gear unit

Removing the oil heater

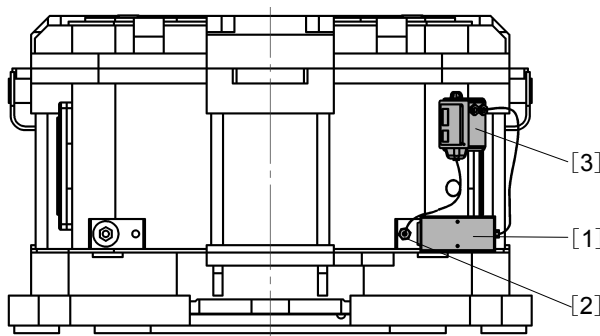


Figure 48: Oil heater ML..V..N gear units

- [1] Oil heater
- [2] Temperature sensor
- [3] Thermostat

- Remove the oil heater [1] and the gasket on the gear unit.
- Remove the base of the terminal box.
- Clean the tubular heating elements with solvent.



Be careful not to damage the heating elements through scratching or scraping!

Mounting the oil heater

- Reinstall the oil heater [1] and the gasket on the gear unit. The tubular heating elements must always be immersed in liquid.
- Mount the base of the terminal box onto the heating rod using a mounting ring.
- Make sure that the gasket is placed correctly between terminal box and upper end of the heating element.
- Insert the temperature sensor [2] into the oil sump of the gear unit. Set the required temperature on the thermostat [3].

Refilling grease



You can use grease of NLGI2 consistency to grease the regreasable dust protection covers or labyrinth seals ("Taconite") attached to input and output shafts as option (→ Sec. "Lubricants", "Sealing grease").

For the locations of regreasing points, refer to the order-specific dimension sheet. Use about 30 g grease per grease nipple disregarding the position of regreasing points and gear unit size.



9. Malfunctions

9.1 Gear unit malfunctions

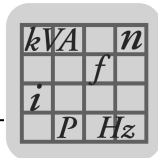
Problem	Possible cause	Solution
Unusual, regular running noise	A Meshing/grinding noise: bearing damage B Knocking noise: irregularity in the gearing	A Check the oil (→ Sec. "Inspection and Maintenance"), replace bearings B Contact customer service
Unusual, irregular running noise	Foreign particles in the oil	• Check the oil (→ Sec. "Inspection and Maintenance") • Stop the drive, contact customer service
Unusual noise in the area of the gear unit mounting	Gear unit mounting has loosened	• Tighten the retaining screws and nuts to the specified torque • Replace the damaged / defective retaining screws or nuts
Operating temperature too high	A Too much oil B Oil too old C Oil contaminated D Gear units with fan: air intake opening / gearcase contaminated E Shaft end pump defective F Malfunctions of oil/air or oil/water cooling system	A Check the oil level, correct if necessary (→ Sec. "Inspection and Maintenance") B Check when the oil was changed last time; change oil if necessary (→ Sec. "Inspection and Maintenance") C Change the oil (→ Sec. "Inspection and Maintenance") D Check the air intake opening and clean if necessary, clean gear unit housing E Check the shaft end pump; replace if necessary F Observe the separate operating instructions of the oil/water and oil/air cooling system!
Bearing point temperatures too high	A Oil not enough or too much oil B Oil too old C Shaft end pump defective D Bearing damaged	A Check the oil level, correct if necessary (→ Sec. "Inspection and Maintenance") B Check when the oil was changed last time; change oil if necessary (→ Sec. "Inspection and Maintenance") C Check the shaft end pump; replace if necessary D Check bearing and replace if necessary, contact customer service
Oil leaking ¹ • from cover plate • from gearcase cover • from bearing cover • from mounting flange • from output/input end oil seal	A Gasket on cover plate / gearcase cover / bearing cover / mounting flange leaking B Sealing lip of oil seal upside down C Oil seal damaged / worn	A Tighten the bolts on the respective cover plate and observe the gear unit. Oil still leaking: contact customer service B Vent the gear unit (→ Sec. "Mounting Positions") Observe the gear unit. Oil still leaking: contact customer service C Contact customer service
Oil leaking • from oil drain plug/ valve • from breather plug	A Too much oil B Drive operated in incorrect mounting position C Frequent cold starts (oil foams) and/or high oil level	A Correct the oil level (→ Sec. "Inspection and Maintenance") B Mount the breather plug correctly (→ Sec. "Mounting Positions") and correct the oil level (→ Sec. "Lubricants")
Malfunctions of the oil/air or oil/water cooling system		Observe separate operating instructions of the oil/water and oil/air cooling system!

¹ It is normal for small amounts of oil/grease to emerge from the oil seal during the running-in phase (24 hour running time, see also DIN 3761).

Customer service

Please have the following information available when contacting our customer service:

- Complete nameplate data
- Nature and extent of the fault
- Time of occurrence and accompanying circumstances of the fault
- Presumed cause



10. Lubricants

10.1 Lubricant selection



Selecting improper lubricants may damage the gear unit.

Note the following:

- The oil viscosity and type (mineral/synthetic) that are to be used are determined by SEW-EURODRIVE specifically for each order. This information is noted in the order confirmation and on the gear unit's nameplate.

You must contact SEW-EURODRIVE in case of a deviation from this specification.



This lubricant recommendation in no way represents guarantee as to the quality of the lubricant delivered by each respective supplier. Each lubricant manufacturer is responsible for the quality of its product.

- Ensure that the gear unit is filled with the correct oil grade and quantity before startup. You can obtain the corresponding information from the gear unit nameplate and the lubricant table in the following chapter.
- Do not mix different synthetic lubricants and do not mix synthetic with mineral lubricants.
- Check the compatibility of the greases and oils used.



10.2 Lubricant table

The lubricant table shows the permitted lubricants for SEW-EURODRIVE gear units. Please note the abbreviations, meaning of shading and notes.

CLP = Mineral oil
CLP HC = Synthetic polyalphaolefin
E = Ester oil (water hazard classification 1)

 = Mineral lubricant
 = Synthetic lubricant

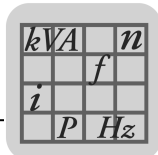
- 3) = Use lubricants only when service factor $F_s \geq 1.3$
4) = Take into account critical startup behavior at low ambient temperatures
6) = Ambient temperature

 = Lubricant for the food industry (food grade oil)
 = Biodegradable oil (lubricant for agriculture, forestry, and water management)



Contact SEW-EURODRIVE if you operate the unit under extreme conditions, such as cold, heat, or if the operating conditions have changed since project planning.

6)	DIN (ISO)	ISO, NLGI	Mobil®	Shell	bp	KLÜBER LUBRICATION	ARAL	TEXACO	Castrol	FUCHS	Q8	TOTAL
Standard -10 +40	CLP CC	VG 320	Mobilgear XMP 320 Mobilgear 600XP 320	Shell Omala F 320	BP Energol GR-XP-320	Klüberoil GEM 1-320 N	Aral Degol BG 320	Meropa 320	Alpha SP 320 Tribol 1100/320	Renolin CLP 320 Plus Renolin High Gear 320	Goya NT 320	Carter EP 320
-20 +20	CLP CC	VG 150 ³⁾	Mobilgear XMP 150 Mobilgear 600XP 150		BP Energol GR-XP-150	Klüberoil GEM 1-150 N	Aral Degol BG 150	Meropa 150	Alpha SP 150 Tribol 1100/150	Renolin CLP 150 Plus Renolin High Gear 150	Goya NT 150	
-15 +30	CLPCC	VG 220	Mobilgear XMP 220 Mobilgear 600XP 220	Shell Omala F 220	BP Energol GR-XP-220	Klüberoil GEM 1-220 N	Aral Degol BG 220	Meropa 220	Alpha SP 220 Tribol 1100/220	Renolin CLP 220 Plus Renolin High Gear 220	Goya NT 3220	Carter EP 220
-5 +45	CLP CC	VG 460	Mobilgear XMP 460 Mobilgear 600XP 460	Shell Omala F 460	BP Energol GR-XP-460	Klüberoil GEM 1-460 N	Aral Degol BG 460	Meropa 460	Alpha SP 460 Tribol 1100/460	Renolin CLP 460 Plus Renolin High Gear 460	Goya NT 460	Carter EP 460
0 +50	CLP CC	VG 680	Mobilgear XMP 680 Mobilgear 600XP 680	Shell Omala F 680	BP Energol GR-XP-680	Klüberoil GEM 1-680 N		Meropa 680	Alpha SP 680 Tribol 1100/680	Renolin CLP 680 Plus Renolin High Gear 680	Goya NT 680	Carter EP 680
Standard -25 +40	CLP HC	VG 320	Mobilgear SHC XMP 320 Mobil SHC 632	Shell Omala HD 320	BP Enersyn EP-XF-320	Klübersynth GEM 4-320 N		Pinnacle EP 320	Alphasyn EP 320	Renolin CLP 320 Plus Renolin High Gear Synth 320	El Greco 320	Carter SH 320
4) -40 +10	CLP HC	VG 68 ³⁾	Mobil SHC 626	Shell Omala HD 68	BP Enersyn EP-XF-68	Klübersynth GEM 4-68 N			Optigear Synthetic X 68	Reolin Unisyn CLP 68		
4) -35 +20	CLP HC	VG 150	Mobilgear SHC XMP 150 Mobil SHC 629	Shell Omala HD 150	BP Enersyn EP-XF-150	Klübersynth GEM 4-150 N		Pinnacle EP 150	Alphasyn EP 150	Reolin Unisyn CLP 150	El Greco 150	Carter SH 150
-30 +30	CLP HC	VG 220	Mobilgear SHC XMP 220 Mobil SHC 630	Shell Omala HD 220	BP Enersyn EP-XF-220	Klübersynth GEM 4-220 N		Pinnacle EP 220	Alphasyn EP 220	Renolin CLP 320 Plus Renolin High Gear Synth 220	El Greco 220	Carter SH 220
-20 +50	CLP HC	VG 460	Mobilgear SHC XMP 460 Mobil SHC 634	Shell Omala HD 460	BP Enersyn EP-XF-460	Klübersynth GEM 4-460 N		Pinnacle EP 460	Alphasyn EP 460	Renolin CLP 320 Plus Renolin High Gear Synth 460	El Greco 460	Carter SH 460
-10 +60	CLP HC	VG 680	Mobilgear SHC XMP 680 Mobil SHC 636	Shell Omala HD 680	BP Enersyn EP-XF-680	Klübersynth GEM 4-680 N		Pinnacle EP 680	Alphasyn EP 680	Reolin Unisyn CLP 680	El Greco 680	Carter SH 680
-10 +30	CLP HC	VG 68 ³⁾		Shell Cassida Fluid GL 68		Klüberöl 4UH1-68 N			Optileb HY 68	Geralyn SF 460		
-20 +20	NSF H1	VG 220 ³⁾		Shell Cassida Fluid GL 220		Klüberöl 4UH1-220 N			Optileb GT 220			
4) -40 -10		VG 460 ³⁾		Shell Cassida Fluid GL 460		Klüberöl 4UH1-460N			Optileb GT 460			
-20 +40	E	VG 460				Klüberbio CA2-460			Tribol BIO TOP 1418/460	Plantogear 460 S		



Lubricants

Lubricant fill quantities for horizontal installation gear units

10.3 Lubricant fill quantities for horizontal installation gear units

The specified fill quantities are guide values. The precise values vary depending on the gear ratio and lubrication type.

The required oil level depends on the mark on the oil sight glass, oil level glass and/or the dipstick.



ML3PVSF..N	Oil Quantity [l]	ML4PVSF..N	Oil Quantity [l]	ML3RVSF..N	Oil Quantity [l]	ML3RVSF..N	Oil Quantity [l]
100	110	100	105	100	105	100	110
110	145	110	140	110	135	110	145
120	195	120	190	120	180	120	195
130	285	130	275	130	255	130	285
140	395	140	390	140	360	140	395
150	605	150	595	150	560	150	605



When using pressure lubrication, it is essential to observe the specifications on the nameplate and in the order-specific documentation!

10.4 Sealing grease / rolling bearing grease

The table shows the grease types recommended by SEW-EURODRIVE for operating temperature from – 20 °C to +100 °C.

Manufacturer	Grease
Aral	Aralub HLP2
BP	Energrease LS-EPS
Castrol	Spheerol EPL2
Fuchs	Renolit CX TOM 15 OEM
Klüber	Centoplex EP2
Kuwait	Q8 Rembrandt EP2
Mobil	Mobilux EP2
Shell	Alvania EP2
Texaco	Multifak EP2
Total	Multis EP2
Castrol 	Obeen FS2
Fuchs 	Plantogel 2S



If the lubricant used is not listed in the above table, you have to make sure that it is suitable for the intended application.

10.5 Grease fill quantities for dry well

The specified fill quantities are guide values.

Size ML..V..N	Diameter of LSS [mm]	First filling		Regreasing	
		Grease volume [l]	Grease mass [g]	Grease volume [l]	Grease mass [g]
100	Ø220	5.18	4402	2.59	2201
110	Ø260	7.45	6333	3.73	3166
120	Ø300	10.38	8819	5.19	4410
130	Ø360	7.98	6784	3.99	3392
140	Ø400	10.30	8758	5.15	4379
150	Ø420	10.36	8810	5.18	4405



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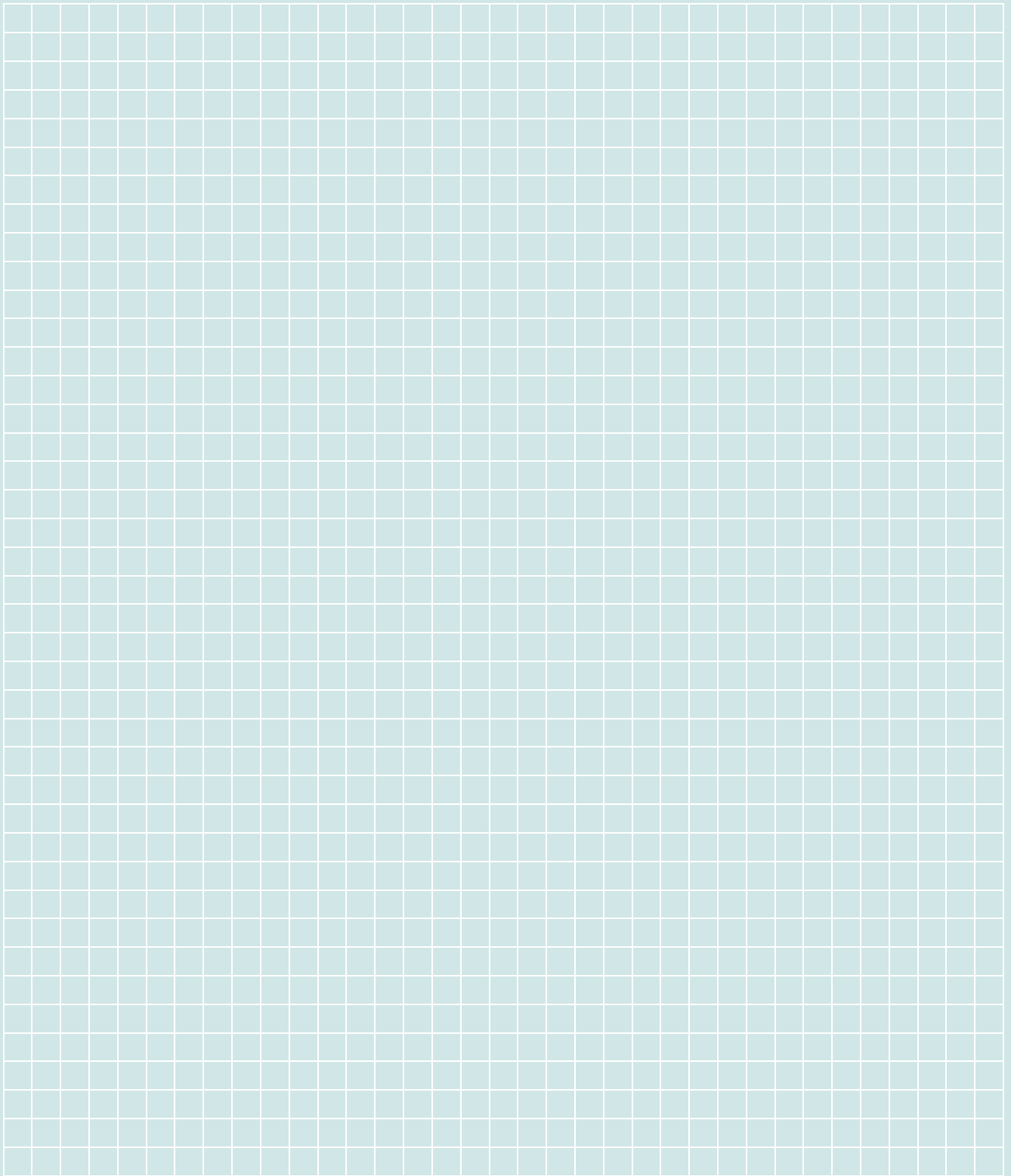
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