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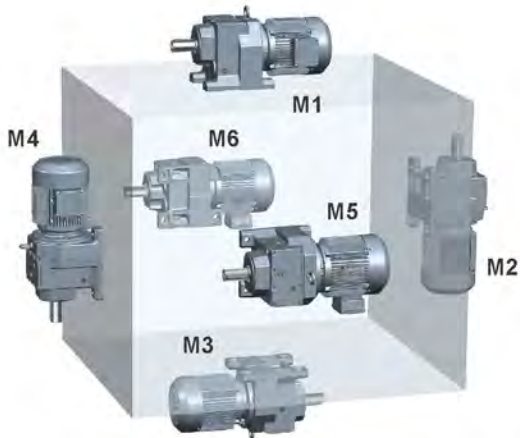
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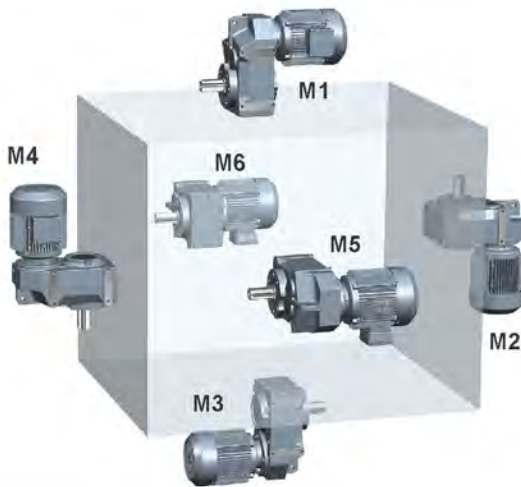
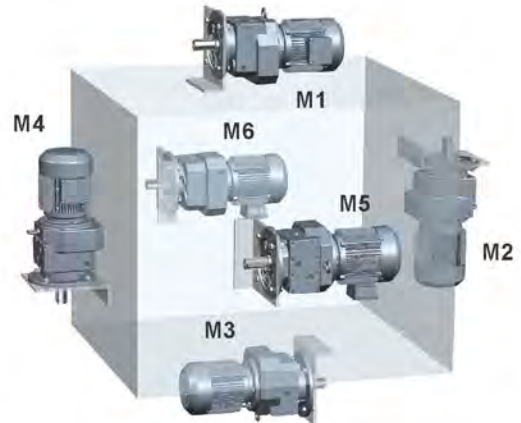
1. MOUNTING POSITIONS

1.1 Mounting position designation

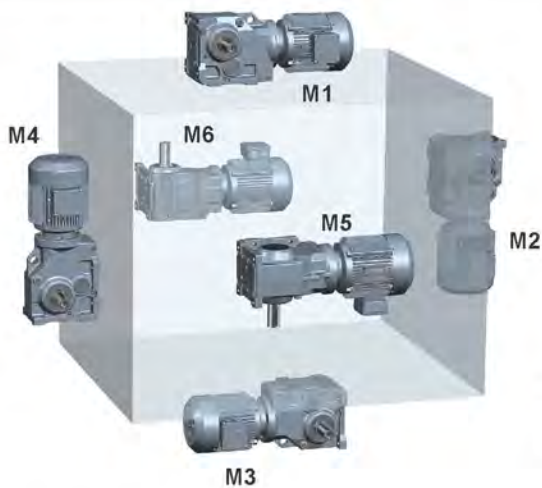
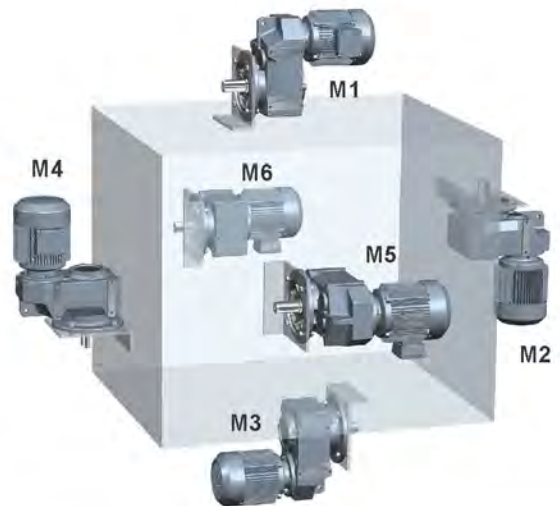
Differentiates between six mounting positions M1 ... M6 for gear units. The following figure shows the spatial orientation of the gearmotor in mounting positions M1 ... M6.



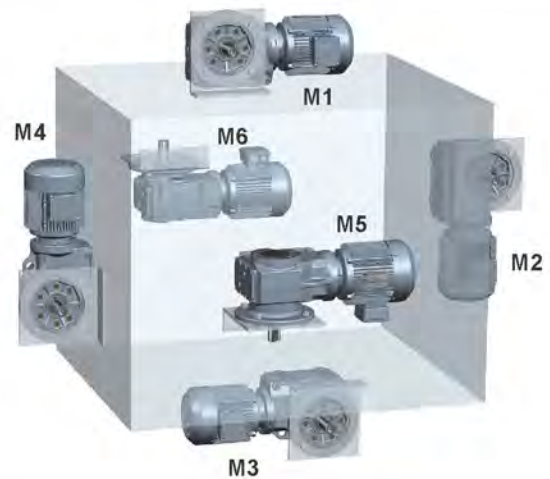
TR..



TF..



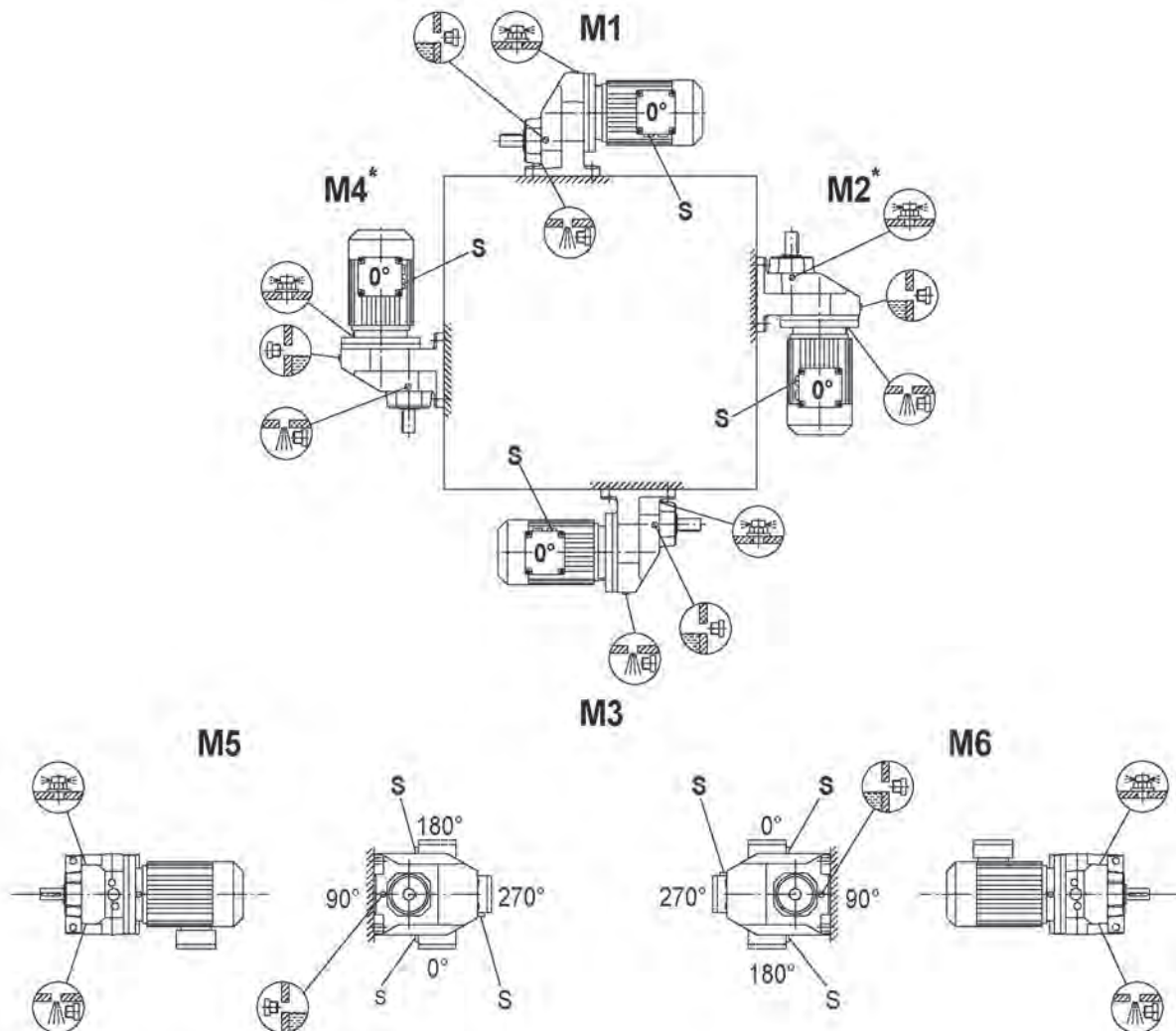
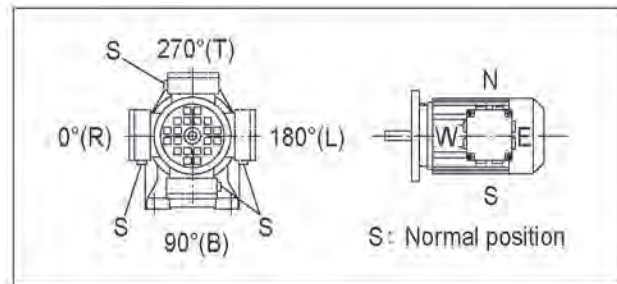
**TK..
TS..**



1.2 TRX.. Mounting positions for helical geared motors

TRX58 - TRX108

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug

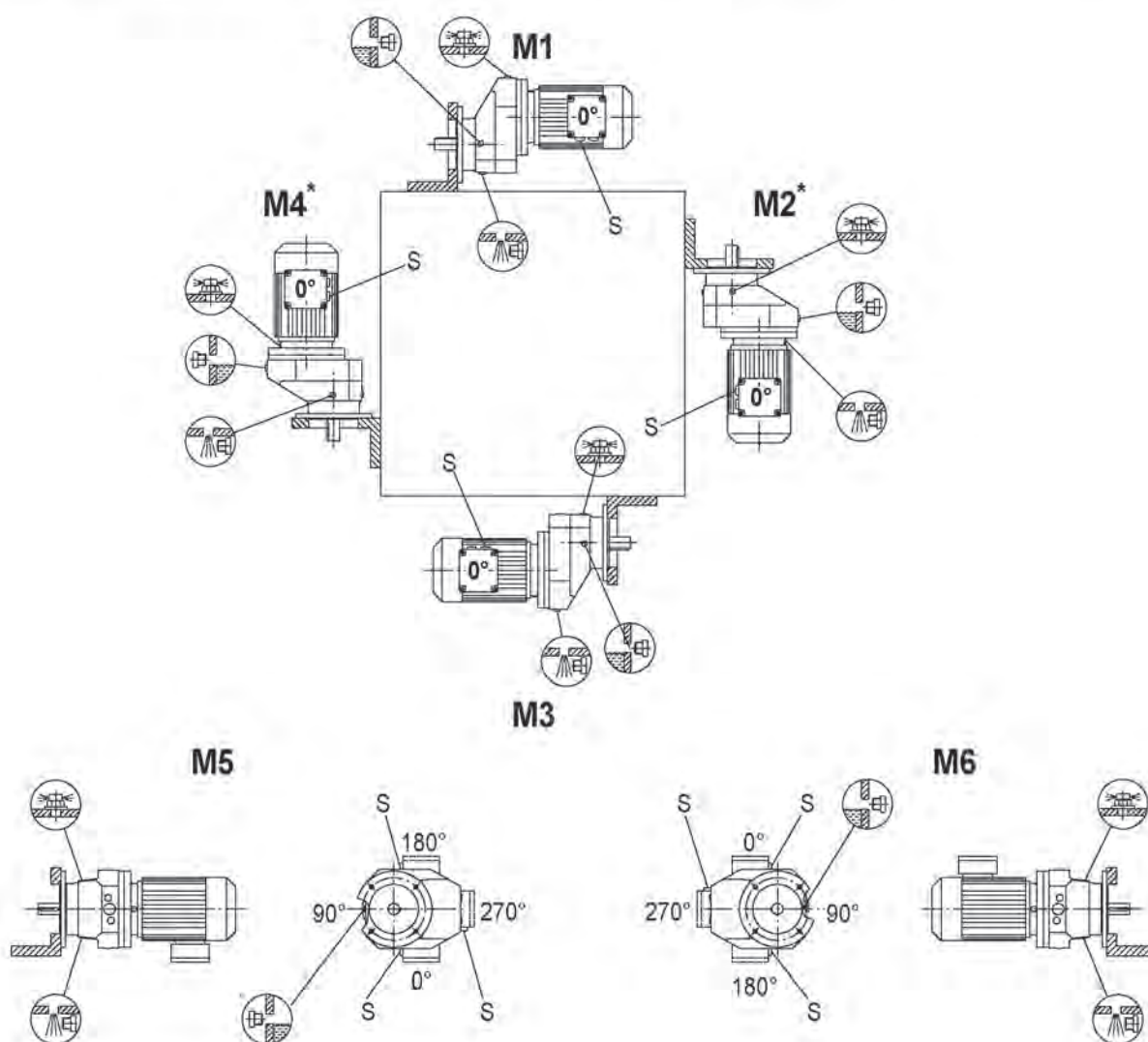
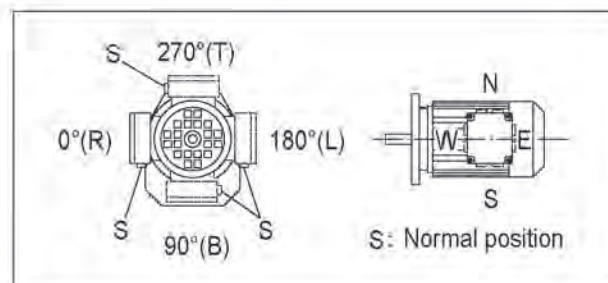


Mounting position	Gear unit size	Input speed [1/min]
M2*, M4*	98...108	>2500
	>108	>1500

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

TRXF58 - TRXF108

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug

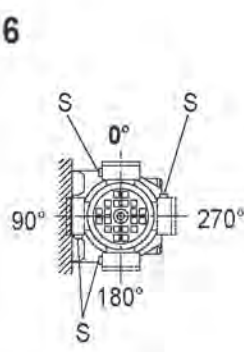
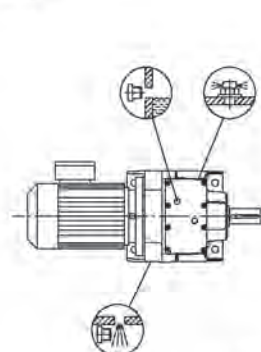
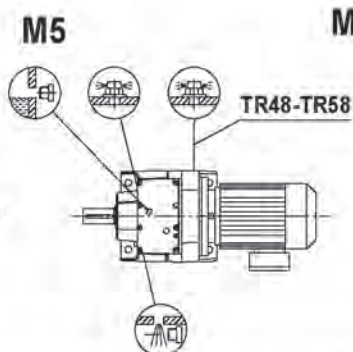
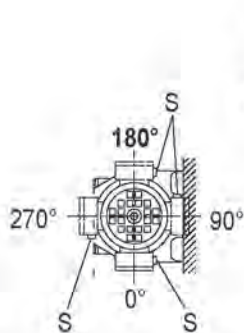
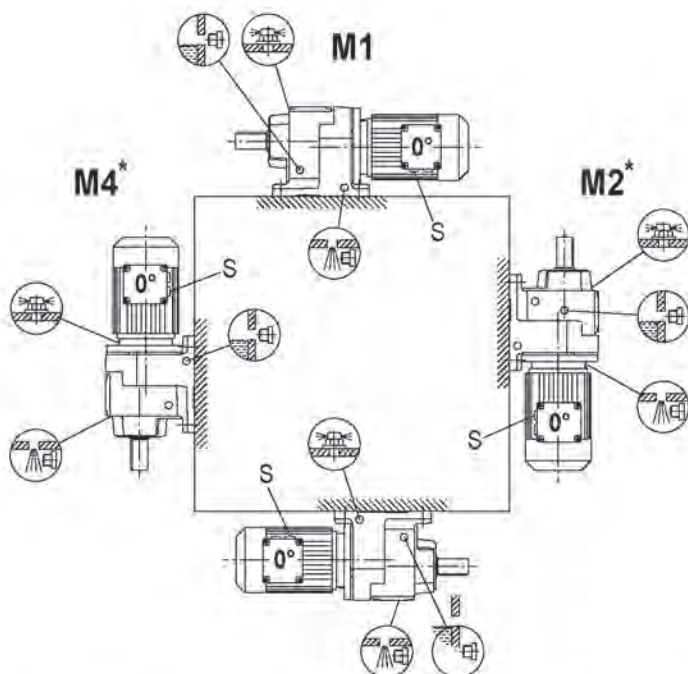
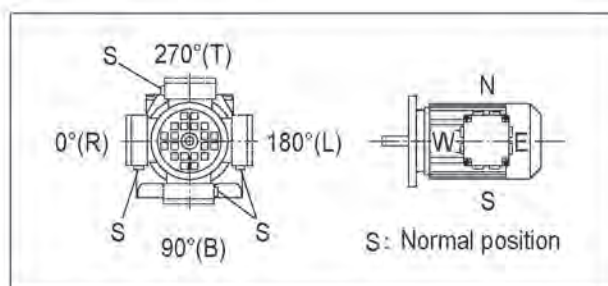


Mounting position	Gear unit size	Input speed [1/min]
M2*, M4*	98...108	>2500
	>108	>1500

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

1.3 TR.. Mounting positions for helical geared motors
TR18 - TR168

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



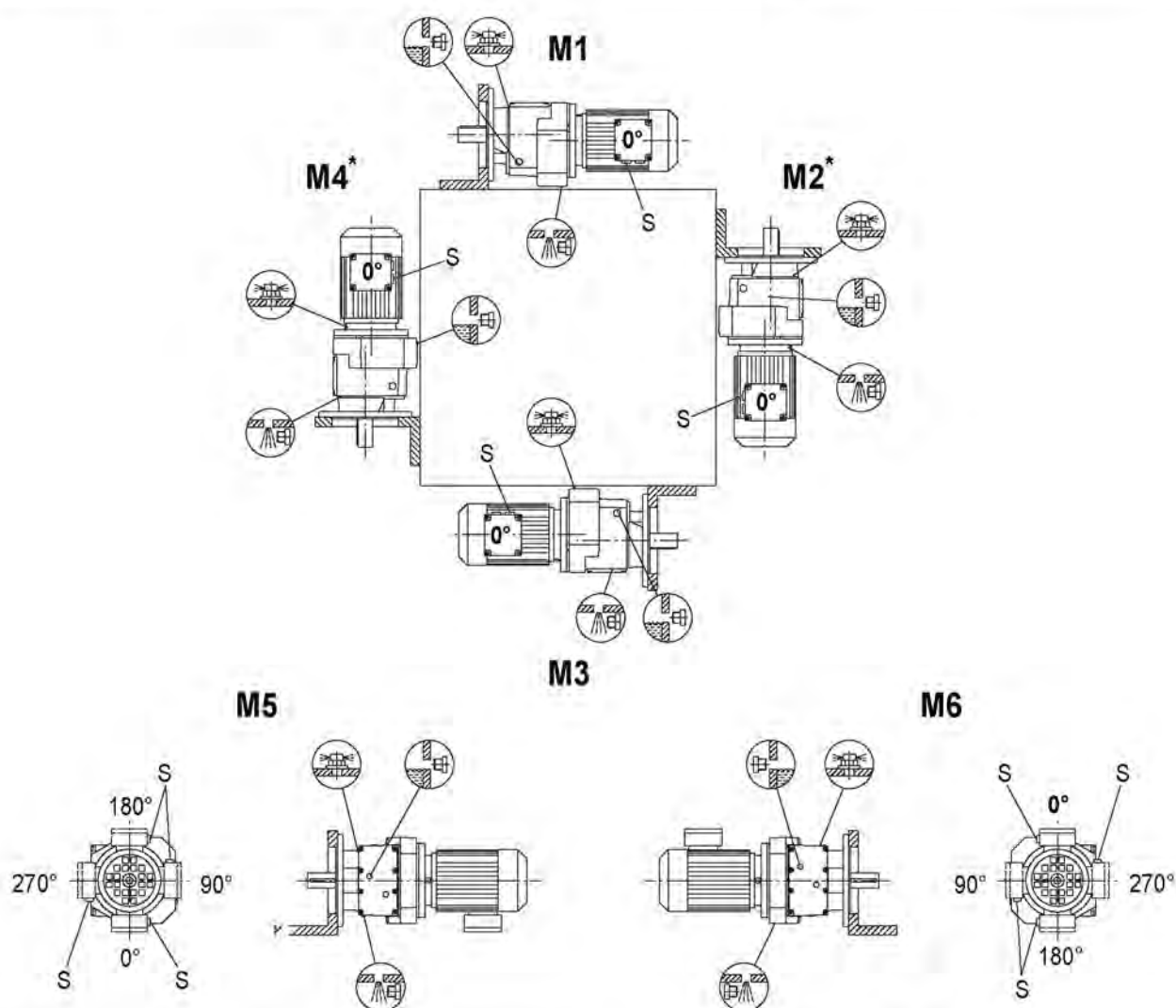
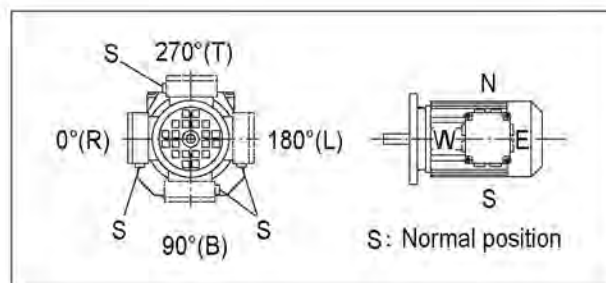
Mounting position	Gear unit size	Input speed [1/min]
M2*, M4*	98...108	>2500
	>108	>1500

TR28		M1, M3, M5, M6
TR28		
TR48, TR58		M5

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

TRF18 - TRF168

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



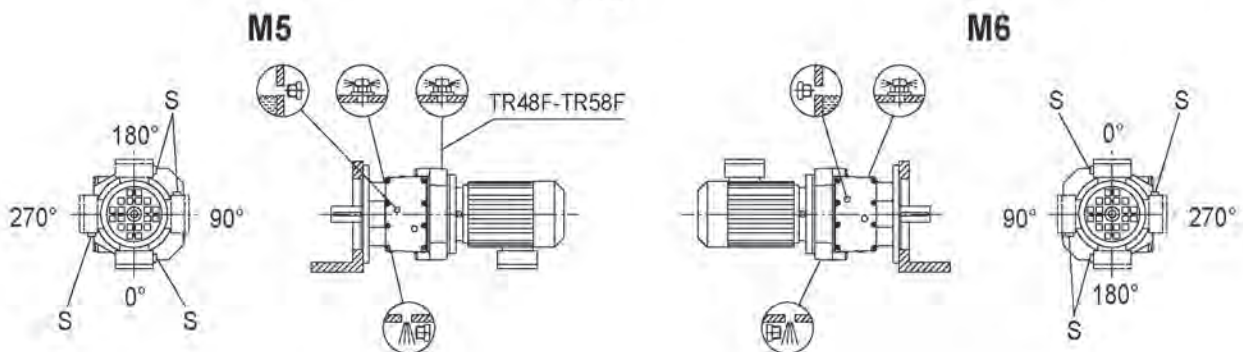
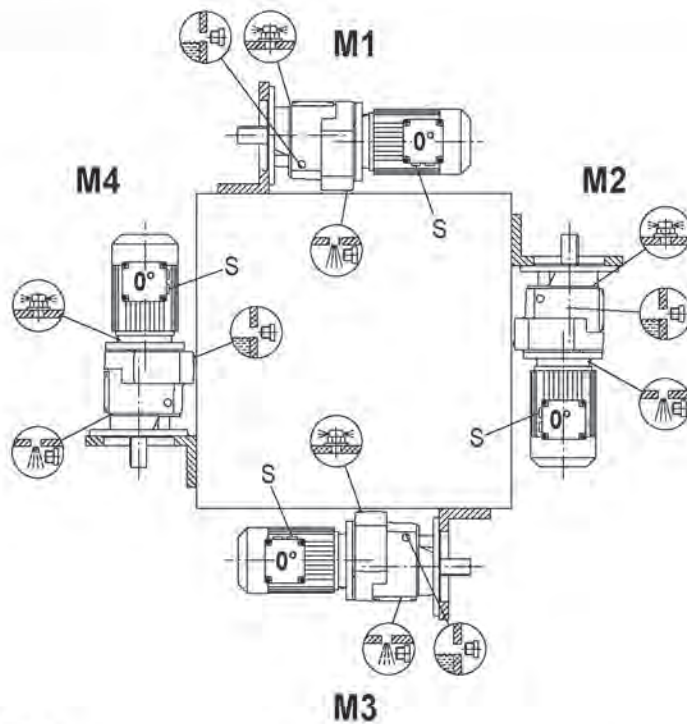
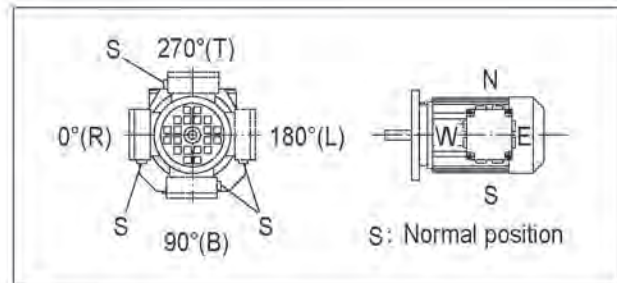
Mounting position	Gear unit size	Input speed [1/min]
M2*, M4*	98...108	>2500
	>108	>1500

TRF28		M1, M3, M5, M6
TRF28		
TRF48, TRF58		M5

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

TR18F - TR88F

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



TR28F  M1, M3, M5, M6

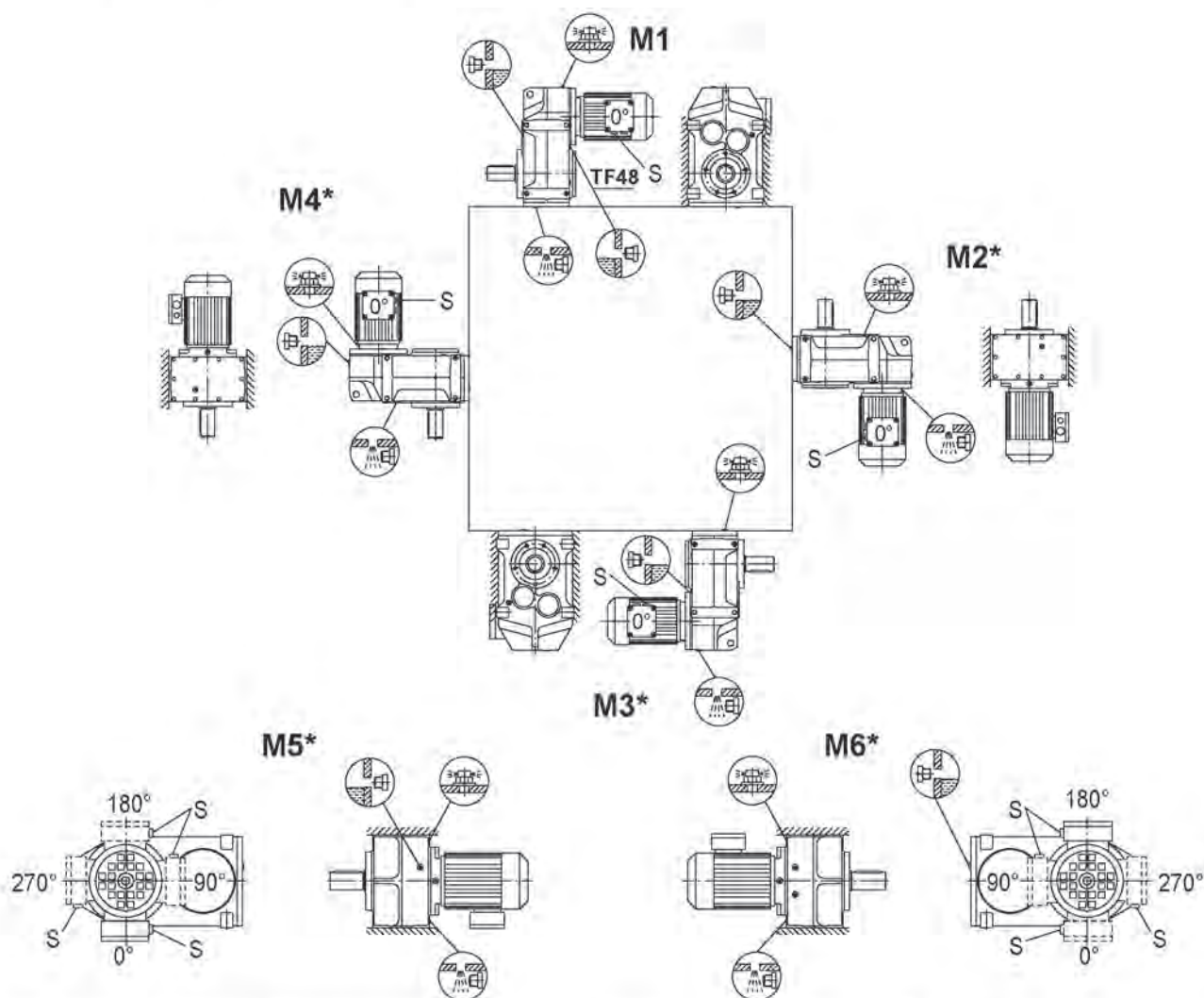
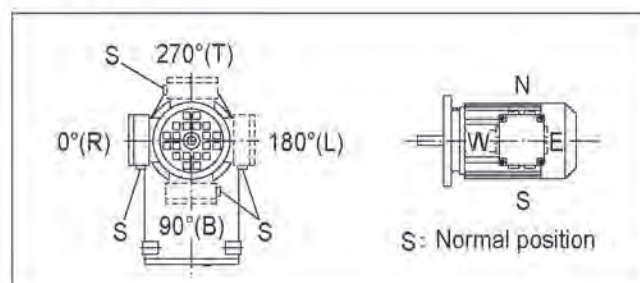
TR28F  

TR48F, TR58F  M5

1.4 TF.. Mounting positions for parallel shaft helical gearmotors

TF/TFA..B/TFH28B-158B,TFV28B-108B

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



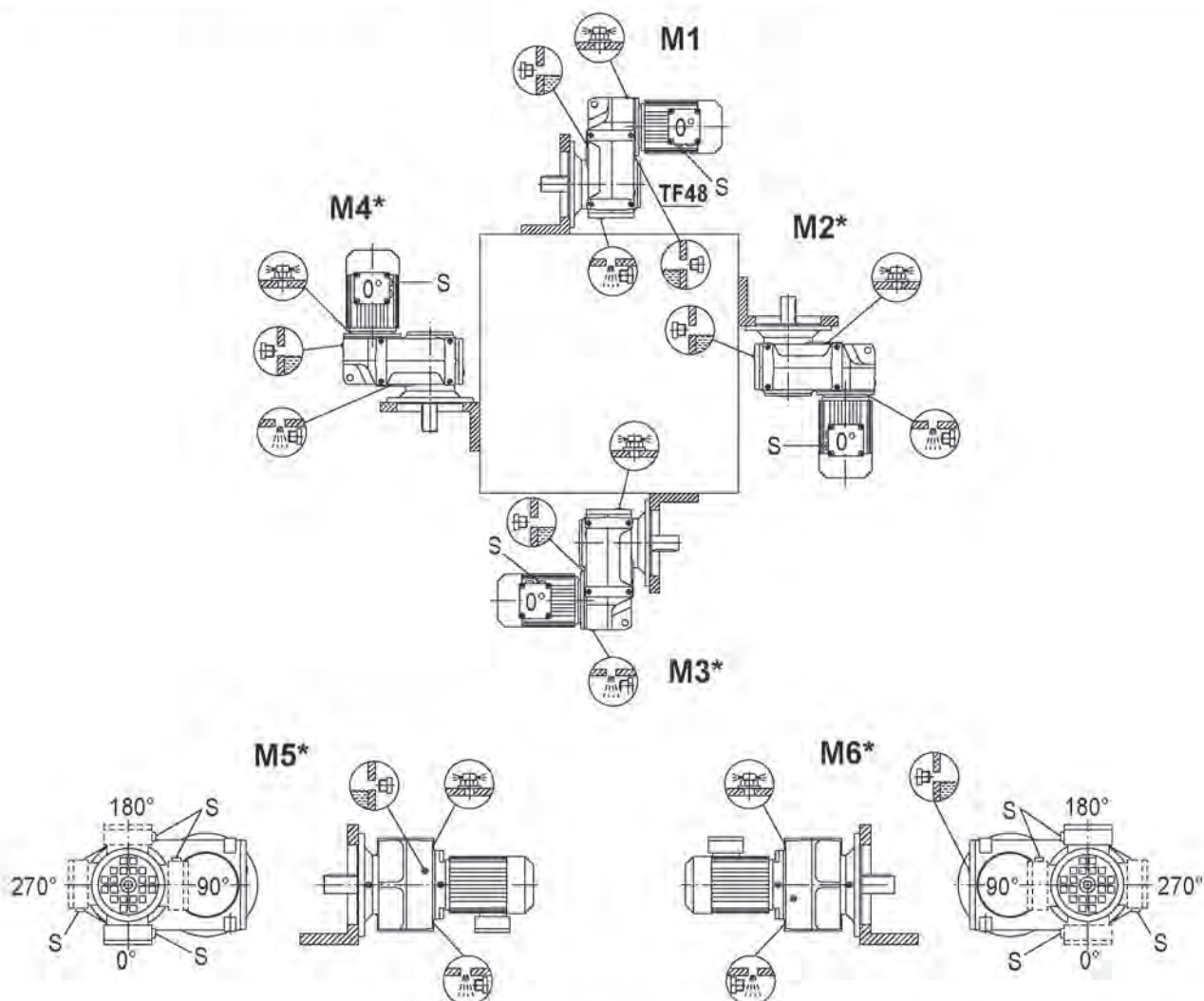
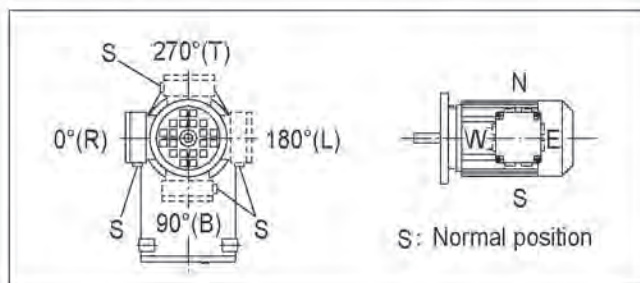
Mounting position	Gear unit size	Input speed [r/min]
M2*, M3*, M4*, M5*, M6*	98...108	>2500
	>108	>1500

TF28		M1, M3, M5, M6
TF28		M1-M6
TF28		M1, M3, M5, M6

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

TFF/TFAF/TFHF/TFAZ/TFHZ28-158,TFVF/TFVZ28-108

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



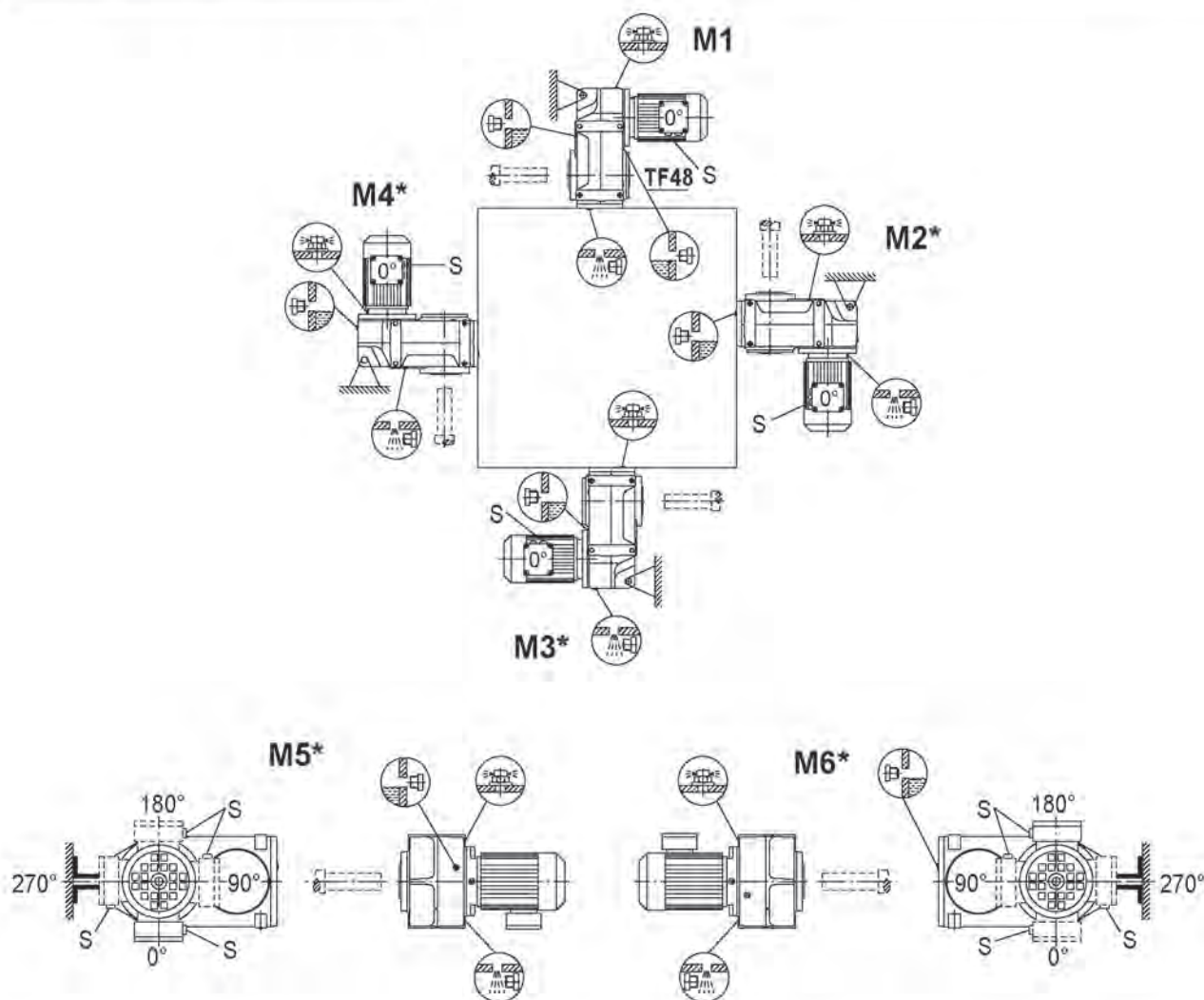
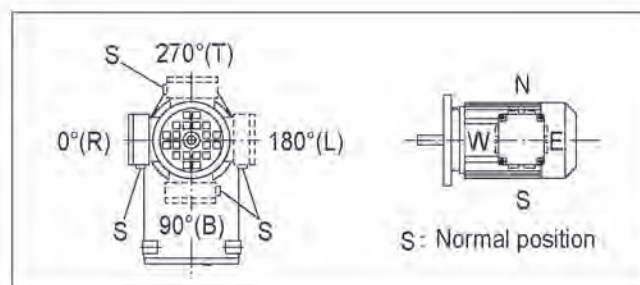
Mounting position	Gear unit size	Input speed [r/min]
M2*, M3*, M4*, M5*, M6*	98...108	>2500
	>108	>1500

TF28		M1, M3, M5, M6
TF28		M1-M6
TF28		M1, M3, M5, M6

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

TFA/TFH28-158,TFV28-108

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



Mounting position	Gear unit size	Input speed [r/min]
M2*, M3*, M4*, M5*, M6*	98...108	>2500
	>108	>1500

TF28  M1, M3, M5, M6

TF28  M1-M6

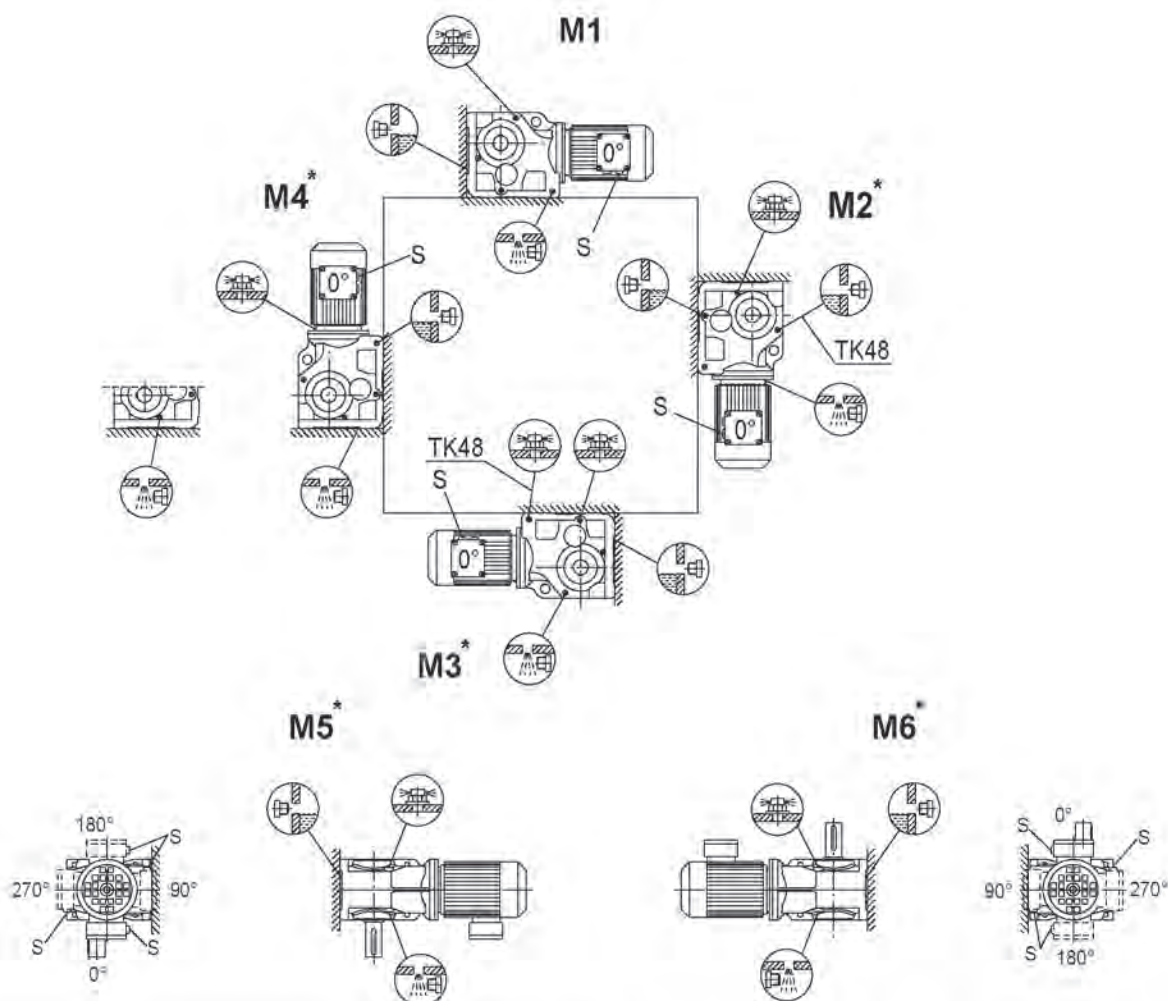
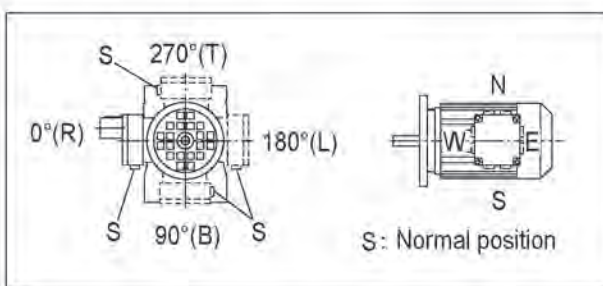
TF28  M1, M3, M5, M6

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

1.5 TK.. Mounting positions for helical-bevel gearmotors

TK/TKA..B/TKH38B-158B,TKV38B-108B

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



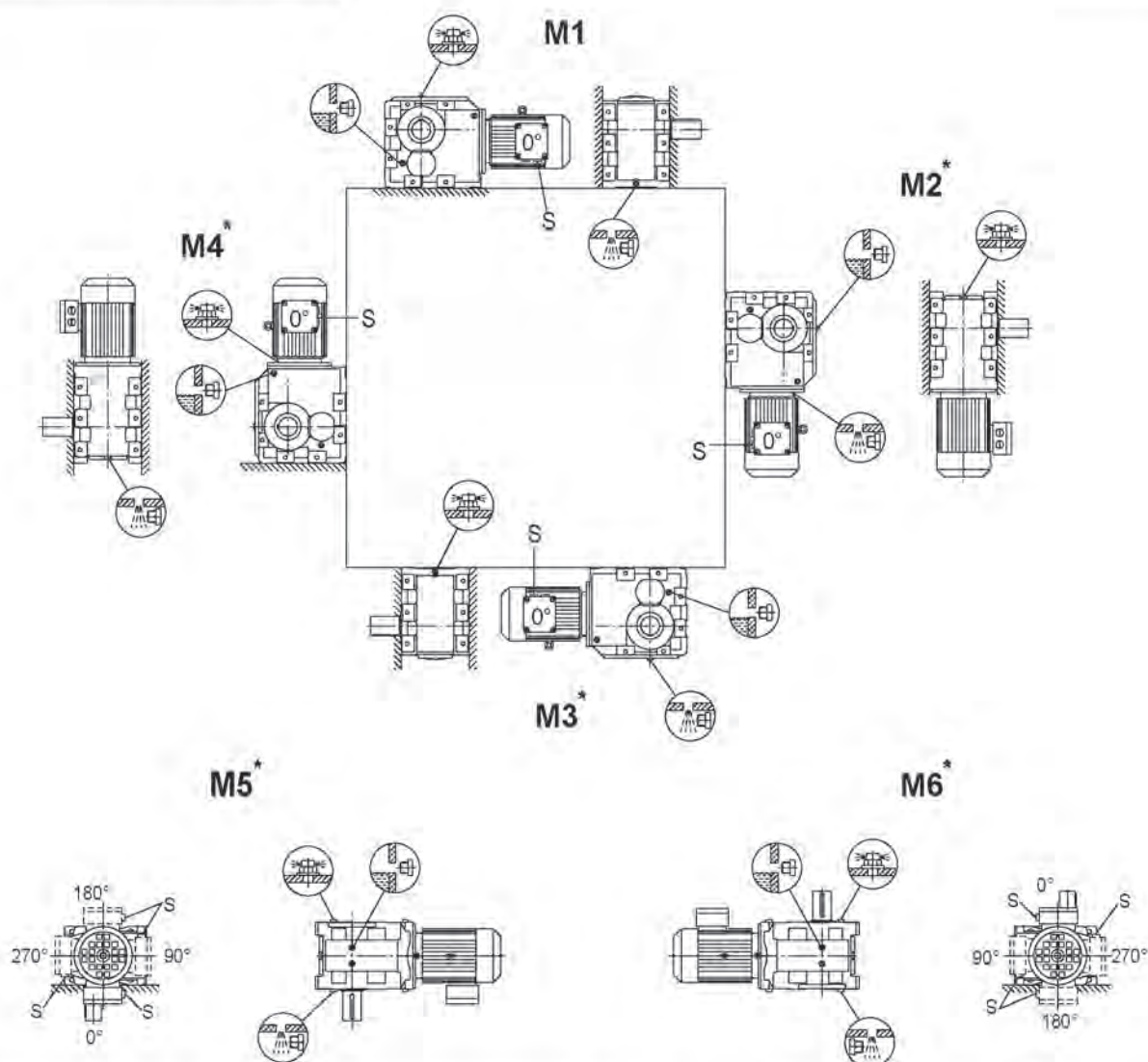
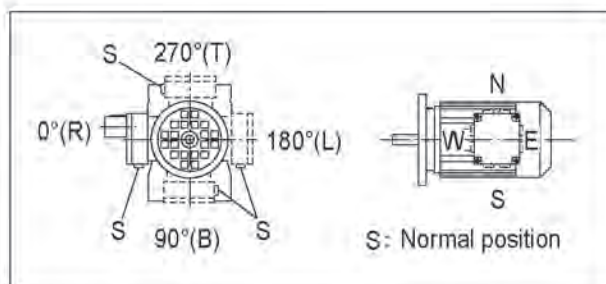
Mounting position	Gear unit size	Input speed [r/min]
M2*,M3*,M4*,M5*,M6*	78...108	>2500
	>108	>1500

Important: Please refer to the **i** information in the 'Geared Motors' catalog, Sec. (page 22).

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

TK168-188, TKH168B-188B

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



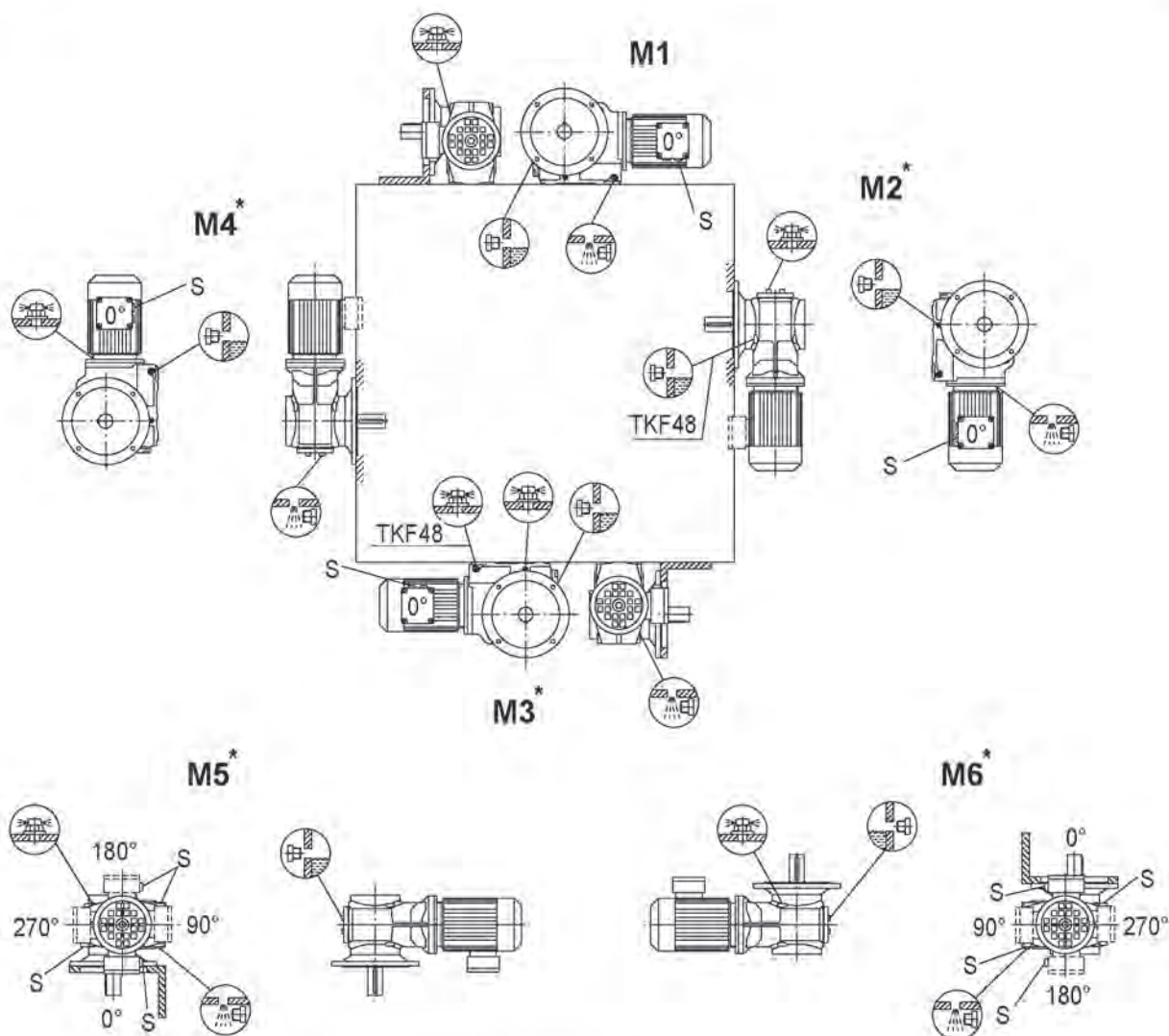
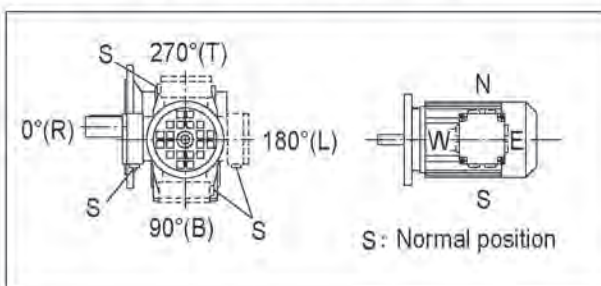
Mounting position	Gear unit size	Input speed [r/min]
M2*, M3*, M4*, M5*, M6*	78...108	>2500
	>108	>1500

Important: Please refer to the **i** information in the 'Geared Motors' catalog, Sec. (page 22).

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

TKF/TKAF/TKHF/TKAZ/TKHZ38-158,TKVF/TKVZ38-108

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug

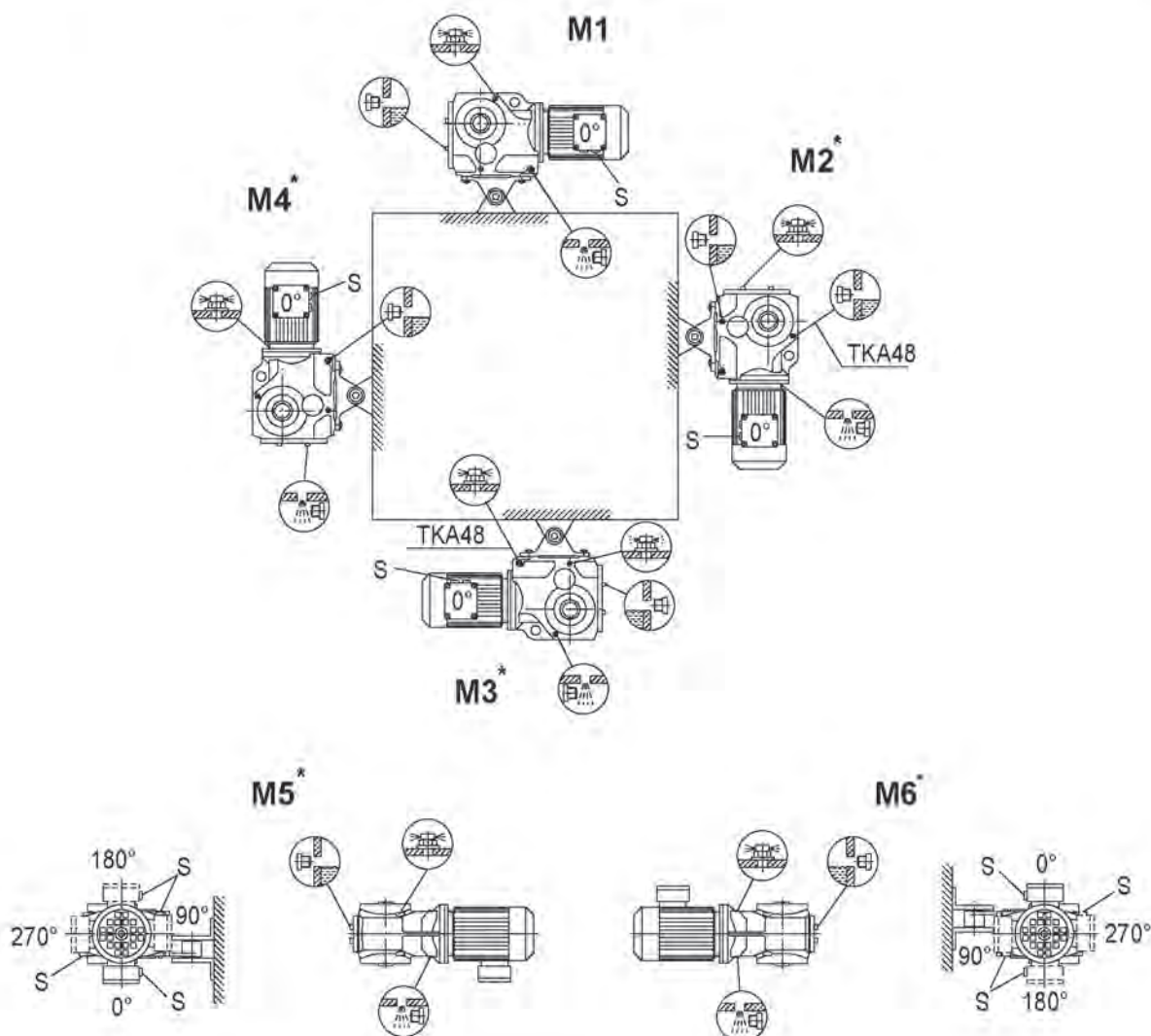
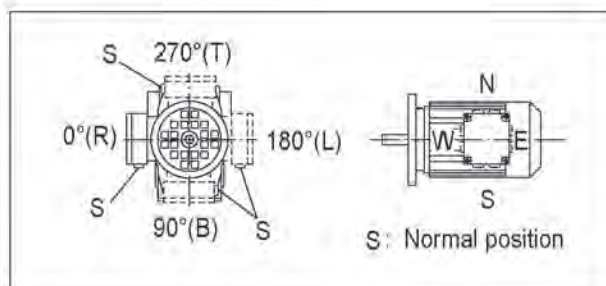


Mounting position	Gear unit size	Input speed [r/min]
M2*, M3*, M4*, M5*, M6*	78...108	>2500
	>108	>1500

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

TKA/TKH38-158,TKV38-108

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug

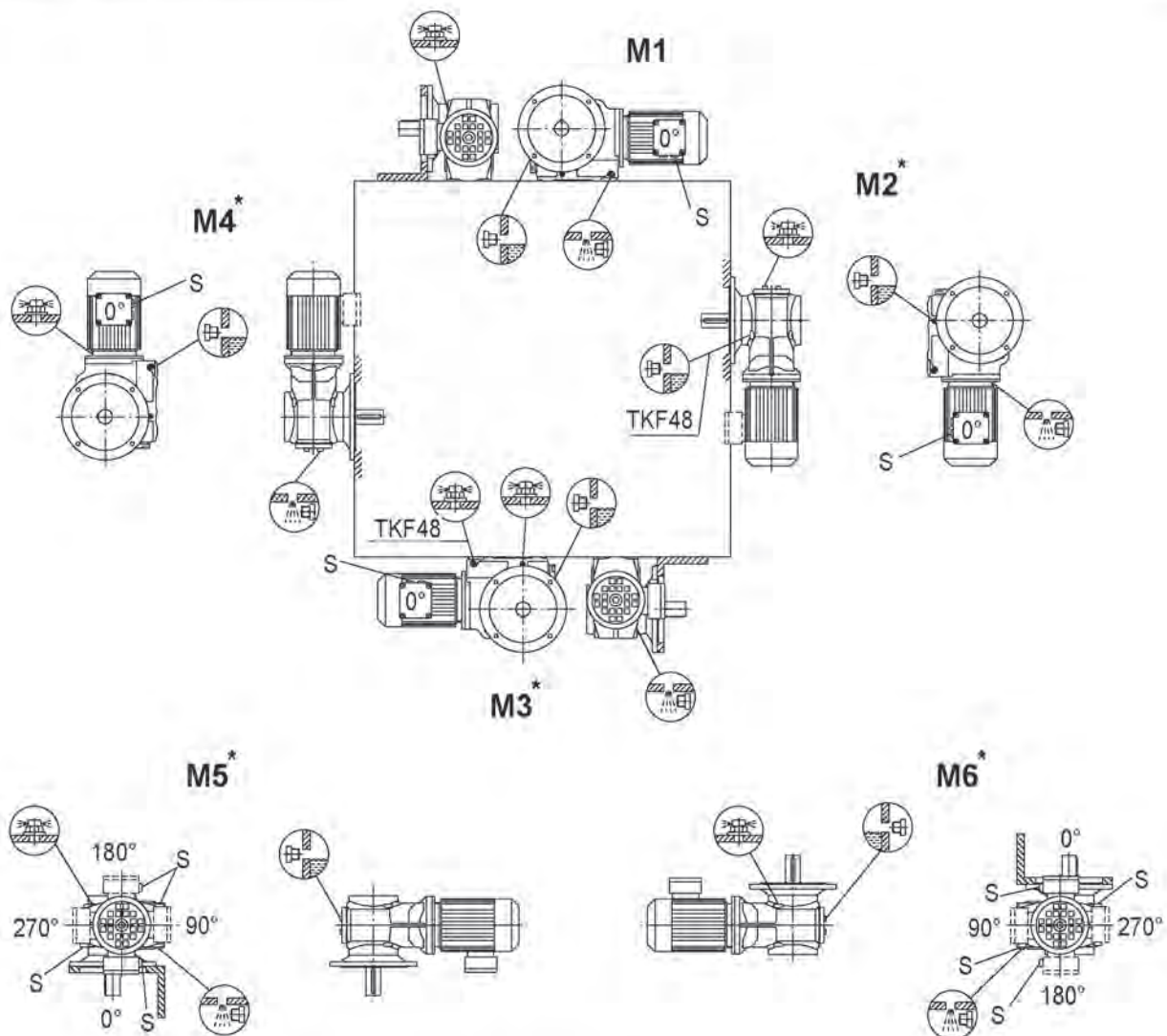
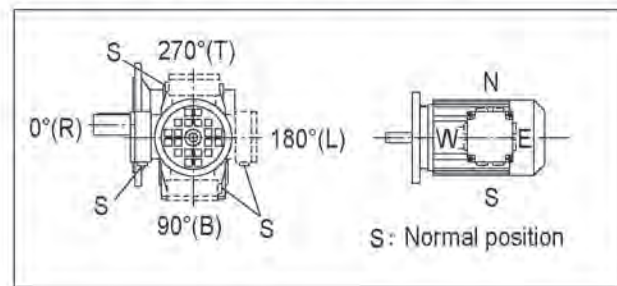


Mounting position	Gear unit size	Input speed [r/min]
M2*, M3*, M4*, M5*, M6*	78...108	>2500
	>108	>1500

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

TKF/TKAF/TKHF/TKAZ/TKHZ38-158,TKVF/TKVZ38-108

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



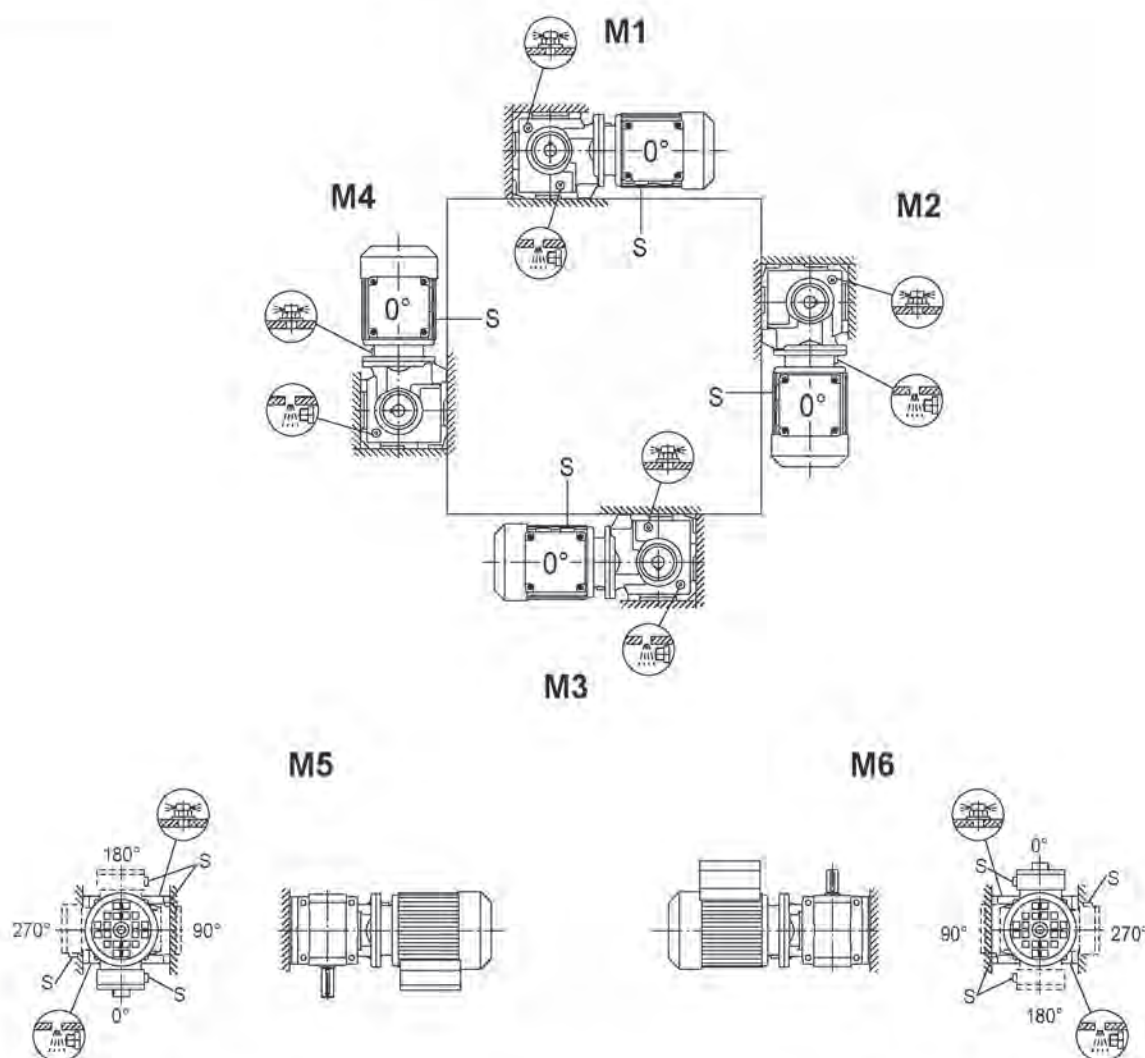
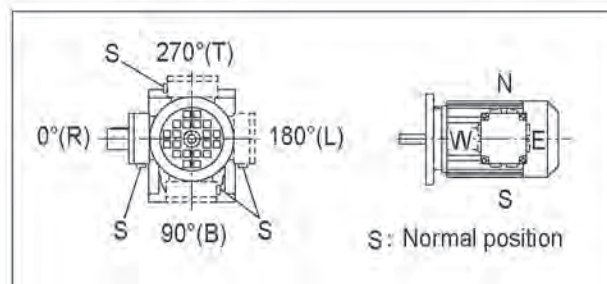
Mounting position	Gear unit size	Input speed [r/min]
M2*, M3*, M4*, M5*, M6*	78...108	>2500
	>108	>1500

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

1.6 TS.. Mounting positions for helical-worm gearmotors

TS38

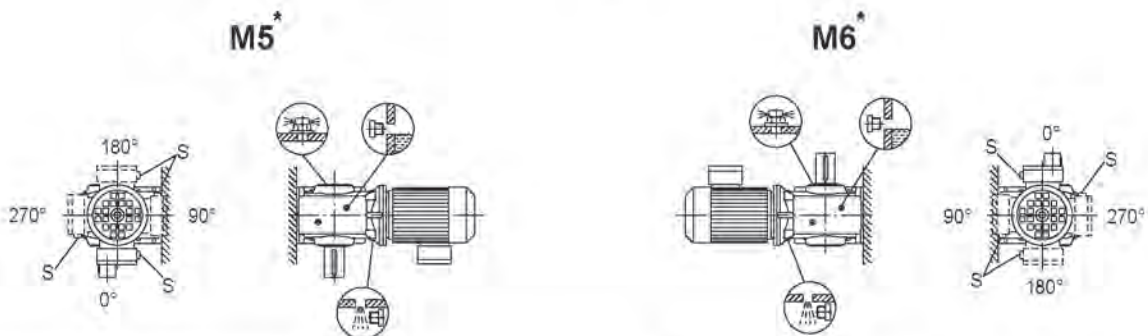
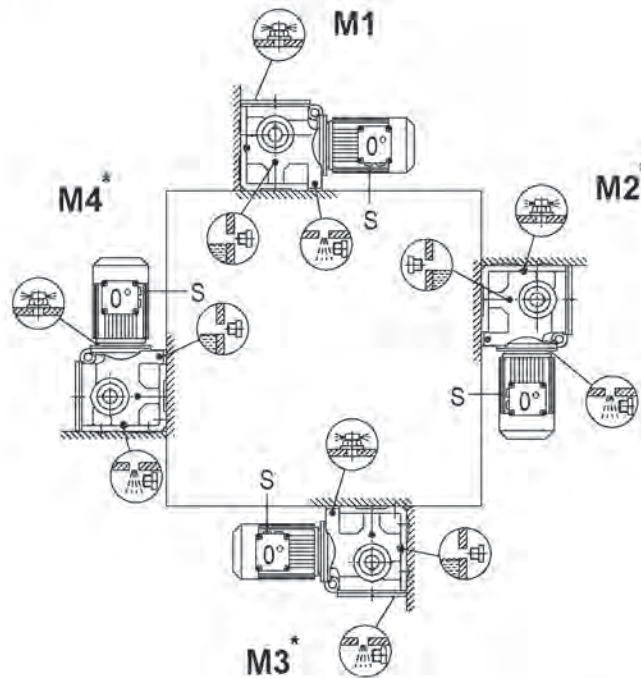
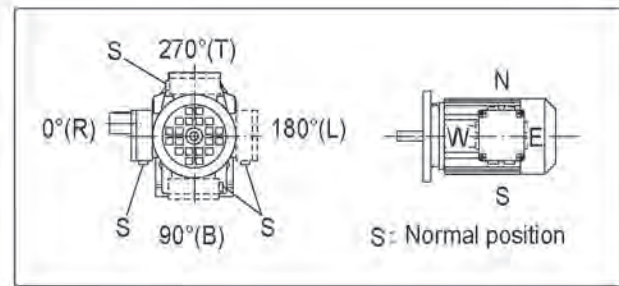
Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



Important: Please refer to the **i** information in the 'Geared Motors' catalog, Sec. (page 22).

TS48-TS98

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



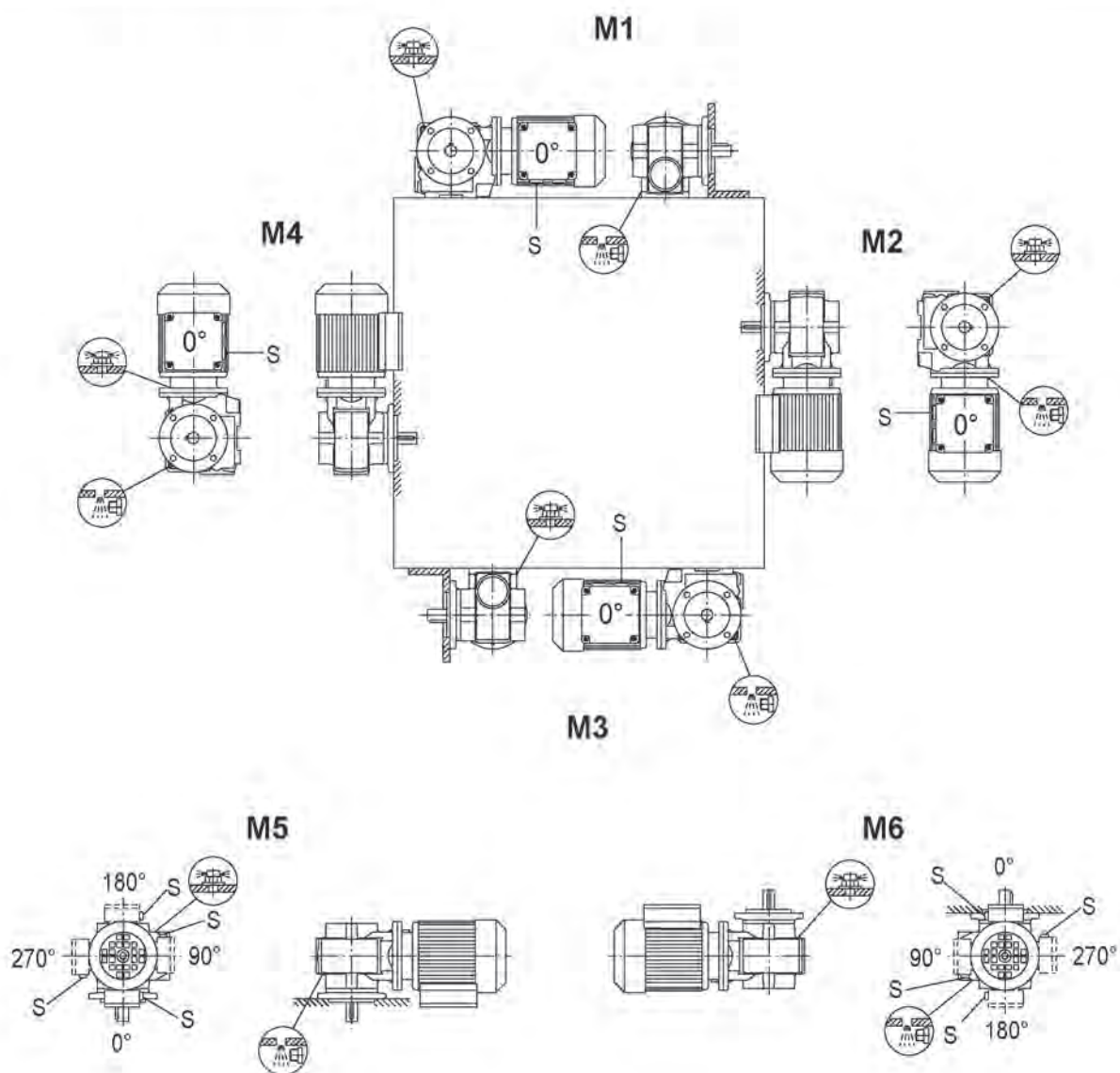
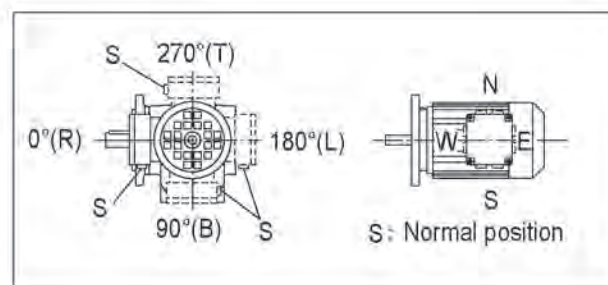
Mounting position	Gear unit size	Input speed [r/min]
M2*, M3*, M4*, M5*, M6*	78...98	>2500

Important: Please refer to the **i** information in the 'Geared Motors' catalog, Sec. (page 22).

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

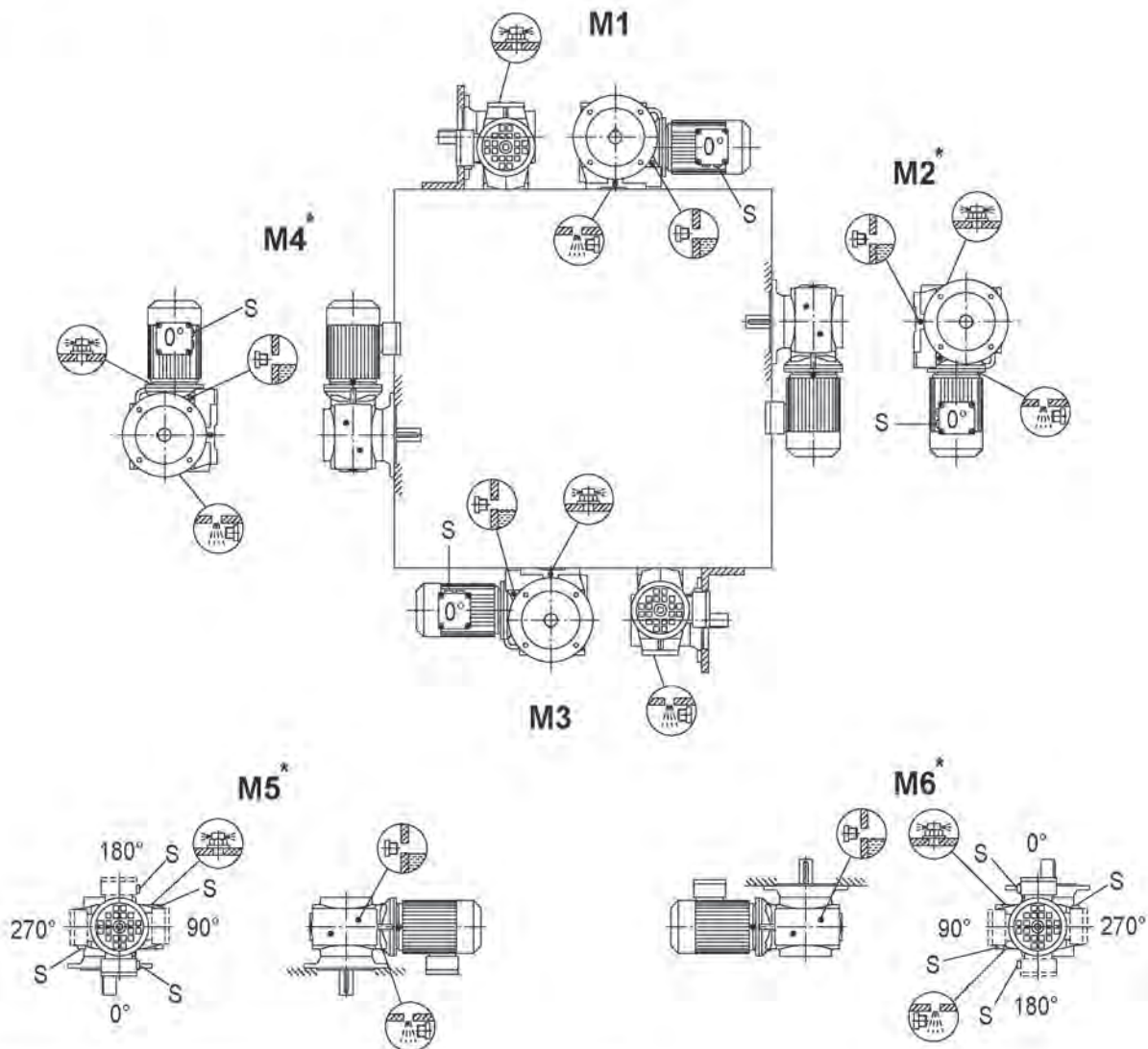
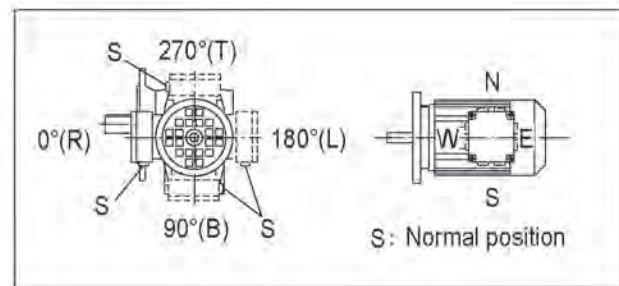
TSF/TSAF/TSHF38

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



TSF/TSAF/TSHF/TSAZ/TSHZ48-98

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug

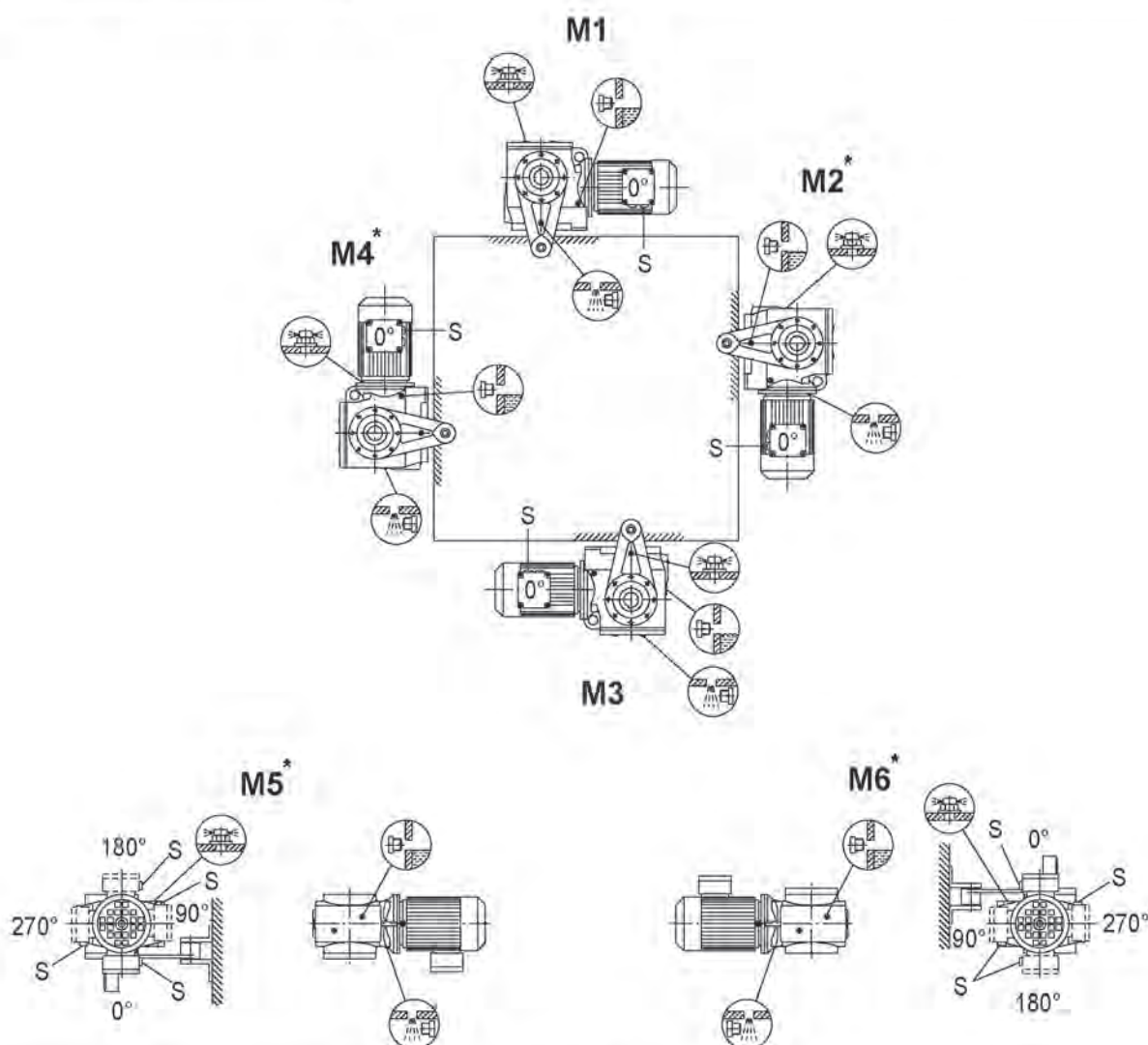
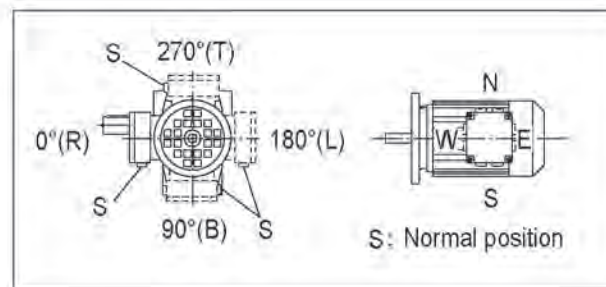


Mounting position	Gear unit size	Input speed [r/min]
M2*, M4*, M5*, M6*	78...98	>2500

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

TSA/TSH48-98

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug

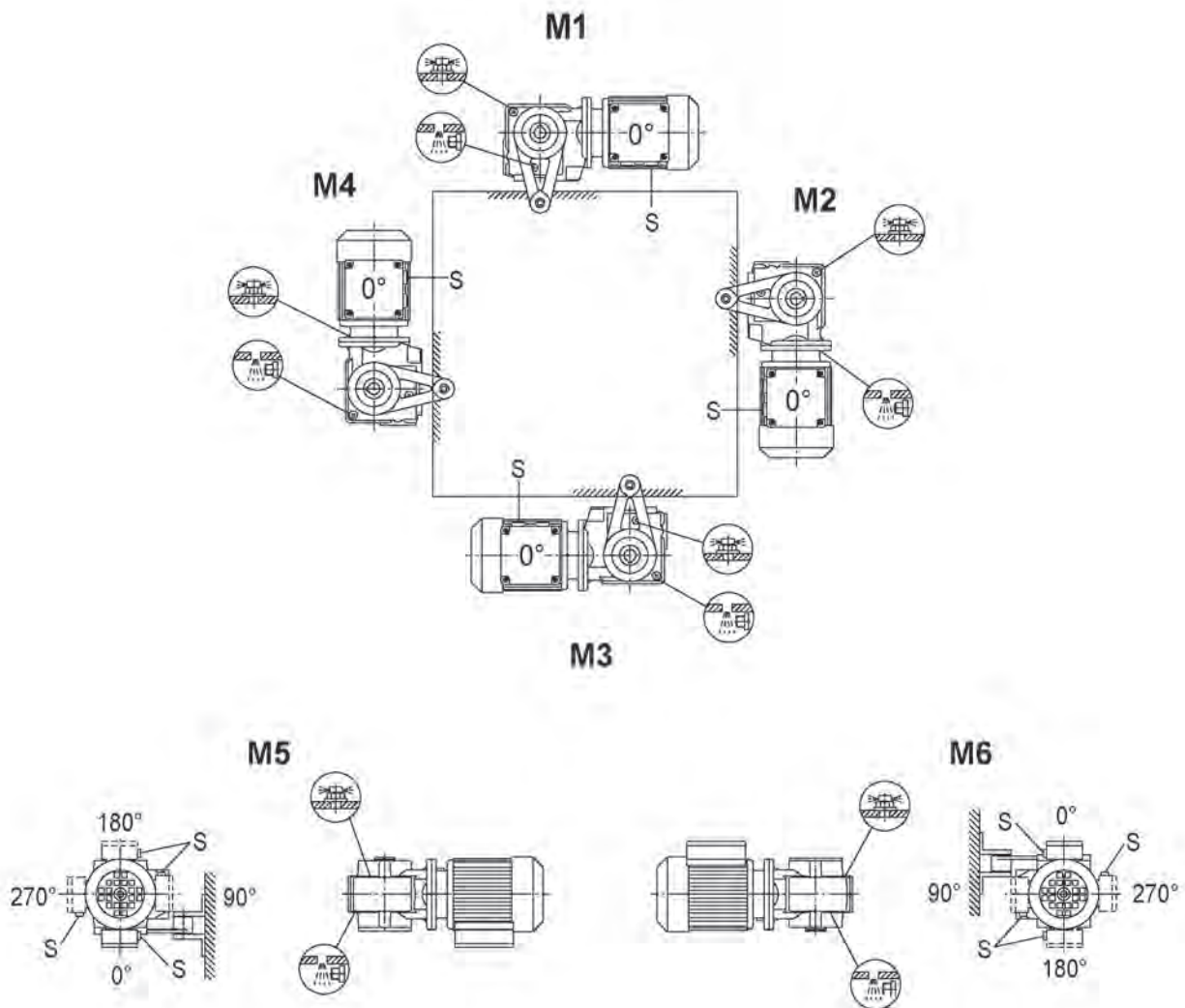
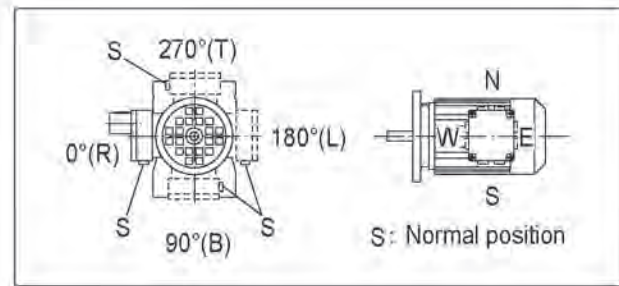


Mounting position	Gear unit size	Input speed [r/min]
M2*, M4*, M5*, M6*	78...98	>2500

Increased churning losses may arise in some mounting positions. Contact GWA - TRANSMISSION in case of the above-mentioned combinations.

TSA/TSH38

Symbol	Meaning
	Breather valve
	Oil level plug
	Oil drain plug



1.7 Direction of rotation

If the drive has a backstop RS, it is also necessary to stipulate the direction of rotation of the drive. The following definition applies, looking onto the output shaft:

Clockwise(CW)=Rotating clockwise

Counterclockwise(CW)=Rotating clockwise

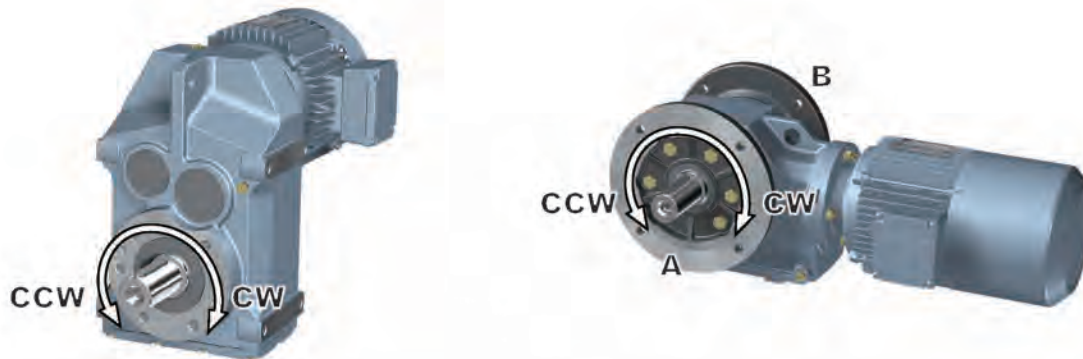


Figure :Direction of rotation of the output.

In right-angle gear units it is also necessary to stipulate whether the direction of rotation is given looking onto the A or B end.

1.8 Position of the output shaft and the output flange

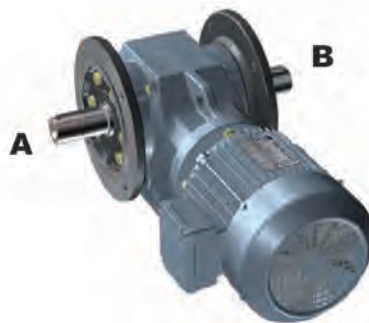


Figure:Position of the output shaft and the output flange

In right-angle gear units ,it is also necessary to stipulate the position of the output shaft and the output flange:

A or B or A+B

1.9 Position of the connection end in right-angle gear units

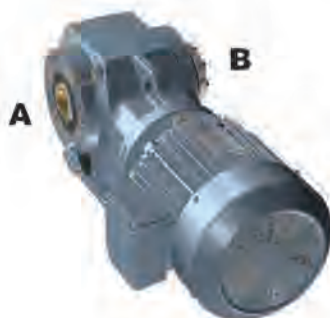


Figure: Position of the connection end

In shaft mounted right-angle gear unit with a shrink disk, it is also necessary to stipulate whether the **A** or **B** end is the connection end. In Figure 12, the **A** end is the connection end, the shrink disk is located opposite to the connection end.

Only connection end at bottom is possible with helical-bevel gear units TK168/TK188 in mounting positions M5 and M6.

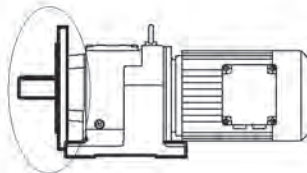
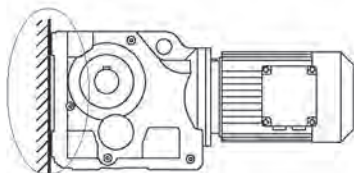
1.10 Sample orders

TYPE (examples)	Mounting position	Shaft with	Flange with	Connection end	Position of shrink disk	Position of terminal box	Position	Direction of rotation of the output
TKF47MY71D4/RS	M2	A	-	-	-	0°	'S'	CW
TSF77MY100L4	M6	A+B	A+B	-	-	90°	'N'	-
TKA97MY132M4	M4	-	-	B	-	270°	'E'	-
TKH107MY160L4	M1	-	-	A	B	180°	'N'	-



The data refer to the radial force acting midway on the shaft end (with right-angle gear units on the A-side output). Worst case conditions have been assumed for the force application angle α and the direction of rotation.

- Only 50% of the F_{r2} value specified in the selection tables is permitted in mounting position **M1** with wall attachment on the front face for **TK** and **TS** gear units.
- Helical-bevel geared motors **TK168** and **TK188** in mounting positions **M1** to **M4**: A maximum of 50% of the overhung load F_{r2} specified in the selection tables in the case of gear unit mounting other than as shown in the mounting position sheets.
- Foot and flange-mounted helical gear units (**TR..F**): A maximum of 50 % of the overhung load F_{r2} specified in the selection tables for torque transmission via flange mounting are permitted.



2. INSTALLATION METHODS

2.1. Preparation before the installation:

- a). Check if the data on the nameplates of the gearmotor matches the voltage supply system.
- b). Check if the drive has not been damaged during transportation and storage.
- c). For standard gear unit, the ambient temperature must be in accordance with the corresponding lubricant table.
- d). The drive must not be assembled in conditions such as oil, gas, vapors, acids, radiation and so on.
- e). Output shaft and flange surfaces must thoroughly cleaned to ensure they are free of anti-corrosion agents, contamination or similar. Use a commercially available solvent. Do not let the solvent come into contact with the sealing lip of the oil seals, or will damage the material!
- f). The supporting structure must have the following characteristics: level, vibration damping and torsionally rigid.
- g). So as to prevent the tolerance of fit of gear units from damaging, the parts assembled on the gear units must be worked as specified tolerance according to **ISOH7**.

2.2. the installation of the gear units:

- a). Do not tighten the housing legs and mounting flanges against one another and ensure that you comply with the permitted radial load and axial load.
- b). Never drive belt pulleys, couplings, pinions, etc. onto the shaft end by hitting them with a hammer. This will damage the bearing, housing and the shaft.
- c). When installing the **IEC** couplings, remove the key from the motor shaft and replace it with the supplied key. Secure key and coupling half using grub screw and tighten to the motor shaft. Seal the contact surface between the adapter and motor using a suitable sealing compound.
- d). Prior to startup, check that if the oil level is as specified for the mounting position. if the oil checking and drain screw and the breather valves are free accessible.

3. LUBRICATION

3.1 General information

Unless a special arrangement is made, GWA supplies the drives with a lubricant fill adapted for the specific gear unit and mounting position. The decisive factor is the mounting position (M1 ... M6, → Sec. "Mounting Positions and Important Order Information") specified when ordering the drive. You must adapt the lubricant fill in case of any subsequent changes made to the mounting position (→ Lubricant fill quantities).

3.2 Anti-friction bearing greases

The lubricant table on the following page shows the permitted lubricants for GWA gear units. Please note the following key to the lubricant table:

	Ambient temperature	Manufacturer	Type	Lubrication type
Anti-friction bearing in gear unit	-20°C ~ +60°C	Mobil	Mobilux EP 2	Mineral oil
	-40°C ~ +80°C	Mobil	Mobiltemp SHC 100	Synthetic oil
Anti-friction bearing in motor	-20°C ~ +80°C	Esso	Unirex EQ3	Mineral oil
	-20°C ~ +60°C	Shell	Alvania RL3	Mineral oil
	+80°C ~ +100°C	Klüber	Barrierta L55/2	Synthetic oil
	-45°C ~ +25°C	Shell	Aero Shell Grease 16	Synthetic oil

The following grease quantities are required:

- For fast-running bearings (motor and gear unit input end): Fill the cavities between the rolling elements one third full with grease.
- For slow-running bearings (in gear units and at gear unit output end): Fill the cavities between the rolling elements two thirds full with grease.

3.3 Types of lubrication

						Lubrication type
TR.. TF.. TK..	Standard -10 +40	VG 220	Shell Omala 220	Mobilgear 630	BP Energol GR-XP 220	Mineral oil
	-20 +25	VG 150 VG 100	Shell Omala 100	Mobilgear 627	BP Energol GR-XP 100	
	-30 +10	VG 68-46 VG 32	Shell Tellus T 32	Mobil D.T.E. 13M		
	-40 -20	VG 22 VG 15	Shell Tellus T 15	Mobil D.T.E. 11M	BP Energol HLP-HM 15	
	-40 +80	VG 220	Shell Omala HD 220	Mobil SHC 630		Synthetic oil
	-40 +40	VG 150		Mobil SHC 629		
	-40 +10	VG 32		Mobil SHC 624		
TS..	-0 +40	VG680	Shell Omala 680	Mobilgear 636	BP Energol GR-XP 680	Mineral oil
	-20 +10	VG 150 VG 100	Shell Omala 100	Mobilgear 627	BP Energol GR-XP 100	
	-20 +60	VG 680 ¹⁾	Shell Tivela S 680		BP Energol GR-XP 680	Synthetic oil
	-30 +80	VG 460	Shell Omala HD 460	Mobil SHC 634		
	-40 +10	VG 150	Shell Omala HD 150	Mobil SHC 629		
	-25 +40	VG 220 ¹⁾	Shell Tivela S 220	Mobil Glygoyle 30		
	-40 0	VG 32		Mobil SHC 624		

3.4 Lubricant fill quantity

The specified fill quantities are recommended values. The precise values vary depending on the number of stages and gear ratio. When filling, it is essential to check the oil level plug since it indicates the precise oil capacity. The following tables show guide values for lubricant fill quantities in relation to the mounting position M1 ~ M6.

Helical (TR) gear units

TR../TR..F:

Gear units	Fill quantity in liters (L)					
	M1**	M2**	M3	M4	M5	M6
TR28/TR28F	0.25/0.40	0.70	0.50	0.70	0.50	0.50
TR38/TR38F	0.30/0.95	0.85	0.95	1.05	0.75	0.95
TR48/TR48F	0.70/1.50	1.60	1.50	1.65	1.50	1.50
TR58/TR58F	0.80/1.70	1.90	1.70	2.10	1.70	1.70
TR68/TR68F	1.10/2.30	2.60/3.50	2.80	3.20	1.80	2.00
TR78/TR78F	1.20/3.00	3.80/4.10	3.60	4.10	2.50	3.40
TR88/TR88F	2.30/6.0	6.7/8.2	7.20	7.70	6.30	6.50
TR98	4.60/9.8	11.7/14.0	11.70	13.40	11.30	11.70
TR108	6.0/13.7	16.30	16.90	19.20	13.20	15.90
TR138	10.0/25.0	28.00	29.50	31.50	25.00	25.00
TR148	15.4/40.0	46.50	48.00	52.00	39.50	41.00
TR168	27.0/70.0	82.00	78.00	88.00	66.00	69.00

TRF../TRZ...:

Gear units	Fill quantity in liters (L)					
	M1**	M2**	M3	M4	M5	M6
TRF/TRZ28	0.25/0.40	0.70	0.50	0.70	0.50	0.50
TRF/TRZ38	0.35/0.95	0.90	0.95	1.05	0.75	0.95
TRF/TRZ48	0.65/1.50	1.60	1.50	1.65	1.50	1.50
TRF/TRZ58	0.80/1.70	1.80	1.70	2.00	1.70	1.70
TRF/TRZ68	1.20/2.50	2.70/3.60	2.70	2.60	1.90	2.10
TRF/TRZ78	1.20/2.60	3.80/4.10	3.30	4.10	2.40	3.00
TRF/TRZ88	2.40/6.0	6.8/7.9	7.10	7.70	6.30	6.40
TRF98	5.1/10.2	11.9/14.0	11.20	14.00	11.20	11.80
TRF108	6.3/14.9	15.90	17.00	19.20	13.10	15.90
TRF138	9.5/25.0	27.00	29.00	32.50	25.00	25.00
TRF148	16.4/42.0	47.00	48.00	52.00	42.00	42.00
TRF168	26.0/70.0	82.00	78.00	88.00	65.00	71.00

Helical (TRX) gear units

TRX...:

Gear units	Fill quantity in liters (L)					
	M1**	M2**	M3	M4	M5	M6
TRX58	0.60	0.80	1.30	1.30	0.90	0.90
TRX68	0.80	0.80	1.70	1.90	1.10	1.10
TRX78	1.10	1.50	2.60	2.70	1.60	1.60
TRX88	1.70	2.50	4.80	4.80	2.90	2.90
TRX98	2.10	3.40	7.40	7.00	4.80	4.80
TRX108	3.90	5.60	11.60	11.90	7.70	7.70

** The large gear unit of multi-stage gear units must be filled with the larger oil volume.

Helical (TRX) gear units**TRXF...:**

Gear units	Fill quantity in liters (L)					
	M1**	M2**	M3	M4	M5	M6
TRXF58	0.50	0.80	1.10	1.10	0.70	0.70
TRXF68	0.70	0.80	1.50	1.40	1.00	1.00
TRXF78	0.90	1.30	2.40	2.00	1.60	1.60
TRXF88	1.60	1.95	4.90	3.95	2.90	2.90
TRXF98	2.10	3.70	7.10	6.30	4.80	4.80
TRXF108	3.10	5.70	11.20	9.30	7.20	7.20

** The large gear unit of multi-stage gear units must be filled with the larger oil volume.

Parallel shaft helical (TF) gear units**TF..., TFA...B, TFH...B, TFV...B:**

Gear units	Fill quantity in liters (L)					
	M1	M2	M3	M4	M5	M6
TF...28	0.60	0.80	0.70	0.70	0.60	0.60
TF...38	0.95	1.25	0.70	1.25	1.00	1.10
TF...48	1.50	1.80	1.10	1.90	1.50	1.70
TF...58	2.6	3.5	2.1	3.5	2.8	2.9
TF...68	2.7	3.8	1.90	3.8	2.9	3.2
TF...78	5.9	7.3	4.3	8.0	6.0	6.3
TF...88	10.8	13.0	7.7	13.8	10.8	11.0
TF...98	18.5	22.5	12.6	25.2	18.5	20.0
TF...108	24.5	32.0	19.5	37.5	27.0	27.0
TF...128	40.5	55	34.0	61	46.5	47.0
TF...158	69	104	63	105	86	78

TFF...:

Gear units	Fill quantity in liters (L)					
	M1	M2	M3	M4	M5	M6
TFF28	0.60	0.80	0.70	0.70	0.60	0.60
TFF38	1.00	1.25	0.70	1.30	1.00	1.10
TFF48	1.60	1.85	1.10	1.90	1.50	1.70
TFF58	2.8	3.5	2.1	3.7	2.9	3.0
TFF68	2.7	3.8	1.90	3.8	2.9	3.2
TFF78	5.9	7.3	4.3	8.1	6.0	6.3
TFF88	10.8	13.2	7.8	14.1	11.0	11.2
TFF98	19.0	22.5	12.6	25.5	18.9	20.5
TFF108	25.5	32.0	19.5	38.5	27.5	28.0
TFF128	41.5	56	34.0	63	46.5	49.0
TFF158	72	105	64	106	87	79

Parallel shaft helical (TF) gear units

TFA...,TFH...,TFV...,TFAF...,TFHF...,TFVF...,TFAZ...,TFHZ...,TFVZ...:

Gear units	Fill quantity in liters (L)					
	M1	M2	M3	M4	M5	M6
TF..28	0.60	0.80	0.70	0.70	0.60	0.60
TF..38	0.95	1.25	0.70	1.25	1.00	1.10
TF..48	1.50	1.80	1.10	1.90	1.50	1.70
TF..58	2.7	3.5	2.1	3.4	2.9	3.0
TF..68	2.7	3.8	1.90	3.8	2.9	3.2
TF..78	5.9	7.3	4.3	8.0	6.0	6.3
TF..88	10.8	13.0	7.7	13.8	10.8	11.0
TF..98	18.5	22.5	12.6	25.0	18.5	20.0
TF..108	24.5	32.0	19.5	37.5	27.0	27.0
TF..128	39.0	55	34.0	61	45.0	46.5
TF..158	68	103	62	104	85	77

Helical-bevel (TK) gear units

TK...,TKA..B,TKH..B,TKV..B:

Gear units	Fill quantity in liters (L)					
	M1	M2	M3	M4	M5	M6
TK..38	0.50	1.00	1.00	1.30	0.95	0.95
TK..48	0.80	1.30	1.50	2.0	1.60	1.60
TK..58	1.20	2.3	2.5	3.0	2.6	2.4
TK.68	1.10	2.4	2.6	3.4	2.6	2.6
TK..78	2.2	4.1	4.4	5.9	4.2	4.4
TK..88	3.7	8.0	8.7	10.9	8.0	8.0
TK..98	7.0	14.0	15.7	20.0	15.7	15.5
TK..108	10.0	21.0	25.5	33.5	24.0	24.0
TK..128	21.0	41.5	44.0	54	40.0	41.0
TK..158	31.0	62	62	90	58	62
TK..168	33.0	95	105	123	85	84
TK..188	53	152	167	200	143	143

TKF...:

Gear units	Fill quantity in liters (L)					
	M1	M2	M3	M4	M5	M6
TKF38	0.50	1.00	1.00	1.50	1.00	1.00
TKF48	0.80	1.30	1.70	2.2	1.60	1.60
TKF58	1.30	2.3	2.7	3.2	2.9	2.7
TKF68	1.10	2.4	2.8	3.6	2.7	2.7
TKF78	2.1	4.1	4.4	6.0	4.5	4.5
TKF88	3.7	8.2	9.0	11.9	8.4	8.4
TKF98	7.0	14.7	17.3	21.5	15.7	16.5
TKF108	10.0	22.0	26.0	35.0	25.0	25.0
TKF128	21.0	41.5	46.0	55	41.0	41.0
TKF158	31.0	66	69	92	62	62

Helical-bevel (TK) gear units**TKA..., TKH..., TKV..., TKAF..., TKHF..., TKVF..., TKAZ..., TKHZ..., TKVZ...:**

Gear units	Fill quantity in liters (L)					
	M1	M2	M3	M4	M5	M6
TK...38	0.50	1.00	1.00	1.40	1.00	1.00
TK...48	0.80	1.30	1.60	2.1	1.60	1.60
TK...58	1.30	2.3	2.7	3.2	2.9	2.7
TK...68	1.10	2.4	2.7	3.6	2.6	2.6
TK...78	2.1	4.1	4.6	6.0	4.4	4.4
TK...88	3.7	8.2	8.8	11.1	8.0	8.0
TK...98	7.0	14.7	15.7	20.0	15.7	15.7
TK...108	10.0	20.5	24.0	32.0	24.0	24.0
TK...128	21.0	41.5	43.0	52	40.0	40.0
TK...158	31.0	66	67	87	62	62
TK...168	33.0	95	105	123	85	84
TK...188	53	152	167	200	143	143

Helical-worm (TS) gear units**TS.. :**

Gear units	Fill quantity in liters (L)					
	M1	M2	M3**	M4	M5	M6
TS38	0.25	0.40	0.50	0.55	0.40	0.40
TS48	0.35	0.80	0.70/0.90	1.00	0.80	0.80
TS58	0.50	1.20	1.00/1.20	1.45	1.30	1.30
TS68	1.00	2.0	2.2/3.1	3.1	2.6	2.6
TS78	1.90	4.2	3.7/5.4	5.9	4.4	4.4
TS88	3.3	8.1	6.9/10.4	12.0	8.4	8.4
TS98	6.8	15.0	13.4/18.0	22.5	17.0	17.0

TSF.. :

Gear units	Fill quantity in liters (L)					
	M1	M2	M3**	M4	M5	M6
TSF38	0.25	0.40	0.50	0.55	0.40	0.40
TSF48	0.40	0.90	0.90/1.10	1.05	1.00	1.00
TSF58	0.50	1.20	1.00/1.50	1.55	1.40	1.40
TSF68	1.00	2.2	2.2/3.0	3.2	2.7	2.7
TSF78	1.90	4.1	3.9/5.8	6.5	4.9	4.9
TSF88	3.8	8.0	7.1/10.1	12.0	9.1	9.1
TSF98	7.4	15.0	13.8/18.8	23.6	18.0	18.0

** The large gear unit of multi-stage gear units must be filled with the larger oil volume.

Helical-worm (TS) gear units

TSA.., TSH.., TSAF.., TSHF.., TSAZ.., TSHZ.. :

Gear units	Fill quantity in liters (L)					
	M1	M2	M3**	M4	M5	M6
TS..38	0.25	0.40	0.50	0.50	0.40	0.40
TS..48	0.40	0.80	0.70/0.90	1.00	0.80	0.80
TS..58	0.50	1.10	1.00/1.50	1.50	1.20	1.20
TS..68	1.00	2.0	1.80/2.6	2.9	2.5	2.5
TS..78	1.80	3.9	3.6/5.0	5.8	4.5	4.5
TS..88	3.8	7.4	6.0/8.7	11.2	8.0	8.0
TS..98	7.0	14.0	11.4/16.0	21.0	15.7	15.7

** The large gear unit of multi-stage gear units must be filled with the larger oil volume.

4. MAINTENANCE

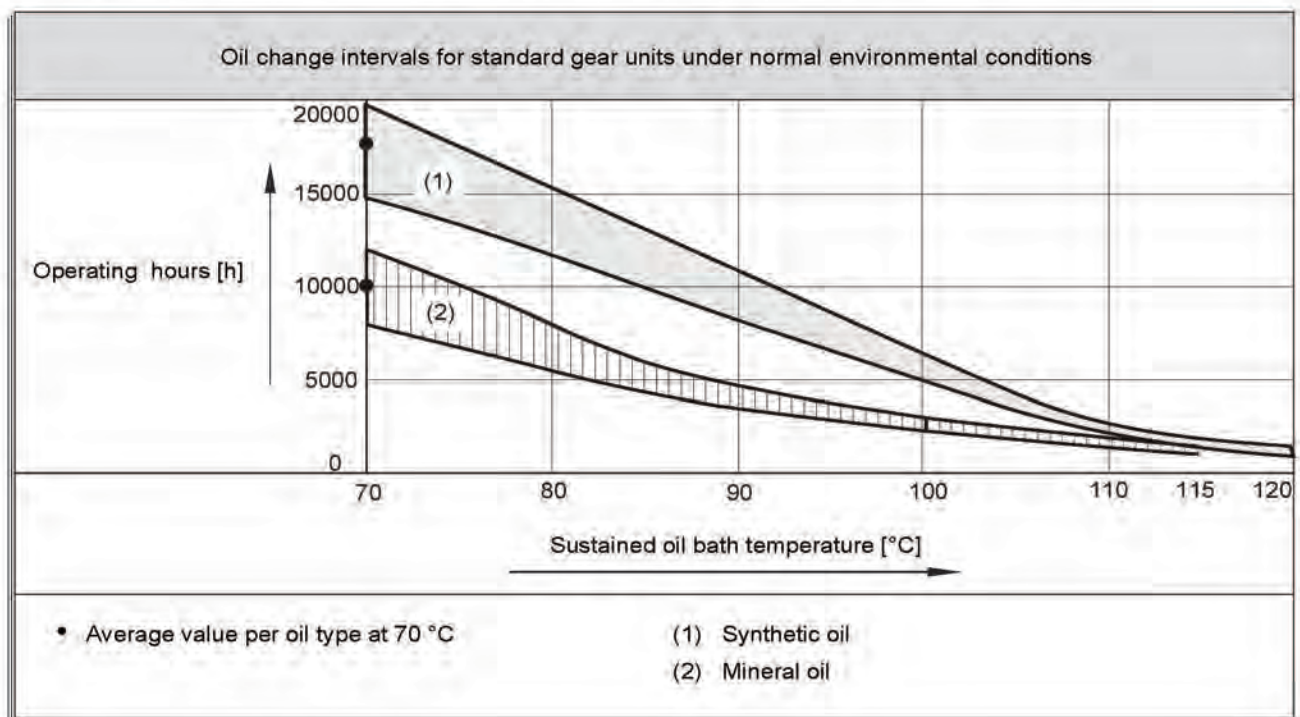
1). For gear units, first oil change should be after about 300 hours (run-in period). The right lotion is required to clean the gear units with care. Never mix the synthetic oil and mineral oil together.

2). Every 3000 working time, at least every 6 months, you have to check the oil and oil level, the seals visually for leakage. For **IEC** input gear units, the elastomer should be tested or replaced if necessary.

3). Depending on the operating conditions (see chart below), every 3 years at the latest for inspection is needed. Then change the mineral oil and replace the bearing grease.

4). Depending on the operating conditions, change the oil seals on output shaft.

5). Once the malfunctions appear, stop disassembling the parts, and firstly please contact the customer service (the information about specification, delivery date, series number, time used, name of machine, machine manufacturer, malfunction problems is required) , then take the reasonable measures.



5. STORAGE

- 1). Under roof, protected against rain and snow, no shock loads.
- 2). Underlay the block and other material between the ground and equipment.
- 3). The opened but not used gear units should be added with the anti-corrosive oil on its surface, and then return to the packing containers timely.
- 4). Two years or more given regular inspections. Check for cleanliness and mechanical damage as part of the inspection, Check corrosion protection.

6. NOTICE FOR ORDER

Please offer the following information when place the orders:

- 1). the model mark of the gear units(type, ratio, power and mounting position).
- 2). gear units are available with "blue/gray" painting optionally. Unless specified, it offers the blue painting as standard.
- 3). quantity ordered.
- 4). other special requirements.
- 5). company, contact and telephone.

7. MALFUNCTIONS

7.1 Gear unit malfunctions

Problem	Possible cause	Remedy
Unusual, regular running noise	A. Meshing/grinding noise: Bearing damage. B. Knocking noise: Irregularity in the gearing	A. Check the oil, change bearings B. Contact customer service
Unusual, irregular running noise	Foreign bodies in the oil	• Check the oil • Stop the drive, contact customer service
Oil leaking ¹⁾ • From the gear cover plate • From the motor flange • From the motor oil seal • From the gear unit flange • From the output end oil seal	A. Rubber seal on the gear cover plate leaking B. Seal defective C. Gear unit not vented	A. Tighten the bolts on the gear cover plate and observe the gear unit. Oil still leaking: Contact customer service B. Contact customer service C. Vent the gear unit (see "Mounting Positions")
Oil leaking from breaking valve	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 (see Sec. "Inspection and Maintenance") B. Mount the breather valve correctly (see Sec. "Mounting Positions") and correct the oil level (see "Lubricants")
Output shaft does not turn although the motor is running or the input shaft is rotated	Connection between shaft and hub in gear unit interrupted	Send in the gear unit/gearmotor for repair

1) Short-term oil/grease leakage at the oil seal is possible in the run-in phase (24 hours running time).

7.2 IEC couplings malfunctions

Problem	Possible cause	Remedy
Unusual, regular running noise	Meshing/grinding noise: Bearing damage	Contact our company customer service
Oil leaking	Seal defective	Contact our company customer service
Output shaft does not turn although the motor is running or the input shaft is rotated	Connection between shaft and hub in gear unit interrupted	Send the gear unit to our company for repair.
Change in running noise and / or vibrations occur	A. Annular gear wear, short-term torque transfer through metal contact B. Bolts to secure hub axially are loose.	A. Change the annular gear B. Tighten the bolts
Premature wear in annular gear	A. Contact with aggressive fluids / oil; ozone influence; too high ambient temperatures etc, which can cause a change in the physical properties of the annular gear. B. Impermissibly high ambient/contact temperature for the annular gear; maximum permitted temperature -20 °C to +80 °C. C. Overload	Contact our company customer service