6 Design and Operating Notes

6.1 Reduced backlash gear units

Helical, parallel shaft helical and helical-bevel gear units with reduced backlash are available from gear unit size 37. The circumferential backlash of these gear units is considerably less than that of the standard versions so that positioning tasks can be solved with great precision. The circumferential backlash is specified in angular minutes ['] in the technical data. The circumferential backlash for the output shaft is specified without load (max. 1% of the rated output torque); the gear unit input end is blocked.

The reduced backlash variant is available for the following gear units:

- Helical gear units (R), sizes 37 to 167
- Parallel-shaft gear units (F), sizes 37 to 157
- Helical-bevel gear units (K), sizes 37 to 187

Multi-stage gear units are not available with reduced backlash.

The dimensions of the reduced backlash variants correspond to the dimensions of the standard designs, except for parallel-shaft gear units FH.87 and FH.97 with reduced backlash.

The following figure shows the dimensions of the FH.87 and FH.97 gear units with reduced backlash:

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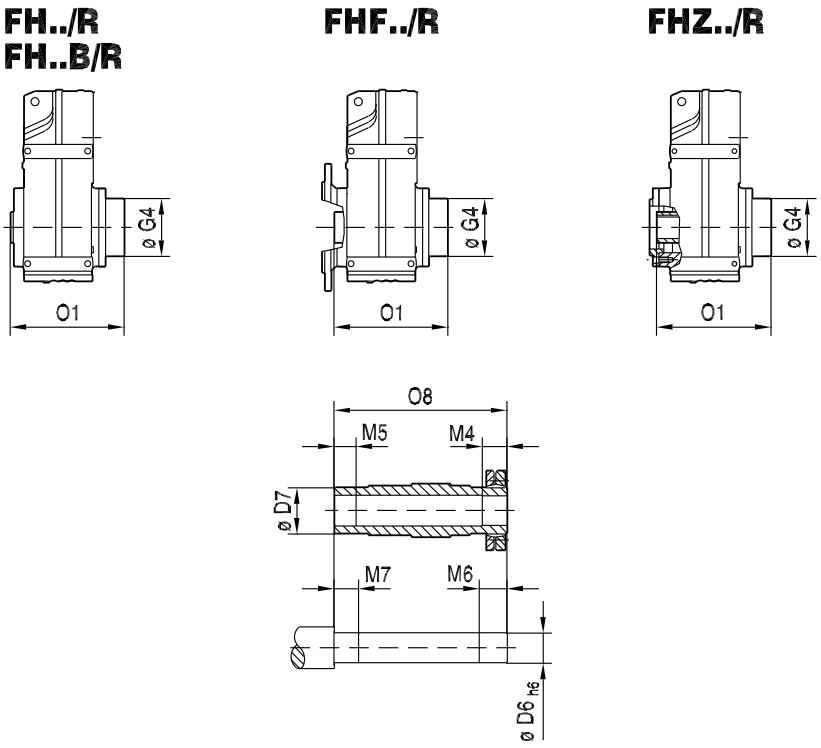

Type	D6	D7	G4	M4	M5	M6	M7	O1	O8
FH.87/R	Ø 65 $_{h6}$	Ø 85	Ø 163	41	40	46	45	312.5	299.5
FH.97/R	Ø 75 $_{h6}$	Ø 95	Ø 184	55	50	60	55	382.5	367

6.2 Assembly/disassembly of gear units with hollow shaft and key

	INFORMATION
	• Always use the supplied NOCO® fluid for assembly. The fluid prevents contact corrosion and facilitates subsequent disassembly. • The key dimension X is specified by the customers, but X > DK must apply, see Figure .

Installation

SEW-EURODRIVE recommends two variants for mounting gear units with hollow shaft and key onto the input shaft of the driven machine (= customer shaft):

1. Use the provided fastening parts for installation.
2. Use the optional installation/removal kit for installation.

1) Supplied fastening parts

The following fastening parts are supplied as standard:

- Retaining screw with washer (2)
- Retaining ring (3)

Note the following points concerning the customer shaft:

- The installation length of the customer shaft with contact shoulder (A) must be L8 - 1 mm.
- The installation length of the customer shaft without contact shoulder (B) must equal L8.

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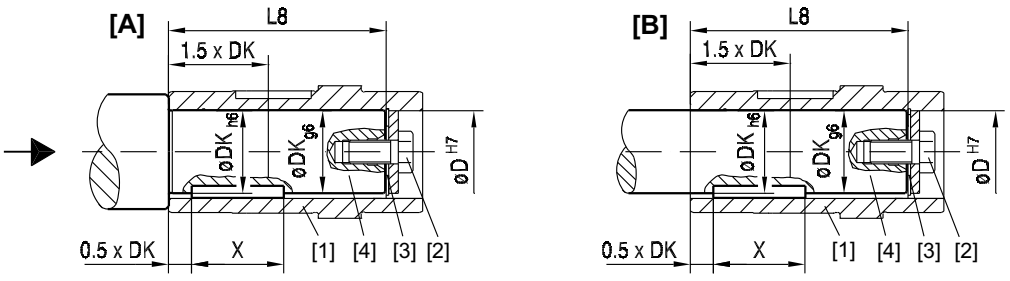


[1] Hollow shaft
[2] Retaining screw with washer
[3] Retaining ring
[4] Customer shaft

Dimensions and tightening torque:

The retaining screw (2) must be tightened to the tightening torque MS given in the following table.

Gear unit type	D^{H7} mm	DK mm	L8 mm	MS Nm
FA..27	25	25	88	20
WA..37	20	20	105	8
SA..37			104	
FA..37, KA..37, SA..47	30	30	105	20
SA..47, WA..37	25	25	118	
			105	
SAF402	30	30	138	
FA..47, KA..47, SA..57	35	35	132	
WA..47	30	30	122	
SA..57			132	
FA..57, KA..57	40	40	142	40
FA..67, KA..67			158	
			156	
SA..67			144	
SA..67	45	45	144	
FA..77, KA..77, SA..77	50	50	183	40
SA..77	60	60	180	80
FA..87, KA..87			210	
SA..87			220	
SA..87	70	70	220	
FA..97, KA..97	70	70	270	
SA..97			260	
SA..97	90	90	255	200
FA..107			313	
KA..107			313	
FA..127, KA..127	100	100	373	
FA..157, KA..157	120	120	460	

2. Installation/removal kit

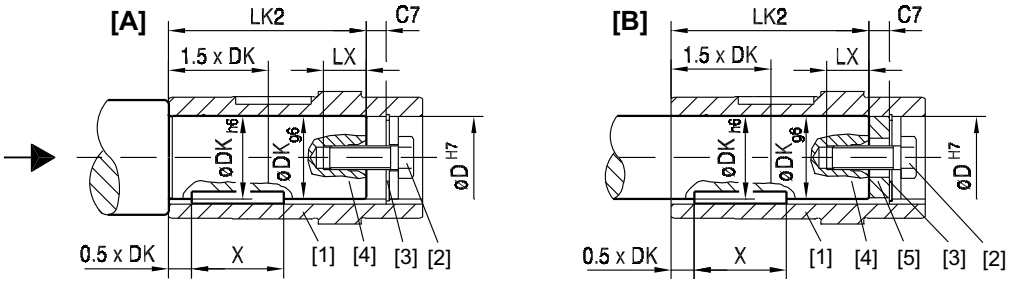
You can use the optional installation/removal kit for installation. You can order the kit for the specific gear unit type(s) by quoting the part numbers in the table below. The delivery includes:

- Spacer tube for installation without contact shoulder (5)
- Retaining screw for installation (2)
- Forcing washer for removal (7)
- Locked nut for removal (8)

The short retaining screw delivered as standard is not required.

Note the following points concerning the customer shaft:

- The installation length of the customer shaft must be LK2. Do not use the spacer if the customer shaft **has a contact shoulder (A)**.
- The installation length of the customer shaft must be LK2. Use the spacer if the customer shaft **has a contact shoulder (B)**.



[1] Hollow shaft
[2] Retaining screw with washer
[3] Retaining ring
[4] Customer shaft
[5] Spacer tube

Dimensions, tightening torque and part numbers:

The retaining screw (2) must be tightened to the tightening torque MS given in the following table.

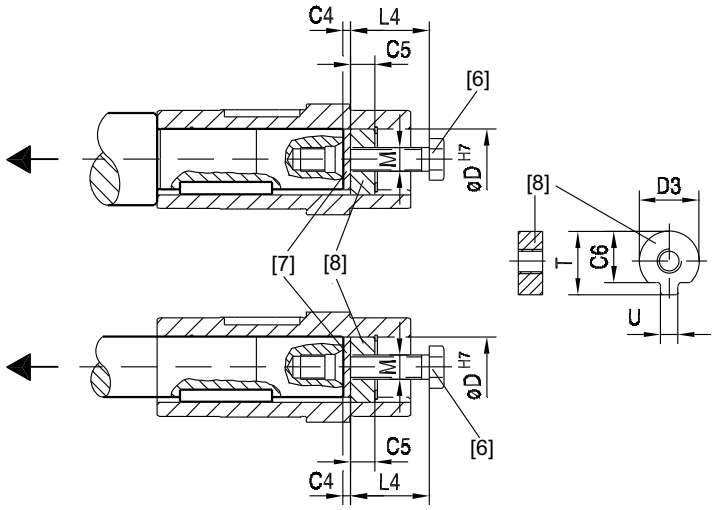
Type	D^{H7} mm	DK mm	LK2 mm	LX^{+2} mm	C7 mm	MS Nm	Part number of installation/removal set
WA..37	20	20	72, 93	16	12	8	643 683 8
SA..37	20	20	92	16	12	8	643 683 8
FA..27	25	25	72	22	16	20	643 684 6
SA..47			89				
WA..47	30	30	106				643 685 4
FA..37, KA..37			89				643 685 4
SA..47			89				
SA..57			116				
FA..47, KA..47, SA..57	35	35	114	28	18		643 686 2
FA..57, KA..57	40	40	124	36		40	643 687 0
FA..67			138				
KA..67			138				
SA..67			126				
SA..67	45	45	126				643 688 9
FA..77, KA..77, SA..77	50	50	165				643 689 7
FA..87, KA..87	60	60	188	42	22	80	643 690 0
SA..77			158				
SA..87			198				
FA..97, KA..97	70	70	248				643 691 9
SA..87			198				
SA..97			238				
FA..107, KA..107	90	90	287	50	26	200	643 692 7
SA..97			229				
FA..127, KA..127	100	100	347				643 693 5
FA..157, KA..157	120	120	434				643 694 3

Removal

Applies only if the installation/removal kit was previously used for installation.

Proceed as follows to remove the gear unit:

1. Loosen the retaining screw (6).
2. Remove the circlip (3) and, if used, the spacer tube (5).
3. According to the Figure place the forcing washer (7) and the locked nut (8) between the customer shaft (4) and circlip (3).
4. Re-install the circlip (3).
5. Re-install the retaining screw (6). Now you can force the gear unit off the shaft.



[6] Retaining screw
[7] Forcing washer
[8] Locked nut for removal

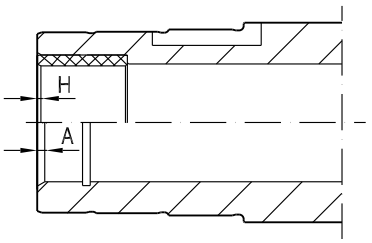
Dimensions and part numbers:

Type	D^{H7} mm	M	C4 mm	C5 mm	C6 mm	$V^{-0.5}$ mm	$T^{-0.5}$ mm	$D3^{-0.5}$ mm	L4 mm	Part number of installation/removal kit
WA..37, SA..37	20	M6	5	6	15.5	5.5	22.5	19.7	25	643 683 8
FA27.., SA..47	25	M10		10	20	7.5	28	24.7	35	643 684 6
FA..37, KA..37, SA..47, SA..57, WA..47	30				25	7.5	33	29.7		643 685 4
FA..47, KA..47, SA..57	35	M12		12	29	9.5	38	34.7	45	643 686 2
FA..57, KA..57, FA..67, KA..67, SA..67	40	M16			34	11.5	41.9	39.7	50	643 687 0
SA..67	45				38.5	13.5	48.5	44.7		643 688 9
FA..77, KA..77, SA..77	50				43.5	13.5	53.5	49.7		643 689 7
FA..87, KA..87, SA..77, SA..87	60	M20		16	56	17.5	64	59.7	60	643 690 0
FA..97, KA..97, SA..87, SA..97	70				65.5	19.5	74.5	69.7		643 691 9
FA..107, KA..107, SA..97	90	M24		20	80	24.5	95	89.7	70	643 692 7
FA..127, KA..127	100				89	27.5	106	99.7		643 693 5
FA..157, KA..157	120				107	31	127	119.7		643 694 3

6.3 Gear units with hollow shaft

Chamfers on hollow shafts

The following illustration shows the chamfers on parallel shaft helical, helical-bevel, helical-worm and SPIROPLAN® gear units with hollow shaft:



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Gear unit	Type	
	with hollow shaft (A)	with hollow shaft and shrink disk (H)
F..27	2 × 30°	0.5 × 45°
F../K../S../W..37	2 × 30°	0.5 × 45°
F../K../S../ W..47	2 × 30°	0.5 × 45°
S..57	2 × 30°	0.5 × 45°
F../K..57	2 × 30°	3 × 2°
F../K../S..67	2 × 30°	3 × 2°
F../K../S..77	2 × 30°	3 × 2°
F../K../S..87	3 × 30°	3 × 2°
F../K../S..97	3 × 30°	3 × 2°
F../K..107	3 × 30°	3 × 2°
F../K..127	5 × 30°	1.5 × 30°
F../K..157	5 × 30°	1.5 × 30°
KH167	-	1.5 × 30°
KH187	-	1.5 × 30°

Special motor/gear unit combinations

Please note for parallel shaft helical gearmotors with hollow shaft (FA..B, FV..B, FH..B, FAF, FVF, FHF, FA, FV, FH, FT, FAZ, FVZ, FHZ):

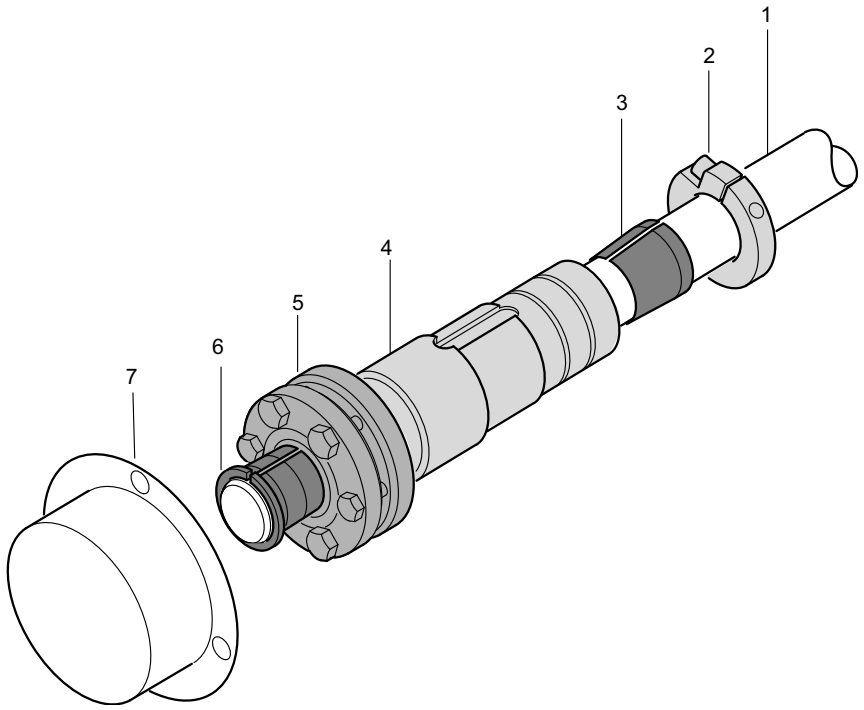
- If you are using a customer shaft pushed through on the motor end, there may be a collision when a "small gear unit" is used in combination with a "large motor".
- Check the motor dimension AC to decide whether there will be a collision with a pushed-through customer shaft.

6.4 TorqLOC® mounting system for gear units with hollow shaft

Description of TorqLOC®

The TorqLOC® hollow shaft mounting system is used for achieving a non-positive connection between customer shaft and the hollow shaft in the gear unit. The TorqLOC® hollow shaft mounting system is an alternative to the hollow shaft with shrink disk, the hollow shaft with key, and the splined hollow shaft.

The TorqLOC® hollow shaft mounting system consists of the following components:



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[1]	Customer shaft	[5]	Shrink disk
[2]	Clamping ring	[6]	Conical steel bushing
[3]	Conical bronze bushing	[7]	Fixed cover
[4]	Hollow shaft in gear unit		

Advantages of TorqLOC®

The TorqLOC® hollow shaft mounting system provides the following advantages:

- Cost saving as the customer shaft can be made from drawn material up to quality h11.
- Costs are saved as different customer shaft diameters can be realized with one hollow shaft diameter and different bushings.
- Simple installation as there is no need to accommodate any shaft connections.
- Simple disassembly even after many hours of operation since the formation of contact corrosion has been reduced and the conical connections can easily be released.

Technical data

The TorqLOC® hollow shaft mounting system is approved for input torques of 92 Nm to 18000 Nm.

The following gear units are available with TorqLOC® hollow shaft mounting system:

- Parallel shaft helical gear units in gear unit sizes 37 to 157 (FT37 to FT157)
- Helical-bevel gear units in gear unit sizes 37 to 157 (KT37 to KT157)
- Helical-worm gear units in gear unit sizes 37 to 97 (ST37 to ST97)
- SPIROPLAN® gear unit sizes 37 and 47 (WT37, WT47)

Available options

The following options are available for gear units with a TorqLOC® hollow shaft mounting system:

- Helical-bevel, helical-worm and SPIROPLAN® gear units with TorqLOC® (KT.., ST.., WT.7): The "torque arm" (../T) option is available.
- Parallel shaft helical gear units with TorqLOC® (FT..): The "rubber buffer" (../G) option is available.

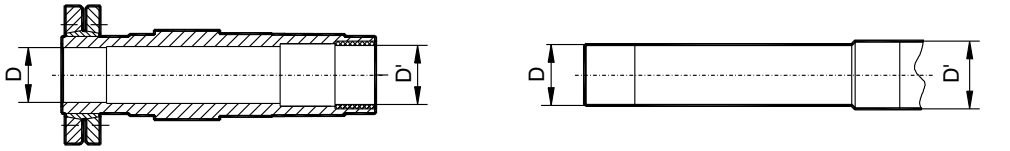
6.5 Gear unit with flange block shaft

	INFORMATION
	Only use screws in **strength class 12.9** to fasten the output elements onto the flange block shaft of the gear unit.

6.6 Shouldered hollow shaft option with shrink disk

As an option, gear units with hollow shaft and shrink disk (parallel-shaft helical gear units FH/FHF/FHZ37-157, helical-bevel gear units KH/KHF/KHZ37-157 and helical-worm gear units SH/SHF47-97) can be supplied with a larger bore diameter D'.

D' = D as standard.



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Gear unit	Bore diameter D / optionally D' mm
FH/FHF/FHZ37, KH/KHF/KHZ37, SH/SHF/SHZ47	30 / 32
FH/FHF/FHZ47, KH/KHF/KHZ47, SH/SHF/SHZ57	35 / 36
FH/FHF/FHZ57, KH/KHF/KHZ57	40 / 42
FH/FHF/FHZ67, KH/KHF/KHZ67, SH/SHF/SHZ67	40 / 42
FH/FHF/FHZ77, KH/KHF/KHZ77, SH/SHF/SHZ77	50 / 52
FH/FHF/FHZ87, KH/KHF/KHZ87, SH/SHF/SHZ87	65 / 66
FH/FHF/FHZ97, KH/KHF/KHZ97, SH/SHF/SHZ97	75 / 76
FH/FHF/FHZ107, KH/KHF/KHZ107	95 / 96
FH/FHF/FHZ127, KH/KHF/KHZ127	105 / 106
FH/FHF/FHZ157, KH/KHF/KHZ157	125 / 126

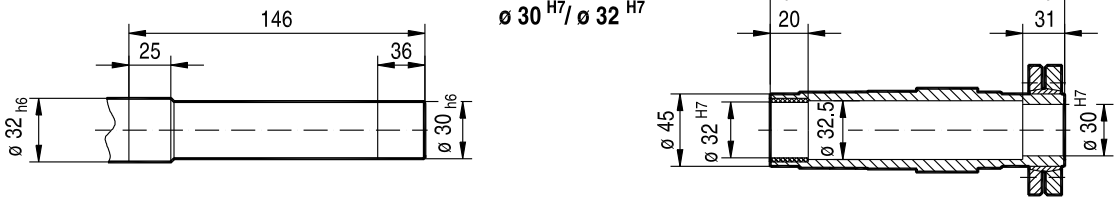
Diameter D/D' must be specified when ordering gear units with a shouldered hollow shaft (optional bore diameter D').

Sample order FH37 DRS80M4 with hollow shaft 30/32 mm

Parallel shaft helical gear units with shouldered hollow shaft (dimensions in mm):

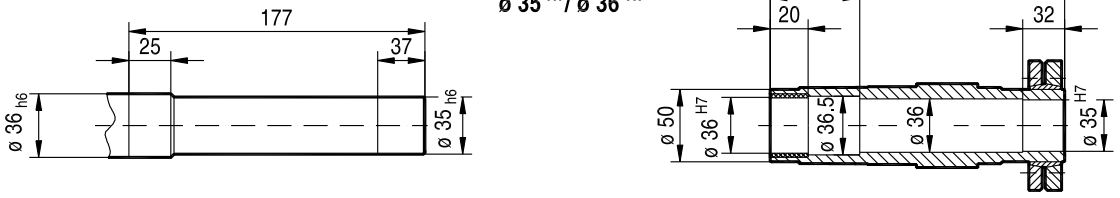
FH / FHF / FHZ37

ø 30 H7/ ø 32 H7



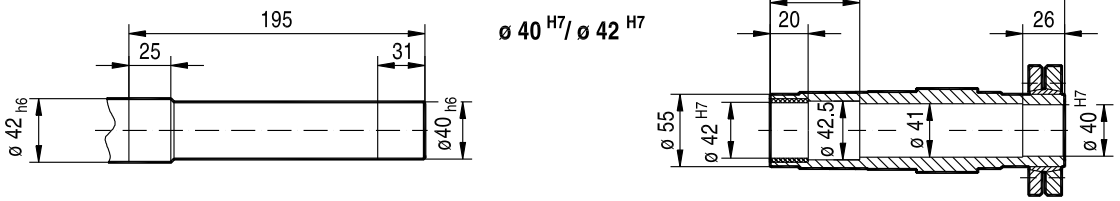
FH / FHF / FHZ47

ø 35 H7/ ø 36 H7



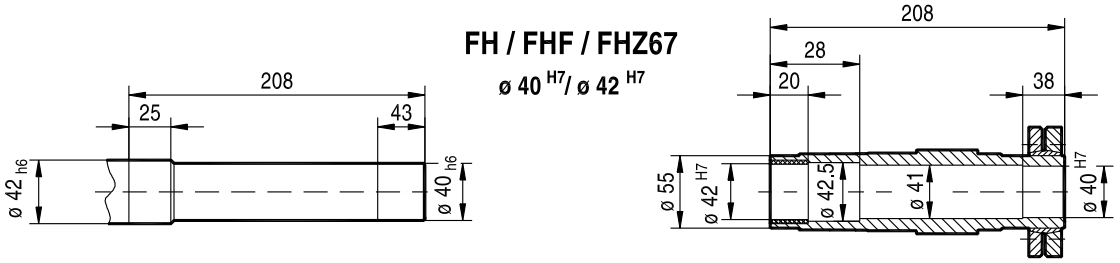
FH / FHF / FHZ57

ø 40 H7/ ø 42 H7



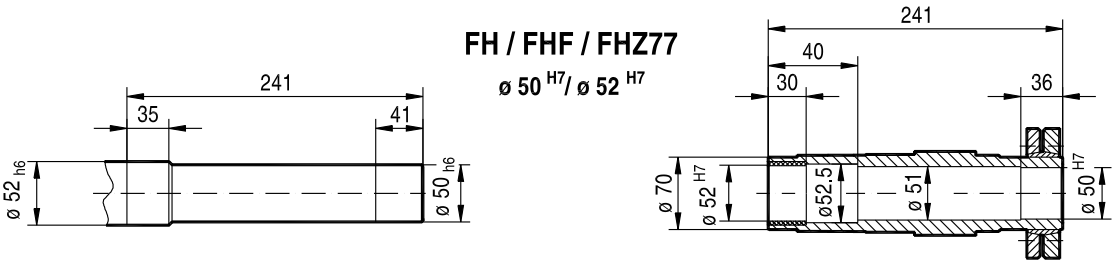
FH / FHF / FHZ67

ø 40 H7/ ø 42 H7



FH / FHF / FHZ77

ø 50 H7/ ø 52 H7



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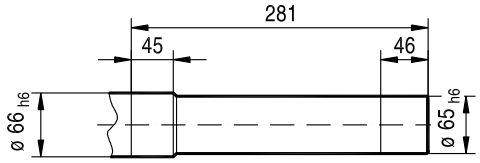
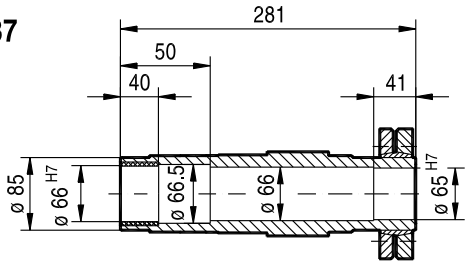
FH / FHF / FHZ87

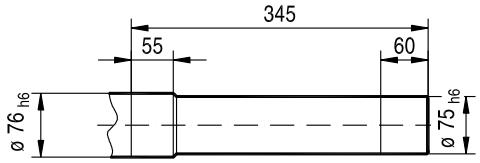
ø 65 H7/ ø 66 H7

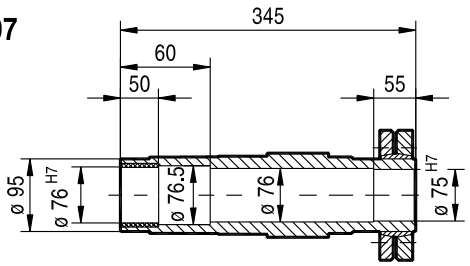




FH / FHF / FHZ97

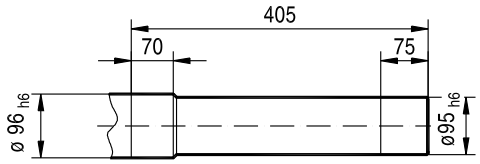
ø 75 H7/ ø 76 H7

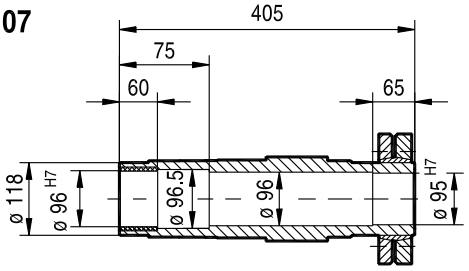




FH / FHF / FHZ107

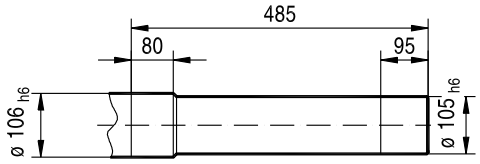
ø 95 H7/ ø 96 H7

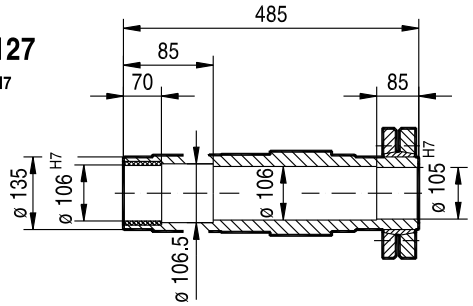




FH / FHF / FHZ127

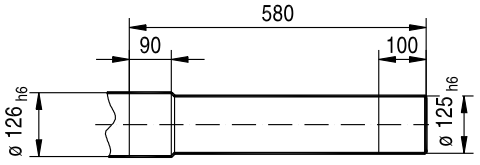
ø 105 H7/ ø 106 H7

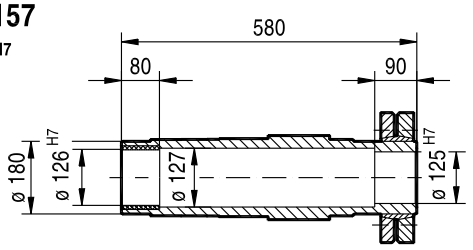




FH / FHF / FHZ157

ø 125 H7/ ø 126 H7





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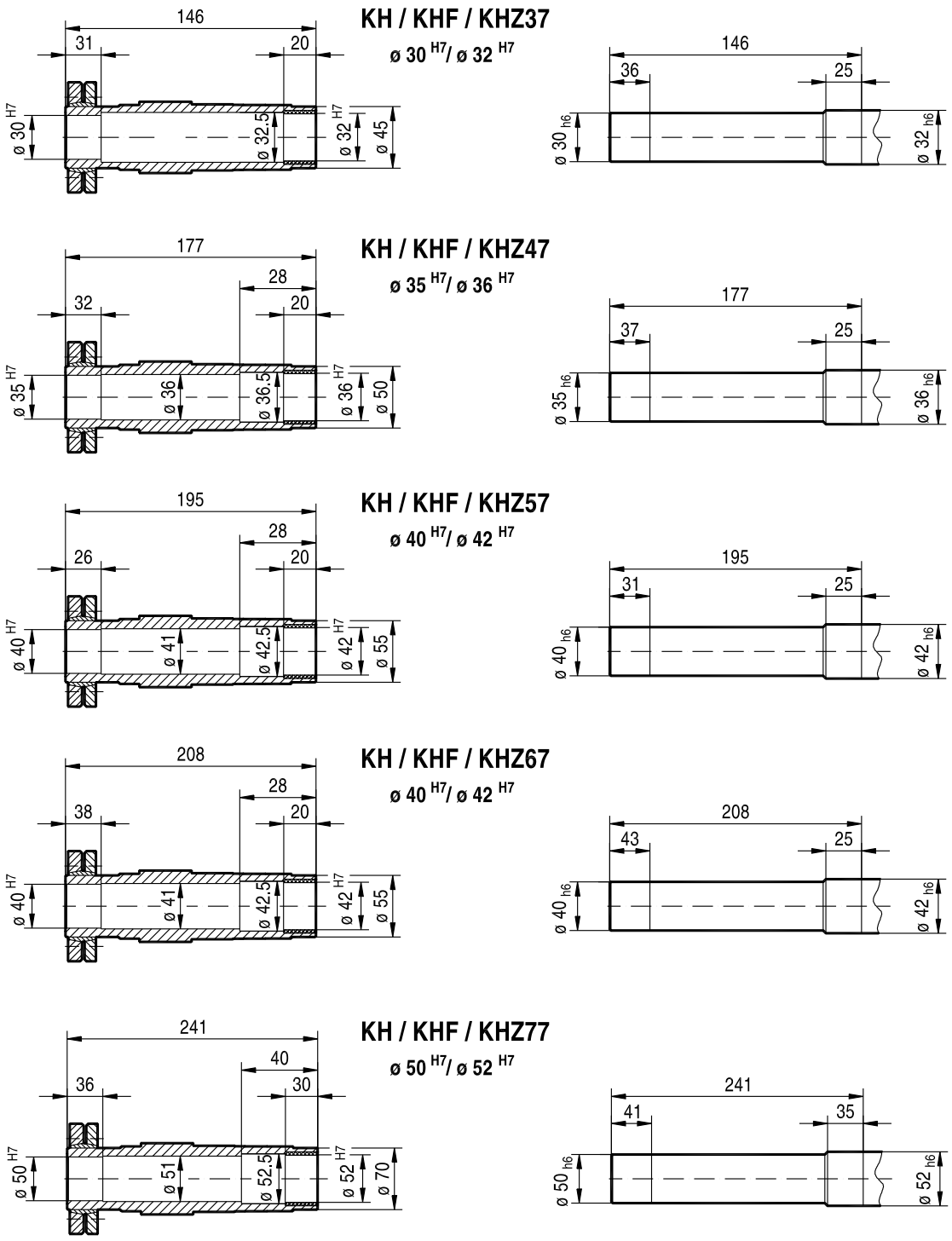
Helical-bevel gear units with shouldered hollow shaft (dimensions in mm):



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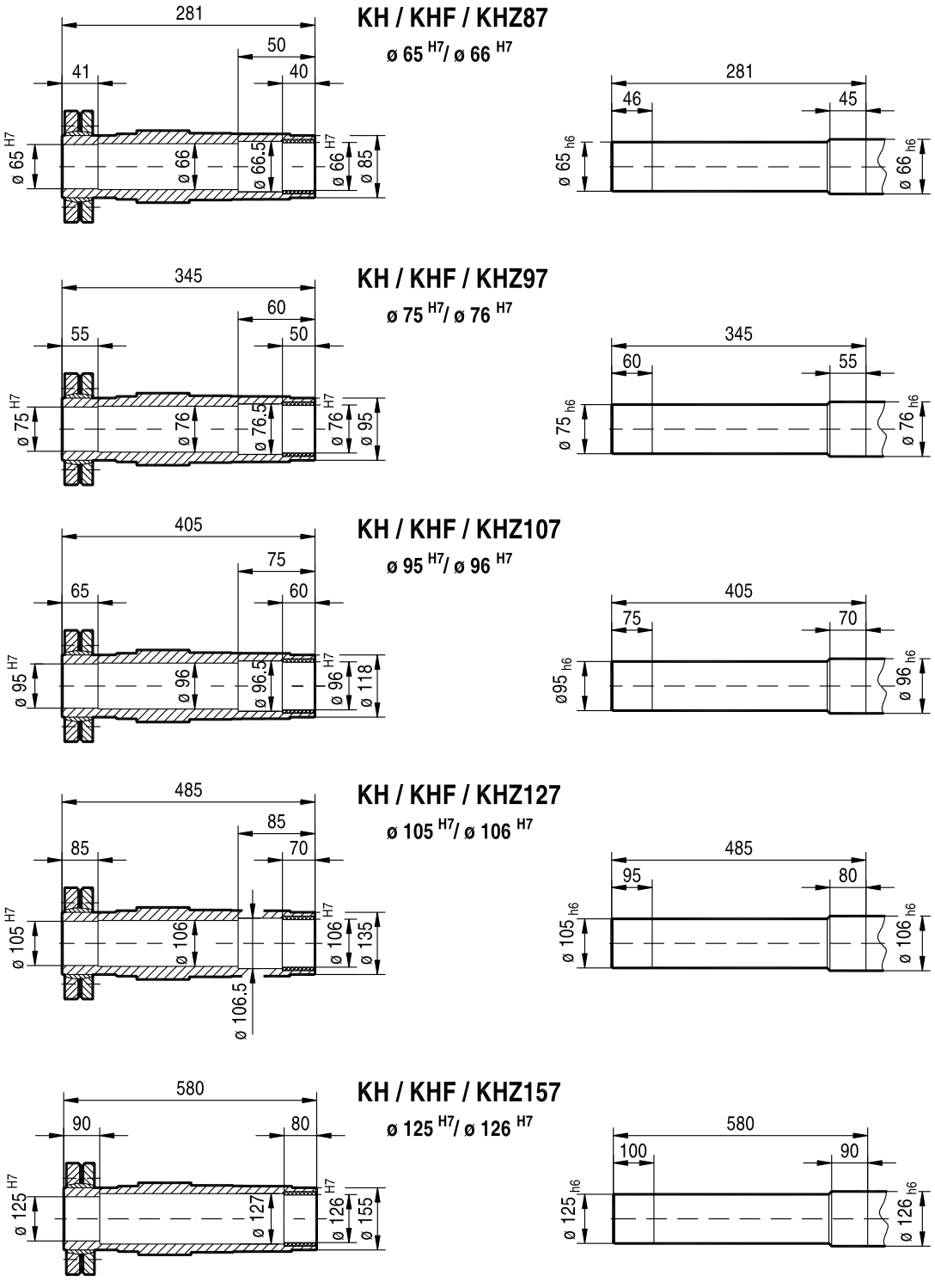
KH / KHF / KHZ87
ø 65 H7/ ø 66 H7
281
50
41
40
ø 65 H7
ø 66
ø 66.5
ø 66 H7
ø 85
281
46
45
ø 65 h6
ø 66 h6
KH / KHF / KHZ97
ø 75 H7/ ø 76 H7
345
60
55
50
ø 75 H7
ø 76
ø 76.5
ø 76 H7
ø 95
345
60
55
ø 75 h6
ø 76 h6
KH / KHF / KHZ107
ø 95 H7/ ø 96 H7
405
75
65
60
ø 95 H7
ø 96
ø 96.5
ø 96 H7
ø 118
405
75
70
ø95 h6
ø 96 h6
KH / KHF / KHZ127
ø 105 H7/ ø 106 H7
485
85
85
70
ø 105 H7
ø 106
ø 106.5
ø 106 H7
ø 135
485
95
80
ø 105 h6
ø 106 h6
KH / KHF / KHZ157
ø 125 H7/ ø 126 H7
580
90
80
ø 125 H7
ø 127
ø 126 H7
ø 155
580
100
90
ø 125 h6
ø 126 h6

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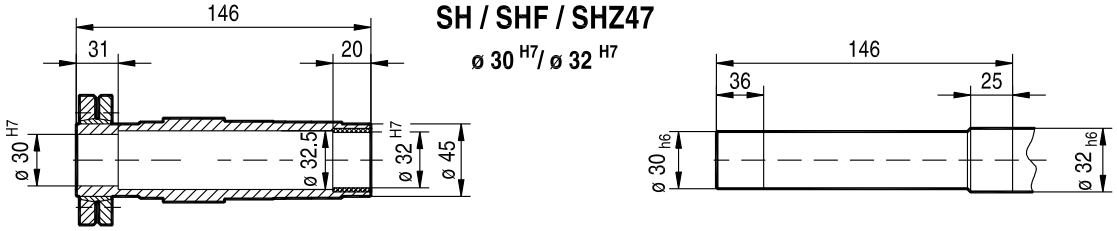
Helical-worm gear units with shouldered hollow shaft (dimensions in mm):

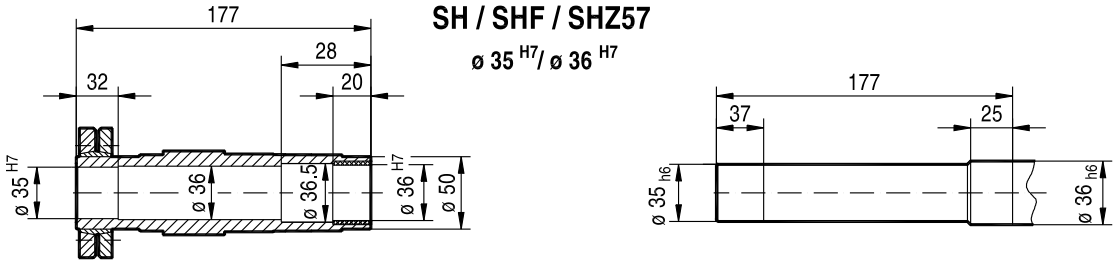
SH / SHF / SHZ47

ø 30 H7/ ø 32 H7



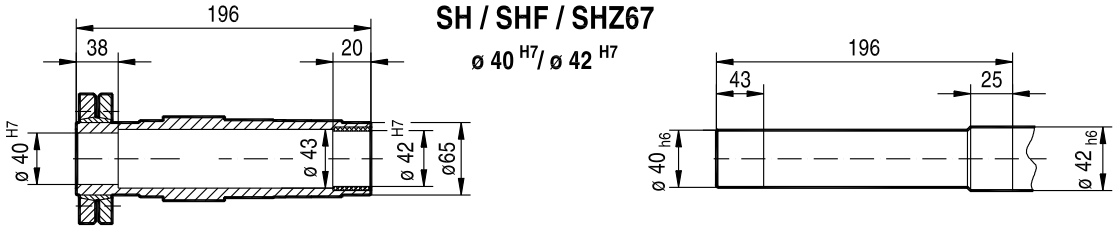
SH / SHF / SHZ57

ø 35 H7/ ø 36 H7



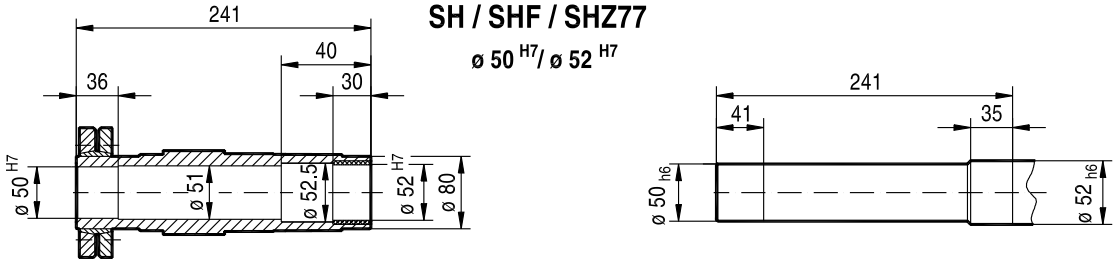
SH / SHF / SHZ67

ø 40 H7/ ø 42 H7



SH / SHF / SHZ77

ø 50 H7/ ø 52 H7



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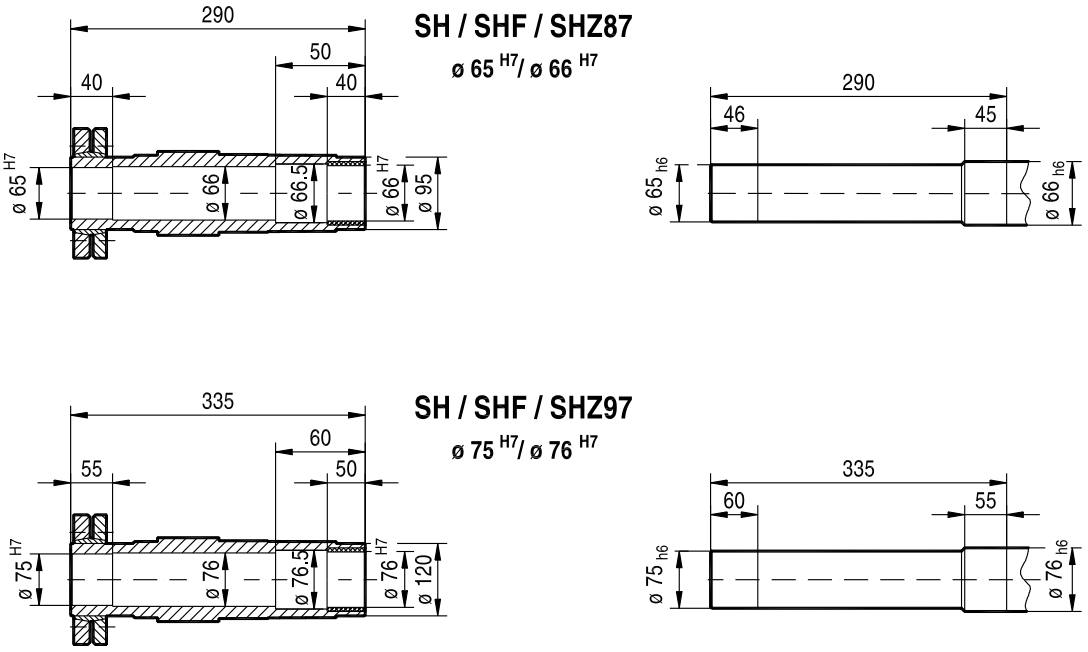
290
50
40
40
ø 65 H7
ø 66
ø 66.5
ø 66 H7
ø 95
SH / SHF / SHZ87
ø 65 H7/ ø 66 H7
290
46
45
ø 65 h6
ø 66 h6
335
60
55
50
ø 75 H7
ø 76
ø 76.5
ø 76 H7
ø 120
SH / SHF / SHZ97
ø 75 H7/ ø 76 H7
335
60
55
ø 75 h6
ø 76 h6
04346AXX

6.7 Fastening the gear unit

Use bolts of quality 8.8 to fasten gear units and gearmotors.

Exception

Use bolts of **quality 10.9** to fasten the customer flange to transmit the rated torques for the following flange-mounted (RF ..ßRZ..) and foot/flange-mounted gearmotors (RF../RZ..):

- RF37, R37F with flange ∅ 120 mm
- RF47, R47F with flange ∅ 140 mm
- RF57, R57F with flange ∅ 160 mm
- RZ37 - RZ87

6.8 Torque arms

Available torque arms

Gear unit	Size					
	27	37	47	57	67	77
KA, KH, KV, KT	-	643 425 8	643 428 2	643 431 2	643 431 2	643 434 7
SA, SH, ST	-	126 994 1	644 237 4	644 240 4	644 243 9	644 246 3
FA, FH, FV, FT Rubber buffer (2 pieces)	013 348 5	013 348 5	013 348 5	013 348 5	013 348 5	013 349 3

Gear unit	Size				
	87	97	107	127	157
KA, KH, KV, KT	643 437 1	643 440 1	643 443 6	643 294 8	-
SA, SH, ST	644 249 8	644 252 8	-	-	-
FA, FH, FV, FT Rubber buffer (2 pieces)	013 349 3	013 350 7	013 350 7	013 351 5	013 347 7

Gear unit	Size				
	10	20	30	37	47
WA	1 061 021 9	1 68 073 0	1 68 011 0	1 061 129 0	1 061 187 8

Torque arms for KH167.., KH187..

As standard, torque arms are not available for gear unit sizes KH167.. and KH187... Consult SEW-EURODRIVE if you need torque arms for these gear units. You will then obtain design proposals.

6.9 Flange contours of RF.. and R..F gear units

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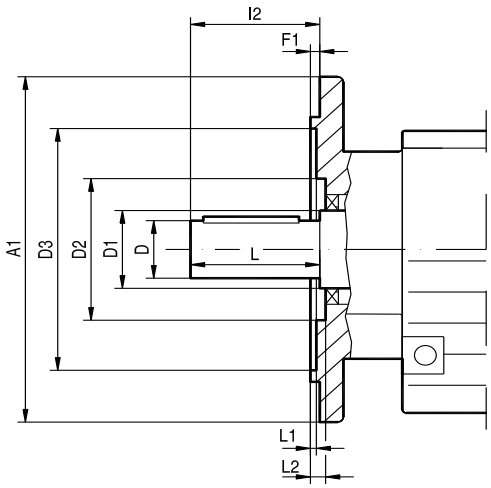

Check dimensions L1 and L2 for selection and installation of output elements.

Type	Dimensions in mm											
	A1	D	D1	D2		D3	F1	I2	L	L1		L2
				RF	R..F					RF	R..F	
RF07, R07F	120	20	22	38	38	72	3	40	40	2	2	6
	140[1)]				-	85	3			2	-	6
	160[1)]				-	100	3.5			2.5	-	6.5
RF17, R17F	120	20	25	46	46	65	3	40	40	1	1	5
	140				-	78	3			1	-	5
	160[1)]				-	95	3.5			1	-	6
RF27, R27F	120	25	30	54	54	66	3	50	50	1	1	6
	140				-	79	3			3	-	7
	160				-	92	3.5			3	-	7
RF37, R37F	120	25	35	60	63	70	3	50	50	5	4	7
	160				-	96	3.5			1	-	7.5
	200[1)]				-	119	3.5			1	-	7.5
RF47, R47F	140	30	35	72	64	82	3	60	60	4	1	6
	160				-	96	3.5			0.5	-	6.5
	200				-	116	3.5			0.5	-	6.5
RF57, R57F	160	35	40	76	75	96	3.5	70	70	4	2.5	5
	200				-	116	3.5			0	-	5
	250[1)]				-	160	4			0.5	-	5.5
RF67, R67F	200	35	50	90	90	118	3.5	70	70	2	4	7
	250				-	160	4			1	-	7.5
RF77, R77F	250	40	52	112	100	160	4	80	80	0.5	2.5	7
	300[1)]				-	210	4			0.5	-	7
RF87, R87F	300	50	62	123	122	210	4	100	100	0	1.5	8
	350				-	226	5			1	-	9
RF97	350	60	72	136		236	5	120	120	0		9
	450					320						
RF107	350	70	82	157		232	5	140	140	0		11
	450			186		316						
RF137	450	90	108	180		316	5	170	170	0		10
	550					416						
RF147	450	110	125	210		316	5	210	210	0		10
	550					416						
RF167	550	120	145	290		416	5	210	210	1		10
	660					517	6			2		11

1) The flange contour protrudes from under the base surface.

6.10 Flange contours of FF.., KF.., SF.. and WF.. gear units

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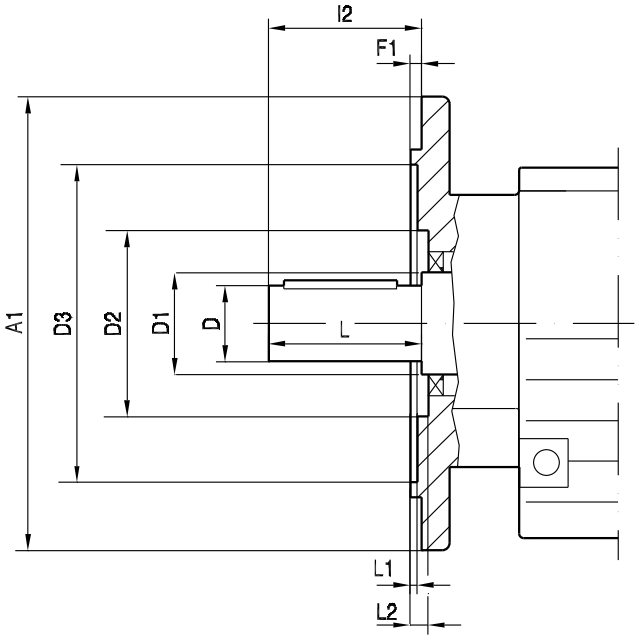

Check dimensions L1 and L2 for selection and installation of output elements.

Type	Dimensions in mm									
	A1	D	D1	D2	D3	F1	l2	L	L1	L2
FF27	160	25	40	66	96	3.5	50	50	3	18.5
FF37	160	25	30	70	94	3.5	50	50	2	6
FF47	200	30	40	72	115	3.5	60	60	3.5	7.5
FF57	250	35	40	84	155	4	70	70	4	9
FF67	250	40	50	84	155	4	80	80	4	9
FF77	300	50	55	82	205	4	100	100	5	9
FF87	350	60	65	115	220	5	120	120	5	9
FF97	450	70	75	112	320	5	140	140	8	10
FF107	450	90	100	159	318	5	170	170	16	9
FF127	550	110	118	-	420	5	210	210	10	-
FF157	660	120	135	190	520	6	210	210	8	14
KF37	160	25	30	70	94	3.5	50	50	2	6
KF47	200	30	40	72	115	3.5	60	60	3.5	7.5
KF57	250	35	40	84	155	4	70	70	4	9
KF67	250	40	50	84	155	4	80	80	4	9
KF77	300	50	55	82	205	4	100	100	5	9
KF87	350	60	65	115	220	5	120	120	5	9
KF97	450	70	75	112	320	5	140	140	8	10
KF107	450	90	100	159	318	5	170	170	16	9
KF127	550	110	118	-	420	5	210	210	10	-
KF157	660	120	135	190	520	6	210	210	8	14
SF37	120	20	25	-	68	3	40	40	6	-
SF37	160	20	25	-	96	3.5	40	40	5.5	-
SF47	160	25	30	70	94	3.5	50	50	2	6
SF57	200	30	40	72	115	3.5	60	60	3.5	7.5
SF67	200	35	45	-	115	3.5	70	70	8.5	-
SF77	250	45	55	108	160	4	90	90	8	9
SF87	350	60	65	130	220	5	120	120	6	10
SF97	450	70	75	150	320	5	140	140	8.5	10

Table continued on next page.

Type	Dimensions in mm									
	A1	D	D1	D2	D3	F1	I2	L	L1	L2
WF37	120	20	30	-	70	2.5	40	40	-	10.5
WF37	160	20	30	-	70	2.5	40	40	-	25.5
WF47	160	30	35	35 -	92	3.5	10	60	6	-

6.11 Flange contours of FAF.., KAF.., SAF.. and WAF.. gear units

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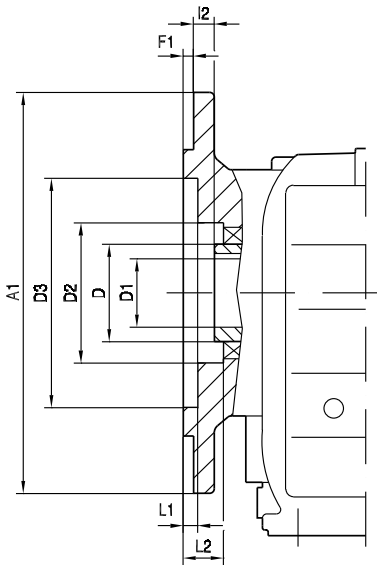


Check dimensions L1 and L2 for selection and installation of output elements.

Type	Dimensions in mm								
	A1	D	D1	D2	D3	F1	I2	L1	L2
FAF27	160	40	25	66	96	3.5	20	3	18.5
FAF37	160	45	30	62	94	3.5	24	2	30
FAF47	200	50	35	70	115	3.5	25	3.5	31.5
FAF57	250	55	40	76	155	4	23.5	4	31
FAF67	250	55	40	76	155	4	23	4	31
FAF77	300	70	50	95	205	4	37	5	45
FAF87	350	85	60	120	220	5	30	5	39
FAF97	450	95	70	135	320	5	41.5	5.5	51
FAF107	450	118	90	224	320	5	41	16	52
FAF127	550	135	100	185	420	5	51	6	63
FAF157	660	155	120	200	520	6	60	10	74
KAF37	160	45	30	62	94	3.5	24	2	30
KAF47	200	50	35	70	115	3.5	25	3.5	8.5
KAF57	250	55	40	76	155	4	23.5	4	31
KAF67	250	55	40	76	155	4	23	4	31
KAF77	300	70	50	95	205	4	37	5	45
KAF87	350	85	60	120	220	5	30	5	39
KAF97	450	95	70	135	320	5	41.5	5.5	51
KAF107	450	118	90	224	320	5	41	16	52
KAF127	550	135	100	185	420	5	51	6	63
KAF157	660	155	120	200	520	6	60	10	74
SAF37	120	35	20	-	68	3	15	6	-
SAF37	160	35	20	-	96	3.5	15	5.5	-

Table continued on next page.

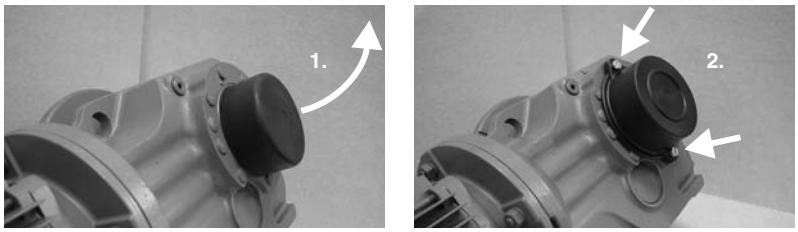
Type	Dimensions in mm								
	A1	D	D1	D2	D3	F1	I2	L1	L2
SAF47	160	45	30 / 25	62	94	3.5	24	2	30
SAF57	200	50	35 / 30	70	115	3.5	25	3.5	31.5
SAF67	200	65	45 / 40	91	115	3.5	42.5	4	48.5
SAF77	250	80	60 / 50	112	164	4	45.5	5	53.5
SAF87	350	95	70 / 60	131	220	5	52.5	6	62.5
SAF97	450	120	90 / 70	160	320	5	60	6.5	69
WAF37	120	35	20 / 25	54	70	2.5	19.5	10.5	27
WAF37	160	35	20 / 25	54	70	2.5	34.5	25.5	42
WAF47	160	45	25 / 30	72	92	3.5	10	6	45

6.12 Fixed covers

Parallel shaft helical gear units, helical-bevel gear units, helical-worm and SPIROPLAN® gear units with hollow shafts and shrink disks of size 37 up to size 97 come equipped with a rotating cover as standard.

If, for safety reasons, you require fixed covers for these gear units, you can order them for the respective gear unit types. You find the part numbers in the tables on page 112. As standard, size 107 parallel-shaft helical gear units and helical-bevel gear units with hollow shafts and shrink disks and size 27 parallel-shaft helical gear units come equipped with a fixed cover.

Figure: Replacing a rotating cover with a fixed cover:



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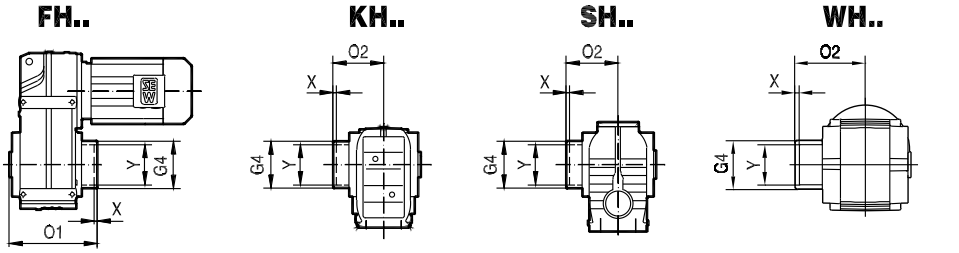
[1] Pull off the rotating cover

[2] Install and fasten fixed cover

Part numbers and dimensions



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Parallel-shaft helical gearmotors	FH..37	FH..47	FH..57	FH..67	FH..77	FH..87	FH..97
Part number	643 513 0	643 514 9	643 515 7	643 515 7	643 516 5	643 517 3	643 518 1
G4	78	88	100	100	121	164	185
O1	157	188.5	207.5	221.5	255	295	363.5
X	2	4.5	7.5	6	6	4	6.5
Y	75	83	83	93	114	159	174

Helical-bevel gearmotors[1)]	KH..37	KH..47	KH..57	KH..67	KH..77	KH..87	KH..97
Part number	643 513 0	643 514 9	643 515 7	643 515 7	643 516 5	643 517 3	643 518 1
G4 [mm]	78	88	100	100	121	164	185
O2 [mm]	95	111.5	122.5	129	147	172	210.5
X [mm]	0	1.5	5.5	3	1	2	4.5
Y [mm]	75	83	83	93	114	159	174

1) Not possible in foot-mounted helical-bevel gear units with hollow shaft and shrink disk (KH..B).

Helical-worm gearmotors	SH..37	SH..47	SH..57	SH..67	SH..77	SH..87	SH..97
Part number	643 512 2	643 513 0	643 514 9	643 515 7	643 516 5	643 517 3	643 518 1
G4 [mm]	59	78	88	100	121	164	185
O2 [mm]	88	95	111.5	123	147	176	204.5
X [mm]	1	0	1.5	3	1	0	0.5
Y [mm]	53	75	83	93	114	159	174

SPIROPLAN® gearmotors	WH..37	WH..47					
Part number	1 061 136 3	1 061 194 0					
G4 [mm]	68	80.5					
O2 [mm]	95.5	109.5					
X [mm]	11	12.5					
Y [mm]	50	72					

6.13 Condition monitoring: Oil aging and vibration sensor

Technical data for oil aging sensor

DUO10A diagnostic unit

/DUO10A	Technical data		
Preset oil grades	OIL1	CLP mineral oil.	T_{max} = 100 °C
		Bio oil	T_{max} = 100 °C
	OIL2	CLP HC synthetic oil:	T_{max} = 130 °C
		CLP PAO oil	T_{max} = 130 °C
	OIL3	CLP PG polyglycol	T_{max} = 130 °C
	OIL4	Food grade oil	T_{max} = 100 °C
Switch outputs	1: Early warning (time to next oil change can be set to between 2 and 100 days) 2: Main alarm (time to oil change 0 days) 3: Exceeded temperature T_{max} 4: DUO10A is ready for operation		
Permitted oil temperature	-40 °C to +130 °C		
Permitted temperature sensors	PT1000		
EMC	IEC1000-4-2/3/4/6		
Ambient temperature	-25 °C to +70 °C		
Operating voltage	DC 18-28 V		
Current consumption at DC 24 V	< 90 mA		
Protection class	III		
Degree of protection	IP67 (optionally IP69K)		
Housing materials	Evaluation unit: V2A, EPDM/X, PBT, FPM Temperature sensor: V4A		
Electrical connection	Evaluation unit: M12 plug connector PT1000 temperature sensor: M12 plug connector		

Designations and part numbers

Designation	Description	Part number
DUO10A 	Evaluation unit (basic unit)	1 343 875 1
DUO10A-PUR-M12-5m	5 m PUR cable with 1 connector	1 343 877 8
DUO10A-PVC-M12-5m	5 m PVC cable with 1 connector	1 343 878 6
DUO10A	Mounting bracket	1 343 880 8
DUO10A D = 34	Mounting clamp	1 343 879 4

Designation	Description	Part number
W4843 PT1000 	PT1000 temperature sensor	1 343 881 6
W4843_4x0.34-2m-PUR	2 m PUR cable for PT1000[1)]	1 343 882 4
W4843_4x0.34-2m-PVC	2 m PVC cable for PT1000[2)]	1 343 883 2
DUO10A 	Protection cap (for aseptic design, IP69K)	1 343 902 2

1) PUR cables are particularly suited for use in oil-contaminated environments.

2) PVC cables are particularly suited for use in wet environments.

Mounting on standard gear units (R, F, K, S)

Adapter for mounting the PT1000 temperature sensor in screw plug holes:

Complete adapter for PT1000 sensor	Part number
M10 × 1	1 343 903 0
M12 × 1.5	1 343 904 9
M22 × 1.5	1 343 905 7
M33 × 2	1 343 906 5
M42 × 2	1 343 907 3

Mounting base for installing the diagnostic unit at the gear unit with an angle bracket:

Mounting base with sealing ring	Part number
M10 × 1	1 343 441 1
M12 × 1.5	1 343 827 1
M22 × 1.5	1 343 829 8
M33 × 2	1 343 830 1
M42 × 2	1 343 832 8

Technical data for vibration sensor

DUV10A/DUV30A diagnostic unit

DUV10A and DUV30A vibration sensors are suited for early detection of gearmotor damage, which can be detected using vibration diagnostics, such as bearing damage or imbalance. The highest load of the drives at constant speed must be present to being able to use the full functionality of the diagnostic unit. Drives in which the maximum load is present during acceleration are suitable for monitoring using vibration sensors to a limited degree only.

	Technical data	
	DUV10A	**DUV30A**
Measuring range	± 20 g	± 20 g
Frequency range	0.125 to 500 Hz	0.125 to 500 Hz / 0.125 to 5000 Hz
Spectral resolution	0.125 Hz	0.125 Hz / 1.25 Hz
Diagnostic methods	FFT, envelope-FFT, trend analysis	
Minimum measuring period	8.0 s	8.0 s / 0.8 s
Speed range	12 to 3500 rpm	12 to 3500 rpm / 120 to 12000 rpm
Switch outputs	1: Early warning 2: Main alarm	
Operating voltage	DC 10-32 V	
Current consumption for DC 24 V	100 mA	
Protection class	III	
EMC	IEC1000-4-2/3/4/6	
Overload capacity	100 g	
Ambient temperature	-30 °C to +60 °C	-30 °C to +70 °C
Degree of protection	IP67	
Housing materials	Zinc die-casting, coating based on epoxy finish, polyester membrane keypad	
Electrical connection for supply and switching output	M12 plug connector	
Electrical connection RS-232 for communication	M8 plug connector	
Certificates and standards	CE, UL	

Designations and part numbers

Designation	Description	Part number
DUV10A / DUV30A 	Diagnostic unit (basic unit)	DUV10A: 1 406 629 7 DUV30A: 1 328 969 1
DUV.0A-S	Parameter setting software	1 406 630 0
DUV.0A-K-RS232-M8	Communication cable	1 406 631 9
DUV.0A-N24DC	DC 24 V power supply unit	1 406 632 7
DUV.0A-I	Pulse tester	1 406 633 5

Designation	Description	Part number
DUV.0A-K-M12-2m PUR	2 m PUR cable with 1 connector[1)]	1 406 634 3
DUV.0A-K-M12-5m PUR	5 m PUR cable with 1 connector[1)]	1 406 635 1
DUV.0A-K-M12-2m PVC	2 m PVC cable with 1 connector[2)]	1 326 620 9
DUV.0A-K-M12-5m PVC	5 m PVC cable with 1 connector[2)]	1 326 621 7

1) PUR cables are particularly suited for use in oil-contaminated environments.

2) PVC cables are particularly suited for use in wet environments.

Mounting on standard gear units (R, F, K, S)

Mounting base for installing the diagnostic unit at the gear unit:

Mounting base with sealing ring	Part number
M10 × 1	1 343 441 1
M12 × 1.5	1 343 827 1
M22 × 1.5	1 343 829 8
M33 × 2	1 343 830 1
M42 × 2	1 343 832 8

6.14 Lubricants and fill quantities

General information

Unless a special arrangement is made, SEW-EURODRIVE supplies the drives with a lubricant fill adapted for the specific gear unit and mounting position. This applies when specifying the M1 - M6 mounting position when ordering the drive, see chapter "Mounting positions of gear units" on page 63 et seq. You must adapt the lubricant fill to any subsequent changes made to the mounting position, see section "Lubricant fill quantities" on page 119 and subsequent pages..

	INFORMATION
	SEW-EURODRIVE fills the gear units with the amount of oil specified for the specific mounting positions. If the mounting position is changed, the amount of oil must be adapted as required. Consequently, a **mounting position may only be changed** after consultation with SEW-EURODRIVE, otherwise your right to claim under warranty **no longer applies**.

Lubricant table

The lubricant table on the following page shows the permitted lubricants for SEW-EURODRIVE gear units. Observe the following key to the lubricant table.

Key to the lubricant table

Abbreviations, meaning of shading and notes:

CLP	= Mineral oil
CLP PG	= Polyglycol (W gear units, conforms to USDA-H1)
CLP HC	= Synthetic hydrocarbons
E	= Ester oil (water hazard classification 1)
HCE	= Synthetic hydrocarbons + ester oil (USDA - H1 certification)
HLP	= Hydraulic oil
	= Synthetic lubricant (= synthetic-based roller bearing grease)
	= Mineral lubricant (= mineral-based rolling bearing grease)
1)	Helical-worm gear units with PG oil: consult SEW-EURODRIVE.
2)	Special lubricant for SPIROPLAN® gear units only
3)	SEW-$f_B \geq 1.2$ required
4)	Observe the critical starting behavior at low temperatures.
5)	Low-viscosity grease
6)	Ambient temperature
	Lubricant for the food industry (food grade oil)
	Biodegradable oil (lubricant for agriculture, forestry, and water management)

Rolling bearing greases

The rolling bearings in gear units and motors are given a factory-fill with the greases listed below. SEW-EURODRIVE recommends regreasing rolling bearings with a grease fill at the same time as changing the oil or replacing the rolling bearings.

	Ambient temperature	Manufacturer	Type
Gear unit rolling bearings	-40 °C to +80 °C	Fuchs	Renolit CX-TOM15[1)]
Motor rolling bearings[2)]	-20 °C to +80 °C	Esso	Polyrex EM
	+20 °C to +100 °C	Klüber	Barrierta L55/2
	-40 °C to +60 °C	Kyodo Yushi	Multemp SRL[3)]
Special greases for gear unit rolling bearings:			
	-30 °C to +40 °C	Aral	Aral Eural Grease EP 2
	-20 °C to +40 °C	Aral	Aral Aralube BAB EP2

1) Rolling bearing grease based on semi-synthetic base oil.

2) The motor rolling bearings are covered on both sides and cannot be regreased.

3) Recommended for continuous operation at ambient temperatures below 0 °C, for example in a cold storage.

INFORMATION

The following grease quantities are required:

- For fast-running bearings (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.

Lubricant table

01 751 05 04

	6) °C -50 0 +50 +100	DIN (ISO)	ISO,NLGI	Mobil®	Shell		ARAL	bp	TEXACO	Castrol Tribol	Castrol Optimol	FUCHS	TOTAL
R..	Standard -15 +40	CLP(CC)	VG 220	Mobilgear 600 XP 220	Shell Omala 220	Klüberoil GEM 1-220 N	Aral Degol BG 220	BP Energol GR-XP 220	Meropa 220	Tribol 1100/220	Optigear BM 220	Renolin CLP 220	Carter EP 220
	-20 +80	CLP PG	VG 220	Mobil Glygoyle 220	Shell Tivela S 220	Klübersynth GH 6-220	Aral Degol GS 220	BP Enersyn SG-XP 220	Synlube CLP 220	Tribol 800/220	Optiflex A 220	Renolin PG 220	Carter SY 220
K...(HK...)	4) -20 +60	CLP HC	VG 220	Mobil SHC 630	Shell Omala HD 220	Klübersynth GEM 4-220 N	Aral Degol PAS 220		Pinnacle EP 220	Tribol 1510/220	Optigear Synthetic X 220	Renolin Unisyn CLP 220	
	4) -40 +40	CLP HC	VG 150	Mobil SHC 629	Shell Omala HD 150	Klübersynth GEM 4-150 N			Pinnacle EP 150		Optigear Synthetic X 150	Renolin Unisyn CLP 150	Carter SH 150
F...	-20 +25	CLP (CC)	VG 150 VG 100	Mobilgear 600 XP 100	Shell Omala 100	Klüberoil GEM 1-150 N	Aral Degol BG 100	BP Energol GR-XP 100	Meropa 150	Tribol 1100/100	Optigear BM 100	Renolin CLP 150	Carter EP 100
	-30 +10	HLP (HM)	VG 68-46 VG 32	Mobil DTE 10 Excel 32	Shell Tellus T 32	Klüberoil GEM 1-68 N	Aral Degol BG 46		Rando EP Ashless 46	Tribol 1100/68	Optigear 32	Renolin B 46 HVI	Equivis ZS 46
	4) -40 +20	CLP HC	VG 68	Mobil SHC 626	Shell Omala HD 68							Renolin Unisyn CLP 68	
	4) -40 + 0	CLP HC	VG 32	Mobil SHC 624		Klüber-Summit HySyn FG-32			Cetus PAO 46		Optileb HY 32	Renolin Unisyn OL 32	Dacnis SH 32
	4) -40 -20	HLP (HM)	VG 22 VG 15	Mobil DTE 10 Excel 15	Shell Tellus T 15	Isoflex MT 30 ROT		BP Energol HLP-HM 15	Rando HDZ 15		Hyspin AWS 22	Renolin MR 310	Equivis ZS 15
S...(HS...)	Standard 0 +40	CLP (CC)	VG 680	Mobilgear 600 XP 680	Shell Omala 680	Klüberoil GEM 1-680 N	Aral Degol BG 680	BP Energol GR-XP 680	Meropa 680	Tribol 1100/680	Optigear BM 680	Renolin SEW 680	Carter EP 680
	-20 +80	CLP PG	VG 680 1)	Mobil Glygoyle 680	Shell Tivela S 680	Klübersynth GH 6-680		BP Enersyn SG-XP 680	Synlube CLP 680	Tribol 800/680	Optiflex A 680	Renolin PG 680	
	4) -20 +60	CLP HC	VG 460	Mobil SHC 634	Shell Omala HD 460	Klübersynth GEM 4-460 N			Pinnacle EP 460		Optigear Synthetic X 460	Renolin Unisyn CLP 460	
	4) -40 +30	CLP HC	VG 150	Mobil SHC 629	Shell Omala HD 150	Klübersynth GEM 4-150 N			Pinnacle EP 150		Optigear Synthetic X 150	Renolin Unisyn CLP 150	Carter SH 150
	-20 +10	CLP (CC)	VG 150 VG 100	Mobilgear 600 XP 100	Shell Omala 100	Klüberoil GEM 1-150 N	Aral Degol BG 100	BP Energol GR-XP 100	Meropa 150	Tribol 1100/100	Optigear BM 100	Renolin CLP 150	Carter EP 100
	-20 +40	CLP PG	VG 220 1)	Mobil Glygoyle 220	Shell Tivela S 220	Klübersynth GH 6-220	Aral Degol GS 220	BP Enersyn SG-XP 220	Synlube CLP 220	Tribol 800/220	Optiflex A 220	Renolin PG 220	Carter SY 220
	4) -40 +20	CLP HC	VG 68	Mobil SHC 626	Shell Omala HD 68							Renolin Unisyn CLP 68	
	4) -40 0	CLP HC	VG 32	Mobil SHC 624		Klüber-Summit HySyn FG-32			Cetus PAO 46		Alphasyn T32	Renolin Unisyn OL 32	Dacnis SH 32
R...K...(HK...), F...S...(HS...)	4) -10 +40	CLPHC NSF H1	VG 460		Shell Cassida Fluid GL 460	Klüberoil 4UH1-460 N					Optileb GT 460	Geralyn SF 460	
	-20 +30		VG 220		Shell Cassida Fluid GL 220	Klüberoil 4UH1-220 N					Optileb GT 220		
	-40 0		VG 68		Shell Cassida Fluid HF 68	Klüberoil 4UH1-68 N					Optileb HY 68		
	-20 +40	E	VG 460			Klüberbio CA2-460				Tribol Bio Top 1418/460		Plantogear 460 S	
W...(HW...)	Standard -20 +40	CLP PG 460 -SEW	VG 460 2)			Klüber SEW HT-460-5							
	4) -40 +10	API GL5	SAE 75W90 (–VG 100)	Mobil Synthetic Gear Oil 75 W90									
	-20 +60	H1 PG	VG 460 2) 3)			Klübersynth UH1 6-460							
PS.F..	Standard -20 +40	CLP PG	VG 220			Klübersynth GH 6-220							
	-20 +60	H1 PG	VG 460 2) 3)			Klübersynth UH1 6-460							
	-40 0	CLP HC	VG 32	Mobil SHC 624									
PS.C..	Standard -10 +40	CLP (CC)	VG 220	Mobilgear 600 XP 220									
	-20 +40	DIN 51 818	00 5)	Mobilux EP 004									
	-20 +40		1 7)			Klübersynth UH1 14-151							
	-40 0	CLP HC	VG 32	Mobil SHC 624									
BS.F..	Standard -40 +40	API GL5	SAE 75W90 (–VG 100)	Mobil Synth Gear Oil 75 W90									
	-20 +60	H1 PG	VG 460 2) 3)			Klübersynth UH1 6-460							

Lubricant fill quantities

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 volume**.

The following tables show guide values for lubricant fill quantities in relation to the mounting position M1 - M6.

Helical gear units (R)

RX..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
RX57	0.60	0.80	1.30	1.30	0.90	0.90
RX67	0.80	0.80	1.70	1.90	1.10	1.10
RX77	1.10	1.50	2.60	2.70	1.60	1.60
RX87	1.70	2.50	4.80	4.80	2.90	2.90
RX97	2.10	3.40	7.4	7.0	4.80	4.80
RX107	3.90	5.6	11.6	11.9	7.7	7.7

RXF..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
RXF57	0.50	0.80	1.10	1.10	0.70	0.70
RXF67	0.70	0.80	1.50	1.40	1.00	1.00
RXF77	0.90	1.30	2.40	2.00	1.60	1.60
RXF87	1.60	1.95	4.90	3.95	2.90	2.90
RXF97	2.10	3.70	7.1	6.3	4.80	4.80
RXF107	3.10	5.7	11.2	9.3	7.2	7.2

R.., R..F

Gear unit	Fill quantity in liters					
	M1[1)]	M2	M3	M4	M5	M6
R07	0.12	0.20	0.20	0.20	0.20	0.20
R17	0.25	0.55	0.35	0.55	0.35	0.40
R27	0.25/0.40	0.70	0.50	0.70	0.50	0.50
R37	0.30/0.95	0.85	0.95	1.05	0.75	0.95
R47	0.70/1.50	1.60	1.50	1.65	1.50	1.50
R57	0.80/1.70	1.90	1.70	2.10	1.70	1.70
R67	1.10/2.30	2.40	2.80	2.90	1.80	2.00
R77	1.20/3.00	3.30	3.60	3.80	2.50	3.40
R87	2.30/6.0	6.4	7.2	7.2	6.3	6.5
R97	4.60/9.8	11.7	11.7	13.4	11.3	11.7
R107	6.0/13.7	16.3	16.9	19.2	13.2	15.9
R137	10.0/25.0	28.0	29.5	31.5	25.0	25.0
R147	15.4/40.0	46.5	48.0	52.0	39.5	41.0
R167	27.0/70.0	82.0	78.0	88.0	66.0	69.0

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

RF..

Gear unit	Fill quantity in liters					
	M1[1)]	M2	M3	M4	M5	M6
RF07	0.12	0.20	0.20	0.20	0.20	0.20
RF17	0.25	0.55	0.35	0.55	0.35	0.40
RF27	0.25/0.40	0.70	0.50	0.70	0.50	0.50
RF37	0.35/0.95	0.90	0.95	1.05	0.75	0.95
RF47	0.65/1.50	1.60	1.50	1.65	1.50	1.50
RF57	0.80/1.70	1.80	1.70	2.00	1.70	1.70
RF67	1.20/2.50	2.50	2.70	2.80	1.90	2.10
RF77	1.20/2.60	3.10	3.30	3.60	2.40	3.00
RF87	2.40/6.0	6.4	7.1	7.2	6.3	6.4
RF97	5.1/10.2	11.9	11.2	14.0	11.2	11.8
RF107	6.3/14.9	15.9	17.0	19.2	13.1	15.9
RF137	9.5/25.0	27.0	29.0	32.5	25.0	25.0
RF147	16.4/42.0	47.0	48.0	52.0	42.0	42.0
RF167	26.0/70.0	82.0	78.0	88.0	65.0	71.0

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

Parallel shaft helical gear units (F)

F.., FA..B, FH..B, FV..B

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
F..27	0.60	0.80	0.65	0.70	0.60	0.60
F..37	0.95	1.25	0.70	1.25	1.00	1.10
F..47	1.50	1.80	1.10	1.90	1.50	1.70
F..57	2.60	3.50	2.10	3.50	2.80	2.90
F..67	2.70	3.80	1.90	3.80	2.90	3.20
F..77	5.9	7.3	4.30	8.0	6.0	6.3
F..87	10.8	13.0	7.7	13.8	10.8	11.0
F..97	18.5	22.5	12.6	25.2	18.5	20.0
F..107	24.5	32.0	19.5	37.5	27.0	27.0
F..127	40.5	54.5	34.0	61.0	46.3	47.0
F..157	69.0	104.0	63.0	105.0	86.0	78.0

FF..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
FF27	0.60	0.80	0.65	0.70	0.60	0.60
FF37	1.00	1.25	0.70	1.30	1.00	1.10
FF47	1.60	1.85	1.10	1.90	1.50	1.70
FF57	2.80	3.50	2.10	3.70	2.90	3.00
FF67	2.70	3.80	1.90	3.80	2.90	3.20
FF77	5.9	7.3	4.30	8.1	6.0	6.3
FF87	10.8	13.2	7.8	14.1	11.0	11.2
FF97	19.0	22.5	12.6	25.6	18.9	20.5
FF107	25.5	32.0	19.5	38.5	27.5	28.0
FF127	41.5	55.5	34.0	63.0	46.3	49.0
FF157	72.0	105.0	64.0	106.0	87.0	79.0

FA.., FH.., FV.., FAF.., FAZ.., FHF.., FHZ.., FVF.., FVZ.., FT..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
F..27	0.60	0.80	0.65	0.70	0.60	0.60
F..37	0.95	1.25	0.70	1.25	1.00	1.10
F..47	1.50	1.80	1.10	1.90	1.50	1.70
F..57	2.70	3.50	2.10	3.40	2.90	3.00
F..67	2.70	3.80	1.90	3.80	2.90	3.20
F..77	5.9	7.3	4.30	8.0	6.0	6.3
F..87	10.8	13.0	7.7	13.8	10.8	11.0
F..97	18.5	22.5	12.6	25.2	18.5	20.0
F..107	24.5	32.0	19.5	37.5	27.0	27.0
F..127	39.0	54.5	34.0	61.0	45.0	46.5
F..157	68.0	103.0	62.0	104.0	85.0	77.0

Helical-bevel gear units (K)

K.., KA..B, KH..B, KV..B

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
K..37	0.50	1.00	1.00	1.25	0.95	0.95
K..47	0.80	1.30	1.50	2.00	1.60	1.60
K..57	1.10	2.20	2.20	2.80	2.30	2.10
K..67	1.10	2.40	2.60	3.45	2.60	2.60
K..77	2.20	4.10	4.40	5.8	4.20	4.40
K..87	3.70	8.0	8.7	10.9	8.0	8.0
K..97	7.0	14.0	15.7	20.0	15.7	15.5
K..107	10.0	21.0	25.5	33.5	24.0	24.0
K..127	21.0	41.5	44.0	54.0	40.0	41.0
K..157	31.0	62.0	65.0	90.0	58.0	62.0
K..167	33.0	95.0	105.0	123.0	85.0	84.0
K..187	53.0	152.0	167.0	200	143.0	143.0

KF..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
KF37	0.50	1.10	1.10	1.50	1.00	1.00
KF47	0.80	1.30	1.70	2.20	1.60	1.60
KF57	1.20	2.20	2.40	3.15	2.50	2.30
KF67	1.10	2.40	2.80	3.70	2.70	2.70
KF77	2.10	4.10	4.40	5.9	4.50	4.50
KF87	3.70	8.2	9.0	11.9	8.4	8.4
KF97	7.0	14.7	17.3	21.5	15.7	16.5
KF107	10.0	21.8	25.8	35.1	25.2	25.2
KF127	21.0	41.5	46.0	55.0	41.0	41.0
KF157	31.0	66.0	69.0	92.0	62.0	62.0

KA.., KH.., KV.., KAF.., KHF.., KVF.., KAZ.., KHZ.., KVZ.., KT..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
K..37	0.50	1.00	1.00	1.40	1.00	1.00
K..47	0.80	1.30	1.60	2.15	1.60	1.60
K..57	1.20	2.20	2.40	3.15	2.70	2.40
K..67	1.10	2.40	2.70	3.70	2.60	2.60
K..77	2.10	4.10	4.60	5.9	4.40	4.40
K..87	3.70	8.2	8.8	11.1	8.0	8.0
K..97	7.0	14.7	15.7	20.0	15.7	15.7
K..107	10.0	20.5	24.0	32.4	24.0	24.0
K..127	21.0	41.5	43.0	52.0	40.0	40.0
K..157	31.0	66.0	67.0	87.0	62.0	62.0

Helical-worm gear units (S)

S

Gear unit	Fill quantity in liters					
	M1	M2	M3[1)]	M4	M5	M6
S..37	0.25	0.40	0.50	0.55	0.40	0.40
S..47	0.35	0.80	0.70/0.90	1.00	0.80	0.80
S..57	0.50	1.20	1.00/1.20	1.45	1.30	1.30
S..67	1.00	2.00	2.20/3.10	3.10	2.60	2.60
S..77	1.90	4.20	3.70/5.4	5.9	4.40	4.40
S..87	3.30	8.1	6.9/10.4	11.3	8.4	8.4
S..97	6.8	15.0	13.4/18.0	21.8	17.0	17.0

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

SF..

Gear unit	Fill quantity in liters					
	M1	M2	M3[1)]	M4	M5	M6
SF37	0.25	0.40	0.50	0.55	0.40	0.40
SF47	0.40	0.90	0.90/1.05	1.05	1.00	1.00
SF57	0.50	1.20	1.00/1.50	1.55	1.40	1.40
SF67	1.00	2.20	2.30/3.00	3.20	2.70	2.70
SF77	1.90	4.10	3.90/5.8	6.5	4.90	4.90
SF87	3.80	8.0	7.1/10.1	12.0	9.1	9.1
SF97	7.4	15.0	13.8/18.8	22.6	18.0	18.0

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

SA.., SH.., SAF.., SHZ.., SAZ.., SHF.., ST..

Gear unit	Fill quantity in liters					
	M1	M2	M3[1)]	M4	M5	M6
S..37	0.25	0.40	0.50	0.50	0.40	0.40
S..47	0.40	0.80	0.70/0.90	1.00	0.80	0.80
S..57	0.50	1.10	1.00/1.50	1.50	1.20	1.20
S..67	1.00	2.00	1.80/2.60	2.90	2.50	2.50
S..77	1.80	3.90	3.60/5.0	5.8	4.50	4.50
S..87	3.80	7.4	6.0/8.7	10.8	8.0	8.0
S..97	7.0	14.0	11.4/16.0	20.5	15.7	15.7

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

SPIROPLAN® gear units (W)

The fill quantities of SPRIOPLAN® gear units W..37 and W..47 in mounting position M4 are different from those of other mounting positions.

W.., WF.., WA..B, WH..B

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
W..37	0.50			0.70	0.50	
W..47	0.90			1,40	0.90	

WA.., WAF.., WT.., WH.., WHF..

Gear unit	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
W..37	0.50			0.70	0.50	
W..47	0.80			1,25	0.80	