Gear unit

H..V, B..V
Sizes 1 to 22

Assembly and operating instructions
BA 5011 en 08/2012

FLENDER gear units

SIEMENS

SIEMENS

Gear unit

H..V, B..V
Sizes 1 to 22

Assembly and operating instructions

Translation of the original assembly and operating instructions

Notes and symbols in these assembly and operating instructions

Note: The term "Assembly and operating instructions" will in the following also be shortened to "instructions" or "manual".

Legal notes

Warning note concept

This manual comprises notes which must be observed for your personal safety and for preventing material damage. Notes for your personal safety are marked with a warning triangle or an "Ex" symbol (when applying Directive 94/9/EC), those only for preventing material damage with a "STOP" sign.

WARNING! Imminent **explosion!**

The notes indicated by this symbol are given to prevent **explosion damage.**
Disregarding these notes may result in serious injury or death.

WARNING! Imminent **personal injury!**

The notes indicated by this symbol are given to prevent **personal injury.**
Disregarding these notes may result in serious injury or death.

WARNING! Imminent **damage to the product!**

The notes indicated by this symbol are given to prevent **damage to the product.**
Disregarding these notes may result in material damage.

NOTE!

The notes indicated by this symbol must be treated as general **operating information**.
Disregarding these notes may result in undesirable results or conditions.

WARNING! Hot surfaces!

The notes indicated by this symbol are made to prevent **risk of burns due to hot surfaces** and must always be observed.
Disregarding these notes may result in light or serious injury.

Where there is more than one hazard, the warning note for whichever hazard is the most serious is always used. If in a warning note a warning triangle is used to warn of possible personal injury, a warning of material damage may be added to the same warning note.

Qualified personnel

The product or system to which these instructions relate may be handled only by persons qualified for the work concerned and in accordance with the instructions relating to the work concerned, particularly the safety and warning notes contained in those instructions. Qualified personnel must be specially trained and have the experience necessary to recognise risks associated with these products or systems and to avoid possible hazards.

Intended use of Siemens products

Observe also the following:

⚠ Siemens products must be used only for the applications provided for in the catalogue and the relevant technical documentation. If products and components of other makes are used, they must be recommended or approved by Siemens. The faultfree, safe operation of the products calls for proper transport, proper storage, erection, assembly, installation, start-up, operation and maintenance. The permissible ambient conditions must be adhered to. Notes in the relevant documentations must be observed.

Trademarks

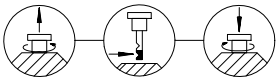
All designations indicated with the registered industrial property mark ® are registered trademarks of Siemens AG. Other designations used in these instructions may be trademarks the use of which by third parties for their own purposes may infringe holders' rights.

Exclusion of liability

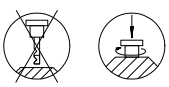
We have checked the content of the instructions for compliance with the hard- and software described. Nevertheless, variances may occur, and so we can offer no warranty for complete agreement. The information given in these instructions is regularly checked, and any necessary corrections are included in subsequent editions.

Symbols

Earth connection point			Air relief point		yellow
Oil-filling point		yellow	Oil-draining point		white
Oil level		red	Oil level		red
Oil overflow			Connection for vibration-monitoring device		
Lubrication point		red	Apply grease		
Lifting eye			Eye bolt		
Do not unscrew					
Alignment surface, horizontal			Alignment surface, vertical		



These symbols indicate the oil-level checking procedure using the oil dipstick.



These symbols indicate that the oil dipstick must always be firmly screwed in.

Contents

1. Technical data

1.1 General technical data

The most important technical data are shown on the rating plate. These data and the contractual agreements between Siemens and the customer for the gear unit determine the limits of its correct use.

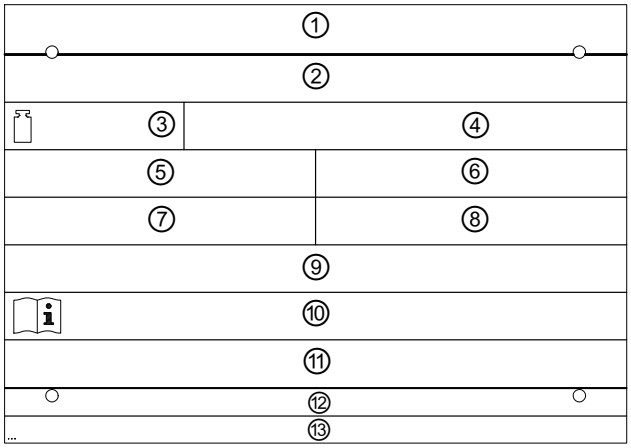
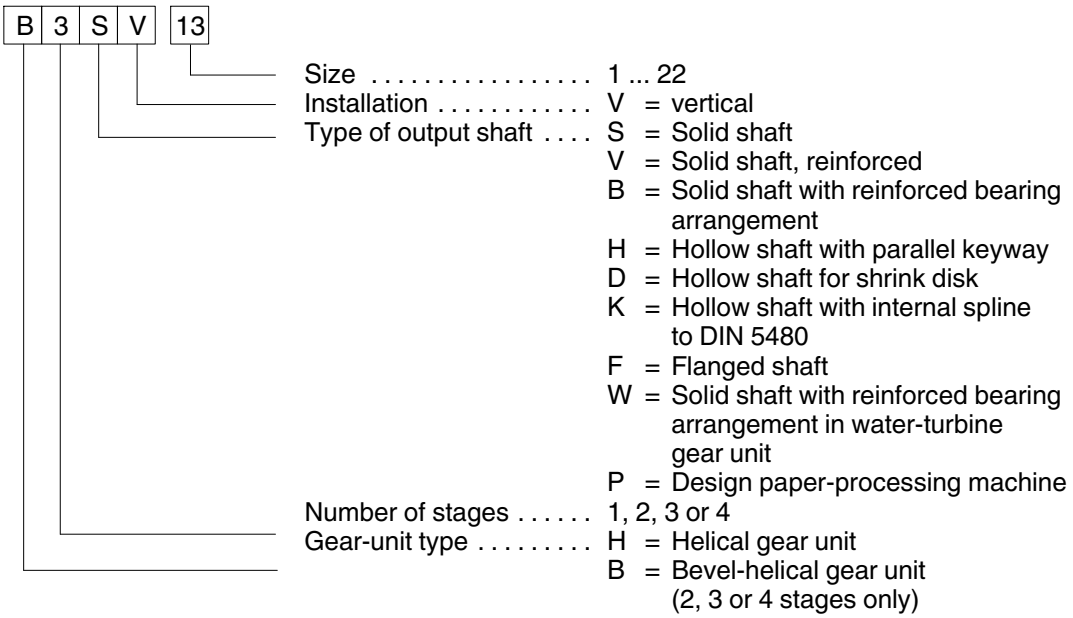


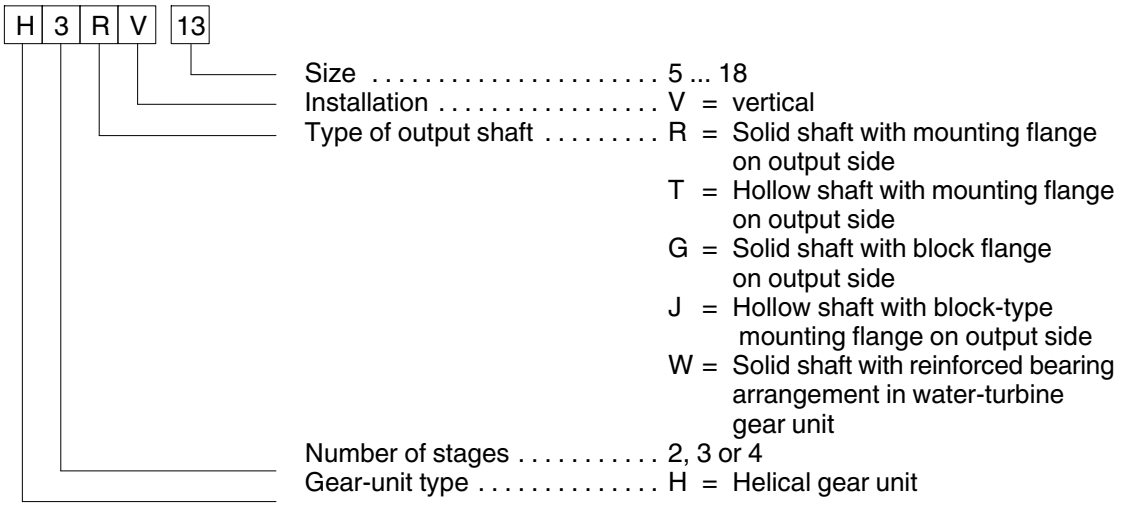
Fig. 1: Rating plate gear unit

①	Company logo	⑧	Speed n_2
②	Order no., item, seq. no. / Year built	⑨	Oil data
③	Total weight in kg		(oil type, oil viscosity, oil quantity)
④	Special information	⑩	Instructions number(s)
⑤	Type, size *)	⑪	Special information
⑥	Power rating P_2 in kW or T_2 in Nm	⑫	Manufacturer and place of manufacture
⑦	Speed n_1	⑬	Country of origin

*) Example 1



*) Example 2



Data on weights and measuring-surface sound-pressure levels of the various gear types are given in items 1.1.1 and/or 1.1.2.

For further technical data, refer to the drawings in the gear-unit documentation.

1.1.1 Configurations and weights

1.1.1.1 Designs of helical gear unit and bevel-helical gear unit of types H..V and B..V

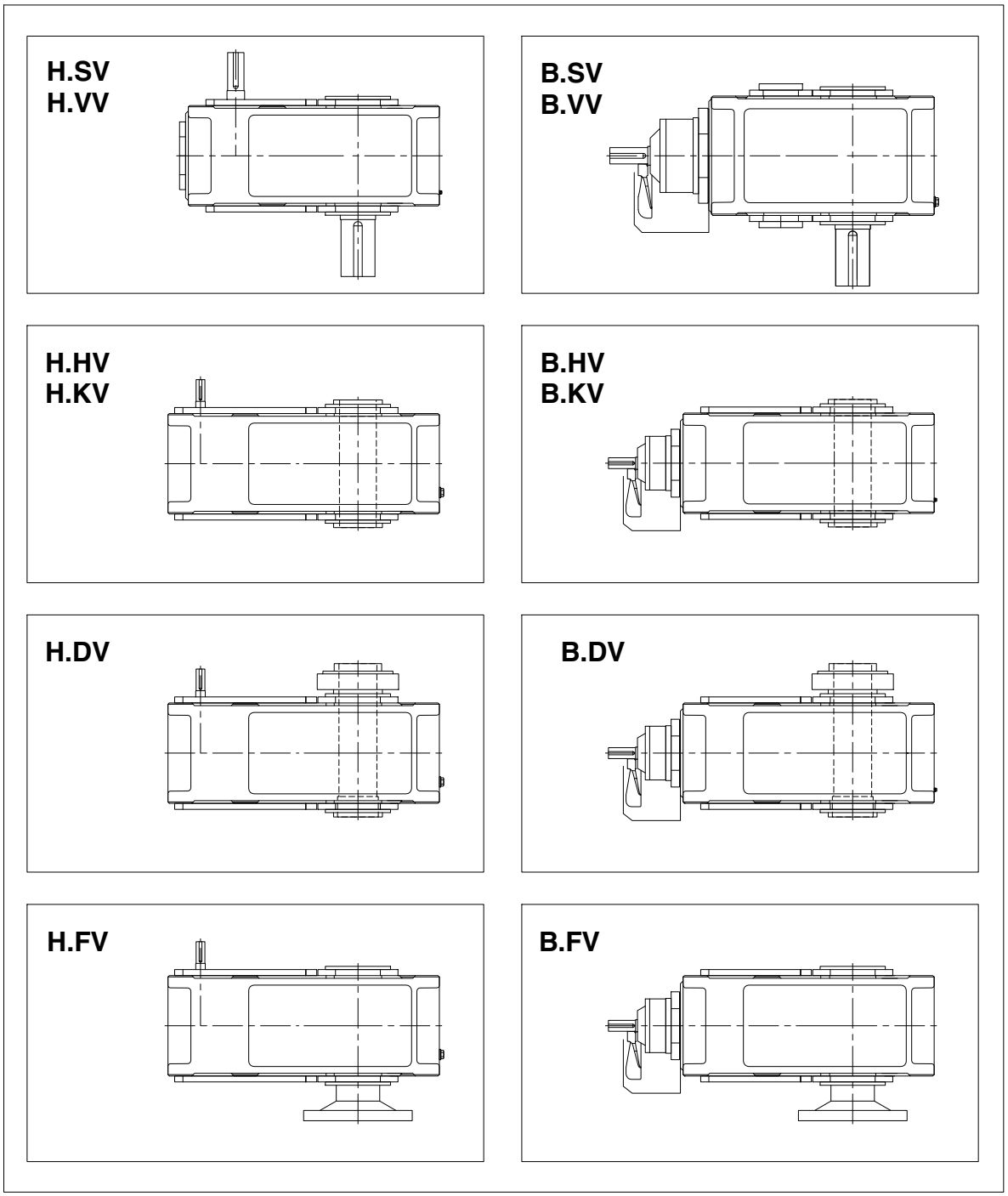


Fig. 2: Designs of helical gear unit and bevel-helical gear unit of types H..V and B..V

Table 1: Weights (approximate values)

Type	Approx. weight (kg) for size											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
H2.V	-	-	115	190	300	355	505	590	830	960	1335	1615
H3.V	-	-	-	-	320	365	540	625	875	1020	1400	1675
H4.V	-	-	-	-	-	-	550	645	875	1010	1460	1725
B2.V	65	90	140	235	360	410	615	700	1000	1155	1640	1910
B3.V	-	-	130	210	325	380	550	635	890	1020	1455	1730
B4.V	-	-	-	-	335	385	555	655	890	1025	1485	1750

Type	Approx. weight (kg) for size									
	13	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
H2.V	1880	2430	3240	3465	4420	4870	5000	6150	6950	7550
H3.V	2155	2490	3260	3625	4250	4740	4750	6250	6550	7050
H4.V	2270	2600	3440	3740	4445	4915	5300	5950	7250	7750
B2.V	2350	2725	3795	4160	5320	5860	-	-	-	-
B3.V	2260	2615	3540	3765	4760	5240	6050	6710	8190	8950
B4.V	2280	2605	3435	3765	4460	4930	5400	6000	7350	7850

All weights are for units without oil filling and add-on parts. For the exact weights, refer to the drawings in the gear-unit documentation.

1.1.1.2 Aerator gear unit

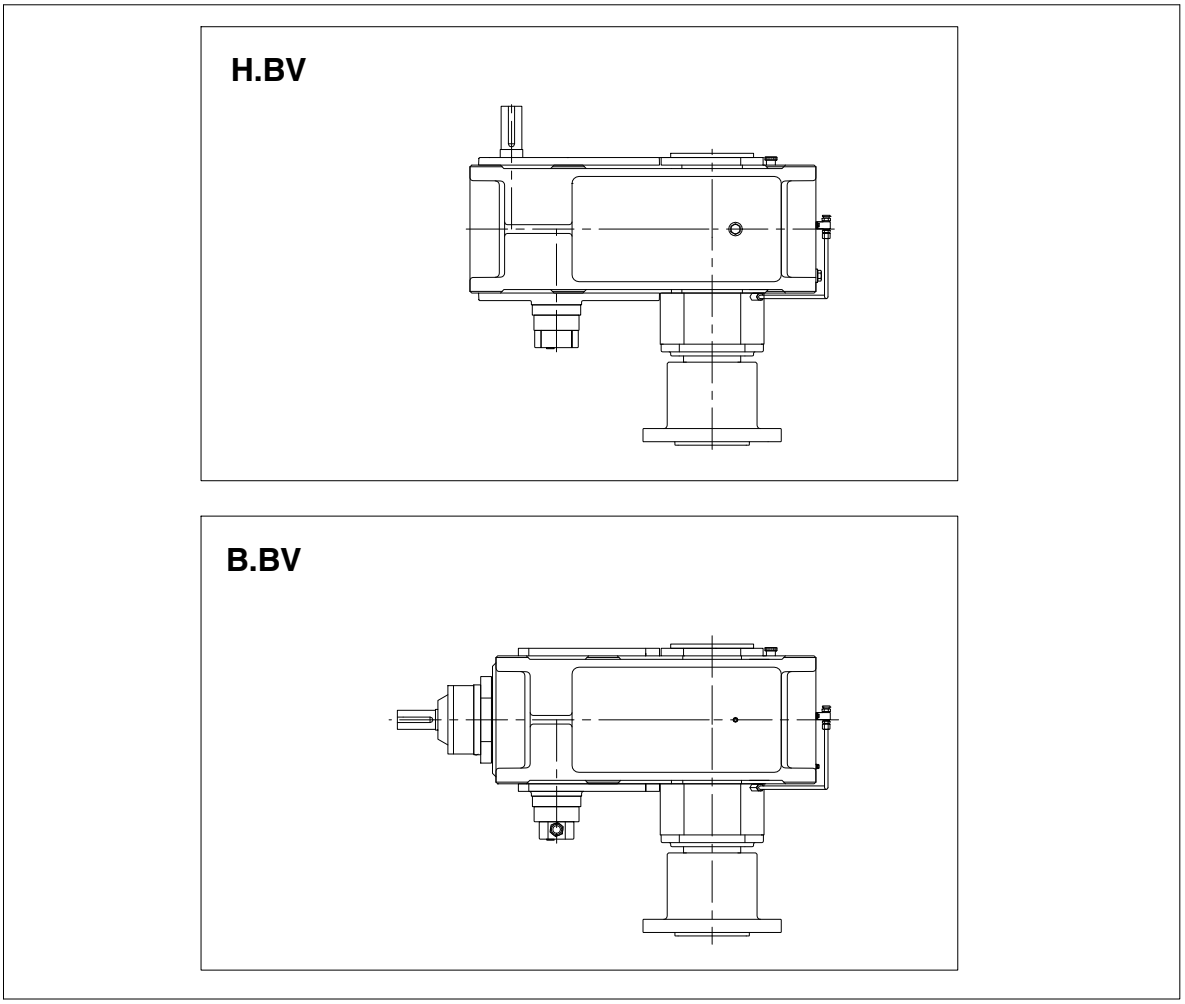


Fig. 3: Aerator gear unit of types H.BV and B.BV

Table 2: Weights (approximate values)

Type	Approx. weight (kg) for size											
	5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
H2BV	330	395	565	670	925	980	1500	1785	2370	2780	3715	4000
H3BV	350	405	600	705	970	1140	1565	1845	2465	2840	3735	4160
B3BV	355	420	610	710	985	1140	1620	1900	2570	2965	4015	4300

☞ All weights are for units without oil filling and add-on parts. For the exact weights, refer to the drawings in the gear-unit documentation.

1.1.1.3 Agitator gear unit

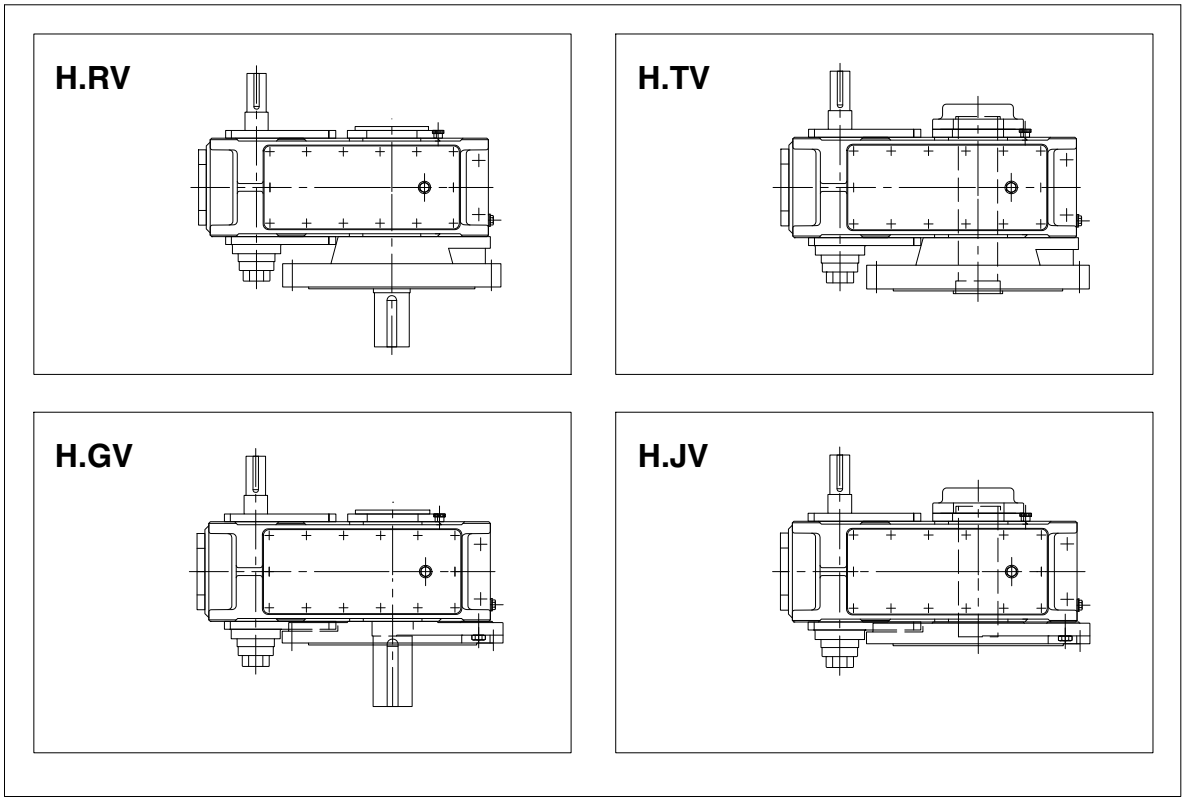


Fig. 4: Agitator gear unit of type H..V

Table 3: Weights (approximate values)

Type	Approx. weight (kg) for size													
	5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
H2RV	380	480	710	840	1100	1240	1630	1980	2360	2830	3780	4130	5350	5950
H2TV	380	470	680	790	1010	1160	1530	1840	2100	2910	3800	4050	4990	5500
H2GV	360	455	610	770	1020	1180	1555	1865	2115	2680	3550	3915	4940	5450
H2JV	360	455	610	770	1020	1180	1555	1865	2115	2680	3555	3915	4940	5450
H3RV	400	490	750	870	1140	1300	1690	2040	2640	2890	3800	4290	5180	5820
H3TV	400	480	720	820	1060	1220	1600	1900	2380	2970	3820	4210	4820	5370
H3GV	380	465	645	805	1065	1240	1620	1925	2390	2740	3570	4075	4770	5320
H3JV	380	465	645	805	1065	1240	1620	1925	2390	2740	3570	4075	4770	5320
H4RV	-	-	760	890	1140	1300	1750	2090	2750	3000	3980	4410	5380	6000
H4TV	-	-	730	840	1060	1210	1660	1950	2490	3080	4000	4330	5020	5550
H4GV	-	-	655	825	1065	1230	1680	1975	2505	2850	3750	4190	4965	5495
H4JV	-	-	655	825	1065	1230	1660	1975	2505	2850	3750	4190	4965	5495

☞ All weights are for units without oil filling and add-on parts. For the exact weights, refer to the drawings in the gear-unit documentation.

1.1.1.4 Water-turbine gear unit

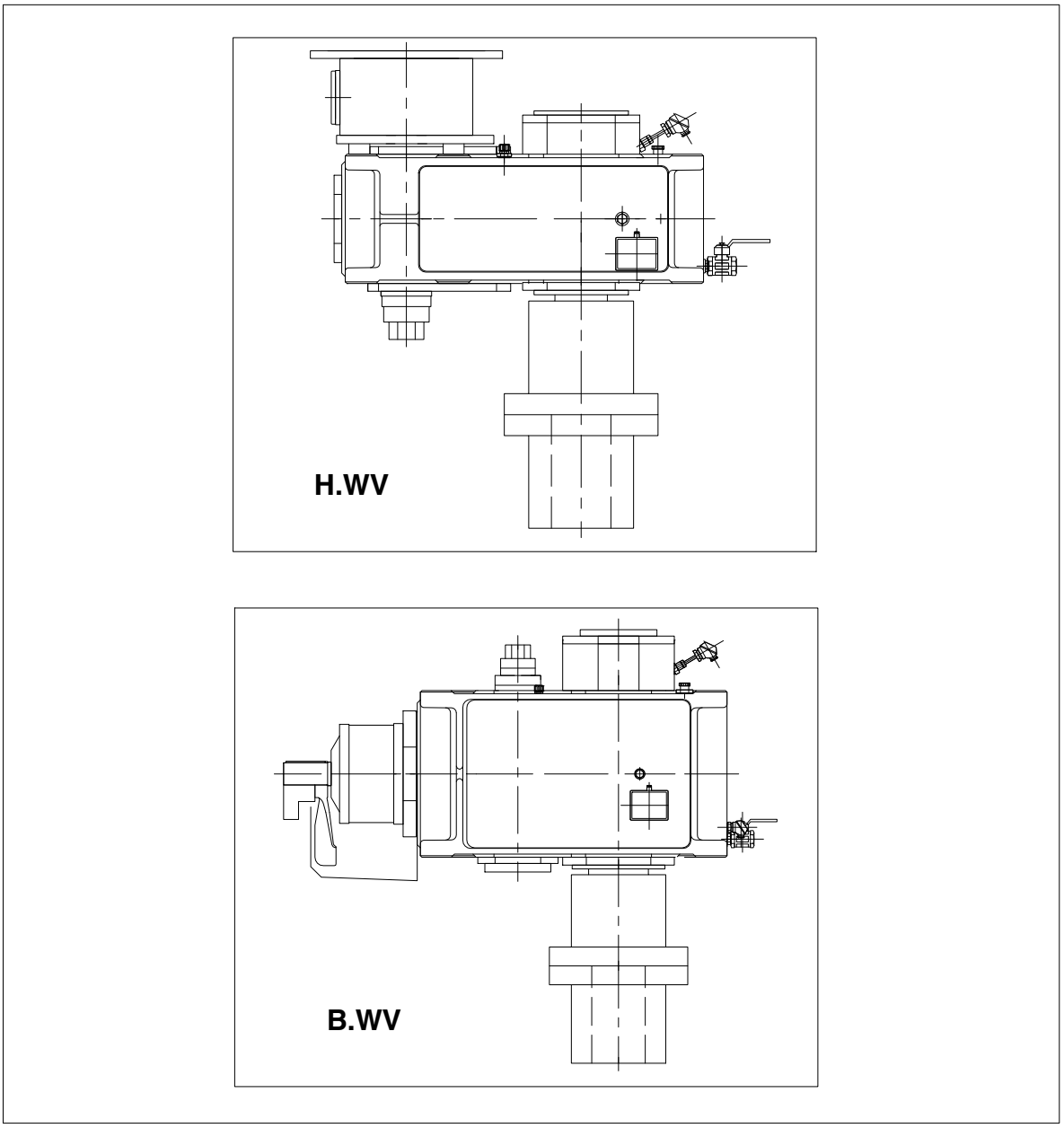


Fig. 5: Water-turbine gear unit of types H.WV and B.WV

Table 4: Weights (approximate values)

Type	Approx. weight (kg) for size																	
	5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
H2WV	400	500	660	750	1050	1200	1600	2000	2600	3000	4100	4700	5550	6400	7500	9200	10400	12000
B2WV	405	470	660	760	1000	1200	1600	2000	2600	3050	4000	4690	5700	6600	-	-	-	-

☞ All weights are for units without oil filling and add-on parts. For the exact weights, refer to the drawings in the gear-unit documentation.

Table 5: Oil quantities (approximate values)

Type	Oil quantity (approximate value) in litres for size																	
	5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
H2WV	14	17	25	28	40	44	64	72	100	110	150	165	215	240	-	-	-	-
B2WV	19	26	37	40	59	60	95	110	125	140	190	210	250	280	-	-	-	-

1.1.1.5 Pulper gear unit

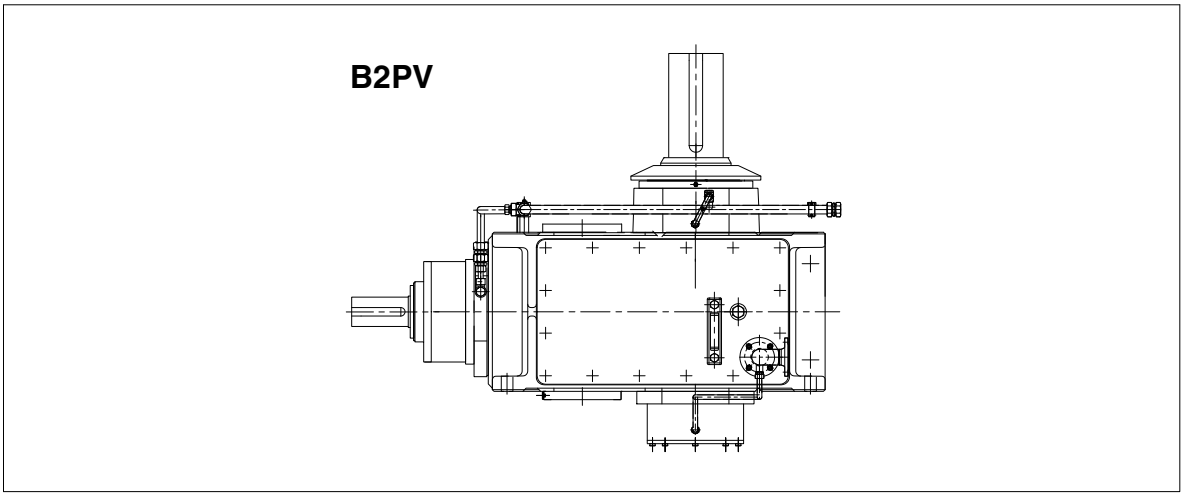


Fig. 6: Bevel-helical pulper gear unit of type B2PV

Table 6: Weights (approximate values)

Type	Approx. weight (kg) for size										
	8	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
B2PV	850	1170	1360	1950	2330	2800	3250	4400	5100	6450	7300

☞ All weights are for units without oil filling and add-on parts. For the exact weights, refer to the drawings in the gear-unit documentation.

1.1.2 Measuring-surface sound-pressure level

The gear unit has a measuring-surface sound-pressure level at a distance of 1 m, which can be found in tables 7 to 10.

The measurement is carried out to DIN EN ISO 9614 Part 2, using the sound-intensity method.

The workplace of the operating personnel is defined as the area on the measuring-surface at a distance of 1 metre in the vicinity of which persons may be present.

The sound-pressure level applies to the warmed-up gear unit at input speed n_1 and output power P_2 stated on the rating plate, as measurement obtained on the Siemens test bench. If several figures are given, the highest speed and power values apply.

The measuring-surface sound-pressure level includes add-on lubrication units, if applicable. With outgoing and incoming pipes, the interfaces are the flanges.

The sound-pressure levels stated in the table were obtained by statistical calculation by our Quality Control Dept. The gear unit can be statistically expected to comply with these sound-pressure levels.

1.1.2.1 Measuring-surface sound-pressure level for bevel-helical gear units (B..V) with fan

Table 7: Measuring-surface sound-pressure level L_{pA} in dB(A) for bevel-helical gear units with fan

Type	i_N	n_1 1/min	Gear-unit size																				
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
B2	5	3000	79	83	85	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	.	1500	65	70	73	76	79	81	83	84	85	87	88	89	91	92	94	-	-	-	-	-	-	-
	.	1000	1)	1)	67	71	73	74	77	78	79	80	82	83	84	85	87	89	90	-	-	-	-	-
	8	750	1)	1)	61	64	66	67	70	71	72	73	75	76	77	78	81	82	83	85	-	-	-	-
	9	3000	79	81	83	87	89	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	.	1500	65	67	70	73	75	76	78	81	82	83	84	85	86	87	88	90	-	-	-	-	-	-
	.	1000	1)	61	63	67	68	70	73	74	75	77	79	80	81	82	83	84	86	87	-	-	-	-
	14	750	1)	1)	1)	61	62	64	66	67	68	70	72	73	74	75	77	78	79	80	-	-	-	-
	16	3000	77	79	81	85	88	89	90	91	92	-	-	-	-	-	-	-	-	-	-	-	-	-
	.	1500	63	65	67	71	74	76	78	79	80	81	83	84	87	88	89	90	-	-	-	-	-	-
	.	1000	1)	1)	60	64	67	68	70	72	73	74	78	79	80	81	82	83	84	84	-	-	-	-
	22.4	750	1)	1)	1)	1)	61	63	65	67	68	69	71	72	73	73	74	74	75	76	-	-	-	-
B3	12.5	3000	-	-	82	86	87	88	90	92	93	-	-	-	-	-	-	-	-	-	-	-	-	-
	.	1500	-	-	69	72	75	77	79	80	81	82	83	85	88	89	90	91	93	93	93	93	95	95
	.	1000	-	-	62	65	68	69	71	72	73	74	77	78	80	82	83	83	84	85	86	86	88	88
	31.5	750	-	-	1)	1)	63	64	66	68	69	70	71	73	74	75	76	77	78	78	79	79	81	81
	35.5	3000	-	-	81	83	85	86	87	88	90	92	95	96	-	-	-	-	-	-	-	-	-	-
	.	1500	-	-	67	69	72	73	74	75	77	79	82	84	86	87	88	89	90	91	92	92	93	93
	.	1000	-	-	1)	63	65	66	67	69	71	72	73	75	77	78	79	80	81	82	83	84	85	86
	56	750	-	-	1)	1)	1)	1)	62	64	65	67	69	70	71	72	73	74	75	76	77	78	79	79
	63	3000	-	-	80	82	84	85	87	88	90	92	94	95	-	-	-	-	-	-	-	-	-	-
	.	1500	-	-	66	68	70	71	73	74	76	78	81	83	85	86	87	88	89	90	91	91	92	92
	.	1000	-	-	1)	61	63	64	66	68	69	71	73	75	77	78	79	80	81	81	82	82	83	84
	90	750	-	-	1)	1)	1)	1)	61	63	64	66	67	68	70	71	72	73	74	75	75	76	77	77

1) $L_{pA} < 60$ dB(A)

1.1.2.2 Measuring-surface sound-pressure level for bevel-helical gear units (B..V) without fan

Table 8: Measuring-surface sound-pressure level L_{pA} in dB(A) for bevel-helical gear units without fan

Type	i_N	n_1 1/min	Gear-unit size																					
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
B2	5	3000	75	81	84	88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	.	1500	63	69	72	75	78	80	82	83	84	86	87	88	89	90	93	-	-	-	-	-	-	-
	.	1000	1)	1)	66	70	72	73	76	77	78	79	81	82	83	84	86	88	89	-	-	-	-	-
	8	750	1)	1)	1)	63	65	66	69	71	72	73	74	75	77	78	80	82	83	84	-	-	-	-
	9	3000	73	77	80	83	86	87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	.	1500	61	64	67	71	74	75	77	79	80	81	83	84	85	86	87	89	-	-	-	-	-	-
	.	1000	1)	1)	61	65	67	69	72	73	74	76	77	78	80	81	82	83	85	86	-	-	-	-
	14	750	1)	1)	1)	1)	60	63	65	66	67	69	71	72	73	74	76	77	78	79	-	-	-	-
	16	3000	69	72	76	79	81	83	85	86	87	-	-	-	-	-	-	-	-	-	-	-	-	-
	.	1500	1)	60	63	66	69	71	72	74	75	77	78	80	81	82	85	85	-	-	-	-	-	-
	.	1000	1)	1)	1)	61	63	65	67	68	69	71	72	74	75	77	79	80	81	81	-	-	-	-
	22.4	750	1)	1)	1)	1)	1)	1)	60	62	63	64	66	67	68	70	72	73	74	75	-	-	-	-
B3	12.5	3000	-	-	77	81	84	86	87	88	90	-	-	-	-	-	-	-	-	-	-	-	-	-
	.	1500	-	-	65	68	71	74	75	76	77	79	81	83	84	85	86	87	87	88	89	90	91	92
	.	1000	-	-	1)	63	66	68	69	70	72	73	75	77	78	80	80	81	82	82	84	85	86	86
	31.5	750	-	-	1)	1)	1)	61	62	64	65	66	68	71	71	73	73	74	75	75	77	78	79	79
	35.5	3000	-	-	72	77	80	82	83	84	84	86	89	92	-	-	-	-	-	-	-	-	-	-
	.	1500	-	-	60	65	67	70	71	71	72	74	77	79	80	81	82	83	83	84	86	86	88	88
	.	1000	-	-	1)	1)	62	65	65	66	66	69	71	73	75	76	76	77	77	78	80	81	82	83
	56	750	-	-	1)	1)	1)	1)	1)	1)	1)	62	65	67	68	69	70	70	71	72	74	74	75	76
	63	3000	-	-	69	73	76	84	80	80	81	83	84	88	89	90	-	-	-	-	-	-	-	-
	.	1500	-	-	1)	61	64	70	67	68	68	70	73	75	76	78	78	79	79	80	82	83	84	84
	.	1000	-	-	1)	1)	1)	63	62	62	62	65	68	70	71	72	73	73	74	75	76	77	78	79
	90	750	-	-	1)	1)	1)	1)	1)	1)	1)	1)	61	63	64	65	66	67	67	68	70	70	72	72
B4	80	3000	-	-	-	-	76	77	79	81	82	85	87	89	90	91	92	-	-	-	-	-	-	-
	.	1500	-	-	-	-	64	65	67	68	70	72	75	76	77	79	80	81	82	83	84	85	86	86
	.	1000	-	-	-	-	1)	1)	61	63	64	67	69	70	72	73	74	75	76	77	78	79	80	80
	125	750	-	-	-	-	1)	1)	1)	1)	1)	1)	62	64	65	66	68	68	69	71	71	72	73	74
	140	3000	-	-	-	-	72	74	76	77	78	81	84	85	86	87	89	89	90	92	-	-	-	-
	.	1500	-	-	-	-	60	61	63	65	66	68	71	72	73	75	76	77	78	79	80	81	82	82
	.	1000	-	-	-	-	1)	1)	1)	1)	61	63	65	67	68	69	71	71	72	74	75	75	76	77
	224	750	-	-	-	-	1)	1)	1)	1)	1)	1)	1)	1)	61	62	64	65	66	67	68	69	69	70
	250	3000	-	-	-	-	69	70	72	74	75	77	80	81	82	84	85	86	87	88	89	90	91	-
	.	1500	-	-	-	-	1)	1)	1)	62	63	65	67	69	70	71	73	73	75	76	77	77	78	79
	.	1000	-	-	-	-	1)	1)	1)	1)	1)	1)	62	63	64	66	67	68	69	70	71	72	73	73
	400	750	-	-	-	-	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	61	62	63	64	65	66	66

1) $L_{pA} < 60$ dB(A)

1.1.2.3 Measuring-surface sound-pressure level for helical-gear units (H..V) with fan

Table 9: Measuring-surface sound-pressure level L_{pA} in dB(A) for helical-gear units with fan

Type	i_N	n_1 1/min	Gear-unit size																					
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
H2	6.3	3000	-	-	-	85	87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	.	1500	-	-	-	75	76	77	80	81	82	84	85	86	88	90	92	94	96	96	-	-	-	-
	.	1000	-	-	-	69	71	72	74	75	77	79	80	81	83	84	85	86	87	88	88	89	90	-
	10	750	-	-	-	66	68	69	70	72	73	75	76	77	79	80	81	82	83	83	84	84	85	85
	11.2	3000	-	-	-	84	86	87	91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	.	1500	-	-	-	73	75	77	79	80	81	82	85	88	90	91	92	93	95	95	-	-	-	-
	.	1000	-	-	-	68	69	70	72	73	75	77	79	80	82	83	84	85	85	86	86	87	87	87
	16	750	-	-	-	64	66	67	69	70	71	73	74	76	78	79	79	80	81	81	82	82	83	83
	18	3000	-	-	-	83	84	85	88	90	92	-	-	-	-	-	-	-	-	-	-	-	-	-
	.	1500	-	-	-	71	73	75	77	78	80	82	84	86	87	90	91	92	93	94	94	95	95	95
	.	1000	-	-	-	65	67	68	71	72	73	75	77	78	80	81	82	83	83	84	85	85	86	86
	28	750	-	-	-	62	64	65	67	68	69	71	73	74	75	77	78	79	79	80	80	81	81	81
H3	22.4	3000	-	-	-	-	84	84	87	87	90	-	-	-	-	-	-	-	-	-	-	-	-	-
	.	1500	-	-	-	-	71	72	75	75	77	77	80	80	81	81	84	84	84	85	-	-	-	-
	.	1000	-	-	-	-	65	66	69	70	71	72	74	75	75	75	78	78	78	79	-	-	-	-
	35.5	750	-	-	-	-	62	62	66	67	67	68	70	70	71	72	74	74	75	76	-	-	-	-
	40	3000	-	-	-	-	84	84	86	86	89	89	92	93	-	-	-	-	-	-	-	-	-	-
	.	1500	-	-	-	-	70	71	73	74	76	76	79	79	80	80	83	82	83	83	-	-	-	-
	.	1000	-	-	-	-	64	65	67	68	69	70	73	73	73	74	77	77	77	77	-	-	-	-
	63	750	-	-	-	-	62	62	63	64	65	66	69	69	69	70	72	73	73	73	-	-	-	-
	71	3000	-	-	-	-	83	83	85	85	89	89	92	92	92	92	-	-	-	-	-	-	-	-
	.	1500	-	-	-	-	70	70	72	72	75	75	78	78	78	78	82	82	82	82	-	-	-	-
	.	1000	-	-	-	-	64	64	65	66	68	69	71	72	72	72	75	75	75	76	-	-	-	-
	112	750	-	-	-	-	61	61	62	62	64	65	67	67	68	68	71	71	71	72	-	-	-	-

1.1.2.4 Measuring-surface sound-pressure level for helical-gear units (H..V) without fan

Table 10: Measuring-surface sound-pressure level L_{pA} in dB(A) for helical-gear units without fan

Type	i_N	n_1 1/min	Gear-unit size																					
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
	1.25	1500	75	-	73	-	77	-	79	-	81	-	83	-	-	-	-	-	-	-	-	-	-	-
	.	1000	70	-	69	-	72	-	75	-	76	-	78	-	80	-	-	-	-	-	-	-	-	-
	2	750	66	-	65	-	69	-	71	-	73	-	75	-	77	-	79	-	-	-	-	-	-	-
	2.24	1500	72	-	70	-	75	-	77	-	79	-	81	-	83	-	-	-	-	-	-	-	-	-
H1	.	1000	67	-	66	-	70	-	72	-	74	-	76	-	78	-	80	-	-	-	-	-	-	-
	3.55	750	63	-	62	-	67	-	68	-	71	-	73	-	75	-	77	-	79	-	-	-	-	-
	4	1500	69	-	67	-	72	-	74	-	76	-	78	-	79	-	82	-	-	-	-	-	-	-
	.	1000	64	-	1)	-	67	-	70	-	71	-	73	-	75	-	77	-	79	-	81	-	-	-
	5.6	750	60	-	1)	-	63	-	66	-	67	-	70	-	71	-	74	-	76	-	78	-	-	-
	6.3	1500	-	-	-	71	74	75	76	77	79	79	80	81	81	82	84	85	85	86	-	-	-	-
	.	1000	-	-	-	66	69	70	71	72	74	74	75	76	76	77	80	80	80	81	83	83	84	-
	10	750	-	-	-	63	66	67	67	69	70	71	72	73	73	74	76	77	77	78	80	80	81	81
	11.2	1500	-	-	-	69	72	73	74	75	77	77	78	79	79	80	82	83	83	84	-	-	-	-
H2	.	1000	-	-	-	64	67	68	69	70	72	72	73	74	74	75	77	78	78	79	81	81	82	82
	16	750	-	-	-	61	64	65	66	67	69	69	70	71	71	72	74	75	75	76	77	78	79	79
	18	1500	-	-	-	66	69	70	71	72	74	74	75	76	77	78	80	80	81	82	83	84	84	85
	.	1000	-	-	-	61	64	65	66	68	69	69	70	71	72	73	75	75	76	77	78	79	79	80
	28	750	-	-	-	1)	61	62	63	64	66	66	67	68	69	70	72	72	73	73	75	75	76	76
	22.4	1500	-	-	-	-	68	69	73	74	74	75	77	77	78	79	81	81	82	83	83	84	85	86
	.	1000	-	-	-	-	63	65	68	69	69	71	72	73	73	74	76	77	77	78	79	79	81	81
	31.5	750	-	-	-	-	60	61	65	66	65	67	69	69	70	71	73	73	74	75	75	76	77	78
	35.5	1500	-	-	-	-	65	67	70	71	71	73	74	75	76	76	78	79	79	80	81	81	83	83
H3	.	1000	-	-	-	-	1)	62	65	66	66	68	69	70	71	72	73	74	75	75	76	77	78	78
	63	750	-	-	-	-	1)	1)	62	63	63	65	66	67	67	68	70	71	71	72	73	73	75	75
	71	1500	-	-	-	-	62	64	67	68	68	70	71	72	73	74	76	76	77	78	78	79	80	81
	.	1000	-	-	-	-	1)	1)	62	63	63	65	66	67	68	69	71	71	72	73	73	74	75	76
	112	750	-	-	-	-	1)	1)	1)	1)	1)	62	63	64	65	66	68	68	69	70	70	71	72	72
	100	1500	-	-	-	-	-	-	66	67	68	69	70	71	72	73	75	75	76	76	77	78	78	78
	.	1000	-	-	-	-	-	-	62	63	63	64	65	66	67	68	70	70	71	72	72	73	73	74
	140	750	-	-	-	-	-	-	1)	1)	1)	61	62	63	64	64	66	67	68	68	69	69	70	70
	160	1500	-	-	-	-	-	-	64	65	66	66	68	68	69	70	72	73	73	74	74	75	75	76
H4	.	1000	-	-	-	-	-	-	1)	60	61	62	63	64	64	65	67	68	68	69	70	70	71	71
	250	750	-	-	-	-	-	-	1)	1)	1)	1)	60	61	61	62	64	64	65	66	66	67	67	68
	280	1500	-	-	-	-	-	-	61	62	63	64	65	66	67	67	69	70	70	71	72	72	73	73
	.	1000	-	-	-	-	-	-	1)	1)	1)	1)	60	61	62	63	64	65	66	66	67	68	68	68
	450	750	-	-	-	-	-	-	1)	1)	1)	1)	1)	1)	1)	1)	61	62	62	63	64	64	65	65

1) $L_{pA} < 60$ dB(A)

2. General notes

2.1 Introduction

These instructions are an integral part of the gear unit supplied and must be kept in its vicinity for reference at all times.

All persons carrying out work on the gear unit must have read and understood these instructions and must adhere to them. Siemens accepts no responsibility for damage or disruption caused by disregard of these instructions.

The **"FLENDER gear unit"** dealt with in these instructions has been developed for driven machines in the most various industry areas. Possible areas of use for gear units of this type include sewage treatment, excavators, chemical industry, iron and steel industry, conveyor systems, crane systems, foodstuffs industry, paper machinery, cableways, cement industry.

The gear unit is designed only for the application specified in section 1, "Technical data". Other operating conditions must be contractually agreed.

The gear unit has been manufactured in accordance with the state of the art and is delivered in a condition for safe and reliable use.

The gear unit must be used and operated strictly in accordance with the conditions laid down in the contract governing performance and supply agreed by Siemens and the customer.

The gear unit described in these instructions reflects the state of technical development at the time these instructions went to print.

In the interest of technical progress we reserve the right to make changes to the individual assemblies and accessories which we regard as necessary to preserve their essential characteristics and improve their efficiency and safety.

2.2 Copyright

Technical enquiries should be addressed to the following works or to one of our customer services:

Siemens Industriegetriebe GmbH
Thierbacher Straße 24
09322 Penig

Tel.: +49 (0)37381 / 61-0
Fax: +49 (0)37381 / 80286

3. Safety instructions

Entry to the gear unit is not permitted during operation!
Entry for maintenance and repair work is only permitted when the gear unit is at a standstill!
Caution! Risk of falling!

Any changes on the part of the user are not permitted. This applies equally to safety features designed to prevent accidental contact.

3.1 Obligations of the user

- The operator must ensure that everyone carrying out work on the gear unit has read and understood these instructions and is adhering to them in every point in order to:
  - avoid injury or damage,
  - ensure the safety and reliability of the unit,
  - avoid disruptions and environmental damage through incorrect use.
- During transport, assembly, installation, dismantling, operation and maintenance of the unit, the relevant safety and environmental regulations must be complied with at all times.
- The gear unit may only be operated, maintained and/or repaired by persons qualified for the work concerned (see "Qualified personnel" on page 3 of this manual).
- The outside of the gear unit must not be cleaned with high-pressure cleaning equipment.
- All work must be carried out with great care and with due regard to safety.

All work on the gear unit must be carried out only when it is not in operation.
The drive unit must be secured against being switched on accidentally (e.g. by locking the key switch or removing the fuses from the power supply). A notice should be attached to the start switch stating clearly that work is in progress.
At the same time the complete installation must be without load, so that no danger occurs during demounting operations (e.g. change of backstop).

- No electrical welding work must be done at all on the drive.
  The drives must not be used as an earthing point for welding operations. Toothed parts and bearings may be irreparably damaged by welding.
- A potential equalisation in accordance with the applying regulations and directives must be carried out!
  If no threaded holes for earth connection are available on the gear unit, other appropriate measures must be taken. This work must always be done by specialist electricians.

If any inexplicable changes are noticed during operation of the gear unit, such as an important increase in temperature or unusual noises, the drive assembly must be switched off immediately.

Rotating and/or movable drive components must be fitted with suitable safeguards to prevent contact.

When the gear unit is incorporated in plant or machinery, the manufacturer of such plant or machinery must ensure that the contents of these instructions are incorporated in his own instructions.

- When removing the safety equipment the fixation means should be stored for later use. Removed safety equipment must be re-installed prior to starting up.
- Notices attached to the gear unit, e.g. rating plate, direction arrows etc., must always be observed. They must be kept free from dirt and paint at all times. Missing plates must be replaced.
- Screws which have been damaged during assembly or disassembly work must be replaced with new ones of the same strength class and type.
- Spare parts should always be obtained from Siemens (refer also to section 11).

3.2 Environmental protection

- Dispose of any packing material in accordance with regulations or separate it for recycling.
- When changing oil, the used oil must be collected in suitable containers. Any pools of oil which may have collected should be removed at once with an oil-binding agent.
- Preservative agents should be stored separately from used oil.
- Used oil, preservative agents, oil-binding agents and oil-soaked cloths must be disposed of in accordance with environmental legislation.
- Disposal of the gear unit after its useful life:
  - Drain all the operating oil, preservative agent and/or cooling agent from the gear unit and dispose of in accordance with regulations.
  - Depending on national regulations, gear-unit components and/or add-on parts may have to be disposed of or sent for recycling separately.

3.3 Special dangers and personal protective equipment

- Depending on operating conditions, the surface of the gear unit may heat up or cool down to extreme temperatures.

In the case of hot surfaces (> 55 °C) there is a risk of burns!

In the case of cold surfaces (< 0 °C) there is a risk of frost injury (pain, numbness, frostbite)!

During oil changes there is a risk of scalding from escaping oil!

Small foreign matter such as sand, dust, etc. can get into the cover plates of the rotating parts and be thrown back by these.
Risk of eye injury!

In addition to any generally prescribed personal safety equipment (such as safety shoes, safety clothing, helmet) handling the gear unit requires wearing **suitable safety gloves** and **suitable safety glasses**!

The gear unit does not comply with the requirements in Directive 94/9/EC and must therefore, in the area of applicability of this directive, not be used in potentially explosive areas.

Caution, serious danger!

Should the gear unit be used outside the area of applicability of Directive 94/9/EC within potentially explosive areas, the nationally applying protective prescriptions with regard to explosion protection must always be observed.

4. Transport and storage

Observe the instructions in section 3, "Safety instructions"!

4.1 Scope of supply

The products supplied are listed in the despatch papers. Check immediately on receipt to ensure that all the products listed have actually been delivered. Parts damaged and/or missing parts must be reported to Siemens in writing immediately.

If there is any visible damage, the gear unit must not be put into operation.

4.2 Transport

When transporting Siemens products, use only lifting and handling equipment of sufficient load-bearing capacity!
Observe the notes regarding load distribution on the packing.

The gear unit is delivered in the fully assembled condition. Additional items are delivered separately packaged, if applicable.

Different forms of packaging may be used, depending on the size of the unit and method of transport. Unless otherwise agreed, the packaging complies with the **HPE Packaging Guidelines.**

The symbols marked on the packing must be observed at all times. These have the following meanings:

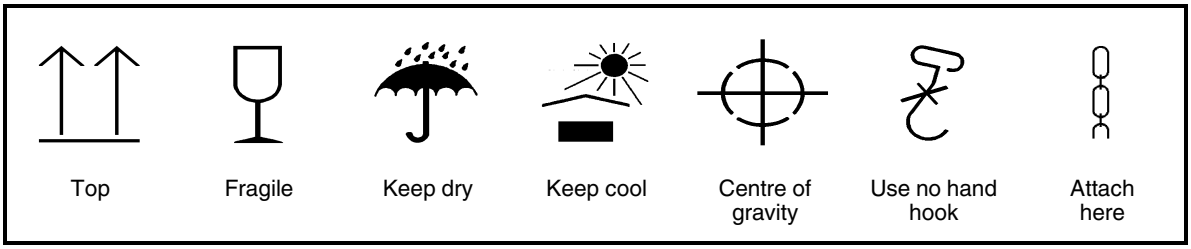


Fig. 7: Transport symbols

Transport of the gear unit must be carried out so as to avoid personal damage and damage to the gear unit.
If, for example, the free shaft ends are knocked, this may damage the gear unit.

The gear units must be transported with suitable equipment only.
During transport the gear unit should be left without oil filling and on the transport packing.

Use only the eyes provided to attach lifting equipment to the unit.
Handling of the gear unit by attaching it to the piping is not permitted.
The pipework must not be damaged.
Do not use the front threads at the shaft ends to attach slinging and lifting gear for transport.
Slinging and lifting gear must be adequate for the weight of the gear unit.

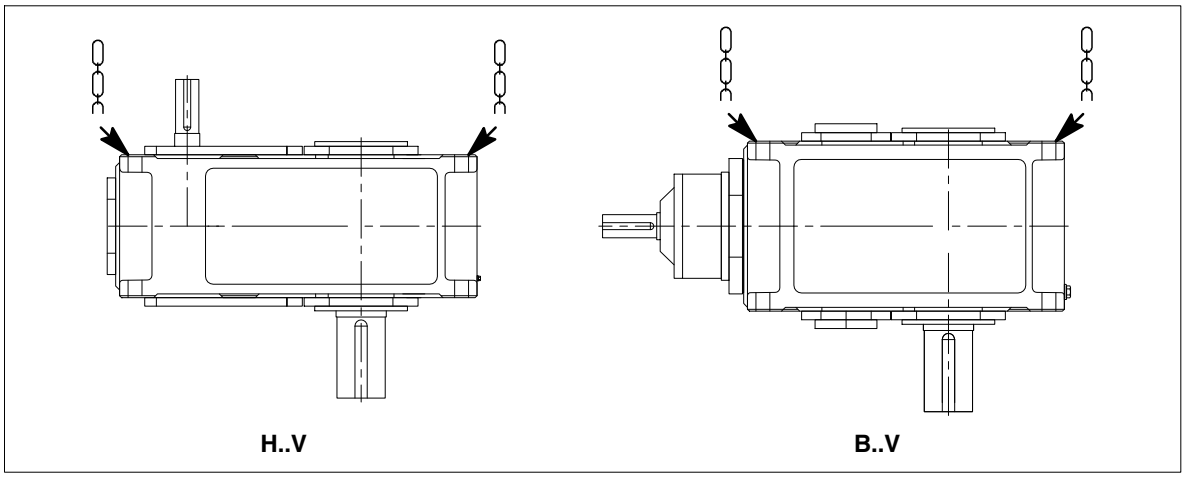


Fig. 8: Attachment points on gear units of types H..V and B..V

For drive units where add-on parts such as motor, add-on coupling etc. are mounted on the gear unit an additional attachment point may be required because of the shift in the centre of gravity.

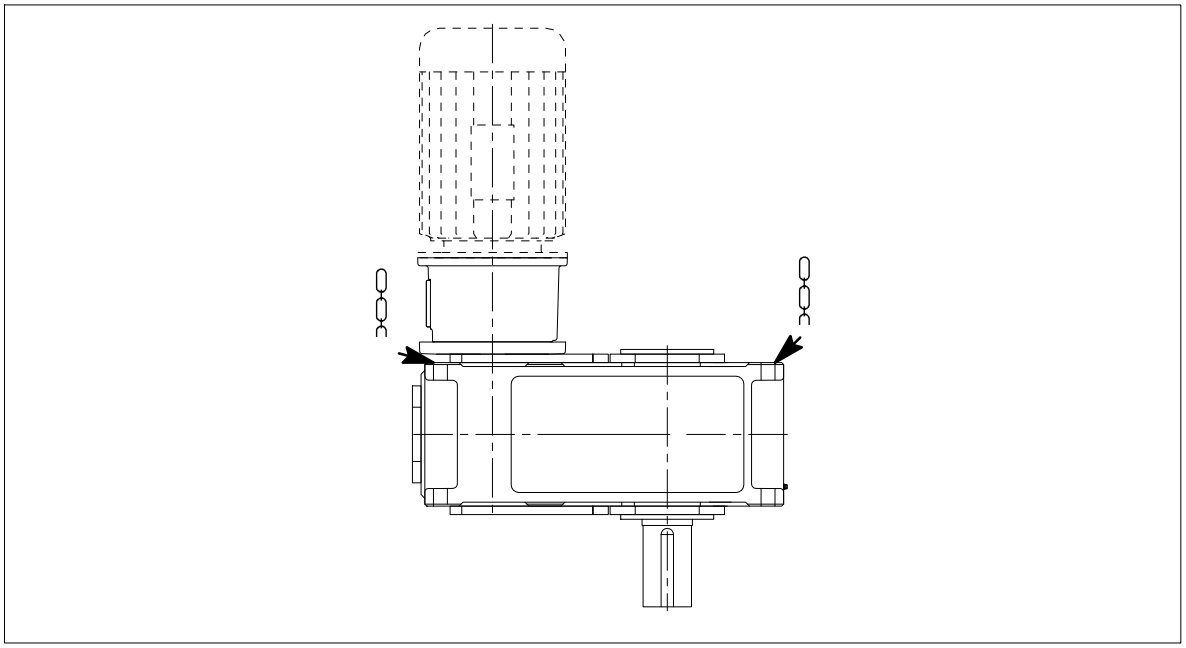


Fig. 9: Attachment points on gear units of type H..V with motor

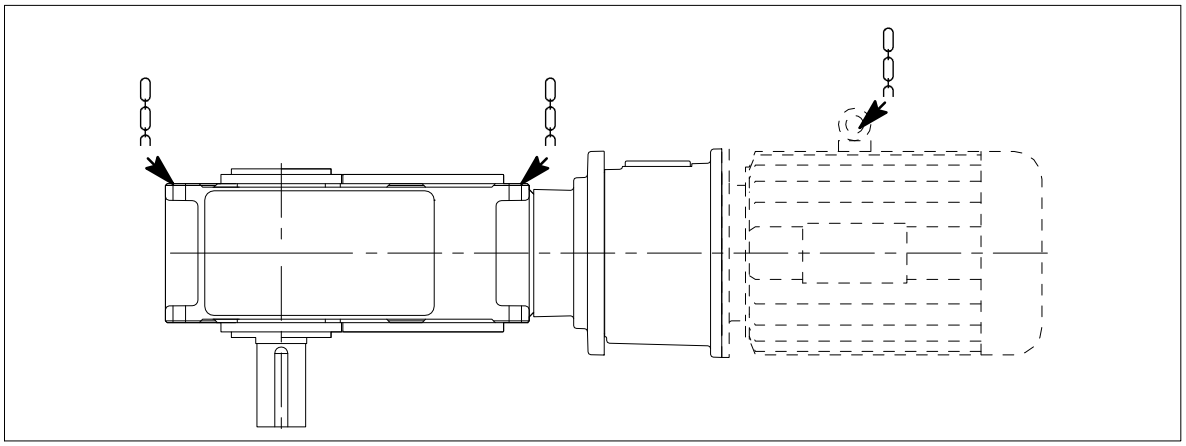


Fig. 10: Attachment points on gear units of type B..V with motor

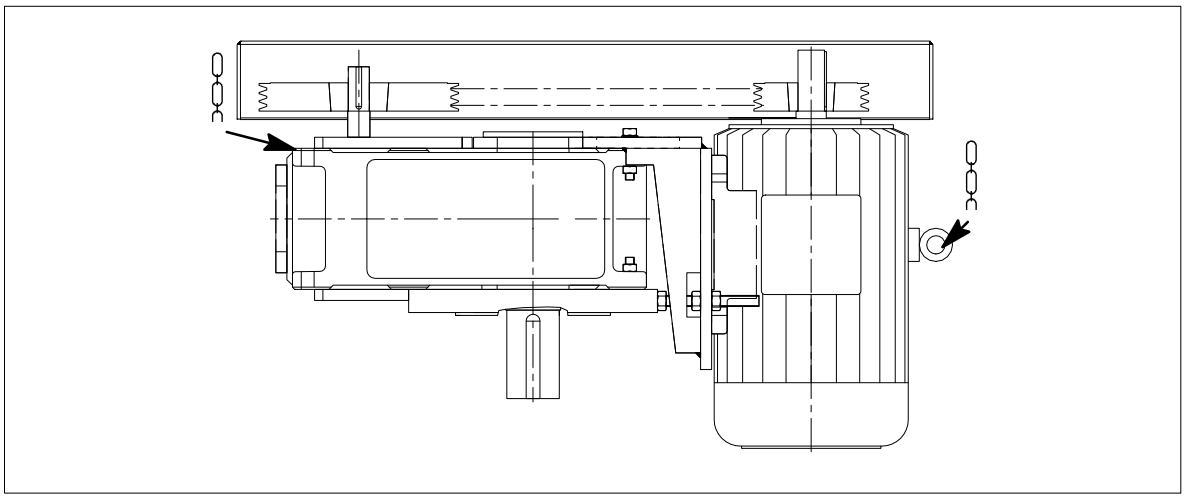


Fig. 11: Attachment points on gear units of type B..V with motor bedplate

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

4.3 Storing the gear unit

The gear unit must be stored in a sheltered place in the position of the original packaging or in the position of use, placed on a vibration-free, dry base, and covered over.

STOP **When temporarily storing the gear unit and any single components supplied with it, the preservative agent should be left on them. It must not be damaged, otherwise there is a risk of corrosion.**

⚠ **Do not stack gear units on top of one another.**

STOP **If the gear unit is being stored out of doors, it must be particularly carefully covered, and care must be taken that neither moisture nor foreign material can collect on the unit. Waterlogging should be avoided.**

☞ Unless otherwise agreed by contract, the gear unit must not be exposed to harmful environmental factors such as chemically aggressive products.

Provision for special environmental conditions during transport (e.g. transport by ship) and storage (climate, termites, etc.) must be contractually agreed.

4.4 Standard coating and preservation

The gear unit is provided with an interior preservative agent; the free shaft ends are painted for protection.

The characteristics of the external coat depend on the ambient conditions stipulated in the order relating to method of transport and area of application.

The gear unit is normally delivered completely ready, with a priming and a finish coat.

Where gear units are delivered with a priming coat only, it is necessary to apply a finish coat in accordance with directives applying to the specific application.
The priming coat alone is not suitable to provide a sufficient long-term corrosion protection.

Ensure that the coat is not damaged!

Any damage may cause failure of the external protective coating and corrosion.

Unless otherwise contractually agreed, the interior preservation is guaranteed for 6 months, and the preservation of the free shaft ends for 24 months, provided that storage is in dry, frostfree sheds.

The guarantee period starts on the date of delivery or that of the notice that the item is ready for shipment.

For longer periods of storage (> 6 months) we advise regular checking and, if necessary, renewal of the interior and exterior preservation (see section 7, "Start-up").

The output shaft must then be rotated at least one turn to change the position of the rolling element in the bearings. The input shaft must not be in the same position as before rotation.

This procedure must be repeated and documented every 6 months until start-up.

4.4.1 Interior preservation with preservative agent

Table 11: Durability period and measures for interior preservation when using mineral oil or PAO-based synthetic oil

Duration of protection	Preservative agent	Special measures
up to **6** months	Castrol Alpha SP 220 S	none
up to **24** months		- Close all holes in the gear unit - Replace air filter with screw plug. (prior to start-up replace screw plug with air filter)
For storage periods longer than 24 months, renew the preservative agent. For storage periods longer than 36 months, Siemens should be consulted before.		

Table 12: Durability period and measures for interior preservation when using PG-based synthetic oil

Duration of protection	Preservative agent	Special measures
up to **6** months	Special anti-corrosion oil TRIBOL 1390 [1)]	none
up to **36** months		- Close all holes in the gear unit - Replace air filter with screw plug. (prior to start-up replace screw plug with air filter)
For storage periods longer than 36 months, Siemens should be consulted before.		

1) Resistant to tropical conditions and sea water; max. ambient temperature 50 °C

4.4.2 Exterior preservation

Table 13: Durability period for exterior preservation of shaft ends and other bright machined surfaces

Duration of protection	Preservative agent	Layer thickness	Remarks
in case of indoor storage up to **36** months [1)]	Tectyl 846 K19	approx. 50 µm	Long-term wax-based preservative agent: - resistant to seawater - resistant to tropical conditions - (soluble with CH compounds)
in case of outdoor storage up to **12** months [2)]			

1) The gear unit must be stored in the position of use in a sheltered place; it must be placed on a vibration-free, dry wooden base and covered over.

2) If the gear unit is being stored out of doors, it must be particularly carefully covered, and care must be taken that neither moisture nor foreign material can collect on the unit. Waterlogging should be avoided.

The procedure for interior and exterior preservation treatment is described in section 7 (see items 7.3.1.3 and 7.3.2.1).

5. Technical description

Observe the instructions in section 3, "Safety instructions"!

5.1 General description

The gear unit described is a gear unit developed for driving machines in most various industry areas.

The gear unit is characterised by a low noise level. This is achieved by bevel and helical gears with a high contact ratio and special sound-damping housings.

The good temperature characteristics of the gear unit are achieved by its high degree of efficiency, large housing surface and performance-related cooling system.

The gear unit can be operated in both directions of rotation.

5.1.1 Basic type

The gear unit is supplied as a single-, two-, three- or four-stage helical or bevel-helical gear unit. It is designed for installation in a vertical position. If necessary, it can also be designed for installation in a different position.

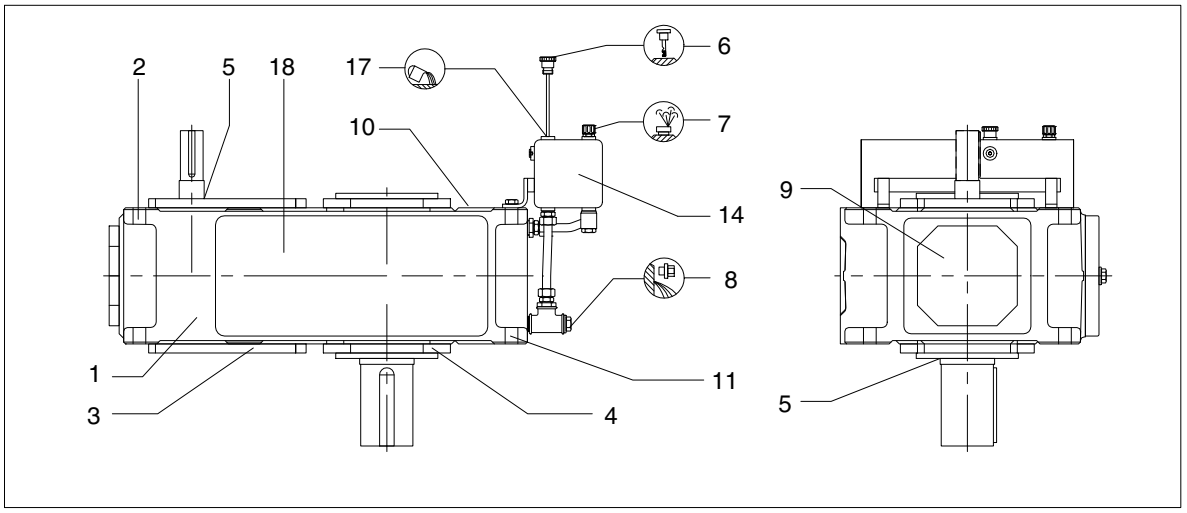


Fig. 12: Gear-unit features on gear units type H..V ≤ 12

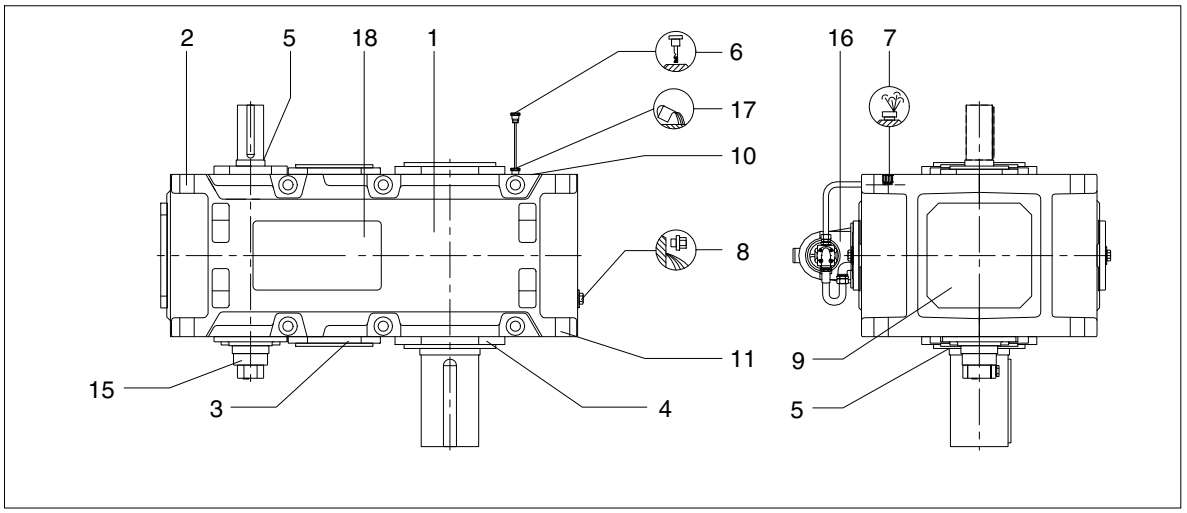


Fig. 13: Gear-unit features on gear units type H..V ≥ 13

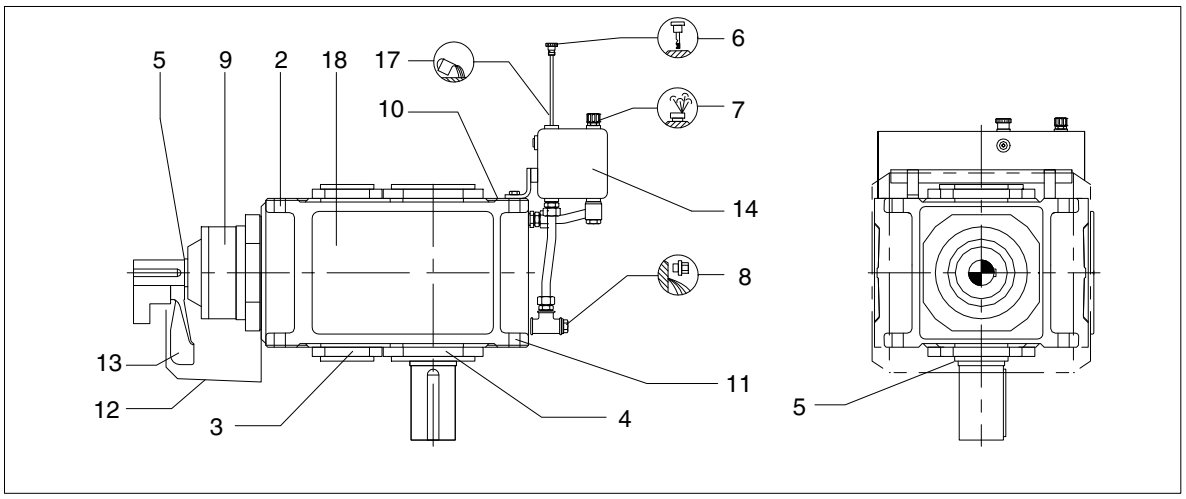


Fig. 14: Gear-unit features on gear units type B..V ≤ 12

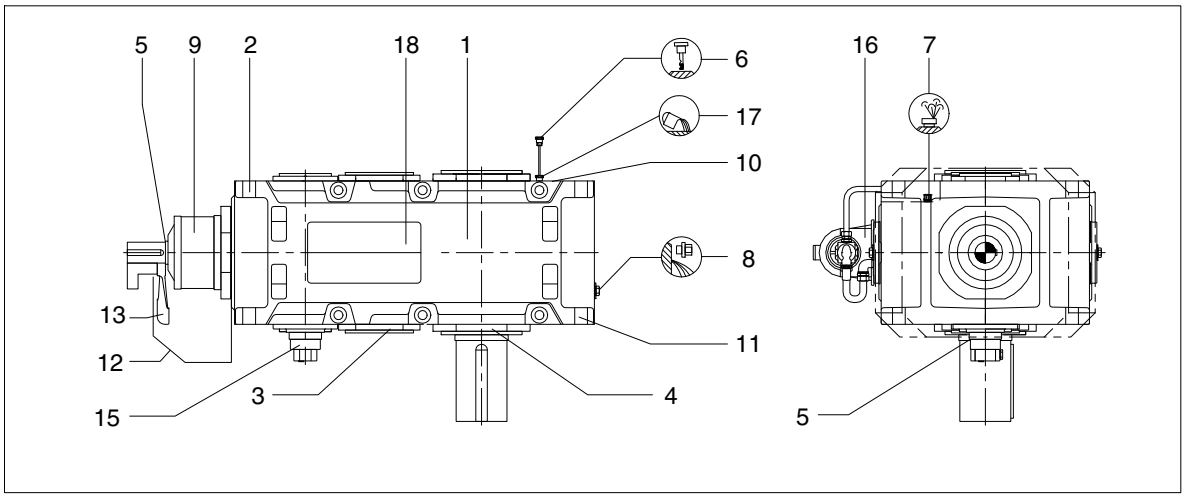


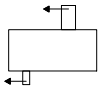
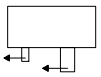
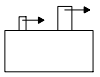
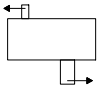
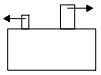
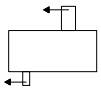
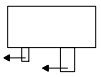
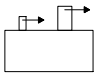
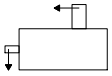
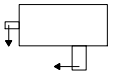
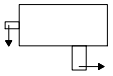
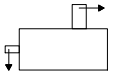
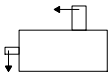
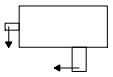
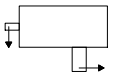
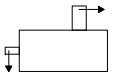
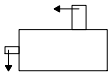
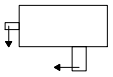
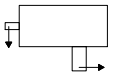
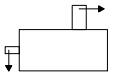
Fig. 15: Gear-unit features on gear units type B..V ≥ 13

1	Housing	10	Rating plate
2	Lifting eyes	11	Gear-unit fastening
3	Cover	12	Fan cowl
4	Cover	13	Fan
5	Shaft seals	14	Oil-equalising tank (splash lubrication)
6	Oil dipstick	15	Flanged pump (option)
7	Housing ventilation	16	Motor pump (option)
8	Oil-drain plug	17	Oil inlet
9	Cover or bearing journal	18	Inspection and/or assembly cover

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

A number of shaft configurations (types and rotation directions) are possible. These are shown in the following table as solid shafts:

Table 14: Types and rotation directions

Type	Design [1]			
	A	B	C	D
H2SV H2HV H2DV H2KV H2FV				
H3SV H3HV H3DV H3KV H3FV				
H4SV H4HV H4DV H4KV H4FV				
B2SV B2HV B2DV B2KV B2FV				
B3SV B3HV B3DV B3KV B3FV				
B4SV B4HV B4DV B4KV B4FV				

[1] If the input and output drive shafts are on both sides, refer to the drawings in the gear documentation for the type designation and the directions of rotation.

5.1.2 Aerator gear unit

The gear unit is supplied as a two- or three-stage helical gear unit or as a three-stage bevel-helical gear unit. It is designed for installation in a vertical position.

The output shaft rotates in an oil-dam pipe. This prevents gear oil from escaping at the shaft end. In the case of types H2BV and H3BV, the oil supply is made possible by a flanged-on oil pump. In the case of type B3BV, the oil supply is assured by a flanged-on pump or by a motor-driven pump.

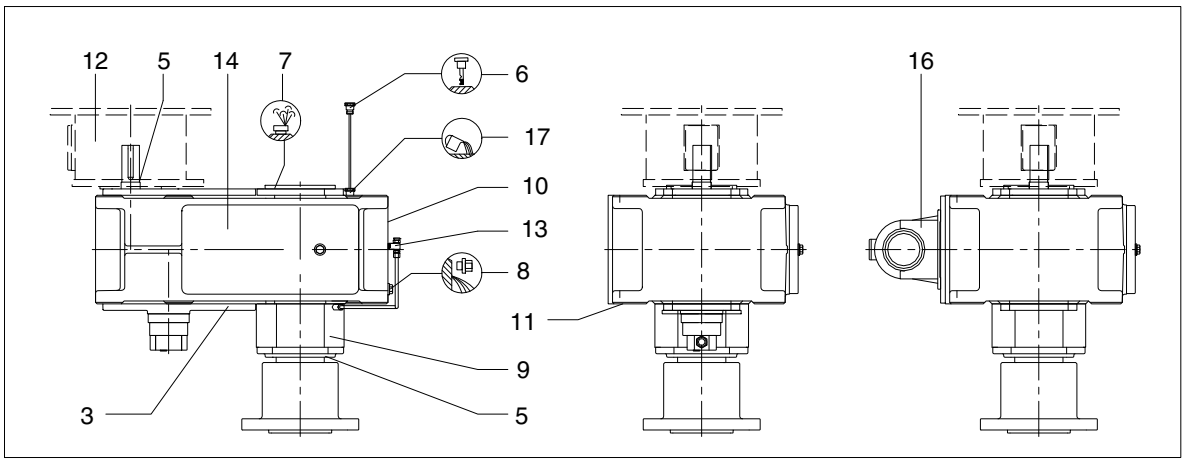


Fig. 16: Aerator gear unit of type H.BV

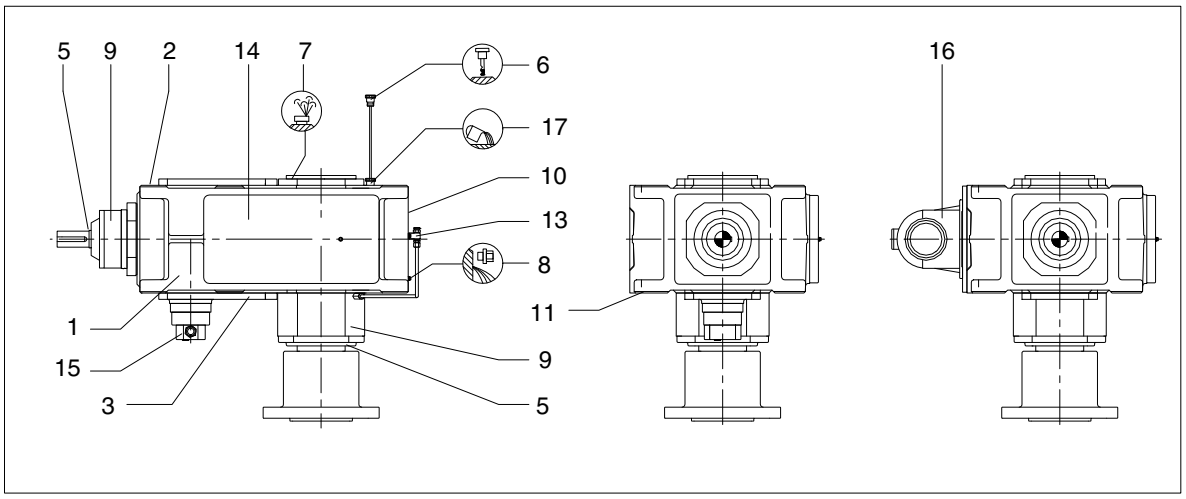


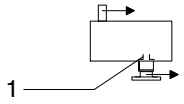
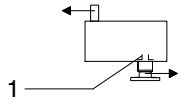
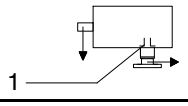
Fig. 17: Aerator gear unit of type B3BV

1	Housing	10	Rating plate
2	Lifting eyes	11	Gear-unit fastening
3	Cover	12	Motor bell housing
5	Shaft seals	13	Lubricating point
6	Oil dipstick	14	Inspection and/or assembly cover
7	Housing ventilation	15	Flange pump } optional
8	Oil-drain plug	16	Motor pump } optional
9	Bearing journal	17	Oil inlet

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

A number of shaft configurations (types and rotation directions) are possible. These are shown in the following table as solid shafts:

Table 15: Types and rotation directions

Type	Configuration	
	B	C
H2BV		-
H3BV		-
B3BV	-	

1 Oil-dam pipe

5.1.3 Agitator gear unit

The gear unit is supplied as a two-, three- or four-stage helical gear unit. It is designed for installation in a vertical position. If necessary, it can also be designed for installation in a different position.

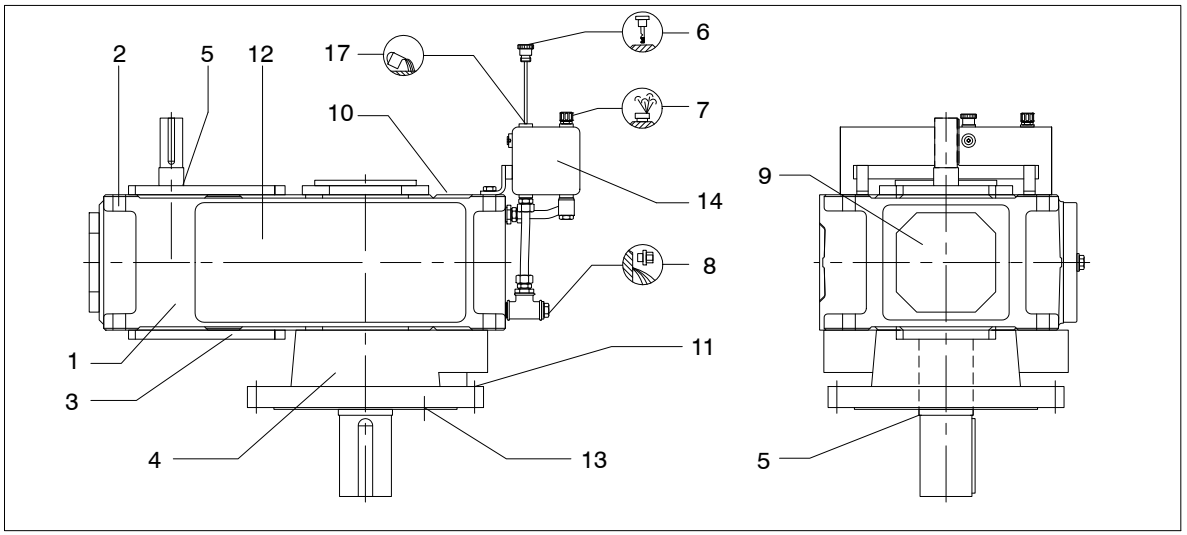


Fig. 18: Agitator gear unit of type H..V ≤ 12

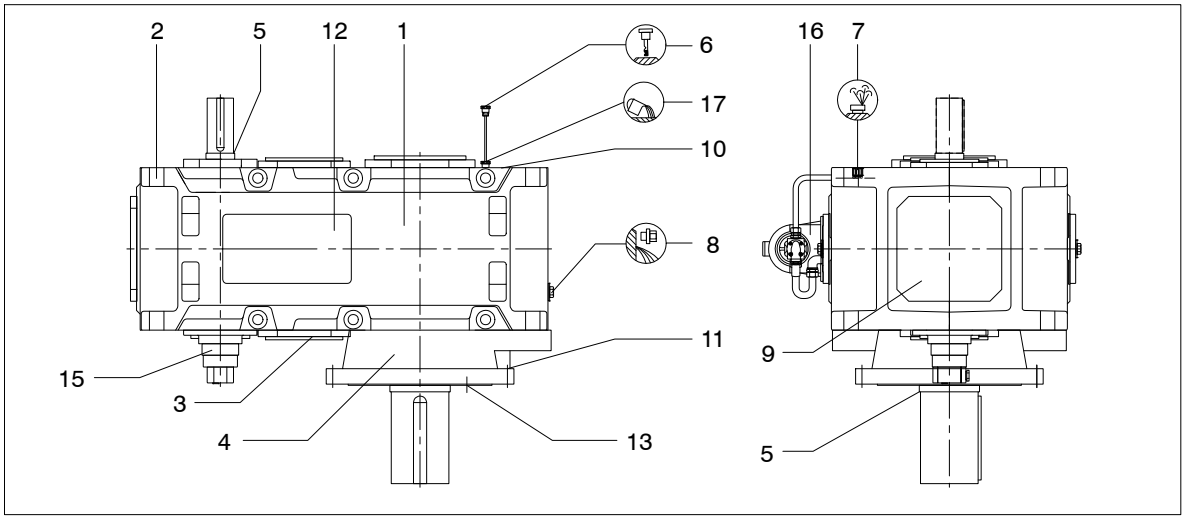


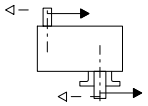
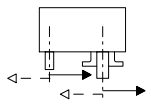
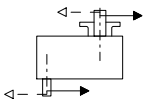
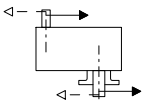
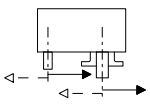
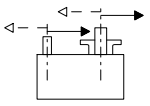
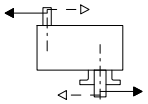
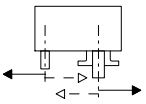
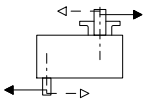
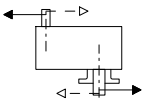
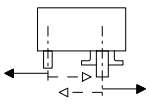
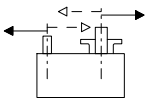
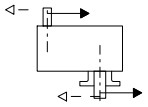
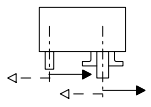
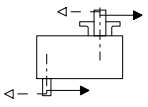
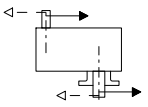
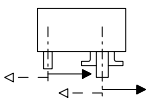
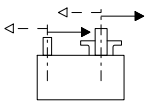
Fig. 19: Agitator gear unit of type H..V ≥ 13

1	Housing	10	Rating plate
2	Lifting eyes	11	Gear-unit fastening
3	Cover	12	Motor bell housing
5	Shaft seals	13	Lubricating point
6	Oil dipstick	14	Inspection and/or assembly cover
7	Housing ventilation	15	Flange pump } optional
8	Oil-drain plug	16	Motor pump } optional
9	Bearing journal	17	Oil inlet

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

A number of shaft configurations (types and rotation directions) are possible. These are shown in the following table as solid shafts:

Table 16: Types and rotation directions

Type	Configuration					
	with splash lubrication		with forced lubrication			
	B	C	A	B	C	D
H2RV H2TV H2GV H2JV						
H3RV H3TV H3GV H3JV						
H4RV H4TV H4GV H4JV						

5.1.4 Water-turbine gear unit

The gear unit is supplied as a two-stage helical or a two-stage bevel-helical gear unit. It is designed for installation in a vertical position. If necessary, it can also be designed for installation in a different position.

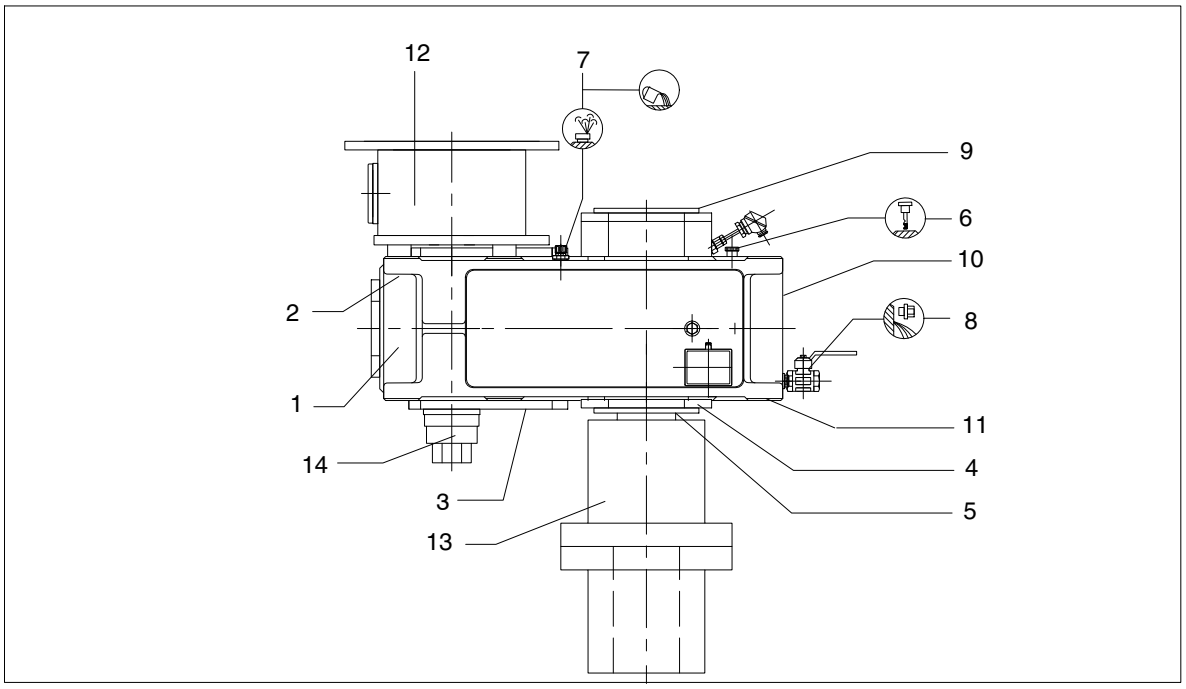


Fig. 20: Water-turbine gear unit of type H2WV

1	Housing	8	Oil-drain cock
2	Lifting eyes	9	Cover
3	Cover	10	Rating plate
4	Cover	11	Gear-unit fastening
5	Shaft seals	12	Motor bell housing
6	Oil dipstick	13	Coupling
7	Housing ventilation, oil-filling point	14	Motor pump

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

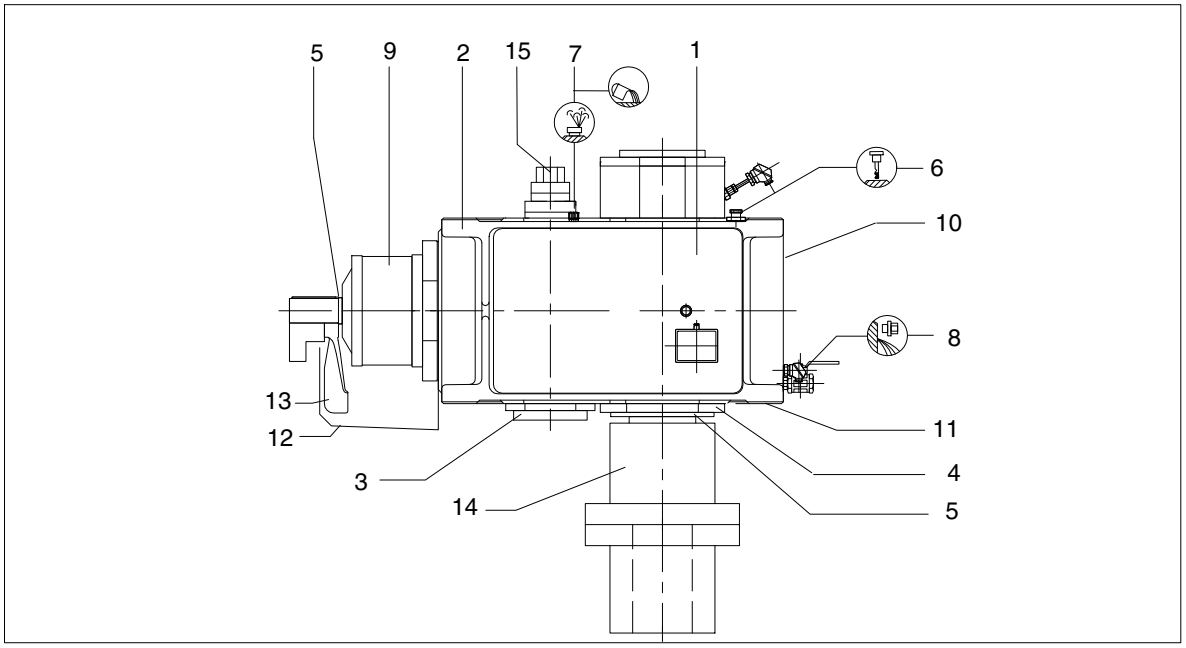


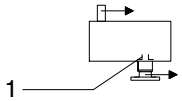
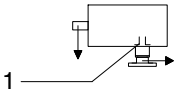
Fig. 21: Water-turbine gear unit of type B2WV

1	Housing	9	Oil-drain cock
2	Lifting eyes	10	Cover or bearing journal
3	Cover	11	Rating plate
4	Cover	12	Gear-unit fastening
5	Shaft seals	13	Fan cowl
6	Oil dipstick	13	Fan
7	Housing ventilation	14	Coupling
8	Oil-filling point	15	Flange pump

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

A number of shaft configurations (types and rotation directions) are possible. These are shown in the following table as solid shafts:

Table 17: Types and rotation directions

Type	Configuration	
	B	C
H2WV		-
B2WV	-	

1 Oil-dam pipe

5.1.5 Pulper gear unit

The gear unit is supplied as a two-stage bevel-helical gear unit. It is designed for installation in a vertical position. If necessary, it can also be designed for installation in a different position.

As a principle, the gear unit can be operated in both directions of rotation.

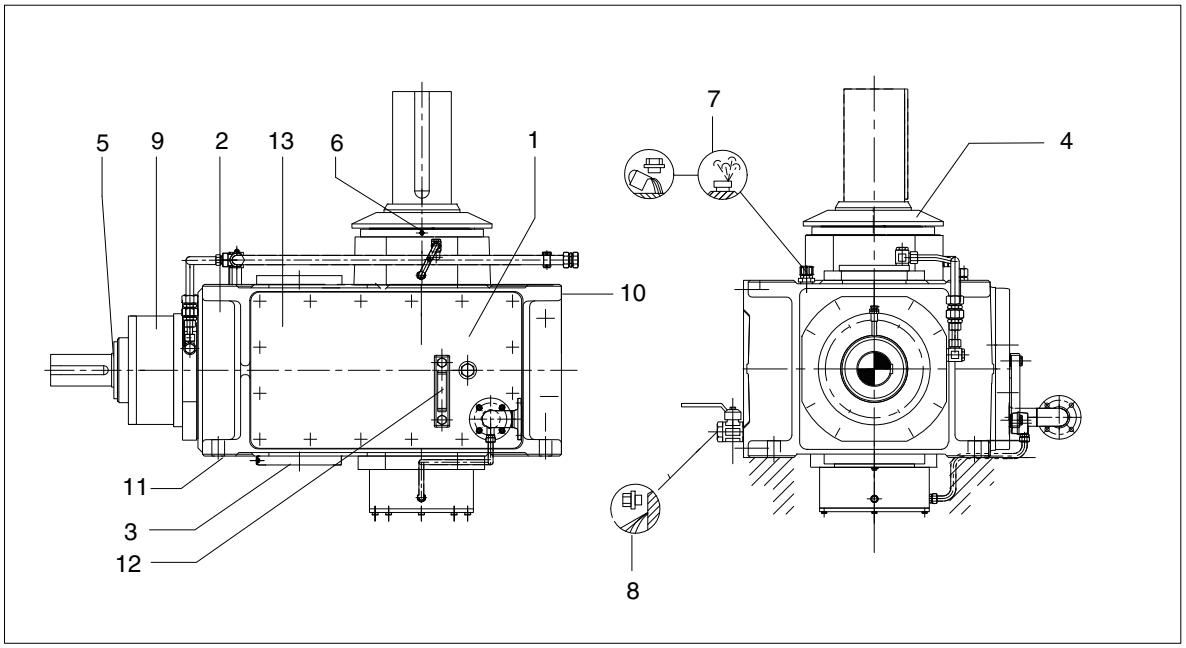


Fig. 22: Gear-unit features on gear units type B2PV ≤ 12

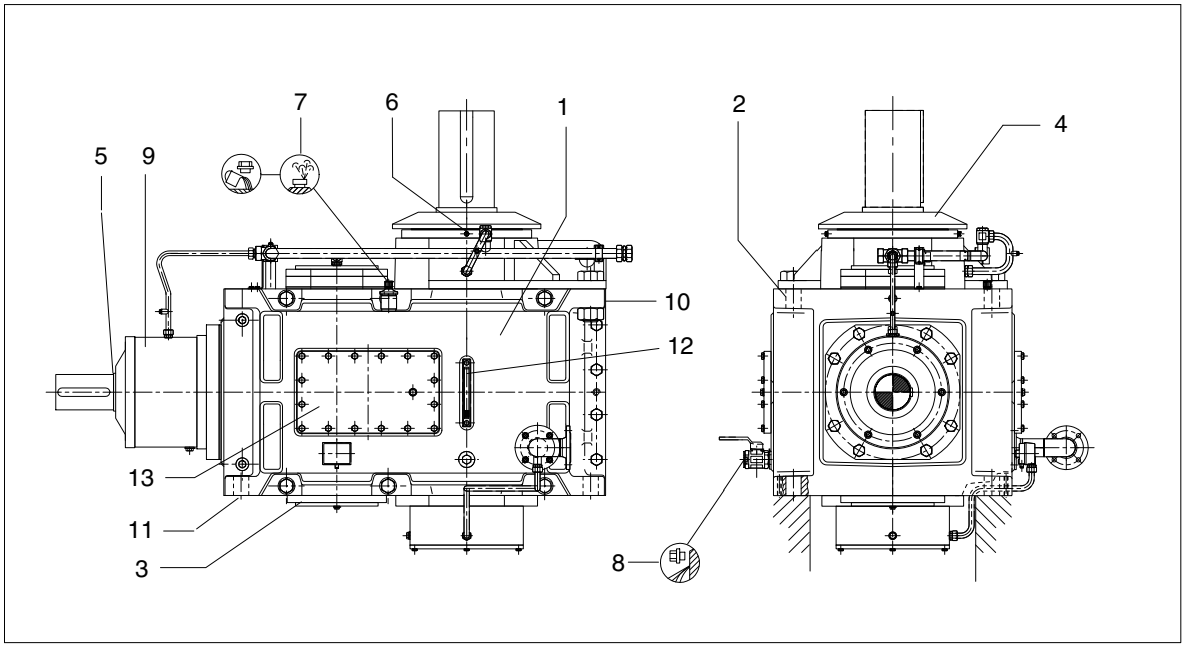


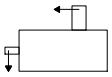
Fig. 23: Gear-unit features on gear units type B2PV ≥ 13

1 Housing
2 Lifting eyes
3 Cover
4 Centrifugal disk
5 Shaft seals
6 Lubrication point
7 Housing ventilation, oil-filling point
8 Oil-drain cock
9 Bearing journal
10 Rating plate
11 Gear-unit fastening
12 Indication of oil level
13 Inspection and assembly cover

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

A number of shaft configurations (types and rotation directions) are possible. These are shown in the following table as solid shafts:

Table 18: Types and rotation directions

Type	Configuration A
B2PV	

5.2 Output designs

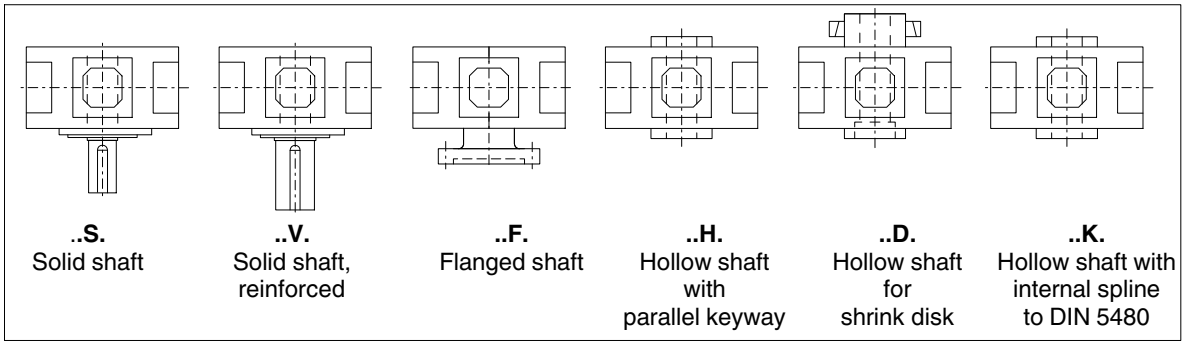


Fig. 24: Output designs

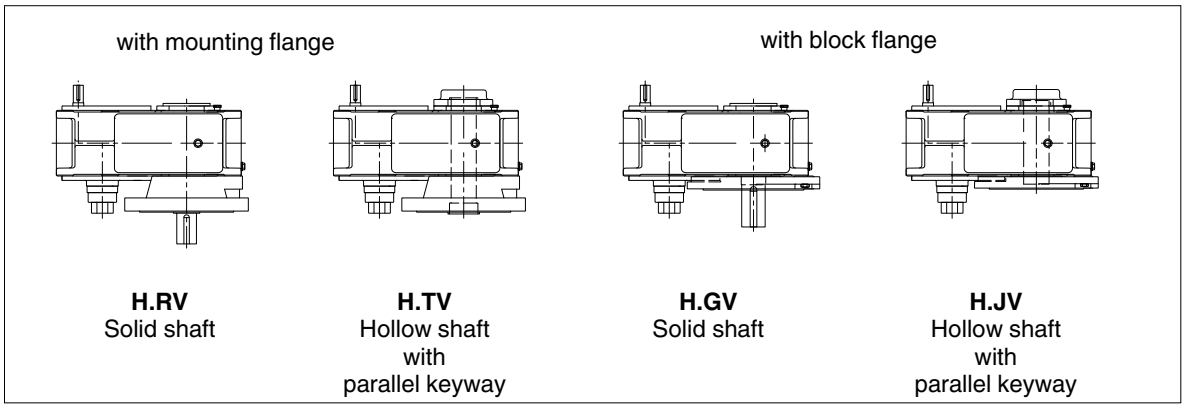


Fig. 25: Agitator gear unit output designs

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

5.3 Housing

The housing is of cast iron; if required, they may also be of steel.

Housings up to size 12 are made in one part. The types 13 to 22 have a two-part gear housing. The housing is rigid in design and due to its form has excellent noise and temperature characteristics.

The gear-unit housing comes with the following equipment:

- Lifting eyes (adequately dimensioned for transport)
- Inspection and/or assembly cover (for oil filling and/or inspection)
- Oil-sight glass or oil dipstick (for checking the oil level)
- Oil-drain plug (for oil drain)
- Air filter or venting screw (for aeration and ventilation)

Colour codes for ventilating, oil inlet, oil level and oil drainage:

Air-relief point:	yellow		Oil-draining point:	white	
Oil-filling point:	yellow		Lubrication points:	red	
Oil level:	red		Oil level:	red	

5.4 Toothed components

The externally toothed components of the gear unit are case-hardened. The bevel-gear and helical-gear teeth are ground. The high quality of the teeth leads to a significant noise reduction and ensures safe and reliable running.

The gears are connected with the shafts by interference fits and parallel keys or by shrink fits. These types of joints transmit with adequate reliability the torques generated.

5.5 Lubrication

5.5.1 Splash lubrication

When installed vertically, all teeth and bearings are submerged in oil. The space required for expansion of the oil is provided by an oil-equalising tank bolted to the unit.

5.5.2 Pressure lubrication through add-on oil-supply system

In non-vertical positions, with high bearing speeds or peripheral velocities on the teeth, the splash lubrication system may be supported and/or replaced with a pressure-lubrication system.

Gear units larger than size 13 are fitted with pressure-lubrication systems. Depending on order requirement, sizes 5 - 12 can also be fitted with pressure-lubrication systems.

The oil-supply system is permanently attached to the gear unit and consists of a flange or motor pump, a coarse filter, a pressure-monitoring device and pipework. For gear units of sizes 13 to 22, the coarse filter is replaced with a double change-over filter.

The direction of flow from the flange pumps is independent of the direction of rotation.

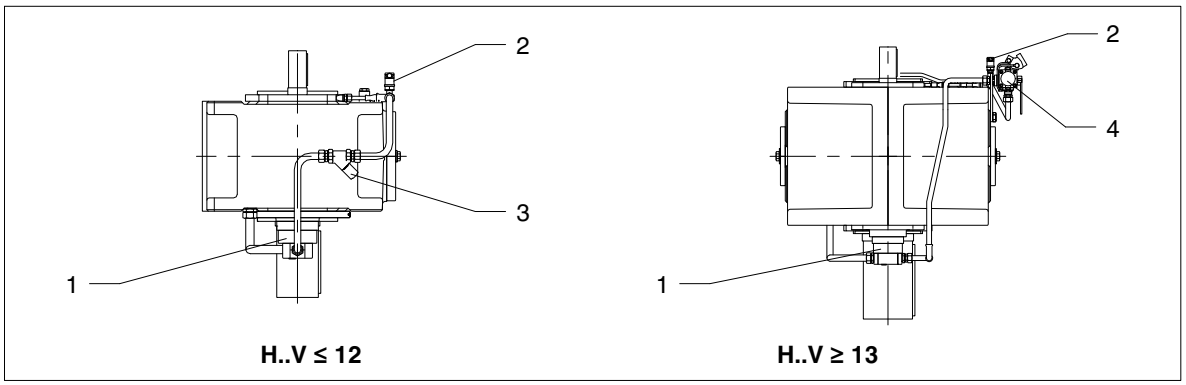


Fig. 26: Add-on oil-supply system with flanged pump in the case of type H..V

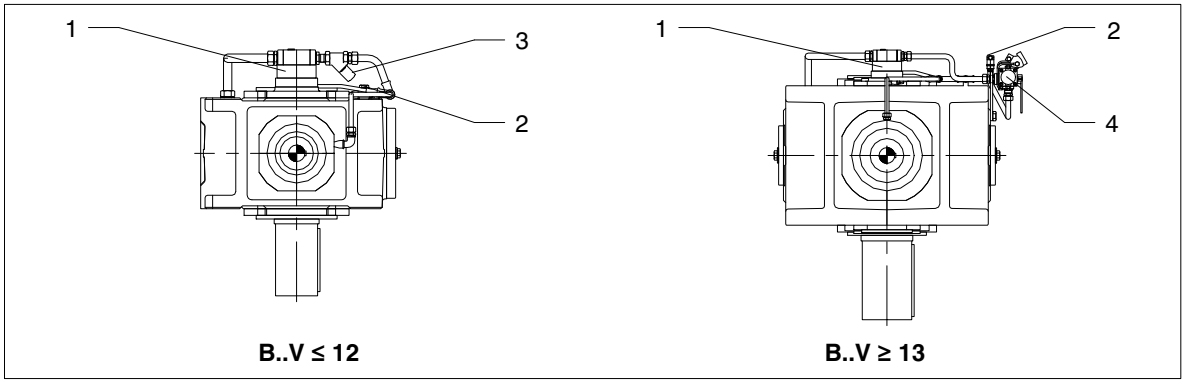


Fig. 27: Add-on oil-supply system with flanged pump in the case of type B..V

1 Flange pump
2 Pressure monitor
3 Coarse filter
4 Double change-over filter

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

Depending on the order specification and application, the flange pump may be replaced with a motor pump.

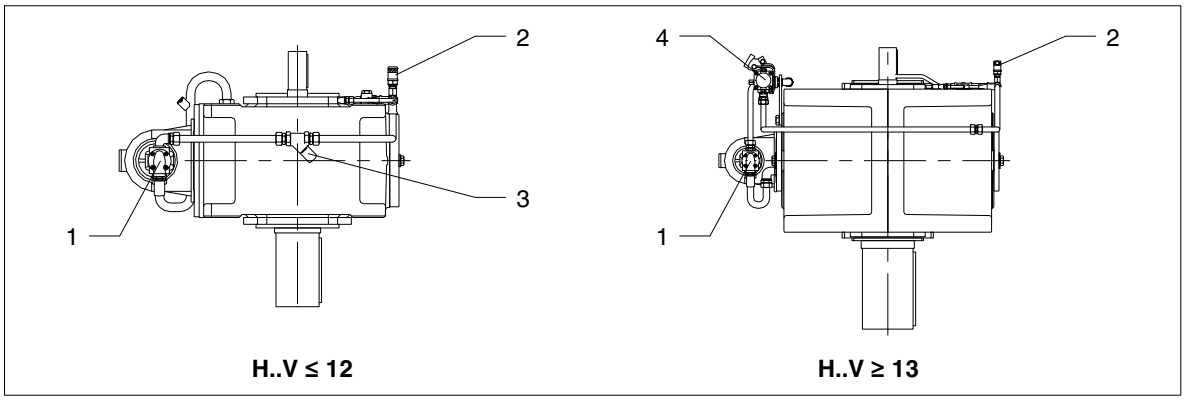


Fig. 28: Add-on oil-supply system with motorpump in the case of type H..V

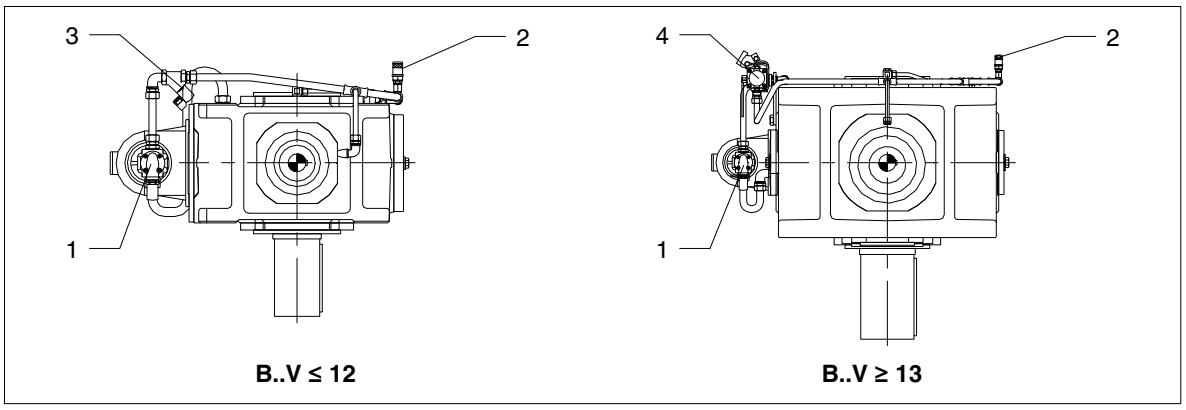


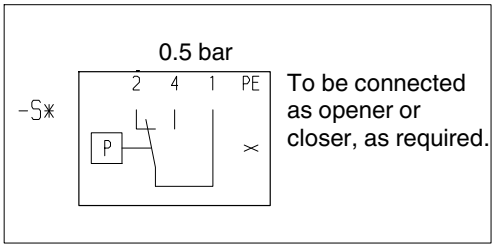
Fig. 29: Add-on oil-supply system with motorpump in the case of type B..V

1 Motor pump
2 Pressure monitor
3 Coarse filter
4 Double change-over filter

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

STOP **In the case of gear units with add-on oil-supply system, before starting the unit up the pressure monitor must always be connected so as to be ready for operation.**

Depending on the order specification and application, the flange pump may be replaced with a motor pump.



When operating and servicing the components of the oil-supply system, observe the operating instructions of the components.
For technical data, refer to the data sheet and/or the list of equipment.

5.6 Shaft bearings

All shafts are mounted in rolling bearings.

5.7 Shaft seals

Radial shaft-sealing rings, labyrinth seals, Taconite seals or special seals (oil-dam pipe, centrigual disk) at the shaft outlets prevent oil from escaping from, or dirt from entering into the gear unit.

5.7.1 Radial shaft-sealing rings

Radial shaft-sealing rings are the standard type of seal. They are fitted preferably with an additional dust lip to protect the actual sealing lip from external contamination.

STOP **Use in an area with much dust is not possible.**

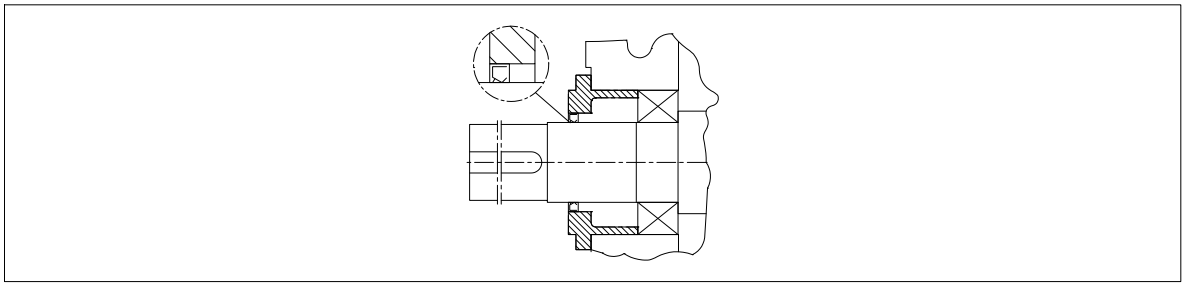


Fig. 30: Radial shaft-sealing ring

5.7.2 Labyrinth seals

Labyrinth seals are non-contacting and avoid wear to the shaft. They therefore require no maintenance and ensure favourable temperature characteristics. They can be used only with certain transmission ratios and minimum speeds.

Check in the spare parts drawing and the spare parts list whether the gear unit is provided with labyrinth seals.

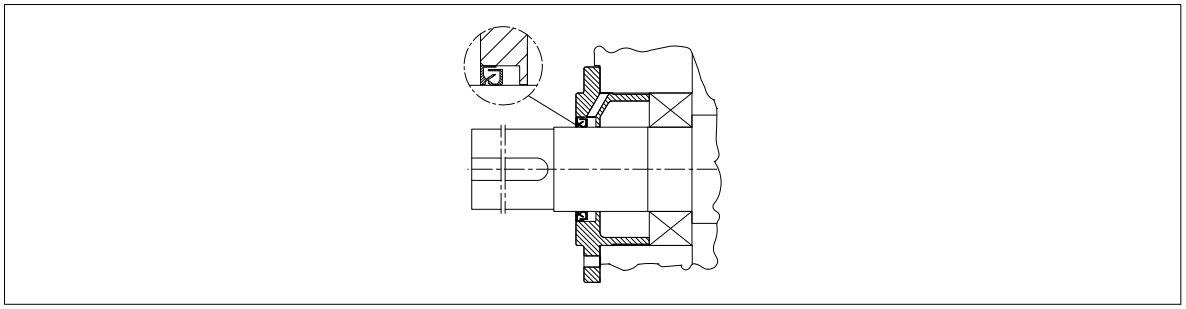


Fig. 31: Labyrinth seal

For reliable operation, this type of seal requires stationary, horizontal positioning in a splash-free and relatively dust-free environment. Overfilling of the gear unit can cause leakage, as can oil with high foam content.

5.7.3 Taconite seals

Taconite seals were specially developed for use in a dusty environment. The penetration of dust is prevented by a combination of three seal elements (radial shaft-sealing ring, lamellar seal and grease-charged labyrinth seal).

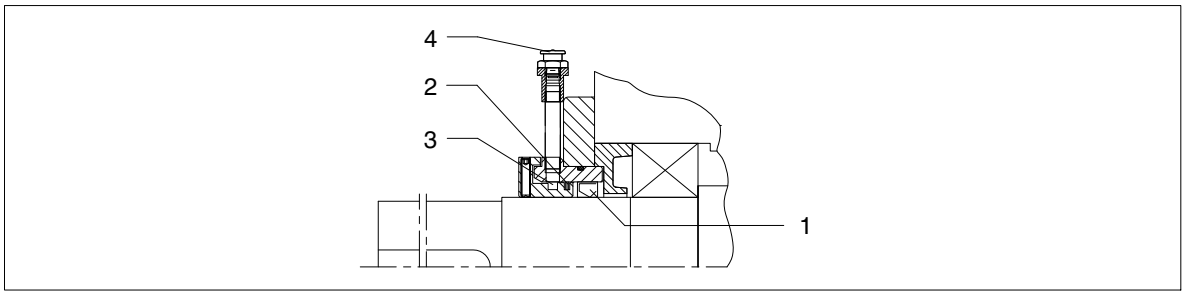


Fig. 32: Taconite seal

1 Radial shaft-sealing ring
2 Lamellar seal
3 Grease-charged labyrinth seal, re-chargeable
4 Flat grease nipple AM10x1 to DIN 3404

Taconite seals are divided into the following types:

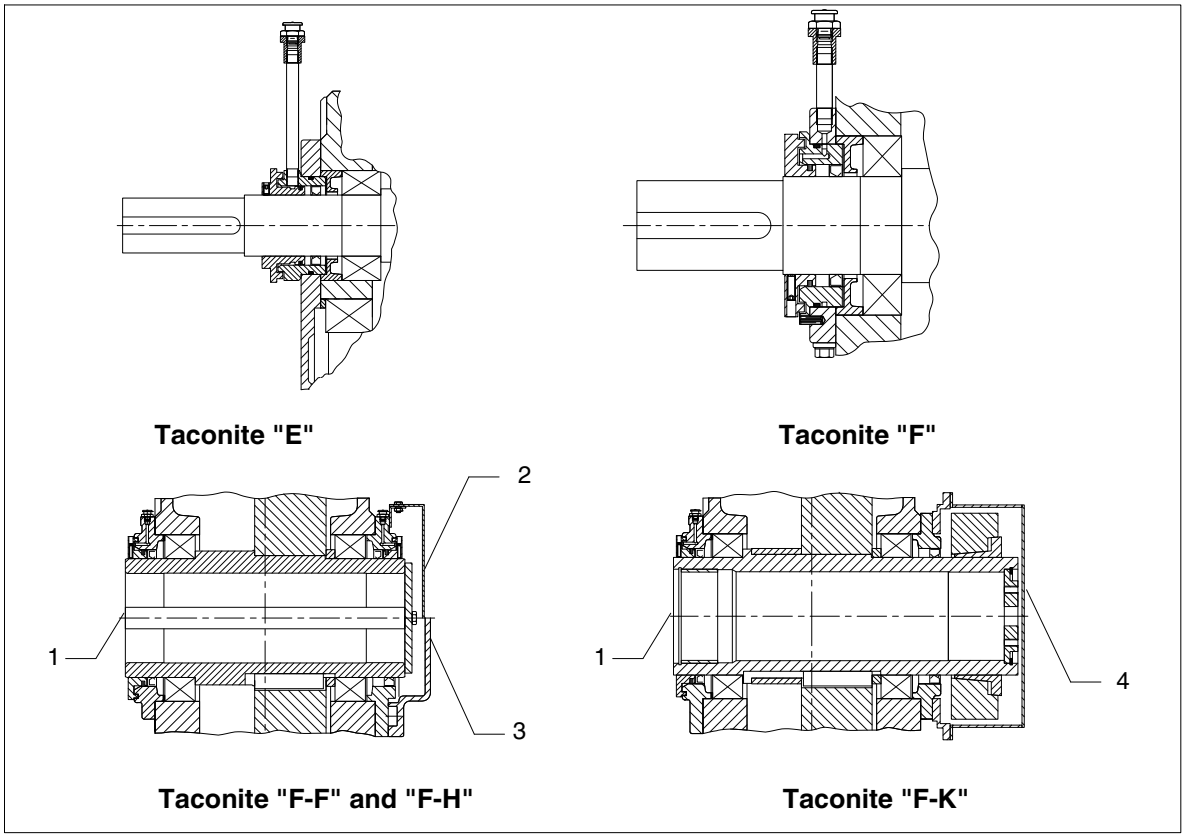


Fig. 33: Taconite seal, variants E, F, F-F, F-H and F-K

1 Output
2 Taconite "F-F"
3 Taconite "F-H"
4 Taconite "F-K"

Table 19: Variant description Taconite seal

Taconite type variant	Application	Remarks
"E"	All input shafts with or without fan	Re-chargeable labyrinth
"F"	Output shaft Type S (Solid shaft) Type V (Solid shaft, reinforced) Type F (Flanged shaft)	
"F-F"	Output shaft Type H (Hollow shaft with parallel keyway) Type K (Hollow shaft with internal spline to DIN 5480)	Labyrinth re-chargeable on both sides, incl. dustproof cowl to prevent contact on gear-unit side facing away from output
"F-H"	Output shaft Type H (Hollow shaft with parallel keyway) Type K (Hollow shaft with internal spline to DIN 5480)	Labyrinth re-chargeable on output side; dustproof cowl on opposite side
"F-K"	Output shaft Type D (Hollow shaft for shrink disk)	

STOP **The specified frequencies must be observed (see section 10, "Maintenance and repair") for re-charging the labyrinth seals with grease.**

5.7.4 Centrifugal disk

A centrifugal disk on the output shaft prevents water from entering the gear unit.

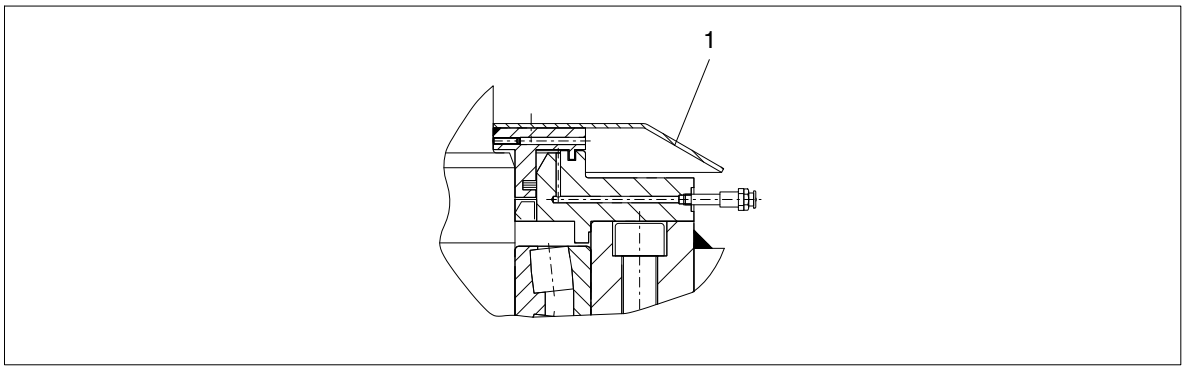


Fig. 34: Centrifugal disk on output side

1 Centrifugal disk

5.7.5 Oil-dam pipe

By sealing the vertically downward pointing input shaft with a contact-free and wear-free shaft seal (a so-called "oil-dam pipe") the shaft outlet is sealed absolutely tight to prevent oil escaping. This system is used only for forced lubrication.

The lower anti-friction bearing of the output shaft is separated from the gear-unit interior by the oil-dam pipe and is lubricrated by grease. Grease is prevented from escaping by the use of a radial shaft sealing ring.

The relubrication intervals must be observed for relubrication of the lower bearing (see section 7, "Startup", and table 40 in section 10, "Maintenance and Repair").

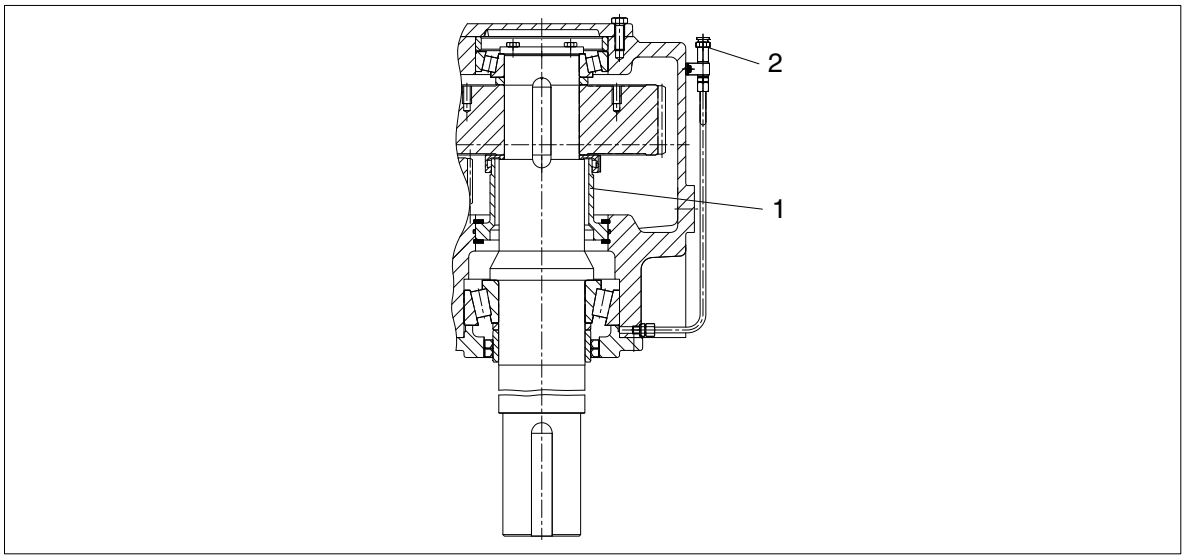


Fig. 35: Oil-dam pipe

1 Oil-dam pipe

2 Lubricating point

5.8 Cooling

Depending on requirement, the gear unit is fitted with a fan, a cooling coil, a water or air oil-cooling system or a separate oil-supply system. In case of a separate oil-supply system, the specific instructions for this oil-supply system must be observed.

☞ When installing the gear unit free convection must be ensured on the housing surface, in order to definitely avoid overheating the gear unit.

5.8.1 Fan

Installation of a fan is possible only with type B..V (bevel-helical gear unit).

The fan is mounted on the high-speed shaft of the gear unit and is protected from accidental contact by an air guide cover. The fan sucks air through the grid of the air guide cover and blows it along the air ducts on the side of the gear housing. It thereby dissipates a certain amount of heat from the housing.

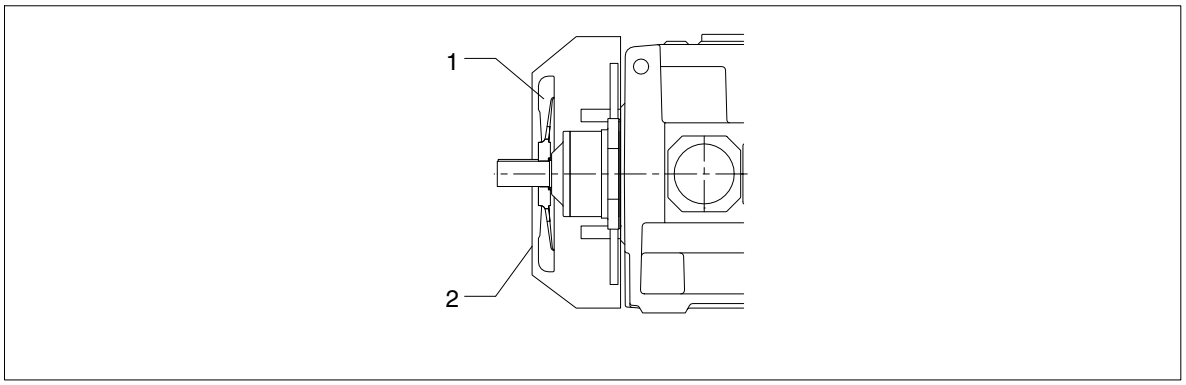


Fig. 36: Fan on gear unit of type B..V

1 Fan 2 Air guide cover

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

STOP **For gear units fitted with a fan, sufficient space must be allowed for air intake when mounting the safety guards for the coupling or other components.**
The correct distance is given in the dimensioned drawing in the gear-unit documentation.
It must be ensured that the air guide cover is correctly fastened. The air guide cover must be protected against damage from outside. The fan must not come into contact with the air guide cover.

STOP **The cooling effect is considerably reduced if the fan or the gear housing are dirty (see section 10, "Maintenance and repair").**

5.8.2 Cooling coil

The gear unit can be fitted with a cooling coil in the oil sump. Cooling water is supplied by way of a water connection. The operator must ensure this. Either fresh water, sea water or brackish water can be used for cooling purposes.

When water is flowing through the cooling coil, a certain amount of heat is transferred from the oil to the water and thereby removed from the system.

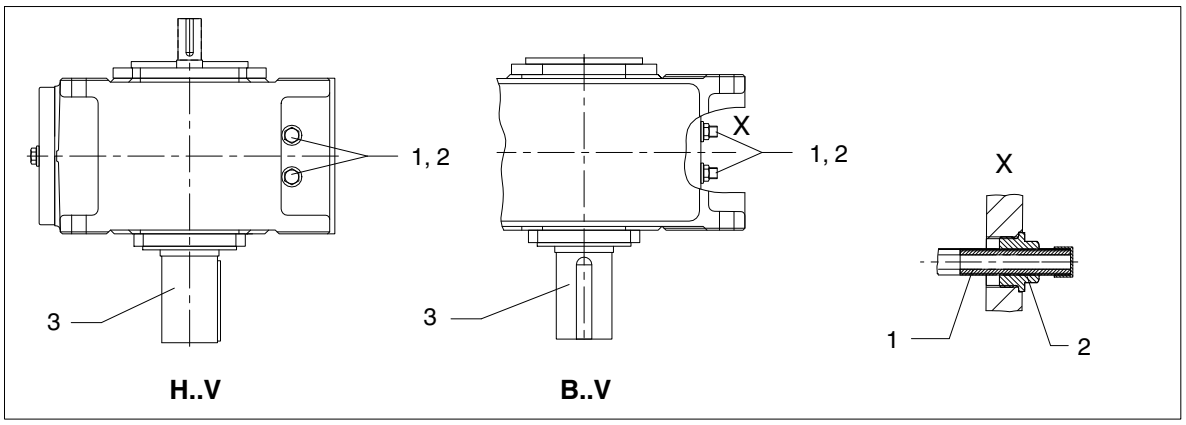


Fig. 37: Cooling coil on gear unit of types H..V and B..V

1 Cooling-water connection 2 Reducing screw 3 Output shaft

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

The water can flow through the gear unit in either direction. The pressure of the cooling water must not exceed 8 bar.
If the gear unit is being withdrawn from service for a longer period and if there is a danger of freezing, the cooling water must be drained off. Remove any remaining water with compressed air.
The ends of the cooling coil must never be twisted because this could destroy the cooling coil.
The reducing bolt must not be tightened or demounted because this may result in damage to the cooling coil.

Be especially careful when blowing with compressed air.
Wear protective glasses!

Avoid too high pressure on the cooling-water entry. For this a cooling-water flow control must be used (e.g. a pressure reducer or a suitable valve).

For connecting dimensions, refer to the dimensioned drawing of the gear unit. The required cooling water quantity and the max. permissible inlet temperature are given on the data sheet and/or the list of equipment.

5.8.3 Add-on oil-supply system with air oil-cooler

For types H2.. and B2.., an oil-supply system with air oil-cooler may be applied. This oil-cooling system is permanently attached to the gear unit.

Components:

- an air oil-cooler
- a flange pump
- a coarse filter (double change-over filter from size 13)
- a pressure-monitoring device
- a temperature-control valve
- pipework

The air oil-cooler is designed to cool the gear oil by means of air from the surrounding atmosphere. Depending on the volume flow, the oil passes through the cooler in one or more streams and through the current of air blown in by the fan. For cold starts, a bypass pipe with a temperature-control valve is provided for.

☞ The flow direction of the pump used is **independent of the direction of rotation**, if nothing is specified in the documentation to the contrary.
When connecting the fittings the actual flow direction must however be observed.

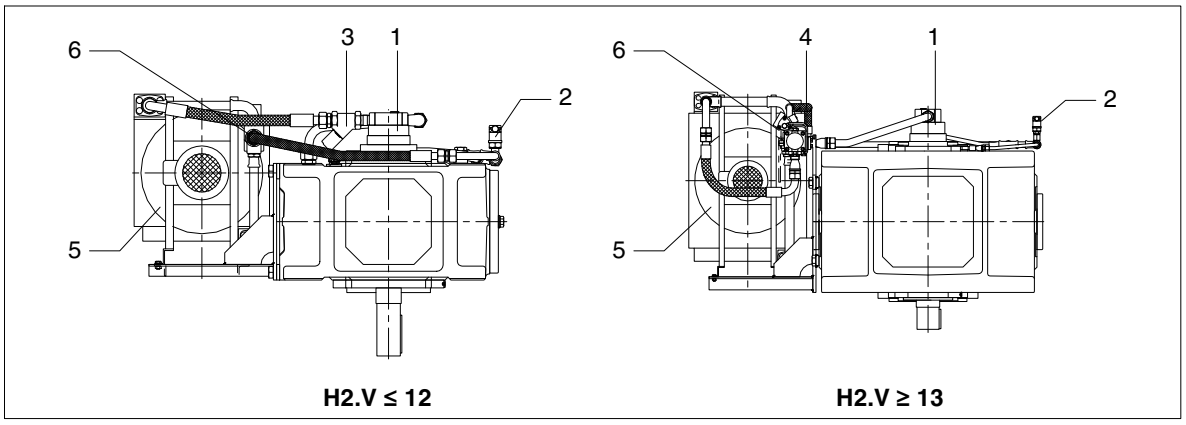


Fig. 38: Air oil-cooling system on gear unit of type H2.V

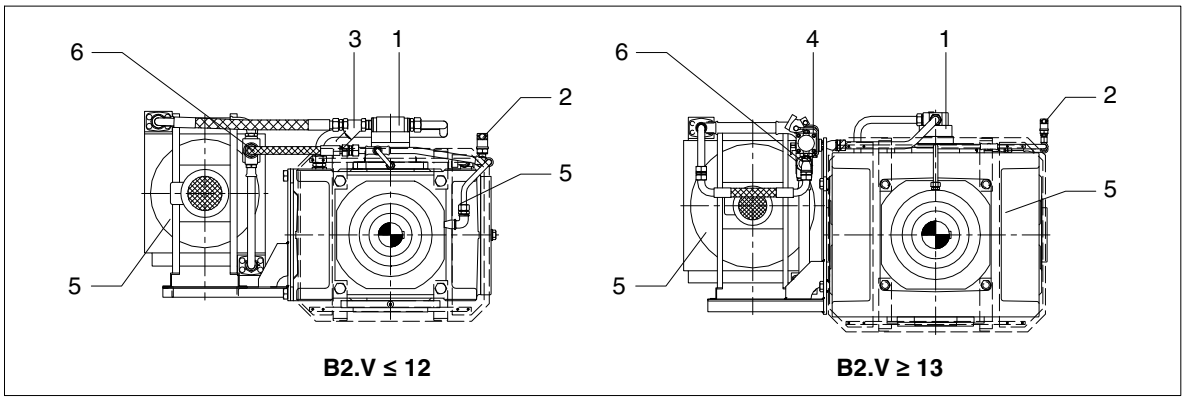


Fig. 39: Air oil-cooling system on gear unit of type B2.V

1 Flange pump
2 Pressure monitor (circuit diagram see item 5.5.2)
3 Coarse filter
4 Double change-over filter
5 Air oil-cooler
6 Temperature-control valve

Depending on the application, the flange pump may have been replaced with a motor pump.

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

When installing gear units with add-on air oil-cooling units, it must be ensured that the air circulation is not obstructed.
The required minimum distance from adjacent components, walls, etc. is indicated in the drawings in the unit documentation.
Add-on pressure monitors must be connected as shown in item 5.5.2.

When operating and servicing the components of the oil-supply system, observe the operating instructions of the components.
For technical data, refer to the data sheet and/or the list of equipment.

The cooling effect is considerably reduced if the cooler or the gear housing are dirty (see section 10, "Maintenance and repair").

5.8.4 Add-on oil-supply unit with water oil-cooler

For types H2.. and B2.., an oil-supply system with water oil-cooler may be applied, if required in the order. This is permanently attached to the gear unit.

Components:

- pump
- water oil-cooler
- pipework

Depending on size and/or order-specification the oil-supply system with water oil-cooler may in addition include the following components:

- filter
- monitoring equipment

The flow direction of the pump used is **independent of the direction of rotation**, if nothing is specified in the documentation to the contrary.
When connecting the fittings the actual flow direction must however be observed.

The required water connection must be provided by the user.

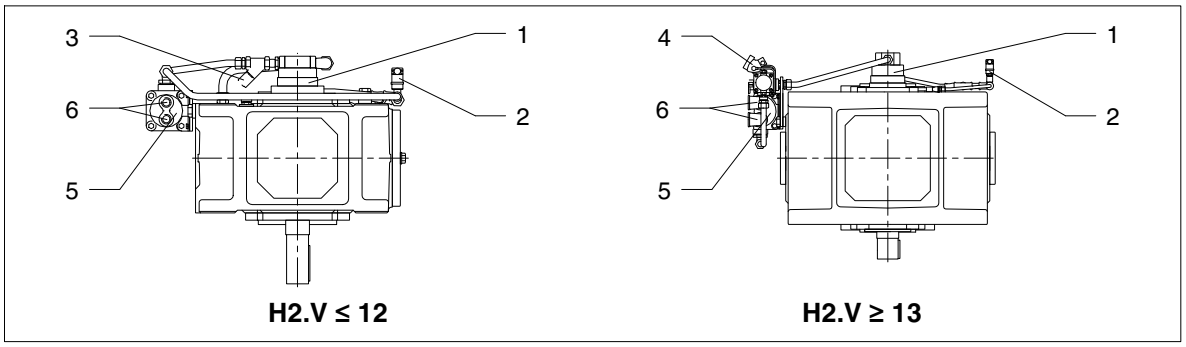


Fig. 40: Water oil-cooling system on gear unit of type H2.V

1 Flange pump
2 Pressure monitor (circuit diagram see item 5.5.2)
3 Coarse filter
4 Double change-over filter
5 Water oil-cooler
6 Water inlet and outlet

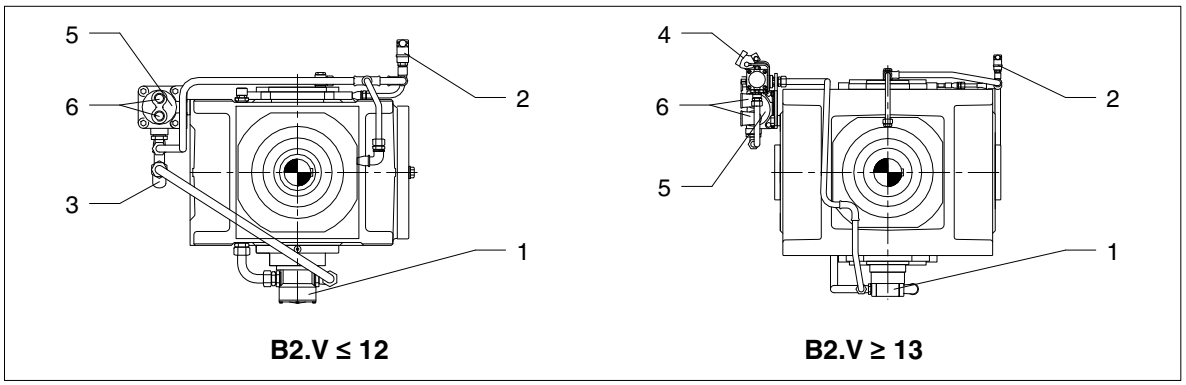


Fig. 41: Water oil-cooling system on gear unit of type B2.V

1	Flange pump	4	Double change-over filter
2	Pressure monitor (circuit diagram see item 5.5.2)	5	Water oil-cooler
3	Coarse filter	6	Water inlet and outlet

Depending on the order specification and application, the flange pump may have been replaced with a motor pump.

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

To ensure optimum cooling performance, the specified direction of flow in the water oil-cooler must be observed. The cooling-water inlet and outlet must not be reversed. The pressure of the cooling water must not exceed 8 bar.
If the gear unit is being withdrawn from service for a longer period and if there is a danger of freezing, the cooling water must be drained off. Remove any remaining water with compressed air.
Add-on pressure monitors must be connected as shown in item 5.5.2.

Be especially careful when blowing with compressed air.
Wear protective glasses!

For operation and maintenance, always observe the operating instructions indicated in the order-specific appendix.
For technical data, refer to the order-specific list of equipment.

5.8.4.1 Pump

The pumps used are suitable for the delivery of lubricants. The flow medium must not contain abrasive components and must not chemically affect the materials of the pump. A precondition of a proper functioning, high reliability and long service life of the pump is in particular a clean and lubrifying delivery medium.

5.8.4.2 Water oil-cooler

Water oil-coolers are suitable for cooling oils. The cooling medium used is water.

For connecting dimensions, refer to the dimensioned drawing of the gear unit. The required cooling water quantity and the max. permissible inlet temperature are given on the data sheet and/or the list of equipment.

5.8.4.3 Filter

The filter protects downstream aggregates, measuring and control devices from contamination. The filter comprises a housing with connections and a sieve. The medium flows through the housing where the dirt particles flowing trough the pipe are retained.
Dirty filter elements must be cleaned or replaced.

5.9 Couplings, clutches

Generally speaking, flexible couplings or hydraulic couplings combined with a flexible coupling are used for the input drive of the gear unit.

☞ In the case of gear units with fan, the hydraulic unit of the hydraulic coupling should be located on the motor shaft to ensure that sufficient space is available for intake of cooling air (see item 5.8.1).

For gear units fitted with solid output shafts (types ..S. and ..V.) flexible couplings are also provided in most cases.

If rigid couplings or other in- and/or output elements, which create additional radial and/or axial forces, (e.g. gear wheels, belt pulleys, disk flywheels) are to be used, this must be agreed by contract.

5.10 Heating

At low temperatures it may be necessary to heat the gear oil before switching on the drive unit or even during operation. In such cases the use of heating elements is possible. These heating elements convert electrical energy into heat which is conducted to the surrounding oil. The heating elements are located in protective tubes inside the housing, thus making it possible to replace them without draining off the oil.

Complete immersion of the heating elements in the oil bath must be guaranteed.

The heating elements can be controlled by a temperature monitor which emits a signal when maximum and minimum temperatures are reached; the signal requires amplification.

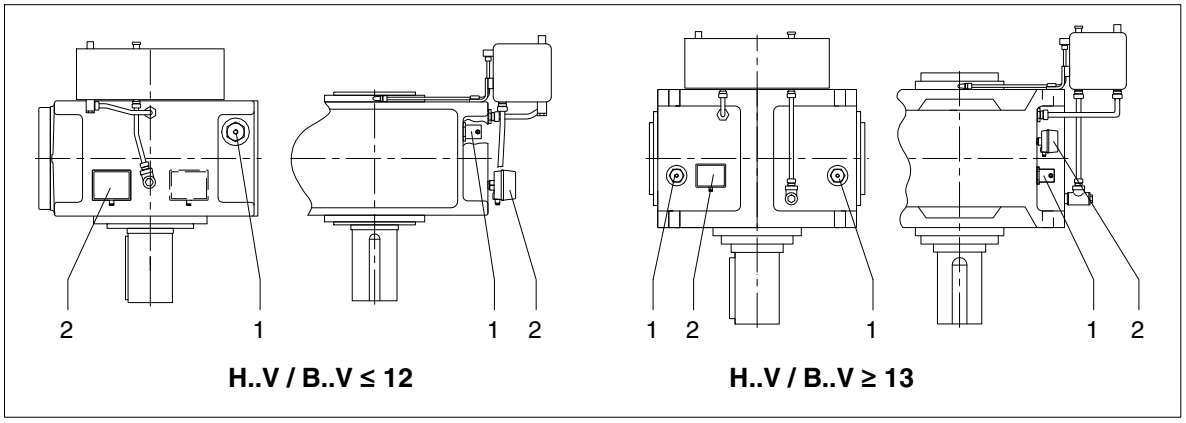


Fig. 42: Heating of gear unit with oil-equalising tank of types H..V and B..V

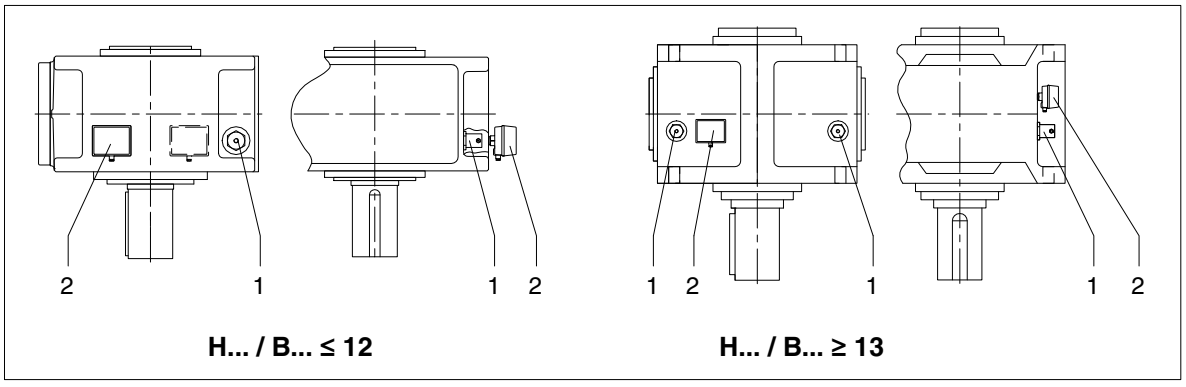


Fig. 43: Heating of gear unit without oil-equalising tank of types H..V and B..V

1 Heating element 2 Temperature monitor

For a detailed illustration of the gear unit and the position of the add-on parts, please refer to the drawings of the gear-unit documentation.

Never switch on the heating elements, unless complete immersion of the heating rod in the oil bath is ensured. Fire hazard!
If heating elements are installed afterwards, the max. heating capacity (see Table 20) on the outer surface of the heating element must not be exceeded.

Table 20: Specific heating output P_{Ho} as a function of the ambient temperature

P_{Ho} (W/cm^2)	Ambient temperature °C
0.9	+ 10 to 0
0.8	0 to -25
0.7	- 25 to - 50

Operation and maintenance must be in accordance with the pertinent operating instructions.
For technical data, refer to the list of equipment.

5.11 Oil-temperature monitoring

Depending on the order specification, the gear unit may be fitted with a Pt 100 resistance thermometer for monitoring the oil temperature in the sump. In order to measure the temperatures or temperature differences, the Pt 100 resistance thermometer should be connected to a suitable instrument provided by the customer. The thermometer has a connection head (protection type IP 54) for the wiring. A two-conductor circuit is provided by the manufacturer. However, the customer may fit his own three- or four-conductor circuit if required.

For control information, refer to the list of equipment.
Observe the operating instructions relating to the device in all instances.

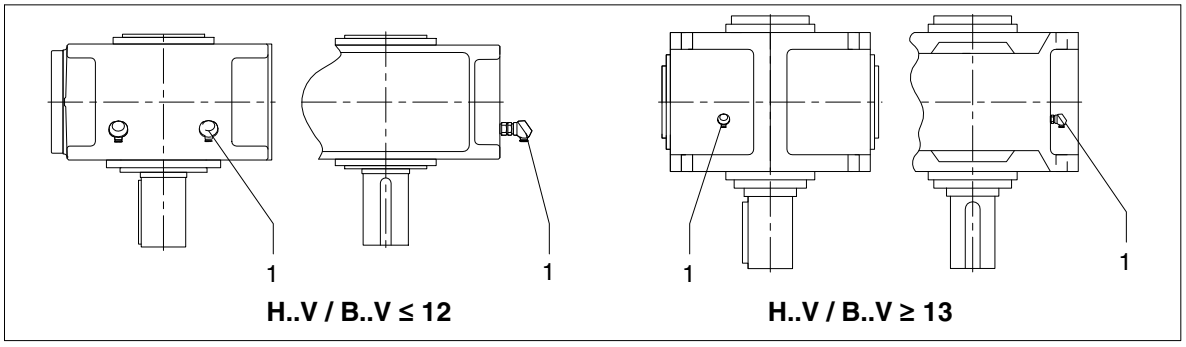


Fig. 44: Oil-temperature measurement on gear unit of types H..V and B..V

1 Pt 100 resistance thermometer

For a detailed illustration of the gear unit and the position of the add-on parts, please refer to the drawings of the gear-unit documentation.

When operating and servicing the components, observe the operating instructions relating to the components.
For technical data, refer to the data sheet and/or the list of equipment.

5.12 Speed transmitter

An incremental speed transmitter may be mounted. Wiring and evaluation instrument should be provided by the customer.

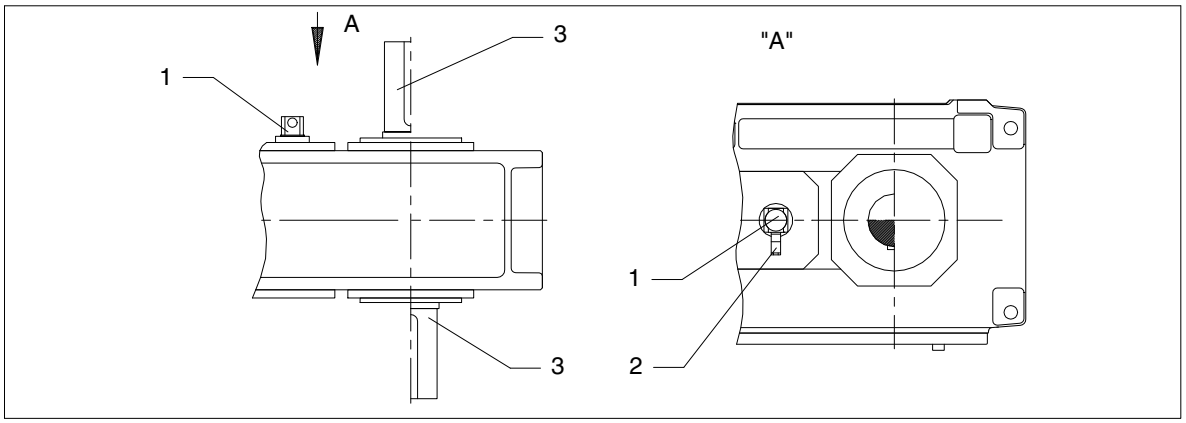


Fig. 45: Speed-monitoring device

1 Incremental transmitter 2 12-pole brass plug 3 Output

When operating and servicing the components, observe the operating instructions relating to the components.
For technical data, refer to the data sheet and/or the list of equipment.

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

6. Fitting

Observe the instructions in section 3, "Safety instructions"!

6.1 General information on fitting

When transporting the gear unit observe the notes in section 4, "Transport and storage".

Fitting work must be done with great care by authorised, trained and qualified personnel. The manufacturer cannot be held liable for damage caused by incorrect assembly and installation.

During the planning phase sufficient space must be allowed around the gear unit for later care and maintenance work.

☞ Free convection through the surface of the housing must be ensured by suitable measures.

If the gear unit is fitted with a fan, there should be sufficient space for air intake.

Adequate lifting equipment must be available before beginning the fitting work.

STOP **During operation the unit must not be allowed to heat up through exposure to heat from external sources such as sunlight, and suitable measures must be taken to prevent this!**
Such measures may be:

- fitting a sunshade roof,
or
- fitting an additional cooling unit,
or
- fitting the oil sump with a temperature-monitoring device with a cut-out function.

STOP **If a sunshade roof is fitted, heat must be prevented from building up!**
If a temperature-monitoring device is fitted, a warning signal must be emitted when the maximum permitted oil-sump temperature is reached. If the maximum permitted oil-sump temperature is exceeded, the drive must be shut off.
Such shutting off may cause the operator's system to stop!

STOP **The operator should ensure that no foreign bodies affect the proper function of the gear unit (e.g. falling objects or heaping over).**

No electrical welding work must be done at all on the drive.
The drives must not be used as an earthing point for welding operations. Toothed parts and bearings may be irreparably damaged by welding.

All the fastening points provided by the design of the unit must be used.
Screws which have been damaged during assembly or disassembly work must be replaced with new ones of the same strength class and type.

☞ To ensure proper lubrication during operation, the mounting position specified on the drawings must always be observed.

6.2 Unpacking

The products supplied are listed in the despatch papers. Check immediately on receipt to ensure that all the products listed have actually been delivered. Parts damaged and/or missing parts must be reported to Siemens in writing immediately.

The packaging must not be opened or damaged, when this is part of the preservation method!

- Remove packaging material and transporting equipment and dispose of in accordance with regulations.
- Perform a visual check for any damage and contamination.

If there is any visible damage, the gear unit must not be put into operation. The instructions in section 4, "Transport and storage", must be observed.

6.3 Installation of gear unit on housing base

6.3.1 Foundation

The foundation must be horizontal and level. The gear unit must not be excessively stressed when tensioning the fastening bolts.

The foundation should be designed in such a way that no resonance vibrations are created and that no vibrations are transmitted from adjacent foundations. The structure on which the unit is to be mounted must be rigid. It must be designed according to the weight and torque, taking into account the forces acting on the gear unit.

Careful alignment with the units on the in- and output sides must be ensured. Any elastic deformation through operating forces must be taken into consideration.

Fastening bolts or nuts must be tightened to the prescribed torque. For the correct torque, refer to item 6.23. Bolts of the minimum strength class 8.8 must be used.

If external forces are acting upon the gear unit, it is advisable to prevent the unit from displacement by means of lateral stops.

For dimensions, space requirement and arrangement of supply connections, refer to the drawings in the gear-unit documentation.

6.3.2 Description of installation work

- Remove the anti-corrosion paint on the shafts with suitable cleaning agent such as benzine.

Do not allow the cleaning agent (e.g. benzine) to contact the shaft-sealing rings.

Ensure adequate ventilation. Do not smoke!
Danger of explosion!

- Mount and secure input and output drive elements (e.g. coupling components) on the shafts.
  If these are to be heated before mounting, refer to the dimensioned drawings in the coupling documentation for the correct joining temperatures.

Unless otherwise specified, the components may be heated inductively, with a burner, or in a furnace.

Take precautions to avoid burns from hot parts!
Wear suitable protective gloves!

Protect shaft-sealing rings from damage and heating to over + 100 °C (use heat-protective screens to protect against radiant heat.)

The elements must be pulled smartly onto the shaft as far as stated in the dimensioned drawing prepared in accordance with the order.

Fit the coupling with the aid of suitable fitting equipment (see also item 6.10). The parts must not be driven on by abrupt force, as this may damage the gear unit.
The shaft-sealing rings and running surfaces of the shaft must not be damaged when pulling in the coupling parts.

When installing the drives, make absolutely certain that the individual components are accurately aligned in relation to each other. Inadmissibly large errors in the alignment of the shaft ends to be connected due to angular and/or axial misalignments result in premature wear and/or material damage.
Insufficiently rigid base frames or sub-structures can also during operation cause a radial and/or axial misalignment, which cannot be measured when the unit is at a standstill.

Gear units whose weight requires the use of lifting gear must be attached at the points shown in section 4, "Transport and storage". If the gear unit is to be transported with add-on parts, additional attachment points may be required. The position of these attachment points is shown in the order related dimensioned drawing.

6.3.2.1 Alignment

The machined surfaces (alignment surfaces) on the top of the housing serve for preliminary alignment of the gear units.

Alignment surface: 

For the exact position of the alignment surfaces please refer to the drawings of the gear-unit documentation.

The alignment surfaces are for aligning the gear unit horizontally, in order to ensure correct running of the gear unit.

The values punched into the alignment surfaces must always be observed.

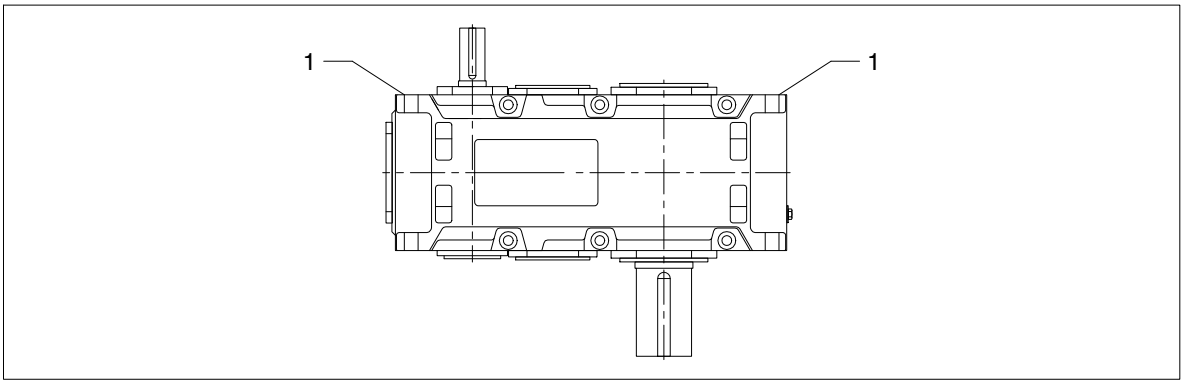


Fig. 46: Alignment surfaces

1 Alignment surfaces

The final fine alignment with the assemblies on the in- and output side must be carried out accurately by the shaft axes, using:

- rulers
- spirit level
- dial gauge
- feeler gauge, etc.

Only then should the gear unit be fastened and the alignment checked once again.

- Record alignment dimensions.
  - The report must be kept with these instructions.

The accuracy of shaft axis alignment is an important factor in determining the life span of shafts, bearings and couplings. If possible, the deviation should be zero (exception: ZAPEX couplings). For amongst others the special requirements for the couplings, refer to the specific operating instructions.

Non-observance can cause shaft rupture, resulting in serious injury or danger of life.

6.3.2.2 Mounting on a foundation frame

- Clean the undersurface of the gear-unit base.
- Using suitable lifting gear, place the gear unit on the foundation frame.
- Tighten the foundation bolts to the specified torque (see item 6.23); if necessary, use stops to prevent displacement.

The gear unit must not be excessively stressed when tensioning the fastening bolts.

- Align the gear unit exactly with the input and output units (see item 6.3.2.1).
- Record alignment dimensions.
  - The report must be kept with these instructions.

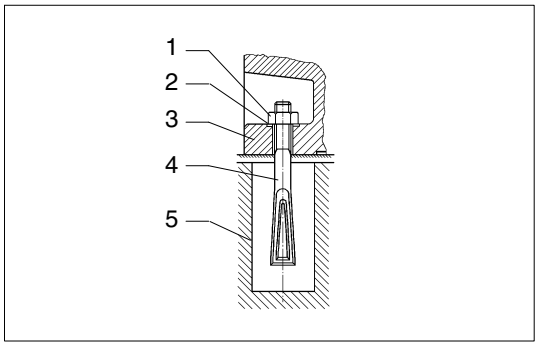
6.3.2.3 Mounting on a concrete foundation by means of stone bolts or foundation blocks

- Clean the undersurface of the gear-unit base.

Placing stone bolts:

- Hook stone bolts with washers and hexagon nuts into the foundation fastening points on the gear-unit housing (see fig. 47).

The hexagon nuts must only be tightened when the concrete has set.



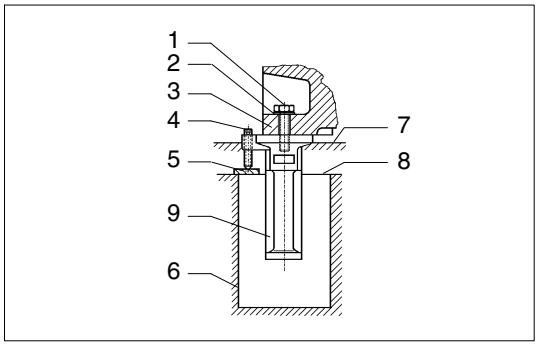
1 Hexagon nut
2 Washer
3 Gear-unit base
4 Stone bolt
5 Foundation

Fig. 47: Stone bolt

Placing the foundation blocks:

– Hook the foundation blocks with washers and fastening bolts into the foundation fastening points on the gear-unit housing (see fig. 48).

The fastening bolts must only be tightened when the concrete has set.



1 Fastening bolt
2 Washer
3 Gear-unit base
4 Threaded stud
5 Flat steel plate
6 Foundation
7 Final foundation height
8 Prepared foundation height
9 Foundation block

Fig. 48: Foundation block

- Using suitable lifting gear, place the gear unit on the concrete foundation.
- Align gear unit horizontally by in- and output shafts:
  – if using stone bolts, with shims
  – using foundation blocks with the aid of the set screws (if available)
- If considerable forces may apply, use stops to prevent the unit from displacement.

Before pouring the concrete foundation, fill up the openings in the foundation blocks with adequate material such as polystyrene.
With type **H2**, remove the air-conducting cowl before tightening the foundation bolts and then bolt it back into position.

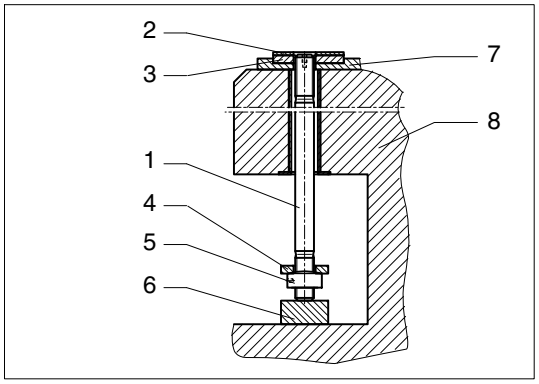
- Pour concrete into the recesses of the stone bolts or foundation blocks.

When the concrete has set, tighten the hexagon nuts of the stone bolts or fastening bolts to the specified torque (see item 6.23).

The gear unit must not be excessively stressed when tensioning the hexagon nuts or fastening bolts.

6.3.2.4 Mounting on a concrete foundation by means of anchor bolts

- Clean the undersurface of the gear-unit base.
- Place support on the base plate in the fine grout.
- Insert anchor bolts.
- Place pressure plates in position and screw nuts on.
- Place wood under the anchor bolts so that they are about 10 mm from the upper edge of the support (see fig. 49).



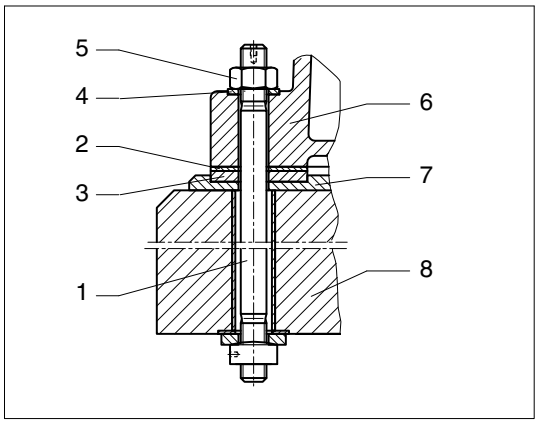
1 Anchor bolt
2 Support
3 Base plate
4 Pressure plate
5 Hexagon nut
6 Wood
7 Fine-grout concrete
8 Raw foundation

Fig. 49: Anchor bolt

- Place gear unit on foundation.

STOP **Use only the eyes provided to attach lifting equipment to the unit.**
Do not use the front threads at the shaft ends to attach slinging and lifting gear for transport.

- Pull anchor bolts up (for this a bolt or threaded rod can be screwed into the thread on the front face).
- Fit washer.
- Unscrew hexagon nut a few turns by hand.
- Align gear unit with supports (see fig. 50).
  - The values punched into the screeds must always be observed.
  - Alignment tolerances in relation to the units on the input and output sides are to be in accordance with the permissible angular and axial displacements of the couplings (see coupling drawings).
- Record alignment dimensions.
  - The report must be kept with these instructions.



1 Anchor bolt
2 Support
3 Base plate
4 Washer
5 Hexagon nut
6 Housing base
7 Fine-grout concrete
8 Raw foundation

Fig. 50: Anchor bolt

STOP **Prior to tensioning the anchor bolts, the fine-grout concrete must have set for at least 28 days.**

- Keep anchor bolts in their position by tightening the nut with your fingers.
- Place the protective sleeve.
- Place hydraulic tensioning device in position.
- Initially tension the bolts alternately (for initial tensioning forces, see item 6.23).
- Using a suitable tool, screw hexagon nuts on as far as the stop.

To ensure correct handling and adjustment of the pretensioning tool, the manufacturer's operating instructions must be adhered to.

The tensioning pressures and/or the initial tensioning forces should be recorded, see also item 7.2.4.

6.4 Coupling flange on output side

The front area of the coupling flange must be absolutely free from grease. This is essential for safe and reliable torque transmission. Do not use contaminated solvents or dirty cloths for removing grease.

Tighten diametrically opposed tensioning bolts to full torque.

- Tightening torques of flange bolts for gear units:

Table 21: Tightening torques for flange connections

Gear-unit size	Strength class Bolt DIN 931	Tightening torque
5 ... 6	10.9	610 Nm
7 ... 10	10.9	1050 Nm
11 ... 14	10.9	2100 Nm
15 ... 16	10.9	3560 Nm

Damaged bolts must be replaced with new bolts of the same type and strength class.

6.5 Gear-unit mounting by mounting flange or block-type mounting flange

6.5.1 Counterflange on the machine side

The counterflange must be horizontal and plain.

The counterflange should be designed such that no resonance vibrations are created and that no vibrations are transmitted from adjacent foundations. The counterflange construction on which the gear unit is to be mounted must be torsionally rigid. It must be designed according to the weight and torque, taking into account the forces acting on the gear unit.

The unit must be carefully aligned with the motor on the input and output sides. Possible strain deformations due to operating forces must be taken into account.

Fastening bolts or nuts must be tightened to the prescribed torque. For the correct torque, refer to item 6.23. Bolts of the minimum strength class 8.8 must be used.

If external forces are acting upon the gear unit, it is advisable to prevent the unit from displacement by means of lateral stops.

For dimensions, space requirement, arrangement of supply connections (e.g. with separate oil-cooling units), refer to the drawings in the gear-unit documentation.

6.5.2 Description of installation work

- Remove the anti-corrosion paint on the shafts with suitable cleaning agent such as benzine.

Do not allow the cleaning agent (e.g. benzine) to contact the shaft-sealing rings.

Ensure adequate ventilation. Do not smoke!
Danger of explosion!

- Mount and secure input and output drive elements (e.g. coupling components) on the shafts.
  If these are to be heated before mounting, refer to the dimensioned drawings in the coupling documentation for the correct joining temperatures.

Unless otherwise specified, the components may be heated inductively, with a burner, or in a furnace.

Take precautions to avoid burns from hot parts!

Protect shaft-sealing rings from damage and heating to over + 100 °C (use heat-protective screens to protect against radiant heat.)

Gear units whose weight requires the use of lifting gear must be attached at the points shown in section 4, "Transport and storage". If the gear unit is to be transported with add-on parts, additional attachment points may be required. The position of these attachment points is shown in the order related dimensioned drawing.

6.5.2.1 Assembly of agitator gear units with solid shaft on the output side (types H.RV and H.GV)

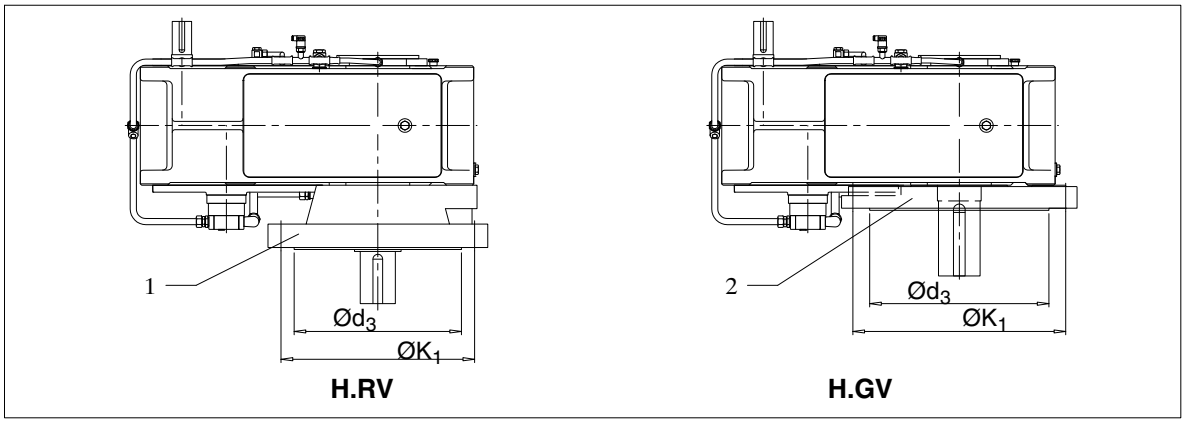


Fig. 51: Agitator gear unit of types H.RV and H.GV

1 Mounting flange 2 Block flange

The mounting or block-type flange on the output side of agitator gear units is provided with a centering shoulder (Ø d_3). The counterflange on the machine side has to be provided with a bore (fit H7) which matches the centering shoulder.

When aligning the machine shaft in relation to the counterflange, the radial and angular misalignments should be kept as small as possible.

The accuracy of shaft axis alignment is an important factor in determining the life span of shafts, bearings and couplings. If possible, the deviation should be zero. For amongst others the special requirements for the couplings, refer to the specific operating instructions.

- Clean the supporting surface of the mounting and block-type flange of the gear unit and the counterflange on the machine side.

The front area of the mounting flange and counterflange must be absolutely free from grease.
This is essential for safe and reliable torque transmission. Do not use contaminated solvents or dirty cloths for removing grease.

- Put the gear unit on the counterflange with the aid of suitable lifting gear.
- Tighten flange bolts.

Tighten the flange bolts crosswise with the full tightening torque.

The joint bolts must be tightened to the prescribed torque. For the correct torque, refer to item 6.23. Bolts of the minimum strength class 8.8 must be used. The transmittable tensioning torque is limited by the bolted joint on bolt circle K_1.

The gear unit must not be excessively stressed when tensioning the fastening bolts.

6.5.2.2 Assembly of agitator gear units with hollow output shaft (types H.TV and H.JV)

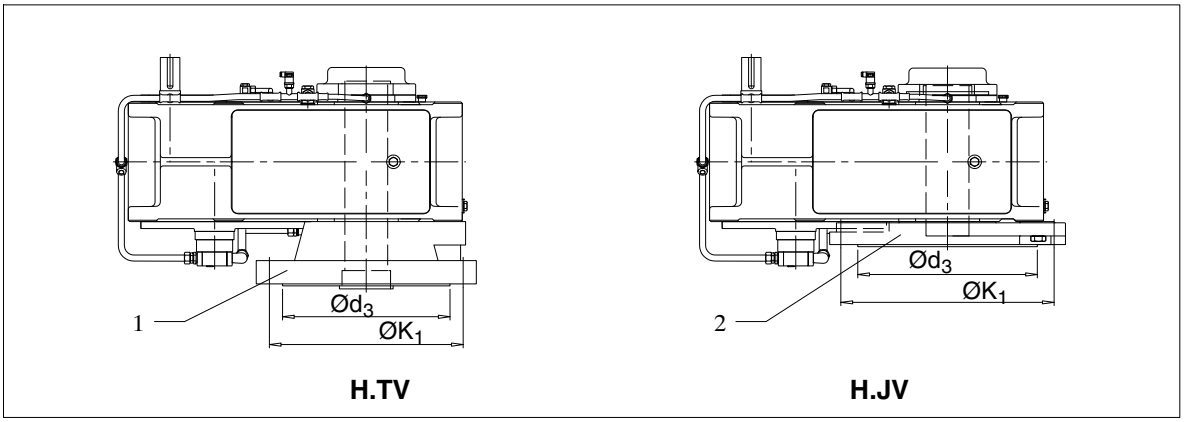


Fig. 52: Agitator gear unit of types H.TV and H.JV

1 Mounting flange 2 Block flange

The mounting or block-type flange on the output side of agitator gear units is provided with a centering shoulder (Ø d_3). If the machine shaft is supported on one side only, i.e. the gear unit takes over as the 2nd bearing location, the counterflange on the machine side has to be provided with a bore (fit H7) which matches the centering shoulder.

In the case of a machine shaft which is double supported in the counterflange on the machine side, centering of the agitator gear unit (centering shoulder Ø d_3) in the counterflange is inadmissible (redundancy).

When aligning the machine shaft in relation to the counterflange, the radial and angular misalignments should be kept as small as possible.

The service life of the shaft and bearings within the gear unit largely depends on the aligning accuracy of the machine shaft in relation to the counterflange. If possible, the deviation should be zero. For permissible tolerances please refer to the drawings in the gear unit documentation.

- Clean the supporting surface of the mounting or block-type flange of the gear unit and the counterflange on the machine side.

The front area of the mounting flange and counterflange must be absolutely free from grease.
This is essential for safe and reliable torque transmission. Do not use contaminated solvents or dirty cloths for removing grease.

- Remove the anti-corrosion agent from the hollow shaft and machine shaft with benzine.

Do not allow the benzine to contact the shaft sealing rings.

Ensure adequate ventilation. Do not smoke!
Danger of explosion!

- Check the hollow and machine shafts to ensure that seat and edges are not damaged. If necessary, rework the parts with a suitable tool and clean them again.

Coat with a suitable lubricant to prevent frictional corrosion of the contact surfaces.

- Pull up the gear unit with suitable lifting gear by means of nut and threaded spindle and put down on the counterflange on the machine side.

6.6 Assembly of a shaft-mounting gear unit with hollow shaft and parallel keyway

The end of the driven-machine shaft (material C60+N or higher strength) must be provided with a parallel key to DIN 6885 Part 1 Form A. Furthermore, a centring hole to DIN 332 Form DS (tapped) should be provided (for the connection dimensions of the driven machine shaft, see dimensioned drawing in the gear unit documentation).

6.6.1 Preparatory work

To facilitate demounting (see also item 6.6.3.), we recommend providing a connection for pressure oil on the end of the driven machine shaft. For this a hole must be drilled through to the hollow shaft bore (see fig. 56). This connection may also be used for supplying rust-releasing agent.

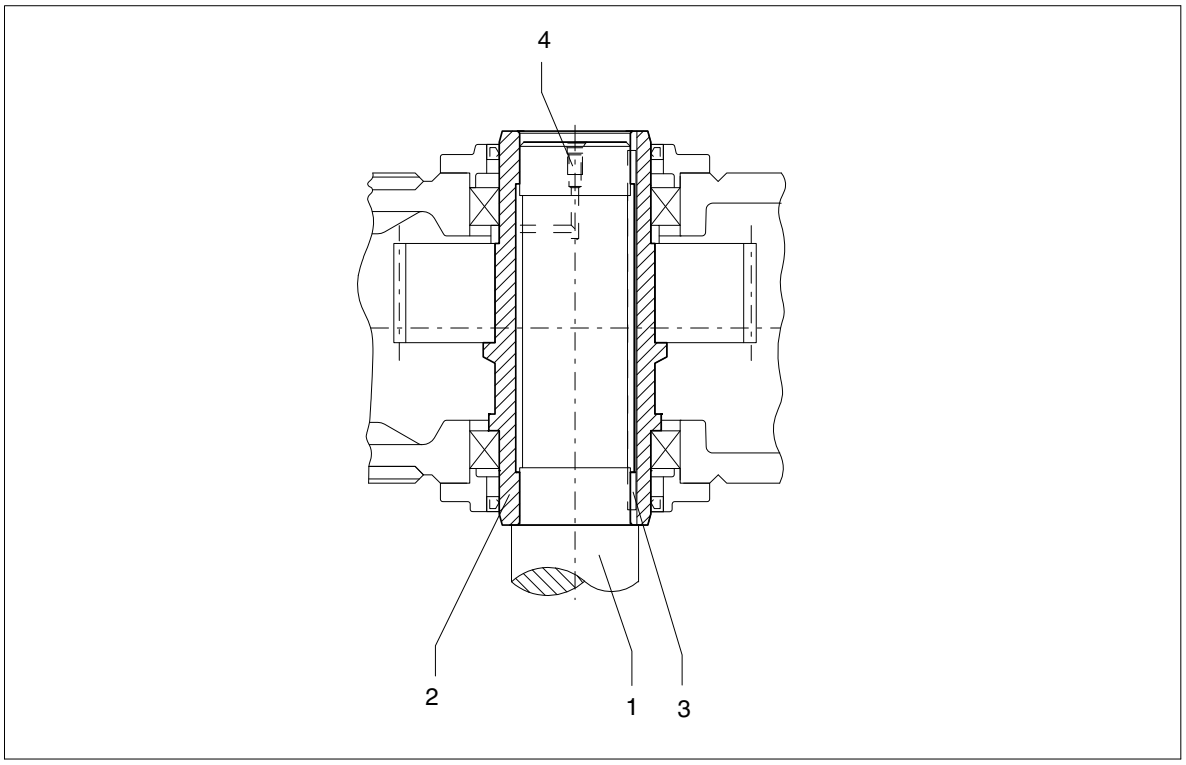


Fig. 53: Hollow shaft with parallel keyway, preparation

1	Machine shaft	3	Parallel key
2	Hollow shaft	4	Pressure-oil connection

6.6.2 Fitting

- Remove the preservative agent from the hollow shaft and the machine shaft with a suitable cleaning agent (e.g. benzine).

Do not allow the cleaning agent (e.g. benzine) to contact the shaft-sealing rings.

Ensure adequate ventilation. Do not smoke!
Danger of explosion!

- Check the hollow and machine shafts to ensure that seats and edges are not damaged. If necessary, rework the parts with a suitable tool and clean them again.

Coat with a suitable lubricant to prevent frictional corrosion of the contact surfaces.

6.6.2.1 Fitting

- Fit the gear unit by means of nut and threaded spindle. The counterforce is provided by the hollow shaft.

The hollow shaft must be exactly aligned with the machine shaft to avoid canting.

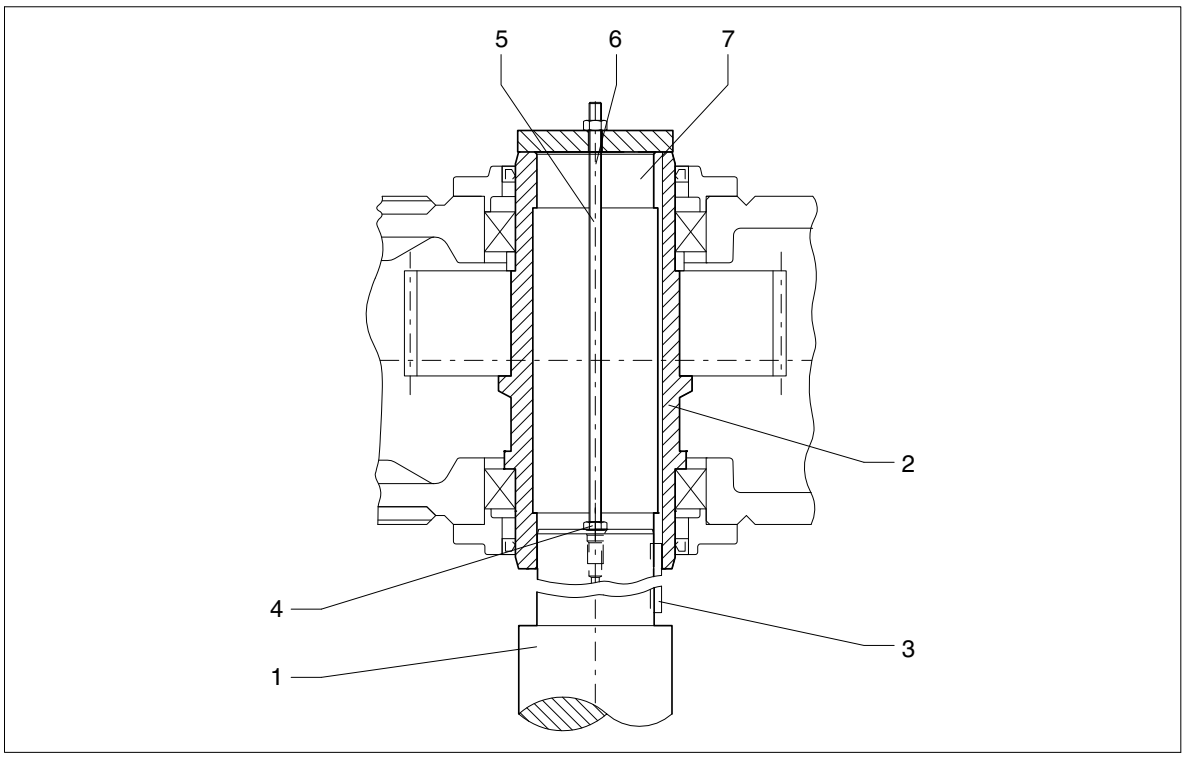


Fig. 54: Hollow shaft with parallel keyway, mounting with threaded spindle

1	Machine shaft	4	Nut	7	End plate
2	Hollow shaft	5	Threaded spindle		
3	Parallel key	6	Nut		

Instead of the nut and threaded spindle shown in the diagram, other types of equipment such as a hydraulic lifting equipment (type "Lukas") may be used.

The hollow shaft may be tightened against a machine-shaft collar only if the gear-unit configuration is one of the following:

- Torque arm
- Support with gear-unit swing base

With a different arrangement the bearings may be excessively stressed.

6.6.2.2 Axial fastening

Depending on type, secure the hollow shaft axially on the machine shaft (e.g. with locking ring, end plate, set screw).

6.6.3 Demounting

- Remove the axial securing device from the hollow shaft.
- If frictional corrosion has occurred on the seating surfaces, rust-releasing agent may be used in order to facilitate forcing off the gear unit. The rust releaser can be injected through the pressure-oil connection (see Fig. 53), e.g. using a pump.
- When the rust-releasing agent has taken effect, pull the gear unit off with the device (see figs. 55 and 56).
- Removing the gear unit from the driven-machine shaft can be done, depending on local possibilities, as follows:
  - using forcing screws in an end plate (see Fig. 56) or
  - using a central threaded spindle or
  - preferably using a hydraulic lifting unit ("Lukas").

☞ The end plate and/or the auxiliary plate for forcing off the gear unit are not included in our delivery.
Each of the two end faces of the hollow shaft is provided with 2 threaded holes (for dimensions, see fig. 57) to receive bolts for fastening the end plate to the hollow shaft.

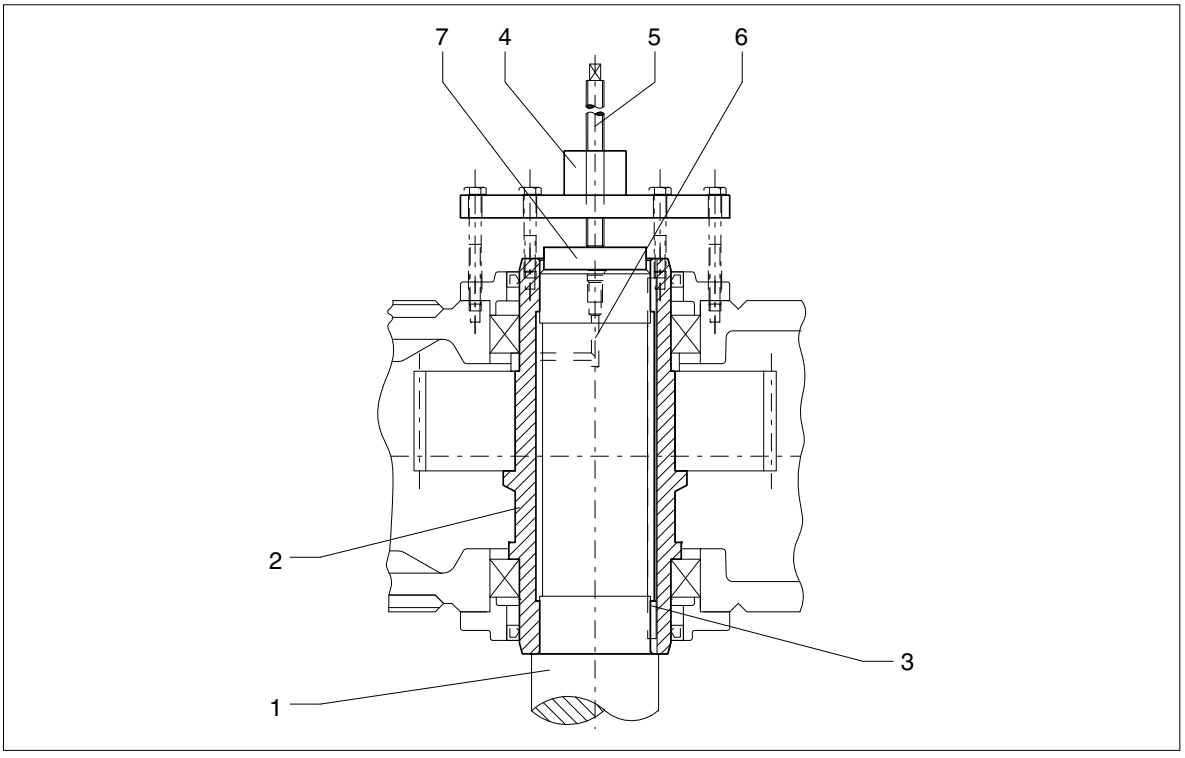


Fig. 55: Hollow shaft with parallel keyway, demounting with hydraulic lifting unit ("Lukas")

1 Machine shaft
2 Hollow shaft
3 Parallel key
4 Hydraulic lifting unit ("Lukas")
5 Threaded spindle
6 Pressure-oil connection
7 Plate for forcing out

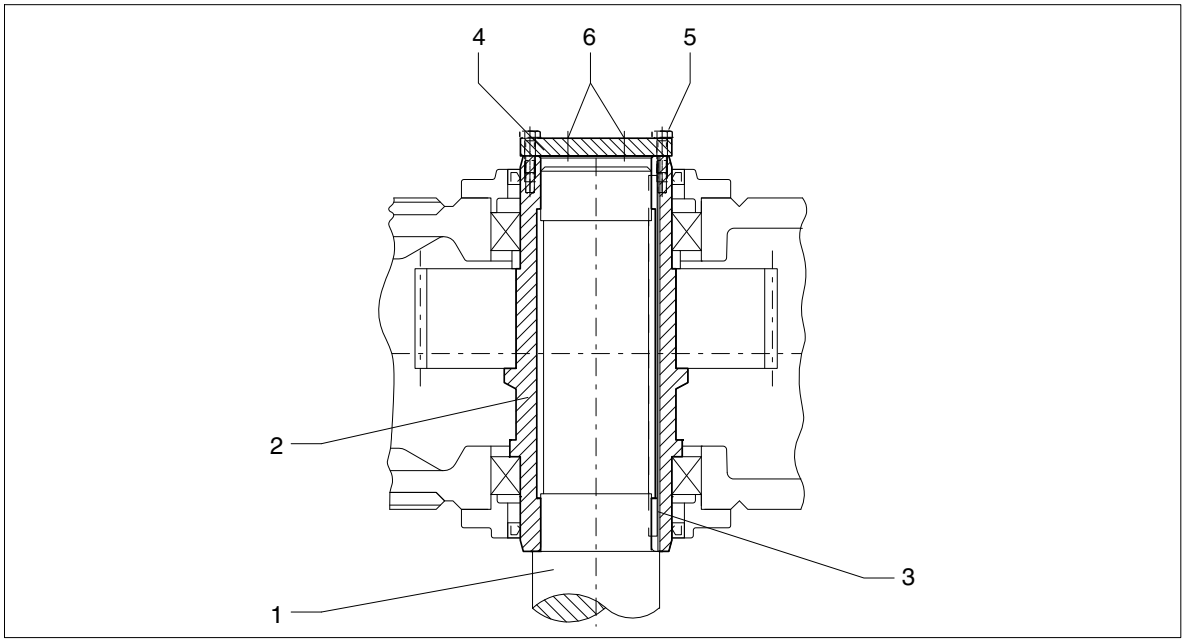


Fig. 56: Hollow shaft with parallel keyway, demounting with end plate

1	Machine shaft	4	End plate for forcing out
2	Hollow shaft	5	Screws
3	Parallel key	6	Forcing screws

STOP **Avoid canting when pulling the unit off.**

The plate for forcing-out is not included in our delivery.

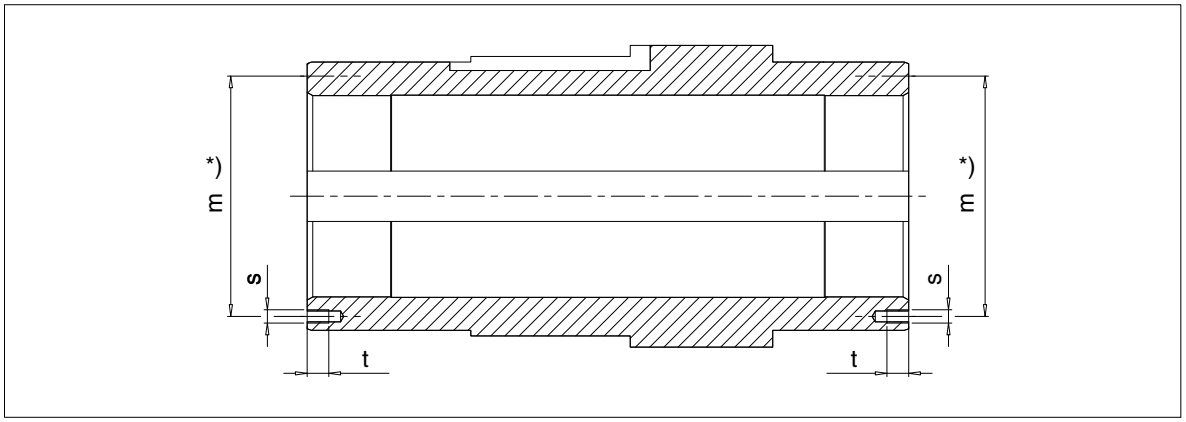


Fig. 57: Hollow shaft with parallel keyway

*) 2 threads offset 180°

Table 22: Threaded holes on the end faces of the gear-unit hollow shafts

Gear-unit size	**m** mm	**s**	**t** mm	**Gear-unit size**	**m** mm	**s**	**t** mm
4	95	M 8	14.5	12	215	M 12	19.5
5	115	M 8	14.5	13	230	M 12	19.5
6	125	M 8	14.5	14	250	M 12	19.5
7	140	M 10	17	15	270	M 16	24
8	150	M 10	17	16	280	M 16	24
9	160	M 10	17	17	300	M 16	24
10	180	M 12	19.5	18	320	M 16	24
11	195	M 12	19.5	19 ... 22	on request		

If the support is provided not only by the hollow shaft, but also by the housing, as shown in fig. 55, the forces used must not exceed the values given in the following table 23.

Table 23: Maximum forcing pressures

Gear-unit size	Maximum forcing pressure N	Gear-unit size	Maximum forcing pressure N
2	11700	11	97200
3	15200	12	113600
4	22600	13	140000
5	33000	14	160000
6	37500	15	193000
7	50000	16	215000
8	56000	17	240000
9	65000	18	266000
10	82000	19 ... 22	on request

If the above values are exceeded, the housing, the hollow-shaft bearings or other gear-unit components may be irreparably damaged. Before replacing the gear unit on the machine shaft, always check the bearings for any signs of damage.

When using forcing screws or threaded spindles, the head of the thread pressing against the driven machine should be rounded and well greased to reduce the risk of seizing at this point.

6.7 Shaft-mounting gear unit with hollow shaft and internal spline to DIN 5480

The shaft end of the driven machine must be designed with internal splines to DIN 5480. Furthermore, a centring hole to DIN 332 Form DS (tapped) should be provided (for the connection dimensions of the driven machine shaft, see dimensioned drawing in the gear unit documentation).

6.7.1 Preparatory work

To facilitate demounting (see also item 6.6.3.), we recommend providing a connection for pressure oil on the end of the driven machine shaft. For this a hole must be drilled through to the hollow shaft bore. This connection may also be used for supplying rust-releasing agent.

6.7.2 Fitting

- Remove the preservative agent from the hollow shaft and the machine shaft with a suitable cleaning agent (such as benzine).

Do not allow the cleaning agent (e.g. benzine) to contact the shaft-sealing rings.

Ensure adequate ventilation. Do not smoke!
Danger of explosion!

- Check the hollow and machine shafts to ensure that seats, teeth or edges are not damaged. If necessary, rework the parts with a suitable tool and clean them again.

Coat with a suitable lubricant to prevent frictional corrosion of the contact surfaces.

6.7.2.1 Fitting with integrated DU bush

- Fit the gear unit by means of nut and threaded spindle. The counterforce is provided by the hollow shaft.

The hollow shaft must be exactly aligned with the machine shaft to avoid canting. When fitting, ensure that the position of the teeth between the machine shaft and hollow shaft is correct. The correct position can be determined by turning the input shaft and/or by swivelling the gear unit lightly around the hollow shaft.

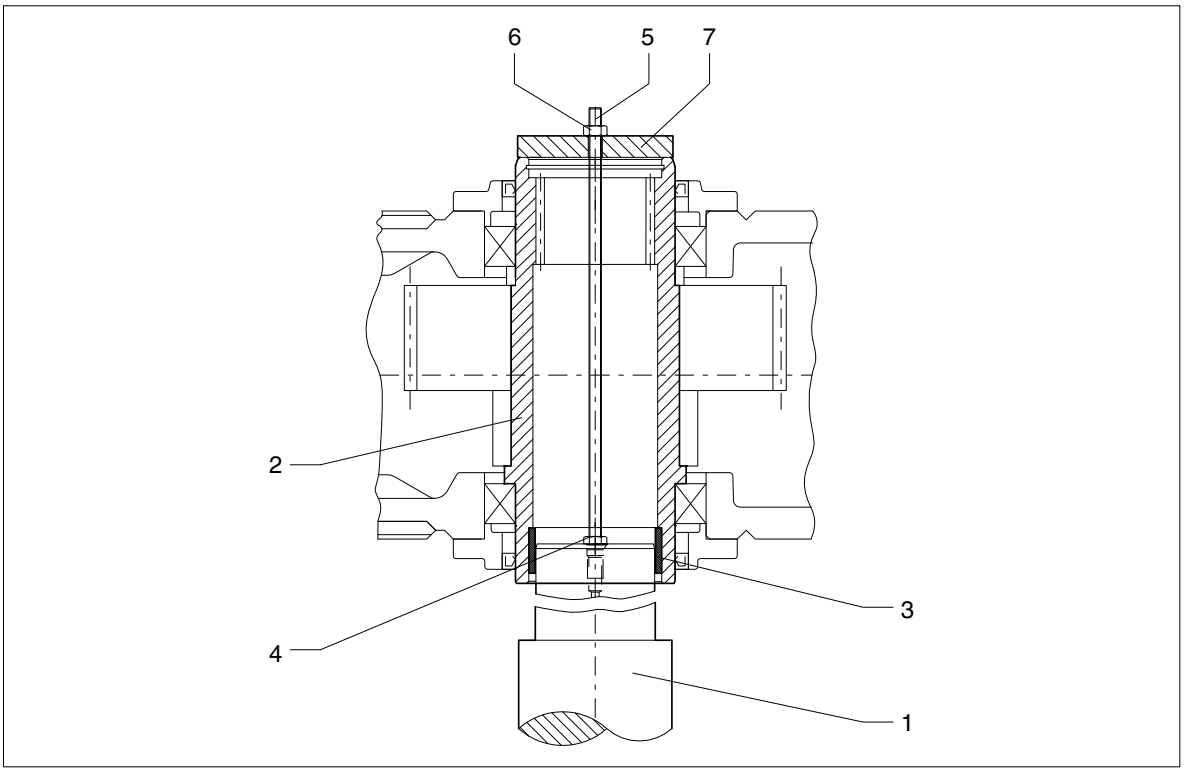


Fig. 58: Hollow shaft with internal spline, mounting with DU bush

1	Machine shaft	4	Nut	7	End plate
2	Hollow shaft	5	Threaded spindle		
3	DU bush	6	Nut		

6.7.2.2 Fitting with loose DU bush

The loose DU bush is pushed onto the machine shaft, fixed rigidly in position with a locating tie and then pulled into the hollow shaft along with the machine shaft (see fig. 58).

The hollow shaft must be exactly aligned with the machine shaft to avoid canting. When fitting, ensure that the position of the teeth between the machine shaft and hollow shaft is correct. The correct position can be determined by turning the input shaft and/or by swivelling the gear unit lightly around the hollow shaft.

Instead of the nut and threaded spindle shown in the diagram, other types of equipment such as a hydraulic lifting equipment (type "Lukas") may be used.

The hollow shaft may be tightened against a machine-shaft collar only if the gear-unit configuration is one of the following:

- Torque arm
- Support with gear-unit swing base

With a different arrangement the bearings may be excessively stressed.

6.7.2.3 Axial fastening

Depending on type, secure the hollow shaft axially on the machine shaft (e.g. with locking ring, end plate, set screw).

6.7.3 Demounting

- Remove the axial securing device from the hollow shaft.
- If frictional corrosion has occurred on the seating surfaces, rust-releasing agent may be used in order to facilitate forcing off the gear unit. The rust releaser can be injected through the pressure-oil connection (see Fig. 59), e.g. using a pump.
- The end plate and the locking ring must first be removed.
- When the rust-releasing agent has taken effect, pull the gear unit off with the device (see figs. 59 and/or 60).
- Removing the gear unit from the driven-machine shaft can be done, depending on local possibilities, as follows:
  - using forcing screws in an end plate (see Fig. 60) or
  - using a central threaded spindle or
  - preferably using a hydraulic lifting unit ("Lukas").

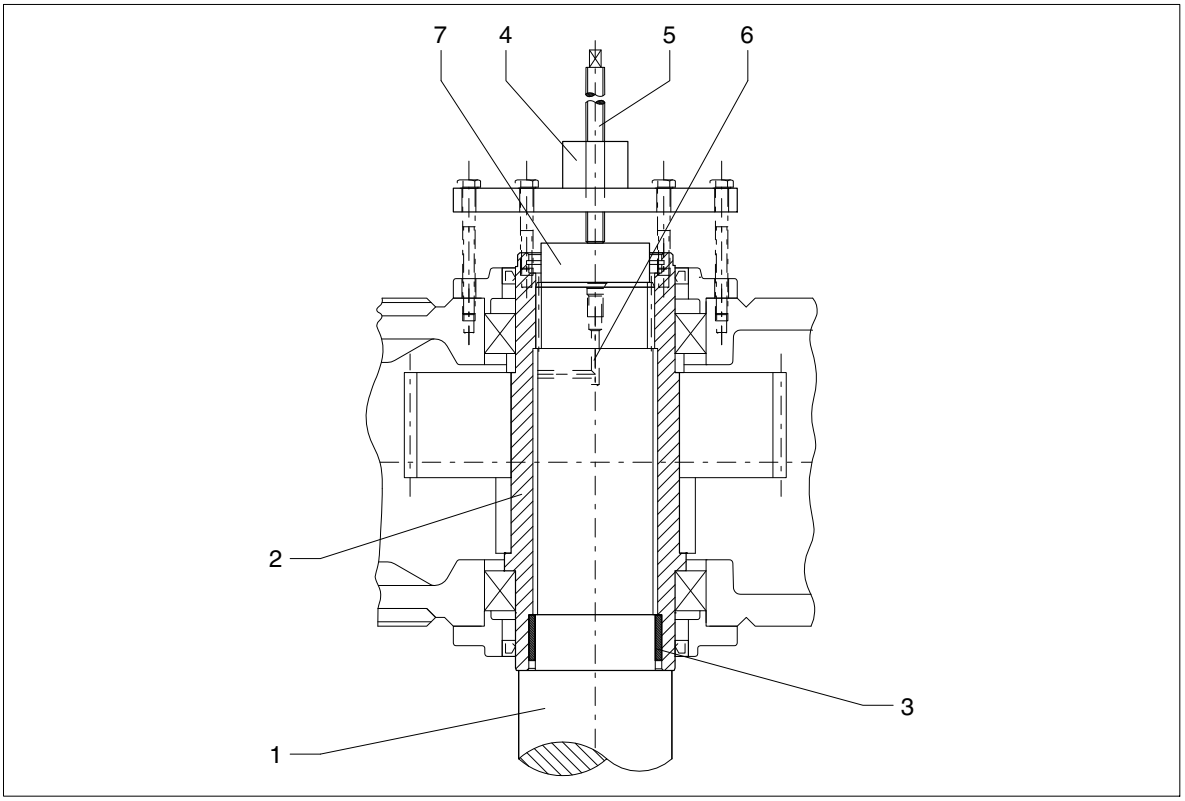


Fig. 59: Hollow shaft with internal spline, demounting with hydraulic lifting equipment ("Lukas")

1 Machine shaft
2 Hollow shaft
3 DU bush
4 Hydraulic lifting unit ("Lukas")
5 Threaded spindle
6 Pressure-oil connection
7 Plate for forcing out

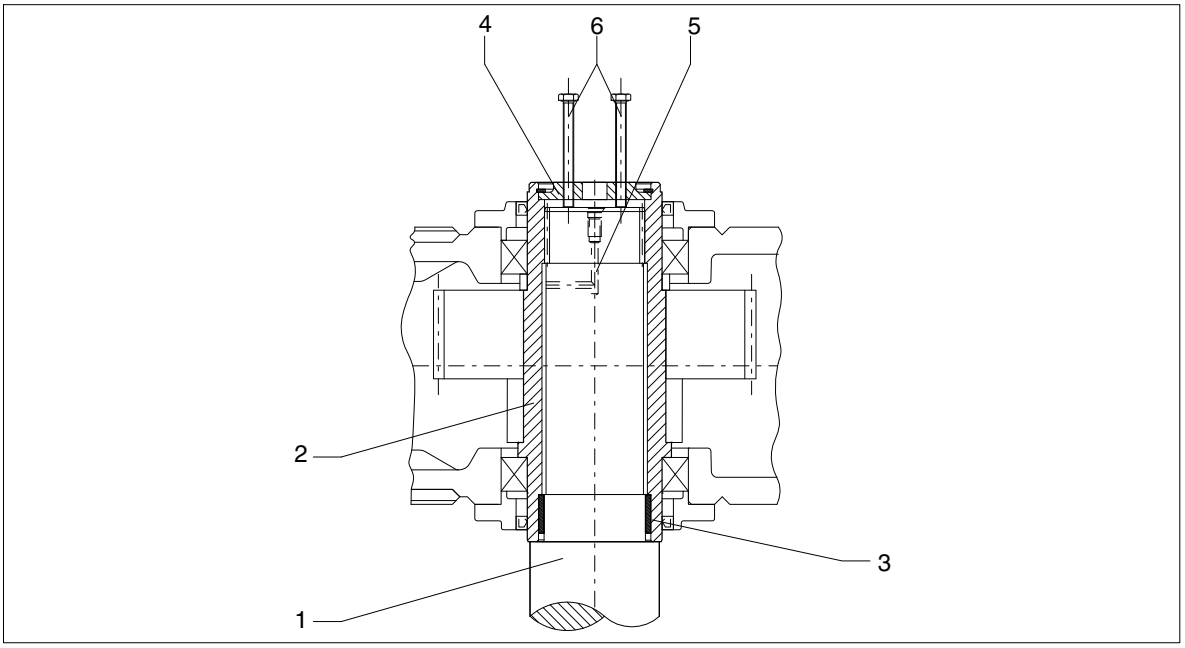


Fig. 60: Hollow shaft with internal spline, demounting with end plate

1	Machine shaft	4	End plate
2	Hollow shaft	5	Pressure-oil connection
3	DU bush	6	Forcing screws

Avoid canting when pulling the unit off.

The plate for forcing-out is not included in our delivery.

If the support is provided not only by the hollow shaft, but also by the housing, as shown in fig. 59, the forces used must not exceed the values given in the following table 24.

Table 24: Maximum forcing pressures

Gear-unit size	Maximum forcing pressure N	Gear-unit size	Maximum forcing pressure N
2	11700	11	97200
3	15200	12	113600
4	22600	13	140000
5	33000	14	160000
6	37500	15	193000
7	50000	16	215000
8	56000	17	240000
9	65000	18	266000
10	82000	19 ... 22	on request

If the above values are exceeded, the housing, the hollow-shaft bearings or other gear-unit components may be irreparably damaged. Before replacing the gear unit on the machine shaft, always check the bearings for any signs of damage.

When using forcing screws or threaded spindles, the head of the thread pressing against the driven machine should be rounded and well greased to reduce the risk of seizing at this point.

6.8 Shaft-mounting gear unit with hollow shaft and shrink disk

The end of the driven machine shaft (material C60+N or higher strength) should have a centring means to DIN 332 Form DS (with thread) in its end face (for connecting dimensions of the driven machine shaft, see dimensioned drawing in the gear-unit documentation).

6.8.1 Fitting

- Remove the preservative agent from the hollow shaft and the machine shaft with a suitable cleaning agent (e.g. benzine).

STOP **Do not allow the cleaning agent (e.g. benzine) to contact the shaft-sealing rings.**

Ensure adequate ventilation. Do not smoke!
Danger of explosion!

- Check the hollow and machine shafts to ensure that seats and edges are not damaged. If necessary, rework the parts with a suitable tool and clean them again.

STOP **The bore of the hollow shaft and the machine shaft must be absolutely free of grease in the area of the shrink disk seat.**
This is essential for safe and reliable torque transmission.
Do not use contaminated solvents or dirty cloths for removing grease.

6.8.1.1 Fitting with integrated DU bush

- Fit the gear unit by means of nut and threaded spindle. The counterforce is provided by the hollow shaft.

STOP **The hollow shaft must be exactly aligned with the machine shaft to avoid canting.**

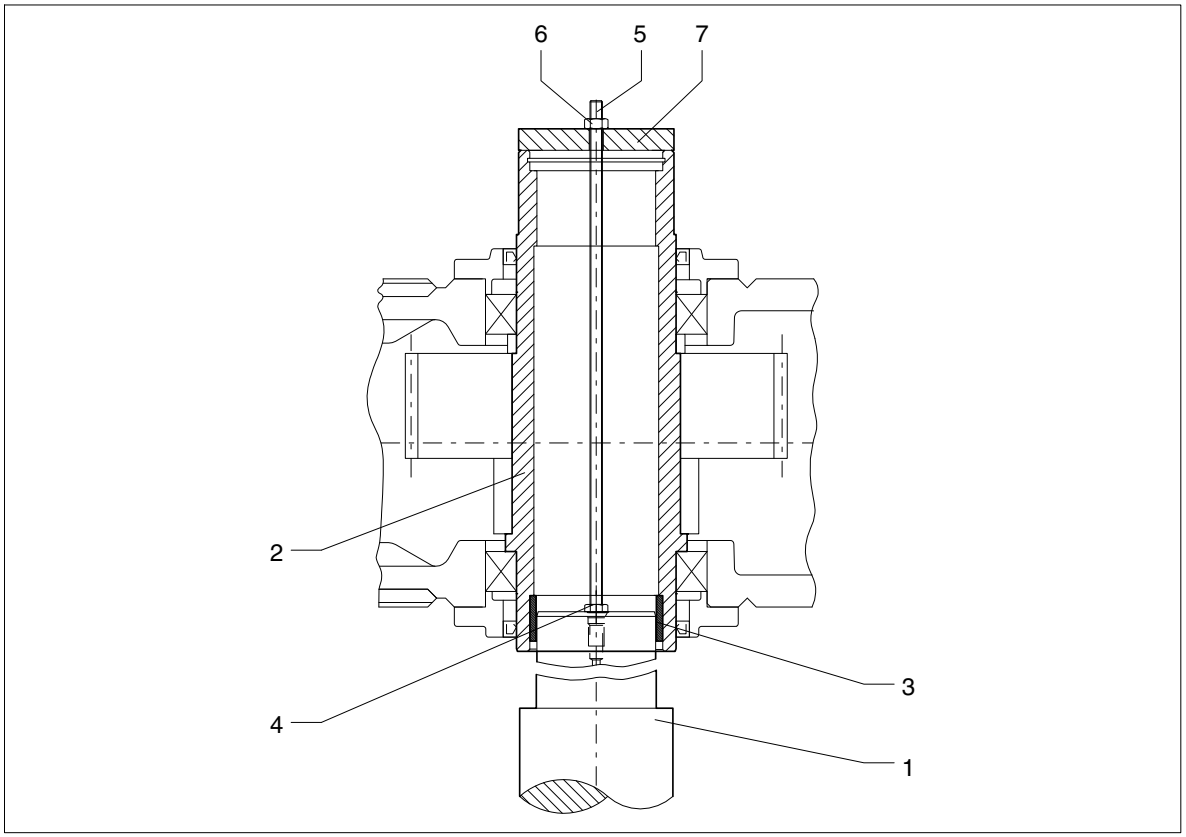


Fig. 61: Hollow shaft in shrink-disk design, mounting with DU bush

1	Machine shaft	4	Nut	7	End plate
2	Hollow shaft	5	Threaded spindle		
3	DU bush	6	Nut		

6.8.1.2 Fitting with loose DU bush

The loose DU bush is pushed onto the machine shaft, fixed rigidly in position with a locating tie and then pulled into the hollow shaft along with the machine shaft (see fig. 61).

The hollow shaft must be exactly aligned with the machine shaft to avoid canting.

Instead of the nut and threaded spindle shown in the diagram, other types of equipment such as a hydraulic lifting equipment (type "Lukas") may be used.

The hollow shaft may be tightened against a machine-shaft collar only if the gear-unit configuration is one of the following:

- Torque arm
- Support with gear-unit swing base

With a different arrangement the bearings may be excessively stressed.

6.8.1.3 Axial fastening

If the shrink disk is fitted according to instructions (see item 6.8), the gear unit is fixed securely in the axial direction. Additional axial fastening is not required.

6.9 Shrink disk

The shrink disk realizes a press-fit connection between a hollow shaft and a stub/machine shaft (in the following called "stub shaft"). The interference fit can transfer torques, bending moments and forces. The jointing pressure between the hollow and stub shafts generated by the shrink disk is essential for the torque and force transmission.

The shrink disk is delivered ready for installation.

The shrink disk must not be dismantled before mounting for the first time.

Mounting and start-up must be carried out by properly trained specialist personnel. Prior to start-up these instructions must be read, understood and adhered to. We accept no liability for personal injury or damage due to non-observance.

6.9.1 Fitting the shrink disk

- Before beginning installation, the hollow shaft and the stub shaft must be carefully cleaned.

Observe manufacturer's instructions for handling lubricants and solvents.

Do not allow cleansing agent or solvent to affect surfaces with paint coating.

The bore of the hollow shaft and the stub shaft must be absolutely clean, free of grease and oil in the area of the shrink disk seat.
This is essential for safe and reliable torque transmission.
Do not use contaminated solvents or dirty cloths nor cleansing agents containing oil (such as paraffin or turpentine) for removing grease.

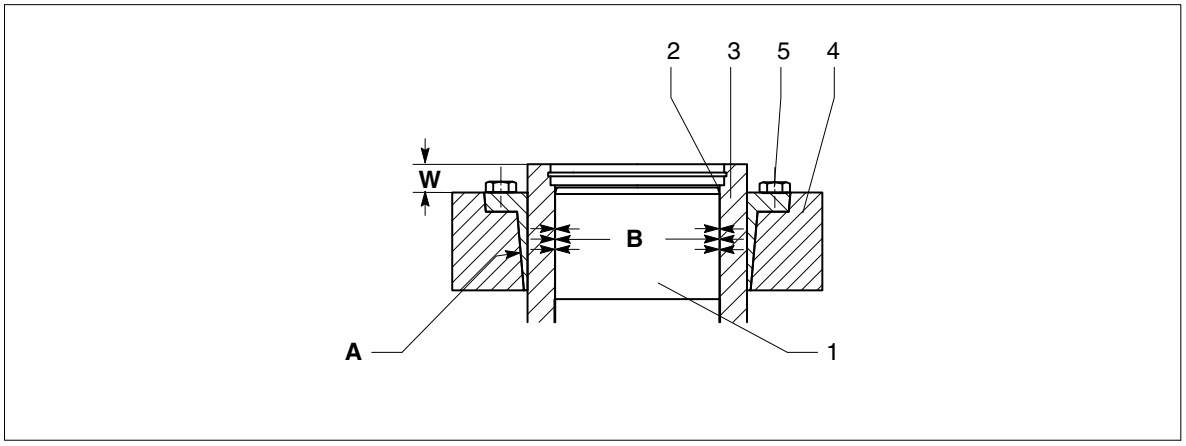


Fig. 62: Fitting the shrink disk

A	Greased	**B**	Absolutely grease- and oil-free	**W**	Installation height
1	Stub shaft	3	Inner ring	5	Tensioning bolt
2	Hollow shaft	4	Outer ring		

The outer surface of the hollow shaft must be lightly greased in the area of the shrink disk seat.

For a detailed view, refer to the dimensioned drawing in the gear-unit documentation.

- Place the shrink disk on the hollow shaft and fasten, if required. For the exact installation height (W) of the shrink disk, refer to the dimensioned drawing.

For transporting and lifting the shrink disk it may be required to use a suitable lifting device!

Make sure that the shrink disk cannot slip off the hollow shaft.

STOP **Do not tighten the tensioning bolts (5) until the stub shaft is installed too.**

- Tighten the tensioning bolts (5) gradually one after the other, working round several times by quarter turns.
- Tighten all tensioning bolts (5) until the end faces of the inner ring (3) and the outer ring (4) are flush and the maximum tightening torque of the tensioning bolts has been achieved. The correct alignment is to be checked using a ruler. The max. tolerance is ± 0.2 mm.

The correct clamping condition can thus be checked visually.

STOP **To avoid overloading the individual bolts, the maximum tightening torque (see table 25) must not be exceeded. If, when tightening the clamping bolts at max. tightening torque, the inner and outer ring are not aligned, Siemens must be consulted.**

Table 25: Maximum torques for tensioning bolts

Tensioning-bolt thread	max. tightening torque per bolt Strength class 12.9 Nm	**Tensioning-bolt thread**	max. tightening torque per bolt Strength class 12.9 Nm
M 8	35	M 20	570
M 10	70	M 24	980
M 12	120	M 27	1450
M 14	193	M 30	1970
M 16	295	M 33	2650

The shrink disk has been identity-marked on the outer ring (4). In case of contacting Siemens this identification must be referred to.

For safety reasons, a protective cover should be mounted to prevent contact! This cover must be applied after completion of all works on the shrink disk.

Only the complete shrink disks supplied by the manufacturer may be used. Combining components from different shrink disks is not permitted.

Tightening the fastening bolts using an impact screwdriver is not permitted!

6.9.2 Demounting the shrink disk

- Remove the protective cover.
- Remove any rust deposits from the shaft and the hollow shaft.

Under no circumstances must the tensioning bolts be unscrewed one after the other.

- Undo all tensioning bolts one after the other by approx. 1/4 turn.

The stored energy of the outer ring is slowly loosened during disassembly via the bolts to be loosened. In order that this is carried out correctly, the procedure described here must be carefully adhered to!

- All tensioning bolts should now be further loosened one after the other by approx. 1 turn.

The outer ring should now release of its own accord from the inner ring. If this is not the case, the outer ring can be detensioned with the forcing threads. To this purpose screw some of the adjacent fastening bolts into the forcing threads. The now releasing outer ring is braced against the remaining bolts. This operation must be carried out until the outer ring completely releases of its own accord.

- The shrink disk is to be secured against axial shifting.
- Draw the stub shaft out of the hollow shaft.
- Pull the shrink disk off the hollow shaft.

For transporting and lifting the shrink disk it may be required to use a suitable lifting device!

6.9.3 Cleaning and greasing the shrink disk

Only dirty shrink disks must be disassembled and cleaned.

- Inspection of all parts for any damage.

Damaged parts must be replaced with new ones! The use of damaged parts is not permissible!

Only the complete shrink disks supplied by the manufacturer may be used. Combining components from different shrink disks is not permitted.

- Thoroughly clean all parts.

Do not use contaminated solvents or dirty cloths nor cleansing agents containing oil (such as paraffin or turpentine) for removing grease.

- The conical surfaces of the inner and outer rings (3 and 4, see Fig. 62) must be free of grease and oil.
  - A thin layer of grease must be applied evenly to the conical surfaces of the inner and outer rings (3 and 4, see Fig. 62).
  - Provide the tensioning bolts (5, see Fig. 62) on the contact surface and on the thread with lubricant.
  - Use a solid lubricant paste with a **high MoS_2-based molybdenum disulphide content** which will not slide during fitting work and which shows the following characteristics:
    - Friction coefficient "μ" = 0.04
    - Resistant to pressure up to a maximum pressure of 300 N/mm^2
    - Ageing-resistant

Table 26: Recommended lubricants for shrink disks after their cleaning [1)]

Lubricant	Form	Manufacturer
Molykote G Rapid	Spray or paste	DOW Corning
Aemasol MO 19 P	Spray or paste	A. C. Matthes
Unimoly P 5	Powder	Klüber Lubrication
gleitmo 100	Spray or paste	Fuchs Lubritec

1) Other lubricants may be used if they have the same characteristics.

- Join inner ring (3) and outer ring (4).
- Place the tensioning bolts and screw in some threads by your fingers.

Observe the manufacturer's instructions for handling lubricants!

Mounting and start-up must be carried out by properly trained specialist personnel.

6.9.4 Re-mounting the shrink disk

For re-mounting the shrink disk the procedure described in item 6.9.1 must be adhered to.

6.9.5 Inspection of the shrink disk

In all cases the inspection relating to the shrink disk should be carried out simultaneously with the examination of the gear unit, **however at least every 12 months**.

Inspection of the shrink disk is limited to a visual assessment of its condition. The following must be observed when carrying out this work:

– loose screws

– damage caused by force

– flush position of the inner ring (3) in relation to outer ring (4)

6.10 Couplings, clutches

As a rule, flexible couplings or safety slip clutches are provided for the drive of the gear unit.

If rigid couplings or other in- and/or output elements, which create additional radial and/or axial forces, (e.g. gear wheels, belt pulleys, disk flywheels, hydraulic couplings) are to be used, this must be agreed by contract.

Couplings must be balanced in accordance with the specifications in the pertinent instructions manual!

For maintenance and operation of the couplings, refer to the specific operating instructions for the couplings.

When installing the drives, make absolutely certain that the individual components are accurately aligned in relation to each other. Inadmissibly large errors in the alignment of the shaft ends to be connected due to angular and/or axial misalignments result in premature wear and/or material damage.
Insufficiently rigid base frames or sub-structures can also during operation cause a radial and/or axial misalignment, which cannot be measured when the unit is at a standstill.

For permissible alignment errors in the case of couplings supplied by Siemens, please refer to the operating instruction manuals for the couplings.
If you use couplings manufactured by other manufacturers, ask these manufacturers which alignment errors are permissible, stating the radial loads occurring.

Increased system-service life and reliability and reduced running noise can be achieved through the least possible radial and angular misalignment.

The coupling parts may get out of alignment

- due to imprecise alignment during assembly or installation
- during operation of the system due to:
  - heat expansion, shaft flexure, too weak machine frames, etc.

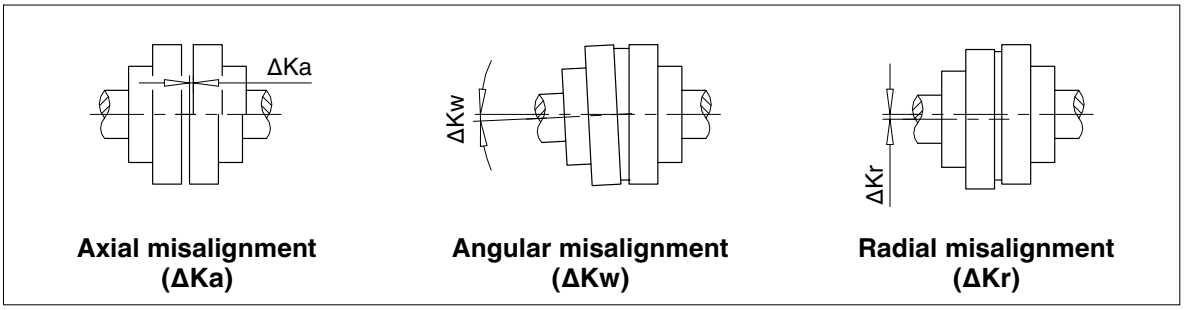


Fig. 63: Possible misalignments

Alignment has to be done in two axial planes arranged perpendicularly to each other. This can be done by means of a ruler (radial misalignment) and feeler gauge (angular misalignment), as shown in the illustration. The aligning accuracy can be increased by using a dial gauge or a laser alignment system.

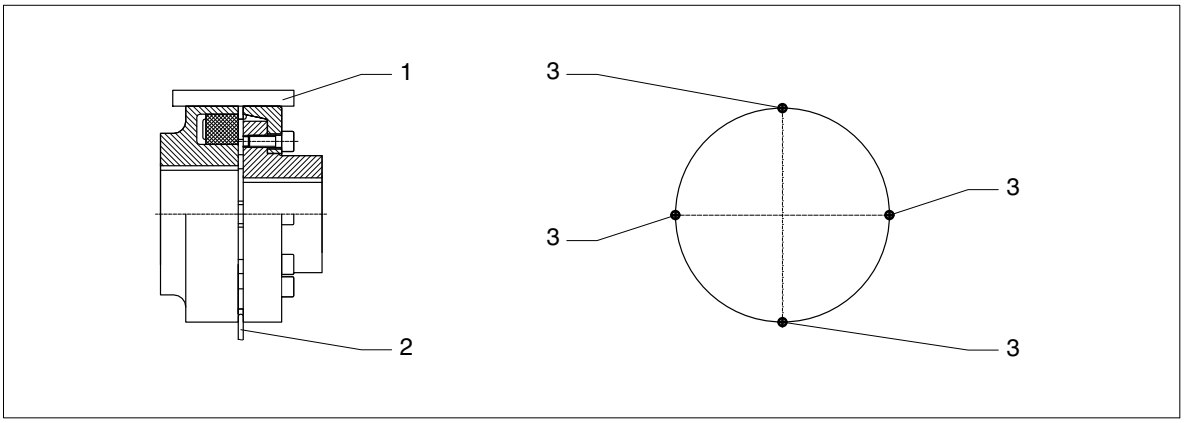


Fig. 64: Example of alignment on a flexible coupling

1 Ruler 2 Feeler gauge 3 Measuring points

STOP **The maximum permissible misalignment values are specified in the operating instructions for the coupling; they must under no circumstances be exceeded during operation.**
Angular and radial misalignments may occur at the same time. The sum of both misalignments must not exceed the maximum permissible value of the angular or radial misalignment.
If you use couplings manufactured by other manufacturers, ask these manufacturers which alignment errors are permissible, stating the radial loads occurring.

☞ For alignment of the drive components (vertical direction), it is recommended to use packing or foil plates underneath the mounting feet. The use of claws with set screws on the foundation for lateral adjustment of the drive components is also advantageous.

In the case of gear units with hollow output shafts or flange output shafts, the coupling on the output side is not required. Gear units with hollow output shafts must be mounted on the shafts of the customer's machinery. Gear units with flanged output shafts must be mounted on the customer's shaft via a counterflange.

6.11 Gear unit with flanged shaft

The front area of the flanged shaft must be absolutely free of grease.
This is essential for safe and reliable torque transmission. Do not use contaminated solvents or dirty cloths for removing grease.

Before tightening the tensioning bolts it must be ensured that the flange centring means are inserted one inside the other.
Then tighten diametrically opposed tensioning bolts to full torque.

- Tightening torques of flange bolts for gear units:

Table 27: Tightening torques for flange connections

Gear-unit size	Strength class		Tightening torque
	Bolt DIN 931	Nut DIN 934	
5 ... 6	10.9	10	610 Nm
7 ... 10	10.9	10	1050 Nm
11 ... 16	10.9	10	2100 Nm
17 ... 20	10.9	10	3560 Nm
21 ... 22	10.9	10	5720 Nm

6.12 Gear unit with block flange

The front area of the block flange must be absolutely free of grease.
This is essential for safe and reliable torque transmission. Do not use contaminated solvents or dirty cloths for removing grease.

Tighten diametrically opposed tensioning bolts to full torque.

The joint bolts must be tightened to the prescribed torque. For the correct torque, refer to item 6.23. Bolts of the minimum strength class 8.8 must be used. The transmittable gear-unit torque is limited by the bolted joint on bolt circle K_1.

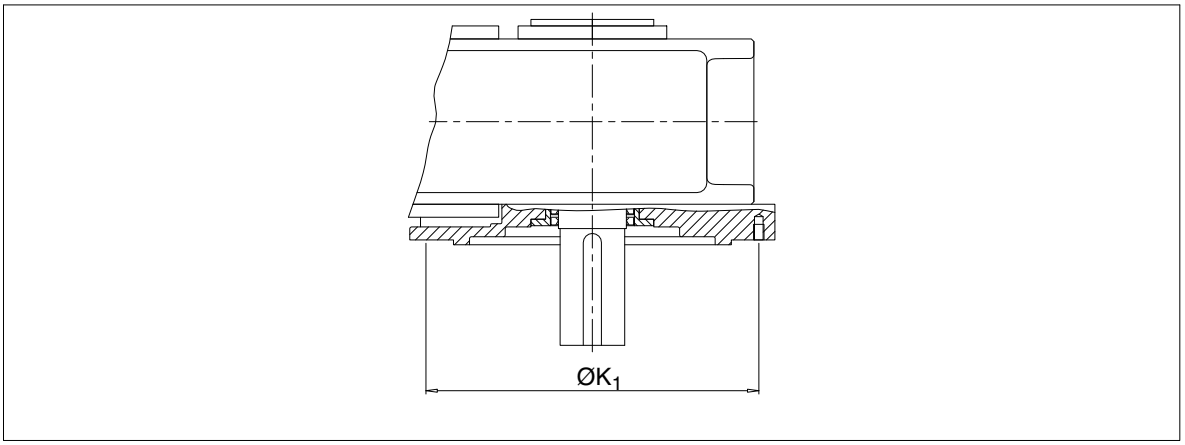
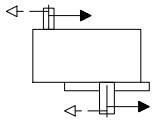
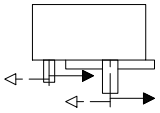
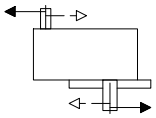
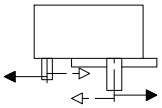
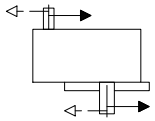
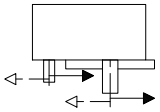
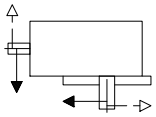
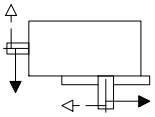
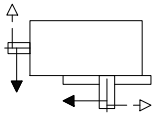
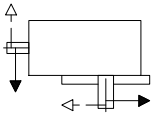
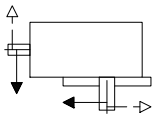
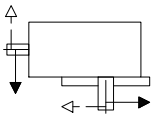


Fig. 65: Illustration with block flange

Table 28: Types and rotation directions

Type	Configuration 1)	
	A	B
H2.V		
H3.V		
H4.V		
B2.V		
B3.V		
B4.V		

1) Configurations with hollow output shaft on request

6.13 Mounting the torque arm for the gear-unit housing

6.13.1 Attaching the torque arm

The torque arm must be mounted stress-free on the machine side

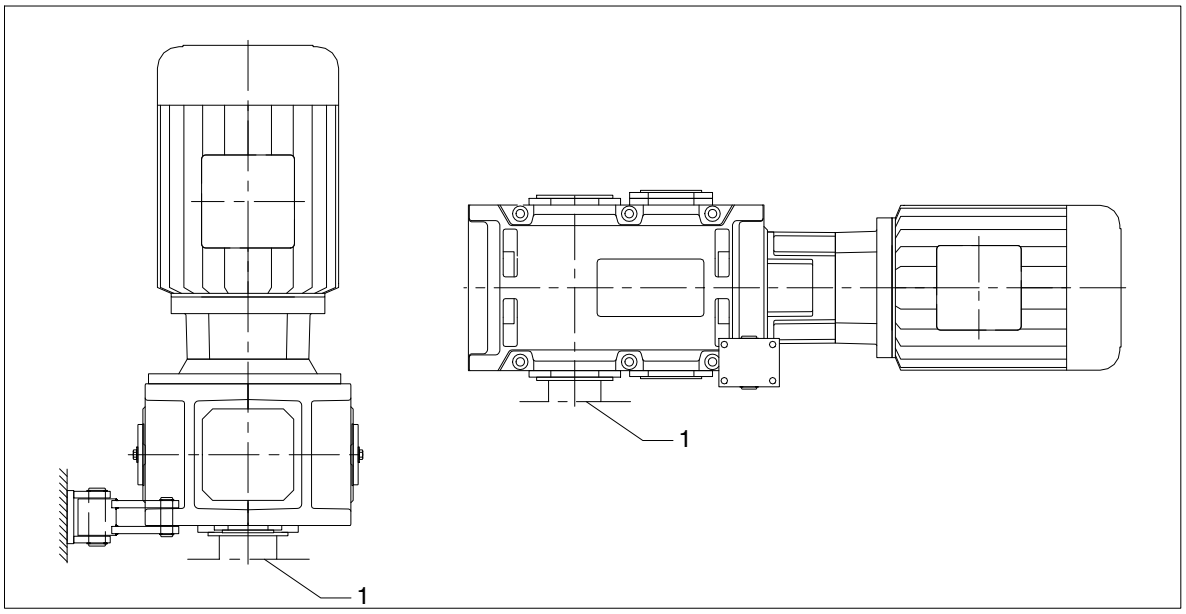


Fig. 66: Torque arm for gear-unit housing

1 Machine side

Table 29: Motor types and torque arms

Gear-unit size	Max. permissible standard-motor size					
	Gear type			Gear type		
	H2	H3	H4	B2	B3	B4
1	-	-	-	112	-	-
2	-	-	-	132	-	-
3	200	-	-	180	180	-
4	225	-	-	200	200	-
5 ... 6	250	250	-	225	225	-
7 ... 8	315M	315M	180	280	280	200
9 ... 10	315M	315M	225	280	280	225
11 ... 12	315M	315M	250	315M	315M	280
13 ... 14	355	355	315M	355	355	315M
15 ... 16	-	355	315	-	355	355M
17 ... 18	-	355	355M	-	355	355
19 ... 22	on request					

Larger motors should be used only with approval of Siemens.

Foundation type for fastening the torque arm, see item 6.3.1, "Foundation".

6.14 Gear units with cooling coil

- Before connecting the cooling coil the screw plugs must be removed from the connecting bushes.
- Flush the cooling coil (in order to remove any contamination).
- Connect the cooling-water in- and outflow pipes (for exact position of the connections, see dimensioned drawing).

☞ Observe also item 5.8.2.

6.15 Gear unit with add-on components

- For the technical data to the add-on components, as stated in item 6.16 to 6.21, refer to the order-specific list of equipment.
- The electrical equipment for regulation and control must be wired in accordance with the equipment suppliers' instructions.
- For operation and maintenance the operating instructions provided specifically for the order and the specifications in items 5.8.2 to 5.12 must be observed.

6.16 Gear units with add-on air oil-cooler

- Wire the contamination indicator for switchover filter (for gear-unit sizes ≥ 13) and pressure monitor electrically.
- Connect the fan motor electrically.

☞ Observe also item 5.8.3.

6.17 Gear units with add-on water oil-cooler

- Before connecting the water oil-cooler remove the sockets from the cooling-water connections.
- Flush the water oil-cooler (in order to remove any contamination).
- Connect the cooling-water in- and outflow pipes (for flow direction and exact position of connections, see dimensioned drawing).

STOP **Make sure when installing the piping that no forces, moments or vibrations act upon the connections of the water oil-cooler.**

- Wire the pressure monitor electrically (in case of gear units with corresponding equipment only).

☞ Observe also item 5.8.4.

6.18 Gear unit with heating element

- Wire heating elements electrically.

6.19 Gear unit with oil-temperature monitoring system

- Wire the resistance thermometer with evaluating instrument (to be provided by customer) electrically.

6.20 Bearing-monitoring system

- The bearing-monitoring device must be fitted by the customer.

6.21 Gear unit with speed transmitter

- Wire the speed transmitter electrically.

6.22 Final work

- After installation of the gear unit check all screw connections for tight fit.
- Check the alignment after tightening the fastening elements (the alignment must not have been changed).
- Check that all the devices which have been demounted for transport reasons have been refitted.
  – For this refer to the details in the data sheet, the list of equipment and the associated drawings.
- Any oil-drain cocks must be secured against accidental opening.
- The gear unit must be protected against falling objects.
- Protective devices for rotating parts must be checked for correct seating. Contact with rotating parts is not permitted.
- A potential equalisation in accordance with the applying regulations and directives must be carried out! If no threaded holes for earth connection are available on the gear unit, other appropriate measures must be taken. This work must always be done by specialist electricians.
- Cable entries should be protected against moisture.
- Check that protective measures have been taken!

6.23 Screw-connection classes, tightening torques and initial tensioning forces

6.23.1 Screw-connection classes

The specified screw connections are to be fastened applying the tightening torques specified in the table below.

Table 30: Screw-connection classes

Screw-connection class	**Distribution of emitted torque on the tool**	**Tightening procedure** (Usually the tightening processes lie within the stated tool distribution)
C	± 5 % up to ± 10 %	- Hydraulic tightening with mechanical screwdriver - Torque-controlled tightening with torque wrench, signal-emitting torque wrench - Tightening with precision mechanical screwdriver with dynamic torque measuring
D	± 10 % up to ± 20 %	- Torque-controlled tightening with mechanical screwdriver
E	± 20 % up to ± 50 %	- Tightening with pulse screwdriver or impact wrench without adjustment checking device - Tightening by hand, using a spanner without torque measuring device

6.23.2 Tightening torques and initial tensioning forces

The tightening torques apply to friction coefficients of μ_{total} = 0.14. The friction coefficient μ_{total} = 0.14 applies here to lightly oiled steel bolts, black-annealed or phosphatised and dry, cut mating threads in steel or cast iron. Lubricants which alter the friction coefficient must not be used and may overload the screw connection.

Table 31: Initial-tensioning forces and tightening torques for screw connections of strength classes **8.8; 10.9; 12.9** with a common friction coefficient of **μ_{total} = 0.14**

Nominal thread diameter	Strength class of the bolt	Initial tensioning force for screw-connection classes from table 30			Tightening torque for screw-connection classes from table 30		
		C	D	E	C	D	E
d mm		$F_{M\ min.}$ N			M_A Nm		
M10	8.8	18000	11500	7200	44.6	38.4	34.3
	10.9	26400	16900	10600	65.4	56.4	50.4
	12.9	30900	19800	12400	76.5	66.0	58.9
M12	8.8	26300	16800	10500	76.7	66.1	59.0
	10.9	38600	24700	15400	113	97.1	86.6
	12.9	45100	28900	18100	132	114	101
M16	8.8	49300	31600	19800	186	160	143
	10.9	72500	46400	29000	273	235	210
	12.9	85000	54400	34000	320	276	246
M20	8.8	77000	49200	30800	364	313	280
	10.9	110000	70400	44000	520	450	400
	12.9	129000	82400	51500	609	525	468
M24	8.8	109000	69600	43500	614	530	470
	10.9	155000	99200	62000	875	755	675
	12.9	181000	116000	72500	1020	880	790
M30	8.8	170000	109000	68000	1210	1040	930
	10.9	243000	155000	97000	1720	1480	1330
	12.9	284000	182000	114000	2010	1740	1550
M36	8.8	246000	157000	98300	2080	1790	1600
	10.9	350000	224000	140000	2960	2550	2280
	12.9	409000	262000	164000	3460	2980	2670
M42	8.8	331000	212000	132000	3260	2810	2510
	10.9	471000	301000	188000	4640	4000	3750
	12.9	551000	352000	220000	5430	4680	4180
M48	8.8	421000	269000	168000	4750	4090	3650
	10.9	599000	383000	240000	6760	5820	5200
	12.9	700000	448000	280000	7900	6810	6080
M56	8.8	568000	363000	227000	7430	6400	5710
	10.9	806000	516000	323000	10500	9090	8120
	12.9	944000	604000	378000	12300	10600	9500
M64	8.8	744000	476000	298000	11000	9480	8460
	10.9	1060000	676000	423000	15600	13500	12000
	12.9	1240000	792000	495000	18300	15800	14100
M72x6	8.8	944000	604000	378000	15500	13400	11900
	10.9	1340000	856000	535000	22000	18900	16900
	12.9	1570000	1000000	628000	25800	22200	19800

Nominal thread diameter d mm	Strength class of the bolt	Initial tensioning force for screw-connection classes from table 30			Tightening torque for screw-connection classes from table 30		
		C	D	E	C	D	E
		$F_{M\ min.}$ N			M_A Nm		
M80x6	8.8	1190000	760000	475000	21500	18500	16500
	10.9	1690000	1100000	675000	30500	26400	23400
	12.9	1980000	1360000	790000	35700	31400	27400
M90x6	8.8	1510000	968000	605000	30600	26300	23500
	10.9	2150000	1380000	860000	43500	37500	33400
	12.9	2520000	1600000	1010000	51000	43800	39200
M100x6	8.8	1880000	1200000	750000	42100	36200	32300
	10.9	2670000	1710000	1070000	60000	51600	46100
	12.9	3130000	2000000	1250000	70000	60400	53900

☞ Damaged bolts must be replaced with new bolts of the same type and strength class.

7. Start-up

Observe the instructions in section 3, "Safety instructions"!

The gear unit must not be started up if the required instructions are not to hand.

7.1 Procedure before start-up

7.1.1 Removal of preservative agent

The location of the oil-draining points is marked by an appropriate symbol in the dimensioned drawing in the gear-unit documentation.

Oil-draining point:

- Place suitable containers under the oil-draining points.
- Unscrew the oil-drain plug or open the oil-drain cock.
- Remove remaining preservative agent and/or running-in oil from the gear unit using a suitable container, unscrew any existing residual-oil drain plugs, to do so.
- Dispose of remaining preservative agent and/or running-in oil in accordance with regulations.

Remove any oil spillage immediately with an oil-binding agent.
The oil must not come into contact with the skin (e.g. the operator's hands).
The safety notes on the data sheets for the oil used must be observed here!

- Screw in oil-drain plug or reclose oil-drain cock.
- Screw in any unscrewed residual-oil-drain plugs again.

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

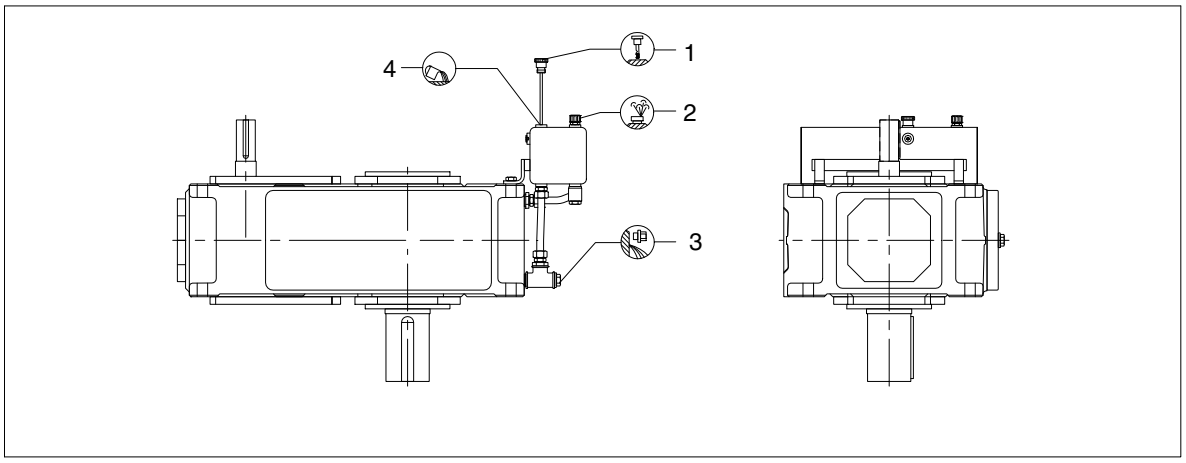


Fig. 67: Oil inlet/oil drain gear unit H..V ≤ 12

1	Oil dipstick	3	Oil-drain plug
2	Breather screw or screw plug	4	Oil inlet

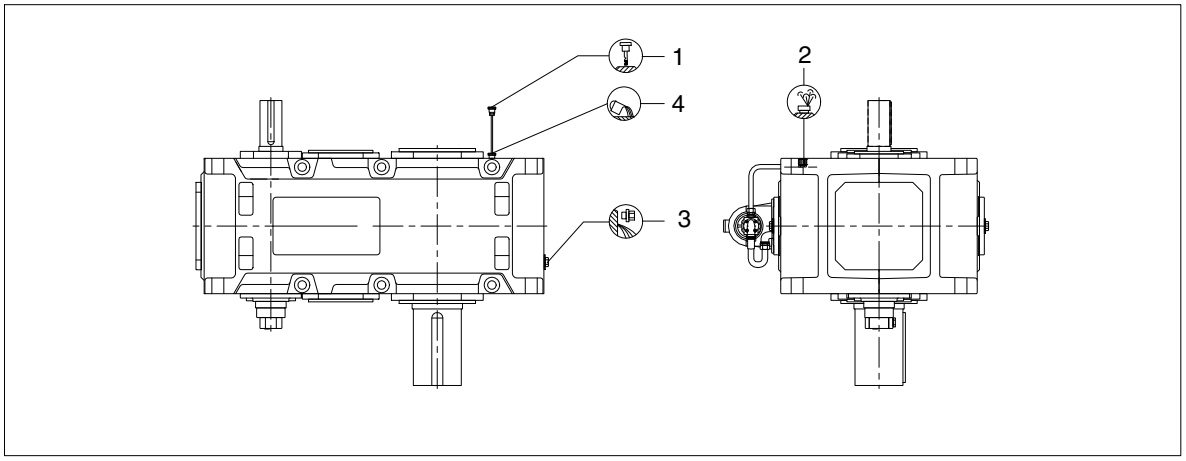


Fig. 68: Oil inlet/oil drain gear unit H..V ≥ 13

1 Oil dipstick
2 Breather screw or screw plug
3 Oil-drain plug
4 Oil inlet

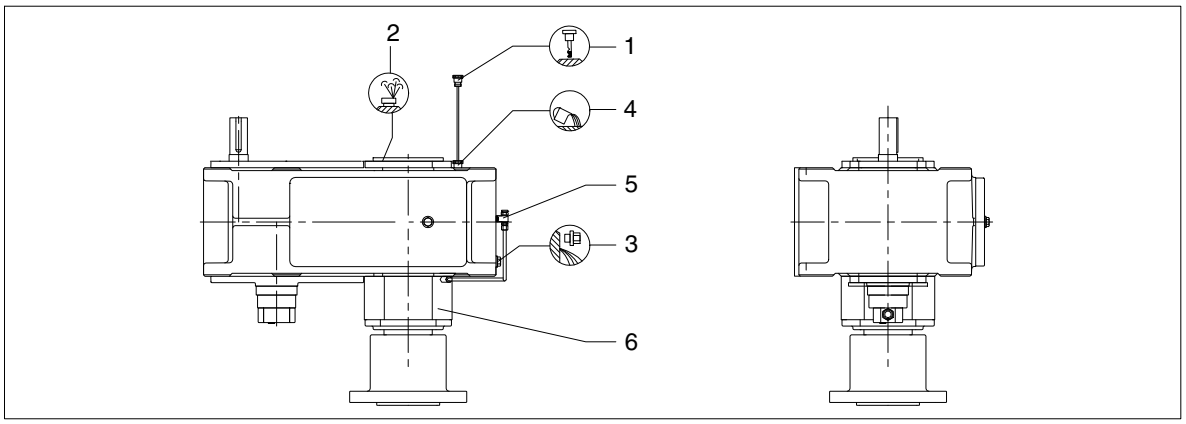


Fig. 69: Oil inlet/oil drain aerator gear unit H.BV

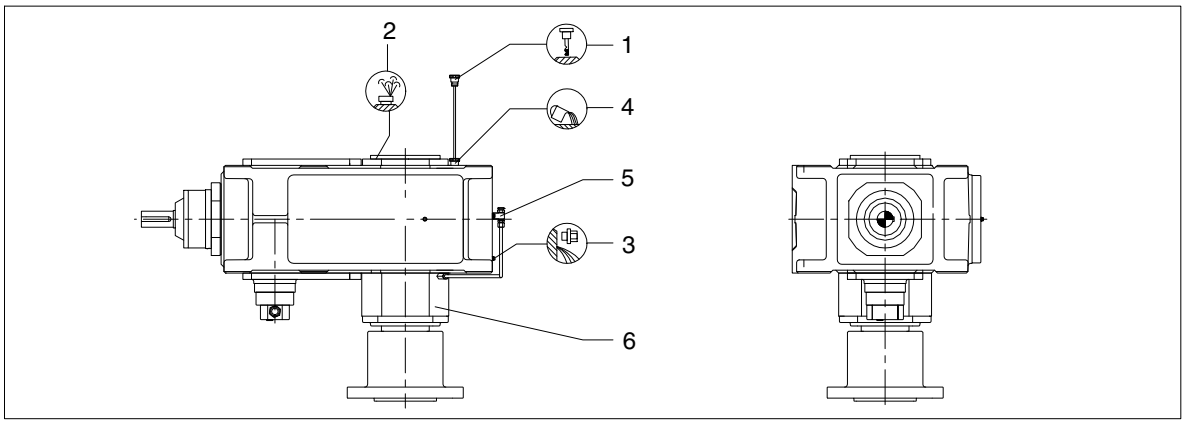


Fig. 70: Oil inlet/oil drain aerator gear unit B3BV

1 Oil dipstick
2 Breather screw or screw plug
3 Oil-drain plug
4 Oil inlet
5 Lubricating point
6 Grease-lubricated rolling bearing

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

7.1.2 Filling with lubricant

- To fill with oil, unscrew the oil dipstick on the gear unit or oil-equalising tank

Using a filter, fill the gear unit with fresh oil (max. mesh 25 µm) up to the MAX mark on the oil dipstick.

The quality of the oil used must meet the requirements of the separately supplied BA 7300 operating instructions, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in BA 7300, because they have been tested and meet the requirements.
Information on the type, quantity and viscosity of the oil is given on the rating plate on the gear unit.
The oil quantity shown on the rating plate is to be understood as an approximate quantity. The marks on the oil dipstick must always be observed.

In the case of gear units fitted with forced lubrication or an oil-cooling system, the oil circuit must also be charged with oil. To do this, briefly start up the gear unit with add-on pump (observing the description in section 8).

- Check the oil level in the gear housing or in the oil-equalising tank using the dipstick

The oil level must be at the upper mark on the oil dipstick.

Remove any oil spillage immediately with an oil-binding agent.

- Screw in the oil dipstick.

7.1.2.1 Oil quantities

Table 32: Approximate figures for the required oil quantity in vertically mounted gear units with **splash lubrication** (gear units with oil-equalising tank)

Type	Oil quantity (approximate value) in litres for size											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
H2SV, H2HV, H2DV, H2RV, H2TV, H2GV, H2JV	-	-	14	23	35	37	62	69	98	110	160	180
H3SV, H3HV, H3DV, H3RV, H3TV, H3GV, H3JV	-	-	-	-	36	40	64	70	110	120	190	205
H4SV, H4HV, H4DV, H4RV, H4TV, H4GV, H4JV	-	-	-	-	-	-	60	65	105	110	175	200
B2SV, B2HV, B2DV, B2RV, B2TV, B2GV, B2JV	5	9,5	11,5	23,5	38	46	74	81	115	120	190	225
B3SV, B3HV, B3DV, B3RV, B3TV, B3GV, B3JV	-	-	14	20	34	36	60	68	96	105	155	175
B4SV, B4HV, B4DV, B4RV, B4TV, B4GV, B4JV	-	-	-	-	36	40	65	73	105	110	175	200

Table 33: Approximate figures for the required oil quantity in vertically mounted agitator gear units with **splash lubrication** (gear units with oil-equalising tank)

Type	Oil quantity (approximate value) in litres for size							
	5	**6**	**7**	**8**	**9**	**10**	**11**	**12**
H2RV H2TV	35	37	62	69	98	110	160	180
H2GV H2JV	23	27	58	62	100	110	160	180
H3RV H3TV	36	40	64	70	110	120	190	205
H3GV H3JV	35	37	60	72	100	110	170	190
H4RV H4TV	-	-	60	65	105	110	175	200
H4GV H4JV	-	-	50	60	95	110	165	180

Table 34: Approximate values for oil quantity required in case of vertical mounting position **with forced lubrication**

Type	Oil quantity (approximate value) in litres for sizee														
	5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19-22**
H2SV, H2HV, H2DV, H2RV, H2TV, H2GV, H2JV	17,5	18,5	31	35	49	55	80	90	120	135	185	200	265	285	on request
H3SV, H3HV, H3DV, H3RV, H3TV, H3GV, H3JV	24	27	42	47	73	80	110	120	160	180	225	260	325	335	
H4SV, H4HV, H4DV, H4RV, H4TV, H4GV, H4JV	-	-	44	48	78	81	113	129	140	160	220	230	280	300	
B2SV, B2HV, B2DV, B2RV, B2TV, B2GV, B2JV	19	23	37	40	57	60	95	110	125	140	190	200	270	295	
B3SV, B3HV, B3DV, B3RV, B3TV, B3GV, B3JV	17	18	30	34	48	52	77	87	115	130	180	190	260	275	
B4SV, B4HV, B4DV, B4RV, B4TV, B4GV, B4JV	18	20	32	36	52	55	87	100	135	150	210	220	270	285	

Table 35: Approximate values for oil quantity required in case of vertical mounting position of the agitator gear units **with forced lubrication**

Type	Oil quantity (approximate value) in litres for size											
	7	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
H2RV H2TV	31	35	49	55	80	90	120	135	185	200	265	285
H2GV H2JV	22	25	42	46	60	70	80	90	140	150	175	185
H3RV H3TV	44	49	75	83	113	123	160	180	225	260	325	335
H3GV H3JV	25	30	40	45	66	75	115	126	180	190	190	200
H4RV H4TV	37	40	64	67	106	122	115	125	170	180	220	230
H4GV H4JV	20	25	38	45	65	75	95	105	150	160	190	200

Table 36: Approximate values for oil quantity required in case of vertical mounting position of the aerator gear units **with forced lubrication**

Type	Oil quantity (approximate value) in litres for size											
	5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
H2BV	14	15	25	28	40	44	64	72	95	110	160	180
H3BV	12,5	14	22	24	38	42	66	72	85	105	130	160
B3BV	14	15	27	30	39	42	62	71	96	105	150	155

Table 37: Approximate values for oil quantity required in case of vertical mounting position of the pulper gear units **with forced lubrication**

Type	Oil quantity (approximate value) in litres for size										
	8	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
B2PV	28	42	45	75	80	95	100	130	130	185	185

7.2 Start-up

Before start-up, replace the yellow plastic screw plug with the air filter (see also notice on gear unit).

7.2.1 Oil level

Check the oil level in the gear unit with the oil dipstick. To do so, the gear unit must be shut down.

When the oil is cool, the level should be at the upper mark on the oil dipstick. When the oil is warm it may slightly exceed this mark.

It must in no case be allowed to fall below the mark. If necessary, top up to the correct level.

7.2.2 Gear unit with cooling coil or external oil-supply system

The permissible pressure and temperature values specified in the data sheet and/or list of equipment must not be exceeded.
This is to be checked before the start-up.

- Fully open the stop valves in the coolant in- and outflow pipes of the cooling system.
- Check that connecting lines are correctly fastened and tight.

For connecting dimensions, refer to the dimensioned drawing of the gear unit. The required cooling water quantity and the max. permissible inlet temperature are given on the data sheet and/or the list of equipment.

7.2.3 Heating

Never switch the heating on, unless complete immersion of the rod heater in the oil bath is ensured. Fire hazard!
If heating elements are installed afterwards the maximum heating capacity (see Table 20 in item 5.10) on the outer surface of the heating element must not be exceeded.

The correct setting of the switch points must be checked!

7.2.4 Checking procedure

The following visual checks must be conducted and recorded when starting up:

- □ Oil level
- □ Leaktightness of the oil-cooling or oil-supply lines
- □ Opening condition of the shut-off valves
- □ Effectiveness of the shaft seals
- □ Freedom of the rotating parts from contact

The tension pressures and/or pretensioning forces in accordance with item 6.3.2.4 must also be recorded in this document.

The document must be kept with the instructions.

7.3 Removal from service

- Switch off drive unit.

Secure the drive unit to prevent it from being started up unintentionally.
Attach a warning notice to the start switch!

- In the case of gear units fitted with cooling coil or water oil-coolers, close the stop valves on the water in- and outflow pipes. To prevent freezing, drain the water from the cooling coil or the water oil-cooler.
- Start the gear unit and allow it to run briefly (5 to 10 minutes) approx. every 3 weeks (during a shut-down period no longer than 6 months).
- Treat the gear unit with preservative, see items 7.3.1 and 7.3.2 (before a shut-down period exceeding 6 months).

7.3.1 Interior preservation during longer disuse

Depending on the type of lubrication and/or shaft sealing, the following types of interior preservation can be applied.

7.3.1.1 Interior preservation with gear oil

Gear units with splash-lubrication systems and contacting shaft seals can be filled with the correct type of service oil up to a point just below the air filter.

7.3.1.2 Interior preservation with preservative agent

Before longer shut-down periods gear units with forced lubrication systems, oil circulation cooling and/or non-contacting shaft seals should be filled with preservative agent and run without load.

7.3.1.3 Interior-preservation procedure

- Stop the gear unit.
- Drain oil into a suitable container (see section 10, "Maintenance and Repair").
- Unscrew the air filter including the reducing screw.
- Pour in the preservative agent through the hole of the reducing screw up to the top mark on the oil-sight glass.

For preservative agent see table 11 or 12 in item 4.4.1!

- Screw in the air filter including reducing screw.
- Start the gear unit and allow it to idle briefly.
- Unscrew the oil-drain plug.
- Drain preservative agent into a suitable container.
- Dispose of preservative agent in accordance with regulations.

There is a risk of scalding from the hot preservative agent draining from the gear unit. Wear protective gloves!

- Screw in the oil-drain plug.
- Replace air filter with screw plug.

Before re-starting the gear unit, replace the screw plug with the air filter. Observe the instructions in item 7.1.1.

7.3.2 Exterior preservation

7.3.2.1 Exterior-preservation procedure

- Clean the surfaces.

For separation between the sealing lip of the shaft-sealing ring and the preservative agent, the shaft should be brushed with grease in way of the sealing lip.

- Apply preservative agent.

For preservative agent see table 13 in item 4.4.2!

7.4 Grease-lubricated rolling bearing

☞ The gear unit is delivered ex works with the necessary grease charge for the lower output-shaft bearing.

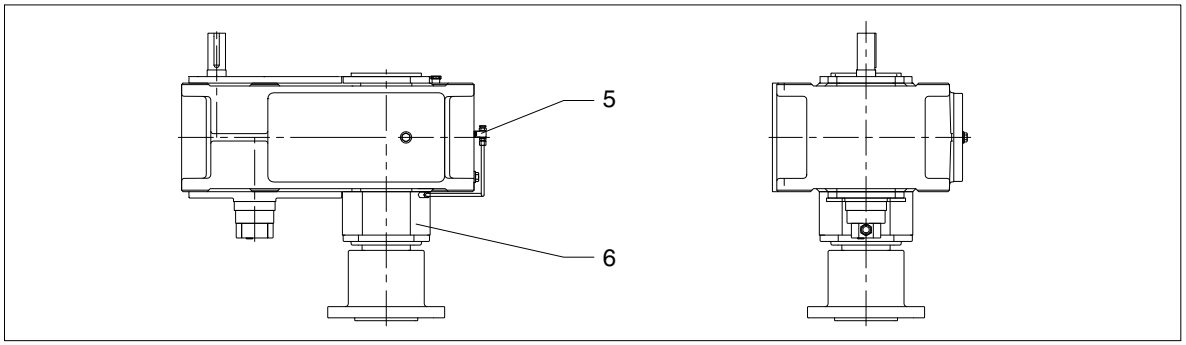


Fig. 71: Lubricating point for lower output-shaft bearing of type H.BV

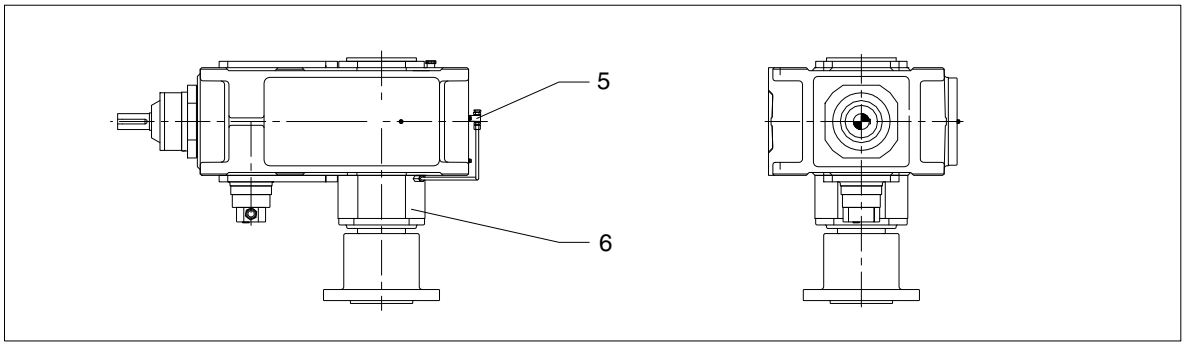


Fig. 72: Lubricating point for lower output-shaft bearing of type B3BV

5 Lubricating point 6 Grease-lubricated rolling bearing

A detailed view of the gear unit can be obtained from the drawings in the gear-unit documentation.

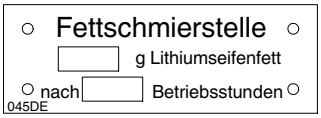
If the gear unit has not been in use for more than 36 months or if the lower output-shaft bearing has been inspected or renewed, the bearing space must be filled with the amount of rolling-bearing grease specified in Table 38. For the correct type of grease to be used, refer to the BA 7300 operating instructions supplied separately.

Table 38: Grease quantities for the lower output-shaft bearing

Type	Grease quantity (approx. value in g) for size											
	5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
H.BV B.BV	450	450	550	500	1300	1400	2000	2300	2500	2700	4250	4300
H.SV B.SV	200	250	300	400	500	700	900	1200	1600	1900	2000	2000

☞ The lubricating points are identified with the following identification plate.

Lubricating point
[...] g lithium-based grease
after [...] operating hours



8. Operation

Observe the instructions in section 3, "Safety instructions", in section 9, "Faults, causes and remedy", and in section 10, "Maintenance and repair"!

8.1 General

To achieve a satisfactory and trouble-free operation of the equipment, be certain to observe the operating values specified in section 1, "Technical Data", as well as the information given in the operating instructions of the oil-supply system, if applicable.

During operation the gear unit must be monitored for:

- Operating temperature — The gear unit is designed for an operating temperature in continuous operation of:
  90 °C (applies to mineral oil)
  The maximum permitted temperature is:
  100 °C (applies to synthetic oil)
- Oil pressure of the oil-supply system (min. 0.5 bar)
- Changes in gear noise
- Possible oil leakage at the housing and shaft seals

8.2 Oil level

To check the oil level, stop operation of the gear unit.
Depending on the type the following oil levels apply when the motor has cooled down:
- Middle of the oil-sight glass
- Top mark on the oil dipstick

If the oil is hot, the oil-level marks may be slightly exceeded. It must in no case be allowed to fall below the mark. If necessary, top up to the correct level.

The oil level in the oil-supply system must be checked.
For this, the operating instructions of the oil-supply system must be observed!

8.3 Irregularities

The drive unit must be switched off at once,

if irregularites are found during the operation

or

if the pressure-monitoring device in the oil-cooling system triggers alarm (only with correspondingly equipped gear units).

Determine the cause of the fault, using table 39, "Faults, causes and remedy" (see item 9.2).

Table 39, "Faults, causes and remedy", contains a list of possible faults, their causes and suggested remedies.

If the cause cannot be found, a specialist from one of our customer-service centres should be called in (see section 2).

9. Faults, causes and remedy

Observe the instructions in section 3, "Safety instructions", and in section 10, "Maintenance and repair"!

9.1 General information on faults and malfunctions

Faults and malfunctions occurring during the guarantee period and requiring repair work on the gear unit must be carried out only by Siemens customer service.
In the case of faults and malfunctions occurring after the guarantee period and whose cause cannot be precisely identified, we advise our customers to contact our customer service.

Siemens will not be bound by the terms of the guarantee or otherwise be responsible in cases of improper use of the gear unit, modifications carried out without Siemens' agreement or use of spare parts not supplied by Siemens.

To remedy faults and malfunctions, the gear unit must always be taken out of service. Secure the drive unit to prevent it from being started up unintentionally. Attach a warning notice to the start switch!

9.2 Possible faults

Table 39: Faults, causes and remedy

Faults	Causes	Remedy
Changes in gear-unit noise.	Damage to gear teeth.	Contact Customer Service. Check all toothed components and replace any damaged parts.
	Excessive bearing play.	Contact Customer Service. Adjust bearing backlash.
	Bearing defective.	Contact Customer Service. Replace defective bearings.
Loud noises in the area of the gear-unit fastening.	Gear-unit fastening has worked loose.	Tighten bolts / nuts to specified torque. Replace damaged bolts / nuts.
Increased temperature at the bearing points.	Oil level in gear-unit housing too low or too high.	Check oil level at room temperature and, if necessary, top up oil.
	Oil too old.	Check date of last oil change and, if necessary, change oil. See section 10.
	Oil-supply system defective.	Check the oil-supply system, replace any defective parts. Consult operating instructions for oil-supply system.
	Bearing defective.	Contact Customer Service. Check and, if necessary, replace bearings.

Faults	Causes	Remedy
Exterior of gear unit is oiled up.	Inadequate sealing of housing covers and/or joints.	Seal joints.
	Labyrinth seals oiled up.	Check oil charge. If necessary, clean labyrinths. Incorrect transport position
Oil leakage from the gear unit.	Inadequate sealing of housing covers and/or joints.	Check and, if necessary, replace sealings. Seal joints.
	Radial shaft-sealing rings defective.	Check radial shaft-sealing rings and, if necessary, replace.
Grease escaping at the output shaft.	Radial shaft-sealing rings defective.	Check radial shaft-sealing rings and, if necessary, replace.
Oil foaming in the gear unit.	Preservation agent not completely drained.	Oil change.
	Oil-supply system has been operated too long at low temperatures.	Stop oil-supply system. Allow the oil to degas.
	Gear unit too cold in operation.	Shut down gear unit and have oil degassed. Restart without cooling water.
	Water in oil.	Test the oil, change oil if necessary.
	Oil too old (defoaming agent used up).	Test the oil, change oil if necessary.
	Unsuitable oils mixed up.	Test the oil, change oil if necessary.
Water in oil.	Oil foams in sump.	Check state of oil by the test-tube method for water contamination. Have oil analysed by laboratory.
	Defective oil-supply system or cooling coil.	Check the oil-supply system or cooling coil, replace any defective parts. Consult operating instructions for oil-supply system.
	Gear unit exposed to cold air from machine-room ventilator: Water condensing.	Protect gear unit with suitable heat insulation. Close air outlet or alter its direction by structural measures.
	Climatic conditions.	Contact Customer Service. If necessary, fit wet-air filter.

Faults	Causes	Remedy
Increased operating temperature.	Oil level in housing too high.	Check oil level and, if necessary, adjust.
	Oil too old.	Check date of last oil change and, if necessary, change oil. See section 10.
	Oil badly contaminated.	Change oil. See section 10.
	Defective oil-supply system or cooling coil.	Check the oil-supply system or cooling coil, replace any defective parts. Consult operating instructions for oil-supply system.
	Gear unit with water oil-cooler: Coolant flow too low.	Fully open valves in in- and outflow pipes. Check for free flow through water oil-cooler.
	Gear unit with air oil-cooler: cooler block contaminated.	Clean cooler block. See section 10.
	Coolant temperature too high.	Check temperature and, if necessary, adjust.
	Oil flow through water oil-cooler too low due to: Badly clogged oil filter.	Clean the oil filter. See section 10.
	Oil pump defective.	Check function of oil pump and, if necessary, repair or replace oil pump.
	On gear units with fan: Suction opening in air guide cover and/or gear-unit housing badly contaminated.	Clean air guide cover and gear-unit housing.
Pressure monitor triggers alarm. (gear units with forced lubrication, water oil-cooler or air oil-cooler)	Oil pressure < 0.5 bar.	Check oil level at room temperature and, if necessary, top up oil. Check and, if necessary, replace oil pump. Check oil filter and, if necessary, clean, see section 10.
Contamination indicator on double change-over filter triggers alarm.	Double change-over filter clogged.	Change double change-over filter over as instructed in separate operating instructions, clean clogged filter element.
Fault in oil-supply system.		Consult operating instructions for oil-supply system.

10. Maintenance and repair

Observe the instructions in section 3, "Safety instructions", and in section 9, "Faults, causes and remedy"!

10.1 General notes on maintenance

All maintenance and repair work must be done with care and by duly trained and qualified personnel only.

The following applies to all work in item 10.2:

Switch the gear unit and add-on components off.

Secure the drive unit to prevent it from being started up unintentionally.
Attach a warning notice to the start switch!

The periods indicated in table 40 depend on the conditions under which the gear unit is operated. Only average periods can therefore be stated here. These refer to:

a daily operating time of	**24**	**h**
a duty factor "ED" of	**100**	**%**
an input-drive speed of	**1500**	**1/min**
a maximum oil temperature of	**90**	**°C (applies to mineral oil)**
	100	**°C (applies to mineral oil)**

The operator must ensure that the intervals stated in table 40 are adhered to.
This also applies if the maintenance work is included in the operator's internal maintenance schedules.

Table 40: Maintenance and repair work

Measures	Periods	Remarks
Check oil temperature	Daily	
Check for unusual gear-unit noise	Daily	
Check oil level	Monthly	
Check gear unit for leaks	Monthly	
Test the water content of the oil	After approx. 400 operating hours, at least once per year	see item 10.2.1
Perform the first oil change	Approx. 400 operating hours after start-up	see item 10.2.2
Perform subsequent oil changes	Every 24 months or 10 000 operating hours	see item 10.2.2
Clean the oil filter	Every 3 months	see item 10.2.3
Clean air filter	Every 3 months	See item 10.2.4
Clean the breather screw	Every 3 months	see item 10.2.5
Clean fan and gear unit.	Depending on requirements, at least every 2 years	see item 10.2.6
Type with oil-dam pipe: recharge with grease	Every 5000 operating hours or at least every 10 months.	see item 10.2.7
Refill Taconite seals with grease	Every 3000 operating hours or at least every 6 months	see item 10.2.7

Measures	Periods	Remarks
Check cooling coil	Every 2 years	see item 10.2.8
Check condition of air oil-cooler	Depending on requirements, at least every 2 years	see item 10.2.9
Check condition of water oil-cooler	Depending on requirements, at least every 2 years	see item 10.2.10
Check hose lines	Yearly	see item 10.2.11
Change the hose lines	6 years from the manufacturing date impressed	see item 10.2.11
Check tightness of fastening bolts	After first oil change, then every 2 years	see item 10.2.13
Check shrink disk	Every 12 months	see item 6.9.5
Inspection of the gear unit	Approx. every 2 years	see item 10.4

10.1.1 General oil-service lives

According to the manufacturers, the following are the expected periods during which the oils can be used without undergoing any significant change in quality. They are calculated on the basis of an average oil temperature of 80 °C:

– for mineral oils, biologically degradable oils and physiologically safe (synthetic esters) oils 2 years or 10 000 operating hours **(does not apply to natural esters - rape seed oils, etc. -).**

– for poly-α-olefins and polyglycols, 4 years or 20 000 operating hours.

The actual service lives may differ. The general rule is that an increase in temperature of 10 K will halve the service life and a temperature decrease of 10 K will approximately double the service life.

10.2 Description of maintenance and repair work

10.2.1 Examine water content of oil / conducting oil analyses

More information about examining the oil for water content or conducting oil analyses is obtainable from your lubricant manufacturer or our customer service.

- For reference purposes, a fresh sample of the operating lubricating oil used must be sent with the used oil sample to the analysing institute for analysis.
- The oil sample must be taken downstream of the filter of the oil-supply system while the gear unit is running. A suitable connection point is normally located upstream of the gear unit input (e.g. oil-drain cock in the pressure line).
- A special sample container should be filled with the specified quantity of oil.
  If there is no such sample container available, at least one litre of oil must be put in a **clean**, transportworthy, sealable vessel.

10.2.2 Change oil

As an alternative to the oil-change intervals indicated in Table 40 (see item 10.1) it is possible to have the oil sample tested at regular intervals by the Technical Service of the relevant oil company and to have it released for further use.

If re-usability has been confirmed, no oil change will be necessary.

Please observe the separately attached operating instructions BA 7300.

- The instructions in item 7.1 must be observed!
- Drain the oil while the gear unit is still warm, i.e. immediately after shutting down the machinery.

When changing the oil, always re-fill the gear unit with the same type of oil. Never mix different types of oil and/or oils made by different manufacturers. Polyglycol-based synthetic oils in particular must not be mixed with PAO-based synthetic or mineral oils. If changing to a different grade or make of oil, the gear unit must, if necessary, be flushed out with the new oil grade. Flushing is not necessary, if the new service oil is fully compatible with the old service oil in all respects. Compatibility must be confirmed by the oil supplier. If there is a change to another oil grade or make, Siemens recommends flushing out the gear unit with the new grade of service oil.

When changing the oil, the housing and the oil-supply system, if available, must be flushed with oil to remove sludge, metal particles and oil residue. Use the same type of oil as is used for normal operation. High-viscosity oils must be heated beforehand using suitable means. Ensure that all residues have been removed before filling with fresh oil.

- Stop the gear unit by switching off the drive assembly.

Secure the drive unit to prevent it from being started up unintentionally.
Attach a warning notice to the start switch.

- Close the stop valves in the coolant in- and outflow pipes (gear units with cooling coil or water oil-cooling system).
- Place a suitable container under the oil-draining point of the gear-unit housing.
- Unscrew the venting screw or air filter including the reducing screw from the housing top.
- Unscrew oil-drain plug or open oil-drain cock and drain the oil into the collecting container.
- Drain the oil from the oil-supply system (see operating instructions to the oil-supply system).

There is a danger of scalding from the hot oil emerging from the housing.
Wear protective gloves!
Remove any oil spillage immediately with an oil-binding agent.

Check the condition of the sealing ring (the sealing ring is vulcanised onto the oil-drain plug). If necessary, use a new oil-drain plug.

- Clean the permanent magnet of the oil drain plug thoroughly.
- Screw in the oil-drain plug or close oil-drain cock.
- Clean the oil filter in the oil-cooling system (see operating instructions of the oil-supply system).
- Clean the air filter or venting screw.
- Screw in the air filter including the reducing screw or breather screw again.
- To fill with oil, unscrew the oil dipstick on the gear unit or oil-equalising tank
- Fill fresh oil into the gear unit (see item 7.1.2).

In the case of gear units fitted with forced lubrication or an oil-cooling system, the oil circuit must also be charged with oil. To do this, briefly start up the gear unit with add-on pump as described in section 7.

10.2.3 Clean the oil filter

For operation and maintenance, always observe the operating instructions indicated in the order-specific appendix.
For technical data, refer to the order-specific list of equipment.

10.2.4 Clean the air filter

If a layer of dust has built up, the air filter must be cleaned, whether or not the minimum period of 3 months has expired.

- Unscrew the air filter including the reducing screw.
- Clean the air filter using benzine or a similar cleanser.
- Dry the air filter and/or blow with compressed air.

Be especially careful when blowing with compressed air.
Wear protective glasses!

Foreign bodies must be prevented from entering the gear unit.

10.2.5 Clean the breather screw

If a layer of dust has built up, the breather screw must be cleaned, whether or not the minimum period of 3 months has expired.

- Unscrew breather screw.
- Clean the breather screw using benzine or a similar cleanser.
- Dry the breather screw and/or blow with compressed air.

Be especially careful when blowing with compressed air.
Wear protective glasses!

Foreign bodies must be prevented from entering the gear unit.

10.2.6 Clean fan and gear unit

- The instructions in item 5.8.1 must be observed!
- Demount the air guide cover.
- Using a stiff brush, remove any dirt adhering to the fan wheel, air guide cover and safety grid.
- Remove any corrosion.
- Screw safety grid with fastening screws back onto the air guide cover.

It must be ensured that the air guide cover is correctly fastened. The fan must not come into contact with the air guide cover.

To prevent the build-up of dust on the gear unit, cleaning must be done in accordance with operating conditions.

The gear unit must not be cleaned with high-pressure cleaning equipment.

10.2.7 For types fitted with Taconite seals or oil-dam pipe, recharge with grease

- Stop the gear unit by switching off the drive assembly.

Secure the drive unit to prevent it from being started up unintentionally.
Attach a warning notice to the start switch.

- Inject approx. 30 g lithium-based rolling-bearing grease into each of the lubrication points of the Taconite seal.
- Recharge the lubrication point on the oil-dam pipe with 40 g of lithium-based rolling-grease
- The lubrication points are fitted with flat grease nipples type AM10x1 to DIN 3404.

Remove and dispose of any old grease escaping.

10.2.8 Check cooling coil

- Shut off the cooling-water supply.
- Disconnect the cooling-water in- and outflow pipes from the cooling coil.
- Check the inside walls of the cooling coil for deposits.

If the cooling coil is dirty, heat is no longer withdrawn effectively from the gear unit. Any dirt adhering to the inside of the coil should be removed by chemical cleaning or the cooling coil should be replaced with a new one.

- If thick deposits have formed on the inside of the cooling coil, the cooling water and/or the deposits themselves should be chemically analysed. Such analyses are offered by specialist companies for chemical cleaning. Such companies also sell special cleansing agents for removing such deposits.
- Before using these cleaning agents, ensure that they will not damage the coil materials (consult Siemens). Observe the manufacturer's instructions at all times when using different cleaning agents by several manufacturers.

Avoid burns when working with corrosive cleaning agents. Always observe the manufacturers' instructions for safety and use.

Wear personal protective equipment (gloves, safety glasses)!

- Seriously contaminated cooling coils must be replaced. Consult our Customer Service.
- Re-connect the water in- and outflow pipes.

10.2.9 Check air oil-cooler

- The instructions in items 5.8.3, 7.1.2 and 10.1 must be observed!
- Close the stop valves in the coolant in- and outflow pipes.
- Remove dirt from the cooler block.
- Check the condition of screw connections and, if necessary, replace.

10.2.10 Check water oil-cooler

- The instructions in items 5.8.4, 7.1.2 and 10.1 must be observed!
- Close the stop valves in the coolant in- and outflow pipes.
- Inspect cooler for leaks in the piping.
- Check the condition of screw connections and, if necessary, replace.

10.2.11 Check hose lines

Even when adequately stored and subjected to permissible loads, hoses and hose lines are subject to a natural ageing process. This limits their period of use.

The period of use of the hose lines must not exceed 6 years from the manufacturing date stamped on them.

The period of use can be determined using available test and empirical values, taking into account the conditions of use.

The operator of the system must ensure that hose lines are replaced at suitable intervals of time, even if no defects which may affect their safe operation are identifiable on them.

Hose lines must be inspected for safe working condition by an expert before the plant is first put into operation and thereafter at least once a year.

If during inspections faults are found, these must be rectified immediately or suitable countermeasures taken.

10.2.12 Top up oil

- The instructions in item 7.1.2 must be observed!
- Always top up with the same type of oil as already used in the unit (see also item 10.2.2).

10.2.13 Check tightness of fastening bolts

- The instructions in item 10.1 must be observed!
- Close the stop valves in the coolant in- and outflow pipes (gear units with cooling coil or water oil-cooling system).
- Check tightness of all fastening bolts.

Damaged bolts must be replaced with new bolts of the same type and strength class.

10.3 Final work

For operating and servicing the components, the pertinent instruction manuals and the specifications in sections 5 and 7 must be observed.
For technical data, refer to the data sheet and/or the list of equipment.

Observe also item 6.22.

Damaged bolts must be replaced with new bolts of the same type and strength class.

10.4 General inspection of the gear unit

The general inspection of the gear unit should be carried out by the Siemens Customer Service, as our engineers have the experience and training necessary to identify any components requiring replacement.

10.5 Lubricants

The quality of the oil used must meet the requirements of the separately supplied BA 7300 operating instructions, otherwise the guarantee given by Siemens will lapse. We urgently recommend using one of the oils listed in BA 7300, because they have been tested and meet the requirements.

To avoid misunderstandings, we should like to point out that this recommendation is in no way intended as a guarantee of the quality of the lubricant supplied. Each lubricant manufacturer is responsible for the quality of his own product.

Information on the type, quantity and viscosity of the oil is given on the rating plate on the gear unit and/or in the supplied documentation.

The quantity of oil indicated on the rating plate is an approximation only. The marks on the dipstick or oil-sight glass are decisive for the amount of oil to be filled in.

The manual containing the current lubricants recommended by Siemens can also be consulted on the Internet (see back cover).

The oils listed there are subjected to continuous tests. Under certain circumstances the oils recommended there may therefore later be removed from the range or replaced with further developed oils.

We recommend regularly checking whether the selected lubricating oil is still recommended by Siemens. If it is not, the brand of oil should be changed.

11. Spare parts, customer-service addresses

11.1 Stocking spare parts

By stocking the most important spare and wearing parts on site you can ensure that the gear unit is ready for use at any time.

To order spare parts, refer to the spare-parts list.

For further information refer to the spare-parts drawing stated in the spare parts list.

We guarantee only the original spare parts supplied by us. Non-original spare parts have not been tested or approved by us. They may alter technical characteristics of the gear unit, thereby posing an active or passive risk to safety. Siemens will assume no liability or guarantee for damage caused by spare parts not supplied by Siemens. The same applies to any accessories not supplied by Siemens.

Please note that certain components often have special production and supply specifications and that we supply you with spare parts which comply fully with the current state of technical development as well as current legislation.

When ordering spare parts, always state the following:

Order number, item Type, size Part number Quantity

11.2 Spare parts and customer-service addresses

When ordering spare parts or requesting a service specialist, please contact Siemens first (see section 2).

12. Declarations

12.1 Declaration of incorporation

Declaration of incorporation

in accordance with Directive 2006/42/EC, Annex II 1 B

The manufacturer, Siemens Industriegetriebe GmbH, 09322 Penig, declares with regard to the partly completed machinery

Gear unit
H..V, B..V
Sizes 1 to 22

developed for driven machines in the most various industry areas:

- The special technical documents described in Annex VII B have been prepared.
- The following basic health and safety requirements set out in Directive 2006/42/EC, Annex I, are applied and are satisfied:
  1.1, 1.1.2, 1.1.3, 1.1.5; 1.2.6; 1.3.1 - 1.3.4, 1.3.6 - 1.3.8.1; 1.4.1, 1.4.2.1;
  1.5.1, 1.5.2, 1.5.4 - 1.5.11, 1.5.13; 1.6.1, 1.6.2; 1.7.1 - 1.7.2, 1.7.4 - 1.7.4.3
- The partly completed machinery must not be put into service until it has been established that the machinery into which the partly completed machinery is to be incorporated has been declared in conformity with the provisions of Directive 2006/42/EC, as appropriate.
- The manufacturer undertakes, in response to a reasoned request by the national authorities, to transmit in electronic form relevant information about the partly completed machinery.
- The person authorised to compile the relevant technical documentation is:
  Friedheim Schreier (Director SGU Engineering)

Penig, 2012-08-30

Friedheim Schreier (Director SGU Engineering)

Penig, 2012-08-30

Michael Kupke (Director Business Subsegment SGU)

Further Information:

"FLENDER gear units" on the Internet
www.siemens.com/gearunits

"FLENDER couplings" on the Internet
www.siemens.com/couplings

Service & Support:
http://support.automation.siemens.com/WW/view/en/10803928/133300

Lubricants:
http://support.automation.siemens.com/WW/view/en/42961591/133000

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