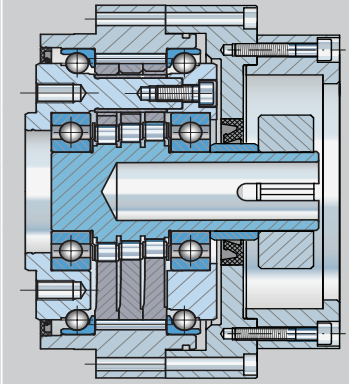
DA Series

Special feature: The gearboxes are supplied with matching clamp ring adapter and motor flange.

Optional: The gearboxes are also available with other attachment variants or without a customer-specific flange.

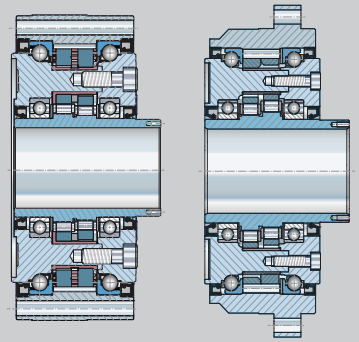
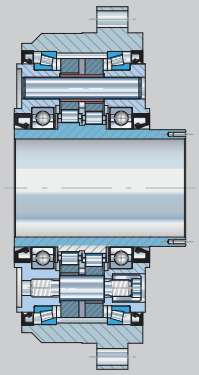
Model		Size	Available single-stage reduction ratios					Outer-Ø flange	Outer-Ø cylinder	Max. motor shaft-Ø with clamp ring design
			29	41	59	89	119			
F4CF-		DA15		•	•	•	•	136	CF	19
		DA25	•	•	•	•	•	159	CF	24
		DA35	•	•	•	•	•	189	CF	32
		DA40		•	•	•	•	198	CF	32
		DA45	•	•	•	•	•	221	CF	38
		DA50		•	•	•	•	238	CF	38

•: available reduction ratio

C Series

Special feature: The large diameter of the hollow shaft allows for effective use of space for feeding through cables or other media.

Optional: Customer-specific customisation of input shaft, output flange, and housing possible.

Model		Size	Available single-stage reduction ratios				Outer-Ø flange	Outer-Ø cylinder	Standard hollow shaft-Ø
			29	59	89	119			
F4C(F)-		C15	•	•	•	•	CF	160	40
		C25		•	•	•	CF	185	49
		C35		•	•	•	256	CF	65
F2CF-		C45		•	•	•	292	CF	79
		C55		•	•	•	325	CF	92
		C65		•	•	•	362	CF	99

•: available reduction ratio

3.5 Torques and speeds

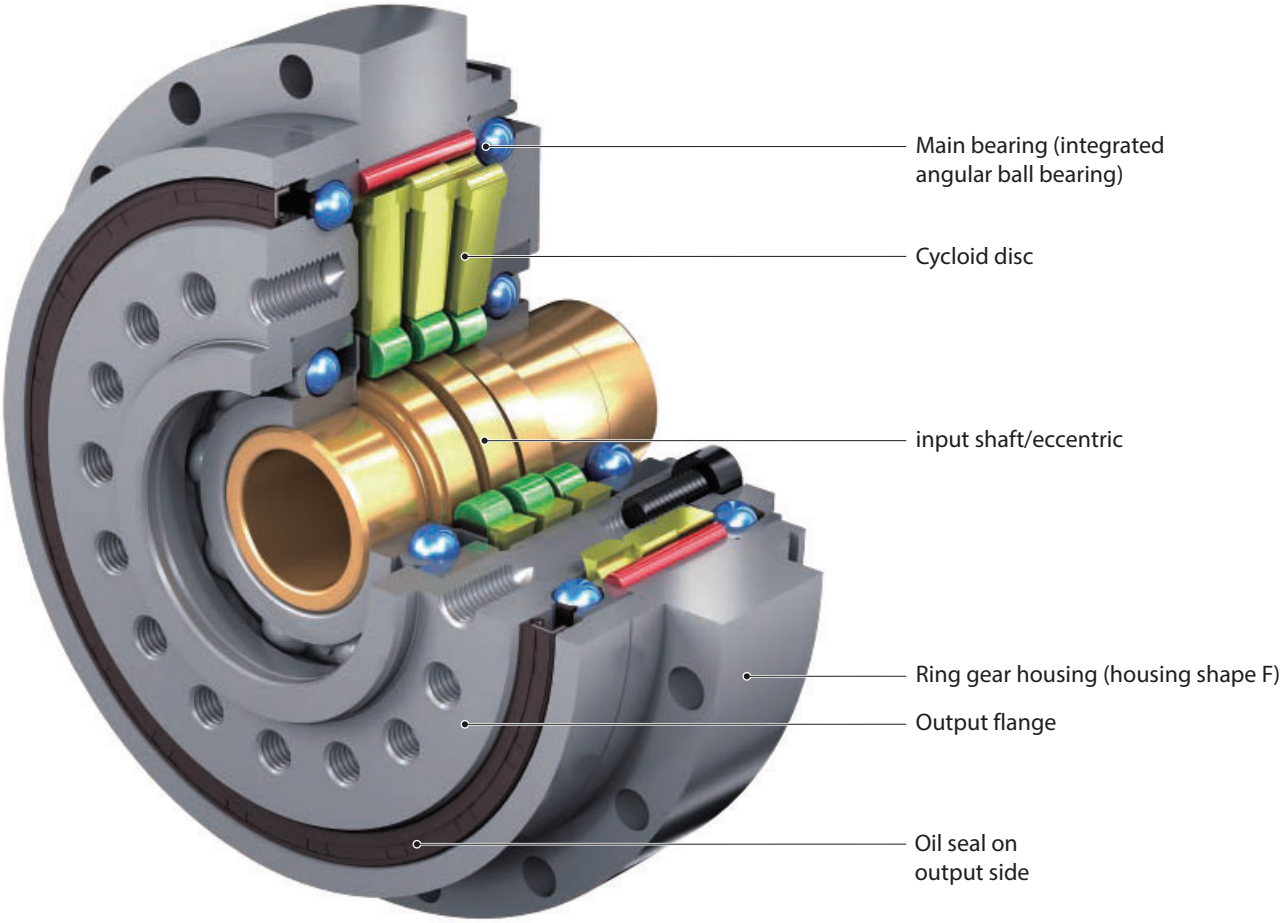
Maximum permissible input speed $n_{1\ ED}$
The gearbox can be used within the maximum input speed range indicated in the table, however, the max. permissible mean input speed is limited by the duty cycle (%ED).

Model	Size	Reduction ratio i	Max. permissible input speed $n_{1\ ED}$ [min^{-1}]		Max. acceleration torque [Nm]	Max. torque for Emergency Stop [Nm]
			50% ED	100% ED		
A Series						
FC- F1C- F2C- F3C-	A15(G)	59 / 89	5600	2800	335	785
	A25(G)	29	3100	1550	721	1930
		59 / 89 / 119	4200	2100	721	1930
	A35(G)	29	2500	1250	1390	3580
		59 / 89 / 119	3300	1650	1390	3580
	A45(G)	29	1900	950	2910	7210
		59 / 89 / 119 / 179	2600	1300	2910	7210
	A65(G)	29	1500	750	5130	13800
		59 / 89 / 119 / 179	2000	1000	5130	13800
	A75(G)	29	1200	600	7610	24000
		59 / 89 / 119	1750	850	7610	24000
DA Series						
F4CF-	DA15	41 / 59 / 89	5600	2800	613	1225
	DA25	29 / 41 / 59 / 89 / 119	4200	2100	1029	2058
	DA35	29 / 41 / 59 / 89 / 119	3300	1650	1960*	3920
	DA40	41 / 59 / 89 / 119	2900	1450	2500	5000
	DA45	29 / 41 / 59 / 89 / 119	2600	1300	3062*	6125
	DA50	41 / 59 / 89 / 119	2400	1200	4000	8000
C Series						
F4C(F)-	C15	29	2400	1200	540	1080
		59 / 89 / 119	3200	1600	540	1080
	C25	59 / 89 / 119	2900	1450	1030	2060
	C35	59 / 89 / 119	2100	1050	1962	3924
F2CF-	C45	59 / 89 / 119	1800	900	3188	6377
	C55	59 / 89 / 119	1500	750	4316	8633
	C65	59 / 89 / 119	1400	700	6278	12577
ECY Series						
	103	50 / 80 / 100	8500	2500	54*	110
	105	50 / 80 / 100	7300	2500	82*	147
	107	50 / 80 / 100	6500	2000	157*	284

* varies according to ratio

6 DA-Series

F4CF-DA



Special feature:

- Last Motion < 1 arcmin
- 6 sizes
- High acceleration torque up to 4,000 Nm
- Torsional stiffness up to 540 Nm/arcmin
- Low-noise design

6.1 Torques according to output speeds

Output speed n_{2m} [min^{-1}]			5			10			15			20			25		
Model	Size	Reduction ratio i	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]
F4CF	DA15	41	338	205	0.22	338	410	0.44	336	615	0.66	308	820	0.81	288	1025	0.94
		59	338	295	0.22	338	590	0.44	301	885	0.59	276	1180	0.72	258	1475	0.84
		89	338	445	0.22	300	890	0.39	266	1335	0.52	244	1780	0.64	228	2225	0.75
		119	340	595	0.22	277	1190	0.36	245	1785	0.48	225	2380	0.59	210	2975	0.69
	DA25	29	625	145	0.41	625	290	0.82	625	435	1.23	573	580	1.50	536	725	1.75
		41	567	205	0.37	567	410	0.74	563	615	1.11	517	820	1.35	483	1025	1.58
		59	567	295	0.37	567	590	0.74	505	885	0.99	463	1180	1.21	433	1475	1.42
		89	567	445	0.37	504	890	0.66	446	1335	0.88	410	1780	1.07	383	2225	1.25
		119	571	595	0.37	465	1190	0.61	412	1785	0.81	378	2380	0.99	353	2975	1.16
	DA35	29	846	145	0.55	846	290	1.11	846	435	1.66	776	580	2.03	726	725	2.38
		41	1081	205	0.71	1081	410	1.41	1073	615	2.11	984	820	2.58	920	1025	3.01
		59	1081	295	0.71	1081	590	1.41	962	885	1.89	882	1180	2.31	825	1475	2.70
		89	1081	445	0.71	960	890	1.26	850	1335	1.67	780	1780	2.04	730	2225	2.39
		119	1087	595	0.71	885	1190	1.16	784	1785	1.54	719	2380	1.88	673	2975	2.20
	DA40	41	1379	205	0.90	1379	410	1.80	1369	615	2.69	1255	820	3.29	1174	1025	3.84
		59	1379	295	0.90	1379	590	1.80	1227	885	2.41	1126	1180	2.95	1053	1475	3.44
		89	1379	445	0.90	1225	890	1.60	1085	1335	2.13	995	1780	2.60	930	2225	3.04
		119	1387	595	0.91	1129	1190	1.48	1000	1785	1.96	917	2380	2.40			
	DA45	29	1674	145	1.10	1674	290	2.19	1674	435	3.29	1535	580	4.02	1436	725	4.70
		41	1689	205	1.11	1689	410	2.21	1676	615	3.29	1538	820	4.03	1438	1025	4.71
		59	1689	295	1.11	1689	590	2.21	1503	885	2.95	1379	1180	3.61	1289	1475	4.22
		89	1689	445	1.11	1500	890	1.96	1328	1335	2.61	1219	1780	3.19	1140	2225	3.73
		119	1699	595	1.11	1383	1190	1.81	1225	1785	2.41	1124	2380	2.94			
	A50	41	2206	205	1.44	2206	410	2.89	2190	615	4.30	2009	820	5.26	1879	1025	6.15
		59	2206	295	1.44	2206	590	2.89	1963	885	3.85	1801	1180	4.71	1684	1475	5.51
		89	2206	445	1.44	1960	890	2.57	1735	1335	3.41	1592	1780	4.17	1489	2225	4.87
		119	2219	595	1.45	1807	1190	2.37	1600	1785	3.14	1468	2380	3.84			

Table DA-1 Rating values (reference value output speed n_{2m})

Size	Reduction ratio i	Max. acceleration and deceleration torque T_{2A}	Peak torque for emergency stop T_{2max}*
		[Nm]	[Nm]
DA15	41-119	613	1225
DA25	29-119	1029	2058
DA35	29	1393	2786
	41-119	1960	3920
DA40	41-119	2500	5000
DA45	29	2756	5513
	41-119	3062	6125
DA50	41-119	4000	8000

Table DA-2 Maximum acceleration and peak torque
* Further limitation by maximum transmittable torque of screw fitting Table DA-21, **Page 76**

30			40			50			60			Max. permissible input speed $n_{1\,max}$ short term [min^{-1}]	Max. permissible input speed $n_{1\,ED}$ [min^{-1}]		Max. moment of inertia j related to the input shaft of the basic gearbox [$\times 10^{-4}$ kgm^2]	Mass [kg]
Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]		50% ED	100% ED		
273	1230	1.07	250	1640	1.31	234	2050	1.53	221	2460	1.74	6150	5600	2800	0.90	4.7
244	1770	0.96	224	2360	1.17	210	2950	1.37	198	3540	1.56					
216	2670	0.85	198	3560	1.04	185	4450	1.21	175	5340	1.38					
199	3570	0.78	183	4760	0.96											
508	870	1.99	466	1160	2.44	435	1450	2.85	412	1740	3.24	5050	3700	1850	2.80	7.6
458	1230	1.80	420	1640	2.20	393	2050	2.57	372	2460	2.92		4200	2100		
410	1770	1.61	376	2360	1.97	352	2950	2.30	333	3540	2.62					
363	2670	1.42	333	3560	1.74											
335	3570	1.31														
687	870	2.70	630	1160	3.30	590	1450	3.86	558	1740	4.38	4550	2960	1480	6.73	11.8
871	1230	3.42	799	1640	4.19	748	2050	4.89	708	2460	5.56		3300	1650		
781	1770	3.07	717	2360	3.75	670	2950	4.39								
691	2670	2.71														
1112	1230	4.36	1020	1640	5.34	954	2050	6.24	903	2460	7.09	3950	2900	1450	8.93	13.9
997	1770	3.91	914	2360	4.79											
881	2670	3.46														
1359	870	5.34	1247	1160	6.53	1166	1450	7.63	1104	1740	8.67	3550	2240	1120	16.43	17.8
1361	1230	5.35	1249	1640	6.54	1168	2050	7.64	1106	2460	8.68		2600	1300		
1221	1770	4.79	1120	2360	5.86											
1779	1230	6.98	1631	1640	8.54	1526	2050	9.99				3150	2400	1200	24.06	22.3
1595	1770	6.26	1463	2360	7.66											

: 50% ED range : 100% ED range (but max. 10 min. without pause)

1. T_{2N} = nominal output torque
   Nominal output torque corresponds to the max. permissible average load torque at all output speeds.
   The nominal output torque for speeds less than 5 min^{-1} is equal to the value at 5 min^{-1}.
   The value for the maximum permissible input power is calculated from the nominal output torque at 100%.
   This value takes the efficiency of Fine Cyclo into consideration.
2. n_{1max} = maximum permissible input speed
   However, it must be n_{1m} (mean input speed) < $n_{1\,ED}$.
3. $n_{1\,ED}$ = permissible input speed according to duty cycle
4. T_{2A} = max. Acceleration and braking torque (for fatigue strength at $2 \cdot 10^7$ load cycles)
   Permissible peak torque for normal start and stop procedures.
5. T_{2max} = max. permissible torque for Emergency Stop situations or in the event of heavy shocks (limited by the mechanical strength) (permissible 1000 times during the entire lifetime).
6. The rated torque T_{2N} is calculated using the following equation when the speed is not shown in the table above:

$$T_{2N} = T_{2N,\,600} \left(\frac{600}{n_{1m}} \right)^{0,3}$$

T_{2N} : Rated torque at output speed n_{1m}
$T_{2N,\,600}$: Rated torque at output speed n_{1m} is 600 min^{-1}

6.2 Torques according to input speeds

Input speed n_{1m} [min^{-1}]			4000			3000			2500			2000			1750		
Model	Size	Reduction ratio i	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]
F4CF-	DA15	41	191	97.6	2.44	209	73.2	2.00	220	61.0	1.76	236	48.8	1.50	245	42.7	1.37
		59	191	67.8	1.70	209	50.8	1.39	220	42.4	1.22	236	33.9	1.05	245	29.7	0.95
		89	191	44.9	1.13	209	33.7	0.92	220	28.1	0.81	236	22.5	0.69	245	19.7	0.63
		119	192	33.6	0.85	210	25.2	0.69	221	21.0	0.61	237	16.8	0.52	246	14.7	0.47
	DA25	29				350	103.4	4.74	370	86.2	4.17	395	69.0	3.57	412	60.3	3.25
		41	321	97.6	4.10	350	73.2	3.35	370	61.0	2.95	395	48.8	2.52	412	42.7	2.30
		59	321	67.8	2.85	350	50.8	2.33	370	42.4	2.05	395	33.9	1.75	412	29.7	1.60
		89	321	44.9	1.89	350	33.7	1.54	370	28.1	1.36	395	22.5	1.16	412	19.7	1.06
		119	323	33.6	1.42	353	25.2	1.16	372	21.0	1.02	398	16.8	0.88	414	14.7	0.80
	DA35	29							501	86.2	5.65	535	69.0	4.83	557	60.3	4.40
		41				667	73.2	6.39	704	61.0	5.62	753	48.8	4.81	784	42.7	4.38
		59				667	50.8	4.44	704	42.4	3.91	753	33.9	3.34	784	29.7	3.04
		89				667	33.7	2.94	704	28.1	2.59	753	22.5	2.22	784	19.7	2.02
		119				671	25.2	2.21	709	21.0	1.95	758	16.8	1.67	789	14.7	1.52
	DA40	41							899	61.0	7.17	961	48.8	6.13	1000	42.7	5.59
		59							899	42.4	4.98	961	33.9	4.26	1000	29.7	3.88
		89							899	28.1	3.30	961	22.5	2.83	1000	19.7	2.57
		119							904	21.0	2.49	966	16.8	2.13	1006	14.7	1.94
	DA45	29										1059	69.0	9.56	1102	60.3	8.71
		41							1101	61.0	8.78	1177	48.8	7.51	1225	42.7	6.84
		59							1101	42.4	6.10	1177	33.9	5.22	1225	29.7	4.76
		89							1101	28.1	4.05	1177	22.5	3.46	1225	19.7	3.15
		119							1107	21.0	3.04	1184	16.8	2.60	1232	14.7	2.37
	DA50	41										1537	48.8	9.81	1600	42.7	8.94
		59										1537	33.9	6.82	1600	29.7	6.21
		89										1537	22.5	4.52	1600	19.7	4.12
		119										1546	16.8	3.40	1610	14.7	3.10

Table DA-3 Rating values (reference value input speed n_{1m})

Size	Reduction ratio i	Max. acceleration and deceleration torque T_{2A}	Peak torque for emergency stop T_{2max}*
		[Nm]	[Nm]
DA15	41-119	613	1225
DA25	29-119	1029	2058
DA35	29	1393	2786
	41-119	1960	3920
DA40	41-119	2500	5000
DA45	29	2756	5513
	41-119	3062	6125
DA50	41-119	4000	8000

Table DA-4 Maximum acceleration and peak torque
* Further limitation by maximum transmittable torque of screw fitting Table DA-21, **Page 76**

1500			1000			750			< 600			Max. permissible input speed $n_{1\ max}$ short term [min^{-1}]	Max. permissible input speed $n_{1\ ED}$ [min^{-1}]		Max. moment of inertia j related to the input shaft of the basic gearbox [×10^{-4} kgm^2]	Mass [kg]
Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]		50% ED	100% ED		
257	36.6	1.23	290	24.4	0.93	316	18.3	0.76	338	14.6	0.65	6150	5600	2800	0.90	4.7
257	25.4	0.85	290	16.9	0.64	316	12.7	0.53	338	10.2	0.45					
257	16.9	0.57	290	11.2	0.43	316	8.4	0.35	338	6.7	0.30					
258	12.6	0.43	292	8.4	0.32	318	6.3	0.26	340	5.0	0.22					
431	51.7	2.92	487	34.5	2.20	531	25.9	1.80	567	20.7	1.54	5050	3700	1850	2.80	7.6
431	36.6	2.06	487	24.4	1.55	531	18.3	1.27	567	14.6	1.09		4200	2100		
431	25.4	1.43	487	16.9	1.08	531	12.7	0.88	567	10.2	0.76					
431	16.9	0.95	487	11.2	0.72	531	8.4	0.59	567	6.7	0.50					
434	12.6	0.72	490	8.4	0.54	534	6.3	0.44	571	5.0	0.38					
584	51.7	3.95	659	34.5	2.97	718	25.9	2.43	768	20.7	2.08	4550	2960	1480	6.73	11.8
821	36.6	3.93	927	24.4	2.96	1011	18.3	2.42	1081	14.6	2.07		3300	1650		
821	25.4	2.73	927	16.9	2.06	1011	12.7	1.68	1081	10.2	1.44					
821	16.9	1.81	927	11.2	1.36	1011	8.4	1.12	1081	6.7	0.95					
826	12.6	1.36	933	8.4	1.03	1017	6.3	0.84	1087	5.0	0.72					
1047	36.6	5.02	1183	24.4	3.78	1289	18.3	3.09	1379	14.6	2.64	3950	2900	1450	8.93	13.9
1047	25.4	3.49	1183	16.9	2.62	1289	12.7	2.15	1379	10.2	1.84					
1047	16.9	2.31	1183	11.2	1.74	1289	8.4	1.42	1379	6.7	1.22					
1054	12.6	1.74	1190	8.4	1.31	1297	6.3	1.07	1387	5.0	0.92					
1154	51.7	7.82	1304	34.5	5.88	1421	25.9	4.81	1520	20.7	4.12	3550	2240	1120	16.43	17.8
1283	36.6	6.14	1449	24.4	4.62	1579	18.3	3.78	1689	14.6	3.23		2600	1300		
1283	25.4	4.27	1449	16.9	3.21	1579	12.7	2.63	1689	10.2	2.25					
1283	16.9	2.83	1449	11.2	2.13	1579	8.4	1.74	1689	6.7	1.49					
1291	12.6	2.13	1458	8.4	1.60	1589	6.3	1.31	1699	5.0	1.12					
1676	36.6	8.02	1892	24.4	6.04	2063	18.3	4.94	2206	14.6	4.23	3150	2400	1200	24.06	22.3
1676	25.4	5.58	1892	16.9	4.20	2063	12.7	3.43	2206	10.2	2.94					
1676	16.9	3.70	1892	11.2	2.78	2063	8.4	2.28	2206	6.7	1.95					
1686	12.6	2.78	1904	8.4	2.09	2075	6.3	1.71	2219	5.0	1.46					

: 50% ED range : 100% ED range (but max. 10 min. without pause)

1. T_{2N} = nominal output torque
   Nominal output torque corresponds to the max. permissible average load torque at all input speeds.
   The nominal output torque for speeds less than 600 min^{-1} is equal to the value at 600 min^{-1}.
   The value for the maximum permissible input power is calculated from the nominal output torque at 100%.
   This value takes the efficiency of Fine Cyclo into consideration.
2. n_{1max} = maximum permissible input speed
   However, it must be n_{1m} (mean input speed) < $n_{1\ ED}$.
3. $n_{1\ ED}$ = permissible input speed according to duty cycle
4. T_{2A} = max. Acceleration and braking torque (for fatigue strength at $2 \cdot 10^7$ load cycles)
   Permissible peak torque for normal start and stop procedures.
5. T_{2max} = max. permissible torque for Emergency Stop situations or in the event of heavy shocks (limited by the mechanical strength) (permissible 1000 times during the entire lifetime).
6. The rated torque T_{2N} is calculated using the following equation when the speed is not shown in the table above:

$$T_{2N} = T_{2N,\,600} \left(\frac{600}{n_{1m}} \right)^{0.3}$$

T_{2N} : Rated torque at input speed n_{1m}
$T_{2N,600}$: Rated torque at input speed n_{1m} is 600 min^{-1}

6.3 Stiffness and Lost Motion

Size	i	Test torque T_p [Nm]	Lost Motion	Torsional stiffness T_p [Nm/arcmin]
			Lost Motion [arcmin]	
DA15	41	10.1	1.0	49.0
	59	9.03		
	89	7.98		
	119	7.35		
DA25	29	18.8		73.0
	41	16.9		112
	59	15.2		
	89	13.4		
	119	12.4		
DA35	29	25.4		135
	41	32.2		208
	59	28.9		
	89	25.5		
	119	23.5		
DA40	41	41.1		186
	59	36.8		286
	89	32.6		
	119	30.0		
DA45	29	50.2		224
	41	50.3		
	59	45.1		344
	89	39.8		
	119	36.8		
DA50	41	65.7		300
	59	58.9		540
	89	52.1		
	119	48.0		

Table DA-5 Torsional stiffness
T_p: Test torque at input speed n_1 = 1500 min^{-1}

Calculation of the twist angle:

1) At a load torque less than 3% T_p

$$\varphi = \frac{\text{Lost Motion}}{2} \cdot \frac{\text{Load torque}}{0.03 \cdot T_p}$$

Note arcmin means "angular minute".
Table values for stiffness are average values.

2) At a load torque greater than 3% T_p (standard case)

$$\varphi = \frac{\text{Lost Motion}}{2} + \frac{\text{Load torque} - (0.03 \cdot T_p)}{\text{Torsional stiffness}}$$

6.4 No-load running torque NLRT

No-load running torque

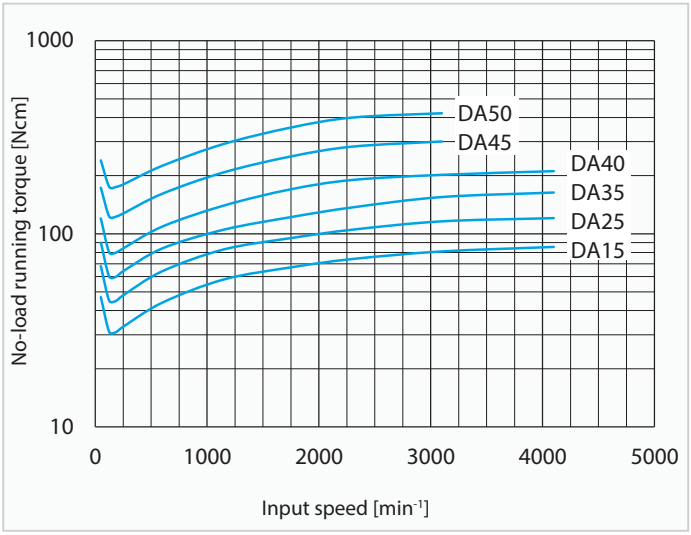


Fig. DA-1 Input side no-load running torque

Note
1. Fig. DA-1 shows the average no-load running torque after gearbox is run in (not factory-new condition).
2. Table DA-6 shows the measuring conditions.

6.5 Breakaway torque

Breakaway torque on output side (BTO)

Note
1. Table DA-7 shows the max. breakaway torque on the output side BTO. Fine Cyclo gearboxes are not self-locking. The BTO is defined as the maximum value (factory-new condition), which steadily decreases during the lifetime.
2. Table DA-6 shows the measuring conditions.

Ring gear housing temperature	approx. 30 °C
Precision during assembly	as per chapter 6.8.1
Lubrication	Standard lubrication

Table DA-6 Measurement conditions

Size	Breakaway torque BTO [Nm]
DA15	< 34
DA25	< 60
DA35	< 72
DA40	< 88
DA45	< 125
DA50	< 167

Table DA-7 Value of the breakaway torque on the output side (BTO)

Breakaway torque on input side (BTI)

Note
1. Table DA-8 shows the max. breakaway torque BTI on the input side. BTI is defined as the maximum value (factory-new condition) which steadily decreases during the lifetime.
2. Table DA-6 shows the measuring conditions.

Size	i	Breakaway torque BTI [Nm]
DA15	41	2.1
	59	1.4
	89	1.0
	119	0.7
DA25	29	5.2
	41	3.7
	59	2.5
	89	1.7
	119	1.3
DA35	29	6.2
	41	4.4
	59	3.1
	89	2.0
	119	1.5
DA40	41	5.4
	59	3.7
	89	2.5
	119	1.8
DA45	29	10.8
	41	7.6
	59	5.3
	89	3.5
	119	2.6
DA50	41	10.2
	59	7.1
	89	4.7
	119	3.5

Table DA-8 Value of the breakaway torque on the input side (BTI)

6.6 Efficiency

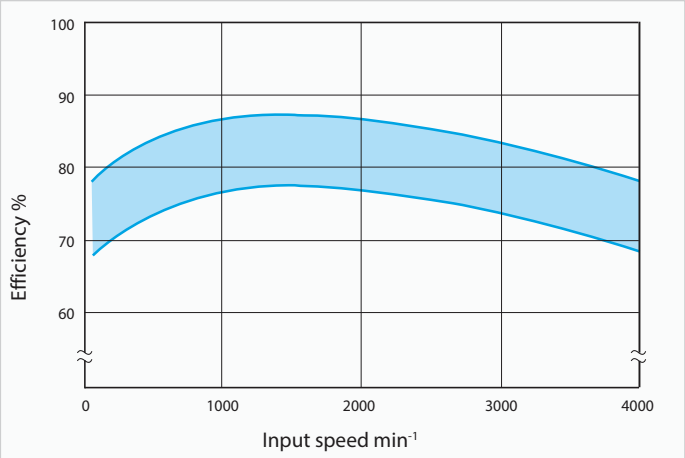


Fig. DA-2 Efficiency curve

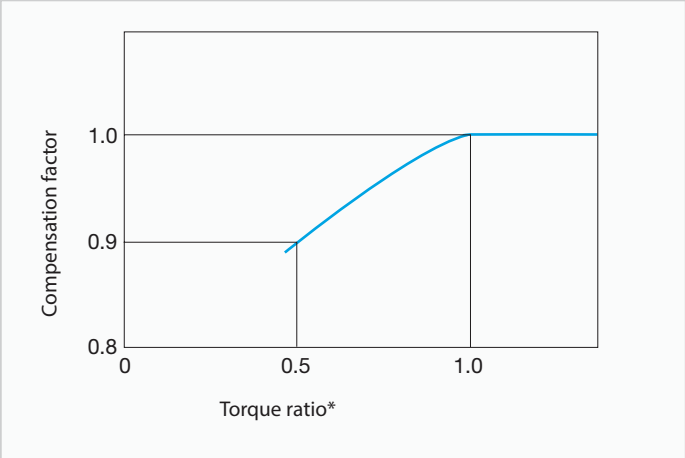


Fig. DA-3 Compensation curve for efficiency

Fig. DA-2 shows the correlation between efficiency and input speed. For further information, see "4 Description of technical specifications for cycloidal gearboxes" on page 22.

Note

1. The efficiency changes if the load torque does not match the nominal torque. Check the compensation factor in the diagram Fig. DA-3.
2. When the torque ratio is over 1.0, the compensation factor for efficiency is 1.0 (diagram Fig. DA-3).

$$\text{* Torque ratio} = \frac{\text{Load torque}}{\text{Nominal output torque}}$$

Compensation efficiency = efficiency · compensation factor

6.7 Bearing loads

6.7.1 Maximum permissible radial and axial load on the input shaft

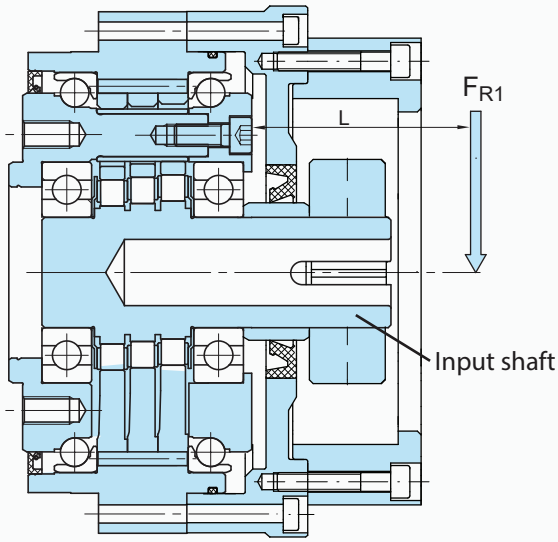


Fig. DA-4 Load position on input shaft

Load factor input L_{f1}							
	[mm]	Size					
		DA15	DA25	DA35	DA40	DA45	DA50
L	10	0.91	0.87	0.85			
	15	0.99	0.94	0.91	0.91	0.88	
	20	1.25	1.00	0.98	0.97	0.93	0.90
	25	1.56	1.25	1.14	1.09	0.98	0.94
	30	1.88	1.50	1.36	1.30	1.11	0.99
	35	2.19	1.75	1.59	1.52	1.30	1.13
	40		2.00	1.82	1.74	1.48	1.29
	45			2.05	1.96	1.67	1.45
	50				2.17	1.85	1.61
	60					2.22	1.94
ℓ_1	If: Ln = 1	16	20	22	23	27	31
a		0.072	0.063	0.061	0.055	0.052	0.046

Table DA-10 Load factor input L_{f1}

L = Distance from input side input shaft front end

$L \geqq \ell_1 \quad L_{f1} = L/\ell_1$

$L < \ell_1 \quad L_{f1} = 1.0 - a/5 \times (\ell_1 - L)$

If a gear or timing belt pulley is mounted on the input shaft, the values for radial load and axial load should be equal to or less than the permissible values. The following equation is used to check whether the shaft load is permissible:

1. Input radial load F_{R1}

$$F_{R1} = 10^3 \cdot \frac{T_{2V}}{\eta \cdot i \cdot r_0} \leq \frac{F_{R1\,max}}{L_{f1} \cdot C_{f1} \cdot B_{f1}} \quad [N] \qquad \text{(Equation DA-1)}$$

2. Input side axial load F_{A1}

$$F_{A1} \leq \frac{F_{A1\,max}}{C_{f1} \cdot B_{f1}} [N] \qquad \text{(Equation DA-2)}$$

3. When radial and axial loads co-exist

$$\left(\frac{F_{R1} \cdot L_{f1}}{F_{R1\,max}} + \frac{F_{A1}}{F_{A1\,max}}\right) \cdot C_{f1} \cdot B_{f1} \leq 1 \qquad \text{(Equation DA-3)}$$

F_{R1} = input side radial load [N]
T_{2V} = reference torque on output shaft [Nm]
r_0 = pitch circle radius of sprocket, pinion, or timing belt pulley [mm]
$F_{R1\,max}$ = maximum permissible input side radial load [N] (Table DA-12)
F_{A1} = input side axial load [N]
$F_{A1\,max}$ = max. permissible input side axial load [N] (Table DA-10)
L_{f1} = load factor input (Table DA-10)
C_{f1} = correction factor input (Table DA-9)
B_{f1} = service factor input (Table DA-11)
L = distance of radial load from front end on input side of the input shaft [mm] (Table DA-10)
η = 0.8 (efficiency)

Correction factor input	C_{f1}
Chain	1
Gear or pinion *	1.25
Timing belt	1.25
V-Belt	1.5

Table DA-9 Correction factor input C_{f1}

* For helical pinions or bevel gears, please consult Sumitomo Drive Technologies.

Service factor input	B_{f1}
Uniform load	1
Light impacts	1.2
Severe impacts	1.6

Table DA-11 Service factor input B_{f1}

Size		Input speed n_{1m} [min^{-1}]								
		4000	3000	2500	2000	1750	1500	1000	750	600
DA15		226	245	265	284	294	314	353	392	422
DA25		334	373	392	422	441	461	530	589	628
DA35			491	520	559	589	618	706	785	844
DA40	Ratio 41			436	470	491	517	592	651	702
	Ratio > 41			573	617	645	679	777	855	921
DA45	Ratio 41			436	470	491	517	592	651	702
	Ratio > 41			608	657	687	726	824	912	981
DA50					657	687	726	824	912	981

Table DA-12 Max. permissible input side radial load $F_{R1\,max}$ [N]

$$F_{R1\,max} = F_{R1,600} \left(\frac{600}{n_{1m}}\right)^{1/3}$$

$F_{R1\,max}$ = maximum permissible input side radial load at input speed n_{1m}

$F_{R1,600}$ = Radial load on input side at input speed $n_{1m} = 600$ min^{-1}

Size		Input speed n_{1m} [min^{-1}]								
		4000	3000	2500	2000	1750	1500	1000	750	600
DA15		245	284	314	343	363	392	471	549	608
DA25		363	412	451	500	540	579	697	804	883
DA35			540	589	657	706	755	922	1059	1167
DA40	Ratio 41			797	886	943	1014	1227	1404	1559
	Ratio > 41			797	886	943	1014	1227	1404	1559
DA45	Ratio 41			956	1061	1130	1215	1470	1683	1869
	Ratio > 41			1010	1118	1197	1295	1570	1795	2001
DA50					1118	1197	1295	1570	1795	2001

Table DA-13 Max. permissible input side axial load $F_{A1\,max}$ [N]

$$F_{A1\,max} = F_{A1,600} \left(\frac{600}{n_{1m}}\right)^{0.47}$$

$F_{A1\,max}$ = maximum permissible input side axial load at input speed n_{1m}

$F_{A1.600}$ = Axial load on input side at input speed $n_{1m} = 600$ min^{-1}

6.7.2 Main bearing

Fine Cyclo - F4C-DA

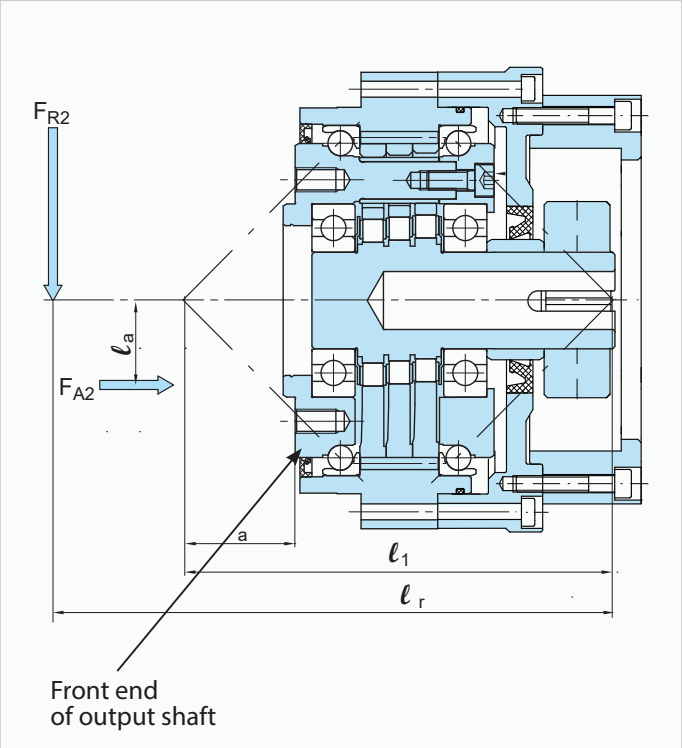


Fig. DA-5 Load position output

Size	Values of internal bearing distance	
	ℓ_1 [mm]	a [mm]
DA15	119	23.9
DA25	139	30.5
DA35	163	37.8
DA40	171	41.0
DA45	190	49.2
DA50	206	52.4

Table DA-14 Bearing clearances

Note If: $\ell_r > 4 \cdot \ell_1$, please contact Sumitomo Drive Technologies.

1. Moment stiffness

   The moment stiffness is the bending moment at which the output flange is tilted by the tilt angle.

   The tilt angle of the input flange is determined as follows:

$$\varphi_1 = \frac{T_k}{\Theta_1} \qquad \text{(Equation DA-5)}$$

External bending moment T_k

$$T_k = 10^{-3} \cdot (F_{R2} \cdot \ell_r + F_{A2} \cdot \ell_a) \qquad \text{(Equation DA-6)}$$

2. Max. permissible bending moment and max. permissible axial load.

   Check the equivalent bending moment and the equivalent axial load using the equations DA-6, DA-7, DA-8, and Fig. DA-6.

Equivalent bending moment T_{ke}

$$T_{ke} = 10^{-3} \cdot (C_{f2} \cdot B_{f2} \cdot F_{R2} \cdot \ell_r + C_{f2} \cdot B_{f2} \cdot F_{A2} \cdot \ell_a) \quad < T_{k\,max} \qquad \text{(Equation DA-7)}$$

Equivalent axial load F_{A2e} at the output shaft

$$F_{A2e} = F_{A2} \cdot C_{f2} \cdot B_{f2} \quad < F_{A2\,max} \qquad \text{(Equation DA-8)}$$

F_{A2} = output side axial load [N]
$F_{A2\,max}$ = maximum permissible output side axial load [N]
F_{A2e} = equivalent output side axial load [N]
F_{R2} = output side radial load [N]
C_{f2} = correction factor output (Table DA-16)
B_{f2} = service factor output (Table DA-17)
ℓ_1 = bearing clearance [mm] (Table DA-14)
ℓ_r = calculated dimension for bending moment [mm]
ℓ_a = distance of axial load [mm]
x = distance from radial force to flange collar [mm]
a = correction factor [mm] (Table DA-14)
T_k = external bending moment [Nm]
$T_{k\,max}$ = maximum permissible bending moment [Nm] (Table DA-18)
T_{ke} = equivalent bending moment [Nm]
φ_1 = tilt angle [arcmin]
Θ_1 = moment stiffness main bearing [Nm/arcmin] (Table DA-19)

Correction factor	C_{f2}
Chain	1
Gear or pinion	1.25
Timing belt	1.25
V-Belt	1.5

Table DA-15 Correction factor output C_{f2}

Correction factor output	C_{f2}
Chain	1
Gear or pinion	1.25
Timing belt	1.25
V-Belt	1.5

Table DA-16 Correction factor output C_{f2}

Service factor output	B_{f2}
Uniform load	1
Light impacts	1.2
Severe impacts	1.6

Table DA-17 Service factor output B_{f2}

Size	Ratio	Max. permissible bending moment $T_{k\,max}$	Max. permissible axial load $F_{A2\,max}$	
			Tension	Compression
		[Nm]	[N]	[N]
DA15		883	3924	3924
DA25		1660	5220	5220
DA35	29	1620	6530	6530
	41- 119	2150		
DA40	41	2430	9000	9000
	59- 119	2700		
DA45	29 – 41	3090	13000	13000
	59 – 119	3430		
DA50	41	3600	15000	15000
	59 -119	4000		

Table DA-18 Max. permissible bending moment and max. permissible axial load

Size	Moment stiffness Θ_1
	[Nm/arcmin]
DA15	510
DA25	833
DA35	1127
DA40	1470
DA45	1500
DA50	2450

Table DA-19 Average values for moment stiffness

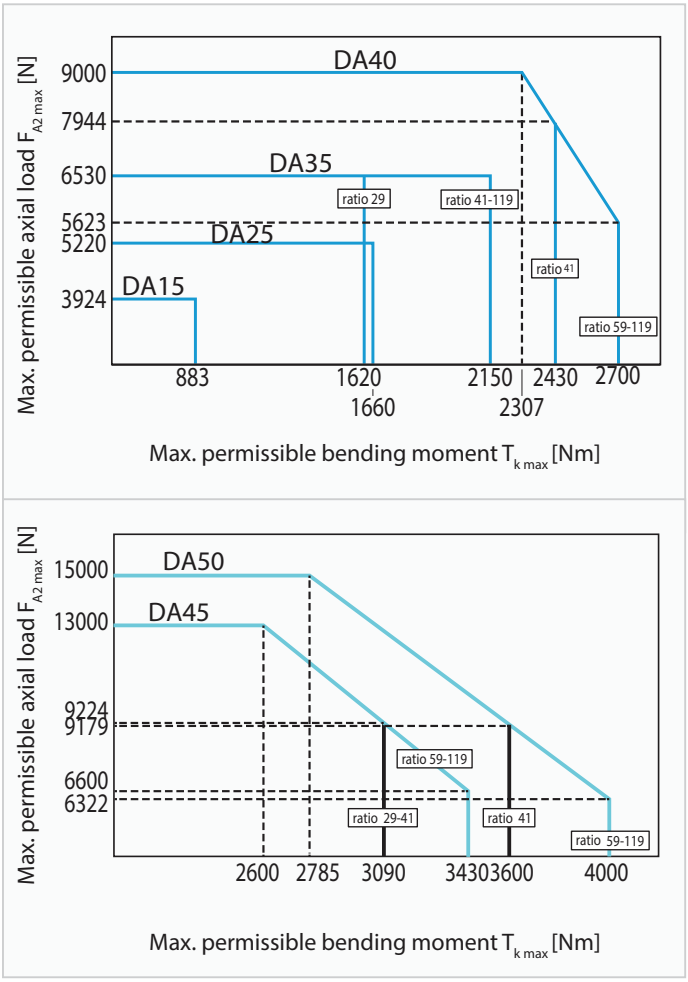
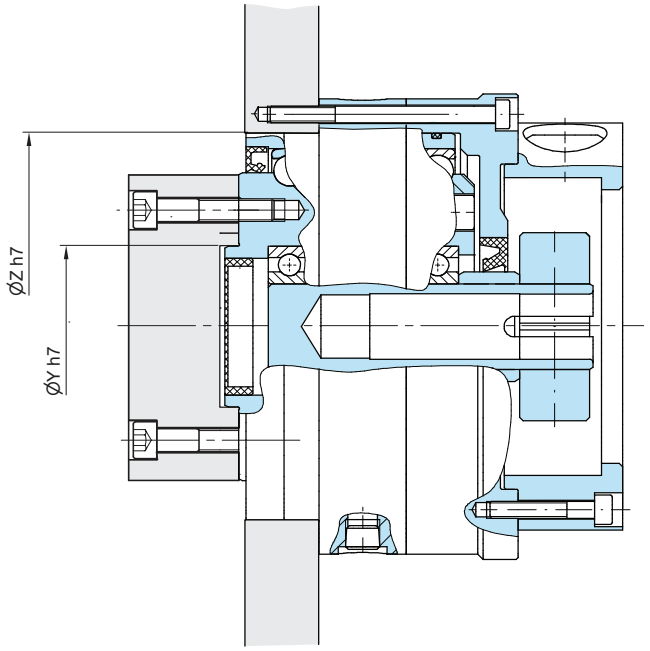


Fig. DA-6 Max. permissible bending moment and axial load

6.8 Assembly specifications and tolerances

6.8.1 Assembly tolerances

To ensure the function, lifetime, and characteristics of the gearbox, the radial run-out of the shaft ends, the coaxiality and the axial run-out of the fastening surface as per EN 50347:2001 are sufficient. When used in high-precision applications, the tolerance according to EN 50347:2001 should be reduced by 50%, which has additional advantages.

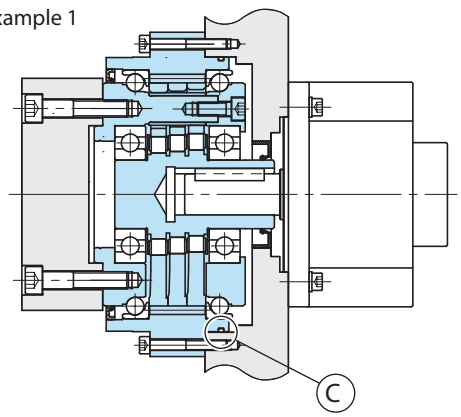


Size	Ø Z	Ø Y
DA15	113	47
DA25	136	65
DA35	160	80
DA40	170	75
DA45	186	90
DA50	202	100

Table DA-20 (Dimensions in mm)

- Take the installation situation in position Ⓒ into consideration on the input side.
- Take the installation situation at the output flange in position Ⓑ and at the customer's housing in position Ⓐ into consideration.

Installation example 1



Installation example 2

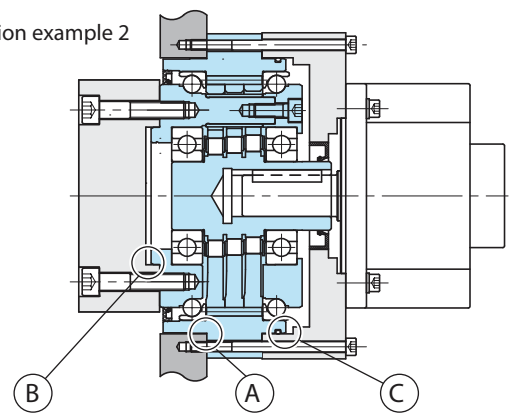


Fig. DA-7 Installation example

6.8.2 Tightening torque and maximum permissible transmittable torque for bolts

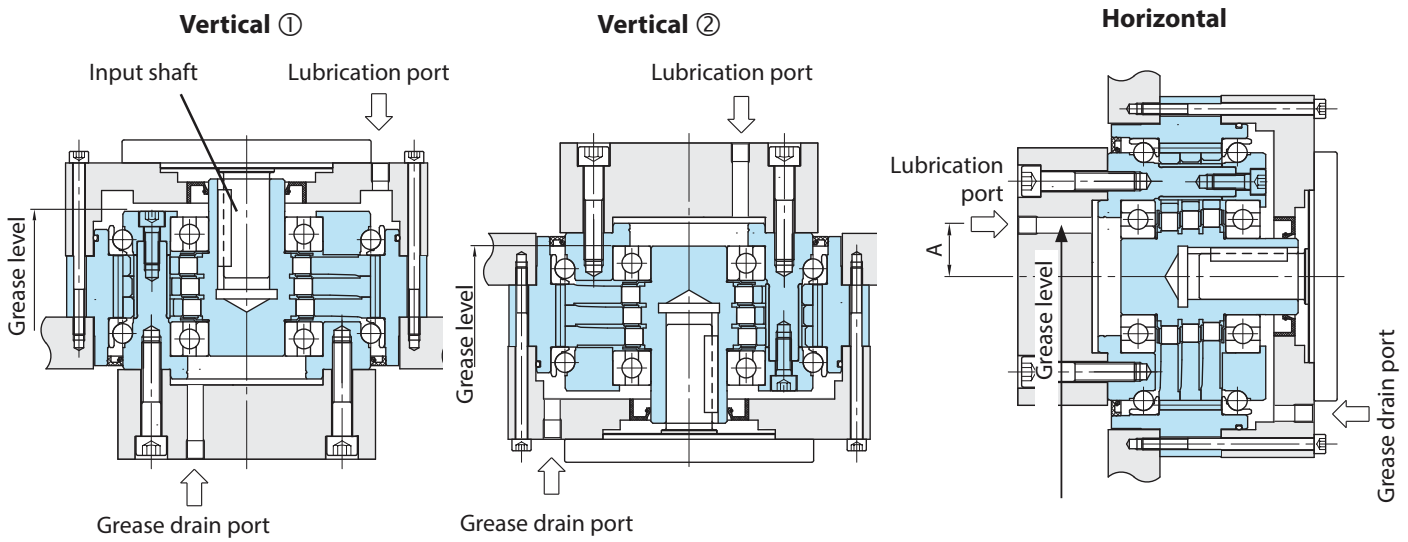
The permissible transmitted torque for bolts and the number, size, and tightening torque for fastening the output side flange and the ring gear housing are listed in Table DA-21. In the event of an Emergency Stop with corresponding load peaks, the output flange and ring gear housing bolts must all be replaced.

Size	Output flange bolts			Bolts for ring gear (housing)		
	Number and size of bolts	Tightening torque [Nm]	Max. permissible transmittable torque for bolts [Nm]	Number and size of bolts	Tightening torque [Nm]	Max. permissible transmittable torque for bolts [Nm]
DA15	12 × M8	38.3	1478	16 × M5	9.1	1389
DA25	18 × M8	38.3	2772	16 × M6	15.7	2356
DA35	16 × M10	76.5	4594	16 × M8	38.3	5073
DA40	16 × M10	76.5	5283	18 × M8	38.3	6000
DA45	18 × M10	76.5	6408	16 × M10	76.5	9371
DA50	18 × M12	133	10516	16 × M10	76.5	10106

Table DA-21

- **Bolting:** Use metric hexagon socket head screws (DIN 4762, strength category 12.9).
- **Countermeasure for bolts loosening:** Use adhesives (Loctite 262, etc.) or spring washer (DIN 127A).
- **Use spring washers** (DIN 6796) when connecting the gearbox to the flange side, so that the bolt contact faces do not get damaged.

6.8.3 Lubrication



- For gearboxes that are not sealed, delivery does not include lubricant (grease filling). Upon receipt, the customer must therefore fill it with the appropriate amount (Table DA-23) of the recommended grease(Table DA-22).
- Use the quantity quoted in Table DA-23 as an approximate value; check the grease level.
- Fit the lubrication port and the grease drain on the output side. (See "A" and Table DA-23)
- When adding grease for the first time, use the lower opening to ensure grease circulation.
- Reconditioning is recommended after 20,000 operating hours, but at least every 3-5 years.
- The lifetime of the gearbox can be increased by returning it to the factory for overhauling and regreasing.
- DA-Modular as per the standard catalogue version are designed for lubrication in any mounting position.

Specified grease	Manufacturer
Multemp FZ No. 00	Kyodo Yushi Co., Ltd.
Conditions for use: Ambient temperature -10 °C to +40 °C	

Table DA-22 Specified grease

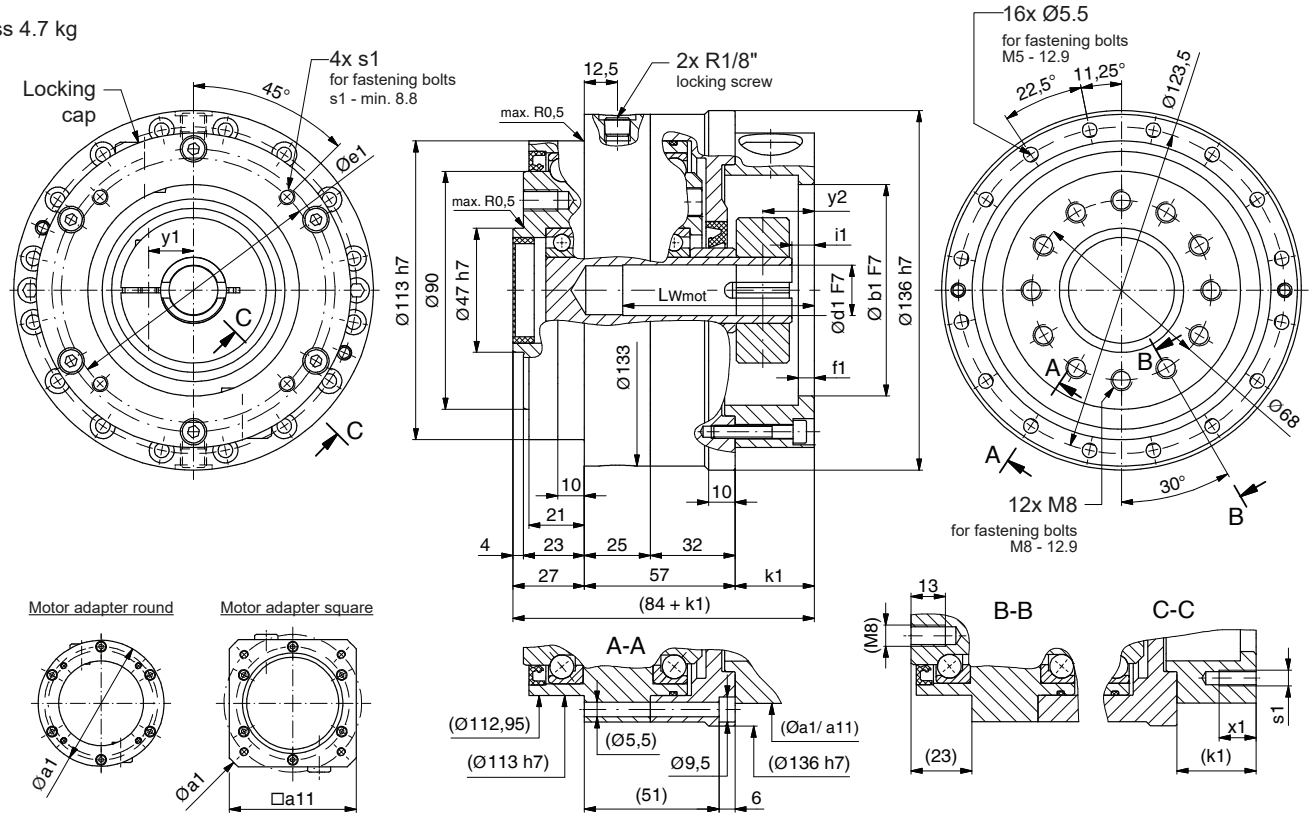
Size	Quantity of grease [g]			Lubrication port distance A [mm]
	Vertical ①	Vertical ②	Horizontal	
DA15	52	52	39	20
DA25	113	113	91	27
DA35	196	196	161	34
DA40	204	204	170	36
DA45	222	222	178	39
DA50	305	305	252	43

Table DA-23 (if delivered without grease filling)

6.8.4 Dimensioned drawings

F4CF-DA15

Mass 4.7 kg

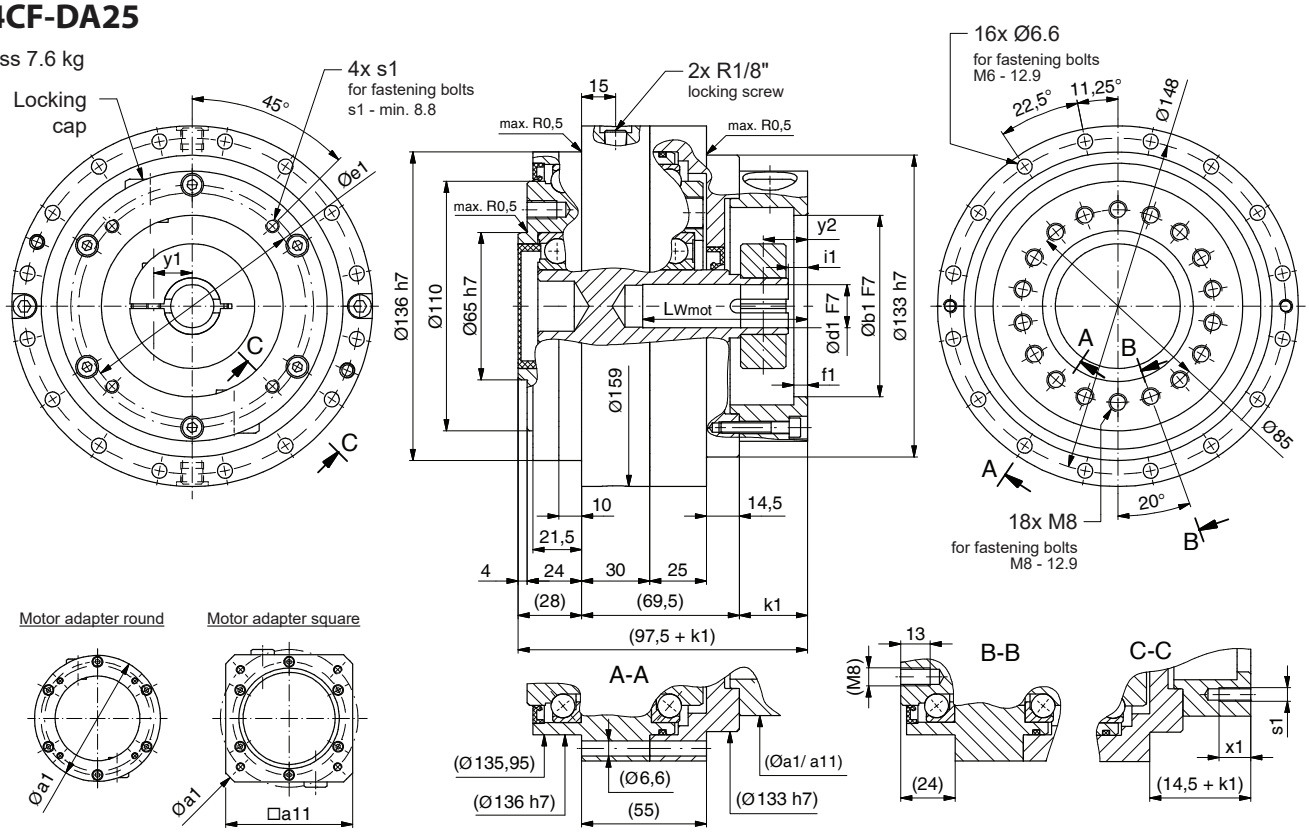


Motor mounting dimensions

Motor code	Hole for shaft	Min./Max. Length of motor shaft	Centering F7	Spigot seat depth	Pitch circle Ø	Thread in gearbox flange	Thread depth	Flange diameter	Flange square dimension	Flange width	Shaft leeway without bushing	Shaft leeway with bushing	Positional dimensions locking lid	
	Ød1	$L_{w\,Mot\ min/max}$	Øb1	f1	Øe1	4x s1	x1	Øa1	□a11	k1	i1		y1	y2
							mm							
D30G	10	25.0 / 48.5	80	6	100	M6	14	119	-	30	-	7.5	18.5	16.5
E08G	11	24.0 / 47.5	40	5.5	63	M5	7.5	119	-	29	-	6.5	17	16.5
E10G		24.0 / 47.5	50	5.5	70	M4	7.5	119	-	29	-	6.5	17	16.5
E11G		24.0 / 47.5	60	5.5	75	M5	7.5	119	-	29	-	6.5	18.5	16.5
F25G	12	24.0 / 47.5	50	5.5	70	M5	7.5	119	-	29	-	6.5	17	16.5
F17G		25.5 / 49.0	70	6	90	M5	12	119	-	30.5	-	8	18.5	17
F24G		25.0 / 48.5	73.02	6	98.4	M5	12	119	-	30	-	7.5	18.5	16.5
H10G	14	24.0 / 47.5	50	5.5	70	M4	7.5	119	-	29	-	6.5	17	16.5
H25G		24.0 / 47.5	50	5.5	70	M5	7.5	119	-	29	-	6.5	17	16.5
H20G		24.0 / 47.5	50	6	95	M6	14	119	-	29	-	6.5	17	16.5
H12G		24.0 / 47.5	60	5.5	75	M6	7.5	119	-	29	-	6.5	18.5	16.5
H18G		25.5 / 49.0	70	6	90	M6	14	119	-	30.5	-	8	18.5	17
H30L		34.0 / 57.5	80	6	100	M6	14	119	-	39	-	7.5	18.5	25.5
H35G		25.0 / 48.5	95	6	115	M8	17	138	120	30	-	7.5	18.5	18
H50G		25.0 / 48.5	110	6	130	M8	17	158	120	30	-	7.5	25	18
H60L		36.5 / 60.0	110	8	145	M8	17	158	120	41.5	-	19	25	29.5
J18G	16	30.0 / 73.0	70	6	90	M6	14	119	-	30.5	-	8	18.5	17
J30G		29.5 / 72.5	80	6	100	M6	14	119	-	30	-	7.5	18.5	16.5
J60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
K60L	17	43.0 / 84.0	110	8	145	M8	17	158	120	41.5	-	19	25	29.5
M30G	19	29.5 / 72.5	80	6	100	M6	14	119	-	30	8.5	-	18.5	16.5
M30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	8.5	-	18.5	25.5
M35G		29.5 / 72.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
M45G		29.5 / 72.5	95	6	130	M8	17	158	120	30	8.5	-	25	18
M60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	8.5	-	25	18
M60L		43.0 / 84.0	110	8	145	M8	17	158	120	41.5	20	-	25	29.5

F4CF-DA25

Mass 7.6 kg

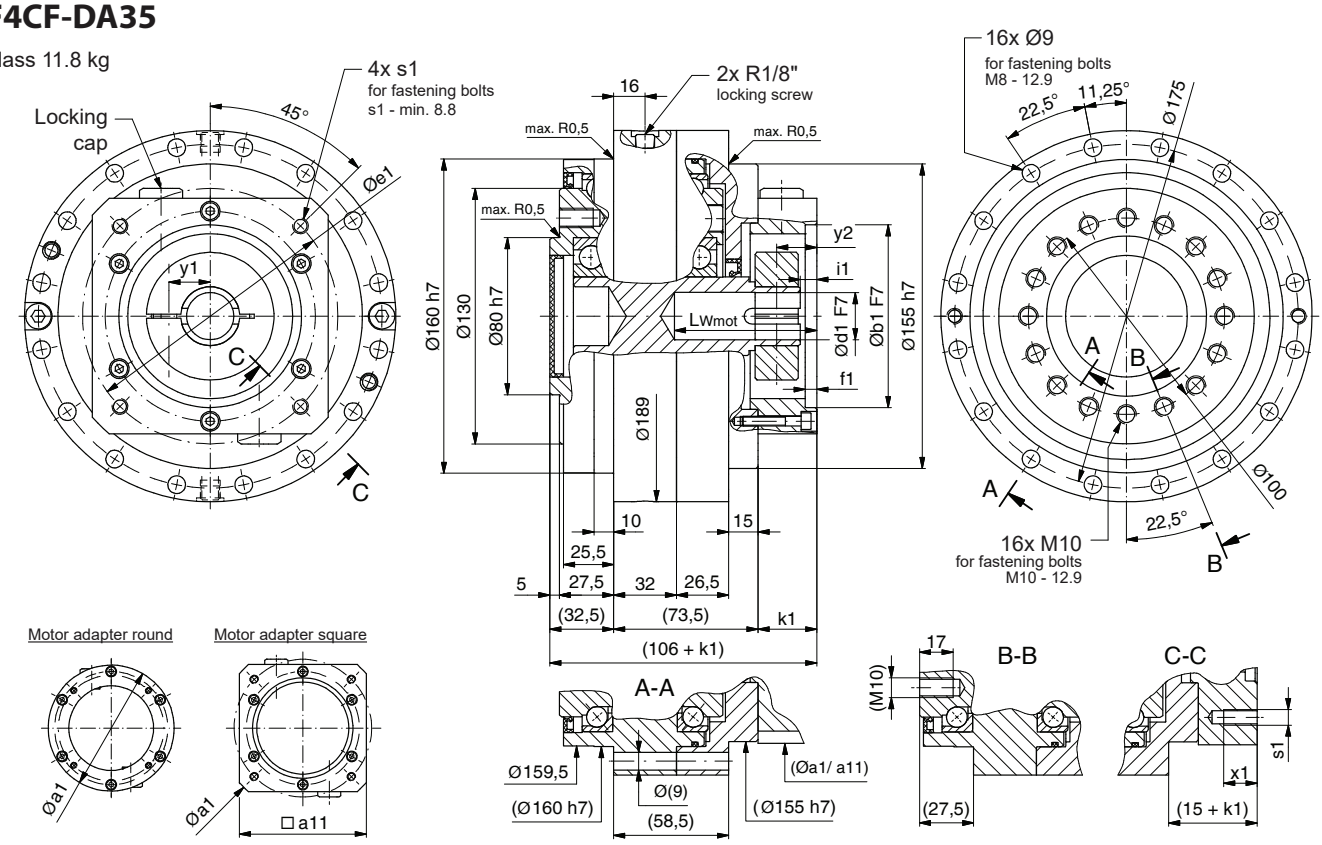


Motor mounting dimensions

Motor code	Hole for shaft	Min./Max. Length of motor shaft	Centering F7	Spigot seat depth	Pitch circle Ø	Thread in gearbox flange	Thread depth	Flange diameter	Flange square dimension	Flange width	Shaft leeway without bushing	Shaft leeway with bushing	Positional dimensions locking lid	
	Ød1	$L_{w\ Mot\ min/max}$	Øb1	f1	Øe1	4x s1	x1	Øa1	□a11	k1	i1		y1	y2
	mm													
D30G	10	25.0 / 48.5	80	6	100	M6	14	119	-	30	-	7.3	18.5	16.5
E08G	11	24.0 / 47.5	40	5.5	63	M5	7.5	119	-	29	-	6.3	17	16.5
E10G		24.0 / 47.5	50	5.5	70	M4	7.5	119	-	29	-	6.3	17	16.5
E11G		24.0 / 47.5	60	5.5	75	M5	7.5	119	-	29	-	6.3	18.5	16.5
F25G	12	24.0 / 47.5	50	5.5	70	M5	7.5	119	-	29	-	6.3	17	16.5
F17G		25.5 / 49.0	70	6	90	M5	12	119	-	30.5	-	7.8	18.5	17
F24G		25.0 / 48.5	73.02	6	98.4	M5	12	119	-	30	-	7.3	18.5	16.5
H10G	14	24.0 / 47.5	50	5.5	70	M4	7.5	119	-	29	-	6.3	17	16.5
H25G		24.0 / 47.5	50	5.5	70	M5	7.5	119	-	29	-	6.3	17	16.5
H20G		24.0 / 47.5	50	6	95	M6	14	119	-	29	-	6.3	17	16.5
H12G		24.0 / 47.5	60	5.5	75	M6	7.5	119	-	29	-	6.3	18.5	16.5
H18G		25.5 / 49.0	70	6	90	M6	14	119	-	30.5	-	7.8	18.5	17
H30L		34.0 / 57.5	80	6	100	M6	14	119	-	39	-	7.3	18.5	25.5
H35G		25.0 / 48.5	95	6	115	M8	17	138	120	30	-	7.3	18.5	18
H50G		25.0 / 48.5	110	6	130	M8	17	158	120	30	-	7.3	25	18
H60L		36.5 / 60.0	110	8	145	M8	17	158	120	41.5	-	18.8	25	29.5
J18G	16	30.0 / 73.0	70	6	90	M6	14	119	-	30.5	-	7.8	18.5	17
J30G		29.5 / 72.5	80	6	100	M6	14	119	-	30	-	7.3	18.5	16.5
J60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.3	25	18
K60L	17	43.0 / 84.0	110	8	145	M8	17	158	120	41.5	-	18.8	25	29.5
M30G	19	29.5 / 72.5	80	6	100	M6	14	119	-	30	-	7.3	18.5	16.5
M30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	-	7.3	18.5	25.5
M35G		29.5 / 72.5	95	6	115	M8	17	138	120	30	-	7.3	18.5	18
M45G		29.5 / 72.5	95	6	130	M8	17	158	120	30	-	7.3	25	18
M60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.3	25	18
M60L		43.0 / 84.0	110	8	145	M8	17	158	120	41.5	-	18.8	25	29.5
N60G	22	31.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.3	25	18
Z35G	24	31.5 / 72.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
Z50G		31.5 / 72.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
Z70G		31.5 / 72.5	130	6	165	M10	20	188	144	30	8.5	-	25	18

F4CF-DA35

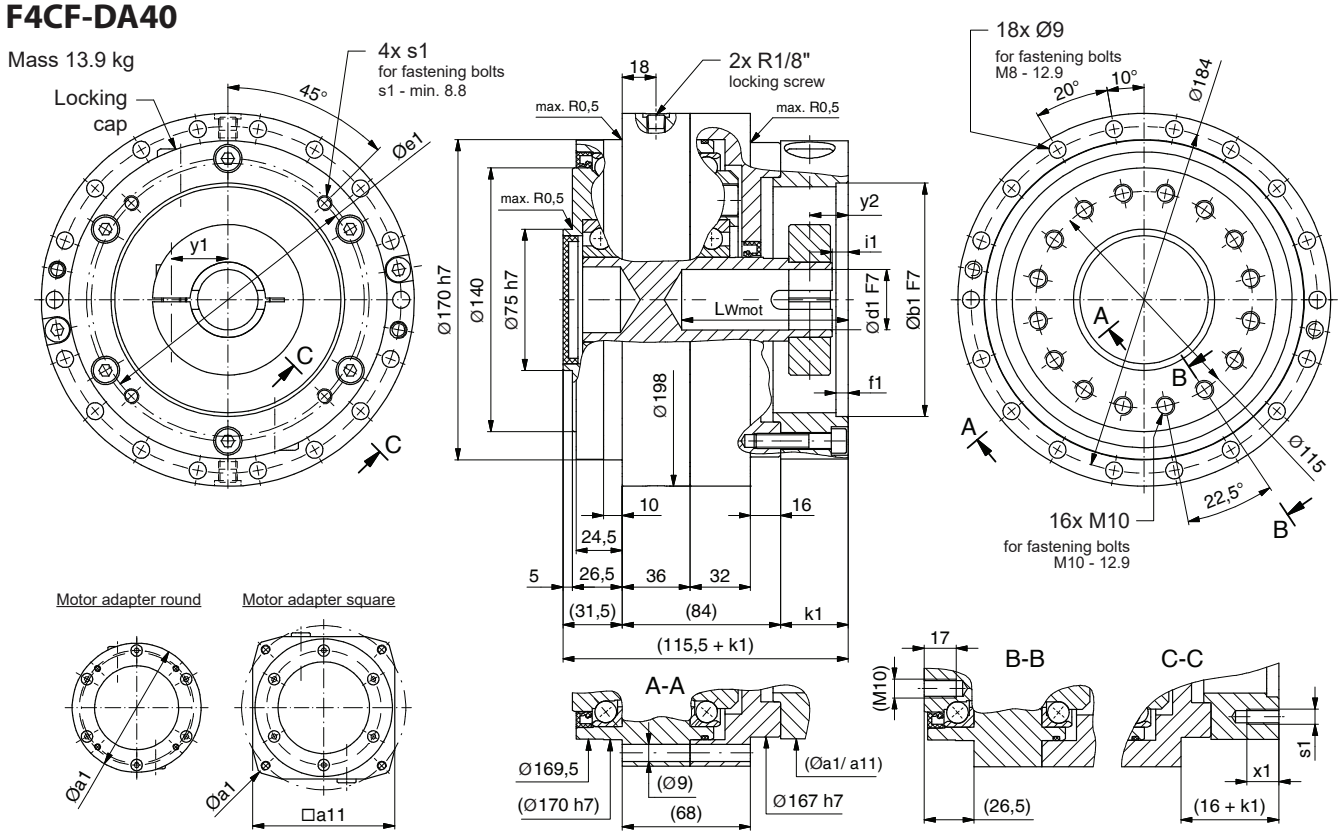
Mass 11.8 kg



Motor mounting dimensions

Motor code	Hole for shaft	Min./Max. Length of motor shaft	Centering F7	Spigot seat depth	Pitch circle Ø	Thread in gearbox flange	Thread depth	Flange diameter	Flange square dimension	Flange width	Shaft leeway without bushing	Shaft leeway with bushing	Positional dimensions locking lid	
	Ød1	$L_{w\,Mot\ min/max}$	Øb1	f1	Øe1	4x s1	x1	Øa1	□a11	k1	i1		y1	y2
						mm								
H35G	14	25.0 / 48.5	95	6	115	M8	17	138	120	30	-	7.3	18.5	18
H50G		25.0 / 48.5	110	6	130	M8	17	158	120	30	-	7.3	25	18
H60L		36.5 / 60.0	110	8	145	M8	17	158	120	41.5	-	18.8	25	29.5
J18G	16	30.0 / 73.0	70	6	90	M6	14	119	-	30.5	-	7.8	18.5	17
J30G		29.5 / 72.5	80	6	100	M6	14	119	-	30	-	7.3	18.5	16.5
J60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.3	25	18
K60L	17	43.0 / 84.0	110	8	145	M8	17	158	120	41.5	-	18.8	25	29.5
M30G	19	29.5 / 72.5	80	6	100	M6	14	119	-	30	-	7.3	18.5	16.5
M30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	-	7.3	18.5	25.5
M35G		29.5 / 72.5	95	6	115	M8	17	138	120	30	-	7.3	18.5	18
M45G		29.5 / 72.5	95	6	130	M8	17	158	120	30	-	7.3	25	18
M60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.3	25	18
M60L		43.0 / 84.0	110	8	145	M8	17	158	120	41.5	-	18.8	25	29.5
N60G	22	31.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.3	25	18
Z35G	24	31.5 / 72.5	95	6	115	M8	17	138	120	30	-	-	18.5	18
Z50G		31.5 / 72.5	110	6	130	M8	17	158	120	30	-	-	25	18
Z70G		31.5 / 72.5	130	6	165	M10	20	188	144	30	-	-	25	18
Q50G	28	31.5 / 88.5	110	6	130	M8	17	158	120	30	-	7.5	25	18
Q60G		31.5 / 88.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
Q60L		43.0 / 100.0	110	8	145	M8	17	158	120	41.5	-	19	25	29.5
Q70G		31.5 / 88.5	130	6	165	M10	20	188	144	30	-	7.5	25	18
S70G	32	31.5 / 88.5	130	6	165	M10	20	188	144	30	8.5	-	25	18

F4CF-DA40

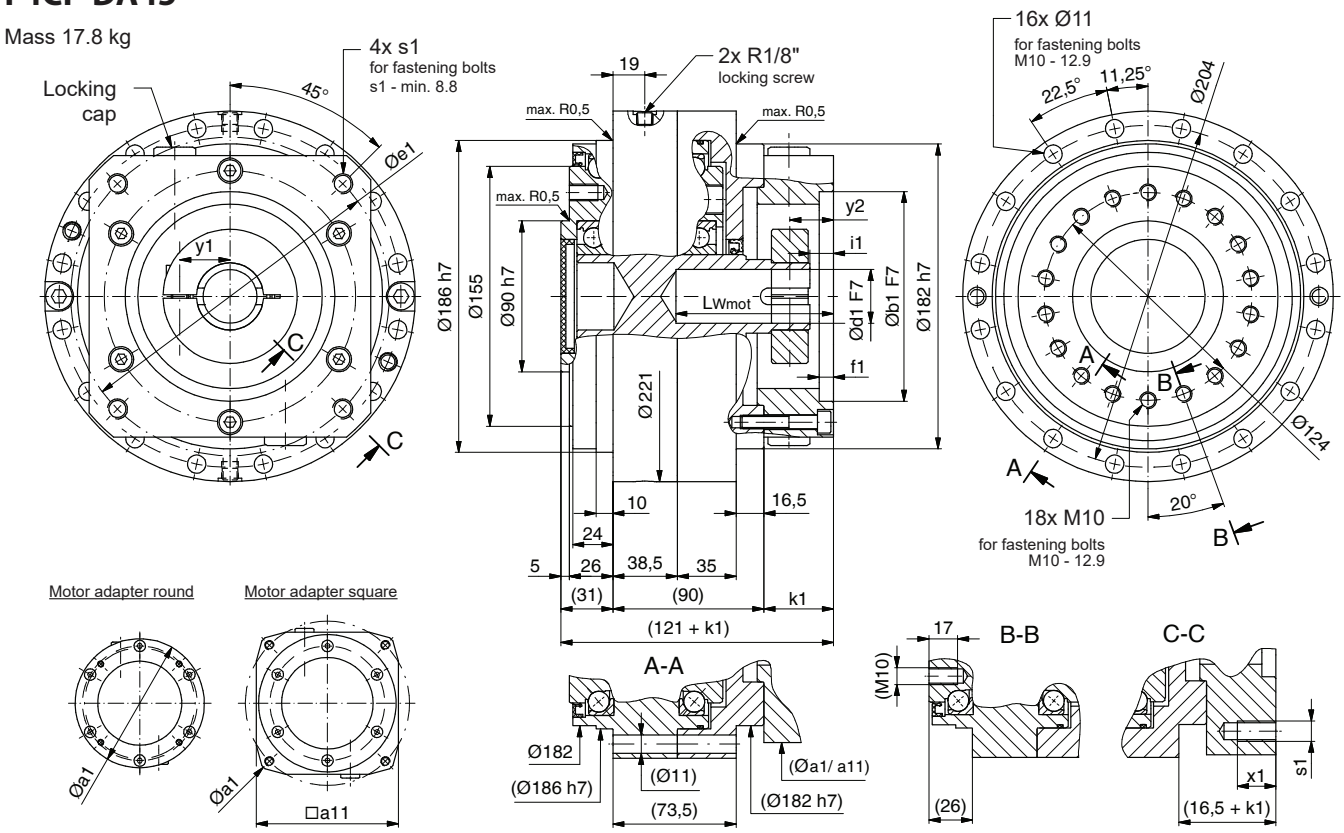


Motor mounting dimensions

Motor code	Hole for shaft	Min./Max. Length of motor shaft	Centering F7	Spigot seat depth	Pitch circle Ø	Thread in gearbox flange	Thread depth	Flange diameter	Flange square dimension	Flange width	Shaft leeway without bushing	Shaft leeway with bushing	Positional dimensions locking lid	
	Ød1	$L_{w\ Mot\ min/max}$	Øb1	f1	Øe1	4x s1	x1	Øa1	□a11	k1	i1		y1	y2
	mm													
H35G	14	25.0 / 48.5	95	6	115	M8	17	138	120	30	-	7.3	18.5	18
H50G		25.0 / 48.5	110	6	130	M8	17	158	120	30	-	7.3	25	18
H60L		36.5 / 60.0	110	8	145	M8	17	158	120	41.5	-	18.8	25	29.5
J18G	16	30.0 / 73.0	70	6	90	M6	14	119	-	30.5	-	7.8	18.5	17
J30G		29.5 / 72.5	80	6	100	M6	14	119	-	30	-	7.3	18.5	16.5
J60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.3	25	18
K60L	17	43.0 / 84.0	110	8	145	M8	17	158	120	41.5	-	18.8	25	29.5
M30G	19	29.5 / 72.5	80	6	100	M6	14	119	-	30	-	7.3	18.5	16.5
M30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	-	7.3	18.5	25.5
M35G		29.5 / 72.5	95	6	115	M8	17	138	120	30	-	7.3	18.5	18
M45G		29.5 / 72.5	95	6	130	M8	17	158	120	30	-	7.3	25	18
M60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.3	25	18
M60L		43.0 / 84.0	110	8	145	M8	17	158	120	41.5	-	18.8	25	29.5
N60G	22	31.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.3	25	18
Z35G	24	31.5 / 72.5	95	6	115	M8	17	138	120	30	-	-	18.5	18
Z50G		31.5 / 72.5	110	6	130	M8	17	158	120	30	-	-	25	18
Z70G		31.5 / 72.5	130	6	165	M10	20	188	144	30	-	-	25	18
Q50G	28	31.5 / 88.5	110	6	130	M8	17	158	120	30	-	7.3	25	18
Q60G		31.5 / 88.5	110	6.5	145	M8	17	158	120	30	-	7.3	25	18
Q60L		43.0 / 100.0	110	8	145	M8	17	158	120	41.5	-	18.8	25	29.5
Q70G		31.5 / 88.5	130	6	165	M10	20	188	144	30	-	7.3	25	18
S70G	32	31.5 / 88.5	130	6	165	M10	20	188	144	30	8.5	-	25	18

F4CF-DA45

Mass 17.8 kg

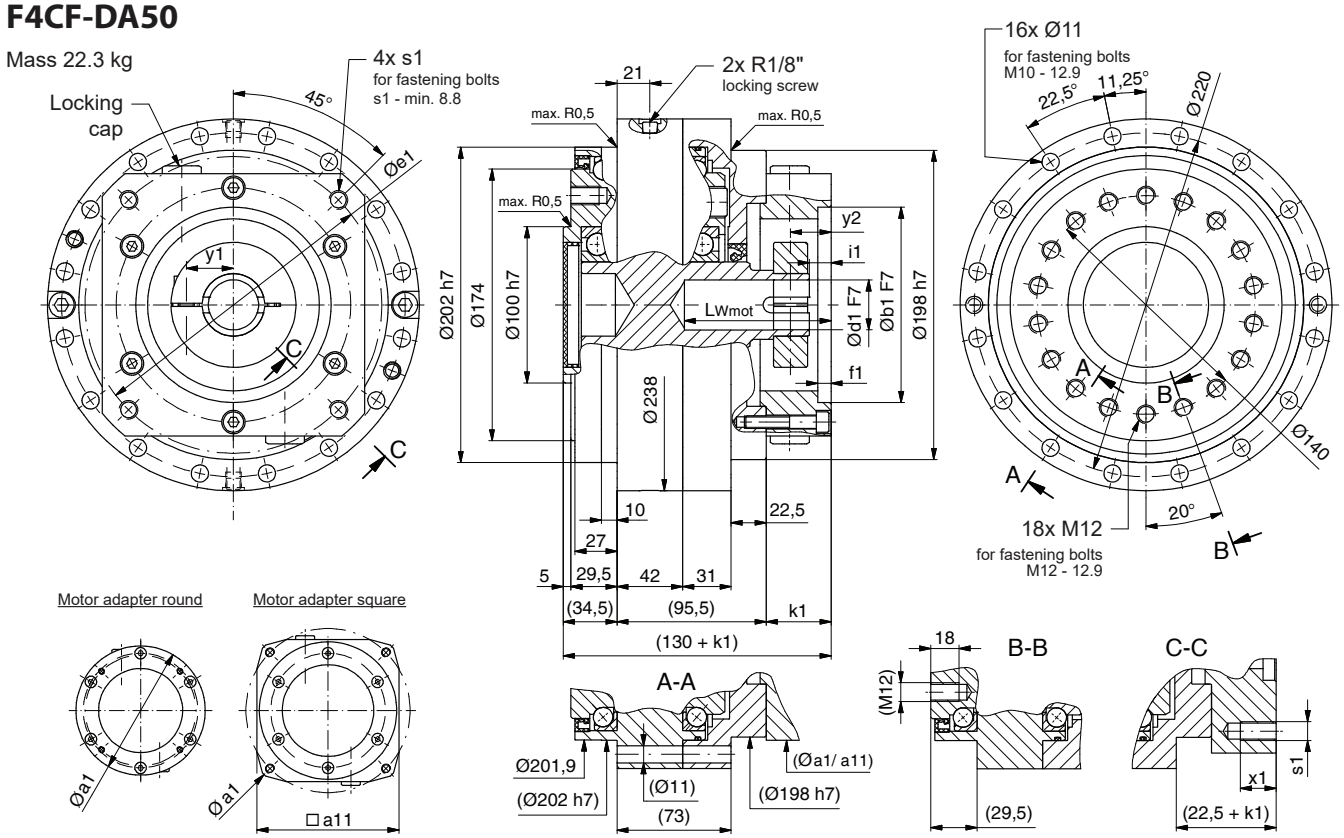


Motor mounting dimensions

Motor code	Hole for shaft	Min./Max. Length of motor shaft	Centering F7	Spigot seat depth	Pitch circle Ø	Thread in gearbox flange	Thread depth	Flange diameter	Flange square dimension	Flange width	Shaft leeway without bushing	Shaft leeway with bushing	Positional dimensions locking lid	
	Ød1	$L_{w\,Mot\ min/max}$	Øb1	f1	Øe1	4x s1	x1	Øa1	□a11	k1	i1		y1	y2
							mm							
H35G	14	29.5 / 72.5	95	6	115	M8	17	169	-	36	-	7.3	24	20.5
H50G		29.5 / 72.5	110	6	130	M8	17	169	-	36	-	7.3	24	20.5
H60L		41.0 / 84.0	110	6	145	M8	17	169	-	47.5	-	18.8	25	32
J18G	16	30.0 / 73.0	70	9	90	M5	12	169	-	36.5	-	7.8	18.5	20
J30G		29.5 / 72.5	80	6	100	M6	14	169	-	36	-	7.3	24	20.5
J60G		29.5 / 72.5	110	6	145	M8	17	169	-	36	-	7.3	25	20.5
K60L	17	41.0 / 84.0	110	6	145	M8	17	169	-	47.5	-	18.8	25	32
M30G	19	29.5 / 72.5	80	6	100	M6	9	169	-	36	-	7.3	24	20.5
M33G		29.5 / 72.5	80	6	100	M8	12	169	-	36	-	7.3	24	20.5
M35G		29.5 / 72.5	95	6	115	M8	17	169	-	36	-	7.3	24	20.5
M45G		29.5 / 72.5	95	6	130	M8	17	169	-	36	-	7.3	24	20.5
M50G		29.5 / 72.5	110	6	130	M8	17	169	-	36	-	7.3	24	20.5
M60G		29.5 / 72.5	110	6	145	M8	17	169	-	36	-	7.3	25	20.5
M60L		41.0 / 84.0	110	6	145	M8	17	169	-	47.5	-	18.8	25	32
M70G		29.5 / 72.5	130	8	165	M10	20	188	-	36	-	7.3	25	20.5
N60G	22	29.5 / 72.5	110	6	145	M8	17	169	-	36	-	7.3	25	20.5
Z35G	24	29.5 / 72.5	95	6	115	M8	17	169	-	36	-	-	24	20.5
Z50G		29.5 / 72.5	110	6	130	M8	17	169	-	36	-	-	24	20.5
Z70G		29.5 / 72.5	130	8	165	M10	20	188	-	36	-	-	25	20.5
Q60G	28	31.5 / 88.5	110	6	145	M8	17	169	-	36	-	7.3	25	20.5
Q60L		41.0 / 100	110	6	145	M8	17	169	-	47.5	-	18.8	25	32
Q70G		31.5 / 88.5	130	8	165	M10	20	188	-	36	-	7.3	25	20.5
R50G	30	31.5 / 88.5	110	6	130	M8	17	169	-	36	-	7.3	24	20.5
S70G	32	31.5 / 88.5	130	8	165	M10	20	188	-	36	-	-	25	20.5
T76G	35	37.0 / 94.0	114.3	6	200	M12	23	223	176	41.5	-	12.8	33	26.5
U80G	38	32.0 / 89.0	180	6.5	215	M12	23	237	186	36.5	9	-	30	21.5

F4CF-DA50

Mass 22.3 kg



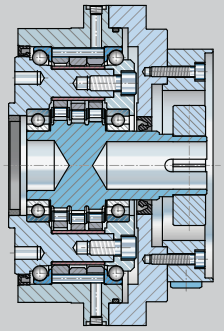
Motor mounting dimensions

Motor code	Hole for shaft	Min./Max. Length of motor shaft	Centering F7	Spigot seat depth	Pitch circle Ø	Thread in gearbox flange	Thread depth	Flange diameter	Flange square dimension	Flange width	Shaft leeway without bushing	Shaft leeway with bushing	Positional dimensions locking lid	
	Ød1	$L_{w\ Mot\ min/max}$	Øb1	f1	Øe1	4x s1	x1	Øa1	□a11	k1	i1		y1	y2
	mm													
H35G	14	29.5 / 72.5	95	6	115	M8	17	169	-	36	-	7.3	24	20.5
H50G		29.5 / 72.5	110	6	130	M8	17	169	-	36	-	7.3	24	20.5
H60L		41.0 / 84.0	110	6	145	M8	17	169	-	47.5	-	18.8	25	32
J18G	16	30.0 / 73.0	70	9	90	M5	12	169	-	36.5	-	7.8	18.5	20
J30G		29.5 / 72.5	80	6	100	M6	14	169	-	36	-	7.3	24	20.5
J60G		29.5 / 72.5	110	6	145	M8	17	169	-	36	-	7.3	25	20.5
K60L	17	41.0 / 84.0	110	6	145	M8	17	169	-	47.5	-	18.8	25	32
M30G	19	29.5 / 72.5	80	6	100	M6	9	169	-	36	-	7.3	24	20.5
M33G		29.5 / 72.5	80	6	100	M8	12	169	-	36	-	7.3	24	20.5
M35G		29.5 / 72.5	95	6	115	M8	17	169	-	36	-	7.3	24	20.5
M45G		29.5 / 72.5	95	6	130	M8	17	169	-	36	-	7.3	24	20.5
M50G		29.5 / 72.5	110	6	130	M8	17	169	-	36	-	7.3	24	20.5
M60G		29.5 / 72.5	110	6	145	M8	17	169	-	36	-	7.3	25	20.5
M60L		41.0 / 84.0	110	6	145	M8	17	169	-	47.5	-	18.8	25	32
M70G		29.5 / 72.5	130	8	165	M10	20	188	-	36	-	7.3	25	20.5
N60G	22	29.5 / 72.5	110	6	145	M8	17	169	-	36	-	7.3	25	20.5
Z35G	24	29.5 / 72.5	95	6	115	M8	17	169	-	36	-	-	24	20.5
Z50G		29.5 / 72.5	110	6	130	M8	17	169	-	36	-	-	24	20.5
Z70G		29.5 / 72.5	130	8	165	M10	20	188	-	36	-	-	25	20.5
Q60G	28	31.5 / 88.5	110	6	145	M8	17	169	-	36	-	7.3	25	20.5
Q60L		41.0 / 100	110	6	145	M8	17	169	-	47.5	-	18.8	25	32
Q70G		31.5 / 88.5	130	8	165	M10	20	188	-	36	-	7.3	25	20.5
R50G	30	31.5 / 88.5	110	6	130	M8	17	169	-	36	-	7.3	24	20.5
S70G	32	31.5 / 88.5	130	8	165	M10	20	188	-	36	-	-	25	20.5
T76G	35	37.0 / 94.0	114.3	6	200	M12	23	223	176	41.5	-	12.8	33	26.5
U80G	38	32.0 / 89.0	180	6.5	215	M12	23	237	186	36.5	9	-	30	21.5

D-Series

Special feature: By default the gearboxes are supplied with matching clamp ring adapter and motor flange

Optional: The gearboxes can also be purchased with other mounting options or without customer-specific flange

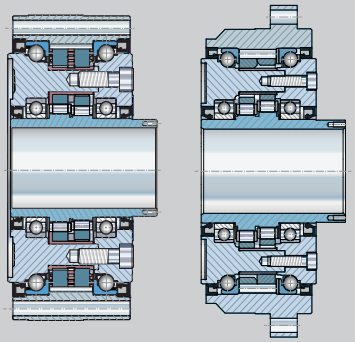
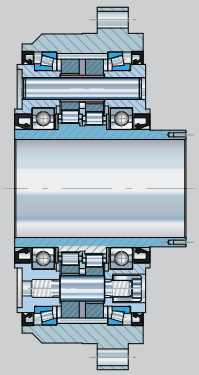
Model		Size	Available single stage reduction ratios					Outer-Ø flange	Outer-Ø cylindrical	Max. hollow shaft-Ø
			29	59	89	119	179			
F4CF-		D15		•	•			145	a. A.	19
		D25		•	•	•		169	a. A.	24
		D30		•	•	•		187	a. A.	32
		D35		•	•	•		204	a. A.	35
		D45		•	•	•		256	a. A.	45

•: available reduction ratio a. A.: Housing shape on request

C-Series

Special feature: The large diameter of the hollow shaft allows for effective use of space for cable or media feed-through

Optional: Customer-specific customisation of input shaft, output flange, and housing possible

Model		Size	Available single stage reduction ratios					Outer-Ø flange	Outer-Ø cylindrical	Standard hollow shaft-Ø
			29	59	89	119	179			
F4C(F)-		C25		•	•	•		a. A.	185	49
		C35		•	•	•		256	a. A.	65
F2CF-		C45		•	•	•		292	a. A.	79
		C55		•	•	•		325	a. A.	92
		C65		•	•	•		362	a. A.	99

•: available reduction ratio a. A.: Housing shape on request

3.5 Torques and speeds

Maximum permissible input speed $n_{1\ ED}$
The gearbox can be used within the maximum input speed range indicated in the table, however, the max. permissible mean input speed is limited by the load duty cycle (%ED).

A-Series

Model	Size	Reduction ratio i	Max. permissible input speed $n_{1\ ED}$ [min^{-1}]		Max. acceleration torque [Nm]	Max. torque for emergency stop
			50% ED	100% ED		
FC- F1C- F2C- F3C-	A15(G)	59 / 89	5600	2800	335	785
	A25(G)	29	3100	1550	721	1930
		59 / 89 / 119	4200	2100	721	1930
	A35(G)	29	2500	1250	1390	3580
		59 / 89 / 119	3300	1650	1390	3580
	A45(G)	29	1900	950	2910	7210
		59 / 89 / 119 / 179	2600	1300	2910	7210
	A65(G)	29	1500	750	5130	13800
		59 / 89 / 119 / 179	2000	1000	5130	13800
	A75(G)	29	1200	600	7610	24000
		59 / 89 / 119	1750	850	7610	24000

D-Series

Model	Size	Reduction ratio i	Max. permissible input speed $n_{1\ ED}$ [min^{-1}]		Max. acceleration torque [Nm]	Max. torque for emergency stop
			50% ED	100% ED		
F4CF-	D15	59 / 89	5600	2800	417	834
	D25	59 / 89 / 119	4200	2100	883	1766
	D30	59 / 89 / 119	3800	1900	1226	2453
	D35	59 / 89 / 119	3300	1650	1717	3581
	D45	59 / 89 / 119	2600	1300	3188	6377

C-Series

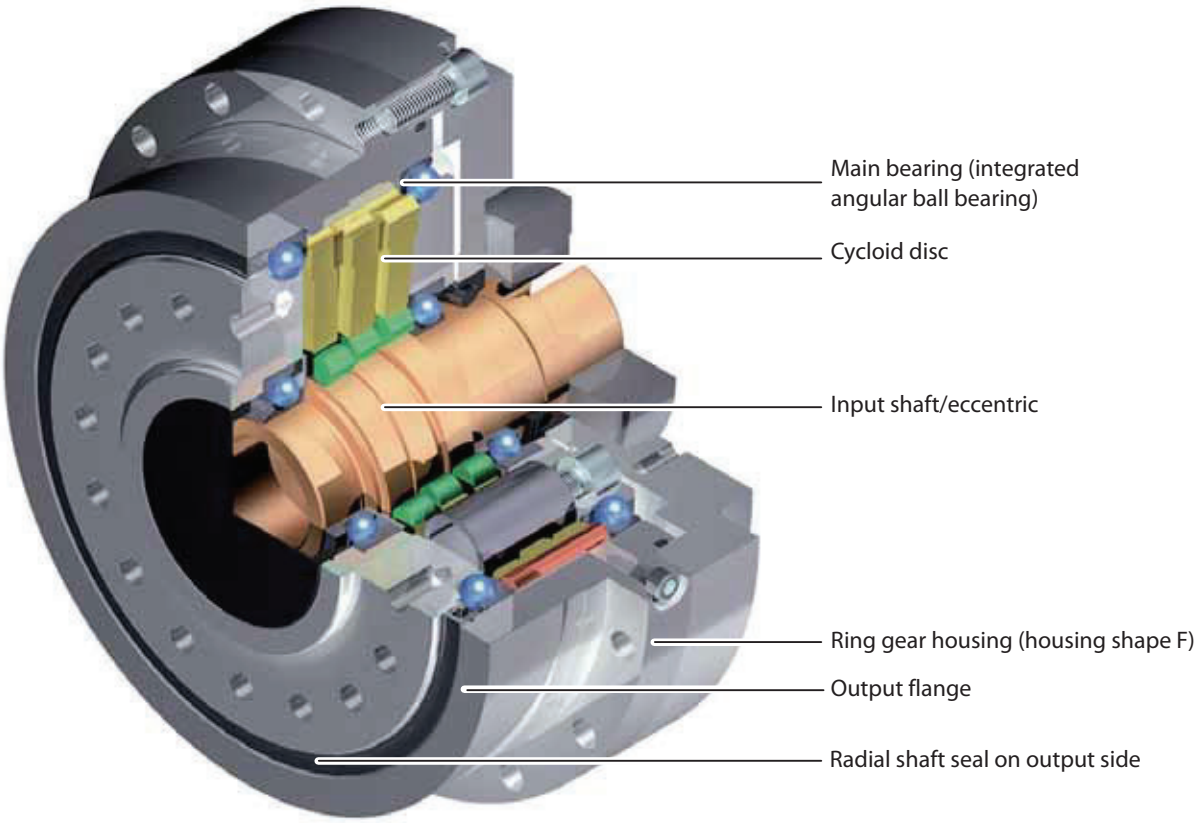
Model	Size	Reduction ratio i	Max. permissible input speed $n_{1\ ED}$ [min^{-1}]		Max. acceleration torque [Nm]	Max. torque for emergency stop
			50% ED	100% ED		
F4C(F)-	C25	59 / 89 / 119	2900	1450	1030	2060
	C35	59 / 89 / 119	2100	1050	1962	3924
F2CF-	C45	59 / 89 / 119	1800	900	3188	6377
	C55	59 / 89 / 119	1500	750	4316	8633
	C65	59 / 89 / 119	1400	700	6278	12577

T-Series

Model	Size	Reduction ratio i	Max. permissible output speed $n_{2\ max}$ [min^{-1}]	Max. acceleration torque [Nm]	Max. torque for emergency stop
F2C(F)-	T155	81 / 118.5 / 141	60	417	834
	T255	81 / 118.5 / 141	50	1030	2060
	T355	81 / 118.5 / 141	40	1960	3920
	T455	81 / 118.5 / 141 / 171	30	3190	6380
	T555	81 / 118.5 / 141 / 171	30	4910	9820
	T655	81 / 118.5 / 141 / 171	25	7850	15700
	T755	81 / 118.5 / 141 / 171	25	11000	22000

6 D-Series

F4CF-D



Special feature:

Single stage flange gearbox with high power density and improved bearings

- Easy motor mounting with clamp ring and adapter flange
- Also obtainable as basic gearbox with hollow shaft
- 5 sizes
- Reduction ratios (single stage) 59/89/119
- Nominal output torques up to 1756 Nm
- Acceleration torques up to 3188 Nm
- Lost motion < 1 arcmin
- Excellent cost-effectiveness
- High torques
- High permissible tilting moments
- Compact design

6.1 Torques according to output speeds

Output speed n_{2m} [min^{-1}]			5			10			15			20			25		
Model	Size	Reduction ratio i	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]
F4CF-	D15	59	226	295	0.15	226	590	0.3	201	885	0.39	184	1180	0.48	172	1475	0.56
		89	226	445	0.15	201	890	0.26	178	1335	0.35	163	1780	0.43	153	2225	0.5
	D25	59	487	295	0.32	487	590	0.64	434	885	0.85	398	1180	1.04	372	1475	1.22
		89	487	445	0.32	433	890	0.57	383	1335	0.75	351	1780	0.92	329	2225	1.08
		119	487	595	0.32	396	1190	0.52	351	1785	0.69	322	2380	0.84	301	2975	0.99
	D30	59	635	295	0.42	635	590	0.84	566	885	1.11	519	1180	1.36	486	1475	1.59
		89	635	445	0.42	565	890	0.74	500	1335	0.98	459	1780	1.2	429	2225	1.4
		119	635	595	0.42	517	1190	0.68	458	1785	0.9	420	2380	1.1	393	2975	1.29
	D35	59	899	295	0.59	899	590	1.18	800	885	1.57	734	1180	1.92	686	1475	2.25
		89	899	445	0.59	798	890	1.05	707	1335	1.39	649	1780	1.7	607	2225	1.98
		119	899	595	0.59	732	1190	0.96	648	1785	1.27	594	2380	1.56	556	2975	1.82
	D45	59	1756	295	1.15	1756	590	2.31	1565	885	3.07	1436	1180	3.76	1343	1475	4.39
		89	1756	445	1.15	1562	890	2.04	1383	1335	2.72	1269	1780	3.32	1180	2225	3.88
		119	1756	595	1.15	1431	1190	1.87	1267	1785	2.49	1162	2380	3.04			

Table D-1 Rating values (reference value output speed n_{2m})

30			40			50			60			Max. permissible input speed $n_{1\,max}$	Max. permissible input speed $n_{1\,ED}$ [min^{-1}]		Moment of inertia j related to the input shaft [×10^{-4} kgm^2]	Mass [kg]
Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Input speed [min^{-1}]	Max. permissible input power [kW]	Max. permissible input speed short term [min^{-1}]	50% ED	100% ED		
163	1770	0.64	150	2360	0.78	140	2950	0.92	133	3540	1.04	6150	5600	2800	CF	7
145	2670	0.57	133	3560	0.69	124	4450	0.81	117	5340	0.92				CF	
353	1770	1.38	323	2360	1.69	302	2950	1.98	286	3540	2.25				CF	
311	2670	1.22	285	3560	1.49							5050	4200	2100	CF	12
285	3570	1.12													CF	
460	1770	1.81	422	2360	2.21	394	2950	2.58	373	3540	2.93				CF	
406	2670	1.59	373	3560	1.95							4550	3800	1900	CF	15.5
372	3570	1.46													CF	
650	1770	2.55	596	2360	3.12	557	2950	3.65							CF	
574	2670	2.25										3950	3300	1650	CF	20.5
															CF	
1271	1770	4.99	1166	2360	6.11										CF	
												3150	2600	1300	CF	35.5
															CF	

: 50% ED range : 100% ED range (but max. 10 min. without pause) CF= Consult Factory

1. T_{2N} = nominal output torque
   Nominal output torque corresponds to the max. permissible average load torque at all output speeds.
   The nominal output torque for speeds less than 5 min^{-1} is equal to the value at 5 min^{-1}.
   The value for the maximum permissible input power is calculated from the nominal output torque at 100%.
   This value takes the efficiency of Fine Cyclo into consideration.
2. n_{1max} = maximum permissible input speed
   However, it must be n_{1m} (mean input speed) < $n_{1\,ED}$.
3. $n_{1\,ED}$ = permissible input speed according to load duty cycles
4. T_{2A} = max. Acceleration and braking torque (for fatigue strength at $2 \cdot 10^7$ load cycles)
   Permissible peak torque for normal start and stop procedures.
5. T_{2max} = max. permissible torque for emergency stop situations or in the event of heavy shocks (limited by the mechanical strength). (permissible 1000 x over the entire lifetime)
6. The nominal torque T_{2N} is calculated using the following equation when the speed is not shown in the table above:

$$T_{2N} = T_{2N,5} \left(\frac{5}{n_{2m}} \right)^{0,3}$$

T_{2N} : Nominal torque at output speed n_{2m}
$T_{2N,5}$: Nominal torque at output speed n_{2m} is 5 min^{-1}

6.2 Torques according to input speeds

Input speed n_{1m} [min^{-1}]			4000			3000			2500			2000			1750		
Model	Size	Reduction ratio i	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]
F4CF-	D15	59	128	67.8	1.13	139	50.8	0.93	147	42.4	0.82	157	33.9	0.7	164	29.7	0.64
		89	128	44.9	0.75	139	33.7	0.61	147	28.1	0.54	157	22.5	0.46	164	19.7	0.42
	D25	59	275	67.8	2.44	300	50.8	2	317	42.4	1.76	339	33.9	1.5	353	29.7	1.37
		89	275	44.9	1.62	300	33.7	1.32	317	28.1	1.16	339	22.5	1	353	19.7	0.91
		119	275	33.6	1.21	300	25.2	0.99	317	21	0.87	339	16.8	0.75	353	14.7	0.68
	D30	59				392	50.8	2.61	414	42.4	2.3	443	33.9	1.96	461	29.7	1.79
		89				392	33.7	1.73	414	28.1	1.52	443	22.5	1.3	461	19.7	1.19
		119				392	25.2	1.29	414	21	1.14	443	16.8	0.97	461	14.7	0.89
	D35	59				554	50.8	3.69	586	42.4	3.25	626	33.9	2.78	652	29.7	2.53
		89				554	33.7	2.44	589	28.1	2.15	626	22.5	1.84	652	19.7	1.68
		119							589	21	1.61	626	16.8	1.38	652	14.7	1.25
	D45	59							1145	42.4	6.35	1224	33.9	5.43	1274	29.7	4.94
		89							1145	28.1	4.21	1224	22.5	3.6	1274	19.7	3.28
		119							1145	21	3.15	1224	16.8	2.69	1274	14.7	2.45

Table D-2 Rating values (reference value input speed n_{1m})

Size	Max. acceleration and deceleration torque T_{2A}	Peak torque for emergency stop T_{2max}
	[Nm]	[Nm]
D15	417	834
D25	883	1766
D30	1226	2453
D35	1717	3581
D45	3188	6377

Table D-3 Maximum acceleration or deceleration torque

1500			1000			750			600			Max. permissible input speed $n_{1\,max}$	Max. permissible input speed $n_{1\,ED}$ [min^{-1}]		Moment of inertia j related to the input shaft [×10^{-4} kgm^2]	Mass [kg]
Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Nominal output torque [Nm]	Output speed [min^{-1}]	Max. permissible input power [kW]	Max. permissible input speed short term [min^{-1}]	50% ED	100% ED		
171	25.4	0.57	194	16.9	0.43	211	12.7	0.35	226	10.2	0.3	6150	5600	2800	CF	7
171	16.9	0.38	194	11.2	0.28	211	8.43	0.23	226	6.74	0.2				CF	
370	25.4	1.23	418	16.9	0.93	455	12.7	0.76	487	10.2	0.65	5050	4200	2100	CF	12
370	16.9	0.81	418	11.2	0.61	455	8.43	0.5	487	6.74	0.43				CF	
370	12.6	0.61	418	8.4	0.46	455	6.3	0.38	487	5.04	0.32				CF	
483	25.4	1.61	545	16.9	1.21	594	12.7	0.99	635	10.2	0.85	4550	3800	1900	CF	15.5
483	16.9	1.06	545	11.2	0.8	594	8.43	0.66	635	6.74	0.56				CF	
483	12.6	0.8	545	8.4	0.6	594	6.3	0.49	635	5.04	0.42				CF	
683	25.4	2.27	771	16.9	1.71	840	12.7	1.4	899	10.2	1.2	3950	3300	1650	CF	20.5
683	16.9	1.5	771	11.2	1.13	840	8.43	0.93	899	6.74	0.79				CF	
683	12.6	1.13	771	8.4	0.85	840	6.3	0.69	899	5.04	0.59				CF	
1334	25.4	4.44	1507	16.9	3.34	1643	12.7	2.73	1756	10.2	2.34	3150	2600	1300	CF	35.5
1334	16.9	2.94	1507	11.2	2.22	1643	8.43	1.81	1756	6.74	1.55				CF	
1334	12.6	2.2	1507	8.4	1.66	1643	6.3	1.35	1756	5.04	1.16				CF	

: 50% ED range : 100% ED range CF = Consult Factory

1. T_{2N} = nominal output torque
   Nominal output torque corresponds to the max. permissible average load torque at all input speeds.
   The nominal output torque for speeds less than 600 min^{-1} is equal to the value at 600 min^{-1}.
   The value for the maximum permissible input power is calculated from the nominal output torque at 100%.
   This value takes the efficiency of Fine Cyclo into consideration.
2. n_{1max} = maximum permissible input speed
   However, it must be n_{1m} (mean input speed) < $n_{1\,ED}$.
3. $n_{1\,ED}$ = permissible input speed according to load duty cycles
4. T_{2A} = max. Acceleration and braking torque (for fatigue strength at $2 \cdot 10^7$ load cycles)
   Permissible peak torque for normal start and stop procedures.
5. T_{2max} = max. permissible torque for emergency stop situations or in the event of heavy shocks (limited by the mechanical strength).
   (permissible 1000 x over the entire lifetime)
6. The nominal torque T_{2N} is calculated using the following equation when the speed is not shown in the table above:

$$T_{2N} = T_{2N,\,600} \left(\frac{600}{n_{1m}} \right)^{0,3}$$

T_{2N} : Rated torque at input speed n_{1m}
$T_{2N,\,600}$: Rated torque at input speed n_{1m} is 600 min^{-1}

6.3 Rigidity and Lost Motion

Size	i	Test torque T_p [Nm]	Lost Motion		Torsional stiffness 3% - 50% T_p [Nm/arcmin]	Torsional stiffness 3% - 100% T_p [Nm/arcmin]	Torsional stiffness 50% - 100% T_p [Nm/arcmin]
			Lost Motion [arcmin]	Domain of definition [Nm]			
D15	59	±171	< 1	±5.13	33.5	40	49
	89						
D25	59	±370		±11.1	67.7	85	112
	89						
	119						
D30	59	±483		±14.49	103	130	173
	89						
	119						
D35	59	±683		±20.49	124	160	220
	89						
	119						
D45	59	±1334		±40.02	257	330	450
	89						
	119						

Table D-4 Torsional stiffness

T_p: Test torque at input speed $n_1 = 1500\ min^{-1}$

1) At a load torque less than 3% T_p

$$\varphi = \frac{\text{Lost Motion}}{2} \cdot \frac{\text{Load torque}}{0.03 \cdot T_p}$$

2) At a load torque greater than 3% T_p (standard case)

$$\varphi = \frac{\text{Lost Motion}}{2} + \frac{\text{Load torque} - (0.03 \cdot T_p)}{\text{Torsional stiffness}}$$

Note arcmin means "angular minute".
Table values for rigidity are average values

6.4 No-load running torque NLRT

The quoted values apply to indicated standard constructions in clamp ring design.

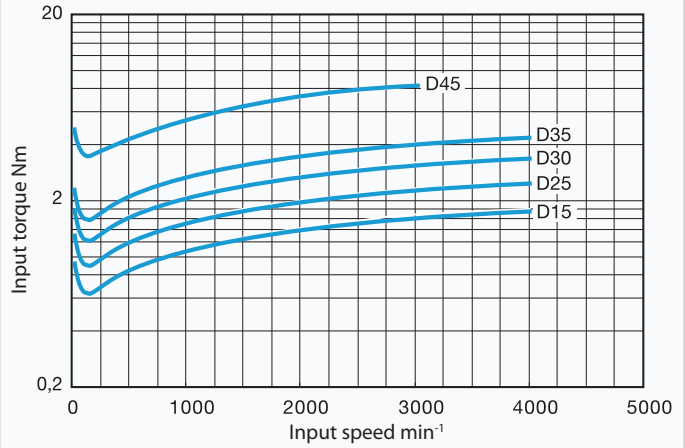


Fig. D-1

Note
1. Fig. D-1 shows the average no-load running torque after gearbox is run in. (not factory-new condition)
2. Table D-6 shows the measuring conditions

Ring gear housing temperature	approx. 30 °C
Precision during assembly	as per 6.8.1
Lubrication	Standard lubrication

Table D-5 Measurement conditions

6.5 Breakaway torque

Breakaway torque on output side (BTO)

Note
1. Table D-7 shows the max. breakaway torque on the output side BTO. Fine Cyclo reducers are not self-locking. The BTO is defined as the maximum value (factory-new condition), which steadily decreases during the lifetime.
2. Table D-6 shows the measuring conditions

Precision during assembly	as per 6.8.1
Lubrication	Standard lubrication

Table D-6 Measurement conditions

Size	Breakaway torque BTO [Nm]
D15	< 70
D25	< 100
D30	< 120
D35	< 140
D45	< 245

Table D-7 Value of the breakaway torque on the output side (BTO)

Breakaway torque on input side (BTI)

Note
1. Table D-8 shows the max. breakaway torque BTI on the input side. The BTI is defined as the maximum value (factory-new condition) which steadily decreases during the lifetime.
2. Table D-6 shows the measuring conditions

Size	i	Breakaway torque BTI [Nm]
D15	59	< 0.9
	89	
D25	59	< 1.3
	89	
	119	
D30	59	< 1.8
	89	
	119	
D35	59	< 3.0
	89	
	119	
D45	59	< 5.0
	89	
	119	

Table D-8 Value of the breakaway torque on the input side (BTI)

6.6 Efficiency

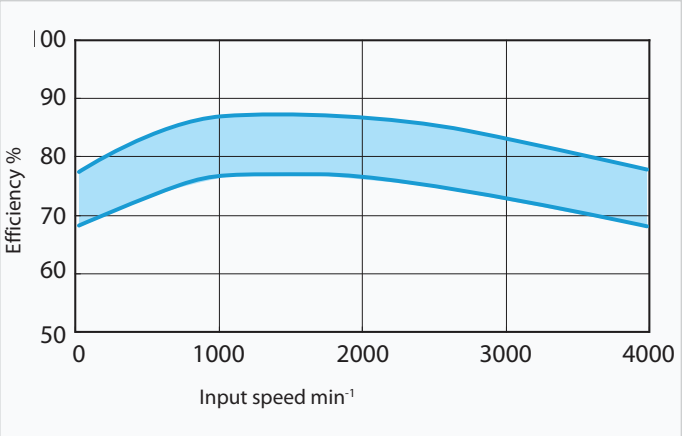


Fig. D-2 Efficiency curve

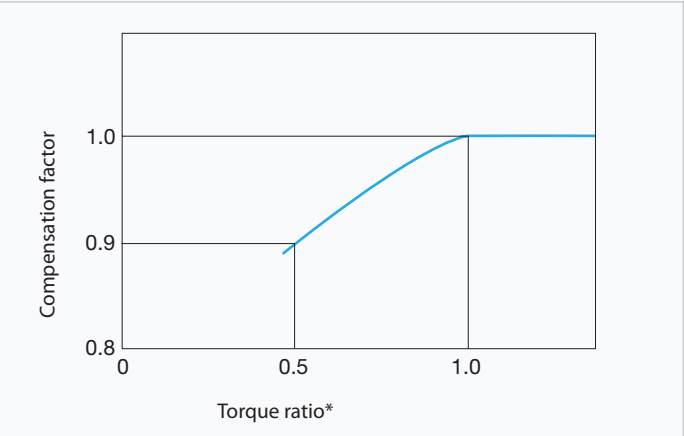


Fig. D-3 Compensation curve for efficiency

Fig. D-2 shows the relation between efficiency and input speed. For further information see "4 Explaining the technical details" on page 18.

Note

1. The efficiency changes if the load torque does not match the nominal torque. Check the compensation factor in the diagram Fig. D-3
2. When the torque ratio is over 1.0, the compensation factor for efficiency is 1.0 (diagram Fig. D-3).

Compensation efficiency = efficiency · compensation factor

$$* \textbf{Torque ratio} = \frac{\textbf{Load torque}}{\textbf{Nominal output torque}}$$

6.7 Bearing loads

6.7.1 Maximum permissible radial and axial load on the input shaft

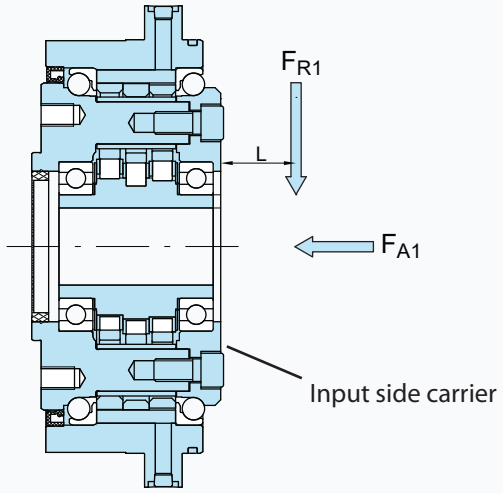


Fig. D-4

L [mm]	Load factor input L_{f1} Size				
	D15	D25	D30	D35	D45
10	0.91	0.87			
15	0.99	0.94	0.92	0.91	
20	1.25	1.00	0.98	0.97	0.90
25	1.56	1.25	1.14	1.09	0.94
30	1.88	1.50	1.36	1.30	0.99
35	2.19	1.75	1.59	1.52	1.13
40		2.00	1.82	1.74	1.29
45			2.05	1.96	1.45
50				2.17	1.61
60					1.94

Table D-9 Load factor
L = distance from input side carrier

If the input shaft is fitted with a pinion or a disc, axial and radial forces act on the input shaft.
The following equation is used to check whether the shaft load is permissible:

1. Input radial load F_{R1}

$$F_{R1} = 10^3 \cdot \frac{T_{2V}}{\eta \cdot i \cdot r_0} \leq \frac{F_{R1\,max}}{L_{f1} \cdot C_{f1} \cdot B_{f1}} \quad [N] \qquad \text{(Equation D-1)}$$

2. Input side axial load F_{A1}

$$F_{A1} \leq \frac{F_{A1\,max}}{C_{f1} \cdot B_{f1}} \quad [N] \qquad \text{(Equation D-2)}$$

3. When radial and axial loads co-exist

$$\left(\frac{F_{R1} \cdot L_{f1}}{F_{R1\,max}} + \frac{F_{A1}}{F_{A1\,max}}\right) \cdot C_{f1} \cdot B_{f1} \leq 1 \qquad \text{(Equation D-3)}$$

F_{R1} = input side radial load [N]
T_{2V} = equivalent output torque on output shaft [Nm]
d_0 = pitch circle diameter of sprocket, pinion [mm]
$F_{R1\,max}$ = maximum permissible input side radial load [N]
F_{A1} = input side axial load [N]
$F_{A1\,max}$ = maximum permissible input side axial load [N]
L_{f1} = load factor input (Table D-9)
C_{f1} = correction factor input (Table D-10)
B_{f1} = service factor input (Table D-11)
L = distance of radial force from input side carrier on gear-boxes without motor adapter (Table D-9)
η = 0.8 (efficiency)

Correction factor input	C_{f1}
Chain	1
Pinion*	1.25
Toothed belt	1.25
V-Belt	1.5

Table D-10

* For helical pinions or bevel gears, please consult Sumitomo Drive Technologies.

Load conditions input	B_{f1}
Uniform load	1
Light impacts	1.2
Severe impacts	1.6

Table D-11

Size	Input speed n_{1m} [min^{-1}] (input side radial load [N])								
	4000	3000	2500	2000	1750	1500	1000	750	600
D15	226	245	265	284	294	314	335	392	422
D25	334	373	392	422	441	461	530	589	628
D30		432	461	500	520	549	628	687	746
D35		491	520	559	589	618	706	785	844
D45			608	657	687	726	824	912	981

Table D-12 max. permissible input side radial load $F_{R1\,max}$

Size	Input speed n_{1m} [min^{-1}] (input side axial load [N])								
	4000	3000	2500	2000	1750	1500	1000	750	600
D15	245	284	314	343	363	392	471	549	608
D25	363	412	451	500	540	579	697	804	883
D30		520	569	638	677	726	883	1001	1118
D35		540	589	657	706	755	922	1059	1167
D45			1010	1118	1197	1295	1570	1795	2001

Table D-13 max. permissible input side axial load $F_{A1\,max}$

Calculation of the max. permissible radial load on the input shaft

Calculation of the max. permissible radial load using the following equation when the speed is not shown in the table above.

$$F_{R1\,max} = F_{R1,600} \left(\frac{600}{n_{1m}} \right)^{1/3}$$

$F_{R1\,max}$ = maximum permissible input side radial load at input speed n_{1m}

$F_{R1,600}$ = input side radial load at input speed $n_{1m} = 600\ min^{-1}$

Calculation of the max. permissible axial load on the input shaft

Calculation of the max. permissible axial load using the following equation when the speed is not shown in the table above.

$$F_{A1\,max} = F_{A1,600} \left(\frac{600}{n_{1m}} \right)^{0,47}$$

$F_{A1\,max}$ = maximum permissible input side axial load at input speed n_{1m}

$F_{A1,600}$ = input side axial load at input speed $n_{1m} = 600\ min^{-1}$

6.7.2 Main bearings

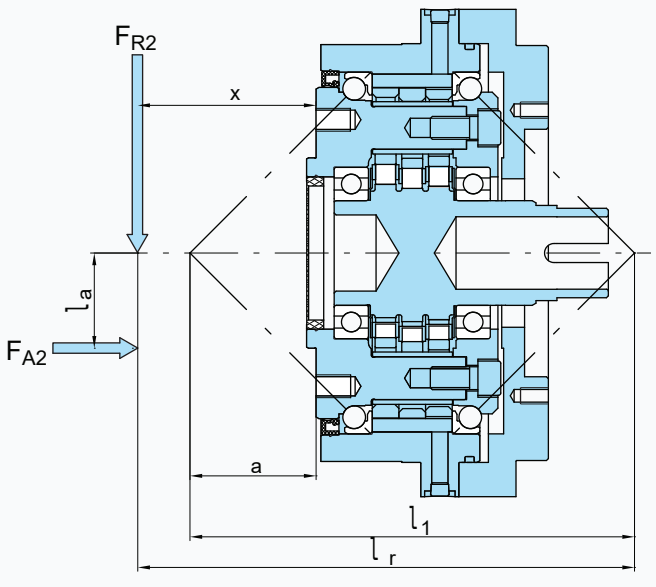


Fig. D-5 Distance between the individual loading points

$$l_r = x - a + l_1 \qquad \text{(Equation D-4)}$$

Size	Values of internal bearing distance	
	l_1 [mm]	a [mm]
D15	119	23.6
D25	139	23.4
D30	157	24.5
D35	170	40.5
D45	206	52.4

Table D-14 Bearing clearances (mm)

Note If: $l_r > 4 \cdot l_1$ please contact Sumitomo Drive Technologies (SDT).

1. Moment stiffness

The moment stiffness is the bending moment at which the output flange is tilted by the tilt angle.

The tilt angle of the input flange is determined as follows:

$$\varphi_1 = \frac{T_k}{\Theta_1} \quad \text{(Equation D-5)}$$

External bending moment T_k

$$T_k = 10^{-3} \cdot (F_{R2} \cdot l_r + F_{A2} \cdot l_a) \quad \text{(Equation D-6)}$$

2. Max. permissible bending moment and max. permissible axial load

Check the equivalent bending moment and the equivalent axial load using the equations D-6, D-7, D-8, and Fig. D-6.

Equivalent bending moment T_{ke} at output

$$T_{ke} = 10^{-3} \cdot (C_{f2} \cdot B_{f2} \cdot F_{R2} \cdot l_r + C_{f2} \cdot B_{f2} \cdot F_{A2} \cdot l_a) \quad < T_{k\,max} \quad \text{(Equation D-7)}$$

Equivalent axial load F_{A2e} at the output shaft

$$F_{A2e} = F_{A2} \cdot C_{f2} \cdot B_{f2} \quad < F_{A2\,max} \quad \text{(Equation D-8)}$$

F_{A2} = output side axial load [N]
$F_{A2\,max}$ = maximum permissible output side axial load [N]
F_{A2e} = equivalent input side axial load [N]
F_{R2} = output side radial load [N]
C_{f2} = correction factor output (Table D-16)
B_{f2} = service factor output (Table D-17)
l_1 = bearing clearance [mm] (Table D-14)
l_r = calculated dimension for bending moment [mm]
l_a = distance of axial load [mm]
x = distance from radial force to flange collar [mm]
a = correction factor [mm] (Table D-14)
T_k = external bending moment [Nm]
$T_{k\,max}$ = maximum bending moment [Nm] (Table D-18)
T_{ke} = equivalent bending moment [Nm]
φ_1 = tilt angle [arcmin]
Θ_1 = moment stiffness main bearing [Nm/arcmin] (Table D-15)

Size	Moment stiffness Θ_1 [Nm/arcmin]
D15	510
D25	833
D30	1127
D35	1470
D45	2450

Table D-15 Average values for moment stiffness

Correction factor output	C_{f2}
Chain	1
Pinion or rack	1.25
Toothed belt	1.25
V-Belt	1.5

Table D-16

Service factor output	B_{f2}
Uniform load (no shock)	1
Light impacts	1.2
Severe impacts	1.6

Table D-17

Size	Max. permissible bending moment $T_{k\,max}$ [Nm]	Max. permissible axial load $F_{A2\,max}$ [N]
D15	883	3924
D25	1177	3924
D30	1668	5199
D35	1962	7848
D45	2943	10791

Table D-18 Maximum bending moment and max. permissible output side axial load

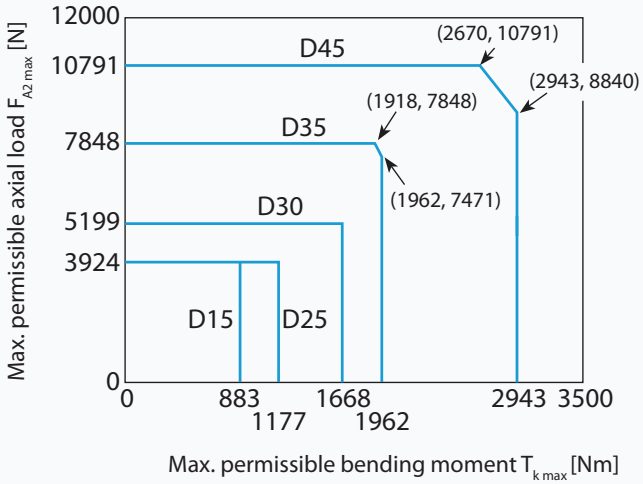
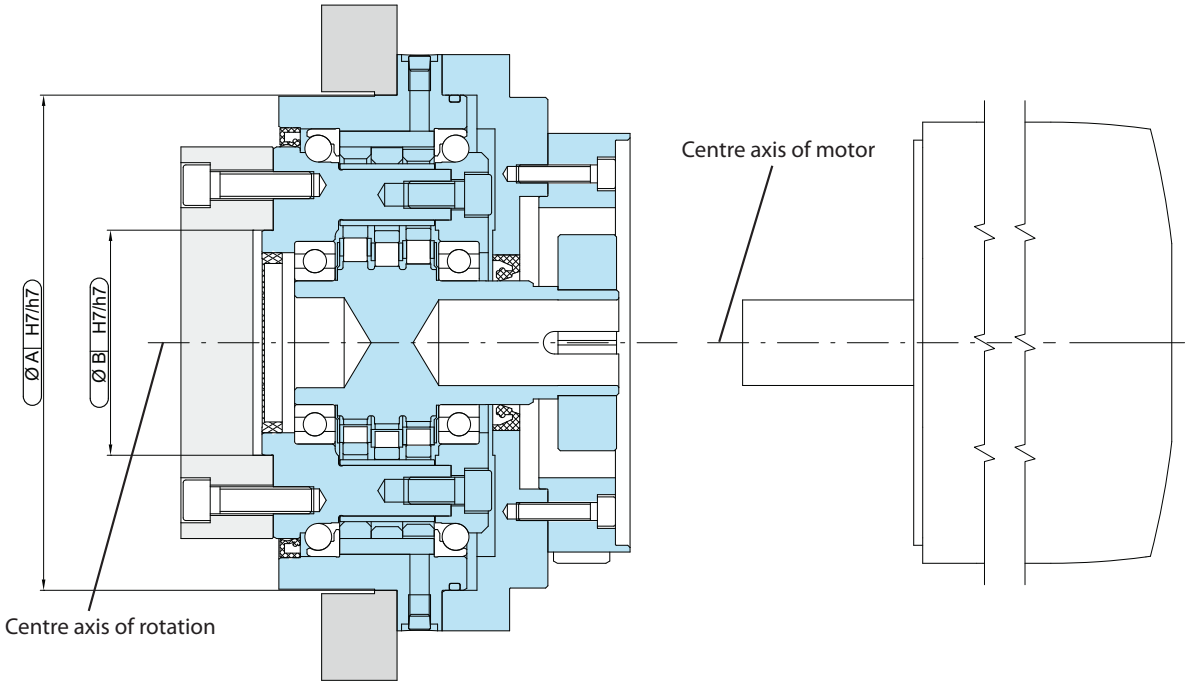


Fig. D-6 Diagram max. permissible bending moment and axial load

6.8 Assembly specifications and tolerances

6.8.1 Assembly tolerances

To ensure the function, lifetime, and characteristics of the gearbox, the radial run-out of the shaft ends, the concentricity, and the axial run-out of the fastening surface as per EN 50347:2001 are sufficient. When used in high-precision applications, the tolerance according to EN 50347:2001 should be reduced by 50%.



Size	Ø A	Ø B
D15	124	47
D25	145	113
D30	163	100
D35	174	75
D45	220	100

Table D-19
(Dimensions in mm)

6.8.2 Tightening torque and maximum permissible transmitted torque for bolts

The permissible transmitted torque for bolts and the number, size, and tightening torque for fastening the output side flange and the ring gear housing are listed in Table D-20. In the event of an emergency stop with corresponding load peaks, the output flange and ring gear housing bolts must all be replaced.

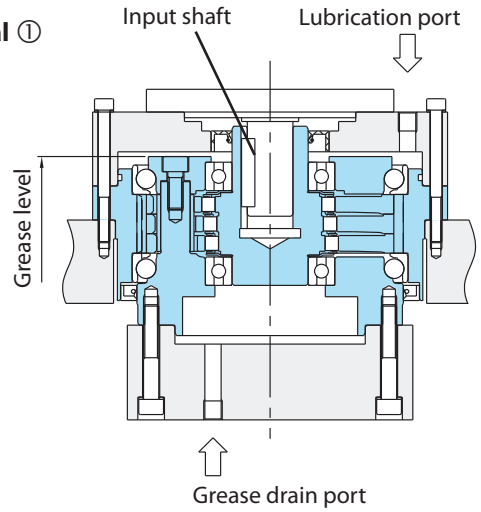
Size	Output flange bolts		Ring gear housing		Max. permissible transmitted torque for bolts [Nm]
	Number and size of bolts	Tightening torque [Nm]	Number and size of bolts	Tightening torque [Nm]	
D15	12 × M8	38.3	12 × M6	15.7	1478
D25	12 × M8	38.3	16 × M6	15.7	2065
D30	16 × M8	38.3	16 × M6	15.7	2786
D35	12 × M10	76.5	16 × M8	38.3	3962
D45	16 × M12	133	16 × M10	76.5	9347

Table D-20

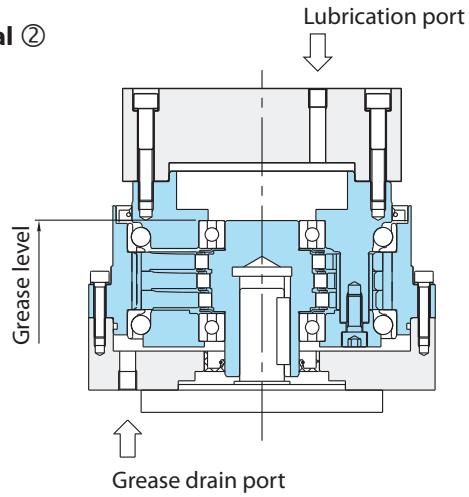
- **Bolting:** Use metric hexagon socket head cap screws (DIN 4762, strength category 12.9).
- **Countermeasure for bolts loosening:** Use adhesives (Loctite 262, etc.) or spring washer (DIN 127A).
- **Use conical spring washers** (DIN 6796) when connecting the gearbox to the flange side, so that the bolt contact faces do not get damaged.

6.8.3 Lubrication

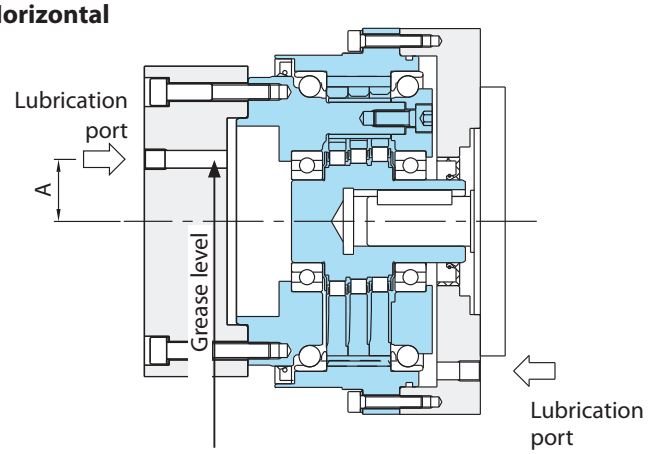
Vertical ①



Vertical ②



Horizontal



- For gearboxes that are not sealed, delivery does not include lubricant (grease filling). Upon receipt, the customer must therefore fill it with the appropriate amount (Table D-22) of the recommended grease (Table D-21).
- Use the quantity quoted in Table D-22 as a guideline value; check the grease level.
- Fit the lubrication port and the grease drain on the output side. (See "A" and Table D-22).
- When filling grease for the first time use the bottom hole in order to ensure grease circulation.
- The grease must be replaced after 20,000 operating hours or every 3-5 years. Regreasing the D gearbox can extend the lifetime of the gearbox.

Grease prescribed	Manufacturer
Multemp FZ No. 00	Kyodo Yushi Co., Ltd.
Conditions for use: Environmental temperature -10 °C to +40 °C	

Table D-21 Specified grease

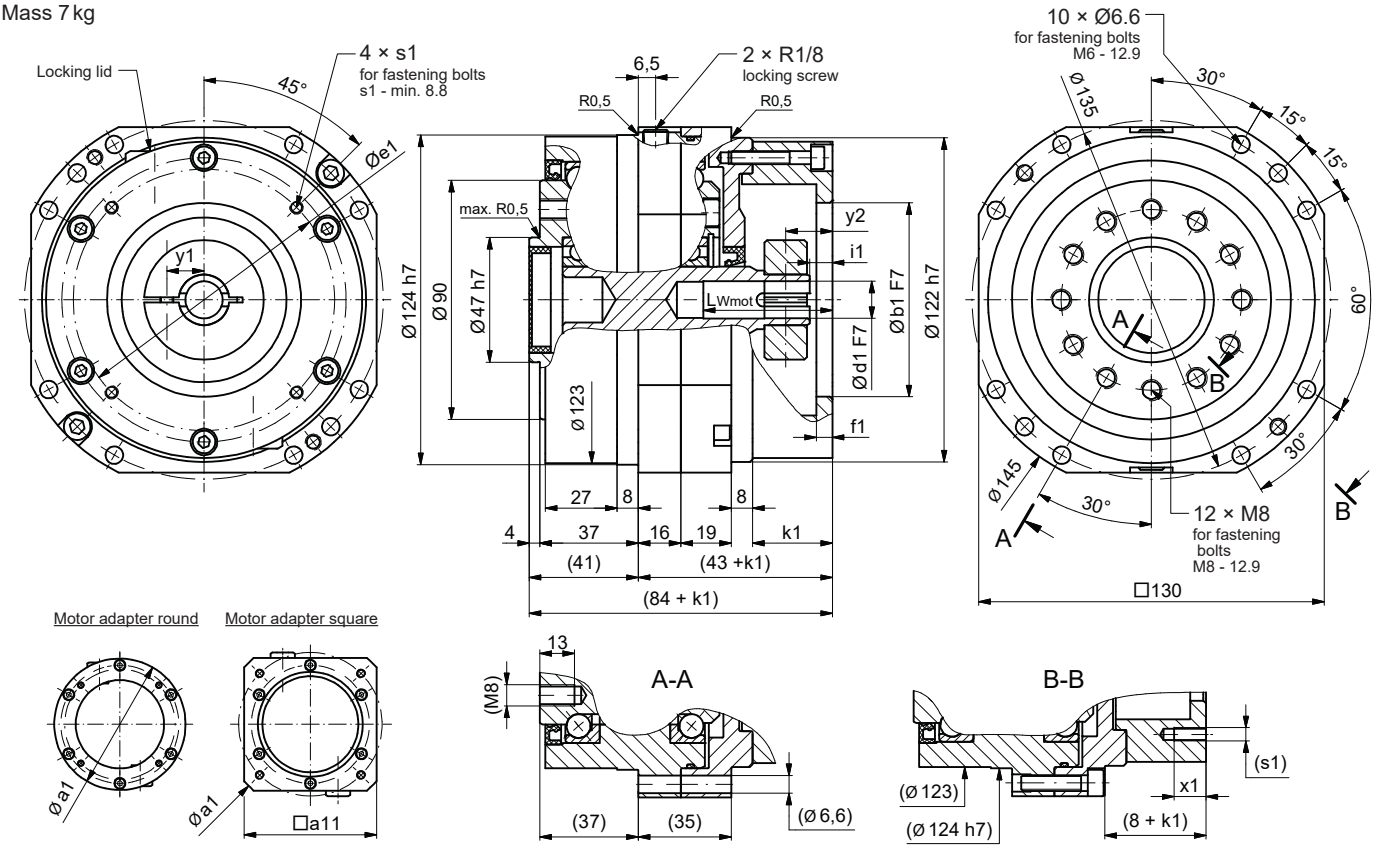
Size	Quantity of grease [g]			Lubrication port distance A [mm]
	Vertical ①	Vertical ②	Horizontal	
D15	55	40	50	20
D25	100	45	95	26
D30	220	85	200	29
D35	190	150	160	34
D45	320	260	270	39

Table D-22 (if delivered without grease filling)

6.9 Dimensioned drawings

F4CF-D15

Mass 7 kg



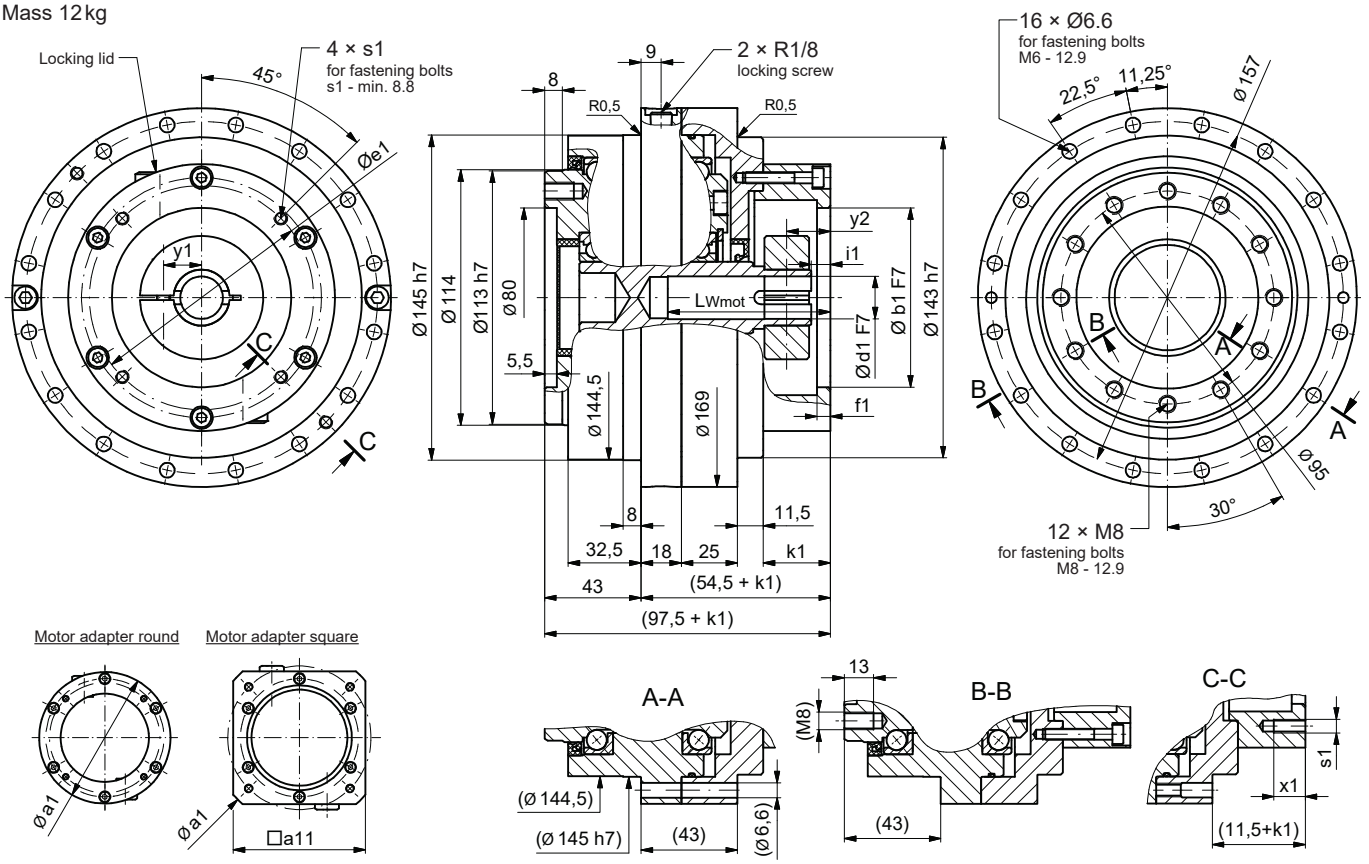
Motor connection dimensions F4CF-D15

Motor code	Hole for shaft	Min./Max. Length of motor shaft	Spigot F7	Spigot seat depth	Pitch circle Ø	Thread in gearbox flange	Thread depth	Flange diameter	Flange square dimension	Flange width	Shaft recess without bushing	Shaft recess with bushing	Positional dimensions locking lid	
	Ød1	$L_{w\ Mot\ min/max}$	Øb1	f1	Øe1	4x s1	x1	Øa1	□a11	k1	i1		y1	y2
	mm													
C06G	9	24.0 / 47.5	40	5.5	63	M4	7.5	119	-	29	-	6.5	17	16.5
C08G		24.0 / 47.5	40	5.5	63	M5	7.5	119	-	29	-	6.5	17	16.5
D30G	10	25.0 / 48.5	80	6	100	M6	14	119	-	30	-	7.5	18.5	16.5
E08G	11	24.0 / 47.5	40	5.5	63	M5	7.5	119	-	29	-	6.5	17	16.5
E10G		24.0 / 47.5	50	5.5	70	M4	7.5	119	-	29	-	6.5	17	16.5
E11G		24.0 / 47.5	60	5.5	75	M5	7.5	119	-	29	-	6.5	18.5	16.5
H10G	14	24.0 / 47.5	50	5.5	70	M4	7.5	119	-	29	7.5	-	17	16.5
H25G		24.0 / 47.5	50	5.5	70	M5	7.5	119	-	29	7.5	-	17	16.5
H20G		24.0 / 47.5	50	6	95	M6	14	119	-	29	7.5	-	17	16.5
H11G		24.0 / 47.5	60	5.5	75	M5	7.5	119	-	29	7.5	-	18.5	16.5
H12G		24.0 / 47.5	60	5.5	75	M6	7.5	119	-	29	7.5	-	18.5	16.5
H18G		25.5 / 49.0	70	6	90	M6	14	119	-	30.5	9	-	18.5	17
H30G		25.0 / 48.5	80	6	100	M6	14	119	-	30	8.5	-	18.5	16.5
H30L		34.0 / 57.5	80	6	100	M6	14	119	-	39	8.5	-	18.5	25.5
H35G		25.0 / 48.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
H50G		25.0 / 48.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
H60L		36.5 / 60.0	110	8	145	M8	17	158	120	41.5	20	-	25	29.5
J18G	16	30.0 / 73.0	70	6	90	M6	14	119	-	30.5	-	8	18.5	17
J30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	-	16.5	18.5	25.5
J60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
K60L	17	43.0 / 84.0	110	8	145	M8	17	158	120	41.5	-	19	25	29.5
M30G	19	29.5 / 72.5	80	6	100	M6	14	119	-	30	8.5	-	18.5	16.5
M30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	8.5	-	18.5	25.5
M35G		29.5 / 72.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
M45G		29.5 / 72.5	95	6	130	M8	17	158	120	30	8.5	-	25	18
M50G		29.5 / 72.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
M60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	8.5	-	25	18
M60L		43.0 / 84.0	110	8	145	M8	17	158	120	41.5	20	-	25	29.5

Note Other motor connection dimensions available on request.

F4CF-D25

Mass 12 kg



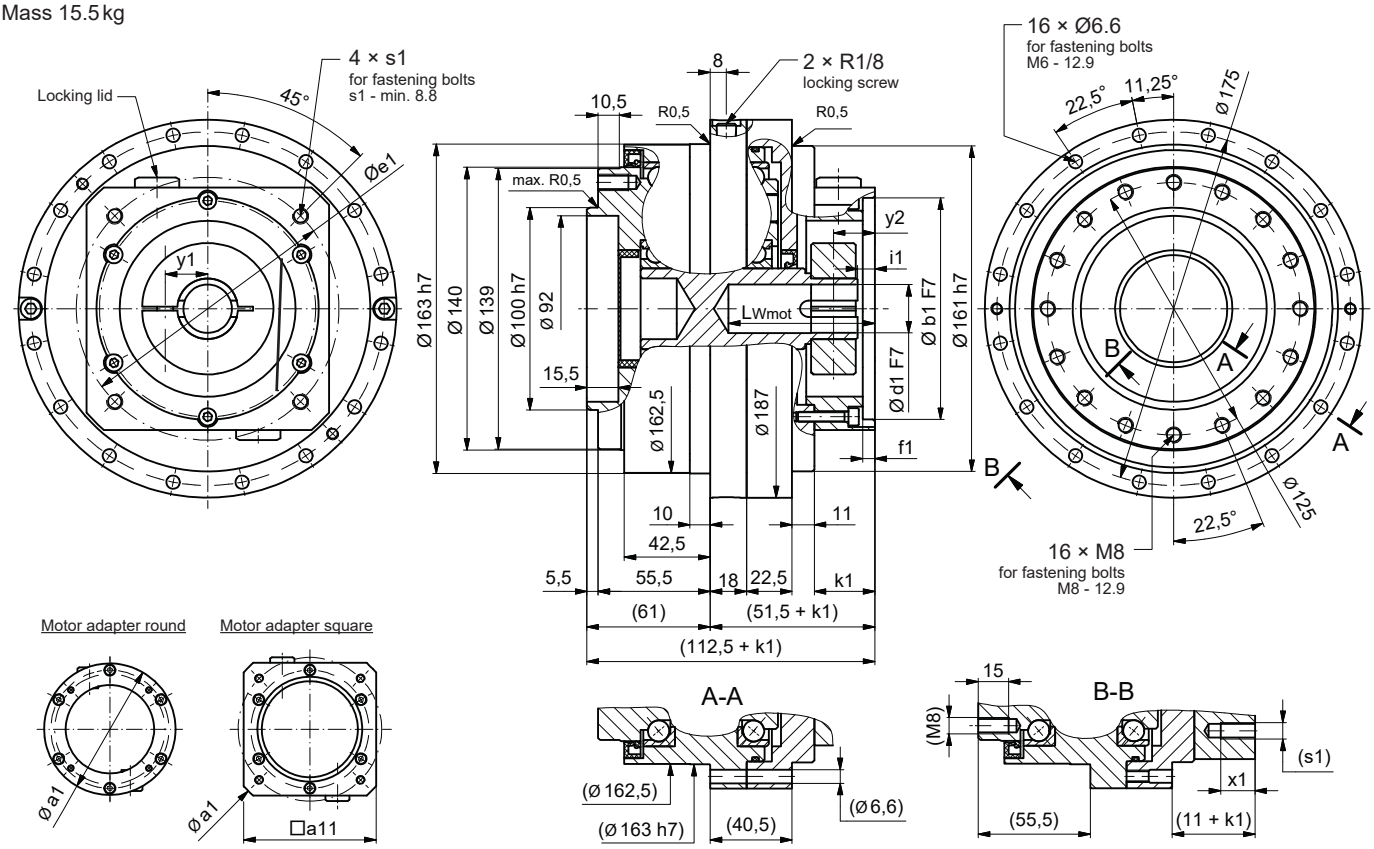
Motor connection dimensions F4CF-D25

Motor code	Hole for shaft	Min./Max. Length of motor shaft	Spigot F7	Spigot seat depth	Pitch circle Ø	Thread in gearbox flange	Thread depth	Flange diameter	Flange square dimension	Flange width	Shaft recess without bushing	Shaft recess with bushing	Positional dimensions locking lid	
	Ød1	$L_{w\,Mot\ min/max}$	Øb1	f1	Øe1	4x s1	x1	Øa1	□a11	k1	i1		y1	y2
							mm							
D30G	10	25.0 / 48.5	80	6	100	M6	14	119	-	30	-	7.5	18.5	16.5
H10G	14	24.0 / 47.5	50	5.5	70	M4	7.5	119	-	29	7.5	-	17	16.5
H25G		24.0 / 47.5	50	5.5	70	M5	7.5	119	-	29	7.5	-	17	16.5
H20G		24.0 / 47.5	50	6	95	M6	14	119	-	29	7.5	-	17	16.5
H11G		24.0 / 47.5	60	5.5	75	M5	7.5	119	-	29	7.5	-	18.5	16.5
H12G		24.0 / 47.5	60	5.5	75	M6	7.5	119	-	29	7.5	-	18.5	16.5
H18G		25.5 / 49.0	70	6	90	M6	14	119	-	30.5	9	-	18.5	17
H30G		25.0 / 48.5	80	6	100	M6	14	119	-	30	8.5	-	18.5	16.5
H30L		34.0 / 57.5	80	6	100	M6	14	119	-	39	8.5	-	18.5	25.5
H35G		25.0 / 48.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
H50G		25.0 / 48.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
H60L		36.5 / 60.0	110	8	145	M8	17	158	120	41.5	20	-	25	29.5
J18G	16	30.0 / 73.0	70	6	90	M6	14	119	-	30.5	-	8	18.5	17
J30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	-	16.5	18.5	25.5
J60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
K60L	17	43.0 / 84.0	110	8	145	M8	17	158	120	41.5	-	19	25	29.5
M30G	19	29.5 / 72.5	80	6	100	M6	14	119	-	30	8.5	-	18.5	16.5
M30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	8.5	-	18.5	25.5
M35G		29.5 / 72.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
M45G		29.5 / 72.5	95	6	130	M8	17	158	120	30	8.5	-	25	18
M50G		29.5 / 72.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
M60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	8.5	-	25	18
M60L		43.0 / 84.0	110	8	145	M8	17	158	120	41.5	20	-	25	29.5
N60G	22	31.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
Z35G	24	31.5 / 72.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
Z50G		31.5 / 72.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
Z70G		31.5 / 72.5	130	6	165	M10	20	188	144	30	8.5	-	25	18

Note Other motor connection dimensions available on request.

F4CF-D30

Mass 15.5 kg



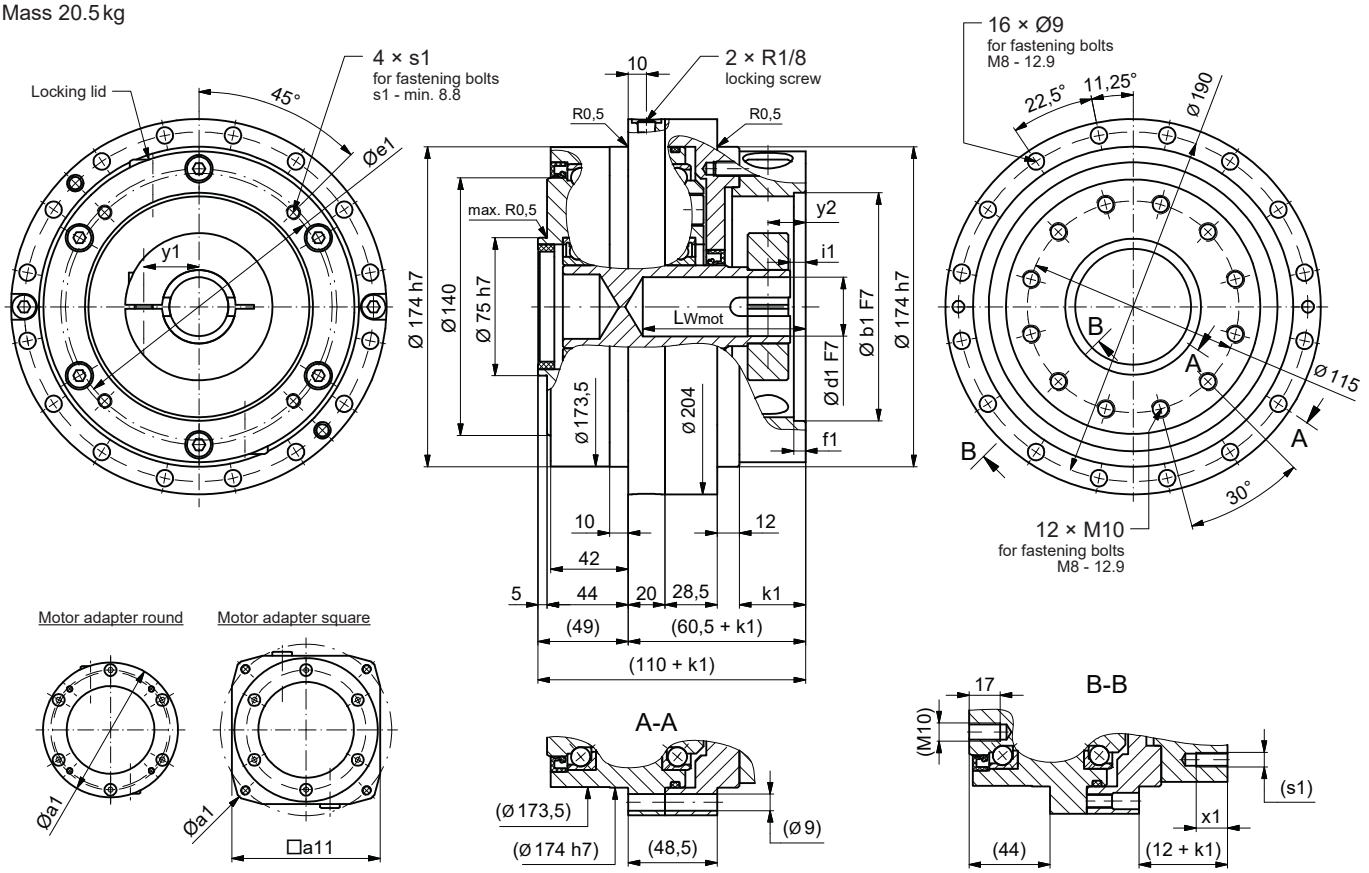
Motor connection dimensions F4CF-D30

Motor code	Hole for shaft	Min./Max. Length of motor shaft	Spigot F7	Spigot seat depth	Pitch circle Ø	Thread in gearbox flange	Thread depth	Flange diameter	Flange square dimension	Flange width	Shaft recess without bushing	Shaft recess with bushing	Positional dimensions locking lid	
	Ød1	$L_{w\ Mot\ min/max}$	Øb1	f1	Øe1	4x s1	x1	Øa1	□a11	k1	i1		y1	y2
							mm							
H35G	14	25.0 / 48.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
H50G		25.0 / 48.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
H60L		36.5 / 60.0	110	8	145	M8	17	158	120	41.5	20	-	25	29.5
J18G	16	30.0 / 73.0	70	6	90	M6	14	119	-	30.5	-	8	18.5	17
J30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	-	16.5	18.5	25.5
J60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
K60L	17	43.0 / 84.0	110	8	145	M8	17	158	120	41.5	-	19	25	29.5
M30G	19	29.5 / 72.5	80	6	100	M6	14	119	-	30	8.5	-	18.5	16.5
M30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	8.5	-	18.5	25.5
M35G		29.5 / 72.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
M45G		29.5 / 72.5	95	6	130	M8	17	158	120	30	8.5	-	25	18
M50G		29.5 / 72.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
M60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	8.5	-	25	18
M60L		43.0 / 84.0	110	8	145	M8	17	158	120	41.5	20	-	25	29.5
N60G	22	31.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
Z35G	24	31.5 / 72.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
Z50G		31.5 / 72.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
Z70G		31.5 / 72.5	130	6	165	M10	20	188	144	30	8.5	-	25	18
Q60G	28	31.5 / 88.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
Q60L		43.0 / 100.0	110	8	145	M8	17	158	120	41.5	-	19	25	29.5
Q70G		31.5 / 88.5	130	6	165	M10	20	188	144	30	-	7.5	25	18
S70G	32	31.5 / 88.5	130	6	165	M10	20	188	144	30	8.5	-	25	18

Note Other motor connection dimensions available on request.

F4CF-D35

Mass 20.5 kg



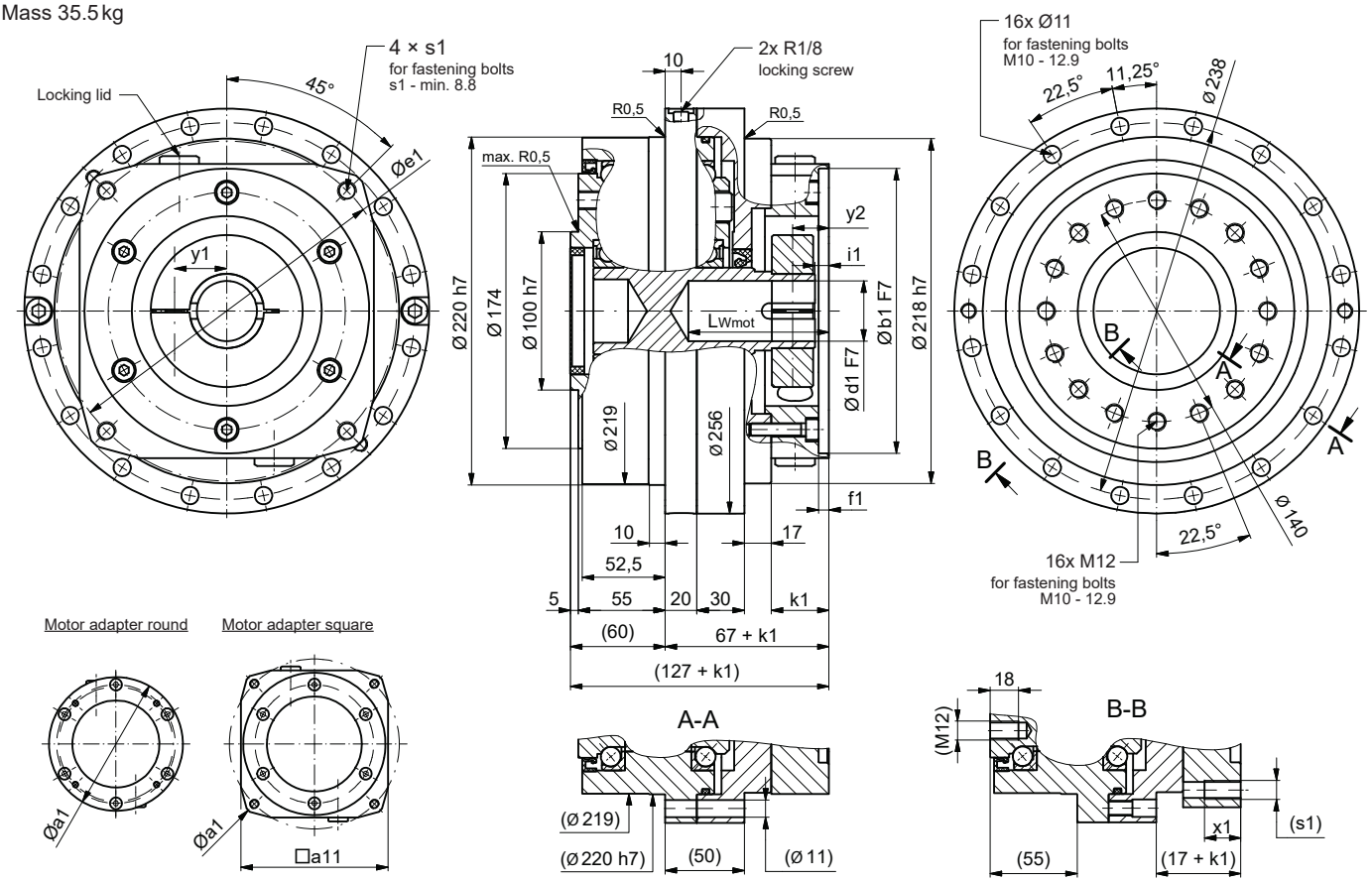
Motor connection dimensions F4CF-D35

Motor code	Hole for shaft	Min./Max. Length of motor shaft	Spigot F7	Spigot seat depth	Pitch circle Ø	Thread in gearbox flange	Thread depth	Flange diameter	Flange square dimension	Flange width	Shaft recess without bushing	Shaft recess with bushing	Positional dimensions locking lid	
	Ød1	$L_{w\ Mot\ min/max}$	Øb1	f1	Øe1	4x s1	x1	Øa1	□a11	k1	i1		y1	y2
							mm							
H35G	14	25.0 / 48.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
H50G		25.0 / 48.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
H60L		36.5 / 60.0	110	8	145	M8	17	158	120	41.5	20	-	25	29.5
J18G	16	30.0 / 73.0	70	6	90	M6	14	119	-	30.5	-	8	18.5	17
J30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	-	16.5	18.5	25.5
J60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
K60L	17	43.0 / 84.0	110	8	145	M8	17	158	120	41.5	-	19	25	29.5
M30G	19	29.5 / 72.5	80	6	100	M6	14	119	-	30	8.5	-	18.5	16.5
M30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	8.5	-	18.5	25.5
M35G		29.5 / 72.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
M45G		29.5 / 72.5	95	6	130	M8	17	158	120	30	8.5	-	25	18
M50G		29.5 / 72.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
M60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	8.5	-	25	18
M60L		43.0 / 84.0	110	8	145	M8	17	158	120	41.5	20	-	25	29.5
N60G	22	31.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
Z35G	24	31.5 / 72.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
Z50G		31.5 / 72.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
Z70G		31.5 / 72.5	130	6	165	M10	20	188	144	30	8.5	-	25	18
Q60G	28	31.5 / 88.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
Q60L		43.0 / 100.0	110	8	145	M8	17	158	120	41.5	-	19	25	29.5
Q70G		31.5 / 88.5	130	6	165	M10	20	188	144	30	-	7.5	25	18
R50G	30	31.5 / 88.5	110	6	130	M8	17	169	-	36	-	7.5	24	20.5
S70G	32	31.5 / 88.5	130	6	165	M10	20	188	144	30	8.5	-	25	18
T76G	35	37.0 / 94.0	114.3	6	200	M12	23	223	176	41.5	14	13	33	26.5

Note Other motor connection dimensions available on request.

F4CF-D45

Mass 35.5 kg



Motor connection dimensions F4CF-D45

Motor code	Hole for shaft	Min./Max. Length of motor shaft	Spigot F7	Spigot seat depth	Pitch circle Ø	Thread in gearbox flange	Thread depth	Flange diameter	Flange square dimension	Flange width	Shaft recess without bushing	Shaft recess with bushing	Positional dimensions locking lid	
	Ød1	$L_{w\,Mot\ min/max}$	Øb1	f1	Øe1	4x s1	x1	Øa1	□a11	k1	i1		y1	y2
							mm							
H35G	14	25.0 / 48.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
H50G		25.0 / 48.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
H60L		36.5 / 60.0	110	8	145	M8	17	158	120	41.5	20	-	25	29.5
J18G	16	30.0 / 73.0	70	6	90	M6	14	119	-	30.5	-	8	18.5	17
J30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	-	16.5	18.5	25.5
J60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
K60L	17	43.0 / 84.0	110	8	145	M8	17	158	120	41.5	-	19	25	29.5
M30G	19	29.5 / 72.5	80	6	100	M6	14	119	-	30	8.5	-	18.5	16.5
M30L		38.5 / 81.5	80	6	100	M6	14	119	-	39	8.5	-	18.5	25.5
M35G		29.5 / 72.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
M45G		29.5 / 72.5	95	6	130	M8	17	158	120	30	8.5	-	25	18
M50G		29.5 / 72.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
M60G		29.5 / 72.5	110	6.5	145	M8	17	158	120	30	8.5	-	25	18
M60L		43.0 / 84.0	110	8	145	M8	17	158	120	41.5	20	-	25	29.5
N60G	22	31.5 / 72.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
Z35G	24	31.5 / 72.5	95	6	115	M8	17	138	120	30	8.5	-	18.5	18
Z50G		31.5 / 72.5	110	6	130	M8	17	158	120	30	8.5	-	25	18
Z70G		31.5 / 72.5	130	6	165	M10	20	188	144	30	8.5	-	25	18
Q60G	28	31.5 / 88.5	110	6.5	145	M8	17	158	120	30	-	7.5	25	18
Q60L		43.0 / 100.0	110	8	145	M8	17	158	120	41.5	-	19	25	29.5
Q70G		31.5 / 88.5	130	6	165	M10	20	188	144	30	-	7.5	25	18
R50G	30	31.5 / 88.5	110	6	130	M8	17	169	-	36	-	7.5	24	20.5
S70G	32	31.5 / 88.5	130	6	165	M10	20	188	144	30	8.5	-	25	18
T76G	35	37.0 / 94.0	114.3	6	200	M12	23	223	176	41.5	14	13	33	26.5
U80G	38	32.0 / 89.0	180	6.5	215	M12	23	237	168	36.5	9	-	30	21.5

Note Other motor connection dimensions available on request.