

SIMOTICS S-1FL6 servomotors

Servomotors SIMOTICS S-1FL6 for SINAMICS V90

Overview

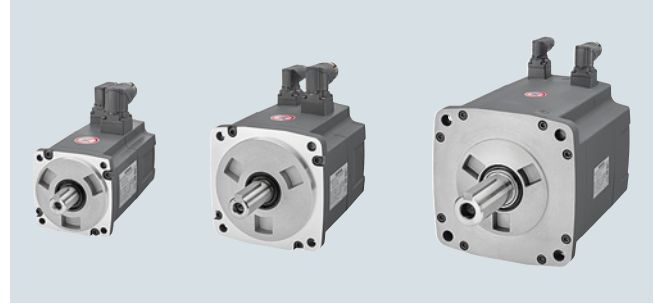
Optimized servomotor solution for motion control applications



SIMOTICS S-1FL6 Low Inertia servomotor

SIMOTICS S-1FL6 motors are permanent-magnet synchronous motors and designed for operation without external cooling. The heat is dissipated through the motor surface.

The motors have a 300 % overload capability and can be combined with the SINAMICS V90 drives to create a powerful servo system with high functionality. Incremental or absolute encoders can be selected depending on the application.



SIMOTICS S-1FL6 High Inertia servomotor

SIMOTICS S-1FL6 motors have a high degree of dynamic performance, wide speed control range and high shaft end and flange precision.

For Selection and Ordering Data please refer to section "System overview" "SINAMICS V90 basic servo drive system" from page 1/9.

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Benefits

- High-performance magnet material
- Rugged design with IP65 degree of protection for complete motor including connectors
- Smooth running quality thanks to low torque ripple
- High rated speed for some variants
- High acceleration due to the 300 % overload capacity
- Rotatable connectors
- Maximum flexibility due to variants with incremental encoder/absolute encoder, with/without brake and plain shaft/feather key

Application

Typical applications

- Handling machines, e.g. pick & place machines
- Packaging machines, e.g. labeling machines, horizontal packaging machines
- Automatic assembly machines
- Metal forming machines
- Printing machines, e.g. screen printing machines
- Winders and unwinders

Function

SIMOTICS S-1FL6 servomotor		
	Low Inertia	High Inertia
Shaft heights	SH 20, SH 30, SH 40, SH 50	SH 45, SH 65, SH 90
Rated torque	0.16 Nm ... 6.37 Nm	1.27 Nm ... 33.4 Nm
Rated speed	3000 rpm	2000 rpm/3000 rpm
Max. speed	5000 rpm	Up to 4000 rpm
Encoders, integrated	<ul style="list-style-type: none"> • Incremental encoder 2500 S/R • Absolute encoder 21 bit single-turn 	<ul style="list-style-type: none"> • Incremental encoder 2500 S/R • Absolute encoder 20 bit + 12 bit multi-turn
Additional advantages	<ul style="list-style-type: none"> • High dynamic performance High acceleration for shorter cycle times as a result of the very low moment of inertia • High speed Maximum speed up to 5000 rpm can increase machine productivity • Compact size The reduced motor length/height compared to High Inertia variants and compact drive size can address critical mounting requirements. 	<ul style="list-style-type: none"> • Smooth operation Higher torque accuracy and low speed ripple as a result of the higher moment of inertia ensures a better product quality. • Robust design High-quality metal connector and standard motor oil seal can withstand harsh environment. • Sufficient torque output Wide range of rated torques up to 33.4 Nm

Technical specifications

General technical specifications

SIMOTICS S-1FL6 servomotors	
Type of motor	Permanent-magnet synchronous motor
Magnet material	High-performance magnetic material
Cooling	Natural cooling
Insulation of the stator winding in accordance with EN 60034-1 (IEC 60034-1)	Temperature class 130 (B)
Thermal class	B (130 °C/266 °F)
Type of construction in accordance with EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3)
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	IP65
Shaft extension in accordance with IEC 60072-1	Plain shaft/feather key (C type)
Shaft and flange accuracy in accordance with IEC 60072-1 ¹⁾	Tolerance N
Vibration severity in accordance with IEC 60034-14	Grade A
Sound pressure level, max.	
• 1FL602	60 dB
• 1FL603	60 dB
• 1FL604	
-Low Inertia	60 dB
-High Inertia	65 dB
• 1FL605	60 dB
• 1FL606	70 dB
• 1FL609	70 dB
Ambient temperature	
• Storage/transport	-20 ... +65 °C (-4 ... +149 °F)
• Operation	
-SIMOTICS S-1FL6 Low Inertia 1FL6052-2AF.../1FL6054-2AF...	0 ... 30 °C (32 ... 86 °F) without derating
-SIMOTICS S-1FL6 Low Inertia 1FL6022/1FL6024/1FL6032/1FL6034/1FL6042/1FL6044	0 ... 40 °C (32 ... 104 °F) without derating
-SIMOTICS S-1FL6 High Inertia	0 ... 40 °C (32 ... 104 °F) without derating
Relative atmospheric humidity	
• Storage/transport	90 % at 30 °C (86 °F) (no condensation)
• Operation	90 % at 30 °C (86 °F) (no condensation)
Installation altitude	Up to 1000 m (3281 ft) above sea level without power derating > 1000 m ... 5000 m (3281 ... 16405 ft) with power derating
Paint finish	Black
Certificate of suitability	CE, EAC

¹⁾ Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.

SIMOTICS S-1FL6 servomotors

Servomotors SIMOTICS S-1FL6 for SINAMICS V90

Technical specifications (continued)

		SIMOTICS S-1FL6 Low Inertia							
		1FL6022-2AF...	1FL6024-2AF...	1FL6032-2AF...	1FL6034-2AF...	1FL6042-2AF...	1FL6044-2AF...	1FL6052-2AF...	1FL6054-2AF...
Shaft height (SH)		20	20	30	30	40	40	50	50
Rated power ¹⁾	kW	0.05	0.10	0.20	0.40	0.75	1.00	1.50	2.00
Horsepower	hp	0.07	0.14	0.27	0.54	1.02	1.36	2.04	2.72
Rated torque ¹⁾	Nm	0.16	0.32	0.64	1.27	2.39	3.18	4.78	6.37
Rated speed	rpm	3000	3000	3000	3000	3000	3000	3000	3000
Maximum torque ¹⁾	Nm	0.48	0.96	1.91	3.82	7.2	9.54	14.3	19.1
Maximum speed	rpm	5000	5000	5000	5000	5000	5000	5000	5000
Rated current	A	1.2	1.2	1.4	2.6	4.7	6.3	10.6	11.6
Maximum current	A	3.6	3.6	4.2	7.8	14.2	18.9	31.8	34.8
Torque constant	Nm/A	0.14	0.29	0.48	0.49	0.51	0.51	0.46	0.55
Moment of inertia									
• without brake	10 ⁻⁴ kgm ²	0.031	0.052	0.214	0.351	0.897	1.15	2.04	2.62
• with brake	10 ⁻⁴ kgm ²	0.038	0.059	0.245	0.381	1.06	1.31	2.24	2.82
Recommended load to motor inertia ratio, max.		30x	30x	30x	30x	20x	20x	15x	15x
Encoder types		<ul style="list-style-type: none"> Incremental encoder TTL, 2500 S/R Absolute encoder 21 bit single-turn 							
Weight ²⁾									
• without brake	kg	0.47	0.63	1.02	1.46	2.8	3.39	5.45	6.66
• with brake	kg	0.70	0.86	1.48	1.92	3.68	4.20	6.96	8.20
Holding brake ³⁾									
Holding torque	Nm	0.32	0.32	1.27	1.27	3.18	3.18	6.37	6.37
Rated voltage	V DC	24 ±10 %	24 ±10 %	24 ±10 %	24 ±10 %	24 ±10 %	24 ±10 %	24 ±10 %	24 ±10 %
Opening time	ms	35	35	75	75	105	105	90	90
Closing time	ms	10	10	10	10	15	15	35	35
Rated current	A	0.25	0.25	0.3	0.3	0.35	0.35	0.57	0.57

		SIMOTICS S-1FL6 High Inertia						
		1FL6042-1AF...	1FL6044-1AF...	1FL6061-1AC...	1FL6062-1AC...	1FL6064-1AC...	1FL6066-1AC...	1FL6067-1AC...
Shaft height (SH)		45	45	65	65	65	65	65
Rated power ¹⁾	kW	0.40	0.75	0.75	1.00	1.50	1.75	2.00
Horsepower	hp	0.54	1.02	1.02	1.36	2.04	2.38	2.72
Rated torque ¹⁾	Nm	1.27	2.39	3.58	4.78	7.16	8.36	9.55
Rated speed	rpm	3000	3000	2000	2000	2000	2000	2000
Maximum torque ¹⁾	Nm	3.8	7.2	10.7	14.3	21.5	25.1	28.7
Maximum speed	rpm	4000	4000	3000	3000	3000	3000	3000
Rated current	A	1.2	2.1	2.5	3.0	4.6	5.3	5.9
Maximum current	A	3.6	6.3	7.5	9.0	13.8	15.9	17.7
Torque constant	Nm/A	1.1	1.2	1.5	1.7	1.6	1.7	1.7
Moment of inertia								
• without brake	10 ⁻⁴ kgm ²	2.7	5.2	8.0	11.7	15.3	22.6	29.9
• with brake	10 ⁻⁴ kgm ²	3.2	5.7	9.1	13.5	16.4	23.7	31.0
Recommended load to motor inertia ratio, max.		10x	10x	5x	5x	5x	5x	5x
Encoder types		<ul style="list-style-type: none"> Incremental encoder TTL, 2500 S/R Absolute encoder 20 bit single-turn + 12 bit multi-turn 						
Weight ²⁾								
• without brake	kg	3.4	5.2	5.7	7.0	8.4	11.1	13.7
• with brake	kg	4.8	6.6	8.8	10.1	11.5	14.2	16.8
Holding brake ³⁾								
Holding torque	Nm	3.5	3.5	12.0	12.0	12.0	12.0	12.0
Rated voltage	V DC	24 ±10 %	24 ±10 %	24 ±10 %	24 ±10 %	24 ±10 %	24 ±10 %	24 ±10 %
Opening time	ms	60	60	180	180	180	180	180
Closing time	ms	45	45	60	60	60	60	60
Rated current	A	0.9	0.9	1.5	1.5	1.5	1.5	1.5

¹⁾ Rated torque, rated power and maximum torque listed in the table above allow for a production tolerance of 10 %.

²⁾ Motor weight with incremental encoder.

³⁾ It is not permissible to use the holding brake for an emergency stop.

Technical specifications (continued)

		SIMOTICS S-1FL6 High Inertia			
		1FL6090-1AC...	1FL6092-1AC...	1FL6094-1AC...	1FL6096-1AC... ⁴⁾
Shaft height (SH)		90			
Rated power¹⁾	kW	2.5	3.5	5	7
Horsepower	hp	3.40	4.76	6.80	9.52
Rated torque¹⁾	Nm	11.90	16.70	23.90	33.40
Rated speed	rpm	2000	2000	2000	2000
Maximum torque¹⁾	Nm	35.7	50.0	70.0	90.0
Maximum speed	rpm	3000	3000	2500	2000
Rated current	A	7.8	11.0	12.6	13.2
Maximum current	A	23.4	33.0	36.9	35.6
Torque constant	Nm/A	1.6	1.6	2.0	2.7
Moment of inertia					
• without brake	10 ⁻⁴ kgm ²	47.4	69.1	90.8	134.3
• with brake	10 ⁻⁴ kgm ²	56.3	77.9	99.7	143.2
Recommended load to motor inertia ratio, max.		5×			
Encoder types		<ul style="list-style-type: none"> • Incremental encoder TTL, 2500 S/R • Absolute encoder 20 bit single-turn + 12 bit multi-turn 			
Weight²⁾					
• without brake	kg	15.4	19.8	24.4	33.3
• with brake	kg	21.5	25.9	30.5	39.3
Holding brake³⁾					
Holding torque	Nm	30.0			
Rated voltage	V DC	24 ± 10 %			
Opening time	ms	220			
Closing time	ms	115			
Rated current	A	1.9			

¹⁾ Rated torque, rated power and maximum torque listed in the table above allow for a production tolerance of 10 %.

²⁾ Motor weight with incremental encoder.

³⁾ It is not permissible to use the holding brake for an emergency stop.

⁴⁾ For SIMOTICS S-1FL6096-... motors with brake, when the ambient temperature exceeds 30 °C (86 °F), the power should be derated by 10 %. Power derating is not required for other motors.

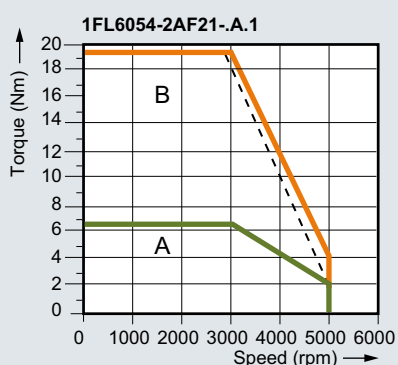
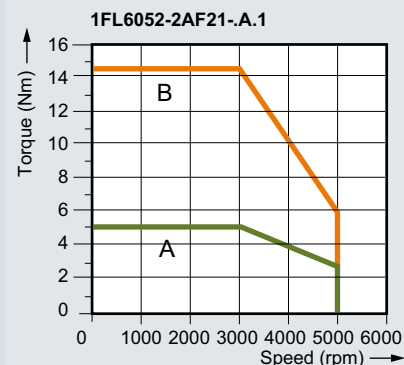
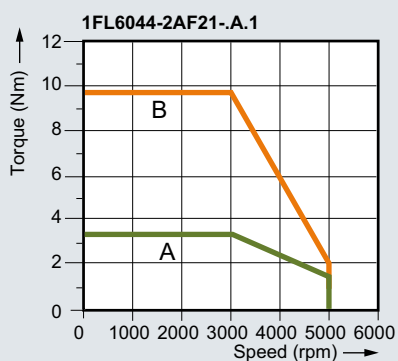
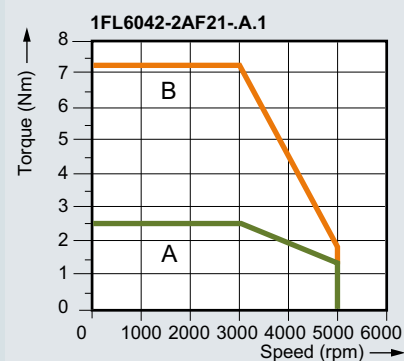
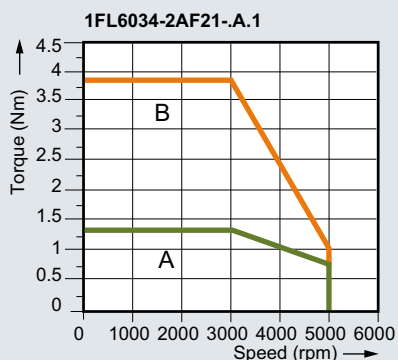
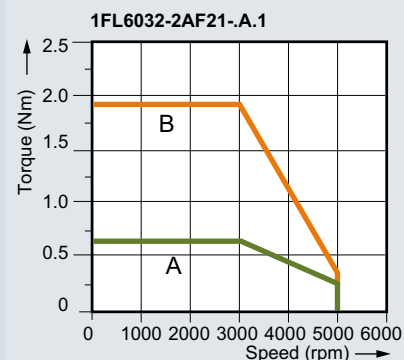
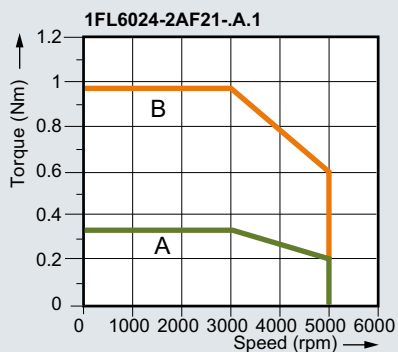
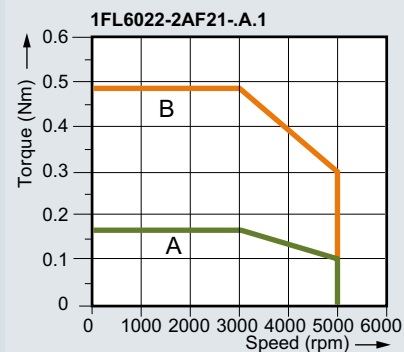
SIMOTICS S-1FL6 servomotors

Servomotors SIMOTICS S-1FL6 for SINAMICS V90

Characteristic curves

Torque-speed characteristic for SIMOTICS S-1FL6 Low Inertia when connected to SINAMICS V90

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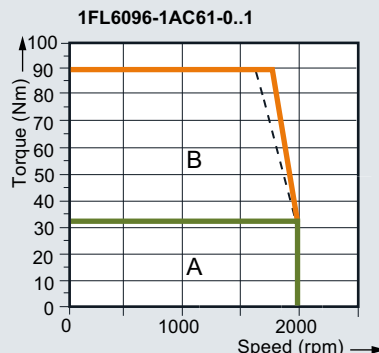
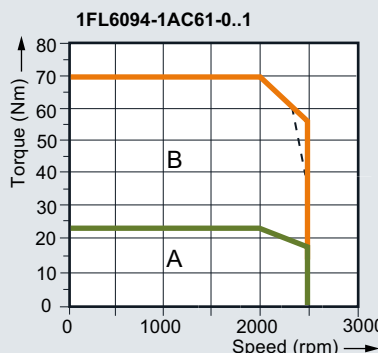
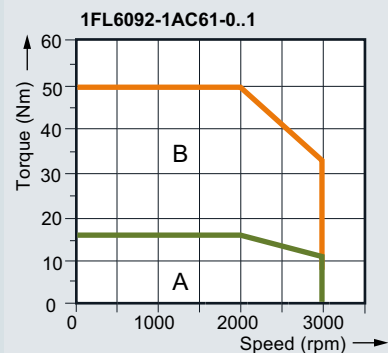
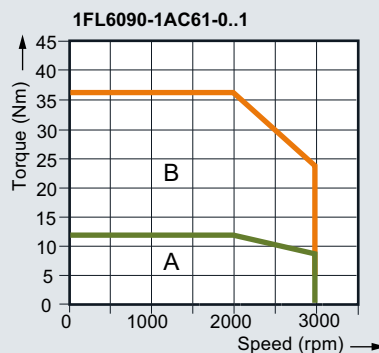
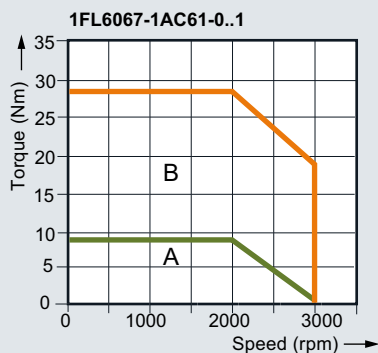
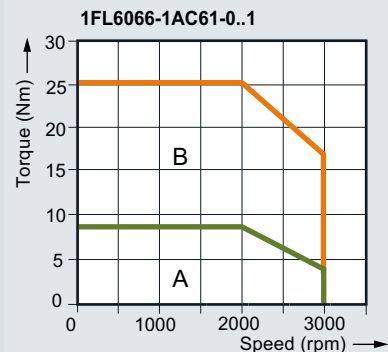
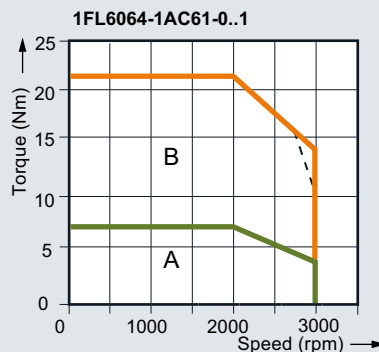
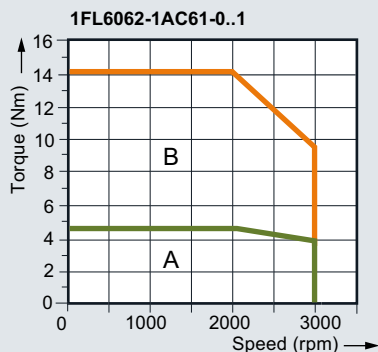
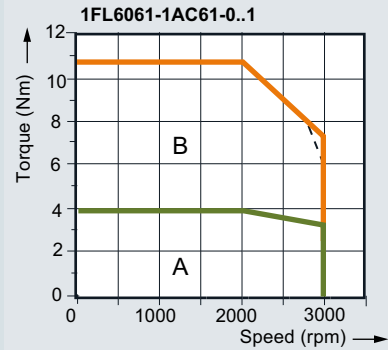
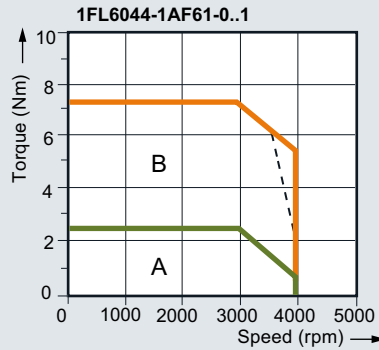
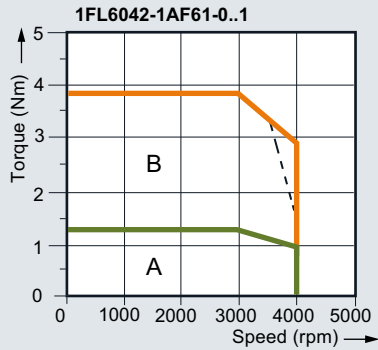
220 V AC supply voltage
 A: Continuous operating area
 B: Short-term operating area

— Supply voltage 220 V
 - - - Supply voltage 198 V

G_D011_EN_00483

Characteristic curves (continued)

Torque-speed characteristic for SIMOTICS S-1FL6 High Inertia when connected to SINAMICS V90



G_D011_EN_00414

Notes:

A: Continuous operating area

B: Short-term operating area

— Supply voltage 400 V

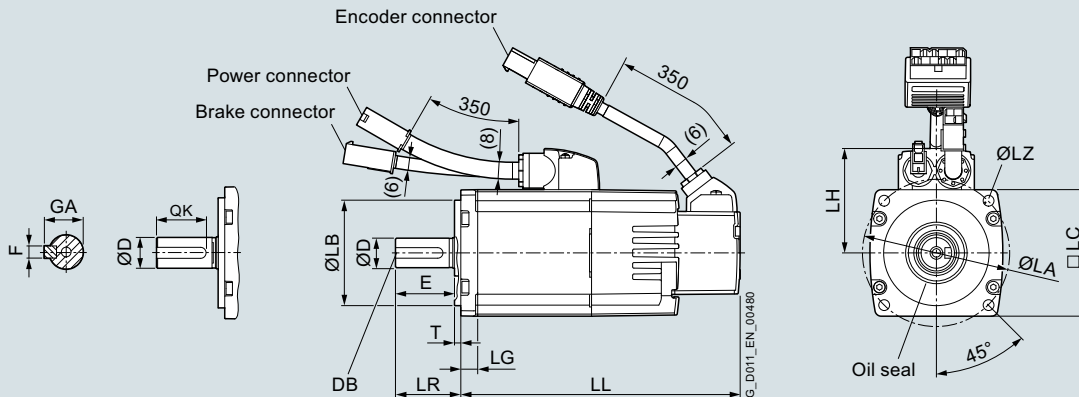
- - - Supply voltage 380 V

SIMOTICS S-1FL6 servomotors

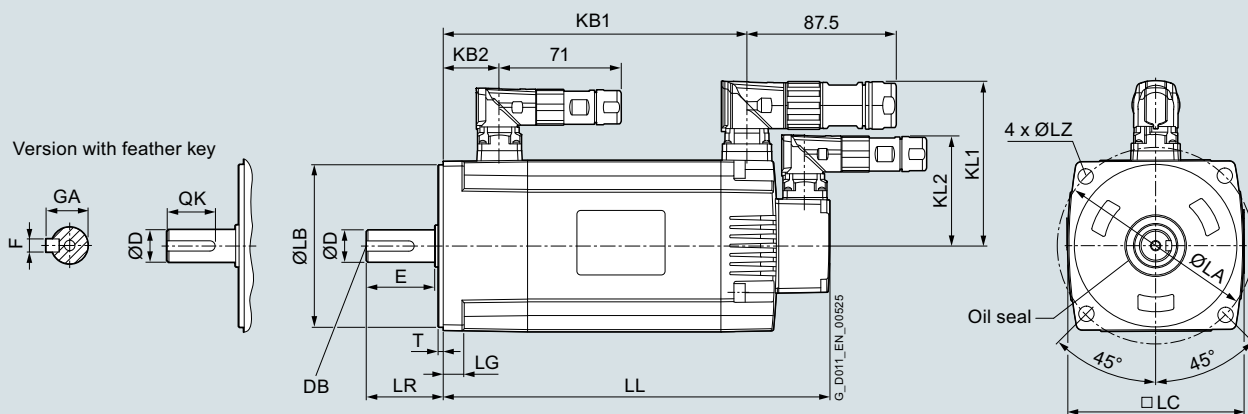
Servomotors SIMOTICS S-1FL6 for SINAMICS V90

Dimensional drawings

SIMOTICS S-1FL6 Low Inertia



SIMOTICS S-1FL6 Low Inertia servomotor, SH 20, SH 30, SH 40

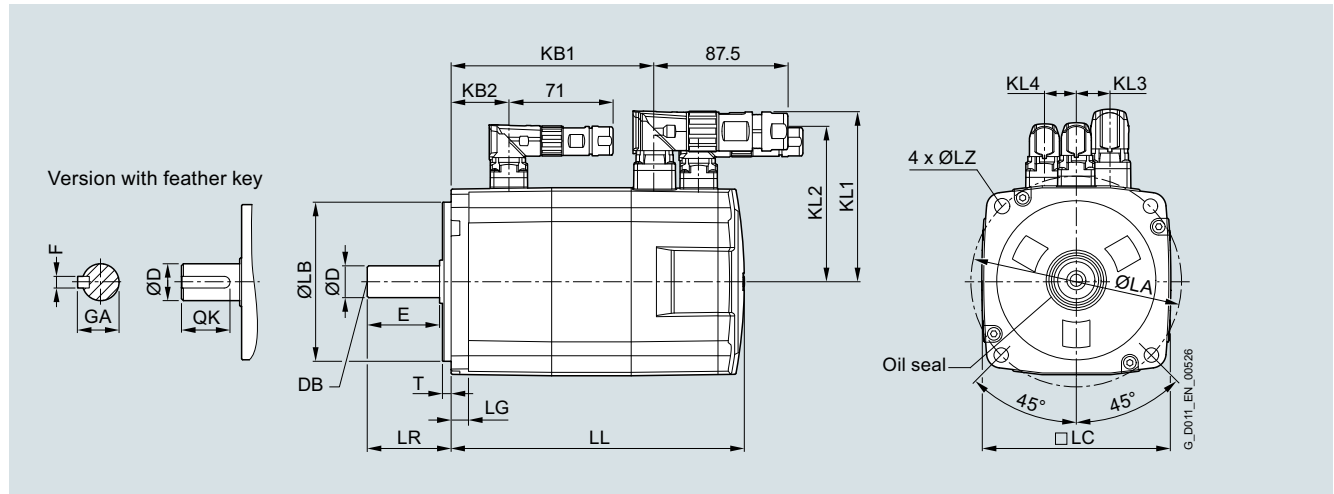


SIMOTICS S-1FL6 Low Inertia servomotor, SH 50

For motor		Dimensions in mm																				
Shaft height	Type	LC	LA	LZ	LB	LH	LR	T	LG	DE shaft extension					Without brake		With brake					
										D	DB	E	QK	GA	F	LL	KB1	LL	KB1	KB2	KL1	KL2
SIMOTICS S-1FL6 Low Inertia, natural cooling, without/with brake																						
20	1FL6022-2AF	40	46	4.5	30	40	25	2.5	6	8	M3×8	22	17.5	9	3	86	–	119	–	–	–	–
	1FL6024-2AF	40	46	4.5	30	40	25	2.5	6	8	M3×8	22	17.5	9	3	106	–	139	–	–	–	–
30	1FL6032-2AF	60	70	5.5	50	50	31	3	8	14	M4×15	26	22.5	16	5	98	–	132.5	–	–	–	–
	1FL6034-2AF	60	70	5.5	50	50	31	3	8	14	M4×15	26	22.5	16	5	123	–	157.5	–	–	–	–
40	1FL6042-2AF	80	90	7	70	60	35	3	8	19	M6×16	30	28	21.5	6	139	–	178.3	–	–	–	–
	1FL6044-2AF	80	90	7	70	60	35	3	8	19	M6×16	30	28	21.5	6	158.8	–	198.1	–	–	–	–
50	1FL6052-2AF	100	115	9	95	–	45	3	12	19	M6×16	40	28	21.5	6	192	143.5	226	177.5	32.5	98	65.5
	1FL6054-2AF	100	115	9	95	–	45	3	12	19	M6×16	40	28	21.5	6	216	167.5	250	201.5	32.5	98	65.5

Dimensional drawings (continued)

SIMOTICS S-1FL6 High Inertia with incremental encoder



SIMOTICS S-1FL6 High Inertia servomotor with incremental encoder

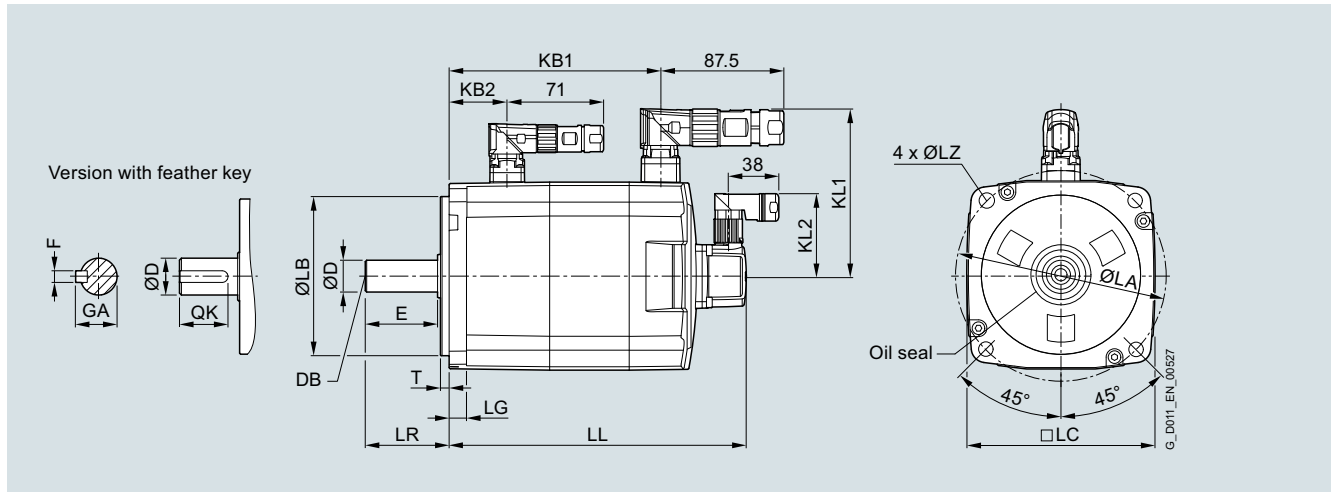
For motor		Dimensions in mm														Encoder system: Incremental encoder 2500 S/R								
Shaft height	Type	LC	LA	LZ	LB	LR	T	LG	D	DB	E	QK	GA	F	without brake		with brake		KL1	KL2	KL3	KL4		
															LL	KB1	KB2	LL					KB1	KB2
SIMOTICS S-1FL6 High Inertia, natural cooling, without/with brake																								
45	1FL6042	90	100	7	80	35	4	10	19	M6×16	30	25	21.5	6	154.5	93.5	-	201	140	31.5	96.2	84.6	13	14
	1FL6044	90	100	7	80	35	4	10	19	M6×16	30	25	21.5	6	201.5	140.5	-	248	187	31.5	96.2	84.6	13	14
65	1FL6061	130	145	9	110	58	6	12	22	M8×16	50	44	25	8	148	85.5	-	202.5	140	39.5	118	108	23	22
	1FL6062	130	145	9	110	58	6	12	22	M8×16	50	44	25	8	164	101.5	-	219	156.5	39.5	118	108	23	22
	1FL6064	130	145	9	110	58	6	12	22	M8×16	50	44	25	8	181	118.5	-	235.5	173	39.5	118	108	23	22
	1FL6066	130	145	9	110	58	6	12	22	M8×16	50	44	25	8	214	151.5	-	268.5	206	39.5	118	108	23	22
90	1FL6067	130	145	9	110	58	6	12	22	M8×16	50	44	25	8	247	184.5	-	301.5	239	39.5	118	108	23	22
	1FL6090	180	200	13.5	114.3	80	3	18	35	M12×25	75	60	38	10	189.5	140	-	255	206	44.5	143	143	34	34
	1FL6092	180	200	13.5	114.3	80	3	18	35	M12×25	75	60	38	10	211.5	162	-	281	232	44.5	143	143	34	34
	1FL6094	180	200	13.5	114.3	80	3	18	35	M12×25	75	60	38	10	237.5	188	-	307	258	44.5	143	143	34	34
	1FL6096	180	200	13.5	114.3	80	3	18	35	M12×25	75	60	38	10	289.5	240	-	359	310	44.5	143	143	34	34

SIMOTICS S-1FL6 servomotors

Servomotors SIMOTICS S-1FL6 for SINAMICS V90

Dimensional drawings (continued)

SIMOTICS S-1FL6 High Inertia with absolute encoder



SIMOTICS S-1FL6 High Inertia servomotor with absolute encoder

For motor		Dimensions in mm													Encoder system: Absolute encoder 20 bit							
Shaft height	Type	LC	LA	LZ	LB	LR	T	LG	DE shaft extension				without brake		with brake		KL1	KL2				
									D	DB	E	QK	GA	F	LL	KB1			KB2	LL	KB1	KB2
SIMOTICS S-1FL6 High Inertia, natural cooling, without/with brake																						
45	1FL6042	90	100	7	80	35	4	10	19	M6×16	30	25	21.5	6	157	100	-	203.5	146.5	31.5	96.2	60
	1FL6044	90	100	7	80	35	4	10	19	M6×16	30	25	21.5	6	204	147	-	250.5	193.5	31.5	96.2	60
65	1FL6061	130	145	9	110	58	6	12	22	M8×16	50	44	25	8	151	92	-	205.5	146.5	39.5	117.5	60
	1FL6062	130	145	9	110	58	6	12	22	M8×16	50	44	25	8	167.5	108.5	-	222	163	39.5	117.5	60
	1FL6064	130	145	9	110	58	6	12	22	M8×16	50	44	25	8	184	125	-	238.5	179.5	39.5	117.5	60
	1FL6066	130	145	9	110	58	6	12	22	M8×16	50	44	25	8	217	158	-	271.5	212.5	39.5	117.5	60
90	1FL6067	130	145	9	110	58	6	12	22	M8×16	50	44	25	8	250	191	-	304.5	245.5	39.5	117.5	60
	1FL6090	180	200	13.5	114.3	80	3	18	35	M12×25	75	60	38	10	197	135	-	263	201	45	143	60
	1FL6092	180	200	13.5	114.3	80	3	18	35	M12×25	75	60	38	10	223	161	-	289	227	45	143	60
	1FL6094	180	200	13.5	114.3	80	3	18	35	M12×25	75	60	38	10	249	187	-	315	253	45	143	60
	1FL6096	180	200	13.5	114.3	80	3	18	35	M12×25	75	60	38	10	301	239	-	367	305	45	143	60

Further information is available in the Drive Technology Configurator (DT Configurator) which can be used on the Internet.

The DT Configurator can be found in the Siemens Industry Mall at the following address:

www.siemens.com/dt-configurator