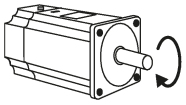
2.7.2 Technical data - servo motors

General technical data

Parameter	Description
Type of motor	Permanent-magnet synchronous motor
Cooling	Self-cooled
Relative humidity [RH]	90% (non-condensing at 30°C)
Installation altitude [m]	≤ 1000 (without power derating)
Thermal class	B
Vibration severity grade	A (according to IEC 60034-14)
Shock resistance [m/s²]	25 (continuous in axial direction); 50 (continuous in radial direction); 250 (in a short time of 6 ms)
Bearing lifetime [h]	> 20000 [1)]
Paint finish	Black
Protection degree of shaft	IP 65, with shaft oil seal
Type of construction	IM B5, IM V1, and IM V3
Positive rotation	Clockwise (default setting in SINAMICS V90 servo drives) 
Certification	

1) This lifetime is only for reference. When a motor keeps running at rated speed under rated load, replace its bearing after 20,000 to 30,000 hours of service time. Even if the time is not reached, the bearing must be replaced when unusual noise, vibration, or faults are found.

Specific technical data

SIMOTICS S-1FL6, low inertia servo motor

Order No. 1FL60...	22	24	32	34	42	44	52	54
Rated power [kW]	0.05	0.1	0.2	0.4	0.75	1	1.5	2
Rated torque [Nm]	0.16	0.32	0.64	1.27	2.39	3.18	4.78	6.37
Maximum torque [Nm]	0.48	0.96	1.91	3.82	7.2	9.54	14.3	19.1
Rated speed [rpm]	3000							
Maximum speed [rpm]	5000							
Rated frequency [Hz]	200							
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
Moment of inertia [10^{-4} kgm^2]	0.031	0.052	0.214	0.351	0.897	1.15	2.04	2.62

Order No.	**1FL60...**	**22**	**24**	**32**	**34**	**42**	**44**	**52**	**54**
Moment of inertia (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				Max. 20x		Max. 15x	
Operating temperature [°C]		1FL602❑, 1FL603❑ and 1FL604❑: 0 to 40 (without power derating) 1FL605❑: 0 to 30 (without power derating)							
Storage temperature [°C]		-20 to +65							
Maximum noise level [dB]		60							
Holding brake	Rated voltage (V)	24 ± 10%							
	Rated current (A)	0.25		0.3		0.35		0.57	
	Holding brake torque [Nm]	0.32		1.27		3.18		6.37	
	Maximum brake opening time [ms]	35		75		105		90	
	Maximum brake closing time [ms]	10		10		15		35	
	Maximum number of emergency stops	2000 [1)]							
Oil seal lifetime [h]		3000 to 5000							
Encoder lifetime [h]		> 20000 [2)]							
Protection degree of motor body		IP 65							
Protection degree of cable end connecor		IP20						-	
Weight [kg]	With brake	0.70	0.86	1.48	1.92	3.68	4.20	6.76	8.00
	Without brake	0.47	0.63	1.02	1.46	2.80	3.39	5.35	6.56

1) Restricted emergency stop operation is permissible. Up to 2000 braking operations can be executed with 300% rotor moment of inertia as external moment of inertia from a speed of 3000 rpm without the brake being subject to an inadmissible amount of wear.

2) This lifetime is only for reference. When a motor keeps running at 80% rated value and the surrounding temperature is 30 °C, the encoder lifetime can be ensured.

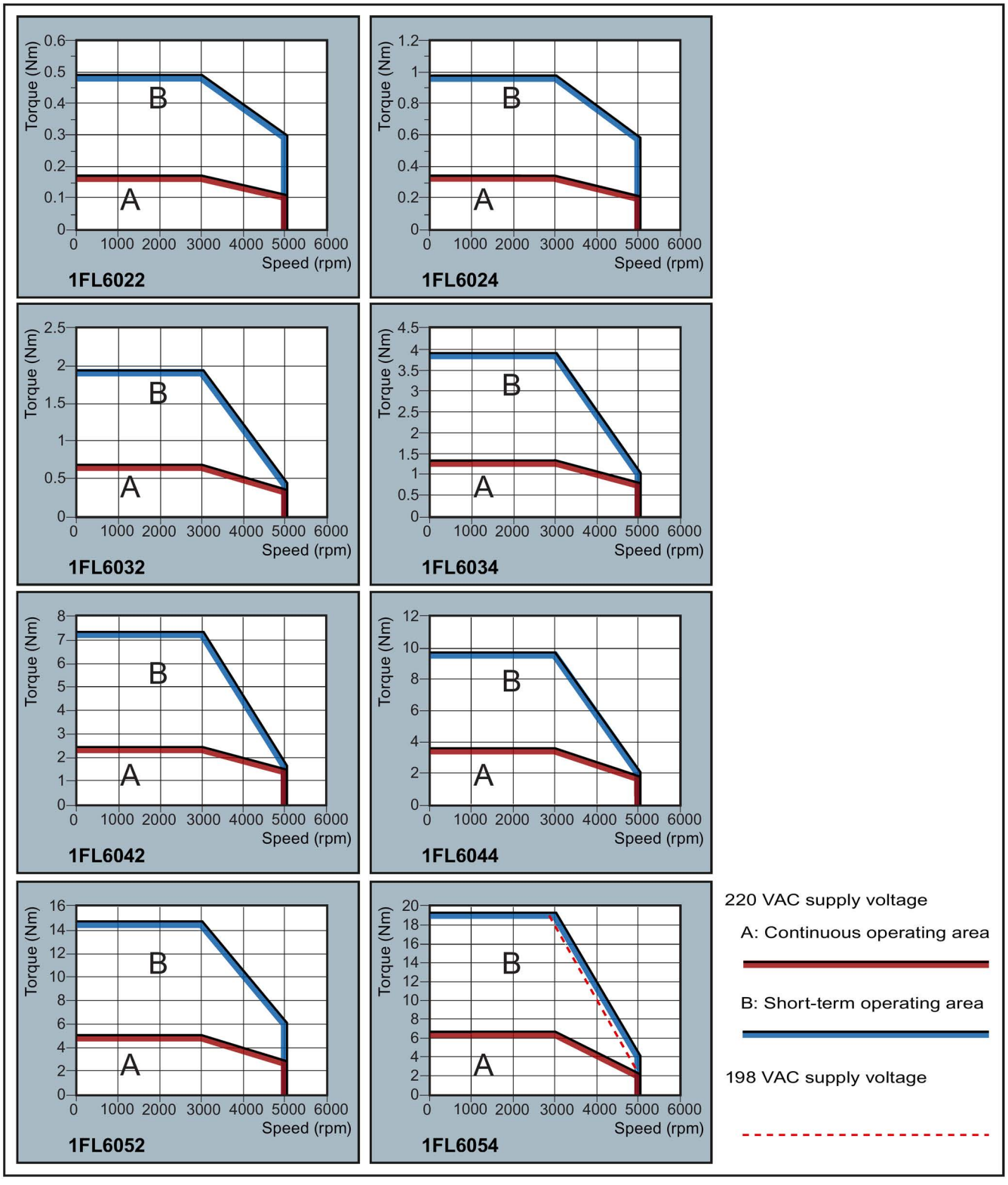
Note:

When the surrounding temperature is between 30 °C and 40 °C, the 1FL605 motor will have a power derating of 10%.

Note

The data of rated torque, rated power, maximum torque, and armature resistance in the above table allow a tolerance of 10%.

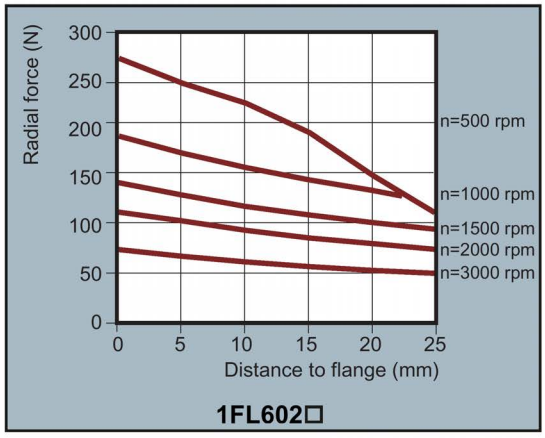
Torque-Speed characteristics



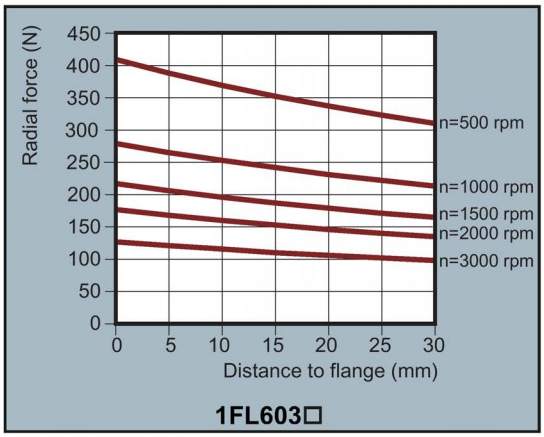
Note

- Continuous operating area is a series of states when a motor can operate continuously and safely. The effective torque must be located in this area.
- Short-term operating area is a series of states when a motor can operate for a short duration if its effective torque is larger than the rated torque.
- For the motors with different rated and maximum speeds, the output torque will decline at a faster rate after the speed exceeds the rated speed.
- The feature in short-term operating area varies with power supply voltages.
- The continuous operating area becomes smaller and the voltage consumptions on the cables grow larger when the cables in the major loop exceed 20 m.

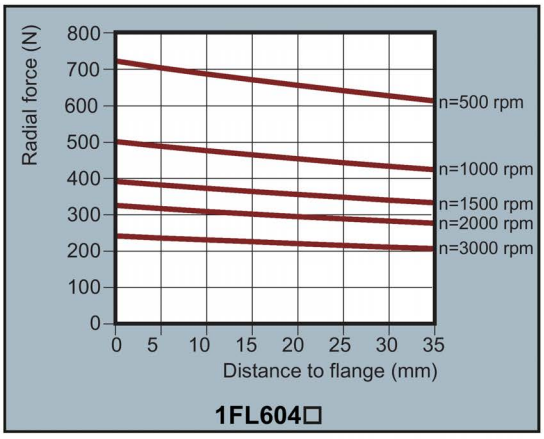
Permissible radial and axial forces



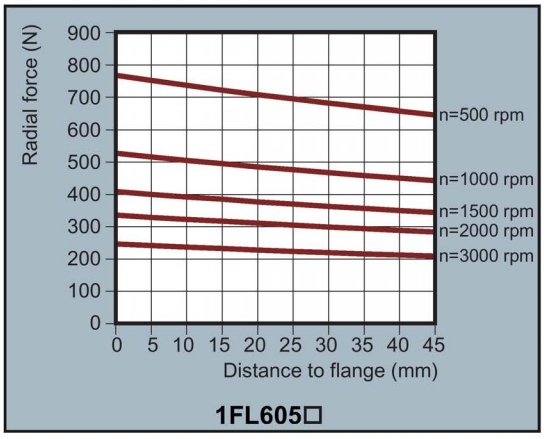
1FL602□



1FL603□



1FL604□



1FL605□

Axial force:
When using, for example, helical toothed wheels as drive element, in addition to the radial force, there is also an axial force on the motor bearings. For axial forces, the spring-loading of the bearings can be overcome so that the rotor moves corresponding to the axial bearing present (up to 0.2 mm).
The permissible axial force can be approximately calculated using the following formula:
$F_A = 0.35 \cdot F_Q$
Where F_A represents axial force and F_Q radial force.