Overview

Regulations, standards and specifications

The motors comply with the appropriate standards and regulations, see table below.

As a result of the fact that in many countries the national regulations have been completely harmonized with the international IEC 60034-1 recommendation, there are no longer any differences with respect to coolant temperatures, temperature classes and temperature rise limits.

General specifications for rotating electrical machines	IEC 60034-1
Terminal designations and direction of rotation for electrical machines	IEC 60034-8
Types of construction of rotating electrical machines	IEC 60034-7
Cooling methods of rotating electrical machines	IEC 60034-6
Degrees of protection of rotating electrical machines	IEC 60034-5
Vibration severity of rotating electrical machines	IEC 60034-14
Noise limit values for rotating electrical machines	IEC 60034-9
Cylindrical shaft extensions for electrical machines	DIN 748-3/IEC 60072-1

The motors listed below are UL-approved by Underwriters Laboratories Inc. and also comply with Canadian cUR standards:
SIMOTICS S-1FK7/1FT7/SIMOTICS T-1FW3/1FW6/
SIMOTICS M-1PH8 (without brake)/SIMOTICS L-1FN3/1FN6.

Degrees of protection for AC motors

A suitable degree of protection must be selected to protect the machine against the following hazards depending on the relevant operating and environmental conditions:

- Ingress of water, dust and solid foreign objects,
- Contact with or approach to rotating parts inside a motor and
- Contact with or approach to live parts.

Degrees of protection of electric motors are specified by a code. This comprises 2 letters, 2 digits and, if required, an additional letter.

IP (International Protection)
Code letter designating the degree of protection against contact and the ingress of solid foreign objects and water

0 to **6**
1st digit designating the degree of touch protection and protection against ingress of solid foreign objects

0 to **8**
2nd digit designating the degree of protection against ingress of water (no oil protection)

W, S and **M**
Additional code letters for special degrees of protection

Most motors are supplied with the following degrees of protection:

Motor	Degree of protection	1st digit: Touch protection	Protection against foreign objects	2nd digit: Protection against water
Internally cooled	**IP23**	Protection against finger contact	Protection against medium-sized, solid foreign objects above 12 mm Ø	Protection against spray water up to 60° from the vertical
Surface-cooled	**IP54**	Complete protection against accidental contact	Protection against harmful dust deposits	Splash water from any direction
	IP55			Jet-water from any direction
	IP64	Complete protection against accidental contact	Protection against dust ingress	Splash water from any direction
	IP65[1)]			Jet-water from any direction
	IP67[1)]			Motor under defined pressure and time conditions under water

Recommended degrees of protection for AC motors

When cooling lubricants are used, protection against water alone is inadequate. The IP rating should only be considered here as a guideline. The motors may have to be protected by suitable covers. Attention must be paid to providing suitable sealing of the motor shaft for the selected degree of protection for the motor (for 1FT7: degree of protection IP67 and flange 0).

The table can serve as a decision aid for selecting the proper degree of protection for motors. A permanent covering of liquid on the flange must be avoided when the motor is mounted with the shaft extension facing upwards (IM V3, IM V19).

Effect \ Liquids	General workshop environment	Water; gen. cooling lubricant (95 % water, 5 % oil)
Dry	IP64	–
Water-enriched environment/ increased humidity	–	IP64
Mist	–	IP65
Spray	–	IP65
Jet	–	IP67
Splash/ brief immersion/ constant inundation	–	IP67

1) DIN VDE 0530 Part 5 or EN 60034 Part 5 specifies that there are only 5 degrees of protection for the first digit code and 8 degrees of protection for the second digit code in relation to rotating electrical machinery. However, IP6 is included in DIN 40050 which generally applies to electrical equipment.

SIMOTICS S-1FK7 motors

Overview

SIMOTICS S-1FK7 motors

SIMOTICS S-1FK7 motors are compact permanent-magnet synchronous motors. The available options, gear units and encoders, together with the expanded product range, mean that the 1FK7 motors can be optimally adapted to any application. They therefore also satisfy the permanently increasing demands of state-of-the-art machine generations.

1FK7 motors can be combined with the SINAMICS S120 drive system to create a powerful system with high functionality. The integrated encoder systems for speed and position control can be selected depending on the application.

The motors are designed for operation without external cooling and the heat is dissipated through the motor surface. 1FK7 motors have a high overload capability.

Benefits

SIMOTICS S-1FK7 Compact motors:

- Space-saving installation due to extremely high power density
- Can be used for universal applications
- Wide range of motors

SIMOTICS S-1FK7 High Dynamic motors:

- Extremely high dynamic response thanks to the very low rotor moment of inertia

SIMOTICS S-1FK7 High Inertia motors:

- Robust closed-loop control properties for high or variable load moment of inertia
- Minimal optimization and commissioning overhead for the compensation of disturbances

Application

- Machine tools
- Robots and handling systems
- Wood, glass, ceramics and stone working
- Packaging, plastics and textile machines
- Printing machines
- Auxiliary axes

Technical specifications

SIMOTICS S-1FK7 Compact/High Dynamic/High Inertia motor	
Type of motor	Permanent-magnet synchronous motor
Magnet material	Rare-earth magnet material
Cooling	Natural cooling
Temperature monitoring	KTY84 temperature sensor in the stator winding
Insulation of the stator winding according to EN 60034-1 (IEC 60034-1)	Temperature class 155 (F) for a winding temperature rise of ΔT = 100 K at an ambient temperature of 40 °C (104 °F)
Type of construction according to EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3)
Degree of protection according to EN 60034-5 (IEC 60034-5)[1]	IP64 (optional IP65)
Shaft extension on the drive end according to DIN 748-3 (IEC 60072-1)	Plain shaft, optional shaft with feather key (half-key balancing)
Shaft and flange accuracy according to DIN 42955 (IEC 60072-1)[2]	Tolerance N
Vibration severity according to EN 60034-14 (IEC 60034-14)	Grade A is maintained up to rated speed
Sound pressure level L_{pA} (1 m) in accordance with EN ISO 1680, max. Tolerance + 3 dB	
• 1FK701 ... 1FK704	55 dB
• 1FK706	65 dB
• 1FK708/1FK710	70 dB
Connection	Connectors for signals and power
Paint finish[3]	Anthracite RAL 7016
2nd rating plate	Enclosed separately
Holding brake	Optional integrated holding brake (free of backlash, 24 V DC)
Approvals, according to	cURus

Built-in encoder systems without DRIVE-CLiQ interface

Incremental encoder	
IC2048S/R encoder	Incremental encoder sin/cos 1 V_{pp} 2048 S/R with C and D tracks
Absolute encoder	
AM2048S/R encoder	Absolute encoder 2048 S/R, 4096 revolutions, multi-turn
AM512S/R encoder	Absolute encoder 512 S/R, 4096 revolutions, multi-turn
AM16S/R encoder	Absolute encoder 16 S/R, 4096 revolutions, multi-turn
Resolver	
Multi-pole resolver	Multi-pole resolver (number of pole pairs corresponds to number of pole pairs of the motor)
2-pole resolver	2-pole resolver

Built-in encoder systems with DRIVE-CLiQ interface

Incremental encoders/absolute encoders, single-turn[4]	
IC22DQ encoder	Incremental encoder, 22 bit + commutation position, 11 bit
AS24DQI encoder	Absolute encoder, single-turn, 24 bit
AS20DQI encoder	Absolute encoder, single-turn, 20 bit
Multi-turn absolute encoder	
AM24DQI encoder	Absolute encoder, 24 bit + 12 bit multi-turn
AM22DQ encoder	Absolute encoder, 22 bit + 12 bit multi-turn
AM20DQI/ AM20DQ encoder	Absolute encoder, 20 bit + 12 bit multi-turn
AM15DQ encoder	Absolute encoder, 15 bit + 12 bit multi-turn
Resolver	
R15DQ resolver	Resolver 15 bit (internal, multi-pole)
R14DQ resolver	Resolver 14 bit (internal, 2-pole)

S/R = signals/revolution

1) 1FK701 can be supplied only with IP54 degree of protection.
2) Shaft extension run-out, concentricity of centering ring and shaft, and perpendicularity of flange to shaft.
3) 1FK702 without a paint finish as standard.
4) The single-turn absolute encoder is applied for the previously used incremental encoders.

SIMOTICS S-1FK7 Compact motors
Natural cooling

Selection and ordering data

Rated speed	Shaft heigh	Rated power	Static torque	Rated torque	Rated current	SIMOTICS S-1FK7 Compact synchronous motors	Number of pole pairs	Moment of inertia of rotor (without brake)	Weight (without brake)
n_{rated}	SH	P_{rated} at ΔT=100 K	M_0 at ΔT=100 K	M_{rated} at ΔT=100 K	I_{rated} at ΔT=100 K		p	J	m
rpm		kW (HP)	Nm (lb_f-ft)	Nm (lb_f-ft)	A	Order No.		10^{-4} kgm^2 (10^{-3} lb_f-in-s^2)	kg (lb)
1FK7 Compact for DC link voltage 510 ... 720 V DC – Natural cooling									
2000	48	0.6 (0.80)	3.0 (2.21)	2.8 (2.07)	1.55	**1FK7042-2AC71-1■■■**	4	2.9 (2.57)	4.6 (10.1)
	63	1.1 (1.48)	6.0 (4.43)	5.3 (3.91)	2.95	**1FK7060-2AC71-1■■■**	4	7.7 (6.82)	7.1 (15.7)
		1.5 (2.01)	8.5 (6.27)	7.0 (5.16)	2.65	**1FK7062-2AC71-1■■■**	4	11.2 (9.91)	9.1 (20.1)
		1.9 (2.55)	11.0 (8.11)	8.9 (6.56)	4.4	**1FK7063-2AC71-1■■■**	4	14.7 (13.0)	11.1 (24.5)
	80	2.1 (2.82)	12.0 (8.85)	10.0 (7.38)	4.4	**1FK7081-2AC71-1■■■**	4	20 (17.7)	12.9 (28.4)
		2.6 (3.49)	16.0 (11.8)	12.5 (9.22)	6.3	**1FK7083-2AC71-1■■■**	4	26 (23.0)	15.6 (34.4)
		3.1 (4.16)	20.0 (14.8)	15.0 (11.1)	6.7	**1FK7084-2AC71-1■■■**	4	32.5 (28.8)	18.3 (40.3)
	100	3.0 (4.02)	18.0 (13.3)	14.5 (10.7)	7.1	**1FK7100-2AC71-1■■■**	4	54 (47.8)	17.6 (38.8)
		4.3 (5.77)	27.0 (19.9)	20.5 (15.1)	9.7	**1FK7101-2AC71-1■■■**	4	79 (69.9)	23.0 (50.7)
		5.2 (6.97)	36.0 (26.6)	25.0 (18.4)	11.0	**1FK7103-2AC71-1■■■**	4	104 (92.0)	28.5 (62.8)
		7.7 (10.3)	48.0 (35.4)	37.0 (27.3)	16.0	**1FK7105-2AC71-1■■■**	4	154 (136)	39.0 (86.0)
3000	48	0.8 (1.07)	3.0 (2.21)	2.6 (1.92)	2.0	**1FK7042-2AF71-1■■■**	4	2.9 (2.57)	4.6 (10.1)
	63	1.5 (2.01)	6.0 (4.43)	4.7 (3.47)	3.7	**1FK7060-2AF71-1■■■**	4	7.7 (6.82)	7.1 (15.7)
		1.9 (2.55)	8.5 (6.27)	6.0 (4.43)	4.0	**1FK7062-2AF71-1■■■**	4	11.2 (9.91)	9.1 (20.1)
		2.3 (3.08)	11.0 (8.11)	7.3 (5.38)	5.6	**1FK7063-2AF71-1■■■**	4	14.7 (13.0)	11.1 (24.5)
	80	2.1 (2.82)	8.0 (5.90)	6.8 (5.02)	4.4	**1FK7080-2AF71-1■■■**	4	14.2 (12.6)	10.3 (22.7)
		2.7 (3.62)	12.0 (8.85)	8.7 (6.42)	6.8	**1FK7081-2AF71-1■■■**	4	20 (17.7)	12.9 (28.4)
		3.3 (4.43)	16.0 (11.8)	10.5 (7.74)	7.2	**1FK7083-2AF71-1■■■**	4	26 (23.0)	15.6 (34.4)
		3.1 (4.16)	20.0 (14.8)	10.0 (7.38)	6.5	**1FK7084-2AF71-1■■■**	4	32.5 (28.8)	18.3 (40.3)
	100	3.8 (5.10)	18.0 (13.3)	12.0 (8.85)	8.0	**1FK7100-2AF71-1■■■**	4	54 (47.8)	17.6 (38.8)
		4.9 (6.57)	27.0 (19.9)	15.5 (11.4)	11.6	**1FK7101-2AF71-1■■■**	4	79 (69.9)	23.0 (50.7)
		4.4 (5.90)	36.0 (26.6)	14.0 (10.3)	11.5	**1FK7103-2AF71-1■■■**	4	104 (92.0)	28.5 (62.8)
		8.2 (11.0)	48.0 (35.4)	26.0 (19.2)	18.0	**1FK7105-2AF71-1■■■**	4	154 (136)	39.0 (86.0)

Encoder systems for motors without DRIVE-CLiQ interface:	IC2048S/R encoder		**A**
	AM2048S/R encoder		**E**
	Multi-pole resolver		**S**
	2-pole resolver		**T**
Encoder systems for motors with DRIVE-CLiQ interface:	AS24DQI encoder		**B**
	AM24DQI encoder		**C**
	AS20DQI encoder		**Q**
	AM20DQI encoder		**R**
	R15DQ resolver		**U**
	R14DQ resolver		**P**
Shaft extension:	**Shaft and flange accuracy:**	**Holding brake:**	
Feather key	Tolerance N	Without	**A**
Feather key	Tolerance N	With	**B**
Plain shaft	Tolerance N	Without	**G**
Plain shaft	Tolerance N	With	**H**
Degree of protection:	IP64		**0**
	IP65		**1**
	IP65 and DE flange IP67		**2**