

Technical specifications

Housing version

SIMOTICS FD motors are designed with a rugged low-vibration cast-iron housing.

Water cooling

For optimum utilization of the marine environment, two water-cooling concepts are available for SIMOTICS FD motors:

- Conventional with air-to-water heat exchanger. In this case, the warm air is routed from within the motor to a heat exchanger. After cooling here, it is drawn back into the machine again.
- The cooling water flows through a meander tube that is pressed into the stator core. The coolant is then extremely close to the points where the heat is generated and can therefore cool extremely efficiently.

Both concepts support the use of fresh water and are provided with measures that prevent the ingress of water into the motor interior, e.g. use of double-pipe cooler.

Cooling with seawater is possible with an air-to-water heat exchanger.

Motor connection

An undrilled entry plate is provided as standard, drilled entry plates with or without cable glands are available on request.

All marine motors generally have an external grounding terminal.

Specifications of the individual classification societies with order codes for ordering SIMOTICS FD motors in marine design

SIMOTICS FD in marine design

Cooling method	Type designation
Water-cooled motors with heat exchanger for converter operation, IC86W cooling method	1LN/1MN
Water-cooled motors with water-jacket cooling for line and converter operation, IC71W cooling method	1LH/1MH
Air-cooled motors for converter operation (self-ventilated), IC411 cooling method	1LM/1MM
Air-cooled motors with mounted separately driven fan for converter operation, IC416 cooling method	1LQ/1MQ

SIMOTICS FD motors for marine applications must be ordered with classification-specific options. This ensures that both the mechanical design of the motor and the tests are performed exactly in accordance with the instructions provided by the respective classification society.

There are four categories of classification-specific options:

- 1 *Design options* define the marine-compatible technical design in accordance with the definitions of the classification society in association with the international standards and practices of our engineers.
- 2 *Certification options* define the scope of the test certificates and cover all the expenses of the classification society and Siemens.
- 3 *Test options* define the scope of the individual tests for final acceptance of the motor in the presence of an inspector of the respective classification society. A class-specific type test is performed on the first motor, and a routine test is performed on all subsequent motors.
- 4 *Additional options* for variations and special conditions – specify the customer's request to participate in the tests at the factory, or to define requirements that deviate from the standards of the classification society.

The options of the categories listed above are combined with each other depending on the class of importance, classification society and other conditions.

If motors are to be designed according to the specifications of several classification societies, a special inquiry is necessary.

Motors for Non-essential Services

The technical design is in accordance with the ambient operating conditions specified by the classification society. One of the marine design options must be ordered by specifying the respective order code **X00**, **X01**, **X12**¹⁾, **X03**, **X04**, **X05** or **X06** (depending on the classification society), acceptance tests are not required. There is no distinction between ordering an individual motor or several motors.

Non-essential Service	Order codes for options in accordance with the classification society (Article No. with additional identification code -Z and order code)					
	ABS	BV	CCS	DNV GL	KR	LR
Technical version	X00	X01	X12 ¹⁾	X03	X05	X06

Motors for Essential Services

The technical design is in accordance with regulations of the classification society: Options with the order codes **X10** to **X16**. An acceptance test certificate 3.2 according to EN 10204 and a product certificate of the classification society is provided with each motor. The options with order codes **J70** to **J82** (first motor), or **J71** to **J83** (additional motors) define the costs for certification of the motor.

Depending on the classification society, the test steps are controlled by the options with order codes **X30** to **X42** for the first motor (even numbers) and **X31** to **X43** for the additional motors (uneven numbers).

¹⁾ Non-essential Service is handled by CCS in the same manner as Essential Service.

Application-specific motors

Marine applications

Technical specifications (continued)

Essential Service	Order codes for options in accordance with the classification society (Article No. with additional identification code -Z and order code)					
	ABS	BV	CCS	DNV GL	KR	LR
Technical version						
	X10	X11	X12	X13	X15	X16
Certification						
• First motor	J70	J72	J74	J76	J80	J82
• Additional motors	J71	J73	J75	J77	J81	J83
Acceptance tests with classification						
• First motor	X30	X32	X34	X36	X40	X42
• Additional motors	X31	X33	X35	X37	X41	X43
Tests in the presence of representatives of the customer (in addition to the inspector of the classification society)						
	X99					

Motors for Essential Services for Propulsion

The technical design is in accordance with regulations of the classification society: Options with the order codes **X20** to **X26**. An acceptance test certificate 3.2 according to EN 10204 and a product certificate of the classification society is provided with each motor. The options with order codes **N40** to **N52** (first motor), or **N41** to **N53** (additional motors) define the costs for certification of the motor.

Depending on the classification society, the test steps are controlled by the options with order codes **X60** to **X72** for the first motor (even numbers) and **X61** to **X73** for the additional motors (uneven numbers).

Essential Service for Propulsion	Order codes for options in accordance with the classification society (Article No. with additional identification code -Z and order code)					
	ABS	BV	CCS	DNV GL	KR	LR
Technical version						
	X20	X21	X22	X23	X25	X26
Certification						
• First motor	N40	N42	N44	N46	N50	N52
• Additional motors	N41	N43	N45	N47	N51	N53
Acceptance tests with classification						
• First motor	X60	X62	X64	X66	X70	X72
• Additional motors	X61	X63	X65	X67	X71	X73
Tests in the presence of representatives of the customer (in addition to the inspector of the classification society)						
	X99					

Additional options

Order code X99:

According to regulations, the acceptance tests are performed in the presence of an inspector of the classification society. If the customer or his representative is required to be present during the tests, order code **X99** must be specified. In this case, the ordering party will be informed as to the dates in the form of an invitation.

All other tests can be ordered separately via the standard options for industrial motors. They will be performed in addition to the specified measurements. You will find the complete range of options for tests in section 11 of the catalog "Article No. supplements and special versions" under "Options".

Notice!

All options that can be ordered with order codes must also be ordered using these order codes.

If, for example, a motor according to the ABS classification is required for an ambient temperature of 45 °C, in addition to the order codes for marine options, order code **D11** must also be specified.

Scope of design options X00 to X26

The design options include all classification-specific technical measures. These options are bundles of additional modifications and accessories which make a motor marine-compatible as well as classification-compliant and application-compatible.

Temperature class and coolant temperature

Standard motors

Most classification societies specify a coolant temperature of CT 45 °C and a cooling water temperature of 38 °C for utilization according to temperature class 155 (F). Motors according to the ABS classification that specify CT 50 °C are an exception. As a result of the increased cooling air and cooling water temperatures specified by the classification societies the reduction factors on page 3/2 shall be taken into account.

More detailed information is available on request.

Technical specifications (continued)

Rating plate and acceptance test certificate

The rating plate indicates the relevant classification society and the associated coolant temperature. The housings of all certified motors are stamped with the certificate number and identifier of the society or testing agency, in accordance with regulations. These stamps are in the vicinity of the rating plate.

The results of the acceptance test are supplied with the motor certificate and the motor.

SIEMENS							
3~ Mot. 1LN1 222-3AB53-2AB5-Z SIMOTICS FD NoN- H61484511010001 / 2016							
m: 1.98 t IP 55 IM B3 Ta: -20...+50°C Th.Cl.: 180(H) Util.:155(F)							
nmax: 3000 1/min IEC/EN 60034-1							
U [V]	I [A]	P [kW]	cosφ	n [1/min]	f [Hz]		Eff.
660 Δ	375	366	0.89	1500	50.40		96.0%
Mot. design: ONLY FOR SINAMICS WITH OPT. PULSE PATTERNS (p1802=19)							
Line supply: 690V/50Hz							
MARINE EQUIPMENT / CLASSIFICATION SOCIETY: ABS							
MAX. WASSERDRUCK / WATER PRESSURE 6 BAR							
KÜHLW./COOL.WATER 115 L/MIN, 38°C							
Made in Germany D-90441 Nürnberg							

Degree of protection

The degrees of protection as specified in the catalog apply. For IP56 (non-heavy sea, order code **K52**) the formation of ice must be avoided. The additional information "non-heavy-sea" means that the machine must not be flooded or submerged by a wave.

Winding and motor protection

To monitor the winding and, if specified by the marine classification society, to monitor the bearings, the motors are equipped with PTC thermistors, temperature sensors or resistance thermometers. All water-cooled motors are equipped with leak sensors as protection against leaks in the cooling circuit. The complete scope of standard accessories depends on the marine classification society and importance class.

Paint finish

The option of the technical design (**X00** to **X06**, **X10** to **X16** or **X20** to **X26**) of a marine motor includes a paint finish with greater paint thickness in accordance with EN ISO 12944-5 C4.

With unprotected installation on deck or in offshore applications a more corrosion-resistant paint finish is required.

The order code **E81** includes a paint finish according to EN ISO 12944-5 C5-M.

Special paint colors are available on request.

Recommended special versions

- Rust-resistant screws (externally) – Order code **M27**
- Shock Pulse Measurement (SPM) nipple for monitoring the bearing vibration for essential and non-essential motors – Order code **G50**
- Mounting of 2 Pt100 screw-in resistance thermometers in basic circuit for rolling-contact bearings for essential and non-essential motors – Order code **A72**
- IP56 degree of protection (non-heavy-sea) – the additional information "non-heavy-sea" means that the machine must not be flooded or submerged by a wave – Order code **K52**
- An inquiry has to be submitted for marine motors for unprotected installation on deck or for offshore applications in order to clarify any special measures that may need to be taken regarding the conditions of use and installation.

More information

Ordering notes

The fees of the classification societies for necessary authorizations, individual acceptance inspections and certificates are included in the order code.

Application-specific motors

Marine applications

More information (continued)

For selection and ordering data, see sections 4 to 10 of the catalog.

Ordering examples

Selection criteria	Requirement	Structure of the Article No.
1st ordering example: 5 motors for Non-Essential Service according to ABS (American Bureau of Shipping), USA		
Motor type	SIMOTICS FD self-ventilated, IC411 cooling method, IP55 degree of protection	1LM1■■■■-■■■■■-■■■■■
Motor series	Low-noise standard version	1LM12■■■-■■■■■-■■■■■
System description	Operation on SINAMICS converter with uncontrolled infeed	1LM122■-■■■■■-■■■■■
Efficiency	Premium Efficiency	1LM1223-■■■■■-■■■■■
Frame size	315	1LM1223-3A■■■-■■■■■
No. of poles	4-pole	1LM1223-3AB■■■-■■■■■
Laminated core length	average	1LM1223-3AB5■-■■■■■
Line voltage and frequency	690 V, 50 Hz – VSD	1LM1223-3AB53-■■■■■
Rated speed	1500 rpm	1LM1223-3AB53-2■■■■■
Type of construction	IM B3	1LM1223-3AB53-2A■■■
Terminal box position	Standard version (terminal box on DE top)	1LM1223-3AB53-2AA■
Separately driven fan position	No separately driven fan/heat exchanger	1LM1223-3AB53-2AA0
Special versions	Technical version according to ABS, CT (air) = 50 °C, temperature class 155 (F) used acc. to 155 (F) incl.: Insulated bearing at NDE, coated internal surfaces and special external coating with 240 µm, 3 PTC thermistors for alarm and tripping in the winding	1LM1223-3AB53-2AA0-ZX00
	Article No. for all 5 motors	1LM1223-3AB53-2AA0-ZX04
2nd ordering example: 5 motors for essential service according to BV (Bureau Veritas), France		
Motor type	Motor of example 1	1LM1223-3AB53-2AA0
Special versions		
1st motor	Technical version according to BV, CT (air) = 45 °C, temperature class 155 (F) used acc. to 155 (F) incl.: Insulated bearing at NDE, coated internal surfaces and special external coating with 240 µm, 3 PTC thermistors for alarm and tripping in the winding	1LM1223-3AB53-2AA0-ZX11
	Certification required for first ordered motor acc. to BV	1LM1223-3AB53-2AA0-ZX11+J72
	Tests required for first ordered motor acc. to BV	1LM1223-3AB53-2AA0-ZX11+J72+X32
	Article No. for 1st motor	1LM1223-3AB53-2AA0-ZX11+J72+X32
4 additional motors	Technical version according to BV, CT (air) = 45 °C, temperature class 155 (F) used acc. to 155 (F) incl.: Insulated bearing at NDE, coated internal surfaces and special external coating with 240 µm, 3 PTC thermistors for alarm and tripping in the winding	1LM1223-3AB53-2AA0-ZX11
	Certification required for additional ordered motors acc. to BV	1LM1223-3AB53-2AA0-ZX11+J73
	Tests required for additional ordered motors acc. to BV	1LM1223-3AB53-2AA0-ZX11+J73+X33
	Article No. for the additional 4 motors	1LM1223-3AB53-2AA0-ZX11+J73+X33

More information (continued)

Ordering examples (continued)

Selection criteria	Requirement	Structure of the Article No.
3rd ordering example: 2 motors for Essential Service for Propulsion according to DNV GL (Det Norske Veritas – Germanischer Lloyd), Germany		
Motor type	SIMOTICS FD water-cooled, IC71W cooling method, IP55 degree of protection	1LH1 ■■■ – ■■■■ – ■■■■
Motor series	Low-noise standard version	1LH1 2 ■■ – ■■■■ – ■■■■
System description	Operation on SINAMICS converter with controlled infeed	1LH1 2 1 ■ – ■■■■ – ■■■■
Efficiency	Premium Efficiency	1LH1 2 1 3 – ■■■■ – ■■■■
Frame size	315	1LH1 2 1 3 – 3 A ■■ – ■■■■
No. of poles	4-pole	1LH1 2 1 3 – 3 A B ■■ – ■■■■
Laminated core length	average	1LH1 2 1 3 – 3 A B 5 ■ – ■■■■
Line voltage and frequency	690 V, 50 Hz – VSD	1LH1 2 1 3 – 3 A B 5 3 – ■■■■
Rated speed	1500 rpm	1LH1 2 1 3 – 3 A B 5 3 – 2 ■■■■
Type of construction	IM B3	1LH1 2 1 3 – 3 A B 5 3 – 2 A ■■
Terminal box position	Terminal box on DE right-hand	1LH1 2 1 3 – 3 A B 5 3 – 2 A B ■
Separately driven fan position	No separately driven fan/heat exchanger	1LH1 2 1 3 – 3 A B 5 3 – 2 A B 0
Special versions		
1st motor	Technical version according to DNV, CT (water) = 32 °C, temperature class 155 (F) used acc. to 155 (F) incl.: Insulated bearing at NDE, coated internal surfaces and special external coating with 240 µm, 6 × Pt100 in the stator winding, PT100 for monitoring the bearing temperature, cables routed externally in stainless steel hoses, heating, leakage sensor, SPM nipple	1LH1 2 1 3 – 3 A B 5 3 – 2 A B 0 -Z X13
	Certification required for first ordered motor acc. to DNV	1LH1 2 1 3 – 3 A B 5 3 – 2 A B 0 -Z X13+J76
	Tests required for first ordered motor acc. to DNV	1LH1 2 1 3 – 3 A B 5 3 – 2 A B 0 -Z X13+J76+X36
This option is not mandatory!	Tests in the presence of representatives of the customer (in addition to the inspector of the classification society)	1LH1 2 1 3 – 3 A B 5 3 – 2 A B 0 -Z X13+J76+X36+X99
	Article No. for 1st motor	1LH1 2 1 3 – 3 A B 5 3 – 2 A B 0 -Z X13+J76+X36+X99
Additional motor	Technical version according to DNV, CT (water) = 32 °C, temperature class 155 (F) used acc. to 155 (F) incl.: Insulated bearing at NDE, coated internal surfaces and special external coating with 240 µm, 6 × Pt100 in the stator winding, PT100 for monitoring the bearing temperature, cables routed externally in stainless steel hoses, heating, leakage sensor, SPM nipple	1LH1 2 1 3 – 3 A B 5 3 – 2 A B 0 -Z X13
	Certification required for additional ordered motors acc. to DNV	1LH1 2 1 3 – 3 A B 5 3 – 2 A B 0 -Z X13+J77
	Tests required for additional ordered motors acc. to DNV	1LH1 2 1 3 – 3 A B 5 3 – 2 A B 0 -Z X13+J77+X37
	Article No. for the second motor	1LH1 2 1 3 – 3 A B 5 3 – 2 A B 0 -Z X13+J77+X37