

Synchronous Servo Motors

Series SM

Technical Manual

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Synchronous Servomotors

Series SM

The low-voltage synchronous servomotors from the SM series are brushless, rotary current motors with permanent magnets in the rotor and three-phase windings for special servo applications.

The neodymium magnet material and the low inertial moment contribute significantly to making these motors highly dynamic and allow them to have a very low cogging. The robust and compact motor with high power density is available in three performance classes 60, 100 and 200 watts

Motors are available in two flange sizes with idling torques from 0.2 to 0.68 Nm and peak torques of up to 1.8 Nm.



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1 General

1.1 About this Handbook

This handbook describes the synchronous servomotors from the SM series. The motors are operated in combination with the servo amplifiers. It is therefore important to note that the entire system documentation consists of:

- The product handbook for the servo amplifier
- Online help for the initial startup of the servo amplifier software
- Accessories handbook
- Technical description of the motor series (this handbook)

1.2 Target Group

This handbook is directed toward the following requirements for trained personnel:







Transport:	only by personnel trained in handling components sensitive to electrostatic discharge
Mech. installation:	by personnel with training in machine building technology only
Electr. installation:	by personnel trained in electrical technology only
Initial startup:	by personnel with extensive training in electrical / drive technology

Trained personnel must be familiar with the national installation standards and regulations, as well as comply with them.

2 Basic Safety Guidelines

2.1 Symbols Used

The following symbols are used in the operator documentation for warning and danger messages, as well as informational notes:

DANGER 	Identifies an immediate danger with high risk, which will lead to immediate death or serious injury if not avoided.
WARNING 	Identifies a possible danger with a mid-level risk, which can lead to death or (serious) injury if not avoided.
CAUTION 	Identifies a low risk danger, which can lead to injury or property damage if not avoided.
	Warning, dangerous electrical voltage
	Provides user tips, informs of special features and identifies especially important information in the text.
	Danger for ESD-sensitive components

2.2 Disclaimer



The contents of this document were prepared with the greatest care. However, deviations cannot be ruled out. This document is regularly checked and required corrections are included in the subsequent versions. The machine manufacturer is responsible for the proper assembly, as well as device configuration. The machine operator is responsible for safe handling, as well as proper operation.

The current document can be found on our website. If necessary, contact our support.

Subject to technical changes, which improve the performance of the devices. The following documentation represents a series of product descriptions. It does not guarantee properties under the warranty.

Please thoroughly read the corresponding data sheets, operating instructions and this system handbook before handling a product.

SIGMATEK GmbH & Co KG is not liable for damages caused through non-compliance with these instructions or applicable regulations.

The general and special safety instructions described in the following sections, as well as technical regulations, must therefore be observed.

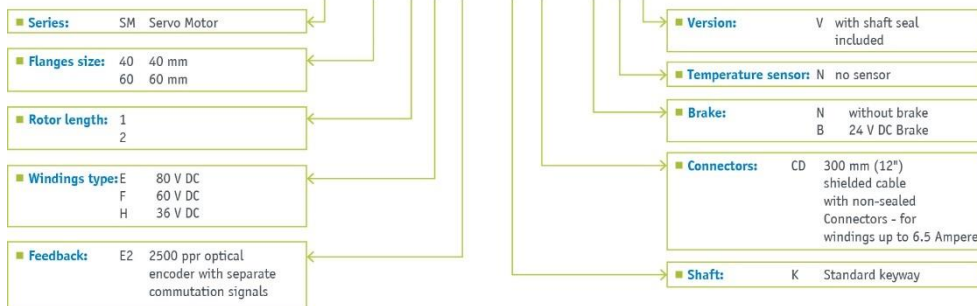
3 Product Identification

3.1 Usage

The motors are designed for operation with the module DC 062.

3.2 Type Key

SM 060 2 E E2 - K CD - N N V



4 Technical Data

4.1 General Data

Insulation class	B
Protection class	IP65 (except shafts without gasket and connector plug)
Installation site	Indoors, without direct sunlight, corrosive or flammable gasses
Max. DC-link voltage	+350 V DC
Environmental temperature, operating	0 ... +40 °C
Environmental temperature, storage	-20 ... +80 °C
Humidity	85 % RH or less (without condensation)
Height (maximum)	in operation 1000 m
Vibration resistance	49 m/s ²

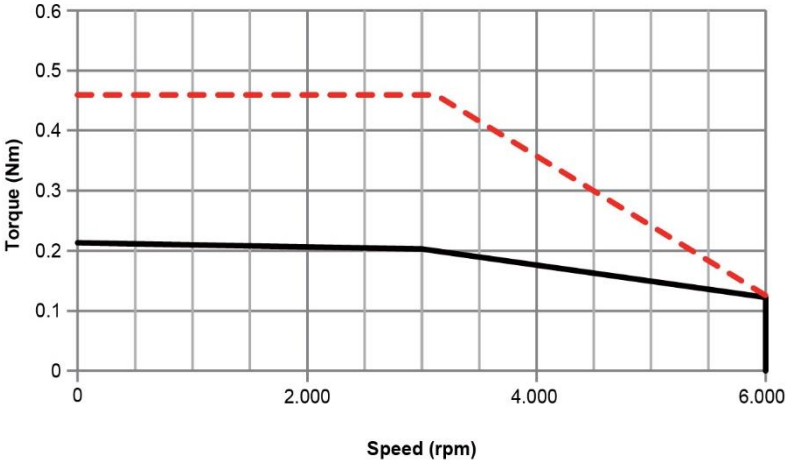
4.2 Performance Data

Data	Symbol Unit	SM0401- HE2-KCD-NNV	SM0402- FE2-KCD-NNV	SM0601- EE2-KCD-NNV
Electrical data				
Standstill torque	M_0 [Nm]	0.2	0.34	0.68
Standstill current	I_{0rms} [A]	5.7	5.6	5.2
Max. nominal supply voltage	U_N [VDC]	24-48	24-48	48-90
Nominal rotation speed	n_n [min ⁻¹]	3000	3000	3000
Rated torque	M_n [Nm]	0.19	0.32	0.64
Nominal power	P_n [W]	60	100	200
Rated current	I_n [A]	5.4	5.2	4.9
Peak current	I_{0max} [A]	13.5	15.6	15
Peak torque	M_{0max} [Nm]	0.46	0.91	1.8
Torque constant $\pm 5\%$	K_{Trms} [Nm/A]	0.035	0.061	0.133
Voltage constant	K_{Erms} [mV/min]	2.1	3.8	7.9
Winding resistance Ph-Ph	R_{25} [Ω]	0.36	0.48	0.67
Winding inductance Ph-Ph	L [mH]	0.39	0.58	2
Mechanical Data				
Rotor inertial torque	J [kgcm ²]	0.0232	0.0422	0.094
Number of motor contacts		8	8	8
Thermal time constant	t_{TH} [min]	12	14.5	15
Weight standard	G [kg]	0.4	0.55	1.1
Radial force allowed on the shaft end at 8000 min ⁻¹	F_R [N]	50	60	200
Axial force allowed	F_A [N]	50	50	70
Brake Data				
Stop torque at 120 °C	M_{BR} [Nm]	0.35	0.35	2
Connection voltage	U_{BR} [VDC]	24	24	24
Electrical power	P_{BR} [W]	6	6	9.1
Inertial torque	J_{BR} [kgcm ²]	0.048	0.048	0.046
Air delay time	t_{BRH} [ms]	25	25	25
Engage delay time	t_{BRL} [ms]	25	25	25
Brake weight	G_{BR} [kg]	0.25	0.25	0.5

4.3 24 V DC Motor Characteristics

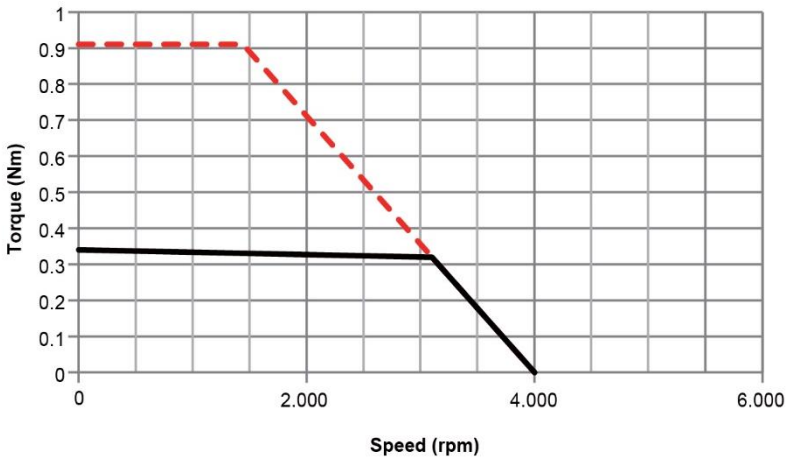
4.3.1 SM0401 (60 Watts)

- - - - - Max. Max. peak torque
— Max. Max. rated torque



4.3.2 SM0402 (100 Watts)

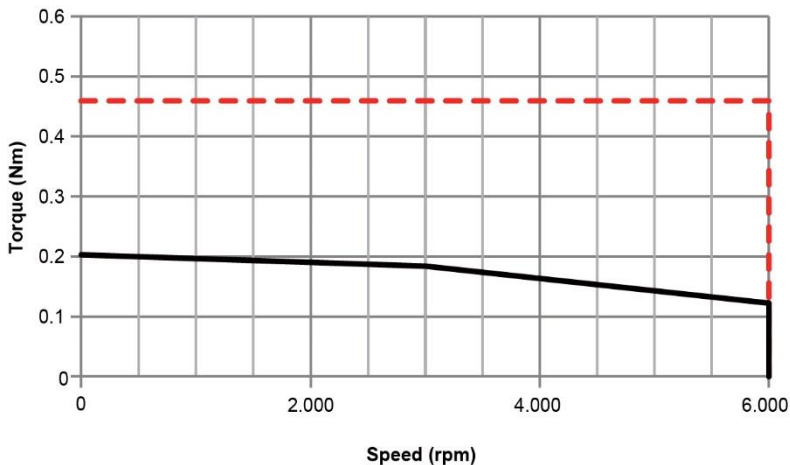
- - - - - Max. Max. peak torque
— Max. Max. rated torque



4.4 48 V Motor Characteristics

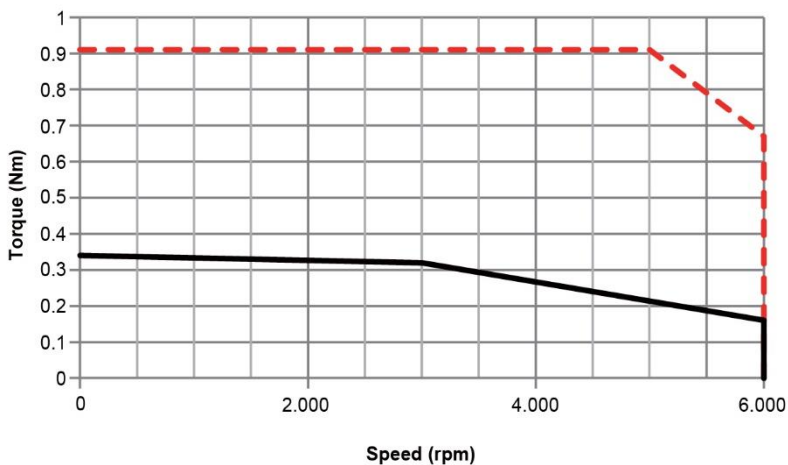
4.4.1 SM0401 (60 Watts)

----- Max. peak torque
 ———— Max. rated torque



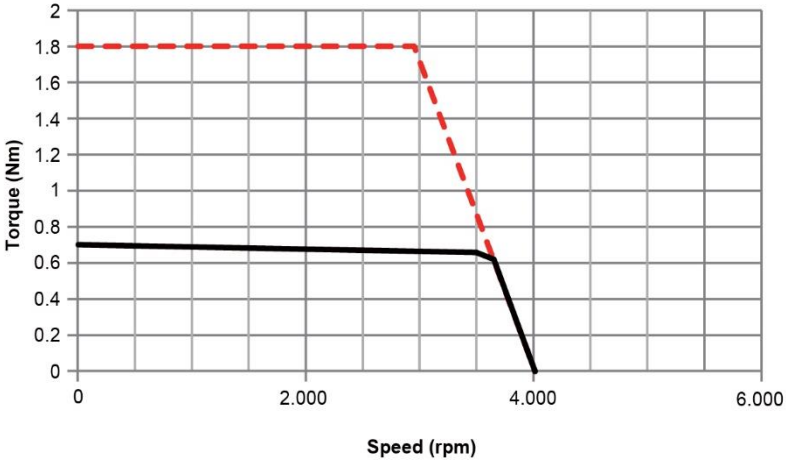
4.4.2 SM0402 (100 Watts)

----- Max. Max. peak torque
 ———— Max. Max. rated torque

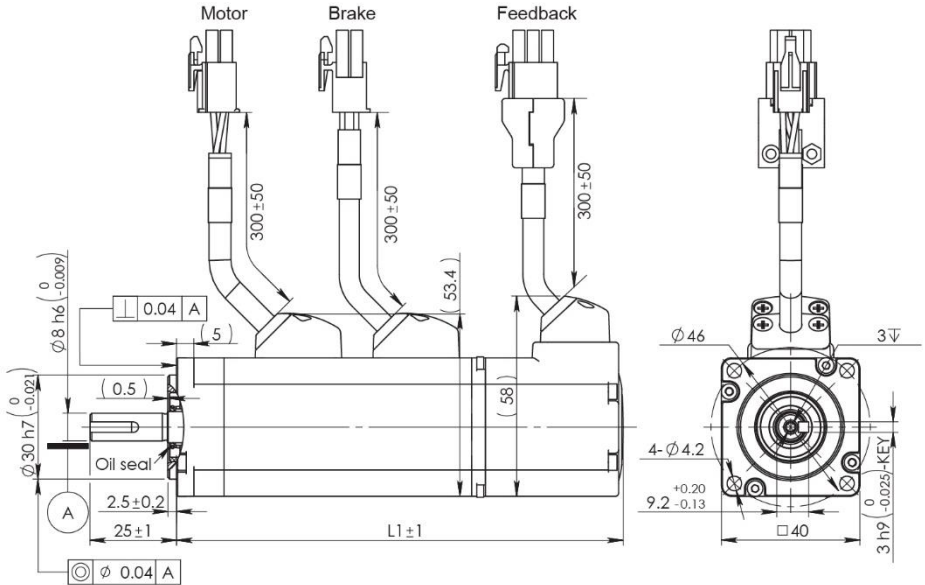


4.4.3 SM0601 (200 Watts)

----- Max. Max. peak torque
————— Max. Max. rated torque

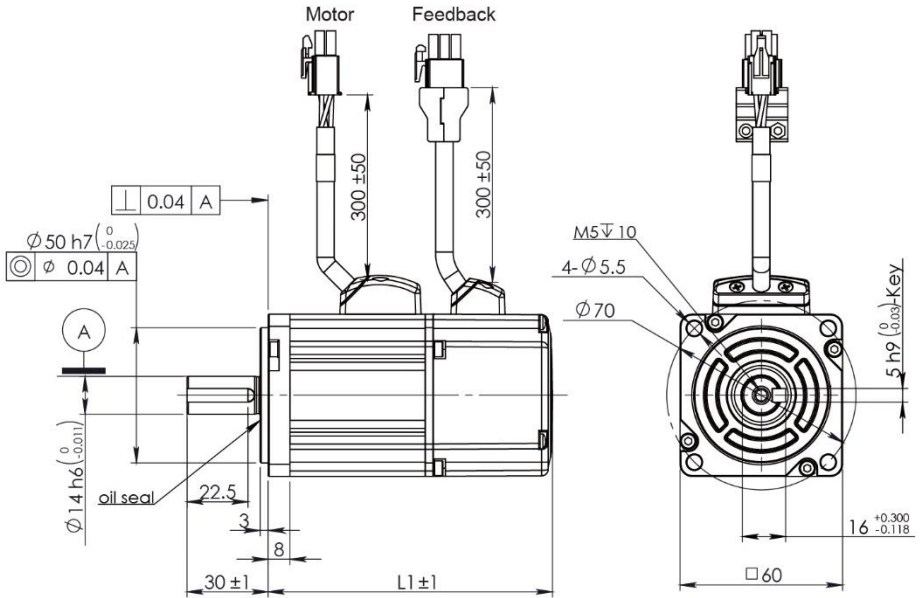


5.2 SM04 with Brake



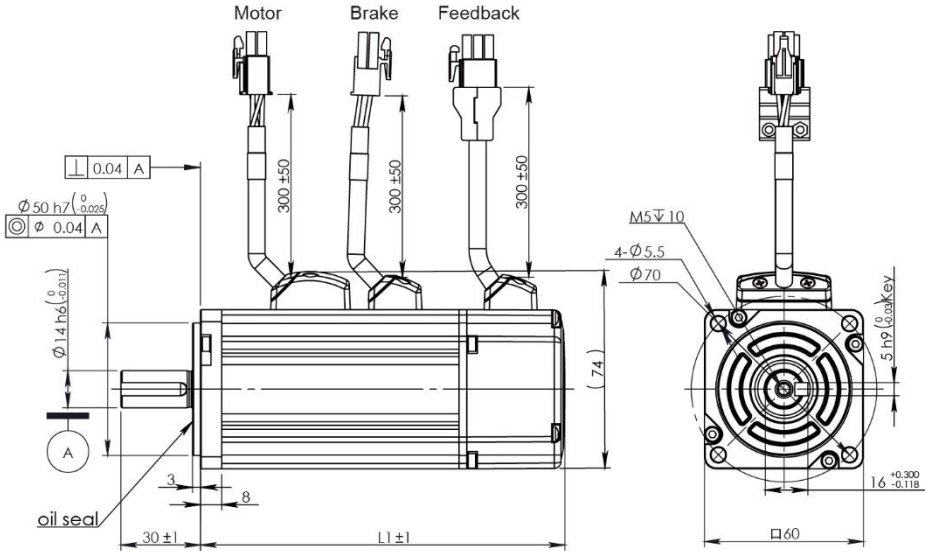
Motor type	L1 [mm]
SM0401	129
SM0402	147

5.3 SM06 without Brake



Motor type	L1 [mm]
SM0601	98

5.4 SM06 with Brake



Motor type	L1 [mm]
SM0601	138

6 Interface Connections

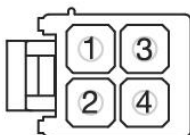
6.1.1 Motor Power Connector

Configuration:

300 mm shielded cable with non-insulated plastic connector

Designed for 6.5 A

4-pin AMP housing P/N: 350779-1



Pin	Signal	Color (type)
1	phase U	red
2	phase V	yellow
3	phase W	blue
4	Mass	green/yellow

6.1.2 Motor Brake

Configuration:

300 mm shielded cable with non-insulated plastic connector

AMP housing P/N: 172165-1



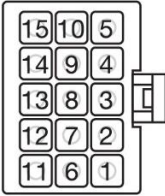
Pin	Signal	Color (type)
1	Brakes	red
2	Brakes	black

6.1.3 Encoder Plug

Configuration:

300 mm shielded cable with non-insulated plastic connector

AMP housing P/N: 172171-1



Pin	Signal	Color (type)	Function
1	+5 V	red	Power
2	GND	black	Mass
3	U+	Brown	not used
4	U	brown/black	
5	V+	grey	
6	V-	grey/black	
7	W+	white	
8	W	white/black	
9	A+	blue/black	Incremental signals
10	A-	blue	
11	B+	green	
12	B-	green/black	Reference signal
13	Z+	yellow	
14	Z-	yellow/black	
15	shield	shield	shield

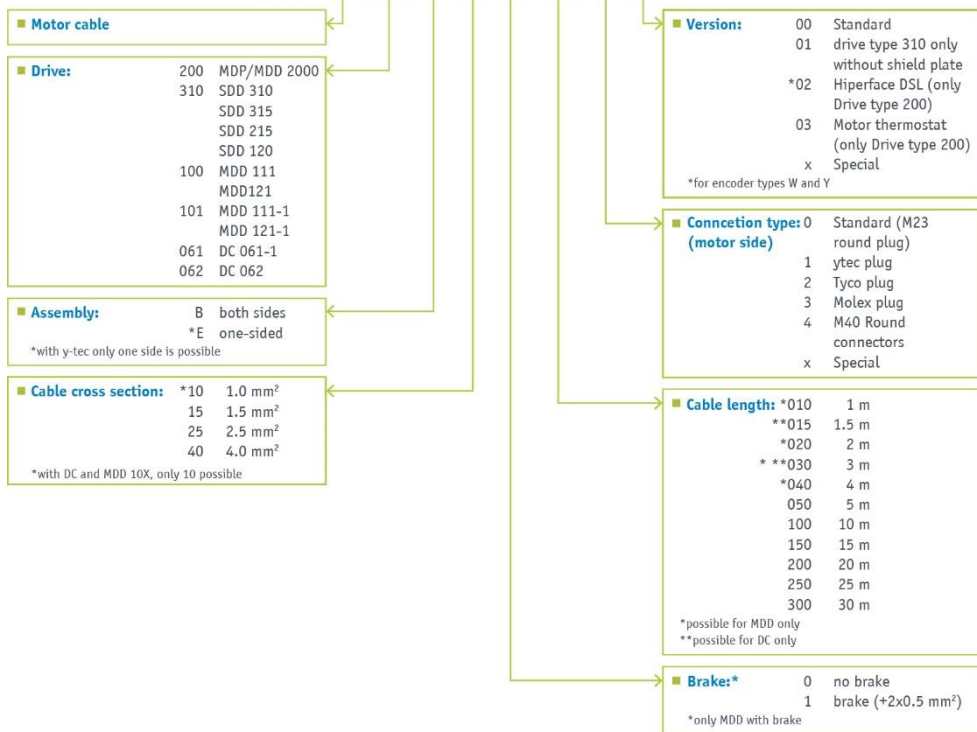
The shield is not connected to the motor housing.

7 Connector Cable

7.1 Motor Cable

7.1.1 Type Key

M 200 B-15-0-050-0-00



Example of article number composition:
 Motor cable for MDD type 2000, assembled on both sides, wire cross section 1.5 mm², without brake, cable length 5 m, Standard configuration

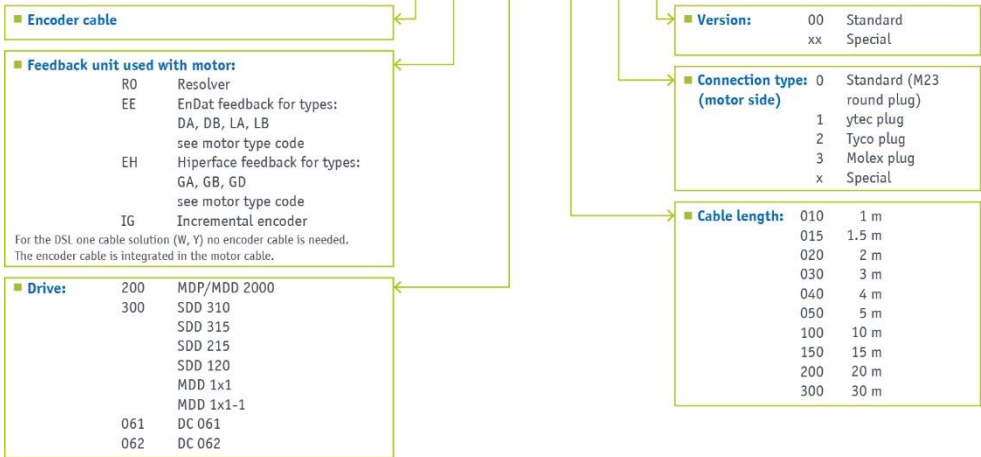
For DC 062				
Description	Brakes	Length	Wires	Outer Diameter
M062E-10-0-015-2-0	no	1.5 meters:	4x1 mm ²	10 mm
M062E-10-0-030-2-0	no	3 meters:	4x1 mm ²	10 mm
M062E-10-0-050-2-0	no	5 Meter	4x1 mm ²	10 mm
M062E-10-0-100-2-0	no	10 Meter	4x1 mm ²	10 mm
M062E-10-1-015-2-0	yes	1.5 meters:	4x1 + 2x0.5 mm ²	10 mm
M062E-10-1-030-2-0	yes	3 meters:	4x1 + 2x0.5 mm ²	10 mm

M062E-10-1-050-2-0	yes	5 Meter	4x1 + 2x0.5 mm ²	10 mm
M062E-10-1-100-2-0	yes	10 Meter	4x1 + 2x0.5 mm ²	10 mm

7.2 Sensor Cables

7.2.1 Type Key

F-R0-200-050-0-00



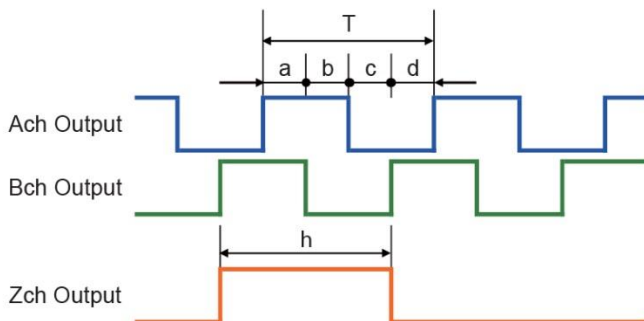
Example of article number composition:
Encoder cable for motor with resolver as feedback, standard configuration, cable length 5 m

For DC 062			
Description	Sensor Type	Length	Outer Diameter
F-IG-062-015-2-00	Incremental	1.5 meters:	6.4 mm
F-IG-062-030-2-00	Incremental	3 meters:	6.4 mm
F-IG-062-050-2-00	Incremental	5 Meter	6.4 mm
F-IG-062-100-2-00	Incremental	10 Meter	6.4 mm

8 Feedback E2 2500 ppr Optical Encoder

The optical encoder provides 2500 pulses per rotation.

● Encoder Signals



$$T = \frac{360 \text{ deg}}{2500C/T}$$

$$a.b.c.d = T/4 \pm T/8$$

$$h = T \pm T/2$$

Documentation Changes

Change date	Affected page(s)	Chapter	Note
07.12.2018	19	7.1 Motor Cable	Numbers changed
08.04.2019	1, 9	Synchronous Servo Motors, 4.2 Performance Data	Product photo and introduction appended, Performance Data corrected
01.07.2019	19 & 20	7.1.1 & 7.2.1 Type Key	Chart changed
07.12.2020	20	7.2.1 Type Key	Graphic exchanged
07.06.2021	19	7 Connector Cable	Graphics changed