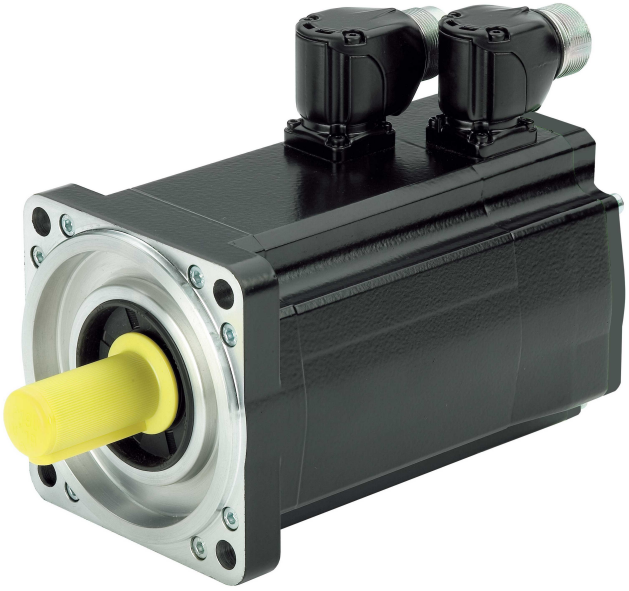
SH3

Servo motor

Motor manual

V2.00, 02.2012



0198441113987, V2.00, 02.2012

www.schneider-electric.com

Schneider Electric

Important information

This manual is part of the product.

Carefully read this manual and observe all instructions.

Keep this manual for future reference.

Hand this manual and all other pertinent product documentation over to all users of the product.

Carefully read and observe all safety instructions and the chapter "Before you begin - safety information".

Some products are not available in all countries.
For information on the availability of products, please consult the catalog.

Subject to technical modifications without notice.

All details provided are technical data which do not constitute warranted qualities.

Most of the product designations are registered trademarks of their respective owners, even if this is not explicitly indicated.

0198441113987, V2.00, 02.2012

Table of contents

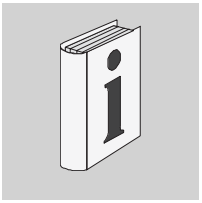
0198441113987, V2.00, 02.2012

0198441113987, V2.00, 02.2012

0198441113987, V2.00, 02.2012

0198441113987, V2.00, 02.2012

About this manual



This manual is valid for the standard products listed in the type code, see chapter "1.4 Type code".

Source manuals

The latest versions of the manuals can be downloaded from the Internet at:

http://www.schneider-electric.com

Corrections and suggestions

We always try to further optimize our manuals. We welcome your suggestions and corrections.

Please get in touch with us by e-mail:
techcomm@schneider-electric.com.

Work steps

If work steps must be performed consecutively, this sequence of steps is represented as follows:

- Special prerequisites for the following work steps
- ▸ Step 1
- ◃ Specific response to this work step
- ▸ Step 2

If a response to a work step is indicated, this allows you to verify that the work step has been performed correctly.

Unless otherwise stated, the individual steps must be performed in the specified sequence.

Making work easier

Information on making work easier is highlighted by this symbol:

Sections highlighted this way provide supplementary information on making work easier.

SI units

SI units are the original values. Converted units are shown in brackets behind the original value; they may be rounded.

Example:
Minimum conductor cross section: 1.5 mm^2 (AWG 14)

Glossary

Explanations of special technical terms and abbreviations.

Index

List of keywords with references to the corresponding page numbers.

0198441113987, V2.00, 02.2012

0198441113987, V2.00, 02.2012

1 Introduction

1

1.1 Motor family

The series SH3 motors are low-inertia AC synchronous servo motors designed for highly dynamic positioning tasks.

A drive system consists of the servo motor and the appropriate drive. Maximum performance requires the motor and drive to be adapted to each other.

Features The motors excel with the following features:

- Overload protection by integrated temperature sensor (external evaluation required)
- Low moment of inertia
- High power density
- Excellent dynamics
- High overload capability
- Broad torque range
- Special winding for low phase currents
- Motor connection via circular connectors
- Easy commissioning via electronic nameplate in SinCos encoder
- Low maintenance

0198441113987, V2.00, 02.2012

1.2 Options and accessories

The motors are available with various options such as:

- Various encoder systems
- Holding brake
- Various shaft versions
- Various degrees of protection
- Various winding versions

The options can be found in the type code section on page 12.

For accessories see chapter "7 Accessories and spare parts", page 73.

0198441113987, V2.00, 02.2012

1.3 Nameplate

The nameplate contains the following data:

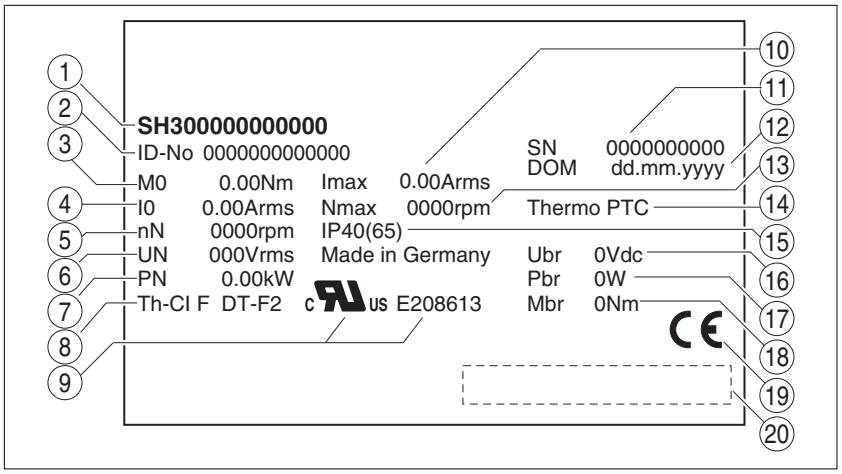


Figure 1: Nameplate

(1) Motor type, see type code
(2) Identification number
(3) Continuous stall torque
(4) Continuous stall current
(5) Nominal speed of rotation
(6) Maximum nominal value of supply voltage
(7) Nominal power
(8) Thermal class
(9) UL marking and assigned UL number
(10) Maximum current
(11) Serial number
(12) Date of manufacture
(13) Maximum speed of rotation
(14) Temperature sensor
(15) Degree of protection
(16) Nominal voltage holding brake
(17) Nominal power (electrical pull-in power) holding brake
(18) Holding torque holding brake
(19) CE marking
(20) Barcode

0198441113987, V2.00, 02.2012

1.4 Type code

SH3	**070**	**1**	**P**	**0**	**0**	**A**	**1**	**0**

Product family: Synchronous motor - low inertia

Size (housing)
055 = 55 mm flange
070 = 70 mm flange
100 = 100 mm flange
140 = 140 mm flange
205 = 205 mm flange

Length
1 = 1 stack
2 = 2 stacks
3 = 3 stacks
4 = 4 stacks

Winding
M = Optimized in terms of high torque [1)]
P = Optimized in terms of torque and speed of rotation

Shaft and degree of protection
0 = Smooth shaft
1 = Parallel key

Encoder system
1 = Absolute singleturn 128 Sin/Cos periods per revolution (SKS36)
2 = Absolute multiturn 128 Sin/Cos periods per revolution (SKM36)

Holding brake
A = Without holding brake
F = With holding brake

Connection version
1 = Straight connector
2 = Angular connector 90°, can be rotated

Degree of protection shaft and housing - type of cooling [2)]
0 = Shaft IP54 [3)] without shaft sealing ring, housing IP65, free convection
1 = Shaft IP65 with shaft sealing ring, housing IP65, free convection
2 = Shaft IP65 with shaft sealing ring, housing IP67, free convection

1) Not available with SH30551.
2) Versions not listed are not considered in this manual.
3) In the case of mounting position IM V3 (drive shaft vertical, shaft end upward), the motor only has degree of protection IP 50.

If you have questions concerning the type code, contact your Schneider Electric sales office.

Designation customized version

In the case of a customized version, position 8 of the type code is an "S". The subsequent number defines the customized version. Example: SH30551S01A00

Contact your machine vendor if you have questions concerning customized versions.

0198441113987, V2.00, 02.2012

2 Before you begin - safety information

2

2.1 Qualification of personnel

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product. In addition, these persons must have received safety training to recognize and avoid hazards involved. These persons must have sufficient technical training, knowledge and experience and be able to foresee and detect potential hazards that may be caused by using the product, by changing the settings and by the mechanical, electrical and electronic equipment of the entire system in which the product is used.

All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

2.2 Intended use

This product is a motor and intended for industrial use according to this manual.

The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements and the technical data.

Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety measures must be implemented.

Since the product is used as a component in an entire system, you must ensure the safety of persons by means of the design of this entire system (for example, machine design).

Operate the product only with the specified cables and accessories. Use only genuine accessories and spare parts.

The product must NEVER be operated in explosive atmospheres (hazardous locations, Ex areas).

Any use other than the use explicitly permitted is prohibited and can result in hazards.

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel.

0198441113987, V2.00, 02.2012

2.3 Hazard categories

Safety instructions to the user are highlighted by safety alert symbols in the manual. In addition, labels with symbols and/or instructions are attached to the product that alert you to potential hazards.

Depending on the seriousness of the hazard, the safety instructions are divided into 4 hazard categories.

⚠ DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

CAUTION

CAUTION used without the safety alert symbol, is used to address practices not related to personal injury (e.g. **can result** in equipment damage).

0198441113987, V2.00, 02.2012

2.4 Basic information

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation and who have received safety training to recognize and avoid hazards involved are authorized to work on and with this drive system. Installation, adjustment, repair and maintenance must be performed by qualified personnel.
- The system integrator is responsible for compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment.
- Supplement the motor cable grounding conductor with an additional protective ground conductor to the motor housing.
- Do not touch unshielded components or terminals with voltage present. Use only electrically insulated tools.
- The motor generates voltage when the shaft is rotated. Prior to performing any type of work on the drive system, block the motor shaft to prevent rotation.
- AC voltage can couple voltage to unused conductors in the motor cable. Insulate both ends of unused conductors in the motor cable.
- Do not short across the DC bus terminals or the DC bus capacitors.
- Before performing work on the drive system:
  - Disconnect all power, including external control power that may be present.
  - Place a "Do Not Turn On" label on all power switches.
  - Lock all power switches in the open position.
  - Wait for the DC bus capacitors to discharge (see the product manual for the power stage). Then measure the DC bus voltage and verify it is less than < 42 V_{dc} (see the product manual for the power stage).
- Install and close all covers before applying voltage.

Failure to follow these instructions will result in death or serious injury.

0198441113987, V2.00, 02.2012

⚠ WARNING

MOVEMENT WITHOUT BRAKING EFFECT

If power outage or errors cause the power stage to be switched off, the motor is no longer decelerated in a controlled way and may cause damage. Overload or errors can cause hazards due to the failure of the holding brake. Incorrect use of the holding brake results in premature wear and failure.

- Secure the hazardous area so it cannot be accessed.
- Verify the function of the holding brake at regular intervals.
- Do not use the holding brake as a service brake.
- If necessary, use a cushioned mechanical stop or a suitable service brake.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop, overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical functions.
- System control paths may include communication links. Consideration must be given to the implication of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines. [1)]
- Each implementation of the product must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death or serious injury.

1) For USA: Additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control” and to NEMA ICS 7.1 (latest edition), “Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems”.

0198441113987, V2.00, 02.2012

2.5 Standards and terminology

Technical terms, terminology and the corresponding descriptions in this manual are intended to use the terms or definitions of the pertinent standards.

In the area of drive systems, this includes, but is not limited to, terms such as "safety function", "safe state", "fault", "fault reset", "failure", "error", "error message", "warning", "warning message", etc.

Among others, these standards include:

- IEC 61800 series: "Adjustable speed electrical power drive systems"
- IEC 61158 series: "Industrial communication networks - Fieldbus specifications"
- IEC 61784 series: "Industrial communication networks - Profiles"
- IEC 61508 series: "Functional safety of electrical/electronic/ programmable electronic safety-related systems"

Also see the glossary at the end of this manual.

0198441113987, V2.00, 02.2012

0198441113987, V2.00, 02.2012

3 Technical Data

3

This chapter contains information on the ambient conditions and on the mechanical and electrical properties of the product family and the accessories.

3.1 General features

Motor type	AC synchronous servo motor	
Degree of protection motor housing	IP65	As per IEC 60034-5
Degree of protection shaft bushing with shaft sealing ring	IP65 1)	As per IEC 60034-5
Degree of protection shaft bushing without shaft sealing ring	IP54 2)	As per IEC 60034-5
Degree of protection in the version with compressed air connection SH3••••••••2	Shaft IP65 Housing IP67	As per IEC 60034-5
Thermal class	F (155 C°)	As per IEC 60034-1
Vibration grade	A	As per IEC 60034-14
Test voltage	> 2400 V_{ac}	As per IEC 60034-1
Perpendicularity	normal class	As per IEC 60072-1, DIN 42955
Housing color	Black RAL 9005	
Overvoltage category	III	As per IEC 61800-5-1
Protection class 3)	I	As per IEC 61140, EN 50178

1) With shaft sealing ring: the maximum speed of rotation is limited to 6000 min^{-1}; shaft sealing ring with initial lubrication, if the seals run dry, this increases friction and reduces the service life
2) In the case of mounting position IM V3 (drive shaft vertical, shaft end upward), the motor only has degree of protection IP 50. The degree of protection only relates to the motor itself, not to mounted components such as, for example, a gearbox.
3) The signals of the holding brake and the temperature sensor at CN1 and the signals at CN2 meet the PELV requirements.

Climatic environmental conditions transportation and storage

The environment during transportation and storage must be dry and free from dust.

The storage time is primarily limited by the service life of the lubricants in the bearings; do not store the product for more than 36 months. It is recommended to periodically operate the motor. Long storage periods may reduce the holding torque of the holding brake. See "Checking/running in the holding brake" in chapter "8 Service, maintenance and disposal".

Temperature	[°C]	-40 ... 70
Relative humidity (non-condensing)	[%]	≤75
Set of class combinations as per IEC 60721-3-2		IE 21

0198441113987, V2.00, 02.2012

Climatic environmental conditions operation

Ambient temperature [1] (no icing, non-condensing)	[°C]	-20 ... 40
Ambient temperature with current reduction of 1% per °C [1]	[°C]	40 ... 60
Relative humidity (non-condensing)	[%]	5 ... 85
Class as per IEC 60721-3-3		3K3, 3Z12 and 3Z2
Installation altitude [2]	[m]	≤1000
Installation altitude with current reduction of 1% per 100 m at altitudes of more than 1000 m [2]	[m]	1000 ... 3000

1) Limit values with flanged motor (steel plate, height and width = 2.5 * motor flange, 10 mm thickness, centered hole.).
2) The installation altitude is defined as altitude above mean sea level.

Vibration and shock SH3055 ... 140

Vibration, sinusoidal	Type test with 10 runs as per IEC 60068-2-6 0.15 mm (von 10 Hz ... 60 Hz) 20 m/s² (from 60 Hz ... 500 Hz)
Shock, semi-sinusoidal	Type test with 3 shocks in each direction as per IEC 60068-2-27 150 m/s² (11 ms)

Vibration and shock SH3205

Vibration, sinusoidal	Type test with 10 runs as per IEC 60068-2-6 0.35 mm (von 10 Hz ... 60 Hz) 50 m/s² (from 60 Hz ... 150 Hz)
Continuous shock	Type test with 3 shocks in each direction as per IEC 60068-2-29 200 m/s² (6 ms)

Service life

The service life of the motors when operated correctly is limited primarily by the service life of the rolling bearing.

The following operating conditions significantly reduce the service life:

- Installation altitude >1000 m above m.s.l.
- Rotary movements exclusively within a fixed angle of <100°
- Operation under vibration load >20 m/s²
- Allowing sealing rings to run dry
- Contact of the seals with aggressive media

Shaft sealing ring / degree of protection

The motors can be equipped with an optional shaft sealing ring. With a shaft sealing ring, they have degree of protection IP65. The shaft sealing ring limits the maximum speed of rotation to 6000 min^{-1}.

Note the following:

- The shaft sealing ring is factory-pre-lubricated.
- If the seals run dry, this increases friction and greatly reduces the service life of the sealing rings.

Compressed air connection

Compressed air must also be available when the system is switched off, for example to maintain the required degree of protection during cleaning work. When the compressed air is switched off, the degree of

0198441113987, V2.00, 02.2012

protection is lost. The degree of protection only relates to the motor itself, not to mounted components such as, for example, a gearbox.

Special compressed air must be used:

Nominal pressure	[bar] [PSI]	0.1 ... 0.3 (1.45 ... 4.35)
Maximum air pressure	[bar] [PSI]	0.4 (5.8)
Permissible humidity	[%]	20 ... 30
Other properties of the compressed air		Free from dust, free from oil

Tightening torque and property class of screws used

Tightening torque of housing screws M3	[Nm] (lb•in)	1 (8.85)
Tightening torque of housing screws M4	[Nm] (lb•in)	1.5 (13.28)
Tightening torque of housing screws M5	[Nm] (lb•in)	5 (44.3)
Tightening torque protective ground conductor M4 (SH3055 ... 140) Tightening torque protective ground conductor M6 (SH3205)	[Nm] (lb•in)	2.9 (25.7) 9.9 (87.3)
Property class of the screws	H	8.8

Table 1: Tightening torques and property classes

Approved drives

You may use drives that are approved for the SH3 motor family (such as LXM52 and LXM62). When selecting, consider the type and amount of the mains voltage. Inquire for additional drives that can be used to operate SH3 motors.

0198441113987, V2.00, 02.2012

3.2 Motor-specific data

3.2.1 SH3055

Motor type			SH30551		SH30552		SH30553	
Winding			**-**	**P**	**M**	**P**	**M**	**P**
Technical data - general								
Continuous stall torque [1]	M_0 [2]	[Nm]	0.5		0.8		1.2	
Peak torque	M_{max}	[Nm]	1.5		2.5		3.5	
Number of pole pairs			3					
With supply voltage U_n = 115 V_{ac})								
Nominal speed of rotation	n_N	[min^{-1}]	-	2000	1000	2000	1000	2000
Nominal torque	M_N	[Nm]	-	0.50	0.77	0.77	1.14	1.13
Nominal current	I_N	[A_{rms}]	-	0.70	0.60	1.18	0.84	1.60
Nominal power	P_N	[kW]	-	0.10	0.08	0.16	0.12	0.24
With supply voltage U_n = 230 V_{ac})								
Nominal speed of rotation	n_N	[min^{-1}]	-	8000	2000	4000	2000	4000
Nominal torque	M_N	[Nm]	-	0.50	0.77	0.75	1.13	1.10
Nominal current	I_N	[A_{rms}]	-	0.68	0.60	1.15	0.79	1.52
Nominal power	P_N	[kW]	-	0.21	0.16	0.31	0.24	0.46
With supply voltage U_n = 400 V_{ac})								
Nominal speed of rotation	n_N	[min^{-1}]	-	8000	4000	8000	4000	8000
Nominal torque	M_N	[Nm]	-	0.48	0.75	0.72	1.10	1.05
Nominal current	I_N	[A_{rms}]	-	0.62	0.60	1.10	0.70	1.35
Nominal power	P_N	[kW]	-	0.40	0.31	0.60	0.46	0.88
With supply voltage U_n = 480 V_{ac})								
Nominal speed of rotation	n_N	[min^{-1}]	-	9000	4800	9000	4800	9000
Nominal torque	M_N	[Nm]	-	0.47	0.75	0.71	1.1	1.03
Nominal current	I_N	[A_{rms}]	-	0.60	0.60	1.09	0.67	1.31
Nominal power	P_N	[kW]	-	0.44	0.38	0.67	0.55	0.97

1) Conditions for performance data: Mounted to steel plate 175 mm * 175 mm * 10 mm
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 min^{-1} the continuous stall torque is reduced to 87%

0198441113987, V2.00, 02.2012

Motor type			SH30551		SH30552		SH30553	
Winding			**-**	**P**	**M**	**P**	**M**	**P**
Technical data - electrical								
Maximum winding voltage	U_{max}	[V_{ac}]	-	480	480	480	480	480
Maximum winding voltage	U_{max}	[V_{dc}]	-	680	680	680	680	680
Maximum voltage to ground		[V_{ac}]	-	280	280	280	280	280
Maximum current	I_{max}	[A_{rms}]	-	2.90	2.60	4.80	3.40	6.50
Continuous stall current	I_0	[A_{rms}]	-	0.73	0.60	1.20	0.90	1.70
Voltage constant [1]	k_Eu-v	[V_{rms}]	-	40.00	74.00	40.00	79.00	41.00
Torque constant	k_t	[Nm/A]	-	0.68	1.33	0.70	1.33	0.70
Winding resistance	R_{20}u-v	[Ω]	-	41.80	55.50	17.40	38.40	10.40
Winding inductance	L_qu-v	[mH]	-	74.3	125.80	36.40	96.10	26.00
Winding inductance	L_du-v	[mH]	-	68.84	118.50	34.28	88.50	23.96
Technical data - mechanical								
Maximum permissible speed of rotation	n_{max}	[min^{-1}]	9000					
Rotor inertia without brake	J_M	[$kgcm^2$]	0.059		0.096		0.134	
Rotor inertia with brake	J_M	[$kgcm^2$]	0.080		0.117		0.155	
Mass without brake	m	[kg]	1.20		1.50		1.80	
Mass of brake	m	[kg]	0.1		0.1		0.1	
Technical data - thermal								
Thermal time constant	t_{th}	[min]	21		26		33	
Response threshold temperature sensor (PTC)	T_{TK}	[°C]	130					

1) RMS value at 1000 min^{-1} and 20°C

0198441113987, V2.00, 02.2012

3.2.2 SH3070

Motor type			SH30701		SH30702		SH30703	
Winding			**M**	**P**	**M**	**P**	**M**	**P**
Technical data - general								
Continuous stall torque [1]	M_0 [2]	[Nm]	1.4		2.2		3.1	
Peak torque	M_{max}	[Nm]	3.5		7.6		11.3	
Number of pole pairs			3					
With supply voltage U_n = 115 V_{ac})								
Nominal speed of rotation	n_N	[min^{-1}]	750	1500	750	1500	750	1500
Nominal torque	M_N	[Nm]	1.40	1.40	2.20	2.15	3.05	2.95
Nominal current	I_N	[A_{rms}]	0.98	1.76	1.50	2.90	2.10	3.90
Nominal power	P_N	[kW]	0.11	0.22	0.17	0.34	0.24	0.46
With supply voltage U_n = 230 V_{ac})								
Nominal speed of rotation	n_N	[min^{-1}]	1500	3000	1500	3000	1500	3000
Nominal torque	M_N	[Nm]	1.40	1.40	2.15	2.10	2.95	2.80
Nominal current	I_N	[A_{rms}]	0.95	1.72	1.50	2.80	2.00	3.70
Nominal power	P_N	[kW]	0.22	0.44	0.34	0.66	0.46	0.88
With supply voltage U_n = 400 V_{ac})								
Nominal speed of rotation	n_N	[min^{-1}]	3000	6000	3000	6000	3000	6000
Nominal torque	M_N	[Nm]	1.40	1.30	2.10	1.90	2.80	2.30
Nominal current	I_N	[A_{rms}]	0.90	1.60	1.50	2.60	1.90	3.00
Nominal power	P_N	[kW]	0.44	0.82	0.66	1.19	0.88	1.45
With supply voltage U_n = 480 V_{ac})								
Nominal speed of rotation	n_N	[min^{-1}]	3600	7200	3600	7200	3600	7200
Nominal torque	M_N	[Nm]	1.35	1.26	2.07	1.80	2.72	2.05
Nominal current	I_N	[A_{rms}]	0.88	1.54	1.50	2.50	1.85	2.65
Nominal power	P_N	[kW]	0.50	0.95	0.78	1.36	1.03	1.55

1) Conditions for performance data: Mounted to steel plate, (2.5 * flange dimensions)^2 area, 10 mm thickness, centered hole.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 min^{-1} the continuous stall torque is reduced to 87%

0198441113987, V2.00, 02.2012

Motor type			SH30701		SH30702		SH30703	
Winding			**M**	**P**	**M**	**P**	**M**	**P**
Technical data - electrical								
Maximum winding voltage	U_{max}	[V_{ac}]	480	480	480	480	480	480
Maximum winding voltage	U_{max}	[V_{dc}]	680	680	680	680	680	680
Maximum voltage to ground		[V_{ac}]	280	280	280	280	280	280
Maximum current	I_{max}	[A_{rms}]	3.10	5.70	6.00	11.80	8.70	17.00
Continuous stall current	I_0	[A_{rms}]	1.00	1.80	1.50	2.90	2.10	4.10
Voltage constant [1)]	k_Eu-v	[V_{rms}]	85.00	46.00	95.90	48.00	95.00	49.00
Torque constant	k_t	[Nm/A]	1.40	0.80	1.47	0.77	1.48	0.78
Winding resistance	R_{20}u-v	[Ω]	35.40	10.40	16.40	4.20	10.70	2.70
Winding inductance	L_qu-v	[mH]	144.80	42.60	83.10	21.30	55.30	14.60
Winding inductance	L_du-v	[mH]	120.00	35.30	65.20	16.70	43.10	11.40
Technical data - mechanical								
Maximum permissible speed of rotation	n_{max}	[min^{-1}]	8000					
Rotor inertia without brake	J_M	[$kgcm^2$]	0.25		0.41		0.58	
Rotor inertia with brake	J_M	[$kgcm^2$]	0.322		0.482		0.807	
Mass without brake	m	[kg]	2.10		2.80		3.60	
Mass of brake	m	[kg]	0.2		0.2		0.2	
Technical data - thermal								
Thermal time constant	t_{th}	[min]	35		38		51	
Response threshold temperature sensor (PTC)	T_{TK}	[°C]	130					

1) RMS value at 1000 min^{-1} and 20 °C

0198441113987, V2.00, 02.2012

3.2.3 SH3100

Motor type			SH31001		SH31002	
Winding			**M**	**P**	**M**	**P**
Technical data - general						
Continuous stall torque [1]	M_0 [2]	[Nm]	3.3		5.8	
Peak torque	M_{max}	[Nm]	9.6		18.3	
Number of pole pairs			4			
With supply voltage U_n = 115 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	625	1250	500	1000
Nominal torque	M_N	[Nm]	3.20	3.15	5.70	5.50
Nominal current	I_N	[A_{rms}]	1.75	3.50	2.45	4.55
Nominal power	P_N	[kW]	0.21	0.41	0.30	0.58
With supply voltage U_n = 230 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	1250	2500	1000	2000
Nominal torque	M_N	[Nm]	3.15	3.00	5.50	5.20
Nominal current	I_N	[A_{rms}]	1.70	3.20	2.40	4.30
Nominal power	P_N	[kW]	0.41	0.79	0.58	1.09
With supply voltage U_n = 400 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	2500	5000	2000	4000
Nominal torque	M_N	[Nm]	3.00	2.70	5.20	4.60
Nominal current	I_N	[A_{rms}]	1.60	2.80	2.30	3.80
Nominal power	P_N	[kW]	0.79	1.41	1.09	1.93
With supply voltage U_n = 480 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	3000	6000	2400	4800
Nominal torque	M_N	[Nm]	2.95	2.60	5.10	4.40
Nominal current	I_N	[A_{rms}]	1.60	2.60	2.25	3.60
Nominal power	P_N	[kW]	0.93	1.63	1.28	2.21

1) Conditions for performance data: Mounted to steel plate, (2.5 * flange dimensions)^2 area, 10 mm thickness, centered hole.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 min^{-1} the continuous stall torque is reduced to 87%

0198441113987, V2.00, 02.2012

Motor type			**SH31001**		**SH31002**	
Winding			**M**	**P**	**M**	**P**
Technical data - electrical						
Maximum winding voltage	U_{max}	[V_{ac}]	480	480	480	480
Maximum winding voltage	U_{max}	[V_{dc}]	680	680	680	680
Maximum voltage to ground		[V_{ac}]	280	280	280	280
Maximum current	I_{max}	[A_{rms}]	6.30	12.00	9.00	17.10
Continuous stall current	I_0	[A_{rms}]	1.80	3.50	2.50	4.80
Voltage constant 1)	k_Eu-v	[V_{rms}]	115.00	60.00	146.00	77.00
Torque constant	k_t	[Nm/A]	1.83	0.89	2.32	1.21
Winding resistance	R_{20}u-v	[Ω]	13.90	3.80	8.60	2.40
Winding inductance	L_qu-v	[mH]	69.40	19.00	48.60	13.50
Winding inductance	L_du-v	[mH]	59.50	16.30	43.20	12.00
Technical data - mechanical						
Maximum permissible speed of rotation	n_{max}	[min^{-1}]	6000			
Rotor inertia without brake	J_M	[$kgcm^2$]	1.40		2.31	
Rotor inertia with brake	J_M	[$kgcm^2$]	2.018		2.928	
Mass without brake	m	[kg]	4.30		5.80	
Mass of brake	m	[kg]	0.5		0.5	
Technical data - thermal						
Thermal time constant	t_{th}	[min]	44		48	
Response threshold temperature sensor (PTC)	T_{TK}	[°C]	130			

1) RMS value at 1000 min^{-1} and 20 °C

0198441113987, V2.00, 02.2012

Motor type			SH31003		SH31004	
Winding			**M**	**P**	**M**	**P**
Technical data - general						
Continuous stall torque 1)	M_0 2)	[Nm]	8		10	
Peak torque	M_{max}	[Nm]	28.3		40.5	
Number of pole pairs			4			
With supply voltage U_n = 115 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	500	1000	375	750
Nominal torque	M_N	[Nm]	7.80	7.50	10.00	9.90
Nominal current	I_N	[A_{rms}]	3.34	6.30	3.20	6.25
Nominal power	P_N	[kW]	0.41	0.79	0.39	0.78
With supply voltage U_n = 230 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	1000	2000	750	1500
Nominal torque	M_N	[Nm]	7.50	7.00	9.90	9.50
Nominal current	I_N	[A_{rms}]	3.27	5.90	3.20	6.10
Nominal power	P_N	[kW]	0.79	1.47	0.78	1.49
With supply voltage U_n = 400 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	2000	4000	1500	3000
Nominal torque	M_N	[Nm]	7.00	5.70	9.50	7.90
Nominal current	I_N	[A_{rms}]	3.10	4.90	3.20	5.30
Nominal power	P_N	[kW]	1.47	2.39	1.49	2.48
With supply voltage U_n = 480 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	2400	4800	1800	3600
Nominal torque	M_N	[Nm]	6.76	5.10	9.30	6.90
Nominal current	I_N	[A_{rms}]	3.00	4.40	3.15	4.80
Nominal power	P_N	[kW]	1.70	2.56	1.75	2.60

1) Conditions for performance data: Mounted to steel plate, (2.5 * flange dimensions)^2 area, 10 mm thickness, centered hole.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 min^{-1} the continuous stall torque is reduced to 87%

0198441113987, V2.00, 02.2012

Motor type			SH31003		SH31004	
Winding			**M**	**P**	**M**	**P**
Technical data - electrical						
Maximum winding voltage	U_{max}	[V_{ac}]	480	480	480	480
Maximum winding voltage	U_{max}	[V_{dc}]	680	680	680	680
Maximum voltage to ground		[V_{ac}]	280	280	280	280
Maximum current	I_{max}	[A_{rms}]	14.70	28.30	16.80	32.30
Continuous stall current	I_0	[A_{rms}]	3.40	6.60	3.20	6.20
Voltage constant [1)]	k_Eu-v	[V_{rms}]	148.00	77.00	198.00	103.00
Torque constant	k_t	[Nm/A]	2.35	1.22	3.13	1.62
Winding resistance	R_{20}u-v	[Ω]	5.30	1.43	6.70	1.81
Winding inductance	L_qu-v	[mH]	34.80	9.40	48.10	13.00
Winding inductance	L_du-v	[mH]	30.00	8.10	39.60	10.70
Technical data - mechanical						
Maximum permissible speed of rotation	n_{max}	[min^{-1}]	6000			
Rotor inertia without brake	J_M	[$kgcm^2$]	3.22		4.22	
Rotor inertia with brake	J_M	[$kgcm^2$]	3.838		5.245	
Mass without brake	m	[kg]	7.50		9.20	
Mass of brake	m	[kg]	0.5		0.7	
Technical data - thermal						
Thermal time constant	t_{th}	[min]	56		58	
Response threshold temperature sensor (PTC)	T_{TK}	[°C]	130			

1) RMS value at 1000 min^{-1} and 20 °C

0198441113987, V2.00, 02.2012

3.2.4 SH3140

Motor type			SH31401		SH31402	
Winding			**M**	**P**	**M**	**P**
Technical data - general						
Continuous stall torque [1]	M_0 [2]	[Nm]	11.1		19.5	
Peak torque	M_{max}	[Nm]	27		60.1	
Number of pole pairs			5			
With supply voltage U_n = 115 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	375	750	375	750
Nominal torque	M_N	[Nm]	11.00	10.95	19.10	18.60
Nominal current	I_N	[A_{rms}]	4.00	7.80	6.70	12.80
Nominal power	P_N	[kW]	0.43	0.86	0.75	1.46
With supply voltage U_n = 230 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	750	1500	750	1500
Nominal torque	M_N	[Nm]	10.95	10.60	18.60	17.10
Nominal current	I_N	[A_{rms}]	4.00	7.60	6.60	12.00
Nominal power	P_N	[kW]	0.86	1.67	1.46	2.69
With supply voltage U_n = 400 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	1500	3000	1500	3000
Nominal torque	M_N	[Nm]	10.60	9.20	17.10	12.30
Nominal current	I_N	[A_{rms}]	4.00	6.80	6.30	8.90
Nominal power	P_N	[kW]	1.67	2.89	2.69	3.86
With supply voltage U_n = 480 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	1800	3600	1800	3600
Nominal torque	M_N	[Nm]	10.40	8.40	16.30	9.70
Nominal current	I_N	[A_{rms}]	4.00	6.30	6.10	7.10
Nominal power	P_N	[kW]	1.96	3.17	3.07	3.66

1) Conditions for performance data: Mounted to steel plate, (2.5 * flange dimensions)^2 area, 10 mm thickness, centered hole.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 min^{-1} the continuous stall torque is reduced to 87%

0198441113987, V2.00, 02.2012

Motor type			SH31401		SH31402	
Winding			**M**	**P**	**M**	**P**
Technical data - electrical						
Maximum winding voltage	U_{max}	[V_{ac}]	480	480	480	480
Maximum winding voltage	U_{max}	[V_{dc}]	680	680	680	680
Maximum voltage to ground		[V_{ac}]	280	280	280	280
Maximum current	I_{max}	[A_{rms}]	10.80	20.80	22.40	44.10
Continuous stall current	I_0	[A_{rms}]	4.00	7.80	6.70	13.20
Voltage constant 1)	k_Eu-v	[V_{rms}]	193.00	100.00	199.00	101.00
Torque constant	k_t	[Nm/A]	2.78	1.43	2.91	1.47
Winding resistance	R_{20}u-v	[Ω]	5.30	1.41	2.32	0.60
Winding inductance	L_qu-v	[mH]	60.90	16.30	29.80	7.70
Winding inductance	L_du-v	[mH]	55.30	14.84	27.20	7.05
Technical data - mechanical						
Maximum permissible speed of rotation	n_{max}	[min^{-1}]	4000			
Rotor inertia without brake	J_M	[$kgcm^2$]	7.41		12.68	
Rotor inertia with brake	J_M	[$kgcm^2$]	9.21		14.48	
Mass without brake	m	[kg]	11.90		16.60	
Mass of brake	m	[kg]	1.1		1.1	
Technical data - thermal						
Thermal time constant	t_{th}	[min]	64		74	
Response threshold temperature sensor (PTC)	T_{TK}	[°C]	130			

1) RMS value at 1000 min^{-1} and 20 °C

0198441113987, V2.00, 02.2012

Motor type			SH31403		SH31404	
Winding			**M**	**P**	**M**	**P**
Technical data - general						
Continuous stall torque [1]	M_0 [2]	[Nm]	27.8		33.4	
Peak torque	M_{max}	[Nm]	90.2		131.9	
Number of pole pairs			5			
With supply voltage U_n = 115 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	375	750	375	750
Nominal torque	M_N	[Nm]	26.30	24.70	31.90	30.20
Nominal current	I_N	[A_{rms}]	8.70	15.90	10.40	19.60
Nominal power	P_N	[kW]	1.03	1.94	1.25	2.37
With supply voltage U_n = 230 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	750	1500	750	1500
Nominal torque	M_N	[Nm]	24.70	21.20	30.20	26.30
Nominal current	I_N	[A_{rms}]	8.30	13.90	10.00	17.40
Nominal power	P_N	[kW]	1.94	3.33	2.37	4.13
With supply voltage U_n = 400 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	1500	3000	1500	3000
Nominal torque	M_N	[Nm]	21.20	12.90	26.30	16.10
Nominal current	I_N	[A_{rms}]	7.30	8.70	9.00	11.00
Nominal power	P_N	[kW]	3.33	4.05	4.13	5.06
With supply voltage U_n = 480 V_{ac})						
Nominal speed of rotation	n_N	[min^{-1}]	1800	3600	1800	3600
Nominal torque	M_N	[Nm]	19.70	9.10	24.50	11.10
Nominal current	I_N	[A_{rms}]	6.90	6.20	8.50	7.70
Nominal power	P_N	[kW]	3.71	3.43	4.62	4.19

1) Conditions for performance data: Mounted to steel plate, (2.5 * flange dimensions)^2 area, 10 mm thickness, centered hole.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 min^{-1} the continuous stall torque is reduced to 87%

0198441113987, V2.00, 02.2012

Motor type			SH31403		SH31404	
Winding			**M**	**P**	**M**	**P**
Technical data - electrical						
Maximum winding voltage	U_{max}	[V_{ac}]	480	480	480	480
Maximum winding voltage	U_{max}	[V_{dc}]	680	680	680	680
Maximum voltage to ground		[V_{ac}]	280	280	280	280
Maximum current	I_{max}	[A_{rms}]	31.30	61.00	47.80	95.60
Continuous stall current	I_0	[A_{rms}]	9.00	17.60	10.70	21.30
Voltage constant 1)	k_Eu-v	[V_{rms}]	205.00	105.00	208.00	104.00
Torque constant	k_t	[Nm/A]	3.09	1.58	3.12	1.57
Winding resistance	R_{20}u-v	[Ω]	1.52	0.40	1.12	0.28
Winding inductance	L_qu-v	[mH]	20.20	5.30	16.30	4.10
Winding inductance	L_du-v	[mH]	18.40	4.84	14.80	3.69
Technical data - mechanical						
Maximum permissible speed of rotation	n_{max}	[min^{-1}]	4000			
Rotor inertia without brake	J_M	[$kgcm^2$]	17.94		23.70	
Rotor inertia with brake	J_M	[$kgcm^2$]	23.44		29.20	
Mass without brake	m	[kg]	21.30		26.00	
Mass of brake	m	[kg]	1.8		1.8	
Technical data - thermal						
Thermal time constant	t_{th}	[min]	79		83	
Response threshold temperature sensor (PTC)	T_{TK}	[°C]	130			

1) RMS value at 1000 min^{-1} and 20 °C

0198441113987, V2.00, 02.2012

3.2.5 SH3205

Motor type			SH32051		SH32052		SH32053	
Winding			**M**	**P**	**M**	**P**	**M**	**P**
Technical data - general								
Continuous stall torque [1]	M_0 [2]	[Nm]	36.90		64.90		94.40	
Peak torque	M_{max}	[Nm]	110		220		330	
Number of pole pairs			5					
With supply voltage U_n = 115 V_{ac})								
Nominal speed of rotation	n_N	[min^{-1}]	375	750	250	500	250	500
Nominal torque	M_N	[Nm]	34.40	31.90	63.50	61.60	89.90	84.90
Nominal current	I_N	[A_{rms}]	10.50	18.80	13.00	25.40	16.30	30.80
Nominal power	P_N	[kW]	1.35	2.51	1.66	3.23	2.35	4.45
With supply voltage U_n = 230 V_{ac})								
Nominal speed of rotation	n_N	[min^{-1}]	750	1500	500	1000	500	1000
Nominal torque	M_N	[Nm]	31.90	27.00	61.60	56.00	84.90	74.40
Nominal current	I_N	[A_{rms}]	10.10	16.50	12.60	24.00	16.00	27.90
Nominal power	P_N	[kW]	2.51	4.24	3.23	5.86	4.45	7.79
With supply voltage U_n = 400 V_{ac})								
Nominal speed of rotation	n_N	[min^{-1}]	1500	3000	1000	2000	1000	2000
Nominal torque	M_N	[Nm]	27.00	17.50	56.00	38.10	74.40	50.70
Nominal current	I_N	[A_{rms}]	9.20	11.50	11.50	17.80	15.00	20.40
Nominal power	P_N	[kW]	4.24	5.50	5.86	7.98	7.79	10.62
With supply voltage U_n = 480 V_{ac})								
Nominal speed of rotation	n_N	[min^{-1}]	1800	3600	1200	2400	1200	2400
Nominal torque	M_N	[Nm]	25.10	13.80	53.10	28.40	70.00	40.20
Nominal current	I_N	[A_{rms}]	8.80	9.40	10.90	13.80	14.50	16.70
Nominal power	P_N	[kW]	4.73	5.20	6.67	7.14	8.80	10.10

1) Conditions for performance data: Mounted to steel plate, (2.5 * flange dimensions)^2 area, 10 mm thickness, centered hole.
2) M_0=Continuous stall torque at low speed of rotation and 100% duty cycle; at speeds of rotation of < 20 min^{-1} the continuous stall torque is reduced to 87%

0198441113987, V2.00, 02.2012

Motor type			SH32051		SH32052		SH32053	
Winding			**M**	**P**	**M**	**P**	**M**	**P**
Technical data - electrical								
Maximum winding voltage	U_{max}	[V_{ac}]	480	480	480	480	480	480
Maximum winding voltage	U_{max}	[V_{dc}]	680	680	680	680	680	680
Maximum voltage to ground		[V_{ac}]	280	280	280	280	280	280
Maximum current	I_{max}	[A_{rms}]	45.20	87.20	49.60	96.80	68.00	136.10
Continuous stall current	I_0	[A_{rms}]	10.90	21.00	13.20	25.70	16.60	33.20
Voltage constant [1)]	k_Eu-v	[V_{rms}]	200.00	104.00	314.00	161.00	344.00	172.00
Torque constant	k_t	[Nm/A]	3.10	1.60	5.04	2.58	5.50	2.76
Winding resistance	R_{20}u-v	[Ω]	1.10	0.30	1.10	0.30	0.80	0.20
Winding inductance	L_qu-v	[mH]	21.90	5.90	21.20	5.60	17.10	4.30
Winding inductance	L_du-v	[mH]	20.80	5.60	20.00	5.20	16.10	4.00
Technical data - mechanical								
Maximum permissible speed of rotation	n_{max}	[min^{-1}]	3800					
Rotor inertia without brake	J_M	[$kgcm^2$]	71.40		129		190	
Rotor inertia with brake	J_M	[$kgcm^2$]	87.40		145		206	
Mass without brake	m	[kg]	35.00		50.00		67.00	
Mass of brake	m	[kg]	3.6		3.6		3.6	
Technical data - thermal								
Thermal time constant	t_{th}	[min]	73		88		101	
Response threshold temperature sensor (PTC)	T_{TK}	[°C]	130					

1) RMS value at 1000 min^{-1} and 20 °C

0198441113987, V2.00, 02.2012

3.3 Dimensions

Dimensions SH3055

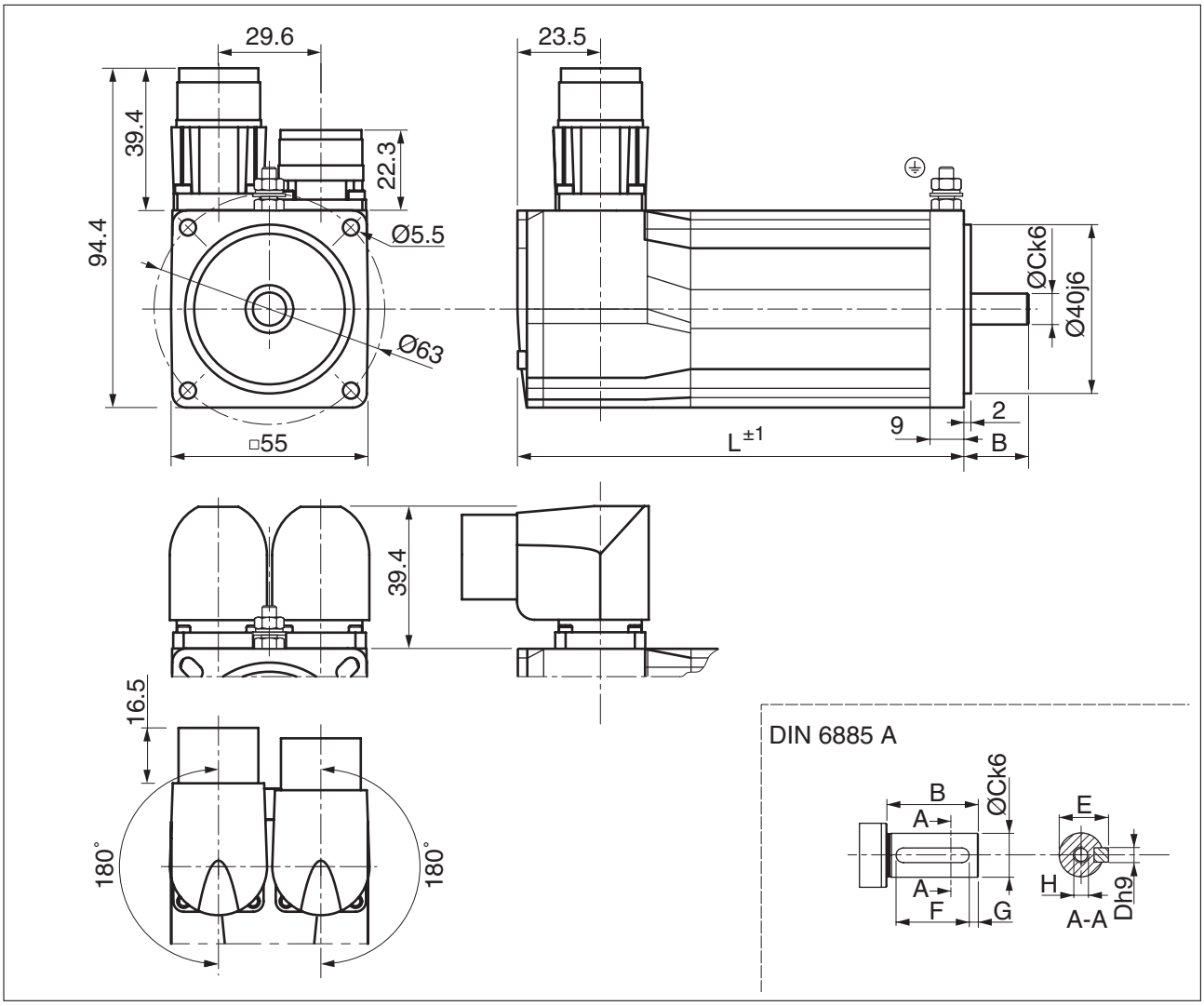


Figure 2: Dimensions SH3055

			SH30551	SH30552	SH30553
L	Length without brake	[mm]	132.5	154.4	176.5
L	Length with brake	[mm]	159	181	203
B	Shaft length	[mm]	20	20	20
C	Shaft diameter	[mm]	9	9	9
D	Width of parallel key	[mm]	3	3	3
E	Shaft width with parallel key	[mm]	10.2	10.2	10.2
F	Length of parallel key	[mm]	12	12	12
G	Distance parallel key to shaft end	[mm]	4	4	4
H	Female thread of shaft		DIN 332-D M3	DIN 332-D M3	DIN 332-D M3
	Parallel key		DIN 6885-A3x3x12	DIN 6885-A3x3x12	DIN 6885-A3x3x12

0198441113987, V2.00, 02.2012

Dimensions SH3070

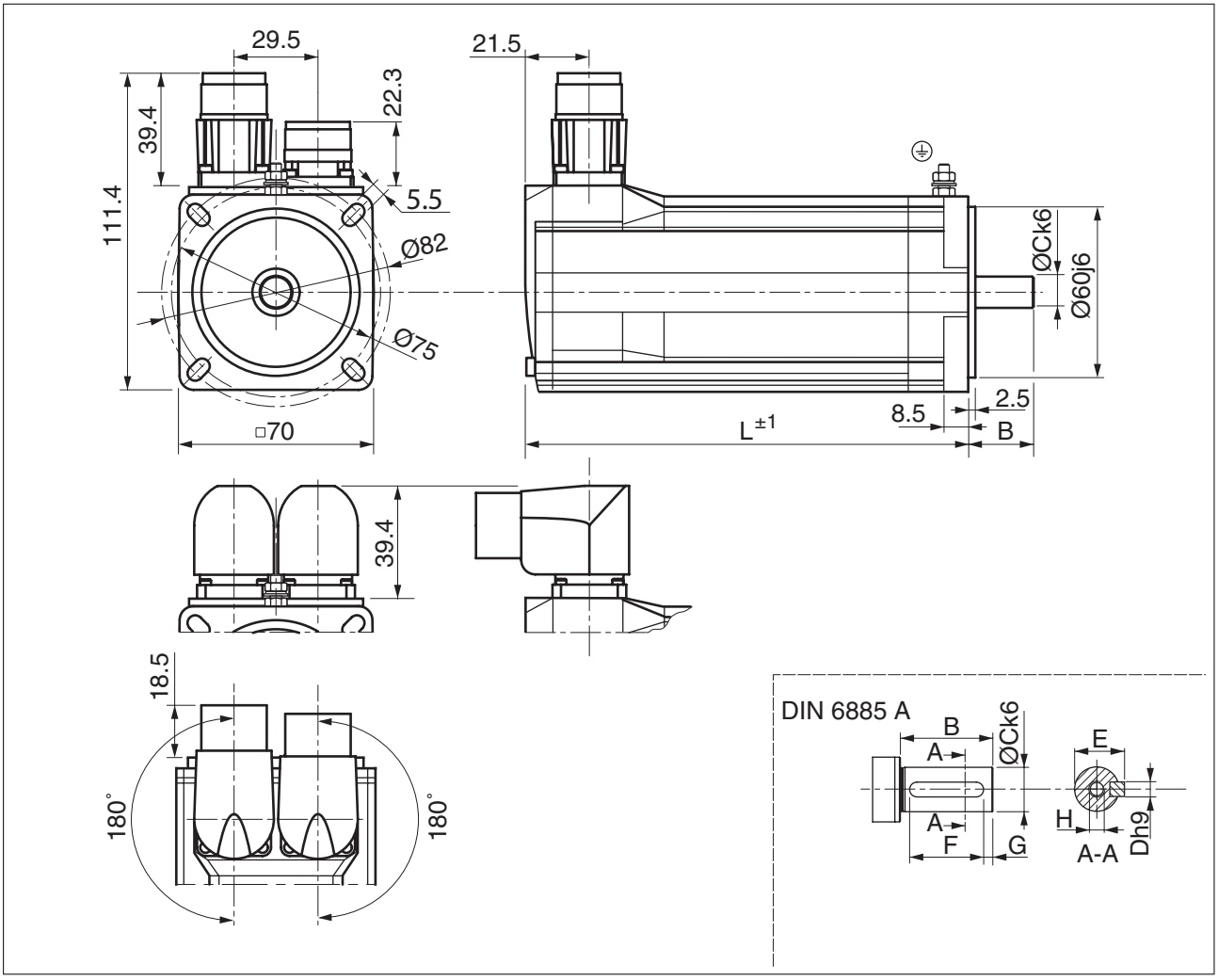


Figure 3: Dimensions SH3070

			SH30701	SH30702	SH30703
L	Length without brake	[mm]	154	187	220
L	Length with brake	[mm]	179.5	212.5	254
B	Shaft length	[mm]	23	23	30
C	Shaft diameter	[mm]	11	11	14
D	Width of parallel key	[mm]	4	4	5
E	Shaft width with parallel key	[mm]	12.5	12.5	12.5
F	Length of parallel key	[mm]	18	18	20
G	Distance parallel key to shaft end	[mm]	2.5	2.5	5
H	Female thread of shaft		DIN 332-D M4	DIN 332-D M4	DIN 332-D M5
	Parallel key		DIN 6885-A4x4x18	DIN 6885-A4x4x18	DIN 6885-A4x4x20

0198441113987, V2.00, 02.2012

Dimensions SH3100

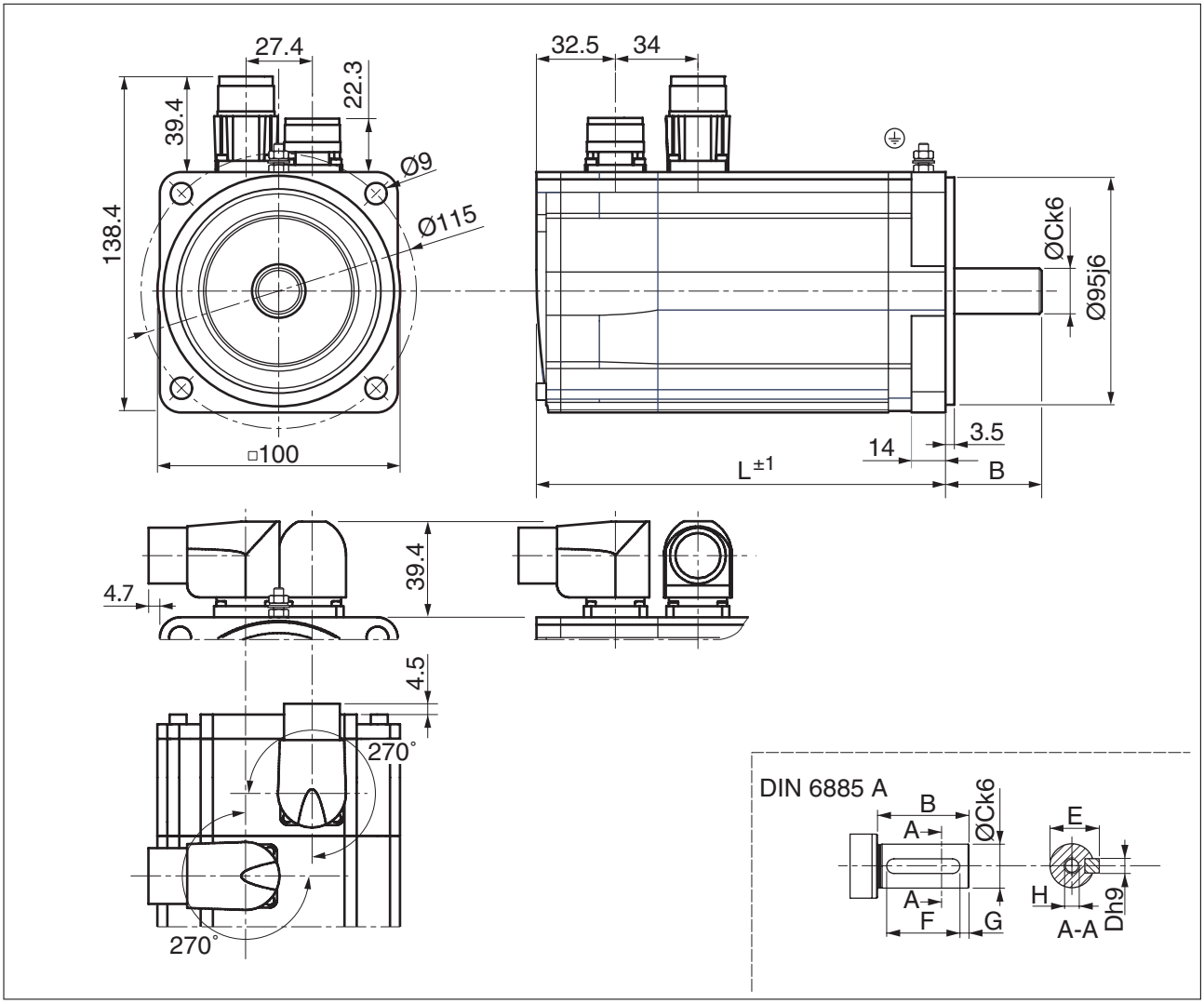


Figure 4: Dimensions SH3100

			SH31001	SH31002	SH31003	SH31004
L	Length without brake	[mm]	168.5	204.5	240.5	276.5
L	Length with brake	[mm]	199.5	235.5	271.5	307.5
B	Shaft length	[mm]	40	40	40	50
C	Shaft diameter	[mm]	19	19	19	24
D	Width of parallel key	[mm]	6	6	6	8
E	Shaft width with parallel key	[mm]	21.5	21.5	21.5	28
F	Length of parallel key	[mm]	30	30	30	40
G	Distance parallel key to shaft end	[mm]	5	5	5	5
H	Female thread of shaft		DIN 332-D M6	DIN 332-D M6	DIN 332-D M6	DIN 332-D M8
	Parallel key		DIN 6885-A6x6x30	DIN 6885-A6x6x30	DIN 6885-A6x6x30	DIN 6885-A8x7x40

0198441113987, V2.00, 02.2012

Dimensions SH3140

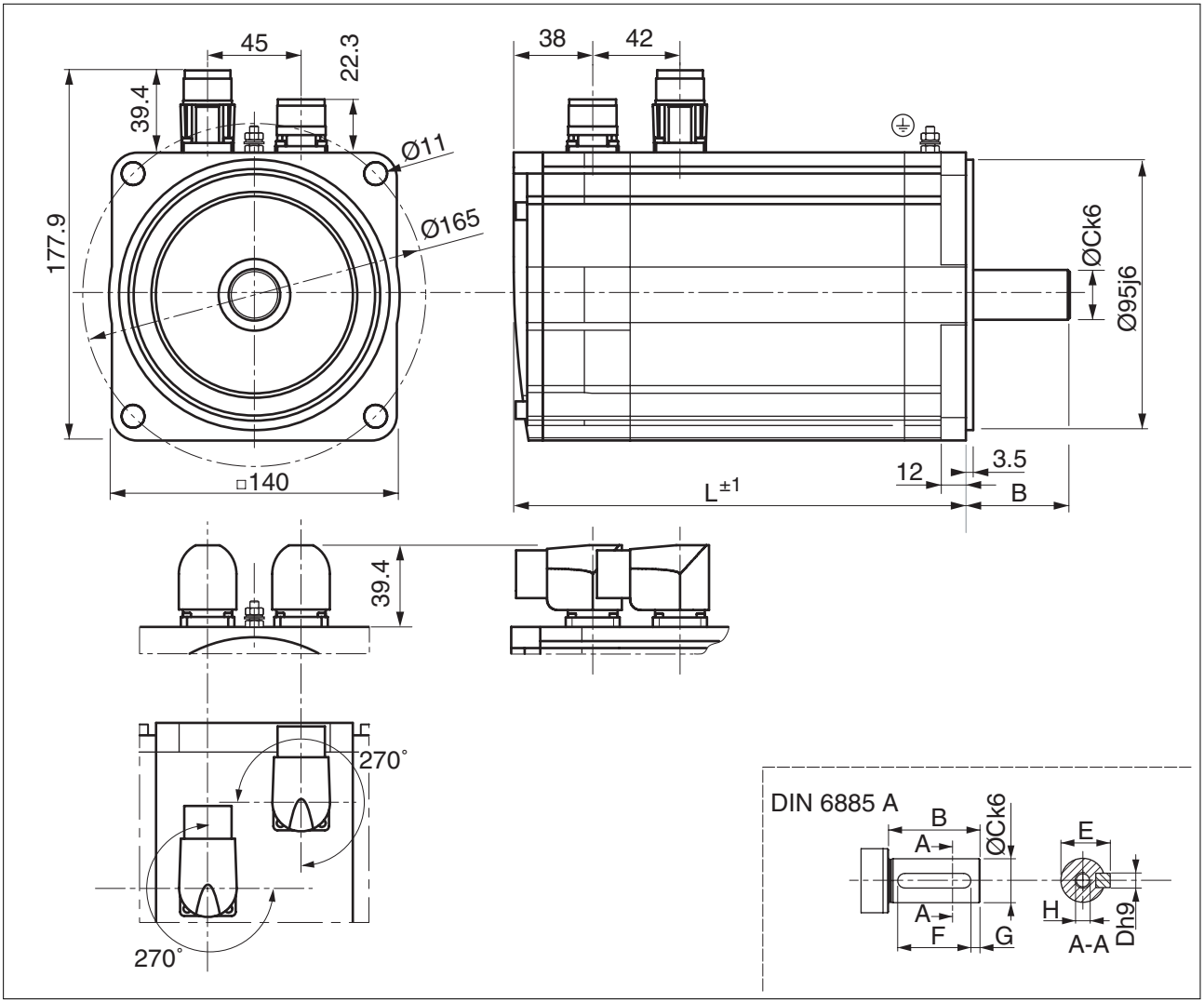


Figure 5: Dimensions SH31401 (M, P); SH31402 (M, P); SH31403 (M, P); SH31404 (M)

0198441113987, V2.00, 02.2012

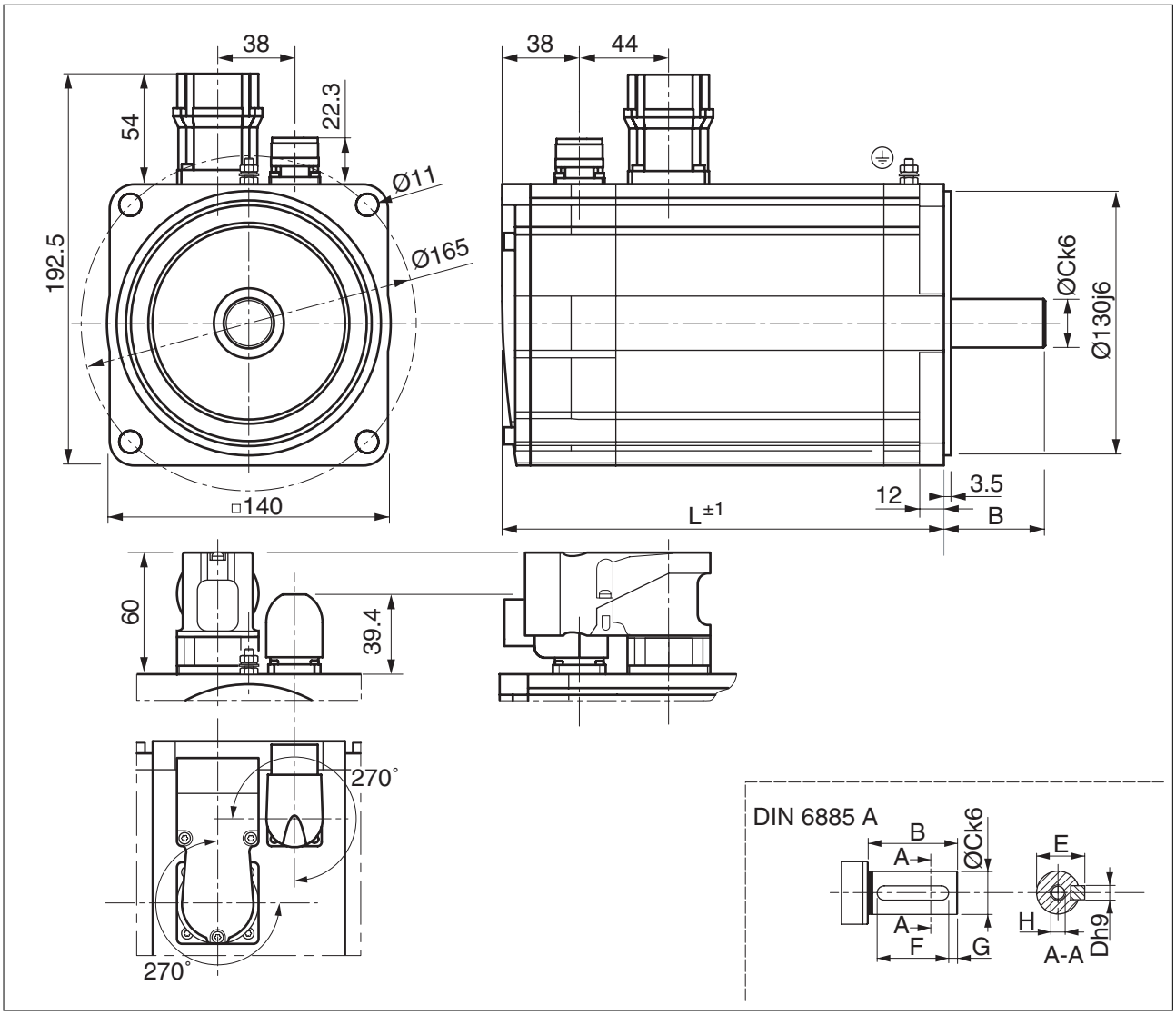


Figure 6: Dimensions SH31404 (P)

			SH31401	SH31402	SH31403	SH31404
L	Length without brake	[mm]	217.5	272.5	327.5	382.5
L	Length with brake	[mm]	255.5	310.5	365.5	420.5
B	Shaft length	[mm]	50	50	50	50
C	Shaft diameter	[mm]	24	24	24	24
D	Width of parallel key	[mm]	8	8	8	8
E	Shaft width with parallel key	[mm]	28	28	28	28
F	Length of parallel key	[mm]	40	40	40	40
G	Distance parallel key to shaft end	[mm]	5	5	5	5
H	Female thread of shaft		DIN 332-D M8	DIN 332-D M8	DIN 332-D M8	DIN 332-D M8
	Parallel key		DIN 6885-A8x7x40	DIN 6885-A8x7x40	DIN 6885-A8x7x40	DIN 6885-A8x7x40

0198441113987, V2.00, 02.2012

Dimensions SH3205

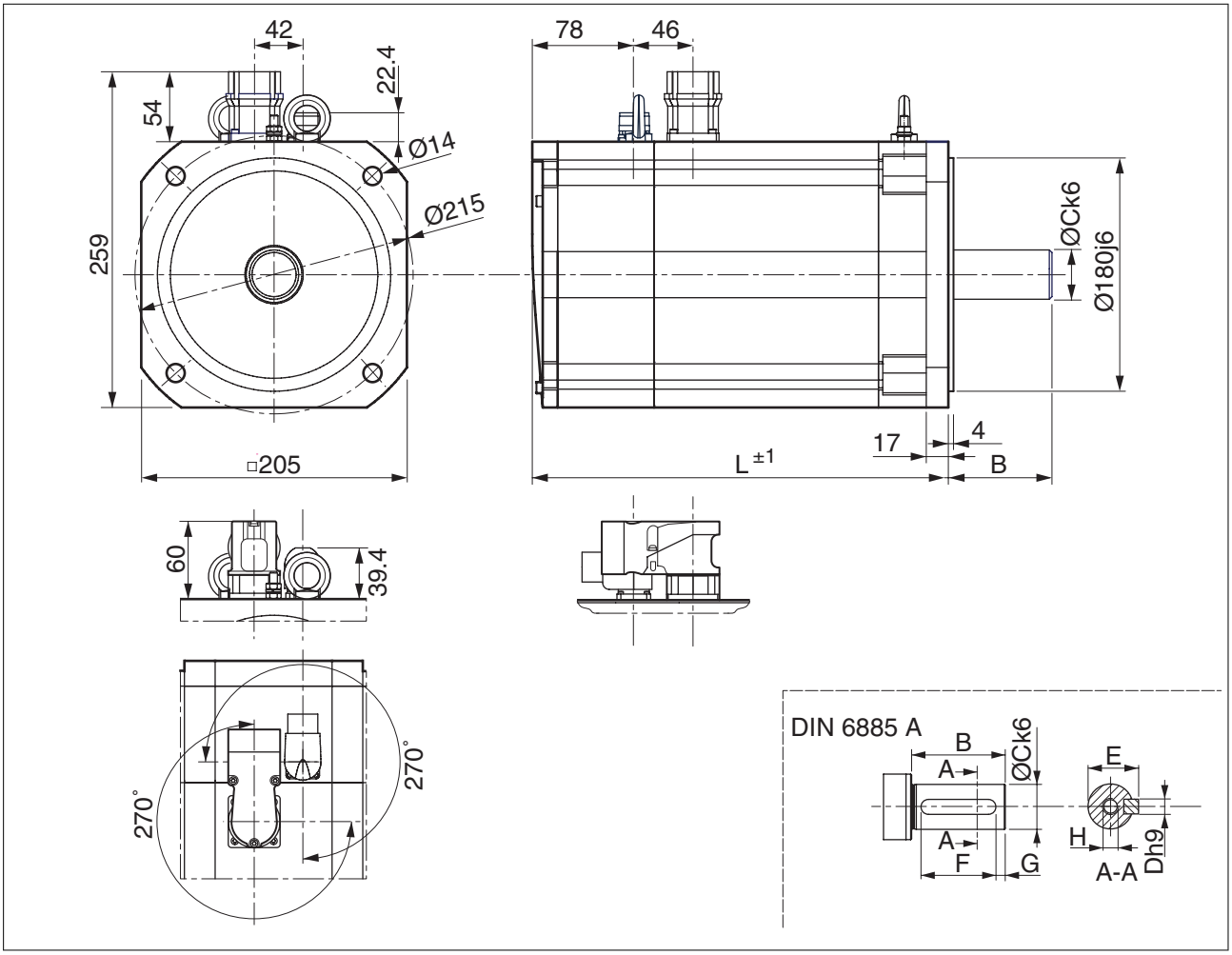


Figure 7: Dimensions SH3205 with connector

			SH32051	SH32052	SH32053
L	Length without brake	[mm]	321	405	489
L	Length with brake	[mm]	370.5	454.5	538.5
B	Shaft length	[mm]	80	80	80
C	Shaft diameter	[mm]	38	38	38
D	Width of parallel key	[mm]	10	10	10
E	Shaft width with parallel key	[mm]	43	43	43
F	Length of parallel key	[mm]	70	70	70
G	Distance parallel key to shaft end	[mm]	5	5	5
H	Female thread of shaft		DIN 332-D M12	DIN 332-D M12	DIN 332-D M12
	Parallel key		DIN 6885-A10x8x70	DIN 6885-A10x8x70	DIN 6885-A10x8x70

0198441113987, V2.00, 02.2012

3.4 Shaft-specific data

⚠ WARNING

UNINTENDED BEHAVIOR CAUSED BY MECHANICAL DAMAGE TO THE MOTOR

If the maximum permissible forces at the shaft are exceeded, this will result in premature wear of the bearing or shaft breakage.

- Do not exceed the maximum permissible axial and radial forces.
- Protect the shaft from impact.
- Do not exceed the maximum permissible axial force when pressing on components.

Failure to follow these instructions can result in death, serious injury or equipment damage.

3.4.1 Force for pressing on

Maximum force during pressing on

The force applied during pressing on must not exceed the maximum permissible axial force that may act on the rolling bearing, see chapter "3.4.2 Shaft load". Applying assembly paste (such as Klüberpaste 46 MR 401) to the shaft and the component to be mounted reduces friction and mechanical impact on the surfaces.

If the shaft has a thread, it is recommend to use it to press on the component to be mounted. This way there is no axial force acting on the rolling bearing.

It is also possible to shrink-fit, clamp or glue the component to be mounted.

The following table shows the maximum permissible axial force F_A at standstill.

SH3...		**055**	**070**	**100**	**140**	**205**
	[N] (lb)	40 (9)	80 (18)	160 (36)	300 (65)	740 (165)

0198441113987, V2.00, 02.2012

3.4.2 Shaft load

The following conditions apply:

- The permissible force applied during pressing on must not be exceed.
- Radial and axial limit loads must not be applied simultaneously
- Nominal bearing service life in operating hours at a probability of failure of 10%
- Mean speed of rotation n = 4000 min^{-1}
- Ambient temperature = 40 °C
- Peak torque = Duty cylcle S3 - S8, 10% duty cycle
- Nominal torque = Duty cylcle S1, 100% duty cycle

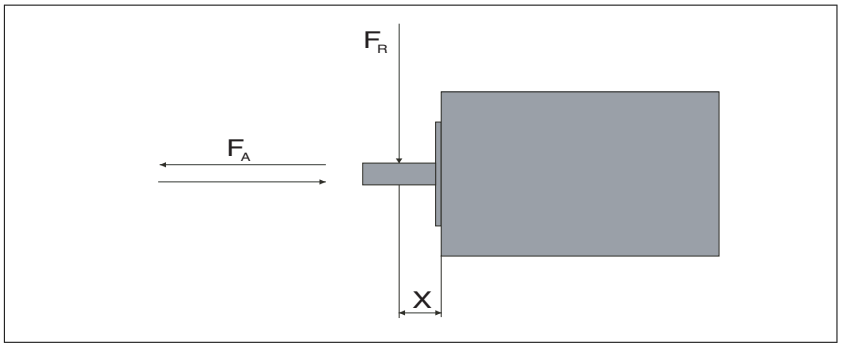


Figure 8: Shaft load

The point of application of the forces depends on the motor size:

Motor version		Values for "X"
SH3055	[mm]	10
SH30701 and SH30702	[mm]	11.5
SH30703	[mm]	15
SH3100 1 ... 3	[mm]	20
SH31004	[mm]	25
SH3140	[mm]	25
SH3205	[mm]	40

0198441113987, V2.00, 02.2012

The following table shows the maximum radial shaft load F_R.

SH3...		055 1	055 2	055 3	070 1	070 2	070 3	100 1	100 2	100 3
1000 min^{-1}	[N]	340	370	390	660	710	730	900	990	1050
2000 min^{-1}	[N]	270	290	310	520	560	580	720	790	830
3000 min^{-1}	[N]	240	260	270	460	490	510	630	690	730
4000 min^{-1}	[N]	220	230	240	410	450	460	570	620	660
5000 min^{-1}	[N]	200	220	230	380	410	430	530	-	-
6000 min^{-1}	[N]	190	200	210	360	390	400	-	-	-
7000 min^{-1}	[N]	180	190	200	-	-	-	-	-	-
8000 min^{-1}	[N]	170	190	190	-	-	-	-	-	-

SH3...		100 4	140 1	140 2	140 3	140 4	205 1	205 2	205 3	-
1000 min^{-1}	[N]	1070	1930	2240	2420	2660	3730	4200	4500	-
2000 min^{-1}	[N]	850	1530	1780	1920	2110	2960	3330	3570	-
3000 min^{-1}	[N]	740	1340	1550	1670	1840	2580	2910	3120	-
4000 min^{-1}	[N]	-	-	-	-		-	-	-	-
5000 min^{-1}	[N]	-	-	-	-		-	-	-	-
6000 min^{-1}	[N]	-	-	-	-		-	-	-	-
7000 min^{-1}	[N]	-	-	-	-		-	-	-	-
8000 min^{-1}	[N]	-	-	-	-		-	-	-	-

The following table shows the maximum axial shaft load F_A.

SH3...		055 1	055 2	055 3	070 1	070 2	070 3	100 1	100 2	100 3
1000 min^{-1}	[N]	68	74	78	132	142	146	180	198	210
2000 min^{-1}	[N]	54	58	62	104	112	116	144	158	166
3000 min^{-1}	[N]	48	52	54	92	98	102	126	138	146
4000 min^{-1}	[N]	44	46	48	82	90	92	114	124	132
5000 min^{-1}	[N]	40	44	46	76	82	86	106	-	-
6000 min^{-1}	[N]	38	40	42	72	78	80	-	-	-
7000 min^{-1}	[N]	36	38	40	-	-	-	-	-	-
8000 min^{-1}	[N]	34	38	38	-	-	-	-	-	-

SH3...		100 4	140 1	140 2	140 3	140 4	205 1	205 2	205 3	-
1000 min^{-1}	[N]	214	386	448	484	532	746	840	900	-
2000 min^{-1}	[N]	170	306	356	384	422	592	666	714	-
3000 min^{-1}	[N]	148	268	310	334	368	516	582	624	-
4000 min^{-1}	[N]	-	-	-	-		-	-	-	-
5000 min^{-1}	[N]	-	-	-	-		-	-	-	-
6000 min^{-1}	[N]	-	-	-	-		-	-	-	-
7000 min^{-1}	[N]	-	-	-	-		-	-	-	-
8000 min^{-1}	[N]	-	-	-	-		-	-	-	-

0198441113987, V2.00, 02.2012

3.5 Options

3.5.1 Holding brake

Holding brake The holding brake in the motor has the task of holding the current motor position when the power stage is disabled, even if external forces act (for example, in the case of a vertical axis). The holding brake is not a safety function.

For a description of the controller, see chapter "4.5.3 Holding brake connection".

Motor type		**SH3055**	**SH30701, 2**	**SH30703**	**SH31001, 2, 3**	**SH31004**	**SH31401, 2**	**SH31403, 4**	**SH3205**
Holding torque 1)	[Nm]	0.8	2	3	9	12	23	36	80
Holding brake release time	[ms]	12	12	35	40	45	50	100	200
Holding brake application time	[ms]	6	6	15	20	20	40	45	50
Nominal voltage	[V_{dc}]	24 +6/-10%							
Nominal power (electrical pull-in power)	[W]	10	10	12	18	17	24	26	40
Moment of inertia	[$kgcm^2$]	0.0213	0.0213	0.227	0.168	1.025	1.8	5.5	16
Mass	[kg]	0.08	0.22	0.32	0.45	0.69	1.10	1.79	3.6

1) The holding brake is factory run in. After longer storage periods, parts of the holding brake may corrode. See "Checking/running in the holding brake" in chapter "8 Service, maintenance and disposal".

Table 2: Technical data holding brake

0198441113987, V2.00, 02.2012

3.5.2 Encoder

The standard motor is equipped with a SinCos encoder. The drive can access the electronic nameplate via the Hiperface interface for easy commissioning.

The signals meet the PELV requirements.

SKS36 Singleturn

This motor encoder measures an absolute value within one revolution during switching on and continues to count incrementally from this point.

Resolution in increments	Depending on evaluation
Resolution per revolution	128 sin/cos periods
Measuring range absolute	1 revolution
Accuracy of the digital absolute value [1)]	±0.0889°
Accuracy of the incremental position	±0.0222°
Signal shape	Sinusoidal
Supply voltage	7 ... 12 V_{dc}
Maximum supply current	60 mA (without load)
Maximum angular acceleration	200,000 rad/s^2

1) Depending on the evaluation through the drive, the accuracy may be increased by including the incremental position in the calculation of the absolute value. In this case, the accuracy corresponds to the incremental position.

SKM36 Multiturn

This motor encoder measures an absolute value within 4096 revolutions during switching on and continues to count incrementally from this point.

Resolution in increments	Depending on evaluation
Resolution per revolution	128 sin/cos periods
Measuring range absolute	4096 revolutions
Accuracy of the digital absolute value [1)]	±0.0889°
Accuracy of the incremental position	±0.0222°
Signal shape	Sinusoidal
Supply voltage	7 ... 12 V_{dc}
Maximum supply current	60 mA (without load)
Maximum angular acceleration	200,000 rad/s^2

1) Depending on the evaluation through the drive, the accuracy may be increased by including the incremental position in the calculation of the absolute value. In this case, the accuracy corresponds to the incremental position.

3.6 Conditions for UL 1004

PELV power supply

Use only power supply units that are approved for overvoltage category III.

Wiring

Use at least 60/75 °C copper conductors.

0198441113987, V2.00, 02.2012

3.7 Certifications

Product certifications:

Certified by	Assigned number	Validity
UL	File E 208613	-

0198441113987, V2.00, 02.2012

3.8 Declaration of conformity

SCHNEIDER ELECTRIC MOTION DEUTSCHLAND GmbH
Breslauer Str. 7 D-77933 Lahr

EC DECLARATION OF CONFORMITY
YEAR 2012

☐ according to EC Directive on Machinery 2006/42/EC
☐ according to EC Directive EMC 2004/108/EC
☒ according to EC Directive Low Voltage 2006/95/EC

We hereby declare that the products listed below meet the requirements of the EC Directives indicated with respect to design, construction and version distributed by us. This declaration becomes invalid in the case of any modification to the products not authorized by us.

Designation:	3 Phase servo motor
Type:	SH3055, SH3070, SH3100, SH3140, SH3205
Applied harmonized standards, especially:	EN 60034-1:2004 EN 60034-5:2001 EN 61800-5-1:2007
Applied national standards and technical specifications, especially:	Versions according to UL File E208613 UL 1004-1 UL 1004-6 CSA 22.2 No. 100-04 Product documentation
Company stamp:	Schneider Electric Motion Deutschland GmbH Postfach 11 80 • D-77901 Lahr Breslauer Str. 7 • D-77933 Lahr
Date/Signature:	17 February 2012 Michael Kunz
Name/Department:	Michael Kunz/R & D

0198441113987, V2.00, 02.2012

4 Installation

4

⚠ WARNING

GREAT MASS OR FALLING PARTS

The motor can have an unexpectedly great mass.

- Consider the mass of the motor when mounting it. It may be necessary to use a suitable crane.
- Use personal protective equipment (for example, safety shoes and protective gloves).
- Mount the motor in such a way (tightening torque, securing screws) that it cannot come loose even in the case of fast acceleration or continuous vibration.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ WARNING

STRONG ELECTROMAGNETIC FIELDS

Motors can generate strong local electrical and magnetic fields. This can cause interference in sensitive devices.

- Keep persons with implants such as pacemakers away from the motor.
- Do not place any sensitive devices close to the motor.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ WARNING

UNEXPECTED BEHAVIOR CAUSED BY DAMAGE OR FOREIGN OBJECTS

Damage to the product as well as foreign objects, deposits or humidity can cause unexpected behavior.

- Do not use damaged products.
- Keep foreign objects from getting into the product.
- Verify correct seat of seals and cable entries.

Failure to follow these instructions can result in death, serious injury or equipment damage.

0198441113987, V2.00, 02.2012

⚠ WARNING

HOT SURFACES

The heat sink at the product may heat up to over 100°C (212°F) during operation.

- Avoid contact with the hot heat sink.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity.
- Consider the measures for heat dissipation described.

Failure to follow these instructions can result in death or serious injury.

⚠ CAUTION

DAMAGE CAUSED BY IMPROPER APPLICATION OF FORCES

If the motor is improperly subjected to loads, it can be damaged or fall down.

- Do not step onto the motor.
- Avoid improper use by means of safeguards at the machine or safety instructions.

Failure to follow these instructions can result in injury or equipment damage.

0198441113987, V2.00, 02.2012

4.1 Overview of procedure

Chapter	Page
"4.2 Electromagnetic compatibility, EMC"	51
"4.3 Before mounting"	53
"4.4 Mounting the motor "	55
"4.5.2 Power and encoder connection"	62
"4.5.3 Holding brake connection"	68

▸ Finally, verify proper installation.

4.2 Electromagnetic compatibility, EMC

⚠ WARNING

SIGNAL AND DEVICE INTERFERENCE

Signal interference can cause unexpected responses of the device.

- Install the wiring in accordance with the EMC requirements.
- Verify compliance with the EMC requirements.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Pre-assembled motor cables and encoder cables in many different lengths are available for the drive solutions. Contact your local sales office.

EMC requirement: Route motor cable separately

When planning the wiring, take into account the fact that the motor cable must be routed separately. The motor cable must be separate from the mains cable or the signal wires.

0198441113987, V2.00, 02.2012

Motor and encoder cables

Motor and encoder cables are especially critical in terms of EMC. Use only pre-assembled cables or cables that comply with the specifications and implement the EMC measures described below.

EMC measures	Effect
Keep cables as short as possible. Do not install unnecessary cable loops, use short cables from the central grounding point in the control cabinet to the external ground connection.	Reduces capacitive and inductive interference.
Ground the product via the motor flange or with a ground strap to the ground connection at the cover of the connector housing.	Reduces emissions, increases immunity.
Connect large surface areas of cable shields, use cable clamps and ground straps.	Reduces emissions.
Do not install switching elements in motor cables or encoder cables.	Reduces interference.
Route the motor cable at a distance of at least 20 cm from the signal cable or use shielding plates between the motor cable and signal cable.	Reduces mutual interference
Route the motor cable and encoder cable without cutting them. [1)]	Reduces emission.

1) If a cable is cut for the installation, take appropriate measures for uninterrupted shielding (such as a metal housing) at the point of the cut. Connect a large area of the cable shield to the metal housing at both ends of the cut.

Pre-assembled connection cables (accessories)

Use pre-assembled cables to reduce the risk of wiring errors, see chapter "7 Accessories and spare parts".

Place the female connector of the motor cable onto the male connector and tighten the union nut. Proceed in the same manner with the connection cable of the encoder system. Connect the motor cable and the encoder cable to the drive according to the wiring diagram of the drive.

Equipotential bonding conductors

Potential differences can result in excessive currents on the cable shields. Use equipotential bonding conductors to reduce currents on the cable shields.

The equipotential bonding conductor must be rated for the maximum current flowing. Practical experience has shown that the following conductor cross sections can be used:

- 16 mm² (AWG 4) for equipotential bonding conductors up to a length of 200 m
- 20 mm² (AWG 4) for equipotential bonding conductors with a length of more than 200 m

0198441113987, V2.00, 02.2012

4.3 Before mounting

Checking for damage

Damaged drive systems must neither be installed nor operated.

- ▸ Prior to mounting, check the drive system for visible damage.

Checking the holding brake (option)

See chapter "8.3 Maintenance", "Checking/running in the holding brake".

Cleaning the shaft

The shaft extensions are factory-treated with an anti-corrosive. If output components are glued to the shaft, the anti-corrosive must be removed and the shaft cleaned. If required, use a grease removal agent as specified by the glue manufacturer. If the glue manufacturer does not provide information on grease removal, it is recommended to use acetone.

- ▸ Remove the anti-corrosive. Avoid direct contact of the skin and the sealing material with the anti-corrosive or the cleaning agent.

Mounting surface for flange

The mounting surface must be stable, clean, deburred and low-vibration.

- ▸ Verify that the system side meets all requirements in terms of dimensions and tolerances.

Conductor cross sections according to method of installation

The following sections describe the conductor cross sections for two standard methods of installation:

- Method of installation B2:

  Cables in conduits or cable trunking systems
- Method of installation E:

  Cables on open cable trays

Cross section [mm²] [1]	**Current carrying capacity with method of installation E [A]** [2]	**Current-carrying capacity with method of installation B2 [A]** [2]
0.75	10.4	8.5
1	12.4	10.1
1.5	16.1	13.1
2.5	22	17.4
4	30	23
6	37	30
10	52	40
16	70	54
25	88	70

1) See chapter "7 Accessories and spare parts" for available cables.
2) Values as per IEC 60204-1 for continuous operation, copper conductors and ambient air temperature 40°C; see IEC 60204-1 for additional information.

Note the derating factors for grouping of cables and correction factors for other ambient conditions (IEC 60204-1).

The conductors must have a sufficiently large cross section so that the upstream fuse can trip.

In the case of longer cables, it may be necessary to use a greater conductor cross section to reduce the energy losses.

0198441113987, V2.00, 02.2012

Cable specifications

Use pre-assembled cables to reduce the risk of wiring errors. See chapter "7 Accessories and spare parts".

The genuine accessories have the following properties:

Cables with connectors		**VW3E1143R•••**	**VW3E1145R•••**	**VW3E1153R•••**
Cable jacket, insulation		PUR matte green (similar to RAL 6018)		
Capacitance Power wires Signal wires	[pF/m]	Approx. 120 (wire/wire) Approx. 208 (wire/shield) Approx. 170 (wire/wire) Approx. 335 (wire/shield)	-	-
Number of contacts (shielded)		[(4 x 1.5 mm^2) + 2 x (2 x 0.75 mm^2)]	[(4 x 2.5 mm^2) + 2 x (2 x 1 mm^2)]	[(4 x 4 mm^2) + (2 x 1 mm^2) + (2 x 1.5 mm^2)]
Connection version		Motor end 8-pin circular connector M23, other cable end open	Motor end 8-pin circular connector M40, other cable end open	Motor end 8-pin circular connector M40, other cable end open
Cable diameter	[mm]	12.4 ± 0.4	14.7 ± 0.3	18.4 ± 0.3
Minimum bending radius	[mm]	5 times the cable diameter with permanently installed connection 12 times the cable diameter with flexible installation		
Nominal voltage Power wires Signal wires	[V]	 1000 300	 1000 300	 1000 300
Maximum orderable length	[m]	75 [1)]		
Permissible temperature range during operation	[°C]	-40 ... 80 (fixed) -30 ... 80 (moving)	-50 ... 80 (fixed) -40 ... 80 (moving)	-40 ... 80 (fixed) -30 ... 80 (moving)
Certifications		UL, cUL, CE		

1) Contact your Schneider Electric sales office for longer cables.

Cables with connectors		**VW3E1154R•••**	**VW3E2094R•••**
Cable jacket, insulation		PUR matte green (similar to RAL 6018)	
Number of contacts (shielded)		[(4 x 10 mm^2) + (2 x 1 mm^2) + (2 x 1.5 mm^2)]	[3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)]
Connection version		Motor end 8-pin circular connector M40, other cable end open	Motor end 12-pin circular connector M23, other cable end open
Cable diameter	[mm]	22.7 ± 0.3	6.8 ± 0.2
Minimum bending radius	[mm]	5 times the cable diameter with permanently installed connection 12 times the cable diameter with flexible installation	5 times the cable diameter with permanently installed connection 10 times the cable diameter with flexible installation
Nominal voltage Power wires Signal wires	[V]	 1000 300	 - 300
Maximum orderable length	[m]	75 [1)]	
Permissible temperature range during operation	[°C]	-50 ... 80 (fixed) -40 ... 80 (moving)	-40 ... 80 (fixed)
Certifications		UL, cUL, CE	

1) Contact your Schneider Electric sales office for longer cables.

0198441113987, V2.00, 02.2012

4.4 Mounting the motor

⚠ WARNING

UNEXPECTED MOVEMENT CAUSED BY ELECTROSTATIC DISCHARGE

In rare cases, electrostatic discharge to the shaft may cause incorrect operation of the encoder system and result in unexpected motor movements and damage to the bearing.

- Use conductive components (such as antistatic belts) or other suitable measures to avoid static charge by motion.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ WARNING

UNEXPECTED MOVEMENT

If the permissible ambient conditions are exceeded, external substances from the environment may penetrate and cause unexpected movement or equipment damage.

- Verify that the ambient conditions are met.
- Do not allow seals to run dry.
- Keep liquids from getting to the shaft bushing (for example in mounting position IM V3).
- Do not expose the shaft sealing rings and cable entries to the direct spray of a pressure washer.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ WARNING

UNINTENDED BEHAVIOR CAUSED BY MECHANICAL DAMAGE TO THE MOTOR

If the maximum permissible forces at the shaft are exceeded, this will result in premature wear of the bearing, shaft breakage or damage to the encoder.

- Do not exceed the maximum permissible axial and radial forces.
- Protect the shaft from impact.
- Do not exceed the maximum permissible axial force when pressing on components.

Failure to follow these instructions can result in death, serious injury or equipment damage.

0198441113987, V2.00, 02.2012

⚠ WARNING

HOT SURFACES

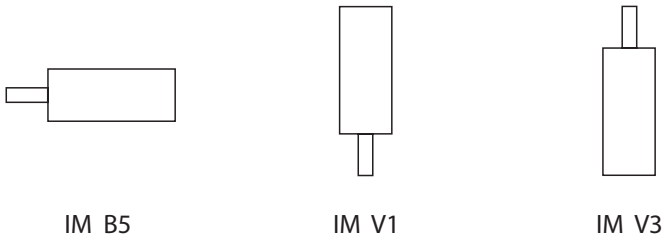
The heat sink at the product may heat up to over 100°C (212°F) during operation.

- Avoid contact with the hot heat sink.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity.
- Consider the measures for heat dissipation described.

Failure to follow these instructions can result in death or serious injury.

Mounting position

The following mounting positions are defined and approved as per IEC 60034-7:



Mounting situation

CAUTION

DAMAGE TO THE MOTOR CAUSED BY FORCES ACTING ON THE REAR SIDE OF THE MOTOR

Motors equipped with eyebolts for transportation purposes are subject to a high risk of damage caused by forces acting at the rear side of the motor, caused by the great mass.

- Do not place the motor on the rear side.
- Protect the rear side of the motor from impact.
- Only lift the motor via the eyebolts, not via the rear side.

Failure to follow these instructions can result in equipment damage.

Mounting

When the motor is mounted to the mounting flange, it must be accurately aligned axially and radially and evenly contact the surface. All mounting screws must be tightened with the specified torque. There must be no tension. See chapter "3 Technical Data" for data, dimensions and degrees of protection (IP).

Mounting output components

If output components are not properly mounted, the motor may be damaged. Output components such as pulleys, couplings must be mounted with suitable equipment and tools. The maximum axial and radial forces acting on the shaft must not exceed the maximum shaft load values specified, see "3.4.2 Shaft load".

Observe the mounting instructions provided by the manufacturer of the output component. Motor and output component must be accurately aligned both axially and radially. Failure to follow the instructions will cause runout, damage to the rolling bearings and premature wear.

0198441113987, V2.00, 02.2012

4.4.1 Compressed air connection

The compressed air connection is only available with the IP67 option (see chapter "1.4 Type code"). The compressed air generates a permanent overpressure inside the motor. This overpressure inside the motor is used to obtain degree of protection IP67.

Note the special requirements in terms of the compressed air in chapter "3 Technical Data".

Compressed air connection The compressed air connection of the L-shaped push-in fitting is designed for compressed air hoses made of standard plastic with an outside diameter of 4 mm.

Compressed air monitoring It is recommended to use a compressed air monitor.

0198441113987, V2.00, 02.2012

4.5 Electrical installation

4.5.1 Connectors and connector assignments

Connection overview

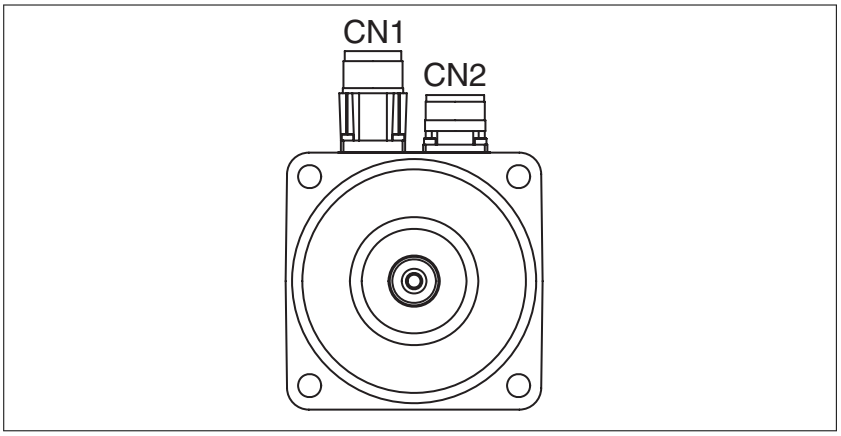


Figure 9: Connection overview

Depending on the motor size, different connector sizes are used for the motor connection CN1. SH3055, SH3070, SH3100, SH31401 and SH31402 have an M23 connection. SH31403,SH31404 and SH3205 have an M40 connection. The encoder connection CN2 is identical irrespective of the motor size.

0198441113987, V2.00, 02.2012

CN1 motor connection M23

Motor connector for connection of the motor phases and the holding brake.

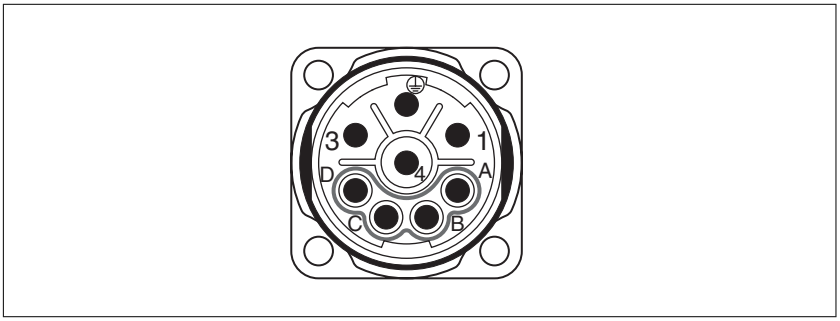


Figure 10: Pin assignment motor connection M23

See chapter "7.1 Connectors" for suitable mating connectors.

The signals of the holding brake and the temperature sensor meet the PELV requirements.

Pin	Assignment	Meaning
1	W	Motor phase W
⏚	PE	Protective ground conductor
3	U	Motor phase U
4	V	Motor phase V
A	BR+	Supply voltage holding brake 24 V_{dc}
B	BR-	Reference potential holding brake
C	PTC	Temperature sensor
D	PTC	Temperature sensor
	SHLD	Shield (to connector housing)

0198441113987, V2.00, 02.2012

CN1 motor connection M40

Motor connector for connection of the motor phases and the holding brake.

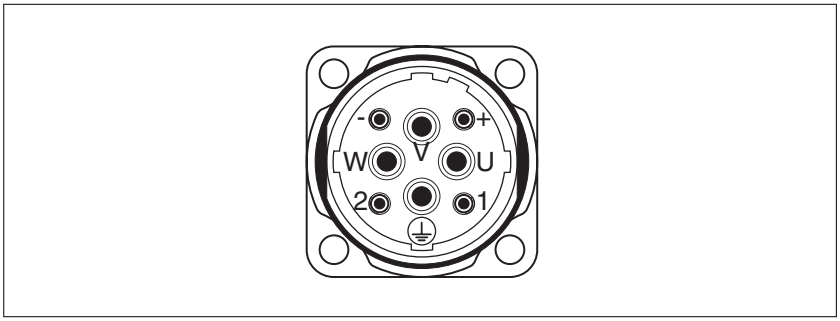


Figure 11: Pin assignment motor connection M40

See chapter "7.1 Connectors" for suitable mating connectors.

The signals of the holding brake and the temperature sensor meet the PELV requirements.

Pin	Assignment	Meaning
U	U	Motor phase U
⏚	PE	Protective ground conductor
W	W	Motor phase W
V	V	Motor phase V
+	BR+	Supply voltage holding brake 24 V_{dc}
-	BR-	Reference potential holding brake
1	PTC	Temperature sensor
2	PTC	Temperature sensor
	SHLD	Shield (to connector housing)

0198441113987, V2.00, 02.2012

CN2 encoder connection M23

Encoder connector for connection of the SinCos encoder (singleturn and multiturn)

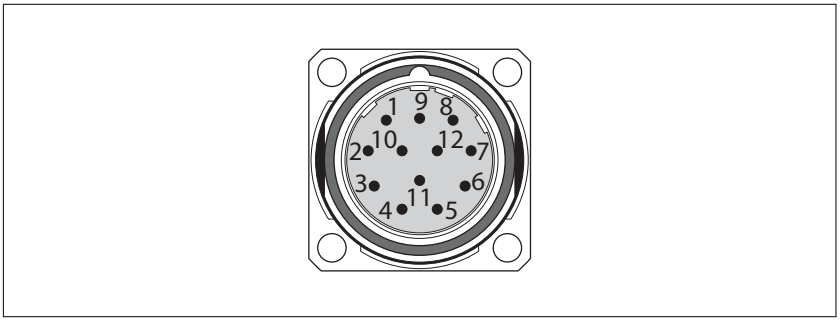


Figure 12: Pin assignment encoder connector

See chapter "7.1 Connectors" for suitable mating connectors.

The signals meet the PELV requirements.

Pin	Signal	Meaning
1	REFCOS_OUT	Reference for cosine signal, 2.5V
2	DATA	Receive data, transmit data
3	Reserved	Reserved
4	Reserved	Reserved
5	SIN_OUT	Sine signal
6	REFSIN_OUT	Reference for sine signal, 2.5 V
7	$\overline{\text{DATA}}$	Receive data and transmit data, inverted
8	COS_OUT	Cosine signal
9	Reserved	Reserved
10	ENC_0V	Reference potential [1)]
11	Reserved	Reserved
12	ENC+10V	7...12 V supply voltage
	SHLD	Shield (to connector housing)

1) The ENC_0V connection of the supply voltage has no connection to the encoder housing.

0198441113987, V2.00, 02.2012

4.5.2 Power and encoder connection

⚠ DANGER

ELECTRIC SHOCK

High voltages at the motor connection may occur unexpectedly.

- The motor generates voltage when the shaft is rotated. Prior to performing any type of work on the drive system, block the motor shaft to prevent rotation.
- AC voltage can couple voltage to unused conductors in the motor cable. Insulate both ends of unused conductors in the motor cable.
- The system integrator is responsible for compliance with all local and national electrical code requirements as well as all other applicable regulations with respect to grounding of all equipment. Supplement the motor cable grounding conductor with an additional protective ground conductor to the motor housing.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

UNEXPECTED MOVEMENT

Drive systems may perform unexpected movements because of incorrect connection or other errors.

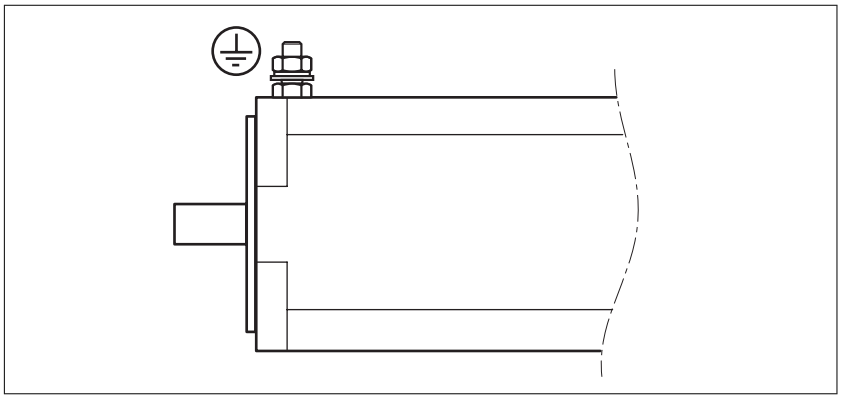
- Operate the motor with approved power stages only. Even if the connectors of a different power stage match, this does not imply compatibility.
- Verify proper wiring.
- Only start the system if there are no persons or obstructions in the hazardous area.
- Perform the first test runs without coupled loads.
- Do not touch the motor shaft or the mounted output components.

Failure to follow these instructions can result in death, serious injury or equipment damage.

The motors are not suitable for direct connection to mains power. The motors must be operated with a suitable power stage.

0198441113987, V2.00, 02.2012

Protective ground conductor connection



- Ground the motor via a grounding screw if grounding via the flange and the protective ground conductor of the motor cable is not sufficient. Use parts with suitable corrosion protection. Note the required tightening torque and the property class of the grounding screw, see Table 1 in chapter 21.

Assembling cables

Insulate unused wires individually.

- Note the EMC requirements for motor cables and encoder cables, page 52.
- Use equipotential bonding conductors for equipotential bonding.

Follow the procedure and note the dimensions in
" Dimensions for crimping and assembling".

Depending on the motor version, different connector sizes are used for the motor connection CN1. The encoder connection CN2 is identical irrespective of the motor version.

0198441113987, V2.00, 02.2012

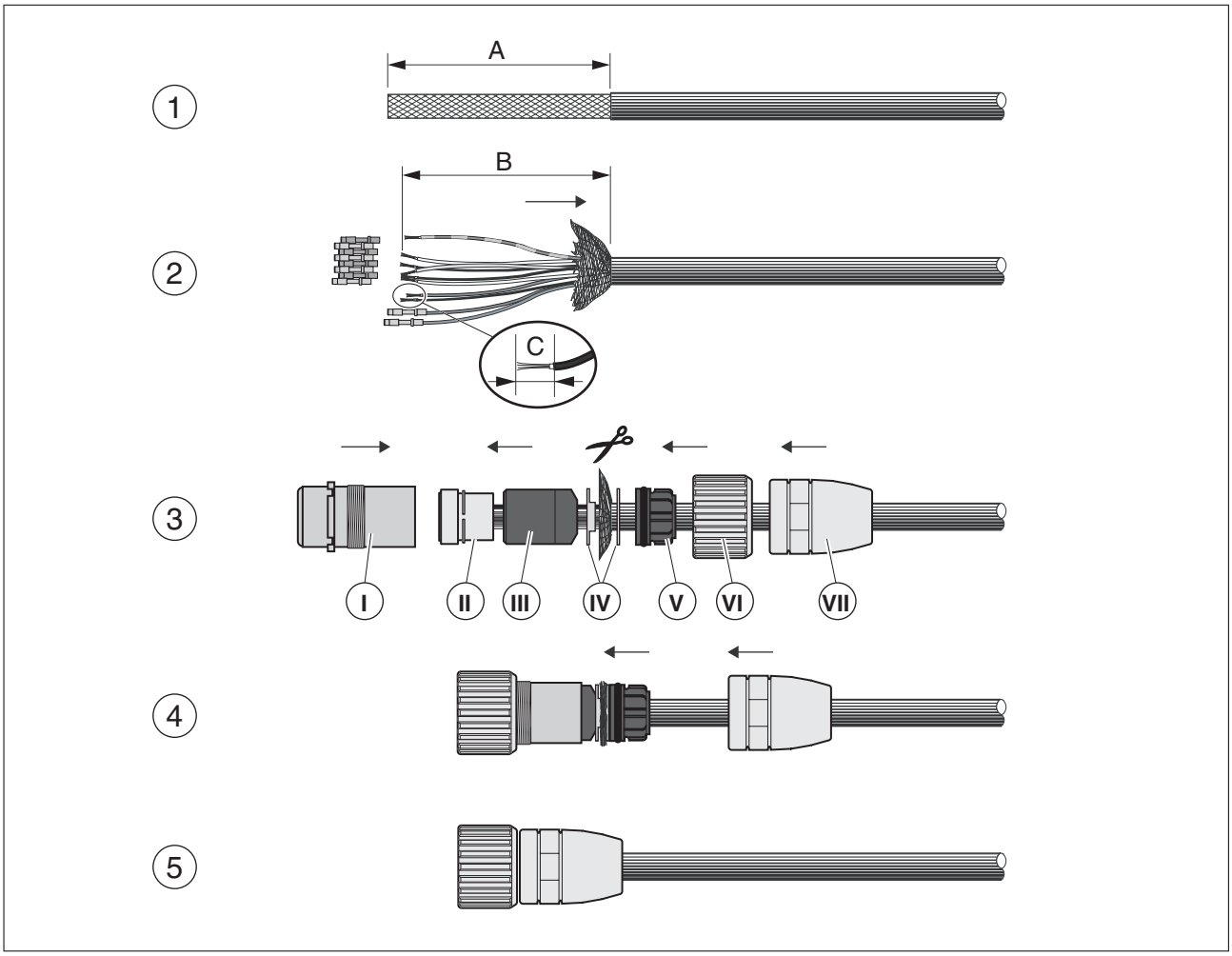


Figure 13: Assembling encoder cables with M23 encoder connector

- (1) Strip the cable jacket; length as specified (see Table 3).
- Open the shield braiding and slide it back over the outer cable jacket.
- Shorten the inner cable jacket.
- (2) Shorten the wires to the specified length (see Table 3) and crimp them to the connector.

  If possible, also connect unused wires. This improves EMC. Wires that are not connected must be insulated at both ends.
- (3) Push part (IV) and part (III) onto the cable. The cable entry contains rubber seals of various sizes for different cable diameters. Use rubber seals matching the diameter of the cable. Enclose the shield with part (IV). Snap the contacts into part (II). Open part (III) at the side and enclose part (II) as well as the rear part of the contacts with it. Slide part (II) into part (I).
- (4) Slide part (IV) behind the shield braiding. Slide part (VI) over part (I).
- Screw part (IV) onto part (I) all the way to the stop.

0198441113987, V2.00, 02.2012

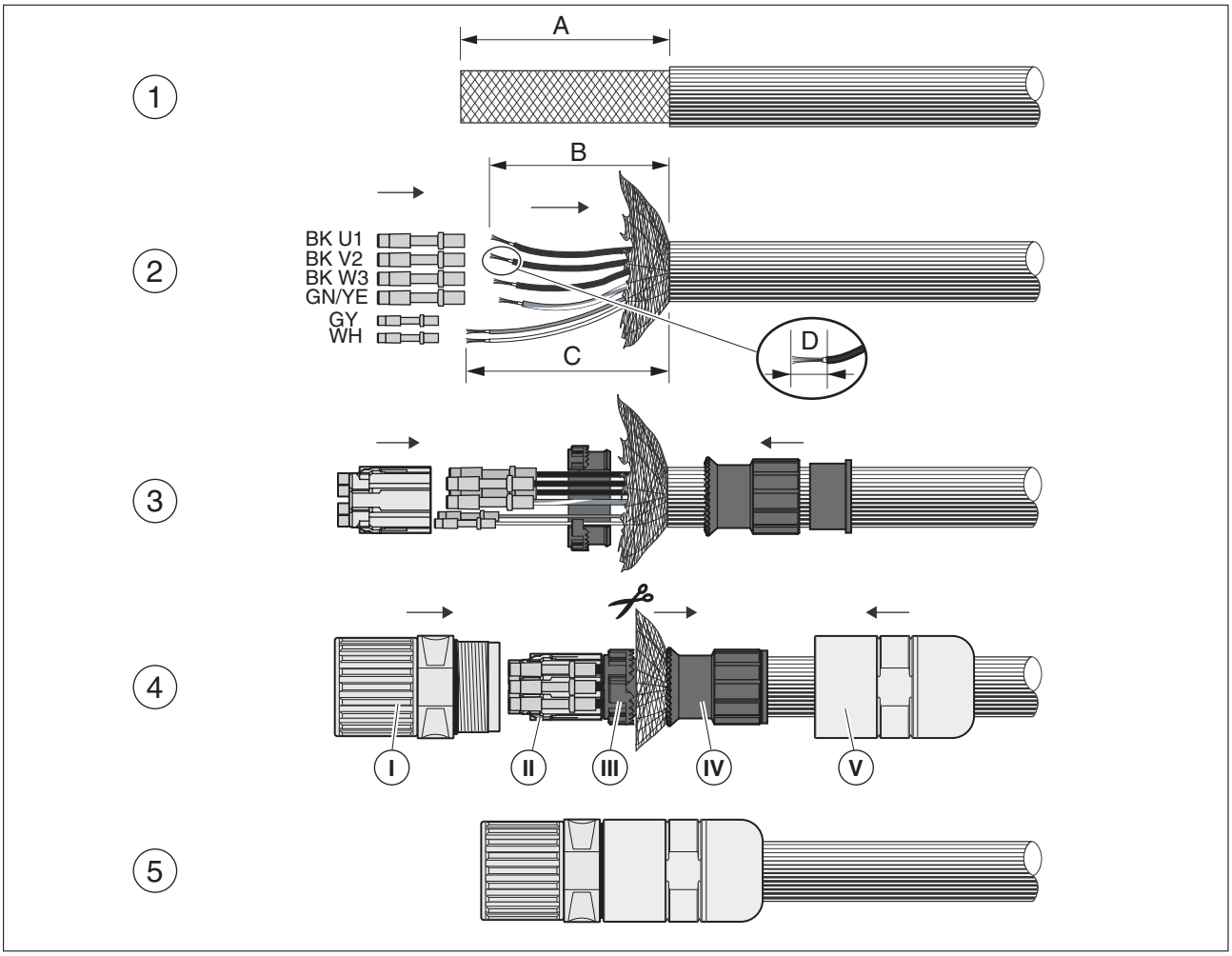


Figure 14: Assembling motor cables with M23 motor connector

- (1) Strip the cable jacket; length as specified (see Table 3).
- Open the shield braiding and slide it back over the outer cable jacket.
- Shorten the inner cable jacket.
- (2) Shorten the wires to the specified length (see Table 3) and crimp them to the connector.

  If possible, also connect unused wires. This improves EMC. Wires that are not connected must be insulated at both ends.
- (3) Push part (IV) and part (III) onto the cable. Snap the contacts into part (II). Open the side of part (III) and enclose the wires using this part.
- (4) Slide part (III) behind the shield braiding and insert part (II) into part (I). Arrange the shield braiding as shown. Push part (I) and part (III) together and shorten the shield braiding.
- Screw part (IV) onto part (I) all the way to the stop.
- If your motor is equipped with a holding brake, follow the instructions in chapter "4.5.3 Holding brake connection".

0198441113987, V2.00, 02.2012

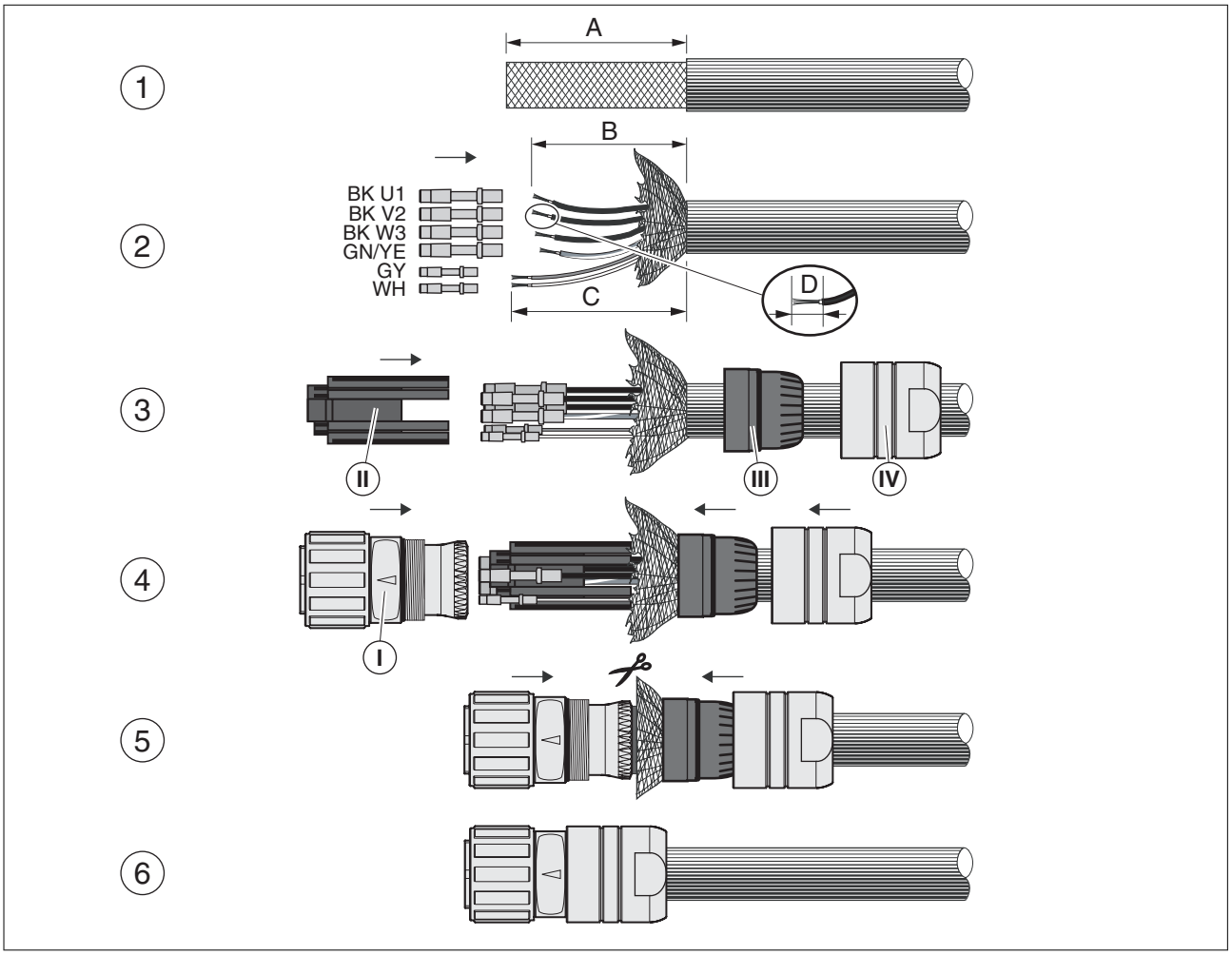


Figure 15: Assembling motor cables with M40 motor connector

- (1) Strip the cable jacket; length as specified (see Table 3).
- Open the shield braiding and slide it back over the outer cable jacket.
- Shorten the inner cable jacket.
- (2) Shorten the wires to the specified length (see Table 3) and crimp them to the connector.

  If possible, also connect unused wires. This improves EMC. Wires that are not connected must be insulated at both ends.
- (3) Push part (IV) and part (III) onto the cable. Snap the contacts laterally into part (II).
- (4) Slide part (III) behind the shield braiding and insert part (II) into part (I).
- (5) Arrange the shield braiding as shown. Push part (I) and part (III) together and shorten the shield braiding.
- Screw part (IV) onto part (I) all the way to the stop.
- If your motor is equipped with a holding brake, follow the instructions in chapter "4.5.3 Holding brake connection".

0198441113987, V2.00, 02.2012

	Signal wires encoder 0.14 mm^2	Signal wires encoder 0.34 mm^2	Signal wires 1 mm^2	Power wire 1.5 mm^2	Power wire 2.5 mm^2	Power wire 4 mm^2	Power wire 10 mm^2
Stripping length A	28 mm	28 mm	40 mm	40 mm	40 mm	40 mm	40 mm
Stripping length B	28 mm	28 mm	-	36 mm	36 mm	36 mm	36 mm
Stripping length C	-	-	40 mm	-	-	-	-
Stripping length D	4.5 mm	4.5 mm	4.5 mm	8 mm	8 mm	10 mm	10 mm
Crimping tool	SF-Z0007	SF-Z0007	SF-Z0007	SF-Z0008	SF-Z0008	SF-Z0008	SF-Z0008
Positioner type	SF-Z2002	SF-Z2002	SF-Z0012	SF-Z0012	SF-Z0012	SF-Z0013	SF-Z0013
Parameters positioner	Fixed	Fixed	+2	-2	-2	-2	-2
Parameters eccentric	5	6	1	4	6	6	6

Table 3: Dimensions for crimping and assembling

Connecting the cables

⚠ DANGER

ELECTRIC SHOCK AND FIRE CAUSED BY INCORRECT INSTALLATION OF THE CABLE

Incorrect installation of the cable may destroy the insulation. Broken conductors in the cable or improperly connected connectors may be melted by arcs.

- Avoid impermissible movements of the cable.
- Avoid forces or movements of the cable at the cable entry.
- Verify that the connector is properly plugged in and locked.

Failure to follow these instructions will result in death or serious injury.

Motor and encoder system connectors must not be disconnected or reconnected as long as voltage is present.

- ▸ Place the female connector of the motor cable onto the motor connector and tighten the union nut. Proceed in the same manner with the connection cable of the encoder system.

  Keep the connection cables from being twisted when tightening the union nut.
- ▸ Connect the motor cable and the encoder cable to the drive according to the wiring diagram of the drive.
- ▸ Ground the shield to a large surface area. See the product manual of the drive for information on connecting the shield.
- ▸ If your motor is equipped with a holding brake, follow the instructions in chapter "4.5.3 Holding brake connection".

0198441113987, V2.00, 02.2012

4.5.3 Holding brake connection

⚠ WARNING

LOSS OF BRAKING FORCE DUE TO WEAR OR HIGH TEMPERATURE

Applying the holding brake while the motor is running will cause excessive wear and loss of the braking force.

- Do not use the brake as a service brake.
- Note that a emergency stop may also cause wear.
- Note the maximum number of brake applications and the kinetic energy during braking of moving loads.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ WARNING

UNEXPECTED MOVEMENT

Releasing the holding brake may cause an unexpected movement in the system, for example if vertical axes are used.

- Take appropriate measures to avoid damage caused by falling or lowering loads.
- Only run the test if there are no persons or obstacles in the hazardous area.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ CAUTION

MISOPERATION OF THE HOLDING BRAKE CAUSED BY INCORRECT VOLTAGE

If the voltage is incorrect, the holding brake cannot be released which causes wear.

- Note that if the voltage is higher than the specified value, the holding brake may be re-applied.
- Note that if the voltage polarity is incorrect, the holding brake cannot be released.
- Note the voltage drop in the cable according to the conductor cross section.
- Verify that the specified voltage is available at the holding brake connection.

Failure to follow these instructions can result in injury or equipment damage.

A motor with a holding brake requires a suitable holding brake controller which releases the brake when the power stage is enabled and locks the motor shaft when the power stage is disabled.

Cable specifications

- Minimum wire cross section: 2 * 1.0 mm^2 (AWG 16)
- Maximum cable length: See product manual of the drive.

0198441113987, V2.00, 02.2012

5 Commissioning

5

⚠ WARNING

UNEXPECTED MOVEMENT

Drive systems may perform unexpected movements because of incorrect connection or other errors.

- Operate the motor with approved power stages only. Even if the connectors of a different power stage match, this does not imply compatibility.
- Verify proper wiring.
- Only start the system if there are no persons or obstructions in the hazardous area.
- Perform the first test runs without coupled loads.
- Do not touch the motor shaft or the mounted output components.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ WARNING

ROTATING PARTS

Rotating parts may cause injuries and may catch clothing or hair. Loose parts or parts that are out of balance may be catapulted away.

- Verify correct mounting and installation of all rotating parts.
- Use a suitable cover.

Failure to follow these instructions can result in death, serious injury or equipment damage.

⚠ WARNING

FALLING PARTS

The motor may move, tip and crash down as a result of the reaction torque.

- Mount the motor securely so it will not break loose during strong acceleration.

Failure to follow these instructions can result in death, serious injury or equipment damage.

0198441113987, V2.00, 02.2012

⚠ WARNING

HOT SURFACES

The heat sink at the product may heat up to over 100°C (212°F) during operation.

- Avoid contact with the hot heat sink.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity.
- Consider the measures for heat dissipation described.

Failure to follow these instructions can result in death or serious injury.

Verifying correct installation

The installation must be checked prior to commissioning.

▸ Check the mechanical installation.

▸ Check the electrical installation.

- Did you connect all protective ground conductors?
- Did you properly connect and install all cables and connectors?
- Did you tighten the cable glands properly?

▸ Check the ambient conditions.

- Does the installation meet the ambient conditions specified?

▸ Check the output components.

- Have the installed output components been balanced and accurately aligned?

▸ Check the parallel key at the shaft end of the motor.

If you have a motor with a parallel key groove and parallel key, the parallel key must not be inserted during commissioning without output component or it must be appropriately secured.

▸ Verify the function of the holding brake.

- Is the holding brake able to hold the maximum acting load?
- Is the holding brake released prior to the start of a movement?

Observe the information on commissioning in the product manual of the drive.

0198441113987, V2.00, 02.2012

6 Diagnostics and troubleshooting

6

6.1 Diagnostics and troubleshooting

6.1.1 Mechanical problems

Error	Cause	Troubleshooting
Excessive heat	Overload	Reduce load
	Holding brake not released	Check the holding brake controller
	Heavy pollution	Clean the motor
Whistling or knocking noise	Rolling bearings	Contact service
Grinding noise	Rotating output component grinds	Align output component
Radial oscillation	Poor alignment of output component	Align output component
	Output component out of balance	Balance output component
	Shaft bent	Contact service
	Resonance with mounting elements	Check the stiffness of the motor mounting
Axial oscillation	Poor alignment of output component	Align output component
	Shocks of the output component	Check output component
	Resonance with mounting elements	Check the stiffness of the motor mounting

6.1.2 Electrical problems

Error	Cause	Troubleshooting
Motor does not start or starts with problems	Overload	Reduce load
	Unsuitable settings for the drive	Check drive settings
	Cable damaged	Check cables and connections
Excessive heat	Overload	Reduce power
Heat at the connection terminals	Connector loose or not tightened	Tighten connector

0198441113987, V2.00, 02.2012

0198441113987, V2.00, 02.2012

7 Accessories and spare parts

7

7.1 Connectors

Description	Order no.
Encoder connector (cable end) for motor M23, 5 pcs	VW3M8214
Encoder connector (cable end) for drive RJ45 (10 pins), 5 pcs	VW3M2208
Motor connector (cable end) M23, 1.5 ... 2.5 mm^2, 5 pcs	VW3M8215
Motor connector (cable end) M40, 4 mm^2, 5 pcs	VW3M8217
Motor connector (cable end) M40, 6 ... 10 mm^2, 5 pcs	VW3M8218

Extras The tools required for cable assembly can be ordered directly from the manufacturer.

- Crimping tool for encoder connector M23:
  Coninvers SF-Z0007 www.coninvers.com
- Crimping tool for power connector M23/M40:
  Coninvers SF-Z0008 www.coninvers.com
- Crimping tools for encoder connector RJ45 10 pins:
  Yamaichi Y-ConTool-11, Y-ConTool-20, Y-ConTool-30
  www.yamaichi.com

0198441113987, V2.00, 02.2012

7.2 Motor cables

7.2.1 Motor cables 1.5 mm^2

Description	Order no.
Motor cable 1.5 m, [(4 x 1.5 mm^2) + 2 x (2 x 0.75 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3E1143R15
Motor cable 3 m, [(4 x 1.5 mm^2) + 2 x (2 x 0.75 mm^2)] shielded; motor 8-pin circular connector M23, other cable end open	VW3E1143R30
Motor cable 5 m, [(4 x 1.5 mm^2) + 2 x (2 x 0.75 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3E1143R50
Motor cable 10 m, [(4 x 1.5 mm^2) + 2 x (2 x 0.75 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3E1143R100
Motor cable 15 m, [(4 x 1.5 mm^2) + 2 x (2 x 0.75 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3E1143R150
Motor cable 20 m, [(4 x 1.5 mm^2) + 2 x (2 x 0.75 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3E1143R200
Motor cable 25 m, [(4 x 1.5 mm^2) + 2 x (2 x 0.75 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3E1143R250
Motor cable 50 m, [(4 x 1.5 mm^2) + 2 x (2 x 0.75 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3E1143R500
Motor cable 75 m, [(4 x 1.5 mm^2) + 2 x (2 x 0.75 mm^2)] shielded; motor end 8-pin circular connector M23, other cable end open	VW3E1143R750

0198441113987, V2.00, 02.2012

7.2.2 Motor cables 2.5 mm²

Description	Order no.
Motor cable 3 m, [(4 x 2.5 mm²) + 2 x (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1145R30
Motor cable 5 m, [(4 x 2.5 mm²) + 2 x (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1145R50
Motor cable 10 m, [(4 x 2.5 mm²) + 2 x (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1145R100
Motor cable 15 m, [(4 x 2.5 mm²) + 2 x (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1145R150
Motor cable 20 m, [(4 x 2.5 mm²) + 2 x (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1145R200
Motor cable 25 m, [(4 x 2.5 mm²) + 2 x (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1145R250
Motor cable 50 m, [(4 x 2.5 mm²) + 2 x (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1145R500
Motor cable 75 m, [(4 x 2.5 mm²) + 2 x (2 x 1 mm²)] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1145R750

0198441113987, V2.00, 02.2012

7.2.3 Motor cables 4 mm²

Description	Order no.
Motor cable 3 m, [(4 x 4 mm²) + (2 x 1 mm²) + (2 x 1.5 mm²] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1153R30
Motor cable 5 m, [(4 x 4 mm²) + (2 x 1 mm²) + (2 x 1.5 mm²] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1153R50
Motor cable 10 m, [(4 x 4 mm²) + (2 x 1 mm²) + (2 x 1.5 mm²] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1153R100
Motor cable 15 m, [(4 x 4 mm²) + (2 x 1 mm²) + (2 x 1.5 mm²] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1153R150
Motor cable 20 m, [(4 x 4 mm²) + (2 x 1 mm²) + (2 x 1.5 mm²] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1153R200
Motor cable 25 m, [(4 x 4 mm²) + (2 x 1 mm²) + (2 x 1.5 mm²] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1153R250
Motor cable 50 m, [(4 x 4 mm²) + (2 x 1 mm²) + (2 x 1.5 mm²] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1153R500
Motor cable 75 m, [(4 x 4 mm²) + (2 x 1 mm²) + (2 x 1.5 mm²] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1153R750

0198441113987, V2.00, 02.2012

7.2.4 Motor cables 10 mm^2

Description	Order no.
Motor cable 3 m, [(4 x 10 mm^2) + (2 x 1 mm^2) + (2 x 1.5 mm^2] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1154R30
Motor cable 5 m, [(4 x 10 mm^2) + (2 x 1 mm^2) + (2 x 1.5 mm^2] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1154R50
Motor cable 10 m, [(4 x 10 mm^2) + (2 x 1 mm^2) + (2 x 1.5 mm^2] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1154R100
Motor cable 15 m, [(4 x 10 mm^2) + (2 x 1 mm^2) + (2 x 1.5 mm^2] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1154R150
Motor cable 20 m, [(4 x 10 mm^2) + (2 x 1 mm^2) + (2 x 1.5 mm^2] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1154R200
Motor cable 25 m, [(4 x 10 mm^2) + (2 x 1 mm^2) + (2 x 1.5 mm^2] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1154R250
Motor cable 50 m, [(4 x 10 mm^2) + (2 x 1 mm^2) + (2 x 1.5 mm^2] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1154R500
Motor cable 75 m, [(4 x 10 mm^2) + (2 x 1 mm^2) + (2 x 1.5 mm^2] shielded; motor end 8-pin circular connector M40, other cable end open	VW3E1154R750

0198441113987, V2.00, 02.2012

7.3 Encoder cables

Description	Order no.
Encoder cable 1.5 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3E2094R15
Encoder cable 3 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3E2094R30
Encoder cable 5 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3E2094R50
Encoder cable 10 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3E2094R100
Encoder cable 15 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3E2094R150
Encoder cable 20 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3E2094R200
Encoder cable 25 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3E2094R250
Encoder cable 50 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3E2094R500
Encoder cable 75 m, [3 x (2 x 0.14 mm^2) + (2 x 0.34 mm^2)] shielded; motor end 12-pin circular connector M23, device end 10-pin connector RJ45	VW3E2094R750

0198441113987, V2.00, 02.2012

8 Service, maintenance and disposal

8

8.1 Service address

If you have any questions please contact your sales office. Your sales office staff will be happy to give you the name of a customer service office in your area.

http://www.schneider-electric.com

Schneider Electric Automation GmbH
Customer Service
Dillberg 12 - 16
97828 Marktheidenfeld
Germany
Fax: +49 (0) 93 91 / 606 - 340

8.2 Storage

The motors must be transported and stored in a dry, dust-free and vibration-free environment. The ambient conditions and application conditions specified in chapter "3.1 General features" must be met; in case of doubt you must air-condition the storage location.

The storage time is primarily determined by the service life of the lubricants; do not store the product for more than 36 months. It is recommended to periodically operate the drive solution to maintain its operability.

8.3 Maintenance

Repairs may only be made by the manufacturer. No warranty or liability is accepted for repairs made by unauthorized persons.

Repairs cannot be made with the device installed.

Prior to any type of work on the drive system, consult the chapters on Installation and Commissioning for information on the precautions and processes to be observed.

Include the following points in the maintenance plan of your machine.

Connections and fastening

- Check all connection cables and connectors regularly for damage. Replace damaged cables immediately.
- Check that all output elements are firmly seated.
- Tighten all mechanical and electrical threaded connections to the specified torque. Check the union nuts at the connection cables.

0198441113987, V2.00, 02.2012

Lubricating the shaft sealing ring

In the case of motors with shaft sealing ring, lubricant must be applied to the space between the sealing lip of the shaft sealing ring and the shaft with a suitable non-metallic tool. If the shaft sealing rings are allowed to run dry, the service life of the shaft sealing rings will be significantly reduced.

Cleaning

⚠ WARNING

UNEXPECTED MOVEMENT

If the permissible ambient conditions are exceeded, external substances from the environment may penetrate and cause unexpected movement or equipment damage.

- Verify that the ambient conditions are met.
- Do not allow seals to run dry.
- Keep liquids from getting to the shaft bushing (for example in mounting position IM V3).
- Do not expose the shaft sealing rings and cable entries to the direct spray of a pressure washer.

Failure to follow these instructions can result in death, serious injury or equipment damage.

Clean dust and dirt off the product at regular intervals. Insufficient heat dissipation to the ambient air may excessively increase the temperature.

Motors are not suitable for cleaning with a pressure washer. The high pressure may force water into the motor.

When using solvents or cleaning agents, verify that the cables, cable entry seals, O-rings and motor paint are not damaged.

Checking/running in the holding brake

Occasional braking while the load moves helps to maintain the holding torque of the holding brake. If the brake does not work mechanically for an extended period of time, parts of the holding brake may corrode. Corrosion reduces the holding torque.

The holding brake is factory run in. If the brake does not work mechanically for an extended period of time, parts of the holding brake may corrode. If the holding brake does not have the holding torque indicated in the technical data, it must be run in again.

- The motor is dismounted. The holding brake is applied.
- ▸ Check the holding torque of the holding brake using a torque wrench.
- ▸ Compare the value to the specified holding torque of the holding brake when it was delivered. See " Technical data holding brake" in chapter "3.5.1 Holding brake"
- ▸ If the holding torque of the holding brake considerably differs from the specified values, manually rotate the motor shaft by 25 rotations in both directions.
- ▸ Repeat the process. Contact your sales office if you cannot restore the original holding torque by repeating the process 3 times.

Replacing the rolling bearing

The customer must not replace the rolling bearing. The motor will be partially demagnetized by this procedure and lose power.

0198441113987, V2.00, 02.2012

8.4 Changing the motor

⚠ WARNING

UNINTENDED MOVEMENT DUE TO CHANGED ABSOLUTE POSITION

If you replace the motor, the absolute position of the encoder changes.

- Reset the absolute position of the encoder after having replaced the motor.

Failure to follow these instructions can result in death, serious injury or equipment damage.

- ▸ Switch off all supply voltages. Verify that no voltages are present (safety instructions).
- ▸ Label all connections and uninstall the product.
- ▸ Note the identification number and the serial number shown on the product nameplate for later identification.
- ▸ Install the new product as per chapter "4 Installation".
- ▸ Commission the product as per chapter "5 Commissioning".

8.5 Shipping, storage, disposal

Note the ambient conditions in chapter "3.1 General features".

Shipping The product must be protected against shocks during transportation. If possible, use the original packaging for shipping.

Storage The product may only be stored in spaces where the specified permissible ambient conditions are met.
Protect the product from dust and dirt.

Disposal The product consists of various materials that can be recycled. Dispose of the product in accordance with local regulations.

0198441113987, V2.00, 02.2012

0198441113987, V2.00, 02.2012

9 Glossary

9

9.1 Units and conversion tables

The value in the specified unit (left column) is calculated for the desired unit (top row) with the formula (in the field).

Example: conversion of 5 meters [m] to yards [yd]
5 m / 0.9144 = 5.468 yd

9.1.1 Length

	in	ft	yd	m	cm	mm
in	-	/ 12	/ 36	* 0.0254	* 2.54	* 25.4
ft	* 12	-	/ 3	* 0.30479	* 30.479	* 304.79
yd	* 36	* 3	-	* 0.9144	* 91.44	* 914.4
m	/ 0.0254	/ 0.30479	/ 0.9144	-	* 100	* 1000
cm	/ 2.54	/ 30.479	/ 91.44	/ 100	-	* 10
mm	/ 25.4	/ 304.79	/ 914.4	/ 1000	/ 10	-

9.1.2 Mass

	lb	oz	slug	kg	g
lb	-	* 16	* 0.03108095	* 0.4535924	* 453.5924
oz	/ 16	-	* $1.942559*10^{-3}$	* 0.02834952	* 28.34952
slug	/ 0.03108095	/ $1.942559*10^{-3}$	-	* 14.5939	* 14593.9
kg	/ 0.45359237	/ 0.02834952	/ 14.5939	-	* 1000
g	/ 453.59237	/ 28.34952	/ 14593.9	/ 1000	-

9.1.3 Force

	lb	oz	p	dyne	N
lb	-	* 16	* 453.55358	* 444822.2	* 4.448222
oz	/ 16	-	* 28.349524	* 27801	* 0.27801
p	/ 453.55358	/ 28.349524	-	* 980.7	* $9.807*10^{-3}$
dyne	/ 444822.2	/ 27801	/ 980.7	-	/ $100*10^{3}$
N	/ 4.448222	/ 0.27801	/ $9.807*10^{-3}$	* $100*10^{3}$	-

9.1.4 Power

	HP	W
HP	-	* 746
W	/ 746	-

0198441113987, V2.00, 02.2012

9.1.5 Rotation

	min^{-1} (RPM)	**rad/s**	**deg./s**
min^{-1} (RPM)	-	* π / 30	* 6
rad/s	* 30 / π	-	* 57.295
deg./s	/ 6	/ 57.295	-

9.1.6 Torque

	lb·in	**lb·ft**	**oz·in**	**Nm**	**kp·m**	**kp·cm**	**dyne·cm**
lb·in	-	/ 12	* 16	* 0.112985	* 0.011521	* 1.1521	* $1.129*10^6$
lb·ft	* 12	-	* 192	* 1.355822	* 0.138255	* 13.8255	* $13.558*10^6$
oz·in	/ 16	/ 192	-	* $7.0616*10^{-3}$	* $720.07*10^{-6}$	* $72.007*10^{-3}$	* 70615.5
Nm	/ 0.112985	/ 1.355822	/ $7.0616*10^{-3}$	-	* 0.101972	* 10.1972	* $10*10^6$
kp·m	/ 0.011521	/ 0.138255	/ $720.07*10^{-6}$	/ 0.101972	-	* 100	* $98.066*10^6$
kp·cm	/ 1.1521	/ 13.8255	/ $72.007*10^{-3}$	/ 10.1972	/ 100	-	* $0.9806*10^6$
dyne·cm	/ $1.129*10^6$	/ $13.558*10^6$	/ 70615.5	/ $10*10^6$	/ $98.066*10^6$	/ $0.9806*10^6$	-

9.1.7 Moment of inertia

	lb·in^2	**lb·ft^2**	**kg·m^2**	**kg·cm^2**	**kp·cm·s^2**	**oz·in^2**
lb·in^2	-	/ 144	/ 3417.16	/ 0.341716	/ 335.109	* 16
lb·ft^2	* 144	-	* 0.04214	* 421.4	* 0.429711	* 2304
kg·m^2	* 3417.16	/ 0.04214	-	* $10*10^3$	* 10.1972	* 54674
kg·cm^2	* 0.341716	/ 421.4	/ $10*10^3$	-	/ 980.665	* 5.46
kp·cm·s^2	* 335.109	/ 0.429711	/ 10.1972	* 980.665	-	* 5361.74
oz·in^2	/ 16	/ 2304	/ 54674	/ 5.46	/ 5361.74	-

9.1.8 Temperature

	°F	**°C**	**K**
°F	-	(°F - 32) * 5/9	(°F - 32) * 5/9 + 273.15
°C	°C * 9/5 + 32	-	°C + 273.15
K	(K - 273.15) * 9/5 + 32	K - 273.15	-

9.1.9 Conductor cross section

AWG	1	2	3	4	5	6	7	8	9	10	11	12	13
mm^2	42.4	33.6	26.7	21.2	16.8	13.3	10.5	8.4	6.6	5.3	4.2	3.3	2.6

AWG	14	15	16	17	18	19	20	21	22	23	24	25	26
mm^2	2.1	1.7	1.3	1.0	0.82	0.65	0.52	0.41	0.33	0.26	0.20	0.16	0.13

0198441113987, V2.00, 02.2012

9.2 Terms and Abbreviations

See chapter "2.5 Standards and terminology" for information on the pertinent standards on which many terms are based. Some terms and abbreviations may have specific meanings with regard to the standards.

Axial forces Tension or compression forces acting longitudinally on the shaft

Centering collar Centering device at the motor flange that allows for accurate motor mounting.

DOM **D**ate **o**f **m**anufacturing: The nameplate of the product shows the date of manufacture in the format DD.MM.YY or in the format DD.MM.YYYY. Example:
31.12.09 corresponds to December 31, 2009
31.12.2009 corresponds to December 31, 2009

Degree of protection The degree of protection is a standardized specification for electrical equipment that describes the protection against the ingress of foreign objects and water (for example: IP 20).

EMC Electromagnetic compatibility

Encoder Sensor that converts a measured distance or angle into an electrical signal. This signal is evaluated by the drive to determine the actual position of a shaft (rotor) or a driving unit.

Error Discrepancy between a detected (computed, measured or signaled) value or condition and the specified or theoretically correct value or condition.

Error class Classification of errors into groups. The different error classes allow for specific responses to errors, for example by severity.

Fatal error In the case of fatal error, the product is no longer able to control the motor so that the power stage must be immediately disabled.

Fault Fault is a state that can be caused by an error. Further information can be found in the pertinent standards such as IEC 61800-7, ODVA Common Industrial Protocol (CIP).

Fault reset A function used to restore the drive to an operational state after a detected error is cleared by removing the cause of the error so that the error is no longer active.

Length In the type code, the length is defined in terms of the number of stacks.

PELV Protective Extra Low Voltage, low voltage with isolation. For more information: IEC 60364-4-41

PTC Resistor with positive temperature coefficient. Resistance value increases as the temperature rises.

Radial forces Forces that act radially on the shaft

Size In the type code, the size is defined in terms of the flange size.

Warning If the term is used outside the context of safety instructions, a warning alerts to a potential problem that was detected by a monitoring function. A warning does not cause a transition of the operating state.

0198441113987, V2.00, 02.2012

0198441113987, V2.00, 02.2012

10 Table of figures

10

0198441113987, V2.00, 02.2012

0198441113987, V2.00, 02.2012

11 Index

11

0198441113987, V2.00, 02.2012

0198441113987, V2.00, 02.2012

W

0198441113987, V2.00, 02.2012