Servodyn-G

Servodyn-G(C)16
Connection conditions

Version 103

BOSCH
Automationstechnik

Servodyn-G

Servodyn-G(C)16
Connection conditions

1070 073 260-103 (97.02) GB

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Discretionary charge 20.– DM

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A Appendix

1 Safety instructions

This manual contains information which is required for the correct use of the products described here.

It is intended for technically qualified personnel who have been specifically trained in or who have relevant knowledge of measuring technology and automatic control engineering.

1.1 Markings on the drive components

The following symbols are found on various components and are used as warnings to point out possible danger, or to call your attention to important information:


➧ Danger due to high voltage.


➧ Electrostatically sensitive devices


➧ PE conductor


➧ Screen


➧ Protect from impact and jolts


➧ Danger from hot surfaces > 60 °C

☞ **Note** **The hazard warning signs accompanying the motors**
– dangerous electrical voltage and
– hot surfaces
must, in accordance with Machine Guideline 89/392/EEC, be attached where they are clearly visible and after installation of the motors, when it is safe to touch the motors.

1.2 Hazard warnings in the manual

Observe and comply with the safety notes and danger warnings given in this manual (“DANGER”, “CAUTION”, and the highlighted information provided under “Note”) in order to avoid serious injury and property damage.

All safety instructions are numbered sequentially in accordance with the chapter in which they appear, for example 1.1. The Appendix provides translations of the safety instructions in all official EC languages.

1.3 Qualified personnel

1.1

! DANGER !

Maintenance and installation of the components to be carried out only by electrotechnicians (VDE 1000-10) in compliance with the accident prevention regulations (UVV VBG4, VDE 100, VDE 105) and installation regulations (EN 60204-part 1, prEN 60204).

Tampering with the drive components, ignoring warning signs attached to the components, or noncompliance with the warning notes given in this manual can result in serious bodily injury or property damage.

For this reason, only **electrotechnicians** as recognized under VDE 1000-10 who are familiar with the contents of this manual may perform the procedures as authorized in this manual.

Such personnel are

- those who, being well trained and experienced in their field and familiar with the relevant norms, are able to analyse the jobs being carried out and recognise any hazards which may have arisen.
- those who have acquired the same amount of expert knowledge through years of experience that would normally be acquired through formal technical training.

Please note that we provide a comprehensive training program. You will find an overview of our seminar program on the inside back page.
Our training centre will be pleased to provide you with further information.

1.4 Proper use

The drive inverters described are components to be installed in the metal switch cabinets of machines and systems for **industrial** use.
With the appropriate adjustments and extensions they can also be used for **commercial** applications.

❑ The inverters themselves with the order numbers designated in section 10.1 meet the protection standard goals of the undervoltage guideline (73/23/EEC) and the co-ordinated norms prEN 50178 (VDE 0160) and EN 60146-1-1 (VDE 0558-11).

The low voltage motors described are intended for **commercial or industrial** systems. They correspond to the harmonised norms belonging to the VDE 0530/EN 60034 series. They must not be employed in hazardous areas unless additional information specifies otherwise.
The conditions at the place of employment should meet the requirements specified on the rating plate.

❑ Before putting the drive inverters and motors into operation, ensure that the machine in which the inverters are to be installed meets the stipulations of the Machine Guideline (89/392/EEC) and the EMC guideline (89/336/EEC).

These products pose no danger to persons or property if they are used in accordance with the handling stipulations and safety notes prescribed for their configuration, mounting, and proper use.

! DANGER !

The safe and reliable operation of this product requires proper transport, storage, set-up and assembly as well as conscientious operation.

1.2

Ensure that no components are bent and none of the insulation distances are changed at the inverters. Do not touch any electronic components and contacts.

CAUTION !

Drive inverters contain electrostactically sensitive components, which can easily be destroyed if handled improperly.

1.3

! DANGER !

Do not allow installed electrical components to be destroyed, as this may lead to the sustainment of personal injury.

1.4

1.5 Manufacturer's declaration

EG-Herstellererklärung
EC Manufactures' Declaration
Déclaration de fabrikant CE

Hiermit erklären wir, daß unser Produkt, Typ:
We hereby declare that our produkt, type:
Nous déclarons par la présente que notre produit, type:

SG–XX.XXX.XXX–YY.ZZZ

X= beliebig
Y, Z= siehe Anlage, beiliegend

folgenden einschlägigen Bestimmungen entspricht:
complies with the following relevant provisions:
correspond aux dispositions pertinentes suivantes:

☐ **Maschinenrichtlinie** (89/392/EWG, 91/368/EWG, 93/68/EWG und 93/44/EWG)
Machine guidelines (89/392/EEC, 91/368/EEC, 93/68/EEC and 93/44/ECC)
Directive sur les machines (89/392/CEE, 91/368/CEE, 93/68/CEE et 93/44/CEE)

Angewendete harmonisierte Normen, insbesondere:
Applied harmonized standards, in particular:
Normes harmonisée utilisées, notamment:

EN 60204 – 1
EN 60034 – 1
EN 60034 – 5
VDE 0110, Teil 1 und Teil 2

Hinweis: Die Inbetriebnahme ist so lange untersagt, bis festgestellt wurde, daß die Mascshine, in die unser Produkt eingebaut werden soll, den Bestimmungen dieser Richtlinie entspricht.

Note: Commissioning is prohibited until ist has been determind, that the maschine in which our produkt is to be installed, meets the guideline specifications.

Remarque: La mise en service est interdite tant qu'il n'a pas été constaté que la machine dans laquelle notre produit doit être monté est conforme aux dispositions de cette directive.

5.6.1996
Datum / Unterschrift / Entwicklungsleitung

5.6.96
Datum / Unterschrift / Produktbereichsleitung

BOSCH

Robert Bosch GmbH
Geschäftsbereich Industrieausrüstung
Produktbereich Industrielle Steuerungselektronik
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Z.Nr. 1070074997-102_476, Blatt 1v2

Supplement to EC Manufacturer's Declaration

YY (Code) Meaning

● = Equipment options

Code	Standard equipment with smooth shaft and without mating connector	Shaft with keyway and featherkey	Holding brake	
			small	large
00		●		
03		●	●	
04		●		●
10	●			
13	●		●	
14	●			●

ZZZ (Code) Meaning

000	Flange accuracy N
010	Flange accuracy R
015	Driving-end shaft gland in IP 67
029	Straight flange sockets

BOSCH IA 1	Designation List of variants	Pages: 2
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054120 – 101411

Your notes:

2 Inverter system Servodyn–G(C)16

2.1 Notes

Automation is a fundamental key to the economical production of industrial products.
Drive engineering plays a central role in production sequences. Reliability and dynamic response are essential conditions for the attainment of a high level of productivity.
Servodyn–G(C)16 meets these requirements in full. The digital servomodules in the 100 W to 2 kW power range offer exact reproduction, functionality of the highest level and flexibility for future expansions.
The employment of modern power electronics has raised the frequency of pulse-width modulation to 10 kHz, resulting in less motor loss. In addition, the use of resolvers yields an extremely robust motor while simultaneously allowing positioning tasks without supplemental encoders.

Typical applications can be found in the following fields:

- Robotics
- Industrial handling technology
- Packing machines
- Printing machines
- Textile manufacturing
- Special machines

Across-the-board use of digital technology offers the user fundamental advantages not only in operation procedures but in the application as well:

- **Digital control loops**
  Digital signal processing offers drift-free, reproducible behaviour which means that phenomena associated with temperature and aging disappear.

- **Modern control processes**
  These processes allows increased loop gains and thus increased torsional stiffness, which in turn means higher positioning accuracy.

- **Implementation of complex functions into the software**
  The higher functionality has no subsequent additional hardware costs; the price:performance ratio is considerably better than with analog servo controllers.

- **Communication via a graphic user interface**
  Simple commissioning, the ability to store application-specific data on disc, and a comprehensive range of diagnosis capabilities all mean reduced cost and time.

- **Digital control via CAN bus possible**
  Digital coupling of the drives via the CAN bus is possible in conjunction with the robot controller rho3.
  For further information refer to the “rho3 Connection conditions”, “rho3 Description of machine parameters”, “rho3 Signal description, error messages” manuals.

2.2 Design and function of the inverters

A typical Servodyn−G drive consists of the following components:

- Transformer TR...−G
- Supply module VM...−G
- Servomodule SM...−G(C)16
- Module rack with bus board BT...−G(C)
- Servo motor SG

Transformer

For power requirements in excess of 2.5 kW, or if a 1 x 230 V or 3 x 230 V connection voltage is unavailable, a transformer is used to match mains voltage.

Supply module

The supply module produces the d.c. link voltage by rectifying and smoothing the power supply input voltage. The latent energy produced by fast braking of the motor is removed via a ballast resistor. The LED status display allows quick diagnosis in case of malfunctions. One relay output allows subsequent evaluation by means of the user control.

Servo module

The servo module is responsible for the electronic commutation of the Type SG brushless servo motors. It closes the speed control loop and provides a 3-phase sinusoidal motor current which is controlled by a current controller of a high band width. The LED status display allows quick diagnosis in case of malfunctions. Two relay outputs allow subsequent evaluation by means of the user control.

Module rack with bus boards

The module rack is used to hold the modules and the bus boards.
The bus board connects the supply module with the servo modules. Here also are located the interfaces used for communication with the user and the motors.

Servo motor

The standard Type SG brushless servo motor consists of a wound stator, a 2-pole resolver, and an NTC thermistor integrated in the stator's winding overhang.

2.3 Design and function of the SG range of motors

Type SG servo motors are permanent-field motors for inverter operations with electronic commutation. The permanent magnets of the rotor consist of rare-earth material, so that the SR motors are, through their low inertia, able to fulfill the highest dynamic demands.
A robust brushless drive has been integrated for speed regulation and rotor position detection.

Important features are:

Very high dynamic response	due to low motor moment of inertia
High load carrying capacity	by means of direct heat dissipation to the outside and a high thermal time constant
Low torque ripple	by means of sinusoidal motor EMF
Maintenance-free operation	because of the brushless design with resolver
Long service life	provided by prestressed closed bearings with permanent lubrication
High protection standard	provided by the IP 65 housing construction
Compact design	throughout the entire power range

2.4 Consistent norms

2.4.1 Inverters

Construction guidelines	DIN VDE 0160
Measurement of air clearances and leakage paths	VDE 0110 Part 2
Insulation coordination	VDE 0110 Part 1
General safety requirements	DIN VDE 0160
Safe separation	DIN VDE 0160
Marking	DIN VDE 0160
Earthing	DIN VDE 0160
Overvoltage protection	DIN VDE 0160

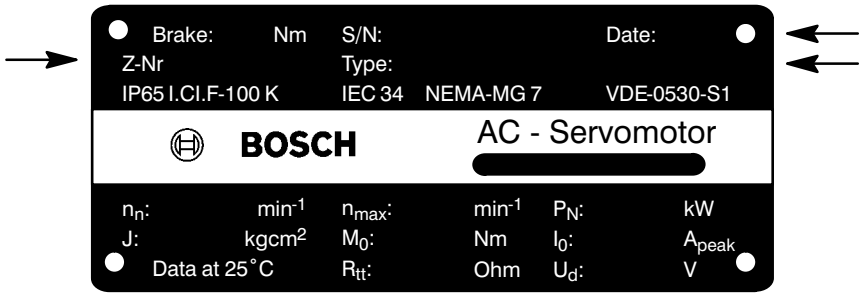
Ambient conditions	IEC 68 Parts 2-3, 2-6
Short-circuit resistance	DIN VDE 0160
Mechanical strength	IEC 68 Part 2-29
Protection through limitation of discharge energy	DIN VDE 0160
Type check	DIN VDE 0160
EMC can only be complied with if using an input filter in the supply voltage	VDE 0871, EN 55011, EN 50082-1

2.4.2 Servo motors

Design of motors	IEC 34 Part 7
Insulation coordination	VDE 0110 Parts 1 and 2
Cylindrical shaft ends	DIN 748 Parts 1 and 3
Mechanical oscillations (class N)	DIN ISO 2373
Quality system	DIN ISO 9001
Protection standard (IP 65)	DIN 40050
Attachment flange	DIN 42948
Cycle run of the shaft end (N or R)	DIN 42955
Ball bearings for electrical machines	DIN 42966
Measuring data and operating values	DIN VDE 0530 Part 1
Insulation class (F)	DIN VDE 0530 Part 1
Featherkey (optional)	DIN 6885
Connector	DIN VDE 0627
Servo motor	NEMA MG-7-1989

2.5 Motor rating plate

Motors SG – B...



For servicing or in case you have any queries, always provide the type designation, the Z no. and the S/N no.

☞ **Note** **For servicing, please use our fault report card in order to speed up diagnosis and processing.**

Your notes:

3 Monitor functions

To protect the drive modules, monitor functions have been built-in, which switch off the module and report the error via an LED.
The modules signal via the contacts that they are ready for operation:

- ○ BTB1 : Warning message SM
- ○ BTB2 : Error message VM (supply module)
- ○ BTB_{ent} : Entire drive assembly error message

Errors are, in addition, protocolled in the module. All errors since the last enable can be requested via the PC with the command '?F'.

3.1 Servo module

1. Errors leading to immediate shut-down of all modules

- □ Short circuit in the power output stage in the SM
- □ Error in the MCO module
- □ Processor fault
- □ Temperature error in SM:
  Heat sink temperature SM 3.5/8 > 95 ˚C
  SM 4.7/20 > 110 ˚C
  SM 6.5/30 > 110 ˚C
  SM 18/60 > 104 ˚C
- □ Resolver error in motor
- □ Temperature error in motor:
  Winding temperature > 140 ˚C

Effect:

- – BTB_{ent} contact opens
- – Enable is disabled

2. Warning messages

- □ Temperature warning SM:
  Heat sink temperature > 70 ˚C or output stage too hot
- □ Temperature warning, motor:
  Winding temperature > 120 ˚C

Effect:

- – BTB1 contact opens
- – Module current is reduced independently of temperature rise
- – If the module current is reduced to zero, the BTB_{ent} contact (temperature error) opens.

Reset After an error is rectified, an enable command must be given (positive slope required) in order to resume operations.

3.2 Supply modules

1. Errors leading to immediate shut-down of all modules

- □ Internal supply voltages not ready
- □ Overvoltage:
  DC link voltage 50 V DC < U_{DC} < 400 V DC
- □ Temperature error in VM:
  Heat sink temperature too high

Effect:

- – BTB_{ent} contact opens
- – Enable is disabled

- □ Phase failure:
  Missing network phase
  (must be switched off during single phase operation)

Effect:

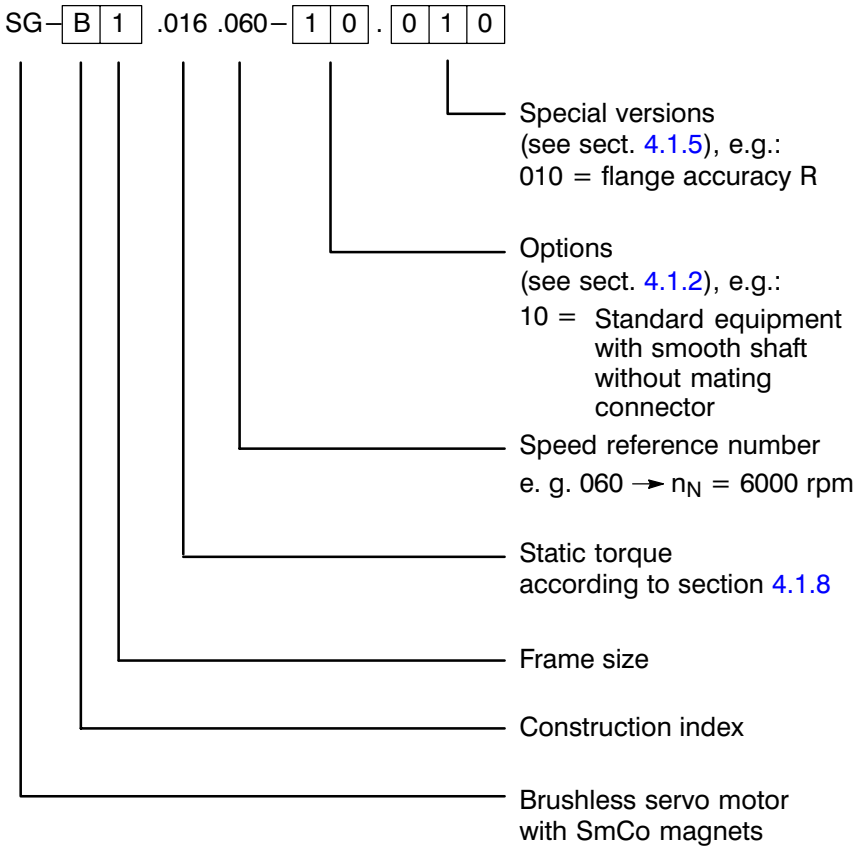
- – BTB2 contact opens

Reset The mains voltage is switched off. The external 24 V supply need not be switched off.
Switch back on after an interval of 5 seconds.

4 Technical data

4.1 Servo motors

4.1.1 Type designation



4.1.2 Options

Code table of options

● = combinations of equipment

Code	Standard equipment with smooth shaft without mating connector	Shaft with keyway and featherkey	Holding brake*	
			small	large
00		●		
03		●	●	
04		●		●
10	●			
13	●		●	
14	●			●

* Installed by manufacturer

The equipment combinations in the code table consist of the following options:

Code

10 Standard equipment with smooth shaft without mating connector

Mating connectors of different designs must be ordered (see specifications in section 4.1.4).

The standard equipment includes:

- IM B5 design
- Shaft without keyway and featherkey
- Vibration severity grade “N”
- Protection type IP 65, without driving-end shaft gland
- Brushless resolver
- Temperature detection device, evaluation in the inverter
- Socket for resolver and power connection

00 Shaft with keyway and featherkey

A driving-end shaft extension with featherkey and keyway in accordance with DIN 6885 for form fitted torque transmission (for dimensions, see section 11.1).
All other equipment as above with standard equipment.

Shaft connections with featherkey, spline connections and multiple-spline connections are suitable for normal requirements.
While under pressure, the shaft-to-hub connection is subjected to a state of stress affecting several axes, resulting from torsion, radial and axial forces and a flexural torque. If reversing duty is strong, the base of the featherkey may swing out, leading to a change in functioning.
We therefore recommend employing the standard equipment with a shaft without keyway and featherkey.

Code		
03/13	**Small integrated holding brake**	A holding brake is used to prevent feed axis play at standstill or when the system's power supply is interrupted or switched off. The holding brake works according to the closed-circuit current principle. The permanent magnet employed exerts a pull on the brake armature disk. This closes the brake when no current is flowing and holds the axis. When 24 V DC are applied, the permanent magnet field is cancelled by the electrically generated magnetic field and the brake is kept open. When the brake is open, there is no residual torque, wheras when the brake is closed, the axis is held without play. For relevant technical data, see section 4.1.8.
04/14	**Large integrated holding brake**	A holding brake is used to prevent feed axis play at standstill or when the system's power supply is interrupted or switched off. Functional principle as above, but with a larger holding torque. For relevant technical data, refer to Section 4.1.8.

! DANGER !

The holding brake is not a working brake and may be operated only when the shaft is stationary.
The holding brake should be checked by the manufacturer
after approx. 1,000 EMERGENCY STOP braking operations where load moment of inertia
≦ motor moment of inertia.

4.1

4.1.3 Connecting leads

Technical data:

- Outer sheath PUR 11Y in acc. with DIN 0250 part 818
- Temperature / bending radius:
  fixed installation: −30 °C to 90 °C / 7 x outer diameter
  flexible: −30 °C to 80 °C / 10 x outer diameter

All leads are drag chain-capable for:

- acceleration ≦ 5 m/sec^2
- speed ≦ 100 m/min

Ready-made leads or components available on request.

4.1.4 Mating connectors, motor end

SG motors require:
- a power connection mating connector
- a resolver mating connector

For space requirements, see the dimensioned drawing section 11.1.

	Motortyp	Mating connector, straight, with crimp contacts		
		Connection cross-section[1] [mm 2]	Permissible lead diameter [mm]	Order no.
Motor (metallic construction)	SG–B0 SG–B1 SG–B2	1,5	7.7...14.5	1070 916 990
	SG–B3.055 SG–B3.100	1,5	12...18.5	1070 917 096
	SG–B3.150 SG–B3.220	2,5	12...18.5	1070 917 096
Resolver (metallic construction)	All motors	0,25	5.5...12	1070 917 424

[1] Necessary line cross section acc. to EN 60204 Part 1/1993, Tab. 5, for installation in cable duct at 40 °C.

☞ **Note** **Avoid damage to the sockets during transport.**

Tools for connector assembly

Connector type		suitable for crimp contacts:	Hand-held crimping tool	Positioning device	Installa-tion tool	Extraction tool
Resolver connector	1070 917 424	Resolver	B 178	B 156	B 118	B 056/A
Power connector	1070 916 990	Motor + brake	B 151	B 157	–	–
	1070 917 096	Motor Brake	B 152 B 151	B 162 B 156	– B 118	– B 056/A

Please give the type designation when ordering.

4.1.5 Special versions

Code		
000	**Flange accuracy 'N'**	Standard for motors with keyway and featherkey
010	**Flange accuracy 'R'**	Standard for motors with smooth shaft
015	**Driving-end shaft gland in IP 65**	SG motors with a driving-end shaft gland in IP 65 are equipped with a PTFE rotary shaft seal.

CAUTION !

The rotary shaft seal is not pressure-sealed, and is therefore not suitable for mounting gears with no seal of their own.

4.2

4.1.6 Fitting kit

(not including installation)

Fitting kit for incremental encoder ROD 426.000B or CE 65–M (with ROD flange/shaft)
Contents: Adaptor flange, drive coupling, miscellaneous small parts for installation

☞ **Note** **Only possible for motors without a holding brake.**

Order number on request.

4.1.7 Motor data

Permissible ambient temperature	ϑ_U = 0˚ to 40 ˚C
Type of protection acc. to DIN VDE 0470, EN 60529	IP 65 without driving-end shaft gland (Optional: driving-end shaft gland in IP 65)
Design	Basic type of construction IM B5 acc. to DIN IEC 34−7, IM V1 and IM V3 also permitted. No fluids should be allowed to settle in the flange end plate with IM V3.
Flange	Flange acc. to IEC 72−2, DIN 42948
Ball bearings	Locating bearing on the driving-end (flange end). Minimum service life 20,000 h
Shaft end	Cylindrical shaft end acc. to DIN 748 without featherkey and keyway. Version with keyway and key, see Options, section 4.1.2. Shaft end with thread for mounting and removing drive elements.
Vibration severity grade	Vibration severity grades 'N' and 'R' acc. to DIN−ISO 2373. Basic version with vibration severity grade 'N' (balancing through featherkey takes place for shaft with keyway and key).
Insulation class	F acc. to VDE 0530
Cooling	Through thermal radiation and natural convection. High surface temperatures may arise at the motors. A touch guard should be provided if necessary.
Thermal motor protection	Temperature detector integrated into the winding with assessment in the appertaining servo module.
Resolver	Encoder for rotor orientation angle and spindle speed. No electronic parts in the motor.
Holding brake	Backlash-free permanent-magnet brake. See Options, section 4.1.2.

4.1.8 Performance data

	Symbol	Unit	SG – B0				SG – B1			
			002.091	004.076	007.070	014.058	006.072	016.060	023.042	034.036
Torque at standstill [1] $\Delta\theta$ w = 100 K	M_0	Nm	0.25	0.50	0.95	1.70	0.60	1.65	2.55	3.70
Nominal speed	n_N	rpm	8100	7400	6800	6200	8800	6300	4800	3900
Standstill current at M_0 $\Delta\theta$ w = 100 K	I_0	Â	0.92	1.7	3.0	4.0	2.2	4.5	4.8	5.9
Torque calculation factor θu = 40 °C; $\Delta\theta$ w = 100 K	K_R	Nm/A	0.26	0.3	0.34	0.43	0.28	0.37	0.54	0.66
Electr. time constant	J	$kgm^2 x10^{-3}$	0.009	0.013	0.022	0.041	0.016	0.039	0.062	0.097
Dimensions Flange	SW	mm	55 □				70 □			
Shaft	d x l	mm	Ø 9 x 20				Ø 11 x 23			
Length w/out h.br.	L	mm	110	123	148	199	115	140	166	204
Weight without holding brake	m	kg	1.0	1.2	1.5	2.3	1.4	2.0	2.6	3.5
Code for holding brake option			13; 03	13; 03	13; 03	13; 03	13; 03 or 14; 04			

Holding brake

Holding torque (transferrable)	M_{BR}	Nm	0.9				1.5	or	3.0	
Connection voltage	U_{BR}	V	24 V ±10 %				24V ±10%		24V ±10%	
Power input	P_{BR}	W	11				11		10	
Moment of inertia	J_{BR}	$kgm^2 x10^{-3}$	0.002				0.007		0.018	
Weight	m_{BR}	kg	0.18				0.2		0.32	

[1] Measurement of motor attached to a free-standing steel plate 300 x 300 x 12 mm.

θw = Winding temperature
θu = Ambient temperature

		Symbol	Unit	SG – B2					SG – B3					
				014.065	027.049	050.038	086.034		055.049	100.029	150.024		220.017	
Torque at standstill [1] $\Delta\theta$ w = 100 K		M_0	Nm	1.3	2.6	4.7	8.2		5.8	11.2	16.6		25	
Nominal speed		n_N	rpm	5800	5500	4300	3500		4800	3500	2700		2200	
Standstill current at M_0 $\Delta\theta$ w = 100 K		I_0	Â	4.4	6.8	9.5	13		13.4	15.6	18.2		20.9	
Torque calculation factor θu = 40°C; $\Delta\theta$ w = 100 K		K_R	Nm/A	0.32	0.41	0.54	0.66		0.45	0.73	0.93		1.26	
Electr. time constant		J	$kgm^2 x10^{-3}$	0.105	0.155	0.260	0.470		0.46	0.80	1.15		1.84	
Dimensions	Flange	SW	mm	100 ☐					140 ☐					
	Shaft	d x l	mm	Ø 19 x 40					Ø 24 x 50					
	Length w/out h.br.	L	mm	134	147	172	223		170	195	220		271	
Weight without holding brake		m	kg	3.0	3.6	4.7	6.9		7.7	9.9	12.1		16.6	
Code for holding brake option				13; 03	13; 03	13; 03	13; 03	14; 04	13; 03	13; 03	13; 03	14; 04	14; 04	13; 03

Holding brake

	Symbol	Unit					
Holding torque (transferrable)	M_{BR}	Nm	6.0	15	15	25	15
Connection voltage	U_{BR}	V	24V ±10%	24V	24V ±10%	24V±10%	24V
Power input	P_{BR}	W	13	19	19	24	19
Moment of inertia	J_{BR}	$kgm^2 x10^{-3}$	0.054	0.1	0.1	0.36	0.1
Weight	m_{BR}	kg	0.53	0.75	0.75	1.3	0.75

[1] Für die Messung Motor an einer freistehenden Stahlplatte 300 x 300 x 12 mm befestigt.

θw = Wicklungstemperatur

θu = Umgebungstemperatur

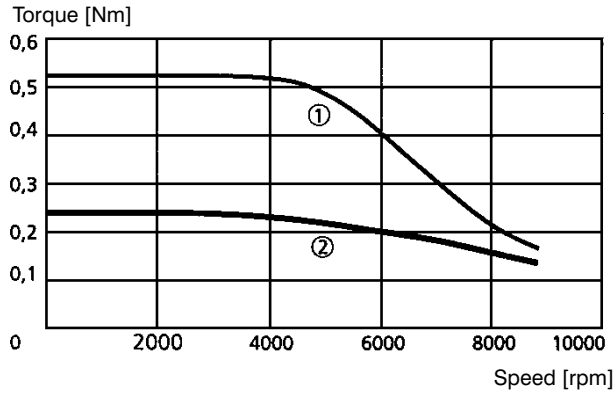
4.1.9 Speed-torque characteristics (S-1 characteristic curves)

SG–B0 motors

① Peak torque, with SM... accordingly

② Permanent torque

SG–B0.002.091 / SM 3.5/8–G(C)16



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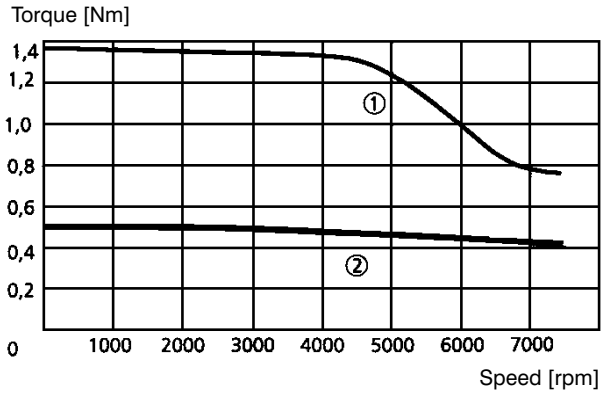
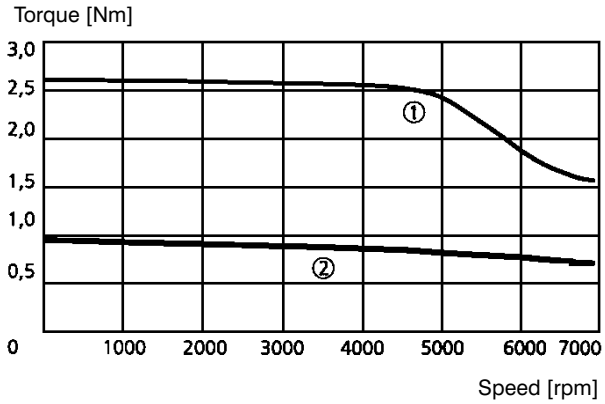
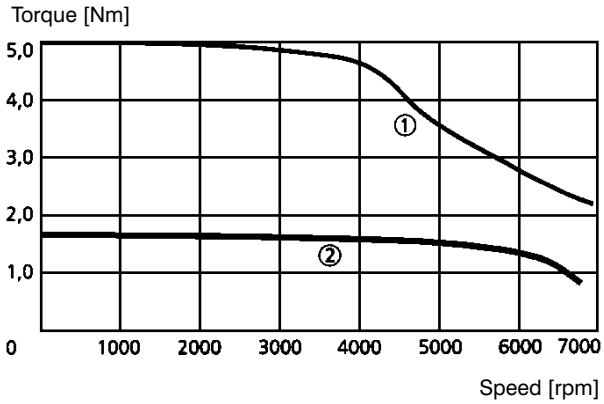


SG–B0.007.070 / SM 4.7/20–G(C)16



SG–B0.014.058 / SM 4.7/20–G(C)16

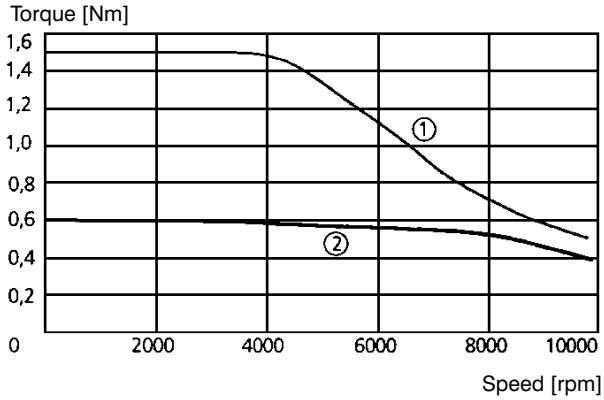


SG–B1 motors

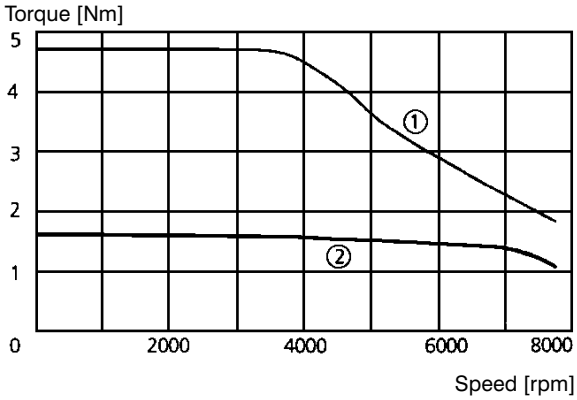
① Peak torque, with SM... accordingly

② Permanent torque

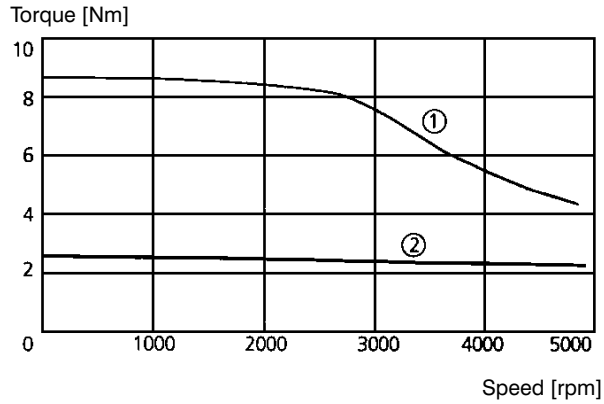
SG–B1.006.072 / SM 3.5/8–G(C)16



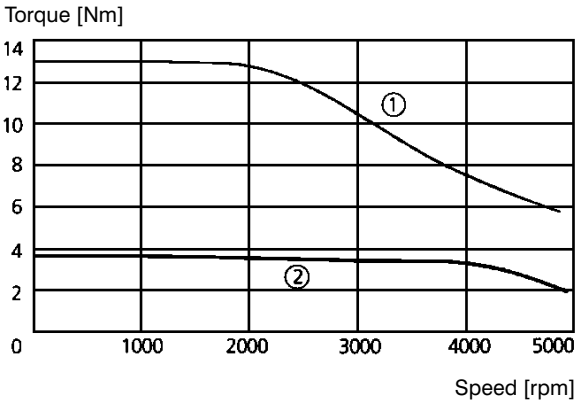
SG–B1.016.060 / SM 4.7/20–G(C)16



SG–B1.023.042 / SM 4.7/20–G(C)16

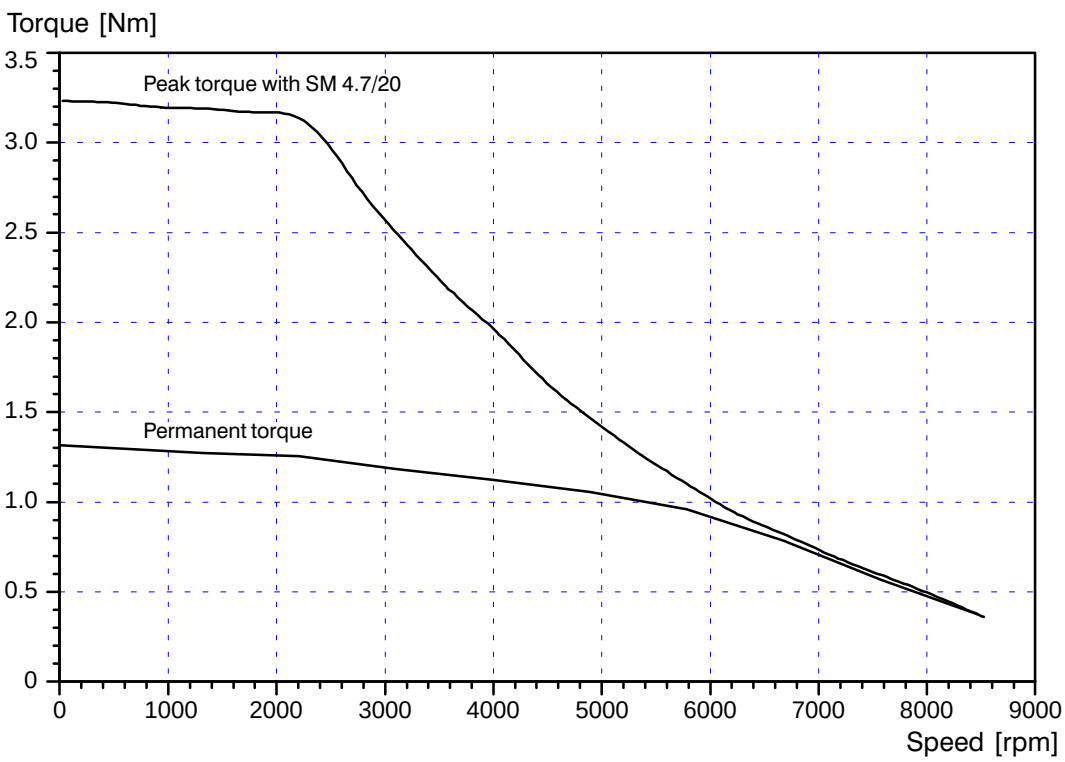


SG–B1.034.036 / SM 6.5/30–G(C)16

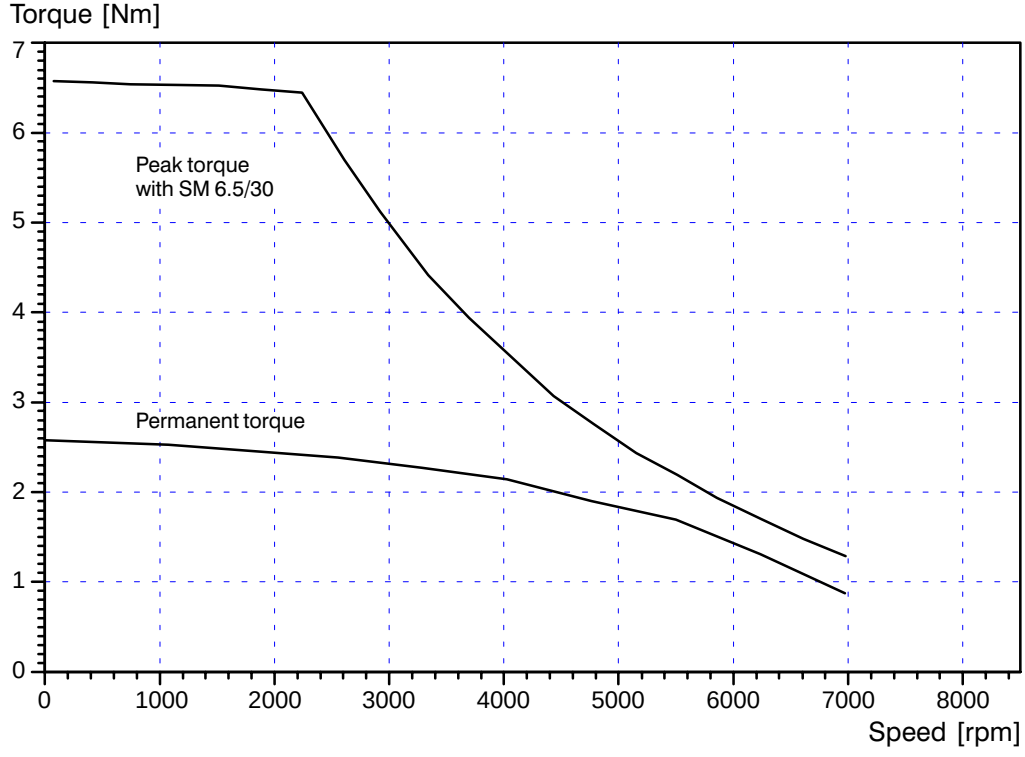


SG – B2 motors

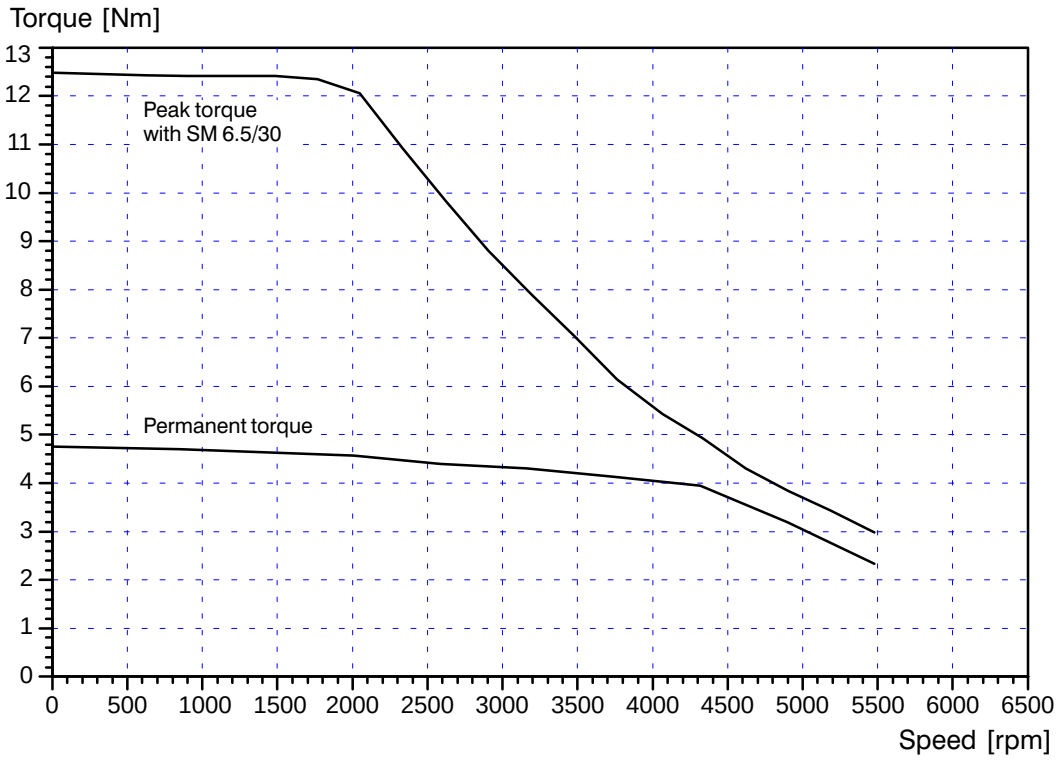
SB – B2.014.065



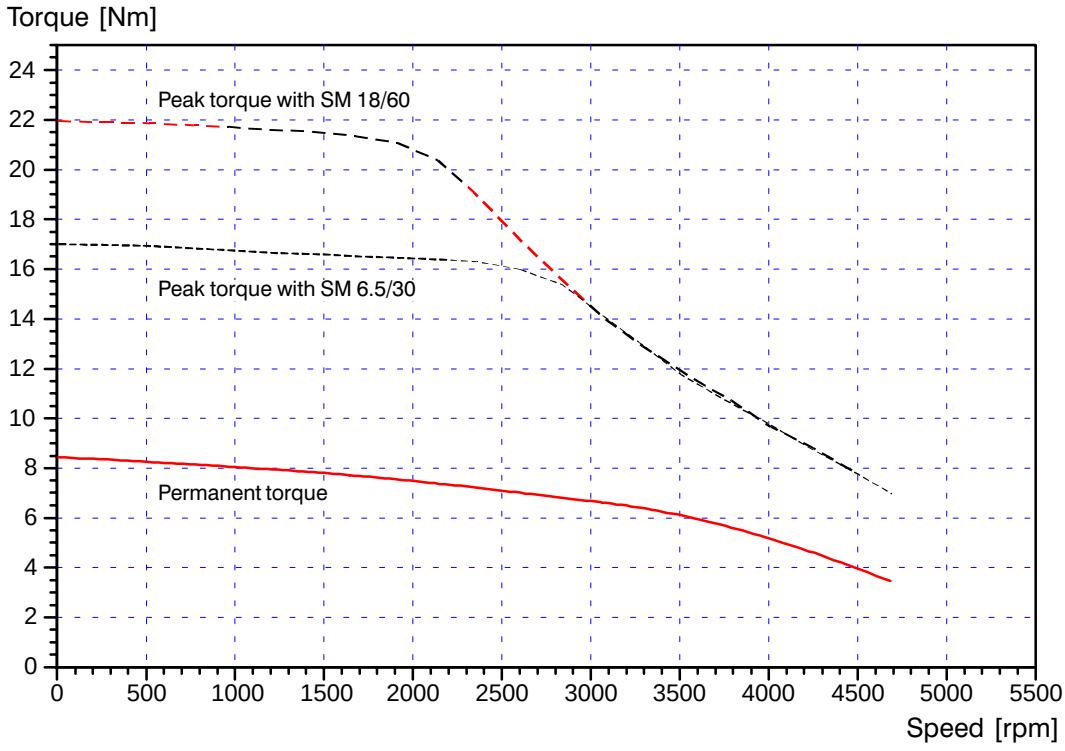
SB – B2.027.049



SB–B2.050.038

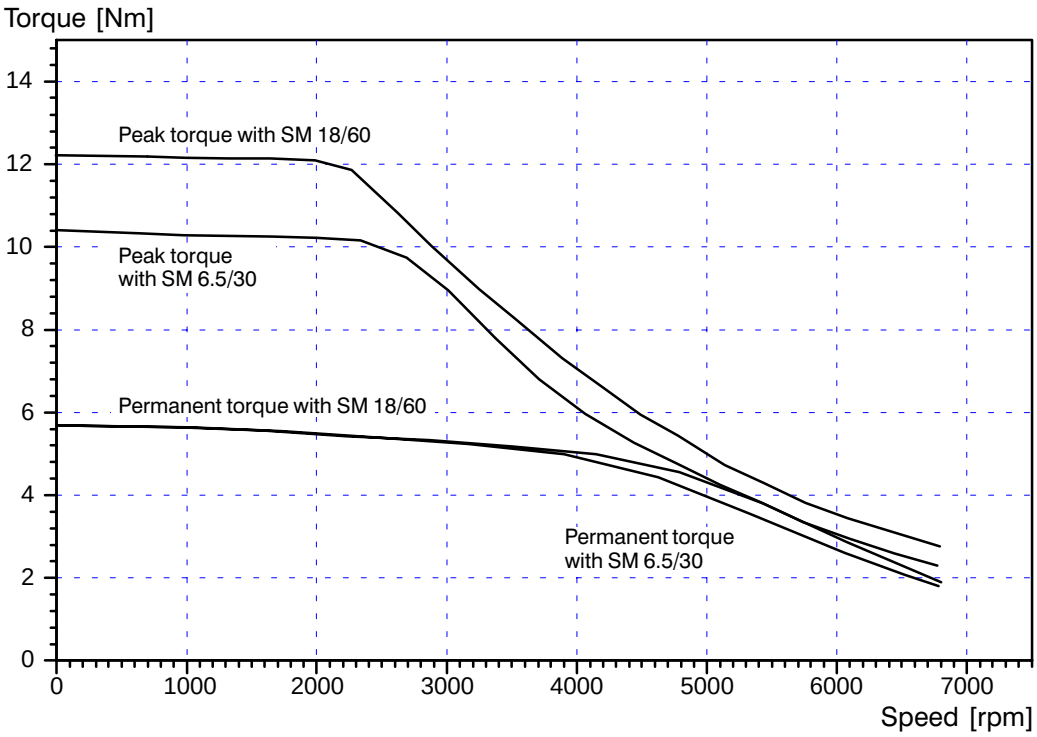


SG–B2.086.034

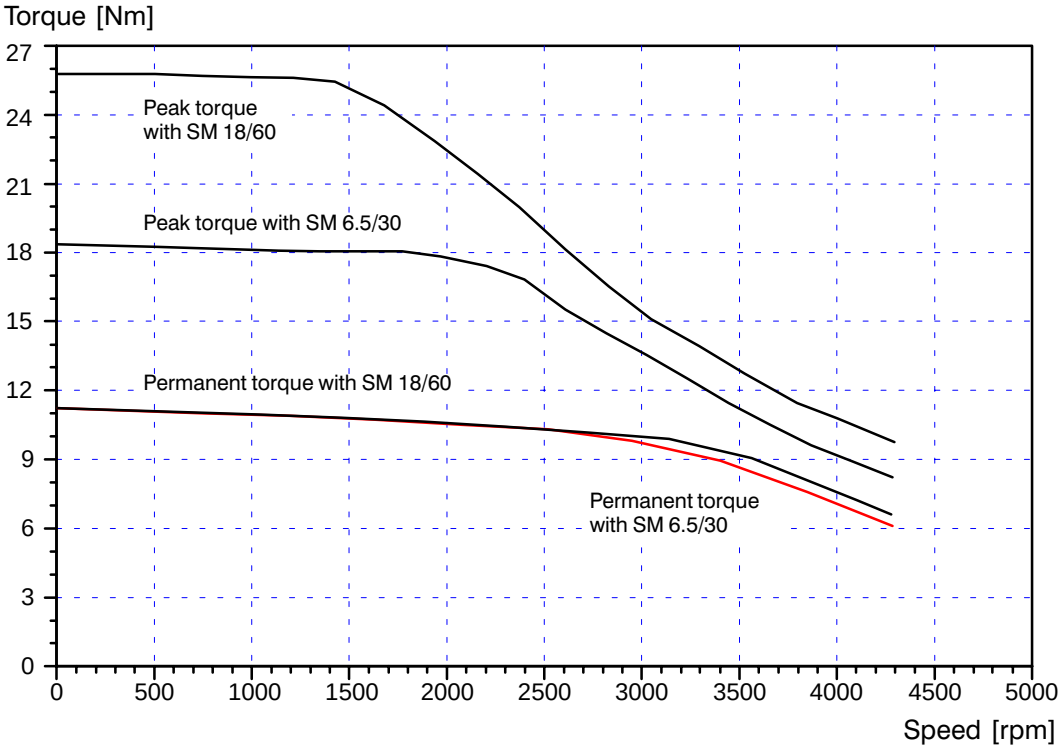


SG–B3 motors

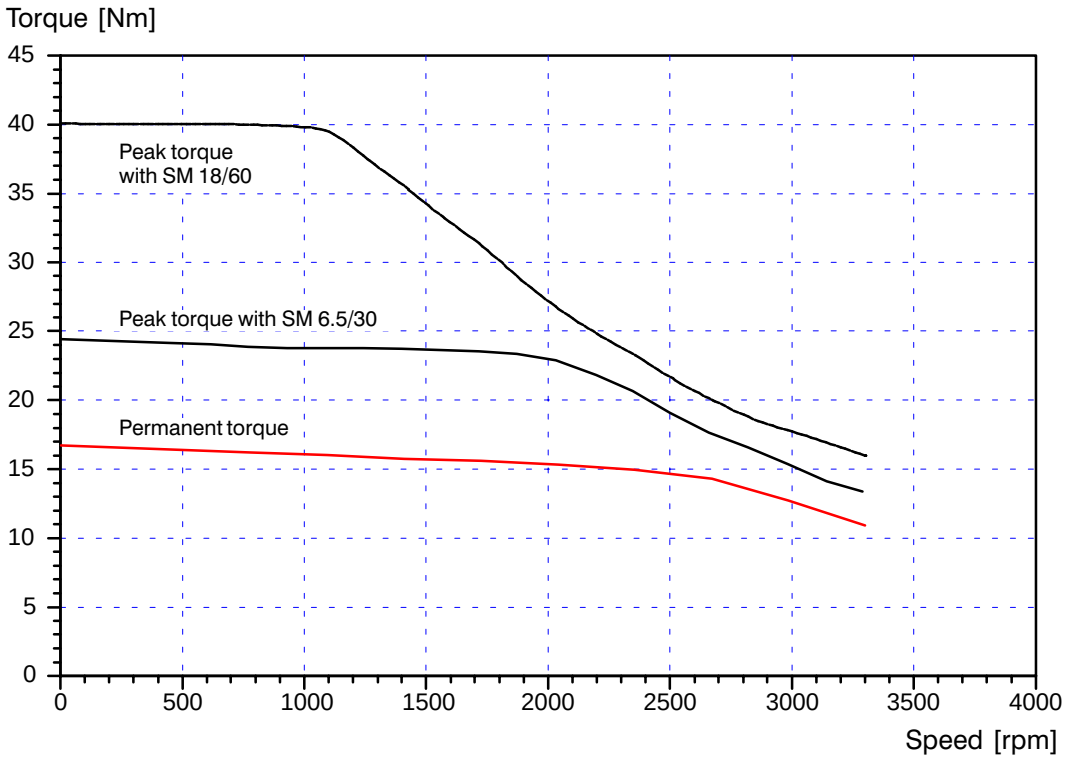
SG–B3.055.049



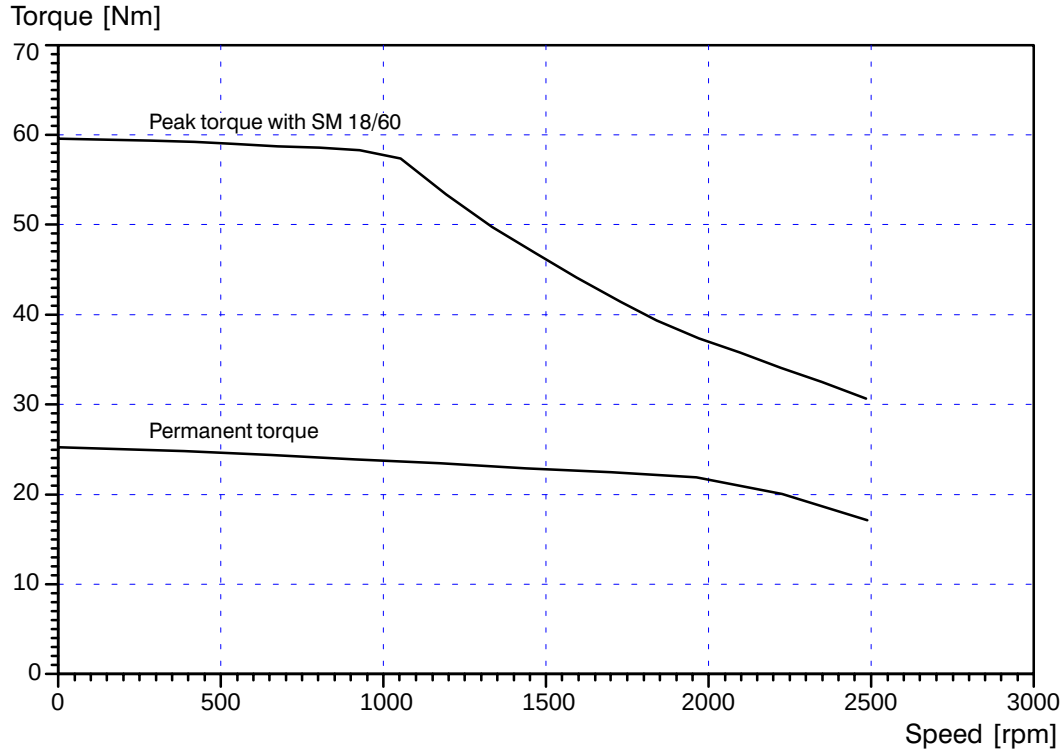
SG–B3.100.029



SG–B3.150.024

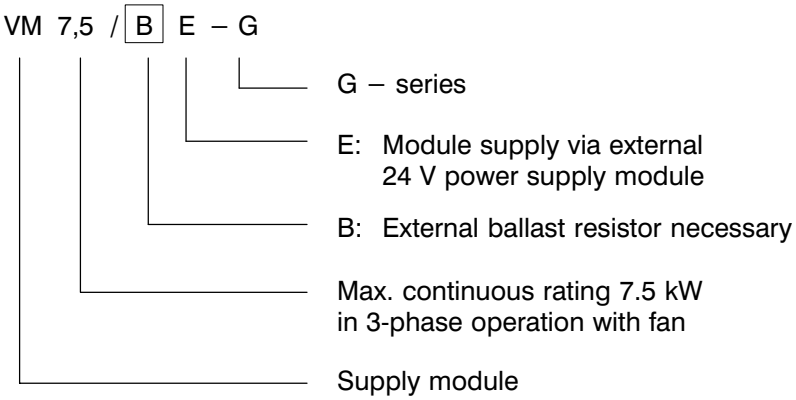


SG–B3.220.017



4.2 Supply module

4.2.1 Type designation



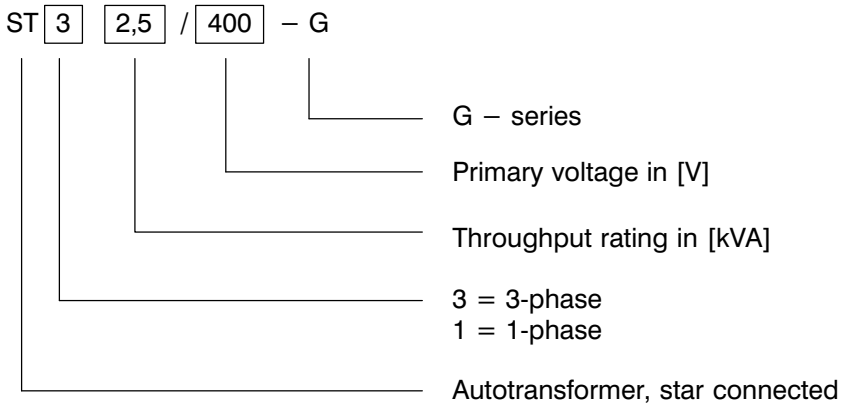
4.2.2 Performance data

Type		Unit	VM 7.5/BE–G	
Nominal voltage		V AC	230 V +7%/–10%, 44...66 Hz	
			1-phase	3-phase
Continuous rating without fan with fan (> 35m³/h)		kW kW	0.8 2.5	2.5 7.5
DC link voltage		V DC	325	
Peak output for t = 1 sec, 25% ED		kW	2 x continuous rating	
Ballast resistor[1)] (switching capacity)	internal	Ω/W	50/55	
	external	Ω/W	50/230 or 10/450	
Fuse F1	internal	A	1.6 A / 415 V, neutral	
	external	A	2.5 A/415 neutral or 8 A/415 V, neutral	
Weight		kg	1.7	

[1)] Ballast resistor selectable internally/externally via jumper.

Operating temperature range Storage temperature range	0 °C to +55 °C. –25 °C to +70 °C
Protection type (built into BT)	IP 20 acc. to EN 60 529
Climate classification	3K3 acc. to EN 60 721
Cooling	For fan installation, see section 4.6
Installation height	≦ 1000 m above sea level

4.2.3 Autotransformer



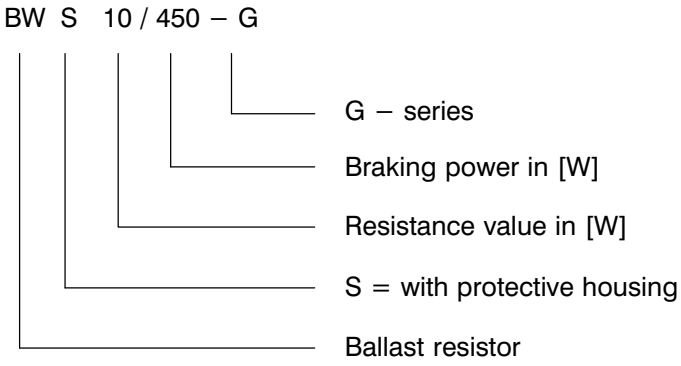
The type ST...–G (acc. to VDE 0550) 3-phase transformer is used to modify the system voltage to the connection voltage of 3 x 230 V AC as required by the VM.
The transformers are, in addition, equipped with a tap for manual mode. Thus, reduced intermediate circuit voltage means safe operation during start up.

Type ST...–G transformers are autotransformers of protection class I as upright models, for the respective dimension sheet, see section 11.4.

Types	Throughput rating	Primary voltage Nominal frequency	Secondary voltage	Tap for manual mode
ST3 1.0/400	1.0 kVA	3 x 400 V 44...66 Hz	3 x 230 V	3 x 55 V
1.5/400	1.5 kVA			
2.0/400	2.0 kVA			
2.5/400	2.5 kVA			
3.0/400	3.0 kVA			
4.0/400	4.0 kVA			
5.0/400	5.0 kVA			
7.5/400	7.5 kVA			
10.0/400	10.0 kVA			

☞ **Note** **Other primary voltage is available on request.**

4.2.4 Ballast resistor (optional)



The external ballast resistor takes up additional braking energy for internal ballast resistance and thus increases, where required, the braking power of the drive assembly.
It is switched on at 380 V DC and switched back off at 370 V DC.

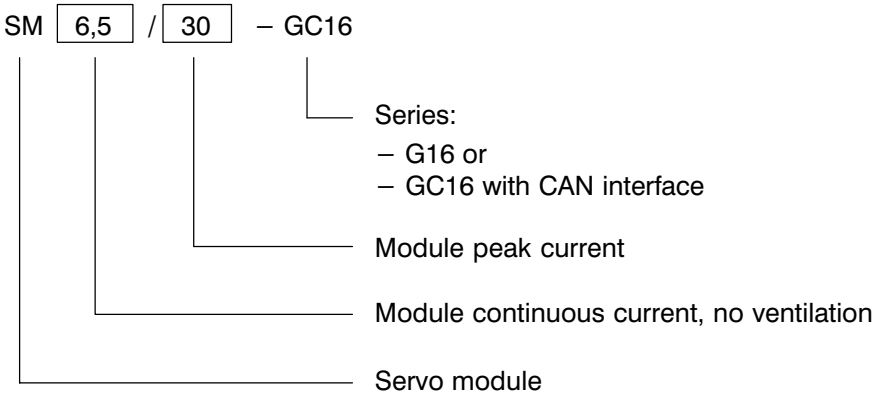
Every supply module has access to two fuses in order to protect the external ballast resistor. Each fuse must be installed in accordance with the accompanying instructions for the ballast resistor.

Type	BWS 50/230–G	BWS 10/450–G
Resistance	50 Ω	10 Ω
Continuous rating	230 W	450 W
Peak output	2800 W	15000 W
F1 fuse for external ballast resistor	2.5 A/415 V, neutral	8 A/415 V, neutral

The external ballast resistor is fitted as standard with a housing, protection standard IP 20.

4.3 Servo modules

4.3.1 Type designation



4.3.2 Performance data

Type	Unit	SM 3,5/8	SM 4,7/20	SM 6,5/30	SM 18/60
Continuous current (n > 50 rpm)					
without fan	Â	3.5	4.7	6.5	–
with fan	Â	6	11	15	18
Peak current for approx. 5 sec (n > 50 rpm)	Â	8	20	30	60
DC link voltage	V DC	325			
Clock frequency	kHz	10	10	5	5
Power loss[2)]	W	13	13	13	13
Weight	kg	2.4	2.4	2.4	3.5

[1)] Add. load components: 8 W per Â module current

Operating temperature range	0 ˚C to +55 ˚C
Storage temperature range	−25 ˚C to +70 ˚C
Protection type (built into BT)	IP 20 acc. to EN 60 529
Climate classification	3K3 acc. to EN 60 721
Cooling	For fan installation, see section 4.6
Installation height	≦ 1000 m above sea level

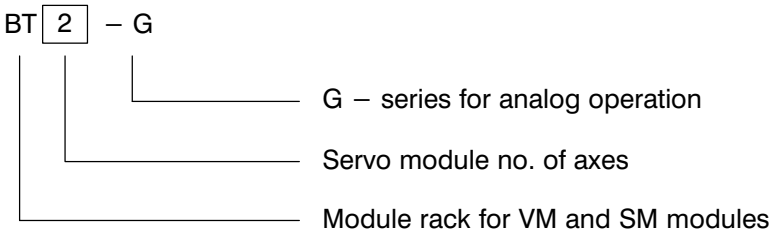
4.4 Module rack with bus board

The module rack holds the VM and all SM modules and uses a bus board to connect them at the back.

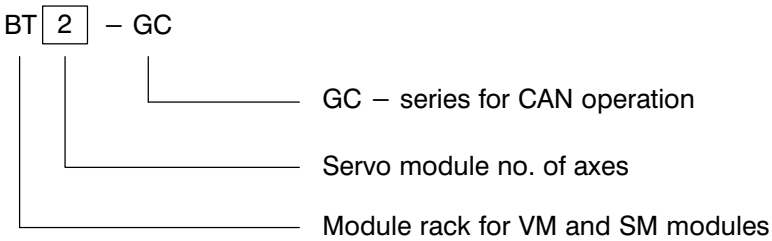
Swivel frames are front-mounted as standard, although BT installation sets allow rear-mounting on hinges.

Type	BT 2–G(C)	BT 4–G(C)	BT 6–G(C)
VM slot	1	1	1
SM slots	2	4	6
	SM 3.5/8 to SM 6.5/30 both occupy 1 slot each. SM 18/60 occupies 2 slots.		

4.4.1 For analog operation



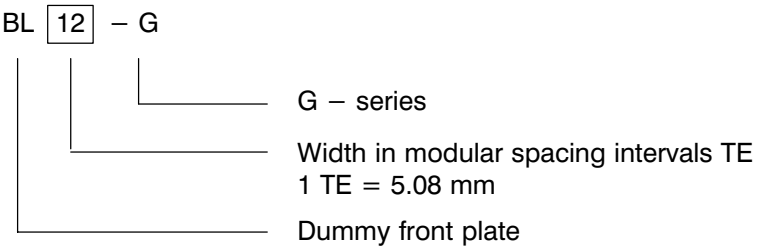
4.4.2 For CAN operation



The bus board is fitted with a socket for installation of a brake relay. For the order number of the brake relays, see section 10.3.

☞ **Note** **The fixed wiring of the external enable with 24 V means that the module rack for CAN operation cannot be employed for analog operation.**

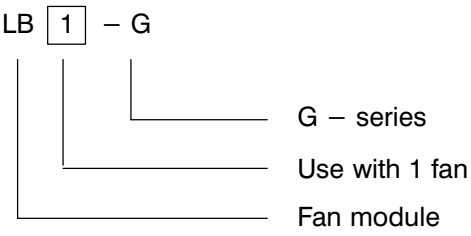
4.5 Dummy front plates



BL 12−G: For covering unused slots in the rack.

BL 6−G: For covering gaps in the rack when using an SM 18/60 servo module

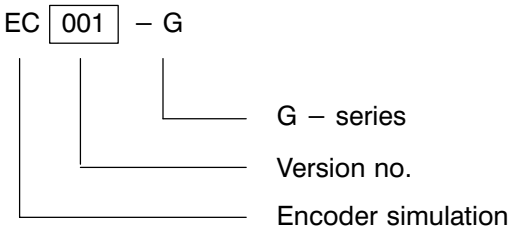
4.6 Fan module (option)



Supply module and servo module can be ventilated to improve performance; see section 4.2.2 and 4.3.2.
A maximum of 3 slots per fan module can be adequately ventilated:

Module racks	BT 2−G(C)	BT 4−G(C)	BT 6−G(C)
VM slot SM slots	1 2	1 4	1 6
Number LB 1−G	1	2	3
Air through-flow	37 m^3/h per fan module		
Connection voltage	1 x 230 V AC, terminal on the bus board		

4.7 Encoder simulation board (option)



The encoder simulation board is used to convert the output signals of the resolver integrated in the motor into square-wave pulse trains. These signals can be further processed, for instance, for position control purposes:

Pulse number	Settable in even-numbered steps from 200 ... 8192 pulses/revolution
Power supply	Refer to Section 8.3
Output signals	TTL-compatible, via RS 422
Signal sequence	Square-wave pulse trains A, B Inverted signals $\overline{A}$, $\overline{B}$ (B lagging to A, clockwise) Reference signal M Inverted impulse $\overline{M}$ (1x per revolution, pulse length can be set: L = long impulse $\hat{=}$ pulse A S = short impulse $\hat{=}$ logical A and B)
Output frequency	0 to 100 kHz
Max. output load	$-I_{High} \leqq 10$ mA $I_{Low} \leqq 10$ mA

☞ **Note** **The encoder simulation board is not required for operations with the CAN bus in conjunction with the rho3 robot control.**

Your notes:

5 Application notes

5.1 Checklist for technical rating of Servodyn−G(C)16

See section 10 for order numbers.

Procedure	See section
1. **SG motors** set according to torque/spindle speed	5.2
2. **Servo modules SM** set acc. to combination table	5.3
3. **Transformer LV** select from performance table	5.4
4. **Supply module VM** set power supply connection and fan	5.4
5. **Ballast resistor BWS** as required	4.2.4
6. **Fan modules LB 1−G** set acc. to performance output from VM and SM	4.6
7. **Module rack with bus board BT** select acc. to no. of axes, for analog operation or CAN operation	4.4
8. **Installation set BT** required for rear-mounting of module rack on hinges	6.2.2
9. **Dummy front plates** 1 BL 6−G part for each SM 18/60 1 BL12−G for each vacant slot	4.5
10. **Encoder simulation board EC 001−G**, in case necessary	4.7
11. **Ready-made leads with connector or** **a) Mating connector, motor end** – mating connector for power connection – mating connector for resolver **b) Mating connector, module end** – Resolver	4.1.4 10.2
12. **Other mating connectors, module end** – for operation with CAN bus – encoder simulation, if no EC card installed	10.2
13. **Bosch commissioning disk DSS−G**	10.2
14. **Connection cable for PC**	10.2

5.2 Selecting the servomotors

To determine a suitable motor-module combination, first select an appropriate motor, and then the appropriate servo module.

- ❑ The S1 characteristic curves in section 4.1.9 are used to select a motor.
- ❑ If motor M_{max} is reached in the application, the preselection must be checked by calculating the effective torque and the mean speed. This requires the following information:
  - □ the cycle time t_{tot} of a processing cycle
  - □ the interval t_i as part of the processing cycle
  - □ the required torque M_i in the respective interval

Preselect motor type SG−A... according to S1 characteristic curve.

$M_{max}\ (n_{max}) \leqq M_{max\ motor}\ (n_{max})$?

Yes

Calculate effective torque:

$$M_{eff} = \sqrt{\frac{\sum_i M_i^2 \cdot t_i}{t_{tot}}}$$

Calculate mean speed n_m:

$$n_m = \frac{\sum_i n_i \cdot t_i}{t_{tot}}$$

Is $M_{eff}\ (n_m)$ within the S1 curve?

Yes

Motor selection complete

No

Select larger motor

No

Select larger motor

5.3 Motor-module combinations Servodyn – G(C)16

◆ = The MCO jumper factory setting has to be changed

SG motors		Servomodule SM... – G(C)16				Application		
Type	I_0 [A][1]	3,5/8	4,7/20	6,5/30	18/60	I_{max} [A]	n_{max} [rpm]	Position MCO jumper
SG – B0.002.091	0.92	●				2,7	11 500	3 2 1 ○ ○ ○
SG – B0.004.076	1.7	●				5,3	10 000	○ ○ ○
SG – B0.007.070	3.0	●				8,0 9,0	9 000 9 000	○ ○ ○ ◆ ○ ○ ○
			●					
SG – B0.014.058	4.0	●				8,0 11,8	7 000 7 000	○ ○ ○ ◆ ○ ○ ○
			●					
SG – B1.006.072	2.2	●				6,5	10 500	○ ○ ○
SG – B1.016.060	4.5		●			15	8 000	○ ○ ○
SG – B1.023.042	4.8		●			17,6	5 500	○ ○ ○
SG – B1.034.036	5.9		●			20 23	4 500 4 500	○ ○ ○ ○ ○ ○ ◆
				●				
SG – B2.014.065	4.4		●			12	10 000	○ ○ ○
SG – B2.027.049	6.8		●			20 21,2	8 000 8 000	○ ○ ○ ○ ○ ○ ◆
				●				
SG – B2.050.038	9.5			●		28,2	5 800	○ ○ ○ ◆
SG – B2.086.034	13.0			●		30 39,6	4 700 4 700	○ ○ ○ ○ ○ ○
					●			
SG – B3.055.049	13.4			●		30 34	6 800 6 800	○ ○ ○ ○ ○ ○
					●			
SG – B3.100.029	15.6			●		30 46,7	4 200 4 200	○ ○ ○ ○ ○ ○
					●			
SG – B3.150.024	18.2			●		30 53,7	3 300 3 300	○ ○ ○ ○ ○ ○
					●			
SG – B3.220.017	20.9				●	60	2 400	○ ○ ○

[1] I_0 = standstill current; further data, see section 4.1.8.

5.4 Selecting transformer and supply module

P_{sys} for SG−B0				
Motor	SG−B0.002.091	SG−B0.004.076	SG−B0.007.070	SG−B0.014.058
P_{sys}	0.2 kVA	0.5 kVA	0.6 kVA	0.75 kVA
P_{sys} for SG−B1				
Motor	SG−B1.006.072	SG−B1.016.060	SG−B1.023.042	SG−B1.034.036
P_{sys}	0.5 kVA	1.0 kVA	1.0 kVA	1.3 kVA
P_{sys} for SG−B2				
Motor	SG−B2.014.065	SG−B2.027.049	SG−B2.050.038	SG−B2.086.034
P_{sys}	0.8 kVA	1.6 kVA	2.0 kVA	2.3 kVA
P_{sys} for SG−B3				
Motor	SG−B3.055.049	SG−B3.081.030	SG−B3.100.029	SG−B3.150.024 SG−B3.220.017
P_{sys}	1.7 kVA	2.2 kVA	2.5 kVA	2.8 kVA 2.9 kVA

Simultaneity factor relating to number of axes (assumed)						
Number of axes per transformer	1	2	3	4	5	6
Factor f	1.0	0.87	0.76	0.57	0.5	0.44

Procedure

1. Total the maximum power P_{sys} of all axes:
   $P_{sys} = P_{sys}(1) + P_{sys}(2) + ... P_{sys}(n)$ [kVA]

2. Calculate the required transformer rating P_T:
   $P_T = f \cdot P_{sys}$ [kVA]

3. Select the appropriate Type ST transformer:

ST3 1.0/400	1.0 kVA
ST3 1.5/400	1.5 kVA
ST3 2.0/400	2.0 kVA
ST3 2.5/400	2.5 kVA
ST3 3.0/400	3.0 kVA
ST3 4.0/400	4.0 kVA
ST3 5.0/400	5.0 kVA
ST3 7.5/400	7.5 kVA
ST3 10.0/400	10.0 kVA

4. Determine the correct power supply connection and fan for VM:

1-phase without fan	0.8 kVA
1-phase with fan	2.5 kVA
3-phase without fan	2.5 kVA
3-phase with fan	7.5 kVA

4. Select use of the ballast resistor:
   - □ internal ballast resistor with 50 Ω/55 W,
   - □ external ballast resistor with 50 Ω/230 W or 10 Ω/450 W

5.5 24 V module supply

Specification data:

- ○ Voltage: nominal + 24 V DC
  minimum + 20 V DC
  maximum + 30 V DC
- ○ Output: max. 20 W for the VM
  +25 W per axis
- ○ Ripple is insignificant; ensure that the momemtary value of the input voltage is > 20 V and < 30 V.

The making current is 2 A per axis for approx. 50 ms.
A power supply module with a B6 bridge rectifier is sufficient for supplying power. Fuse protection is provided by a 10 A/24 V neutral fuse.

CAUTION !

If the 24 V module supply is switched-off or disconnected, the mains voltage may not be switched on at the VM, as this may damage the VM.

5.1

For suggested circuitry for switching the 24 V supply on and off, see section 7.7.

Your notes:

6 Installation notes

6.1 Type SG servo motors

6.1.1 General notes

- Ensure that thermal radiation and natural convection allow sufficient **heat dissipation.**

CAUTION ! 6.1

The motors are subject to surface temperatures of up to approx. 100 °C.
A touch guard should be provided if necessary.

- Maintain the proper **protection standard** by complying with the required minimum cable cross sections in the mating connectors.
- There must be no fluid on the flange end plate when motors are vertically mounted (**type IM V3**).
- Drive elements such as belt pulleys, clutch disks, gear wheels, and similar components must only be installed or removed with the appropriate **installation and extraction device.** Use the thread in the shaft end.

CAUTION ! 6.2

Ensure that the shaft end is never subjected to impact or jolts!
This damages the rotary encoder and ball bearings.

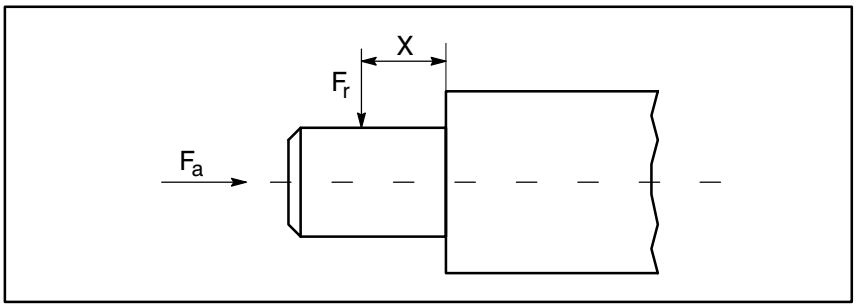
- Motors provided with **keyways and featherkeys** are balanced with half of the featherkey.

! DANGER ! 6.3

Danger of injury from featherkeys being slung out.
Motors with keyway and featherkey may only be operated as installed or with a secured featherkey.

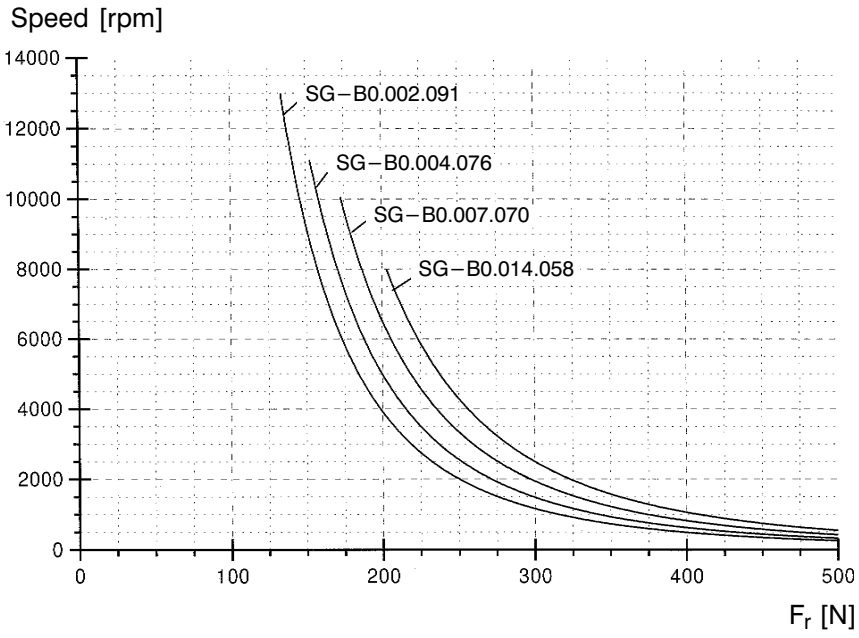
- Servo motors must **not be dismantled.**
  Installation work may only be carried out at the factory.

6.1.2 Mechanical motor shaft load



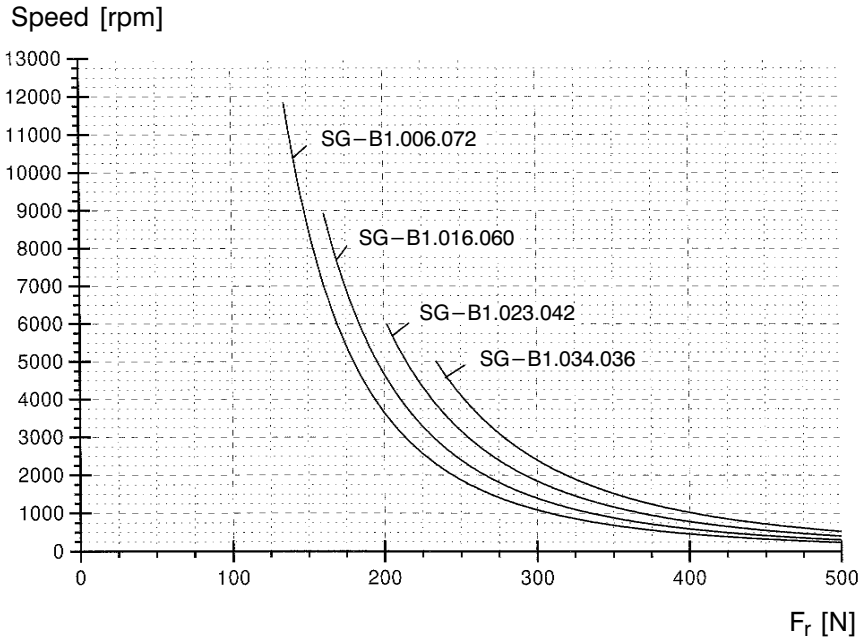
Permissible shaft load

SG−B0



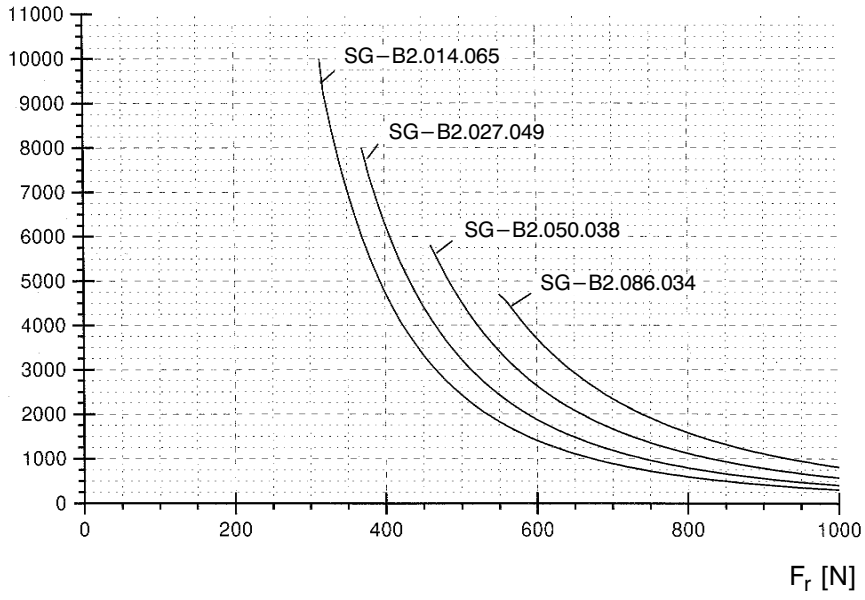
Permitted radial load for 20,000 operating hours (L_{h10})
Centre of load pressure: middle of shaft
Maximum axial load during operation: F_a = 75 N

SG–B1



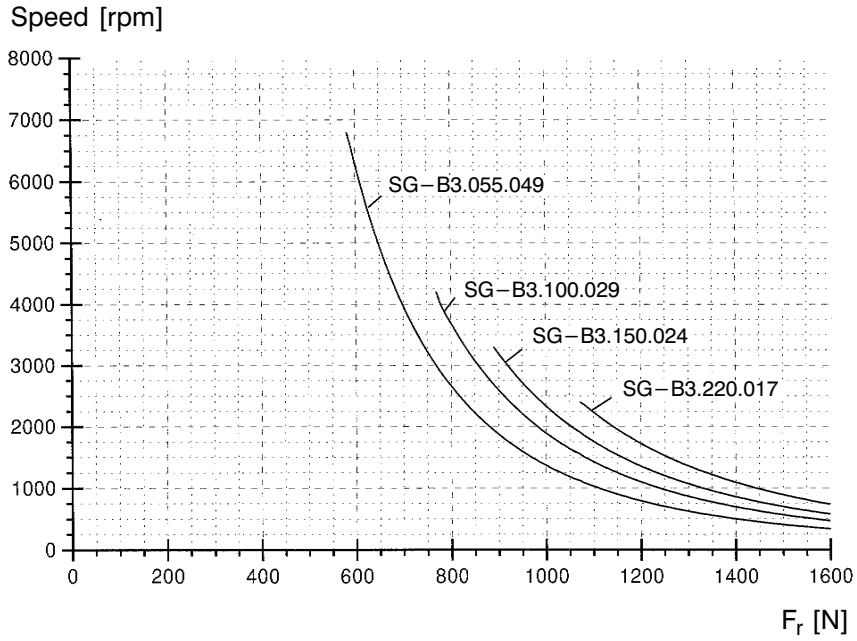
Permitted radial load for 20,000 operating hours (L_{h10})
Centre of load pressure: middle of shaft
Maximum axial load during operation: 75 N

SG–B2



Permitted radial load for 20,000 operating hours (L_{h10})
Centre of load pressure: middle of shaft
Maximum axial load during operation: 150 N

SG–B3



Permitted radial load for 20,000 operating hours (L_{h10})
Centre of load pressure: middle of shaft
Maximum axial load during operation: 200 N

6.2 Inverters

6.2.1 Installation compartment

Modules must only be installed in switch cabinets which conform to protection standard IP 54 (with dust filters preceding air entries and exits).

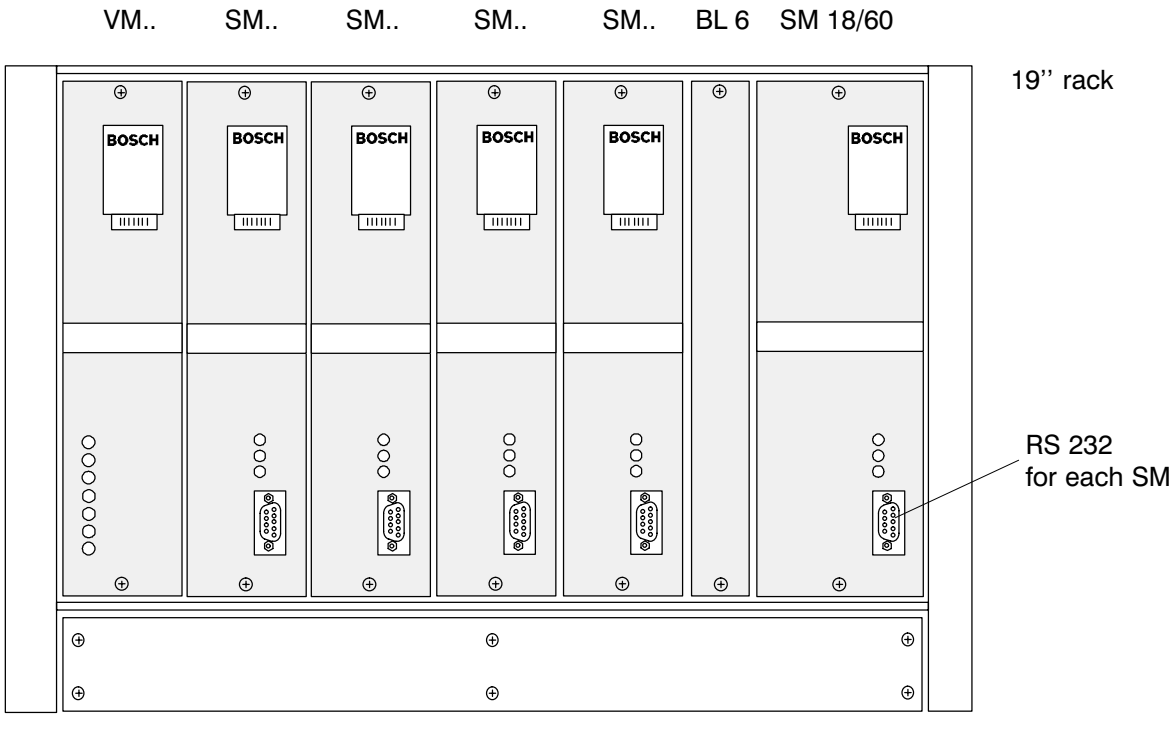
All modules must be installed vertically.
The cooling air flow passes through the modules from the bottom and must not be obstructed by other switching cabinet components or parts. In addition, a minimum clearance of 150 mm should be provided both above and underneath the module rack.
No minimum clearance need be provided at the sides, except in cases of swinging movements during rear panel-mounting.

The air temperature inside the racks may be between 0...+ 55 °C. If several modules are arranged on top of each other, the maximum permissible supply air temperature for the top module is + 55 °C.

CAUTION !

The surrounding air must be free of acids, alkalis, corrosives, salts, metallic fumes etc.
Do not allow condensation to form on the modules!

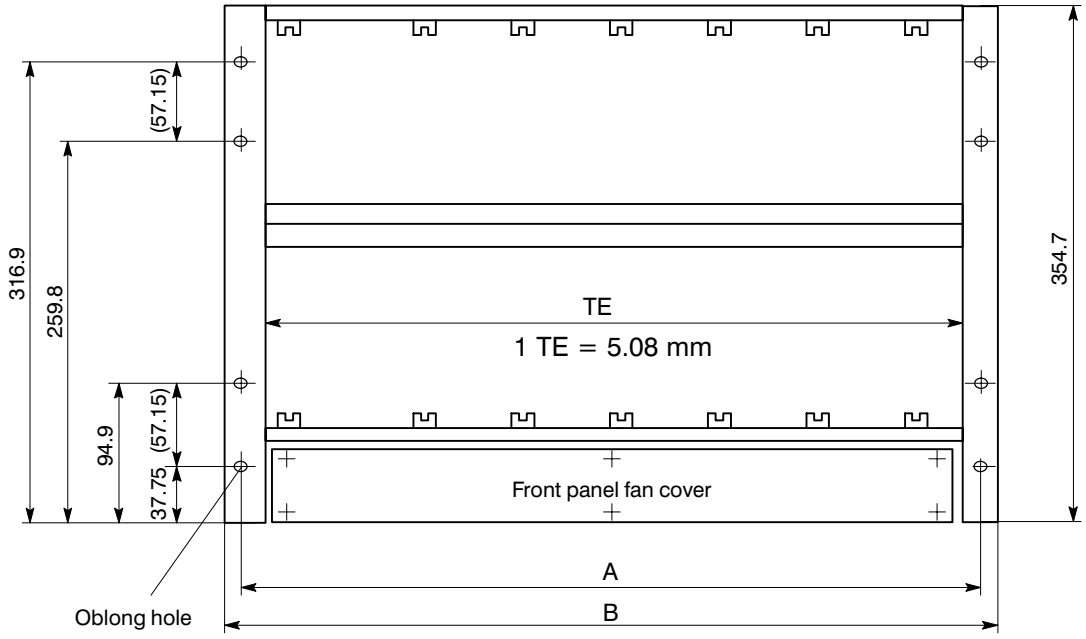
6.4



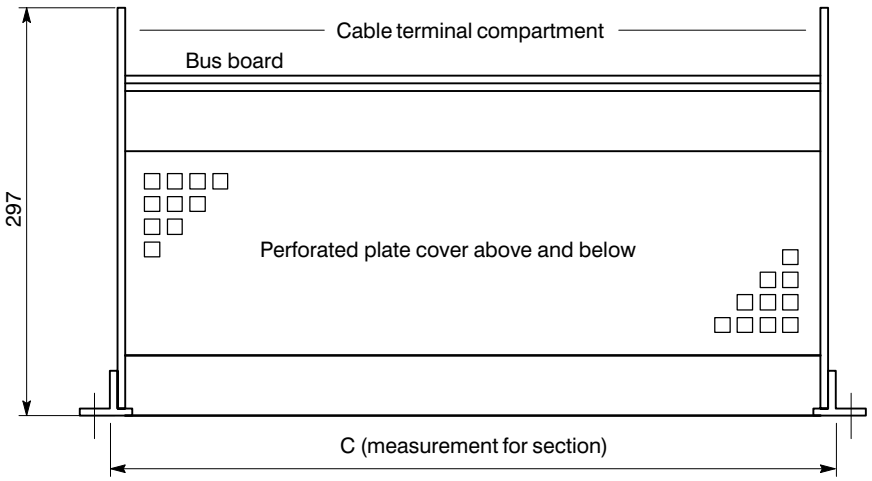
6.2.2 Layout and installation position

Front installation

The BT.. – G module rack for front installation is secured with M6 screws.

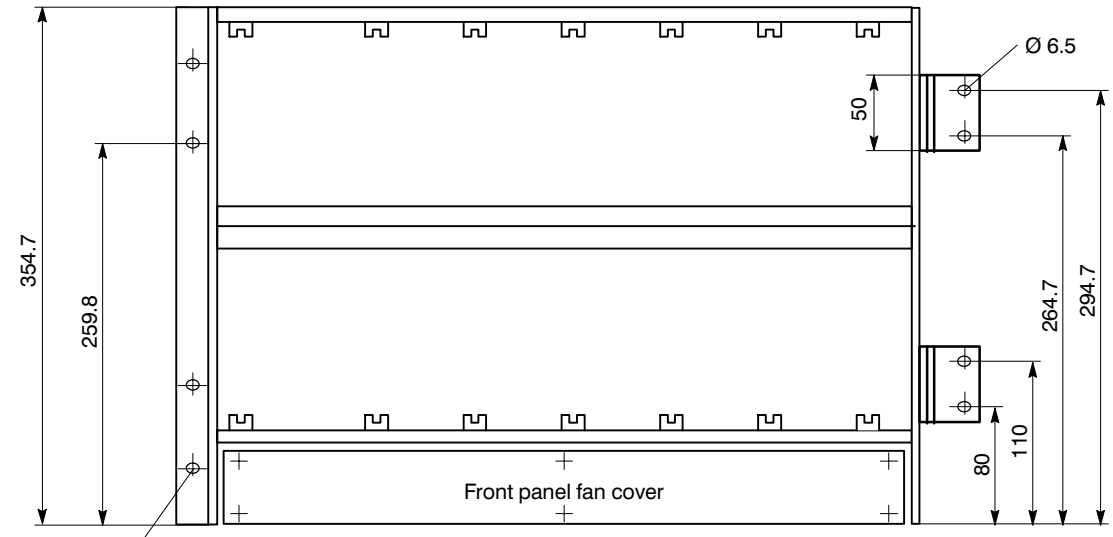


Type	A [mm]	B [mm]	in TE	C [mm]	No. of fans
BT 2 – G(C)	222.5	239,5	36	207	1
BT 4 – G(C)	344.5	361,5	60	330	2
BT 6 – G(C)	466.5	483,5	84	451	3

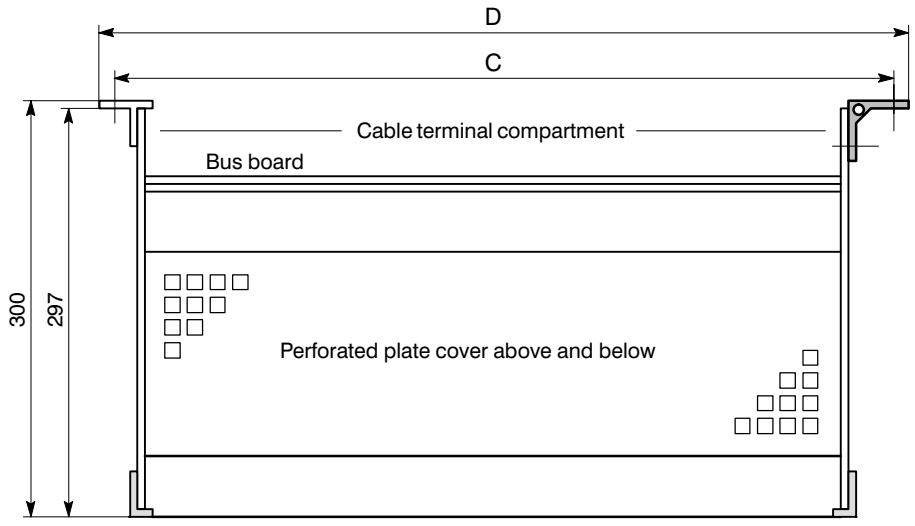


Rear panel installation

The **BT installation set** additionally allows backplane installation of BT.. – G module rack.
Bores holes on the left or on the right are provided for attaching two hinges. The module rack is swung out for wiring work. The area required for swinging out, corresponding to the unit depth of 300 mm, must be observed.



Type	C [mm]	D [mm]
BT 2 – G(C)	243	261.5
BT 4 – G(C)	365,5	384
BT 6 – G(C)	486,5	505



All modules are inserted vertically into the module rack and screwed in using fastening screws.
The supply module is inserted on the very left hand side, with all servo modules to the right.

Unused slots must be covered with a dummy front plate:

- BL 12−G covers unused slots
- BL 6−G covers the empty space beside an SM 18/60−G.

Fan module LB 1−G

To increase performance, supply modules and servo modules can be cooled by fans.
The LB 1 −G is ready for connection and is inserted on guide rails beneath the Servodyn−G modules. The fan module's cable is connected to connector X9 on the bus board.

6.2.3 Ballast resistor

Ballast resistor specifications, see section 11.5.

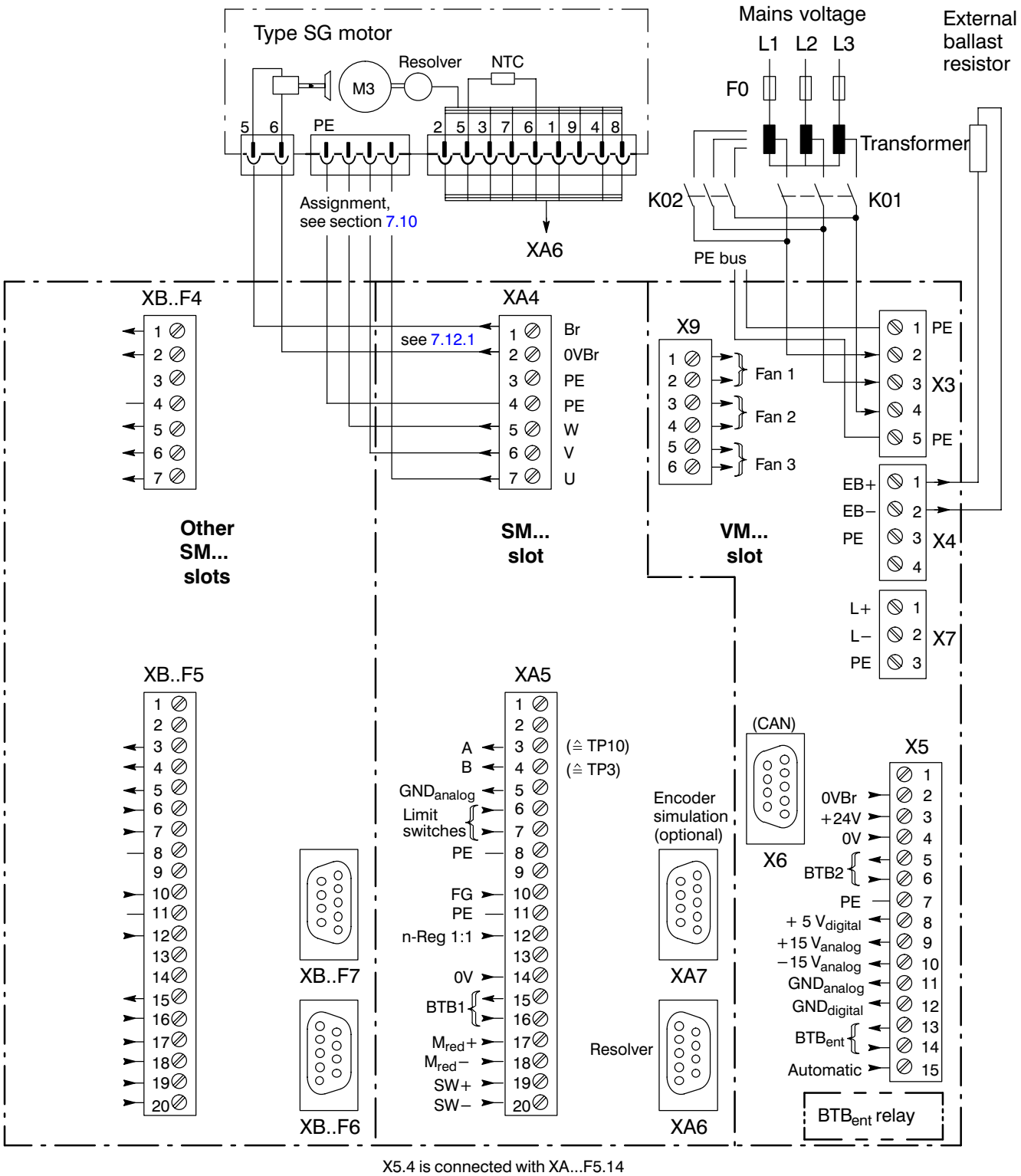
6.5

! DANGER !

The terminals of the ballast resistor carry lethal voltages.
The ballast resistor can get very hot.

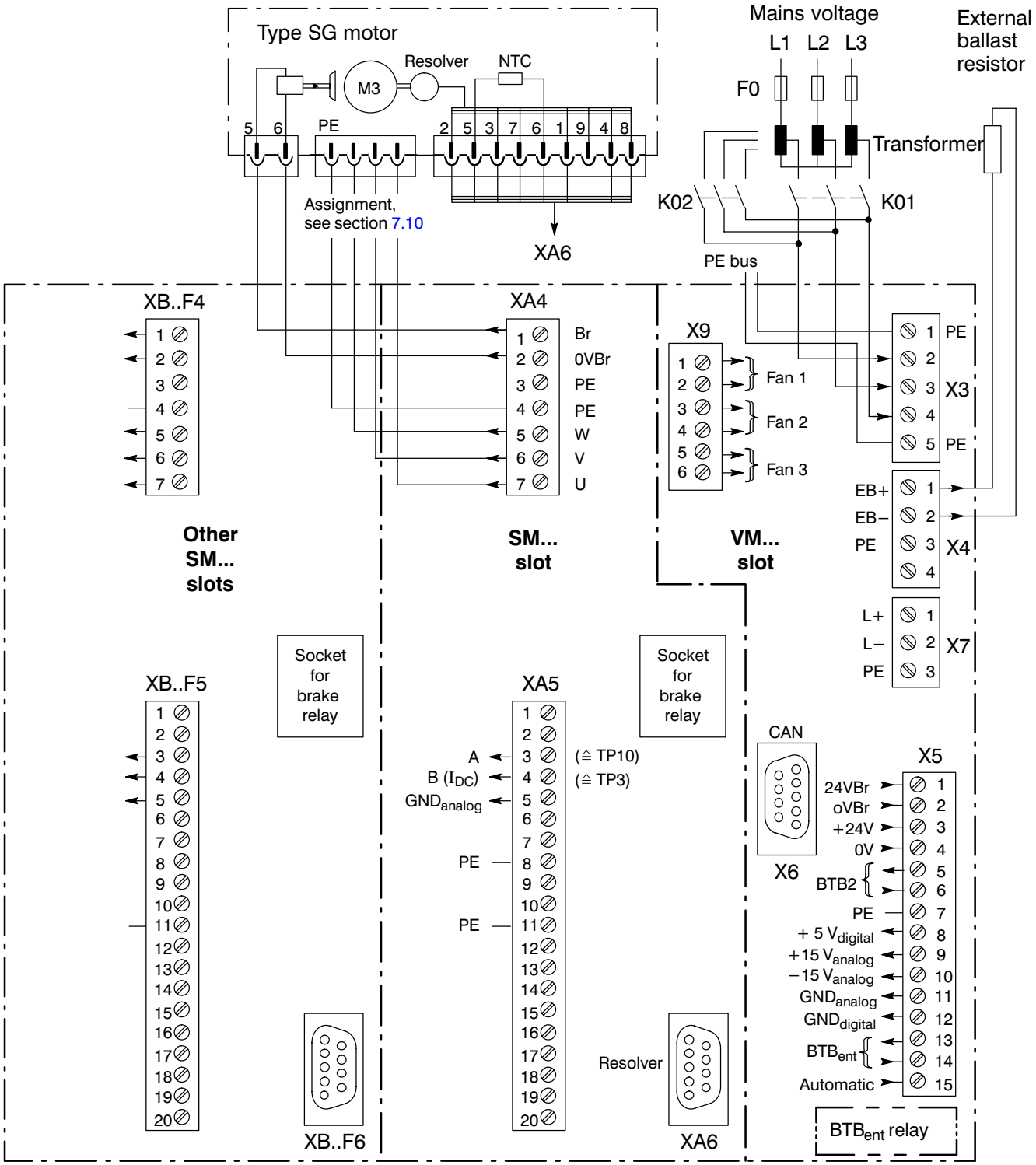
7 Electrical connection

7.1 Block diagram for analog operation, rear of the bus board

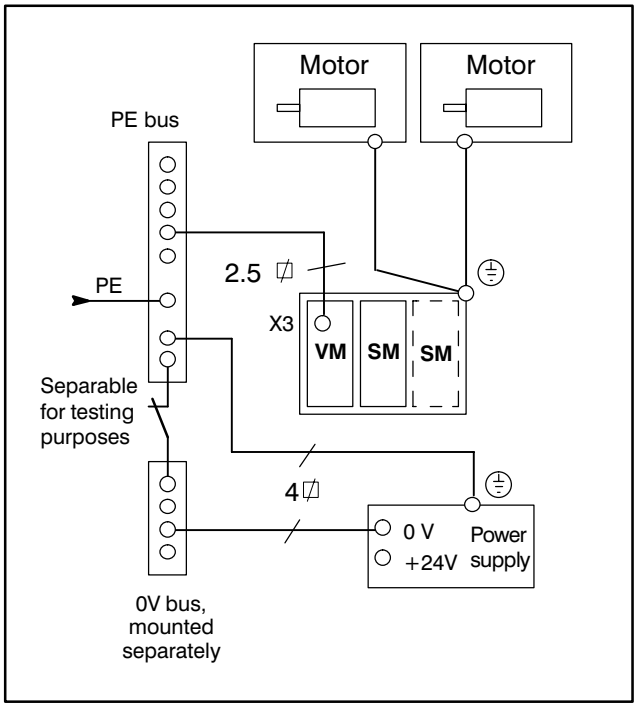


X5.4 is connected with XA...F5.14

7.2 Block diagram for operation with CAN bus, rear of the bus board



7.3 Earthing



CAUTION !

Inverter modules may only be operated with earthed mains power supplies.
Operation in conjunction with non-directly earthed mains systems (IT system) is not permitted, as air clearances and leakage paths in the module could be overloaded.

7.1

Protective earth modules The modules (terminal strip X3) and the subrack must be earthed.

Protective earth, motors The PE wire cross section must be designed for $\sqrt{3}$-times the nominal load of the power conductors according to DIN VDE 0160.
If there are at least two motors present at the machine which are connected to each other via the housing, the PE wire cross section has grown accordingly in size and the condition mentioned above has been fulfilled.

PE bus The PE buses must be attached to the mounting plate so that good conduction is provided.
Insulated PE bars must be connected with the mounting plate on both sides with max. 20 cm long copper strips.
The cross sections of the copper strips must correspond to a minimum of that of the mains supply cable.

The cross section of the PE bus and mounting plate earthing must correspond to that of the mains supply cable to the supply module.

24 V power supply module The PE bus connection and the secondary circuit earthing must be set up in accordance with the primary current, but must have a cross section of at least 1.5 mm^2.

7.4 Electromagnetic compatibility (EMC)

For EMC-correct installation, comply with the EMC manual Servodyn−G, −GC (order no. 1070 066 000, german), as well as the following measures:

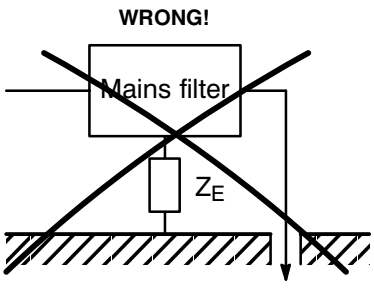
- Lay out the power and control cables separate from each other both inside and outside the switch cabinet.
  Distance between the cable ducts at least 10 cm.
- Lay cables from the servo module to the motor in completely enclosed metal ducts. In case of multi-chamber ducts, lay the resolver cable in a separate chamber.

7.5 Mains filter

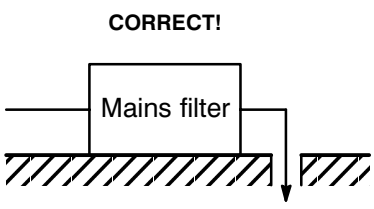
Use a mains filter at the drive cabinet interface in order to avoid power cable-associated interference voltages.
EMC norms VDE 0871, EN 55011 and EN 50082-1 can only be met if a mains input filter is used.

Attach the filter directly to the partition so that the incoming cables behind the filter take the shortest path through it.

☞ **Note** **The effectiveness of the filter is determined by the quality of the filter's earthing connection (see illustration).**



Earth connection by means of connection lead to the metal housing



Flat chassis earth connection to the metal housing

7.6 Mains connection

7.2

! DANGER !

Inverter modules may only be operated with earthed mains power supplies.

The only permissible protection measure in accordance with prEN 50 178 is a protective earth connection!

Operation on installations with normal current-operated earth-leakage circuit breakers is not permissible, because fault current from the DC link could flow back into the mains over ground, without triggering the current-operated earth-leakage circuit breaker.

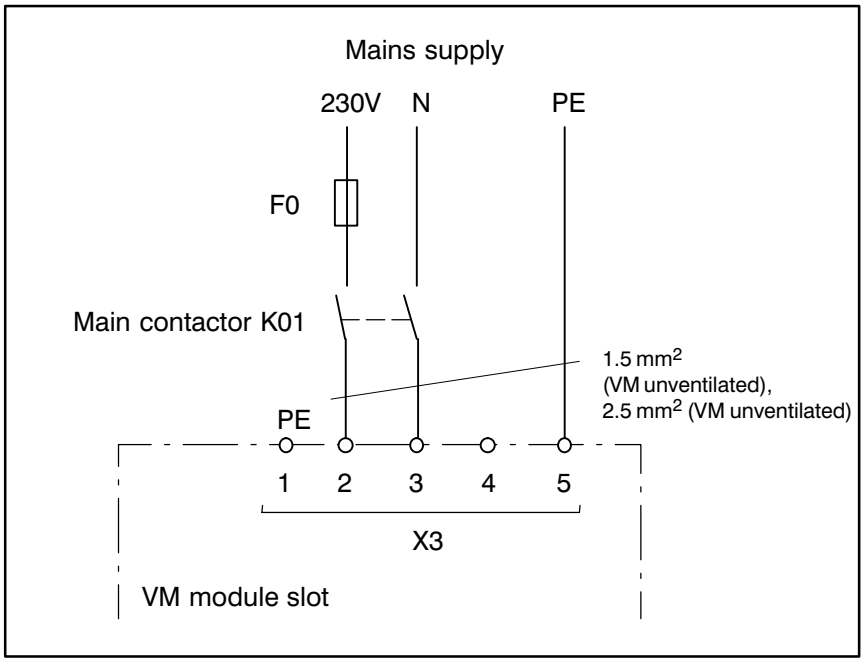
Earthing only one end of the DC link when operating by means of isolating transformers is prohibited.

Terminal strip X3

Printed circuit terminal block, inclined connection, type: Phoenix GSMKDS3.

Single-phase operation

Single-phase operation allows direct 230 V AC connection.
The required making current limiting capacity is integrated.



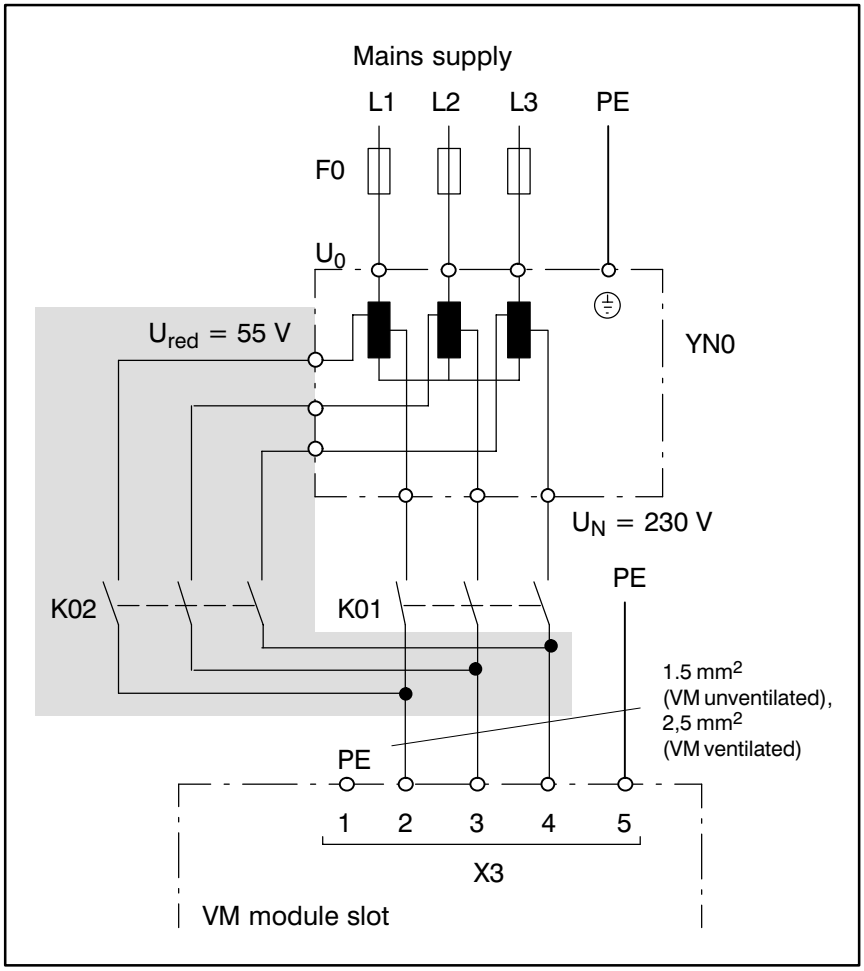
☞ **Note** **Open-phase protection must be deactivated for single-phase operation.**

Supply module (VM)	Single-phase operation (watchdog off)	Three-phase operation
Position jumper JW 1	1 – 2	2 – 3 (works setting)

Three-phase operation

Use a TR.. – G transformer, or set up a three-phase, star connected isolating transformer or autotransformer for the permissible connection voltage of the VM's 3 x 3 V AC eff.
This requires transformer earthing in accordance with the safety regulations.

Wiring for 'manual mode'



Manual mode

Manual mode requires a 3 x 55 V tap for the ST3 autotransformer.
The axes can be moved at a reduced DC link voltage by closing the K02 start-up contactor and simultaneoulsy locking with the K01 main contactor (see section 7.7).

7.3

! DANGER !

K01 and K02 must be securely locked against each other!

7.6.1 Fuses F0

Use slow-blowing fuses:

Fuses F0	VM without fan	VM with fan	Trigger time
Single-phase operation	6 A	10 A	2 x I_N > 2 s
Three-phase operation	6 A	16 A	5 x I_N > 50 ms

! DANGER !

In three-phase operation, use a three-phase automatic circuit breaker so that all three phases are interrupted in case of a fault.

7.4

7.7 Power-up logic

7.5

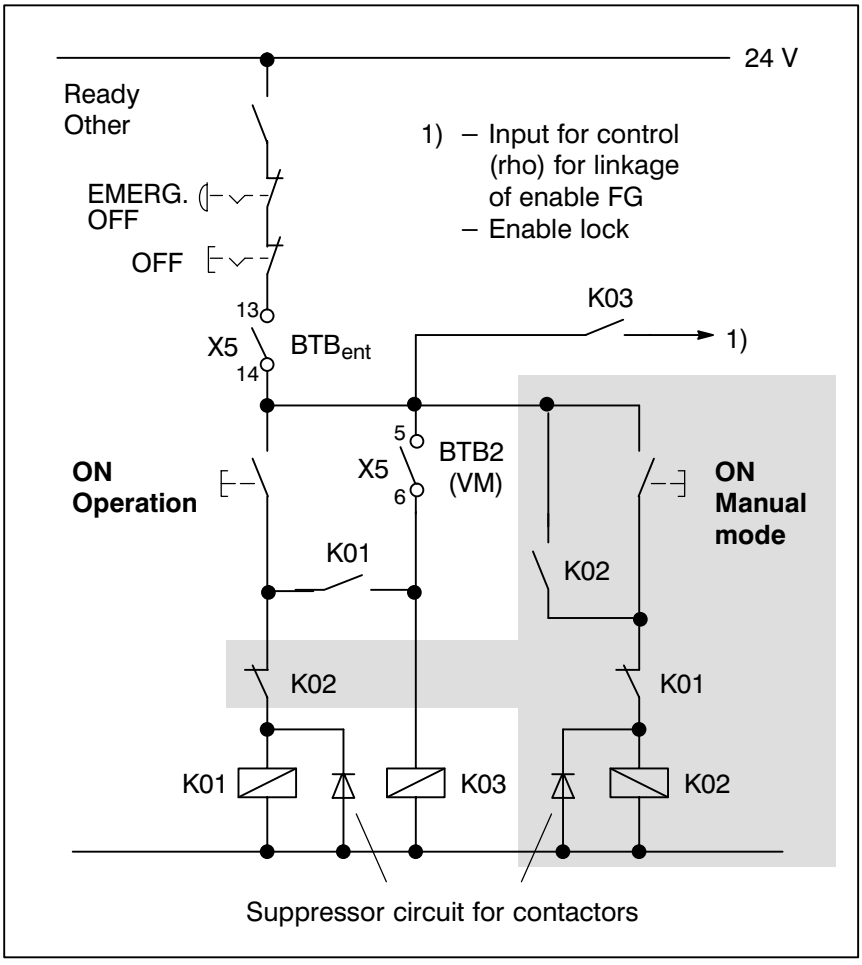
! DANGER !

If a fault occurs, the drive must be separated from the supply system!

7.6

CAUTION !

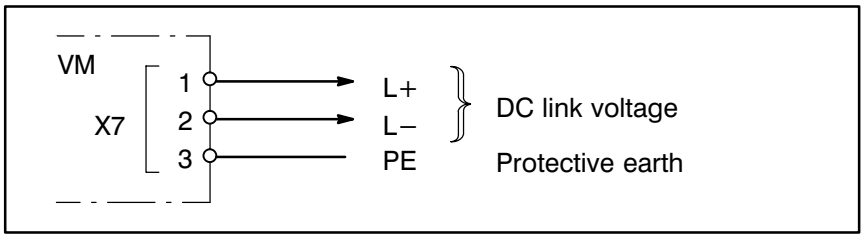
If the 24 V module supply is switched-off or disconnected, the mains voltage may not be switched on at the VM, as this may damage the VM.



7.8 DC link connection

The bus board is used for the DC link between the modules. The DC link voltage can be measured at the terminal strip X7.

Terminal strip X7

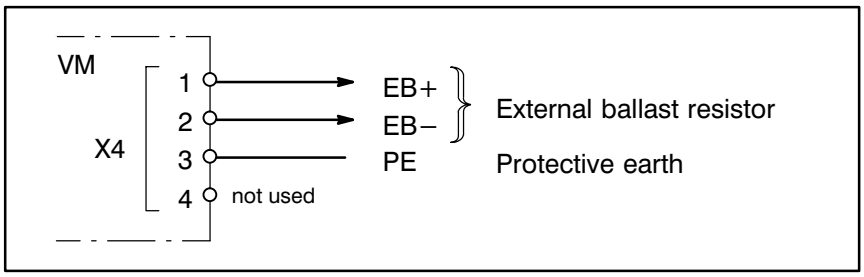


☞ **Note** **The DC link connection may only be made after consulting with us.**

7.9 Connection of ballast resistor

External ballast resistor for raising the braking power.

Terminal strip X4



☞ **Note** **The following must be done in accordance with the accompanying instructions before operation of the external ballast resistor:**
- **change of F1 fuse and**
- **removal of internal connector of X3 and transfer to X4 or X5 depending on ballast resistance.**

CAUTION !

Only those fuse-ballast resistor combinations included in the instructions are permissible.
The VM may be destroyed if the wrong fuse or connector position (X3, X4, X5) is employed.

7.7

7.10 Power connection

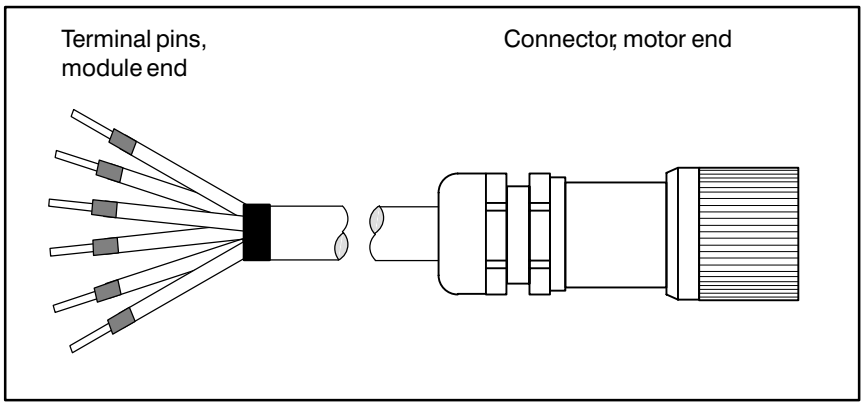
7.8

! DANGER !

Disconect the unit from the mains power supply and ensure it is in an energy-free state.
Due to the permanent magnet excitation, the power plug carries a dangerously high voltage if the rotor is rotating and the motor is not electrically connected!

Ready-made cables with connectors on the motor end and terminal pins on the inverter end are provided for all motors with a connector system:

Ready-made motor line (see section 4.1.3)



7.9

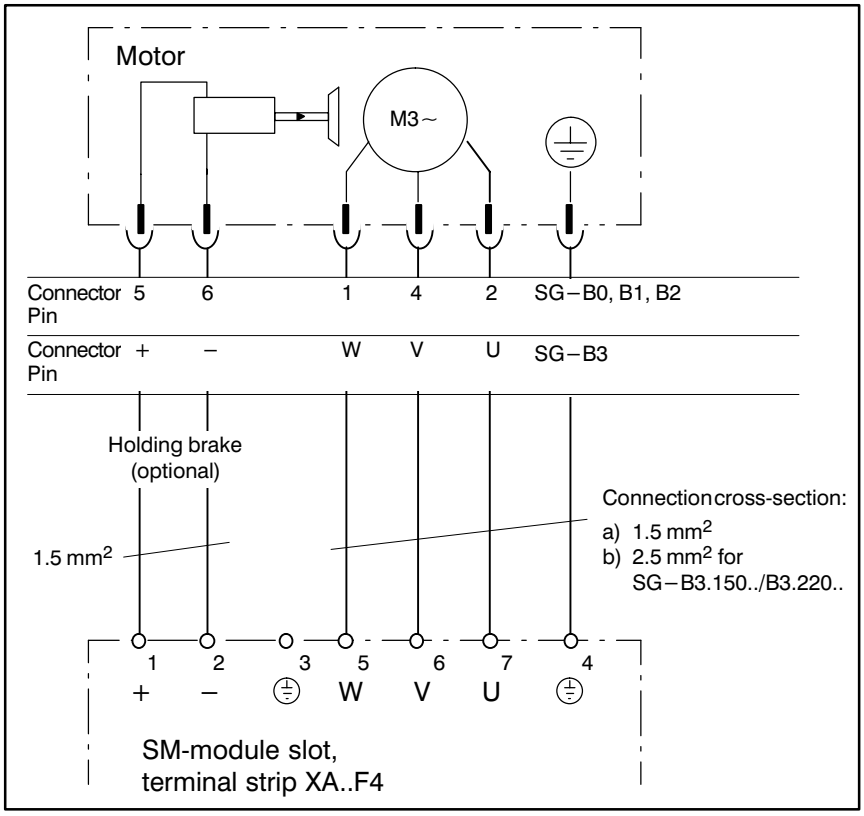
CAUTION !

Motor connections must on all accounts be made in the correct phase sequence.

Terminal strip XA..F4

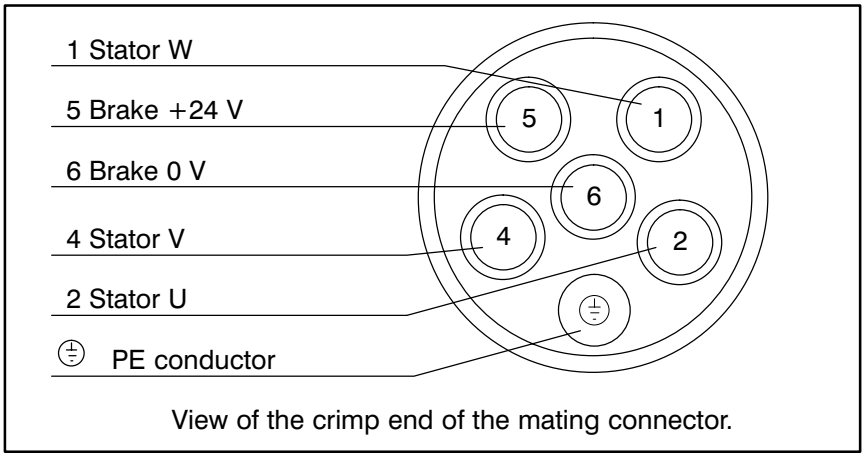
- If motor lines are cyclically reversed:
  Motor performance characteristics cannot be defined
- If two neighboring motor lines are reversed:
  This results in stepper motor-type running characteristics which cannot be influenced by the setpoint input, and the motor shaft may come to a standstill.
- If one motor line is missing:
  Motor does not rotate at a low spindle speed (ca. ≦ 60 rpm) and torque load (machine friction sufficient).

Type SG motors

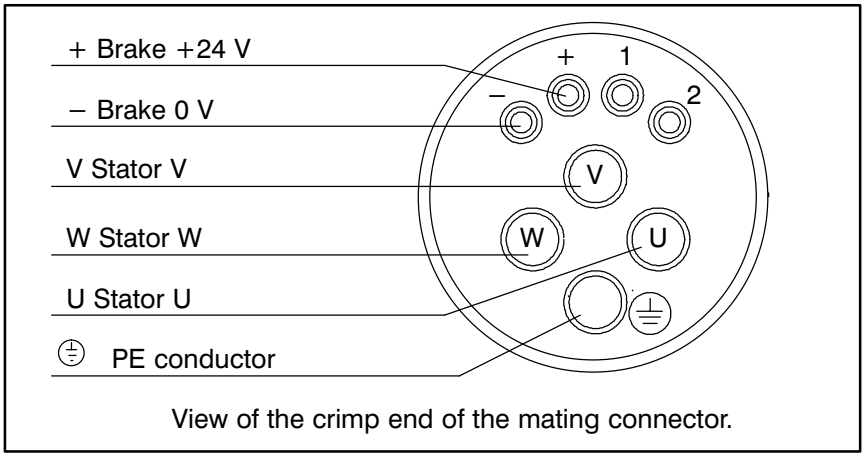


Connection cross-section in accordance with EN 60 204 Part 1/1993, Tab. 5 for installation in cable duct at 40 ˚C (see also section 4.1.4)

Mating connector SG–B0, B1, B2



Mating connector SG–B3

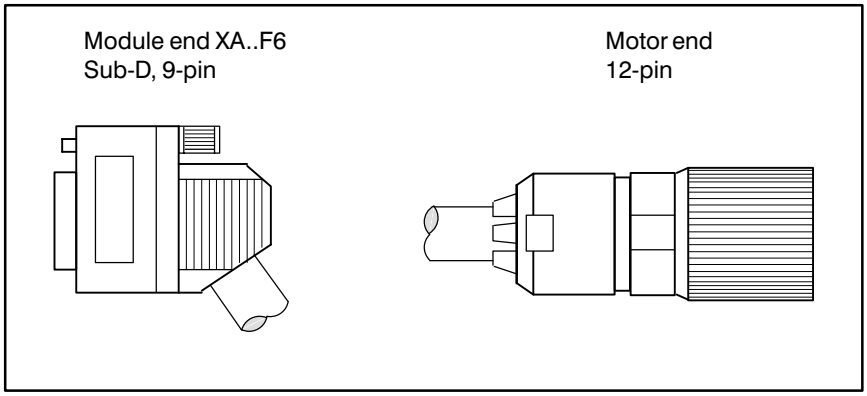


View of the crimp end of the mating connector.

7.11 Resolver connection

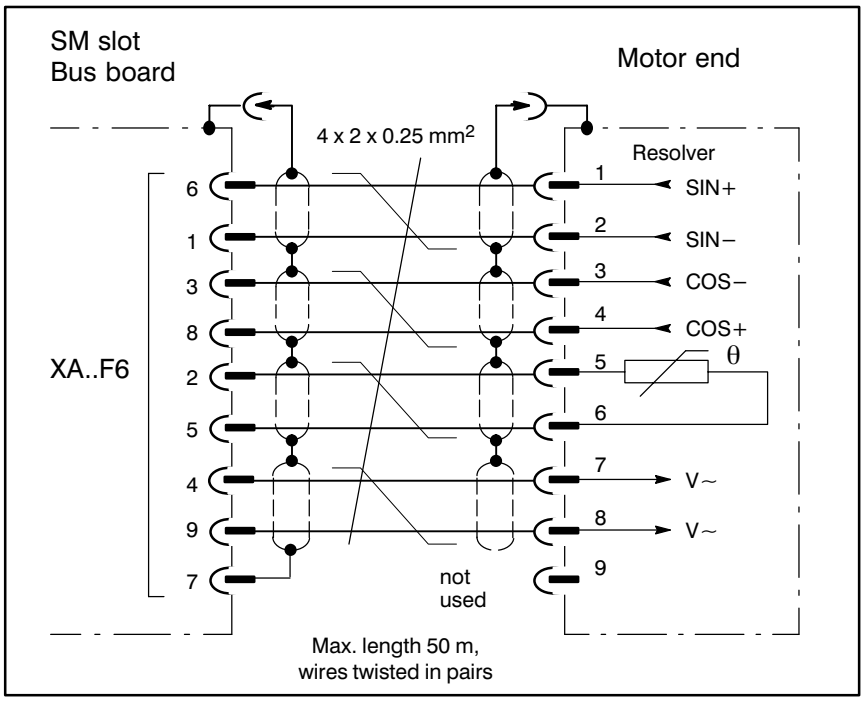
The resolver cable contains the resolver's primary and secondary winding supply cables and the thermistor lines of the motor temperature monitor.

Ready-made resolver cable (see section 4.1.3)

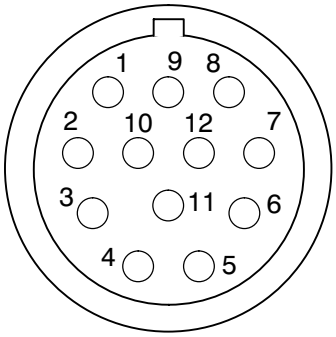


Connector XA..F6

Sub-D socket contact with 9 pins.



Connector system, motor end



View of the crimp end of the mating connector.

Screen connection

In the **motor-end mating connector,** establish a conductive connection between the screen and the plug housing in accordance with the assembly instructions.

In the **module-end mating connector**, secure the screen with the strain-relief clamp. The screen thus has a conductive connection to the connector housing.

7.12 Holding brake connection

Control voltage for releasing the brake: 24 V DC ±10 %

☞ **Note** **If the voltage tolerance is above a certain level, the holding brake cannot be safely released.**
If the polarity is reversed, the holding brake remains closed.

7.10

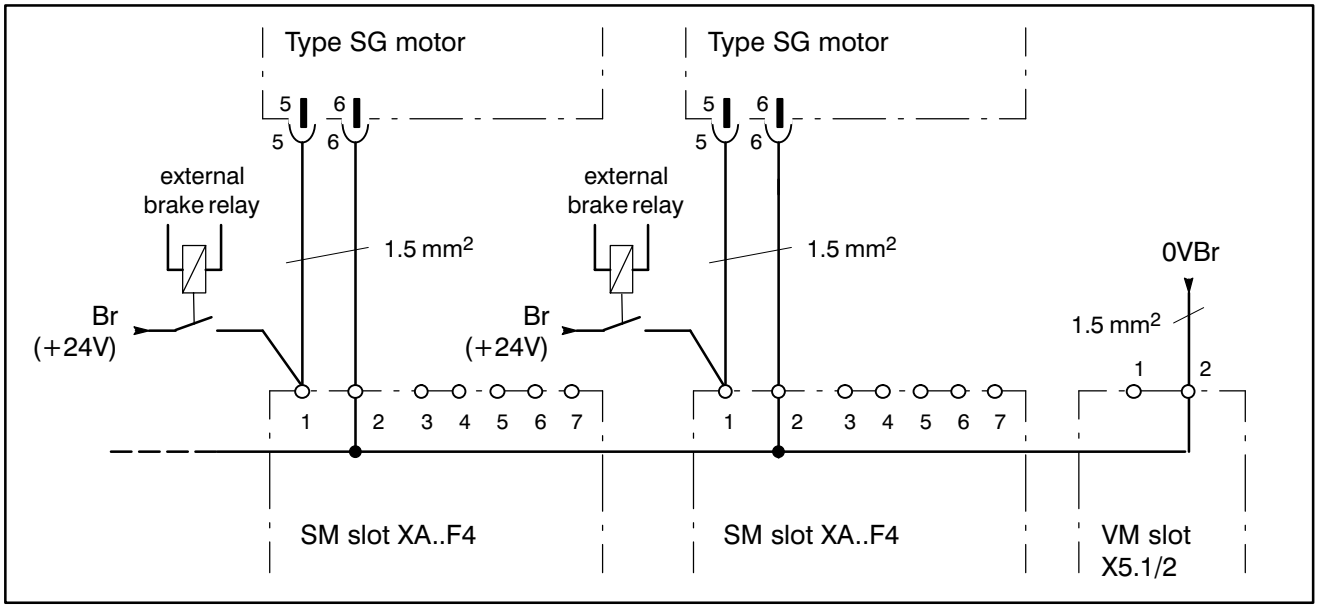
! DANGER !

The holding brake is not a working brake and may be operated only when the shaft is stationary.

7.12.1 Bus board for analog operation

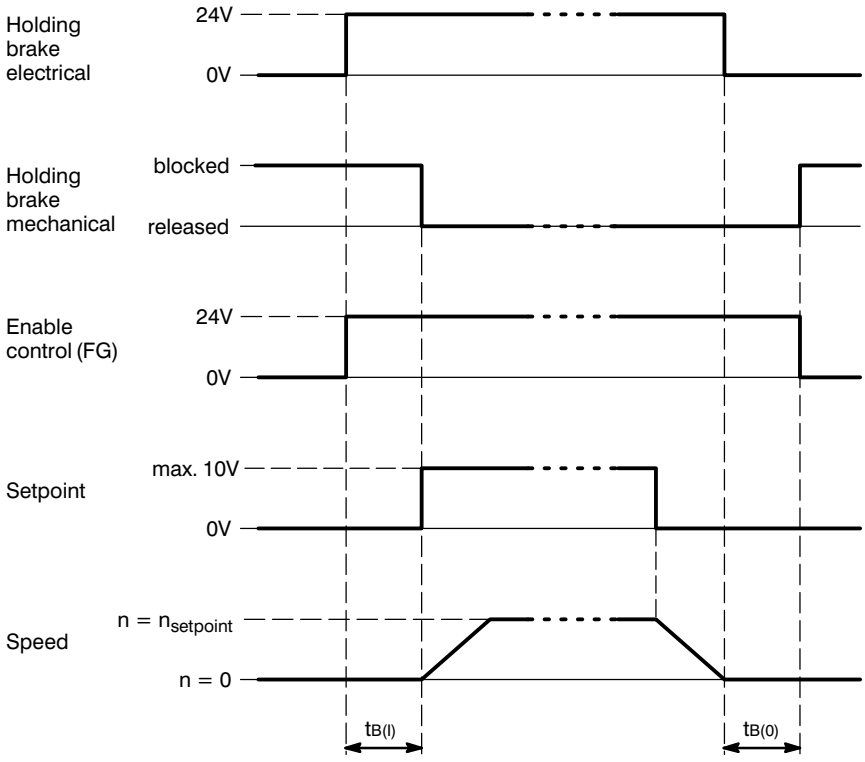
See the diagram below for connecting the holding brake control voltage:

- 0 V centrally to X5.2
- +24 V decentrally to the brake relays installed.
  Combine with the brake supply conductor in a wire end ferrule at connecting point XA...F4.



Control

Control of the holding brake and the setpoint and enable of the servo module must be synchronized in accordance with the following diagram:



$t_{B(I)}$ = Switch-on time
Time between set-up of supply voltage and completely blocked brake

$t_{B(0)}$ = Switch-off time
Time between switch-off of supply voltage and completely blocked brake

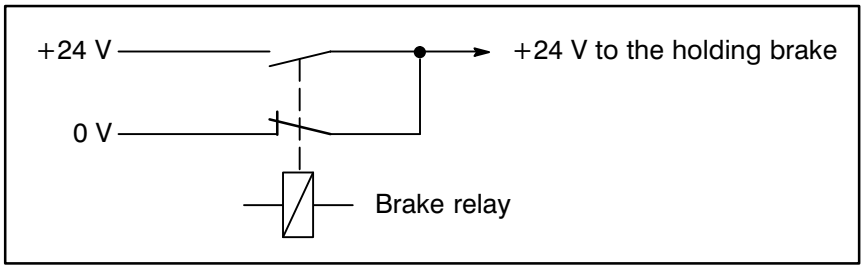
In accordance with the diagram above, the holding brake is switched on and off when the servo motor is at a standstill. Applying a setpoint SW1 = 0V yields a speed n = 0 rpm and the axis is locked until the holding brake is completely released or blocked.

Note the following holding brake switch-on and switch-off times:

Size	Switch-on time $t_{B(I)}$ [ms]	Switch-off time $t_{B(0)}$ [ms]
SG – B0	7	8
SG – B1	20	15
SG – B2	35	25
SG – B3	45	35

Interferences

Capacitive pickup on the 24 V line may lead to delayed brake switch-off. Should such interference occur, we recommend that the holding brake be controlled according to the following circuit diagram:



7.12.2 Bus board for CAN operation

The holding brakes are driven by the higher order control via the CAN bus. This requires no more than plugging the required number of brake relays onto the prepared sockets of the bus board (see section 7.2).

Connection of the holding brake control voltage:

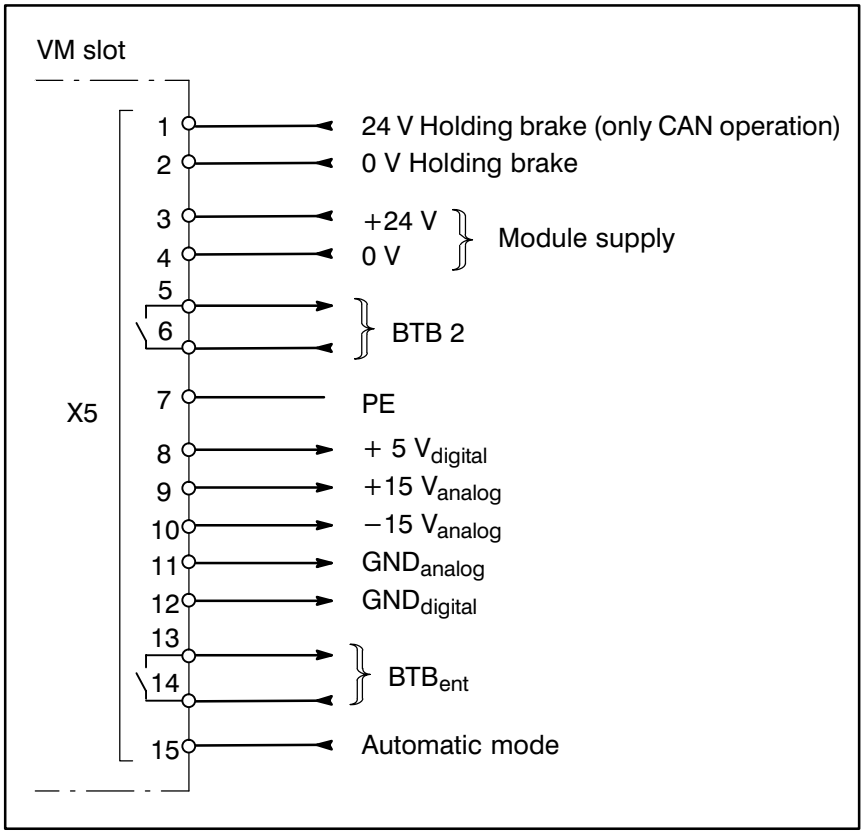
- 0 V centrally to X5.2
- 24 V centrally to X5.1

The brake is connected to the motor via the motor cable, in accordance with section 7.10.

7.13 VM supply and control connections

Terminal strip X5

Analog operation or operation with CAN bus



X 5.1 +24 V Holding brake

Make 24 V central connection only in case of operation with CAN bus and corresponding bus board.
The connection to the 24 V terminal of the XA...F4.1 holding brake is established via the bus board. Control is via CAN bus.
For analog operation, see section 7.12.1.

X 5.2 0 V Holding brake

Connect 0 V centrally.
The connection to the 0 V terminal of the XA...F4.2 holding brake is established via the bus board.
Complete connection of parking brakes, see section 7.12.

X 5.3/4 **24 V module supply**

The supply module uses a DC/DC converter to provide the internal supply voltages ±15 V, +5 V generated from the 24 V module supply for all servo-modules.

7.11

CAUTION !

If the 24 V module supply is switched-off or disconnected, the mains voltage may not be switched on at the VM, as this may damage the VM.

For suggested circuitry for switching the 24 V supply on and off, see section 7.7.

X 5.5/6 **BTB2** **Ready 2**

Floating relay contact. Load carrying capacity 50 V, 100 mA, 10 VA
Display indirect via green LEDs.
The contact closes after switching on the supply voltage if the following conditions are fulfilled:

- DC link voltage 50 V < U_{DC} < 400 V DC
- no heat sink overtemperature
- all supply phases available,
  this monitoring function must be deactivated for single-phase operation (see section 8.2).

In case of a malfunction, the BTB2 contact is immediately opened.

The **BTB2 contact of the supply module (VM)** must be switched via an auxiliary relay K03 in accordance with section 7.7.

X 5.7 **PE**

Screen connection if a screen is used.

X 5.8–12 **Internal voltages**

Load carrying capacity 100 mA.

X 5.13/14 **BTB_{ent}** **Entire drive assembly ready**

Floating relay contact. Load carrying capacity 30 V/6 A resistive load.
No display.

☞ **Note** **If there are vacant slots in the module rack, the XA..F5.1 terminal must be bridged with the XA..F5.2 terminal at each of these slots, in order that the BTB_{ent} contact closes.**

The contact closes immediately after switching on the 24 V module supply under any of the following conditions:

- GC link voltage U_{DC} < 400 V DC
- No heat sink overtemperature in the VM module

- No short in the power output stage in the SM
- No error in the MCO module
- No resolver error
- No computer error in the SM module
- No temperature error in the SM module
- No temperature error in the motor

In case of a malfunction, the BTB_{ent} contact is immediately opened.

The **BTB_{ent} contact** must be switched to the self-holding circuit of the K01 mains contactor (see section 7.7).

☞ **Note** **After an error is rectified, an enable command must be given (positive slope required) in order to resume operations.**

X 5.15 **Automatic mode**

Digital 24 V to X5.15, 0 V to X5.4.

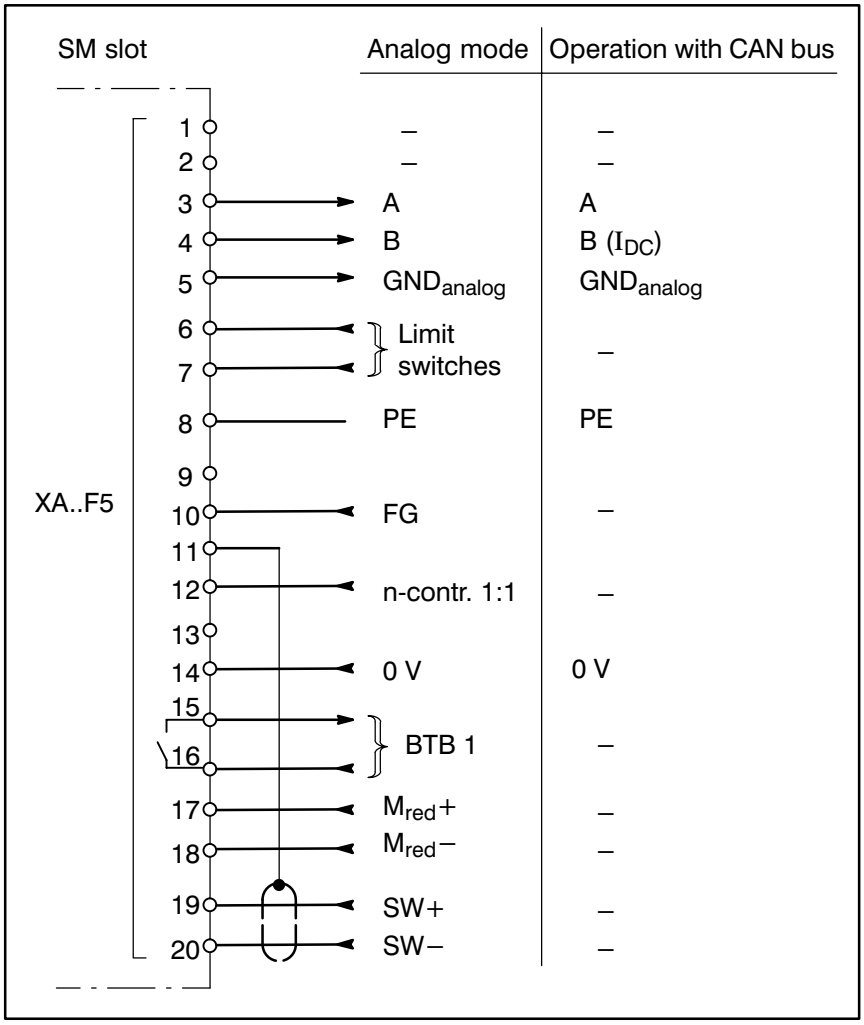
When 24 V is applied, all connected axes in the module rack are centrally switched over from “manual” to “automatic”.
In manual mode, speed and torque are limited to 10 % of the maximum value of the selected motor. This presetting can be changed.
In automatic mode, speed and torque are not limited.

Note that operations with the set-up parameter set do not guarantee safe operation. Safe operation is only possible with power tapping, see page 7-6.

☞ **Note** **In analog mode the X5.15 terminal must be wired or switched off with the “OM” command (see manual no. 24).**

7.14 SM control connections

Terminal strips XA..F5



XA..F 5.3 Analog output A, programmable

Level: 0 ... ±10 V,
10 V ≙ Maximum value as related to the current motor-servo module combination.

The same signal is also available at the TP10 testpoint on the SM PC board.

❑ The following can be programmed with the 'OTA' command in **analog mode:**

- □ Zero shift
- □ Current setpoint I_{DC}
- □ Speed setpoint
- □ Actual speed
- □ Actual position

- □ Filtered actual speed
- □ Observer speed
- □ Observer position error

❑ The following can be programmed with the 'OTA' command in **CAN bus operation mode:**

- □ Zero point offset
- □ Current setpoint I_{DC}
- □ Command speed
- □ Actual speed
- □ Position setpoint
- □ Actual position
- □ Position deviation

XA..F 5.4 Analog output B

Level: 0 ... ±10 V,
10 V ≙ Maximum value as related to the current motor-servo module combination.

The same signal is also available at the TP3 testpoint on the SM PC board.

❑ In **analog mode** the 'OTB' command can be used to program the same output signals as analog output A.

❑ In **CAN bus operation mode** analog output B can be assigned a fixed value with the current setpoint (I_{DC}).
The output signal here is identical to that at analog output A only during commissioning with the function generator.

XA..F 5.5 GND_{analog}

Reference potential for the analog outputs XA..F 5.3 and XA..5.4.

XA..F 5.6 Limit switch input, clockwise rotation

Connect only for analog operations.
Digital 24 V to XA..F5.6 and 0 V to XA..F5.14.
Input for a limit switch, which is reached by turning clockwise.

At 0 V level, the setpoint for the rotational direction is set to SW = 0. The motor brakes at a presettable braking ramp.
Speed setpoints for the opposite direction remain possible.

XA..F 5.7 Limit switch input, counter-clockwise

Connect only for analog operations.
Digital 24 V to XA..F5.7 and 0 V to XA..F5.14.
Input for a limit switch, which is reached by turning anti-clockwise. Function is as described above.

XA..F 5.8 and 11 **PE**

Screen connection for command line.

XA..F 5.10 **External enable**

Connect only for analog operations.
Digital 24 V, indicated by green LED.

- If 24 V are present at XA..F5.10 as opposed to XA..F5.14 and BTB1 and BTB2 are active, the output stage and regulator are enabled.
- If the axis can be braked or seized, the enable controller must be switched off when braking and seizing are active.
- After cancelling ready status and rectifying the fault, the enable command must be given again (positive slope).
- The enable must be guided via the K03 contact (see section 7.7).

XA..F 5.12 **n-controller 1:1**

Only for commissioning purposes in analog mode.
Digital 24 V to XA..F5.12 and 0 V to XA..F5.14.
The speed controller in the SM switches to 1:1 gain at H level.

XA..F 5.14 **GND**

Connect only for analog operations.
Reference potential for the analog inputs XA..F5.6, 7, 10, and 12.

XA..F 5.15/16 **BTB1 Ready 1**

Floating relay contact. Load carrying capacity 50 V, 100 mA, 10 VA
Indicated via yellow LED.

The contact closes immediately after switching on the 24 V supply voltage if the following conditions are met in the SM:

- No module temperature warning
  (temperature model of the output stage and heat sink temperature)
- No motor temperature warning

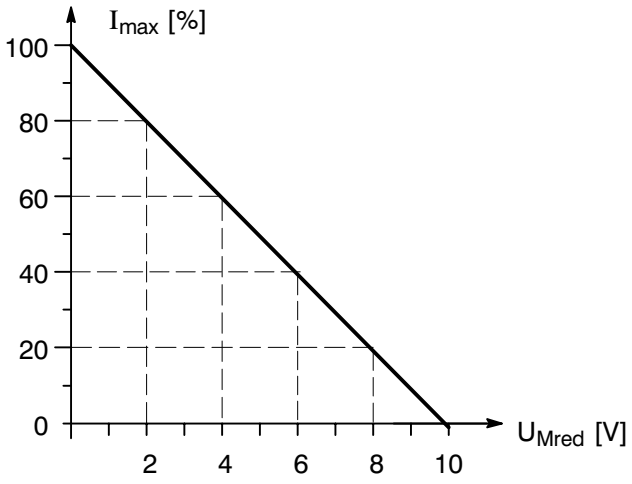
Module current is immediately reduced if the warning temperature is exceeded. The yellow LED comes on simultaneously.
The BTB1 contact opens, and depending on further temperature increases, the module current can be reduced to zero. In this case, BTB_{ent} opens (temperature fault).

☞ **Note** **In some dynamic acceleration processes, the yellow LED may light up briefly, which means that the current reduction function is active without triggering BTB1.**

The **BTB1 contact of the servo module** can be separately evaluated as a prewarning.

XA..F 5.17/18 Torque reduction

Only possible for analog operations.
Differential input. Module peak current can be limited by an analog signal 0...+10 V. In this way, the torque available in the motor is reduced by the same amount.



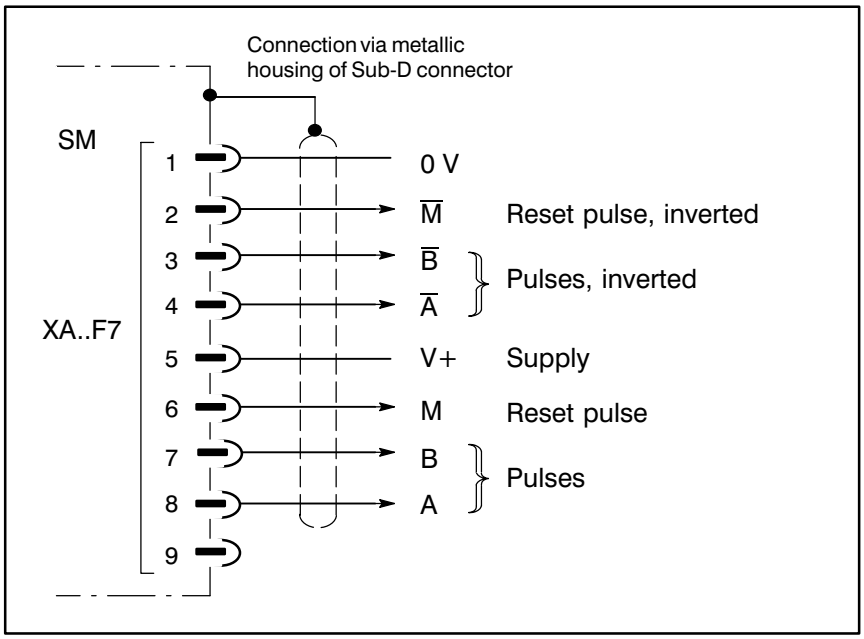
XA..F 5.19/20 Setpoint input

- Always make a 2-pole setpoint connection, differential input.
- Input voltage for the maximum setpoint is ±10 V.
- 0 V level is not necessary as reference potential of the setpoint input.
- Direction of rotation is determined by polarity.
- The screen must not be interrupted if wiring is through intermediate terminals or connectors.
- The same setpoint input is used for an activation operation with torque setpoint. A 24 V signal to XA..F5.12 switches over to torque setpoint.
- Screening is required on both ends.

7.15 Connection of the encoder EC.. – G simulation board (option)

The resolver's output signals are available as a square-wave pulse train when the option encoder EC... – G simulation board is used.
These signals can be further processed during module analog operation, for instance, for position control.
This option is not required for operations with the CAN bus in conjunction with the rho 3.1-C robot control.

Connector XA..F7 Sub-D connector, 9 pins



7.16 Serial RS 232 interface for commissioning

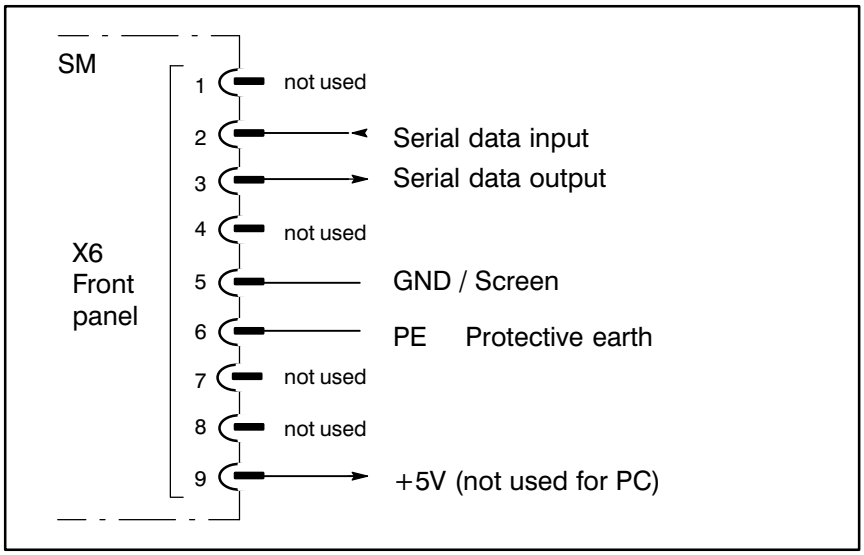
The RS 232 is located on the front panel of each servo module as the connector X6.
The RS 232 is used to connect a commercially available IBM-compatible PC to the respective SM.

For **analog operations and operation with the CAN bus,** commissioning procedures and paramaters changes via the RS 232 are performed with the aid of a BOSCH commissioning disk.

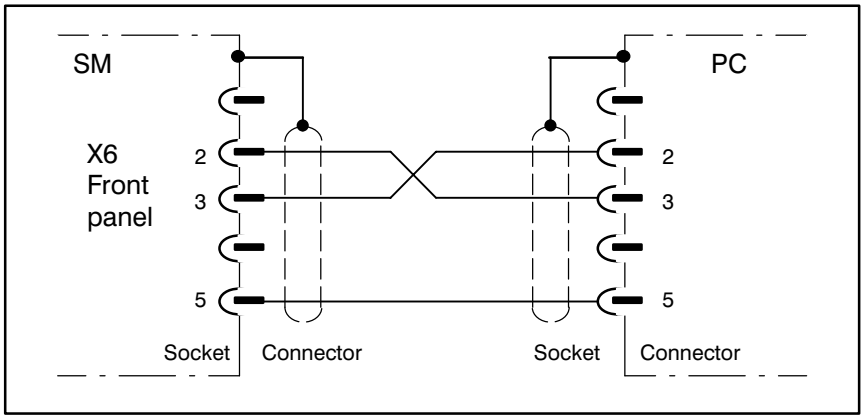
- 9600 baud transmission rate

Front panel X6

Sub-D connector on the front panel, 9 pins



Connection cable

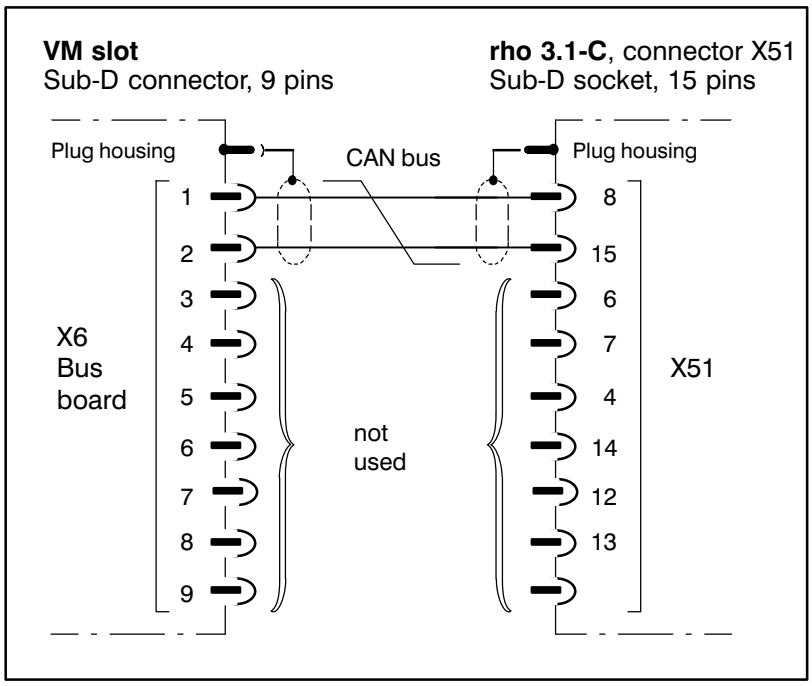


7.17 Serial interface for CAN bus

The connector for the CAN bus is located on the bus board in the VM slot area as connector X6.

The drives are driven together with the rho 3.1-C robot control via the CAN bus.
This substantially reduces the amount of circuitry involved (see section 7.2), the commissioning procedure is performed using a PC.

CAN bus via connector X6



8 Presettings on the drive modules

After assembling the subrack with the bus board and concluding the electrical connections, check the following presettings.

8.1 Preparation of the module rack with bus board

The module rack with bus board is supplied in different versions for analog operations and for operations with the CAN bus.

Analog mode

No additional steps need be taken.

CAN bus mode

For motors with a holding brake, the required brake relays are plugged onto the corresponding slots in the bus board.
No additional steps need be taken for motors without a holding brake.

Vacant slots

If there are vacant slots in the BGT, the XA..F5.1 and XA..F5.2 terminals on the bus board must be bridged at each of these slots!
Commissioning is not possible without a bridge.

8.2 Preparation of the VM module

The supply module as delivered is set up for three-phase operations. For single-phase operations, the phase failure monitoring function must be disabled by moving jumper JW1 to another position:

VM	Single-phase operation	Three-phase operation, monitoring active
Position JW 1	1 – 2	2 – 3 (works setting)

☞ **Note** **Jumper JW2 is only used for test purposes.**
It must remain in position 2 – 3.

8.3 Preparation of the VM modules

Motor adjustment

By checking and, if necessary, changing the MCO jumper according to the table in section 5.3, the SM module is modified to the connected motor. Position of the jumper on the PC board, see section 9.2.

Commissioning interface

In analog and CAN bus operation modes the SM modules are modified separately via the RS 232 on the module front panel and put into operation. The following jumper positions should not be changed:

SM		RS 232 active (front panel)
Position jumper	L2	occupied
	L3	occupied
	L4	not occupied
	L5	occupied

Encoder simulation (optional)

❑ **Jumper settings on the EC card.**
Like a standard encoder (e.g. ROD encoder), the encoder simulation board is evaluated with the factory settings of the jumpers.
The reset pulse and power supply can, in exceptional cases, be changed.

□ Reset pulse:

EC card	Long reset pulse, ≙ Pulse A	Short reset pulse, ≙ logical A and B
Position Jumper L1	 L	 S

= factory setting

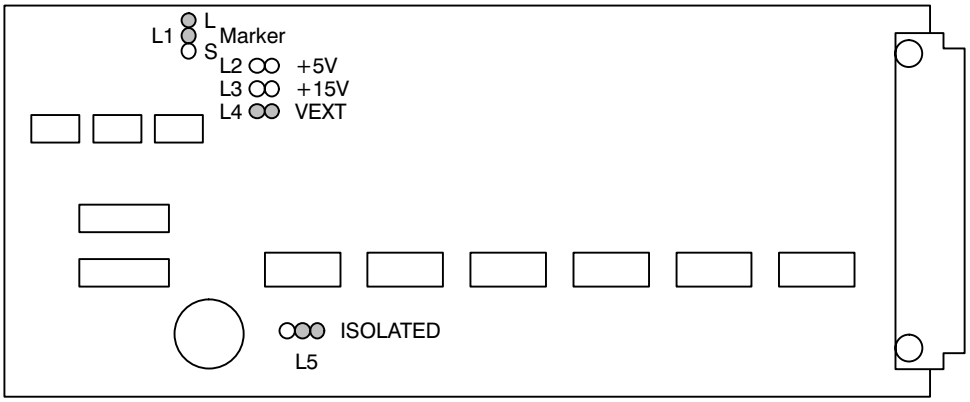
□ Power supply:

Position jumper:	Internal supply + 5 V	Internal supply + 15 V	External supply without elec. isolation	External supply with elec. isolation
L2				
L3				
L4				
L5				

= factory setting

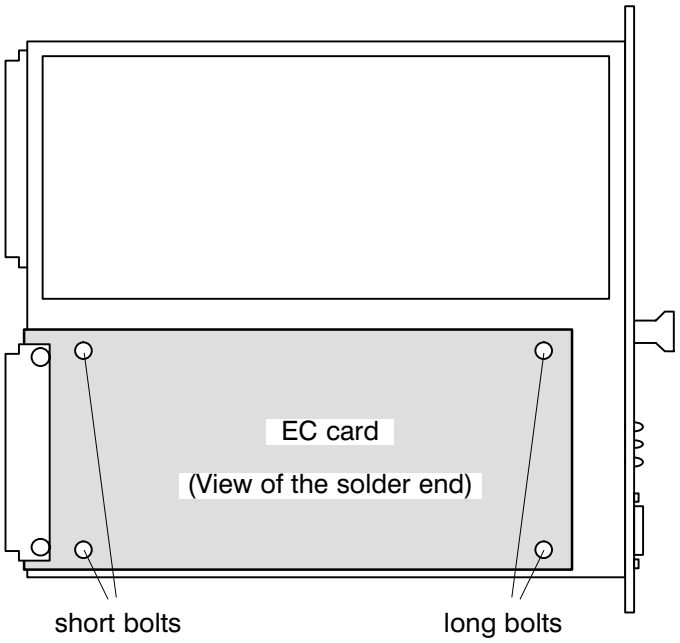
As with a standard encoder, power is supplied via the terminals where factory settings apply. Complete electrical isolation can be deselected via L5.

In case of internal power supply, supply voltage is given together with the encoder signals at XA..F7.5/1. Selection of +5 V or +15 V is possible as required.



❑ **Installing the EC card**

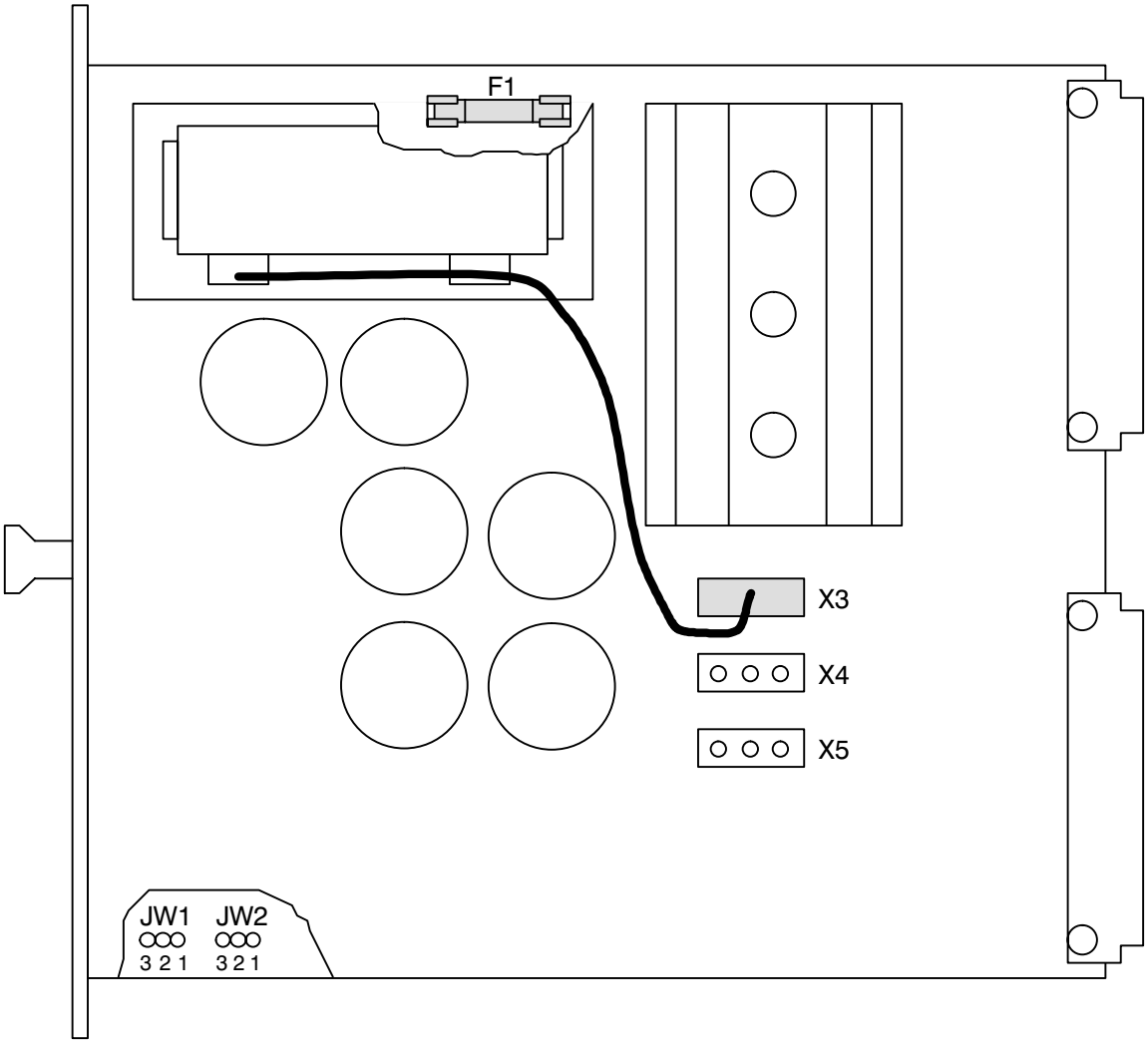
1. Screw the spacing pins into the SM module:
   short bolts on the connector side, **long bolts** opposite the front panel
2. Place the EC card onto the spacing pins, with the solder end pointing outwards.
3. Screw in EC card: Twist the **longer screws** into the short bolts (connector end) and the **shorter screws** into the long bolts.



Your notes:

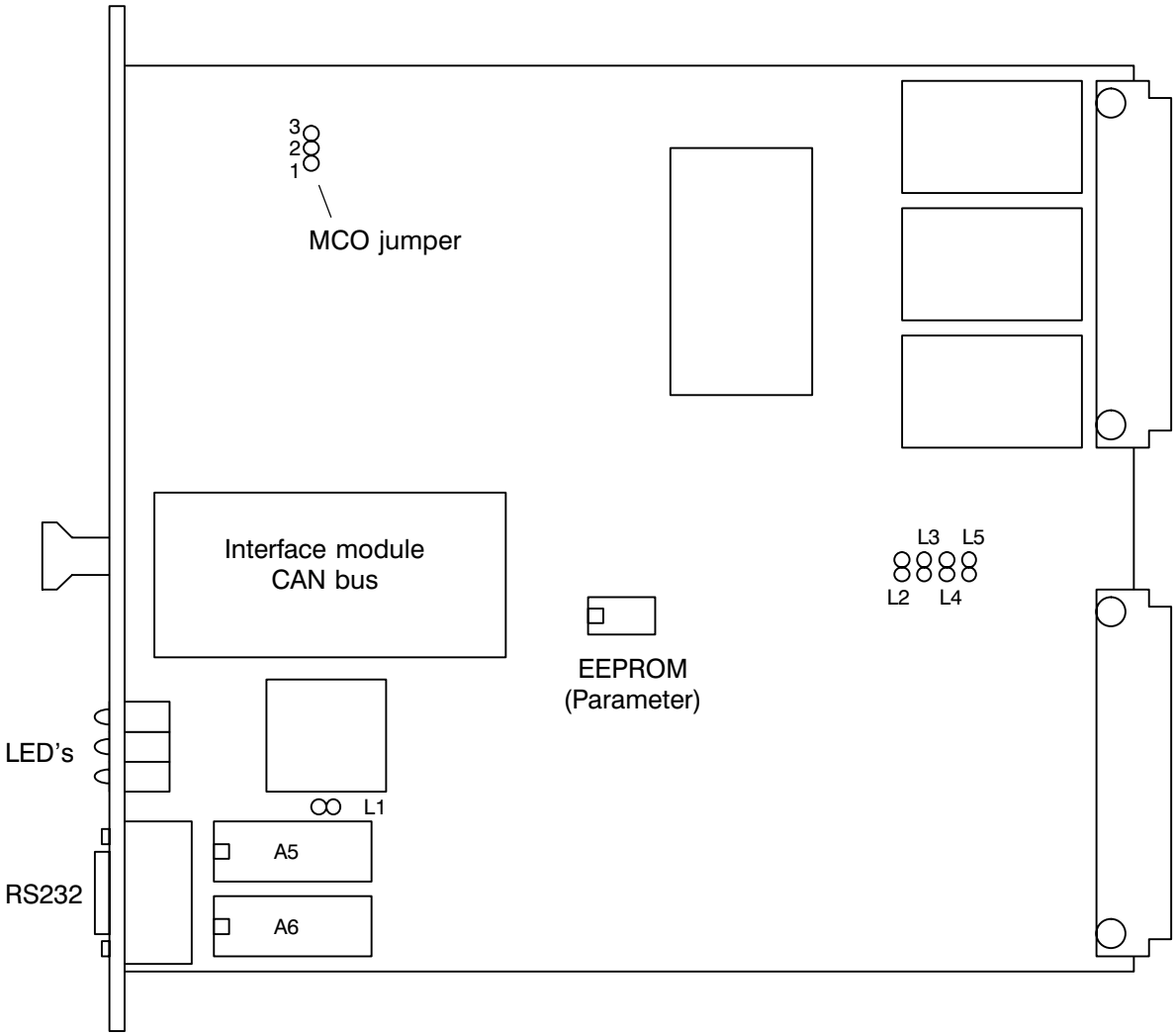
9 PC boards

9.1 Supply module VM.. – G(C)



Element		Function	cf. section
Connector	X3/X4/X5	Internal/external ballast resistor	7.9
Jumper	JW1	Phase failure monitoring	8.2
Jumper	JW2	Only for test purposes, always position 2 – 3	–
Fuse	F1	Size according to ballast resistor: 1.6 A/415 V slow-blow or 2.5 A/415 V slow-blow or 8 A/415 V, slow-blow	4.2.2

9.2 Servo module SM.. – G(C)16



Element		Function	cf. section
MCO jumper		Optimisation of the motor-module combination	5.3
Jumper	L1	Change-over analog/CAN bus*	–
Jumper	L2, L3, L4, L5	Commissioning via RS 232 or RS 485	8.3
EPROM	A5, A6	Operational software	–

*Jumper L1 is occupied for analog mode but open for CAN mode and may not be changed, as the two modes have different software.

10 Order numbers

10.1 Drive modules

Designation		Order no.
Supply module	VM 7.5/BE–G	1070 918 573
Servo modules (new generation)	SM 3.5/8 – G16	1070 917 160
	SM 4.7/20 – G16	1070 917 161
	SM 6.5/30 – G16	1070 917 162
	SM 18/60 – G16	1070 917 163
	SM 3.5/8 – GC16	1070 917 164
	SM 4.7/20 – GC16	1070 917 165
	SM 6.5/30 – GC16	1070 917 166
	SM 18/60 – GC16	1070 917 167
Module racks with bus boards	BT 2 – G	1070 916 951
	BT 4 – G	1070 916 953
	BT 6 – G	1070 916 952
	BT 2 – GC	1070 918 790
	BT 4 – GC	1070 918 791
	BT 6 – GC	1070 918 792

10.2 Accessories

Designation		Order no.
Mating connector, motor end		see section 4.1.4
Mating connector module end	Resolver	1070 070 897
	RS 485 (CAN bus)	1070 070 898
Bosch commissioning disk	3.5''	1070 077 275
Connecting lead for PC	5 m, with 9-pin Sub-D connector	1070 077 170
Transformer	ST3 1.0/400 – G	1070 917 051
	ST3 1.5/400 – G	1070 917 141
	ST3 2.0/400 – G	1070 916 902
	ST3 2.5/400 – G	1070 917 142
	ST3 3.0/400 – G	1070 917 050
	ST3 4.0/400 – G	1070 917 987
	ST3 5.0/400 – G	1070 917 059
	ST3 7.5/400 – G	1070 918 683
	ST3 10.0/400 – G	1070 918 682
Fan module	LB 1 – G	1070 916 954

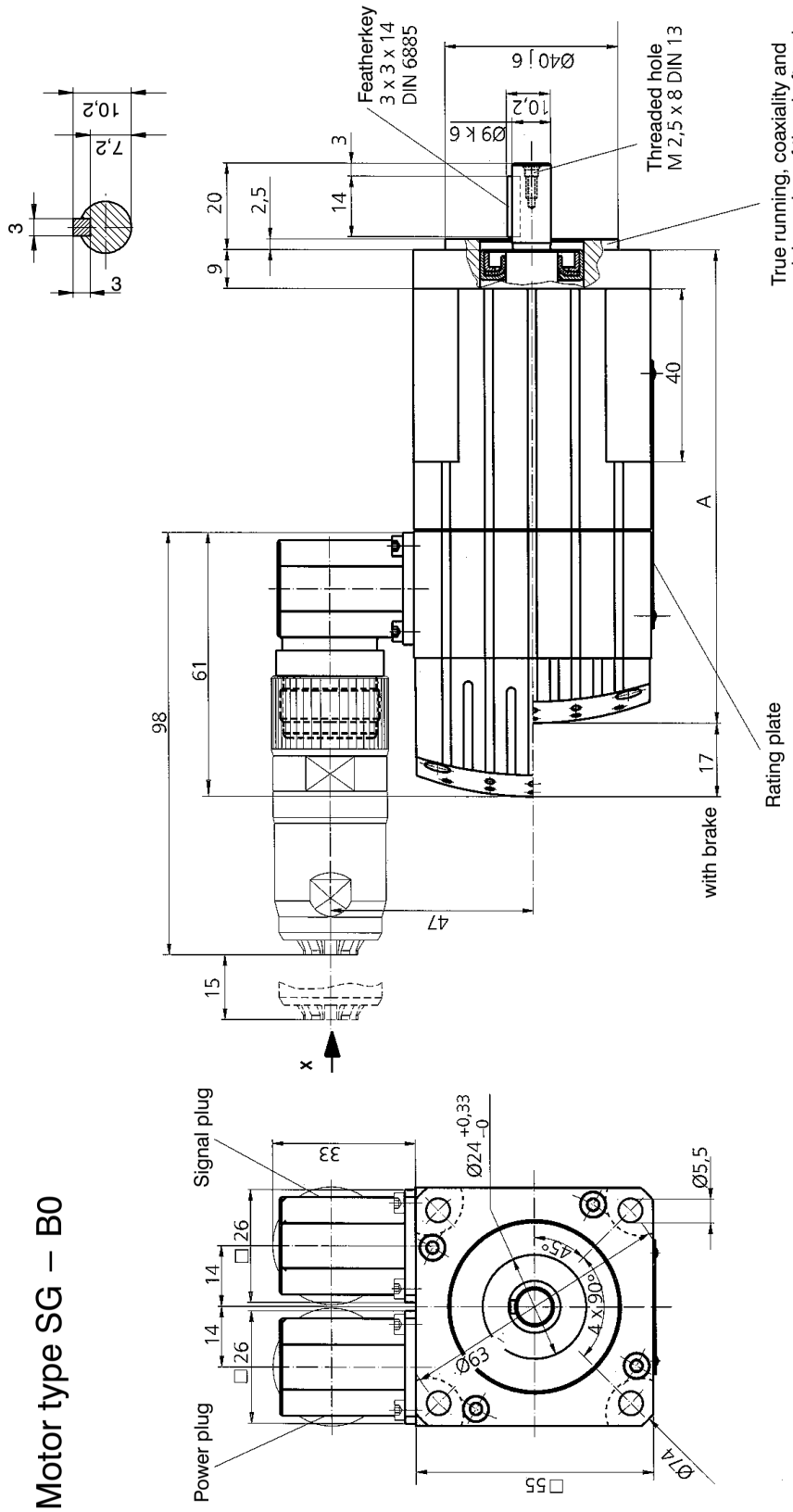
Designation		Order no.
Dummy front plates	BL 6 – G BL12 – G	1070 916 956 1070 916 955
Power cables, mobile, as components	4 x 1.5 + 2 x 1.5 4 x 2.5 + 2 x 1.5	1070 917 070 1070 917 099
Encoder cables, mobile, as components	4 x 2 x 0.25	1070 917 169
Power cables, ready-made		on request
Encoder cable, ready-made		on request
CAN data line	for rho control for rho and 2 BT	on request on request

10.3 Options

Designation		Order no.
Installation set BT for rear panel installation of the module rack		1070 917 082
Ballast resistor with protective housing	BWS 50/230 – G BWS 10/450 – G	1070 917 045 1070 917 445
Encoder simulation board	EC 001 – G Mating connector for 1 x EC 001 – G	1070 916 853 1070 070 913
Brake relay	for BT.. – GC	1070 917 783

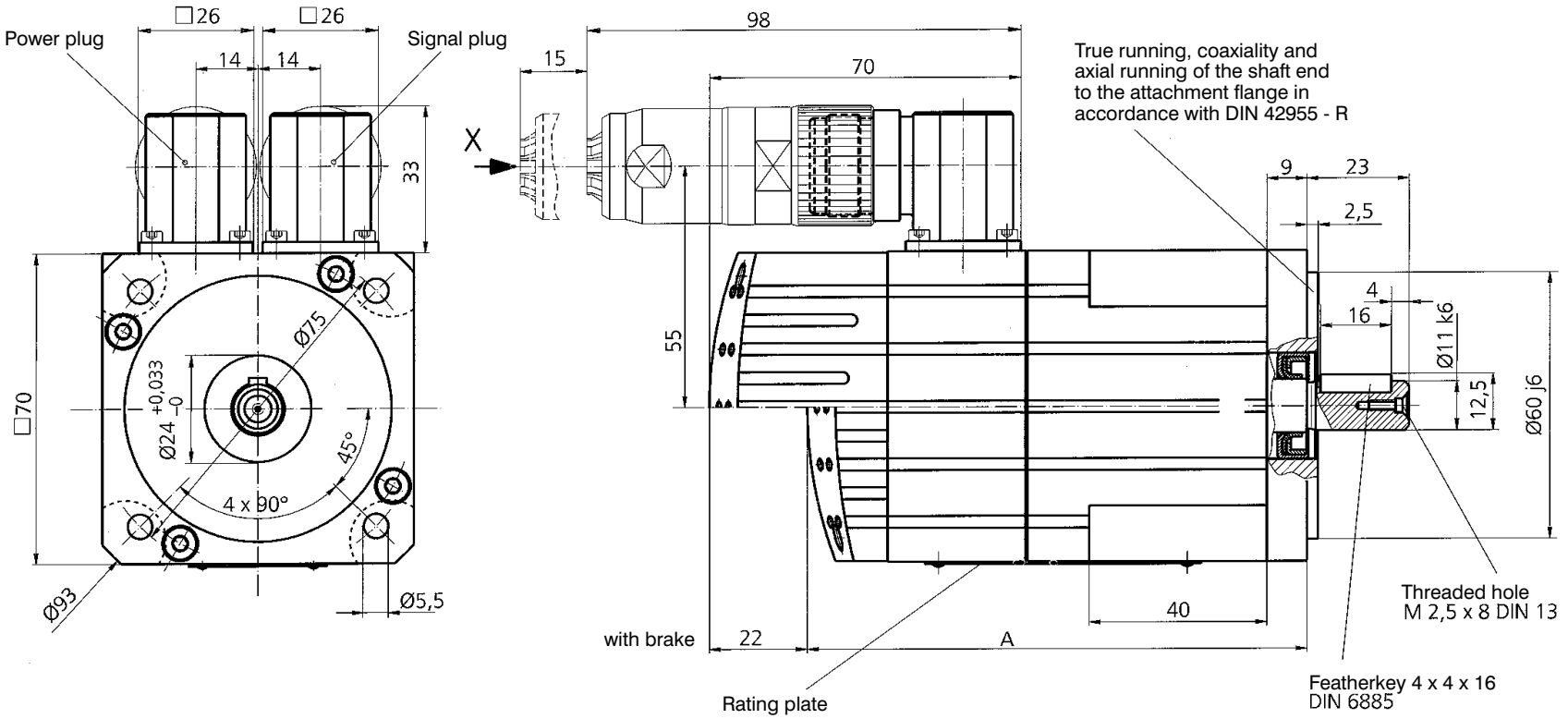
11 Dimensioned drawings

11.1 Dimensioned drawings, Servo motors, Type SG



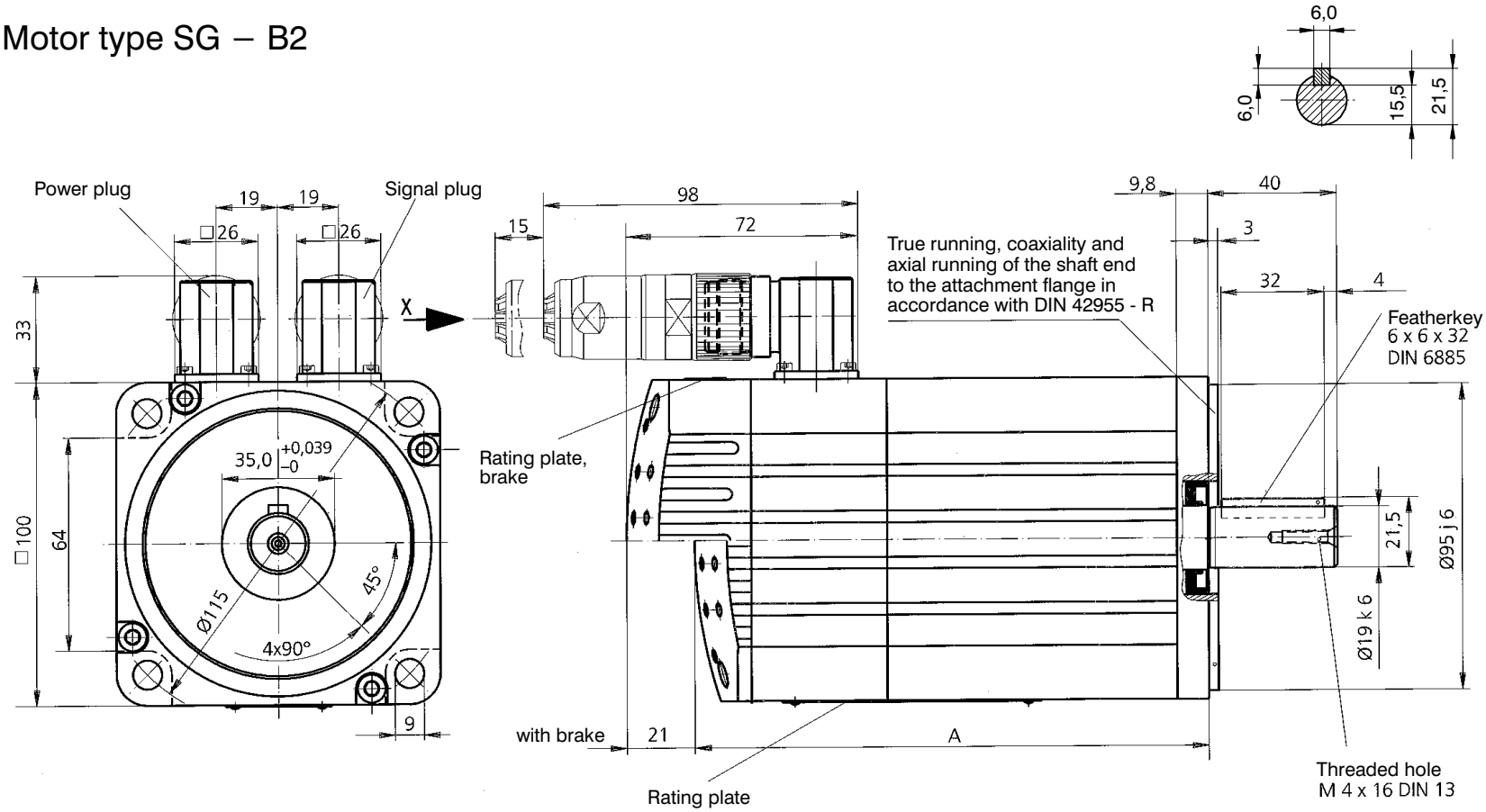
Type	Length A [mm] w/out holding brake	Length A [mm] with holding brake	Weight [kg] w/out holding brake	Weight [kg] with holding brake
SG–B0.002	110	127	1,0	1,2
SG–B0.004	123	140	1,2	1,4
SG–B0.007	148	165	1,5	1,7
SG–B0.014	199	216	2,3	2,5

Motor type SG – B1



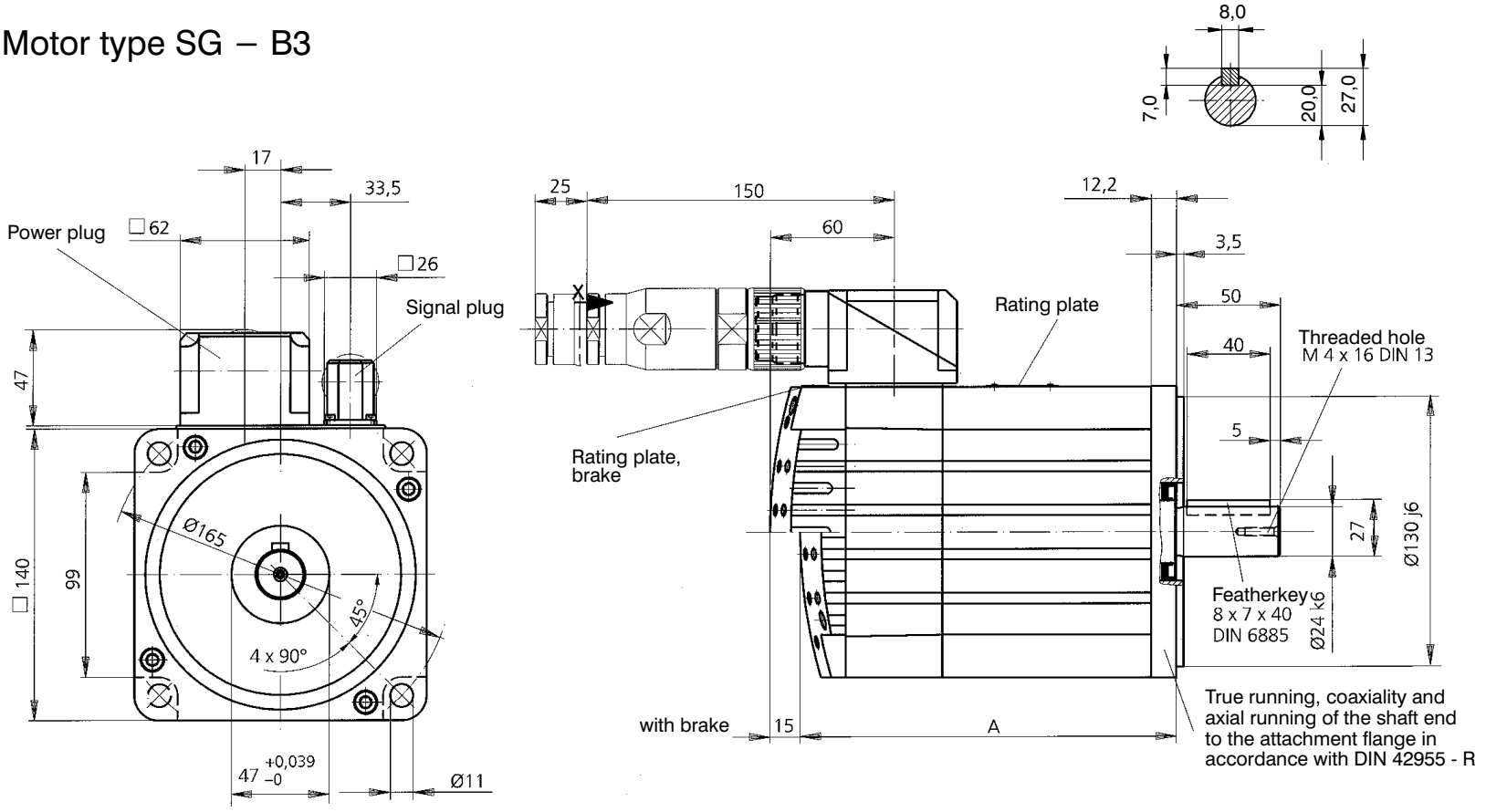
Type	Length A [mm]		Weight [kg]	
	w/out holding brake	with brake	w/out holding brake	with (x3/4) brake
SG–B1.006	115	137	1,4	1,6 / 1,8
SG–B1.016	140	162	2,0	2,2 / 2,4
SG–B1.023	166	188	2,6	2,8 / 3,1
SG–B1.034	204	226	3,5	3,7 / 4,0

Motor type SG – B2



Type	Length A [mm]		Weight [kg]	
	w/out holding brake	with brake	w/out holding brake	with (x3/4) brake
SG–B2.014	134	155	3,0	3,6 / 3,8
SG–B2.027	147	168	3,6	4,1 / 4,4
SG–B2.050	172	193	4,7	5,2 / 5,5
SG–B2.086	223	244	6,9	7,4 / 7,7

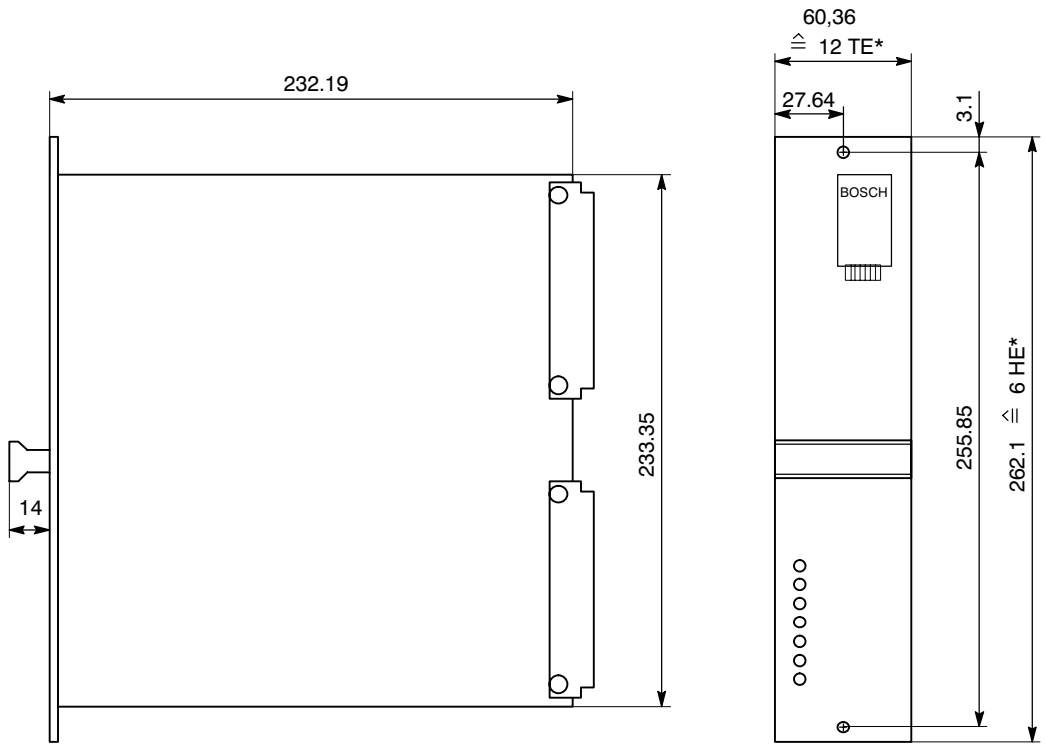
Motor type SG – B3



Type	Length A [mm]		Weight [kg]	
	w/out holding brake	with brake	w/out holding brake	with (x3/4) brake
SG–B3.055	170	185	7,7	8,5 / 9,0
SG–B3.100	195	210	9,9	10,7 / 11,2
SG–B3.150	220	235	12,1	12,9 / 13,4
SG–B3.220	271	286	16,6	17,4 / 17,9

11.2 Dimensioned drawing, Supply module

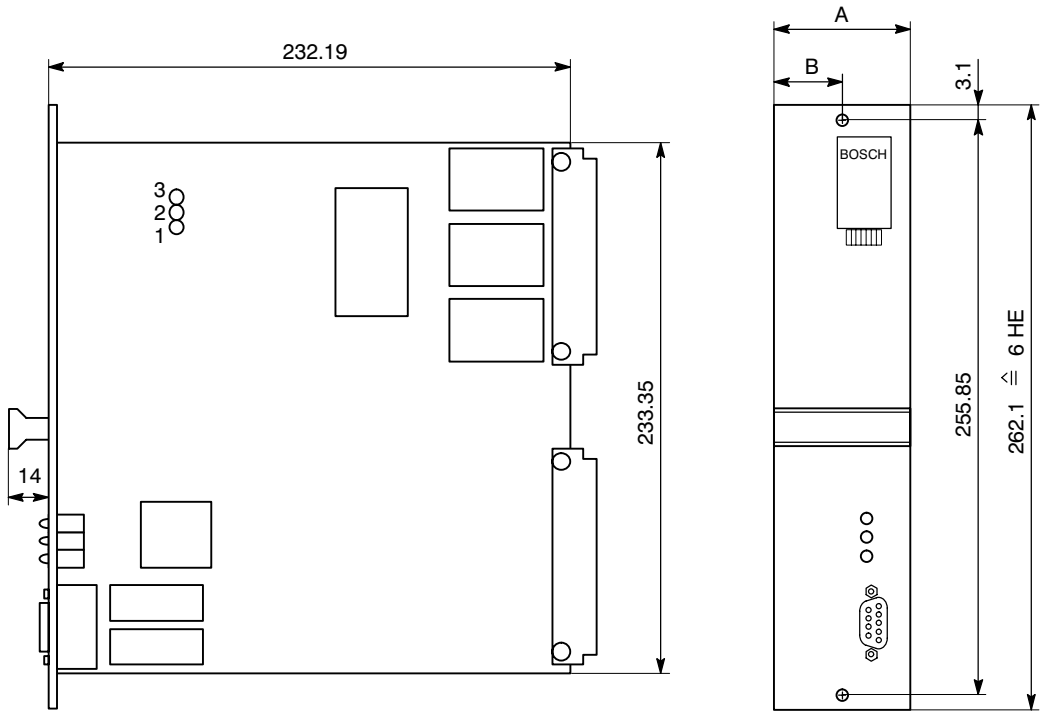
Dimensions in mm:



* 1 TE = modular spacing interval = 5.08 mm
  1 HE = height interval = 43.68 mm

11.3 Dimensioned drawing, Servo modules

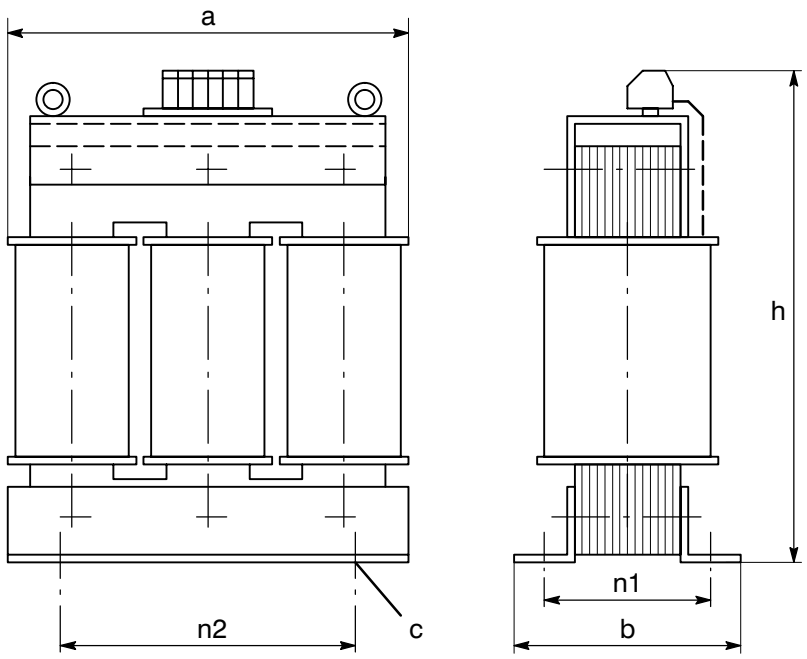
Dimensions in mm:



Dimensions [mm]	A	B
SM 3.5/8 to SM 6.5/30	60.36 ≙ 12 TE	27.64
SM 18/60	91.44 ≙ 18 TE	

1 TE = modular spacing interval = 5.08 mm
1 HE = height interval = 43.68 mm

11.4 Dimensioned drawing, Autotransformer ST



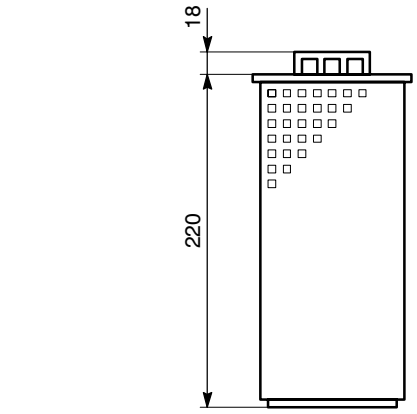
Type	a* [mm]	b* [mm]	h* [mm]	n2 [mm]	n1 [mm]	c [mm]	Weight [kg]
ST3 1.0/400	180	85	185	136	58	7 x 13	6.5
ST3 1.5/400	180	105	185	136	78	7 x 13	10.0
ST3 2.0/400	210	100	210	136	67	8 x 12	12.5
ST3 2.5/400	210	110	210	136	78	8 x 12	15.0
ST3 3.0/400	245	100	230	185	76	10 x 18	18.0
ST3 4.0/400	245	115	230	185	96	10 x 18	23.0
ST3 5.0/400	270	140	290	200	91	10 x 18	28.0
ST3 7.5/400	300	125	270	224	96	10 x 18	35.0
ST3 10/400	310	180	320	224	107	10 x 18	41.0

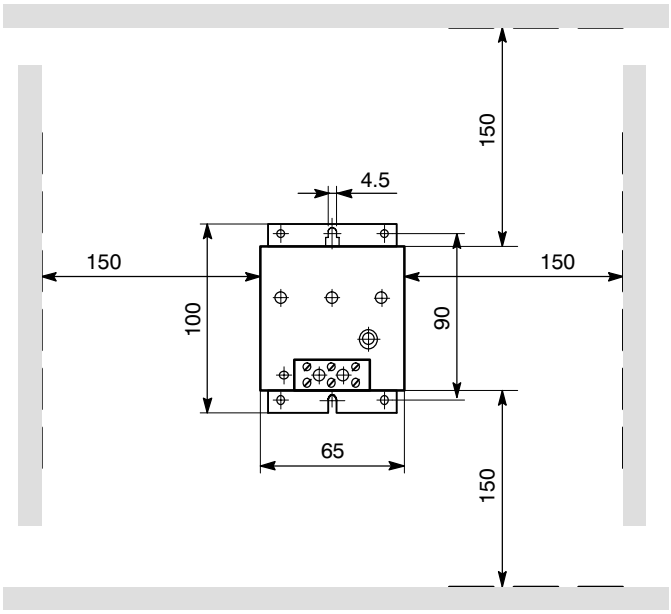
* maximum exterior dimensions

11.5 Dimensioned drawing, Ballast resistors

BWS 50/230 – G
in the IP 20 protective housing, 340 °C surface temperature possible at the resistor

Dimensions in mm:



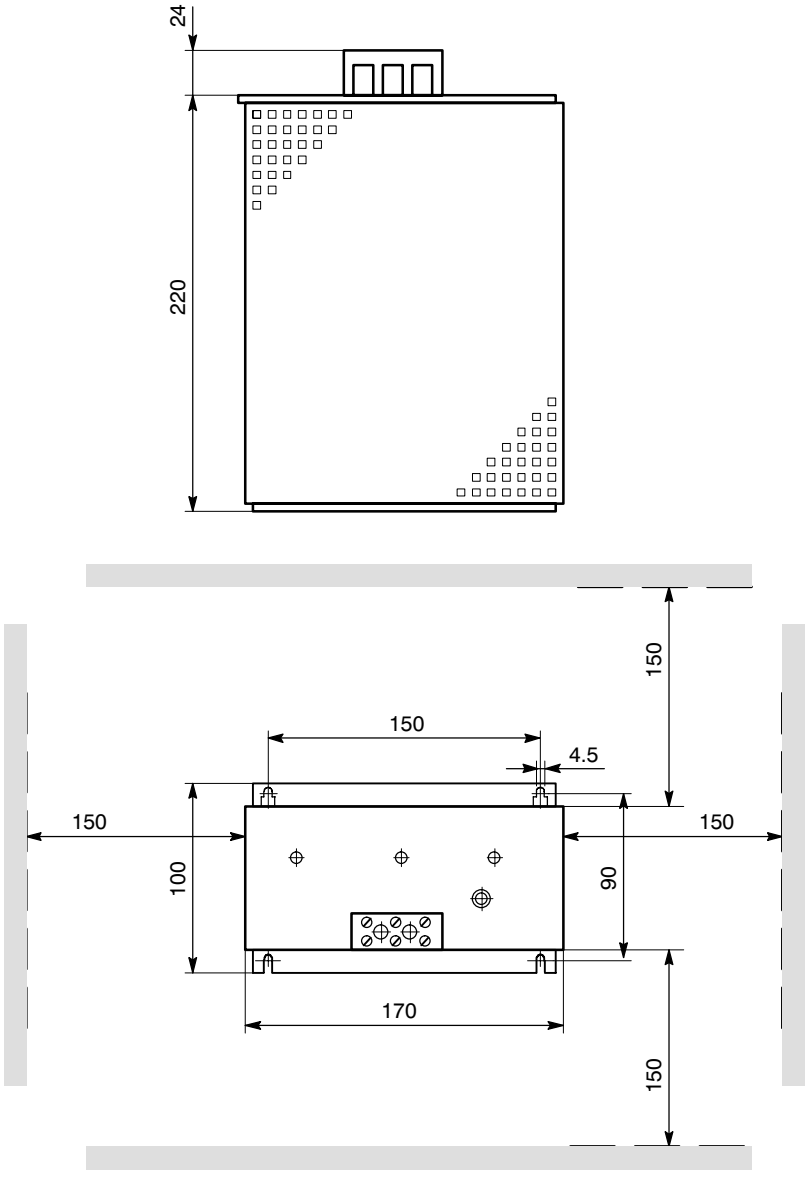


Installation clearance

150 mm in all four directions

BWS 10/450 – G
in the IP 20 protective housing, 340 °C surface temperature possible at the resistor

Dimensions in mm:



Installation clearance

150 mm in all four directions

Your notes:

A Appendix

A.1 Glossary

Numbers

A

B

C

D

E

S

T

U

A.2 Safety instructions

A.2.1 Dansk

Farehenvisninger i håndbogen.

Følg sikkerhedshenvisningerne i håndbogen (FARE, ADVARSEL) om farer for liv og helbred og forebyggelse af materielle skader, såvel som de fremhævede informationer om produktet (Bemærk).

Alle sikkerhedshenvisninger har et fortløbende nummer med henvisning til kapitlerne, eksempelvis 1.1. I tillægget finder De de tilhørende oversættelser af disse sikkerhedshenvisninger på alle sprog indenfor EU.

! FARE ! 1.1

Vedligeholdelse og installation af komponenter må kun udføres af kvalificeret personale under overholdelse af de ulykkesforebyggende forskrifter samt installationsforskrifterne (EN 60204-del 1, prEN 50178).

! FARE ! 1.2

En fejlfri og sikker brug af produktet, forudsætter formålstjenlig transport, korrekt oplagring, opstilling og montering såvel som en omhyggelig betjening.

ADVERSEL ! 1.3

Drevomformer indeholder konstruktionsdele, som har risiko for elektrostatisk ladning, og som gennem usagkyndig behandling let kan ødelægges.

! FARE ! 1.4

Indbyggede elektriske komponenter må pga. den mulige sundhedsfare ikke destrueres.

! FARE ! 4.1

**Holdebremsen er ikke en arbejdsbremse og må kun aktiveres, når akslen er stoppet.
Efter ca. 1000 NØDSTOP-opbremsninger
med fremmedinertimoment ≦ motorinertimomentet er et eftersyn af holdebremsen på fabrikken nødvendigt!**

ADVERSEL ! 4.2

Akselpakningsringen er ikke tryktæt, og derfor ikke egnet for gearmontering.

ADVERSEL ! 5.1, 7.6, 7.11

Ved frakoblet eller ikke tilsluttet 24 V-modulforsyning må netspændingen på VM ikke slås til, da dette vil kunne beskadige VM.

ADVERSEL ! 6.1

På motorerne kan der forekomme overfladetemperaturer på op til ca. 100 ˚C.
Der skal om nødvendigt monteres en berøringsbeskyttelse.

ADVERSEL ! 6.2

Akselenden må under ingen omstændigheder blive udsat for slag og stød.
Synkro og kugleleje vil blive beskadiget heraf.

! FARE ! 6.3

Fare for tilskadekomst p.g.a. udslyngede pasfedre.
Motorer med not og pasfeder må kun drives i monteret tilstand eller med sikret pasfeder.

ADVERSEL ! 6.4

Den omgivende luft skal være fri for højere koncentrationer af støv, syrer, lud, korroderende materialer, salt, metaldampe o.s.v.

Fugtansamlinger i eller på modulet kan ikke tillades.

! FARE ! 6.5

Der er farlig spænding på klemmerne til ballastmodstanden.
Ballastmodstanden kan være meget varm.

ADVERSEL ! 7.1

Omformermoduler må kun drives ved jordede net.
Drift på ikke direkte jordede net (IT-net) er ikke tilladt, da luft- og krybestrækninger i modulet kan overbelastes.

! FARE ! 7.2

Omformermoduler må kun benyttes på jordede net.

Kun tilladt beskyttelsesforanstaltning iflg. prEN 50 178: Beskyttelsesjord!
Drift på anlæg med normale FI-beskyttelsesrelæer er ikke tilladt,
da fejlstrøm fra mellemkredsen kan flyde tilbage i nettet via jord,
uden at udløse FI-beskyttelsesrelæet.

Eensidig jording af mellemkredsen ved drift via skilletrafo er ikke tilladt.

! FARE ! 7.3

K01 og K02 skal være være fastlåst sikkert mod hinanden!

! FARE ! 7.5

I tilfælde af fejl skal drevet afbrydes fra strømnettet!

ADVERSEL ! 7.7

Kun de sikringsbelastningsmodstands-kombinationer, der overholder vejledningen, er tilladte.
En forkert sikring eller en forkert stikposition (X3, X4, X5) kan beskadige VM.

! FARE ! 7.8

Der må kun foretages tilslutnings- og montagearbejder i spændingsløs tilstand!
På grund af permamagnetens magnetisering er der farlig spænding på effektstikdåsen, når løberne roterer og motoren ikke er el-tilsluttet!

ADVERSEL ! 7.9

Den rigtige faserækkefølge i motortilslutningerne skal ubetinget overholdes.

! FARE ! 7.10

Holdebremsen er ikke en arbejdsbremse og må kun aktiveres, når akslen er stoppet.

A.2.2 Deutsch

Gefahrenhinweise im Handbuch

Beachten Sie die im Handbuch enthaltenen Sicherheitshinweise ('GEFAHR', 'ACHTUNG') zu Gefahren für Leben und Gesundheit und zur Vermeidung von Sachschäden, sowie die hervorgehobenen Informationen zum Produkt ('Hinweis').

Alle Sicherheitshinweise haben eine fortlaufende Nummer mit Bezug zu den Kapiteln, z.B. 1.1 . Im Anhang finden Sie die zugehörigen Übersetzungen dieser Sicherheitshinweise in allen Amtssprachen der EU.

! GEFAHR ! 1.1

Warten und Installieren der Komponenten nur durch Elektrofachkräfte (VDE 1000-10) unter Beachtung der Unfallverhütungsvorschriften (UVV VBG4, VDE 100, VDE 105) und Installationsvorschriften (EN 60204-Teil1, prEN 50178).

! GEFAHR ! 1.2

Der einwandfreie und sichere Betrieb des Produktes setzt sachgemäßen Transport, sachgerechte Lagerung, Aufstellung und Montage sowie sorgfältige Bedienung voraus.

ACHTUNG ! 1.3

Antriebsumrichter enthalten elektrostatisch gefährdete Bauelemente, die durch unsachgemäße Behandlung leicht zerstört werden können.

! GEFAHR ! 1.4

Eingebaute elektrische Komponenten dürfen wegen möglicher Gesundheitsgefährdung nicht zerstört werden.

! GEFAHR ! 4.1

Die Haltebremse ist keine Arbeitsbremse und darf nur im Stillstand der Achse betätigt werden.

Nach ca.1000 NOT-AUS-Bremsungen mit Fremdträgheitsmoment ≦ Motorträgheitsmoment ist eine Überprüfung der Haltebremse im Herstellerwerk notwendig!

ACHTUNG ! 4.2

Der Wellendichtring ist nicht druckdicht und daher nicht für den Anbau von Getrieben ohne eigene Dichtung geeignet.

ACHTUNG ! 5.1, 7.6, 7.11

Bei ausgeschalteter oder nicht angeschlossener 24 V-Modulversorgung darf die Netzspannung am VM nicht eingeschaltet werden, weil dadurch das VM beschädigt werden könnte.

ACHTUNG ! 6.1

An den Motoren können Oberflächentemperaturen bis ca. 100˚C auftreten.
Ein Berührungsschutz ist bei Bedarf vorzusehen.

ACHTUNG ! 6.2

Unter keinen Umständen dürfen Schläge und Stöße auf das Wellenende einwirken.
Drehgeber und Kugellager werden dadurch beschädigt.

! GEFAHR ! 6.3

Verletzungsgefahr durch herausschleudernde Paßfeder.
Motoren mit Nut und Paßfeder dürfen nur im eingebauten Zustand oder mit gesicherter Paßfeder betrieben werden.

ACHTUNG ! 6.4

Die Umgebungsluft muß frei sein von Konzentrationen an Säuren, Laugen, Korrosionsmitteln, Salz, Metalldämpfen usw.
Eine Betauung der Module ist nicht zulässig!

! GEFAHR ! 6.5

An den Klemmen des Ballastwiderstandes liegen lebensgefährliche Spannungen an.
Der Ballastwiderstand kann sehr heiß werden.

ACHTUNG ! 7.1

Umrichtermodule dürfen nur an geerdeten Netzen betrieben werden.
Der Betrieb an nicht direkt geerdeten Netzen (IT-Netz) ist unzulässig, da Luft- und Kriechstrecken im Modul überlastet werden können.

! GEFAHR ! 7.2

Umrichtermodule dürfen nur an geerdeten Netzen betrieben werden.

**Allein zulässige Schutzmaßnahme gemäß prEN 50 178: Schutzerdung!
Der Betrieb an Anlagen mit normalen FI-Schutzschaltern ist nicht zulässig,
da Fehlerströme aus dem Zwischenkreis über Erde in das Netz zurückfließen können,
ohne den FI-Schutzschalter auszulösen.**

Einseitiger Erdung des Zwischenkreises bei Betrieb über Trenntrafo ist nicht zulässig.

! GEFAHR ! 7.3

K01 und K02 müssen sicher gegeneinander verriegelt sein!

! GEFAHR ! 7.4

Im 3-Phasenbetrieb ist ein 3-phasiger Sicherungsautomat zu verwenden, damit im Störungsfall alle drei Phasen unterbrochen werden.

! GEFAHR ! 7.5

Im Fehlerfall muß der Antrieb vom Versorgungsnetz getrennt werden!

ACHTUNG ! 7.7

**Es sind nur Sicherungs-Ballastwiderstands-Kombinationen gemäß Anleitung zulässig.
Bei falscher Sicherung oder falscher Steckerposition (X3, X4, X5) kann das VM zerstört werden.**

! GEFAHR ! 7.8

**Alle Anschluß- und Montagearbeiten dürfen nur in spannungslosem Zustand erfolgen.
Aufgrund der Dauermagneterregung liegt bei rotierendem Läufer und elektrisch nicht angeschlossenem Motor an der Leistungssteckdose eine gefährliche Spannung an!**

ACHTUNG ! 7.9

Die richtige Phasenfolge der Motoranschlüsse ist unbedingt einzuhalten.

! GEFAHR ! 7.10

Die Haltebremse ist keine Arbeitsbremse und darf nur im Stillstand der Achse betätigt werden.

A.2.3 Ελληνικά

Υποδείξεις για πηγές κινδύνου στο Εγχειρίδιο

Προσέξτε τις υποδείξεις ασφαλείας στο Εγχειρίδιο (”ΚΙΝΔΥΝΟΣ”, ”ΠΡΟΣΟΧΗ”) για την πρόληψη κινδύνων για τη ζωή και την υγεία, καθώς και για την αποφυγή υλικών ζημιών, και τις πληροφορίες για το προϊόν (”Υπόδειξη”).

Ολες οι υποδείξεις ασφαλείας έχουν έναν αύξοντα αριθμό που αντιστοιχεί στα επιμέρους κεφάλαια, π.χ. 1.1. Στο παράρτημα βρίσκετε τη μετάφραση αυτών των υποδείξεων ασφαλείας σε όλες τις επίσημες γλώσσες της Ευρωπαϊκής Ενωσης.

! ΚΙΝΔΥΝΟΣ ! **1.1**

Η συντήρηση και εγκατάσταση των στοιχείων πρέπει να γίνεται μόνο από ειδικευμένο προσωπικό τηρώντας τις προδιαγραφές πρόληψης ατυχημάτων και τις προδιαγραφές ασφαλείας (EN 60204 Μέρος 1, προEN 50178).

! ΚΙΝΔΥΝΟΣ ! **1.2**

Η απρόσκοπτη και ασφαλής λειτουργία του προϊόντος προϋποθέτει σωστή μεταφορά, κατάλληλη αποθήκευση, τοποθέτηση και συναρμολόγηση καθώς και προσεκτικό χειρισμό

ΠΡΟΣΟΧΗ ! **1.3**

Οι προωθητικοί μεταλλάκτες περιέχουν ηλεκτροστατικά επισφαλή στοιχεία κατασκευής, που μπορούν εύκολα να καταστραφούν από απρόσεκτο χειρισμό.

! ΚΙΝΔΥΝΟΣ ! **1.4**

Τα ενσωματωμένα ηλεκτρικά στοιχεία δεν επιτρέπεται να καταστρέφονται, λόγω πιθανών κινδύνων για την υγεία.

! ΚΙΝΔΥΝΟΣ ! **4.1**

Η πέδη στάσης δεν είναι πέδη εργασίας και πρέπει να τίθεται σε λειτουργία μόνο όταν ο άξονας είναι ακινητοποιημένος.
Μετά από 1000 περίπου πεδήσεις Στάσης κινδύνου (NOT-AUS) με εξωτερική ροπή αδράνειας ≦ ροπή αδράνειας κινητήρα απαιτείται έλεγχος της πέδης στάσης στο εργοστάσιο κατασκευής.

ΠΡΟΣΟΧΗ ! 4.2

Ο δακτύλιος στεγανοποίησης άξονα δεν είναι στεγανός κατά της πίεσης και δεν ενδείκνυται για τυχόν επιπρόσθετη τοποθέτηση μηχανισμού μετάδοσης κίνησης

ΠΡΟΣΟΧΗ ! 5.1, 7.6, 7.11

Σε περίπτωση που η τροφοδοσία modul 24 Βολτ έχει διακοπεί ή δεν είναι συνδεδεμένη δεν επιτρέπεται η τεθεί σε λειτουργία η τάση δικτύου στο VM, γιατί έτσι θα μπορούσε να πάθει βλάβη το VM.

ΠΡΟΣΟΧΗ ! 6.1

Στα μοτέρ μπορούν να αναπτυχθούν θερμοκρασίες επιφανείας μέχρι 100 °C περίπου.
Εν ανάγκη πρέπει να προβλέψετε για προστασία από αγγίγματα.

ΠΡΟΣΟΧΗ ! 6.2

Δεν επιτρέπεται σε καμιά περίπτωση να επιφέρετε κτυπήματα και ωθήσεις στην άκρη του άξονα.
Με αυτόν τον τρόπο φθείρονται ο μετατροπέας και τα έδρανα.

! ΚΙΝΔΥΝΟΣ ! 6.3

Κίνδυνος τραυματισμού από εκσφενδονιζόμενα ελατήρια συναρμογής.
Μοτέρ με αύλακα και ελατήρια συναρμογής επιτρέπεται να τίθενται σε λειτουργία μόνο συναρμολογημένα ή με ασφαλισμένα ελατήρια συναρμογής.

ΠΡΟΣΟΧΗ ! 6.4

Ο αέρας που περιβάλλει τον χώρο λειτουργίας πρέπει να είναι ελεύθερος από υψηλές συγκεντρώσεις σκόνης, οξέων, αλκαλικών διαλυμάτων, διαβρωτικών ουσιών, αλάτων, μεταλλούχων ατμών κλπ.

Δεν επιτρέπεται η ύγρανση της μονάδας!

! ΚΙΝΔΥΝΟΣ ! 6.5

Στις κλέμμες της συμπληρωματικής αντίστασης υπάρχουν θανατηφόρες τάσεις. Η συμπληρωματική αντίσταση μπορεί να ζεσταθεί υπερβολικά.

ΠΡΟΣΟΧΗ ! 7.1

Οι μετατροπείς πρέπει να λειτουργούν μόνο σε γειωμένα δίκτυα.
Η λειτουργία σε δίκτυα που δεν είναι απευθείας γειωμένα (δίκτυο IT) δεν επιτρέπεται, γιατί μπορούν να υπερφορτωθούν διάκενα αέρος ή οδοί ρεύματος επιφανείας.

! ΚΙΝΔΥΝΟΣ ! 7.2

Οι μετατροπείς πρέπει να λειτουργούν μόνο σε γειωμένα δίκτυα.
Μοναδικό επιτρεπτό μέτρο προστασίας σύμφωνα με prEN 50 178: Γείωση προστασίας!
Η λειτουργία σε εγκαταστάσεις με κανονικούς διακόπτες προστασίας FI δεν επιτρέπεται, γιατί εσφαλμένο ρεύμα από το ενδιάμεσο κύκλωμα μπορεί να επιστρέει μέσω της γης στο δίκτυο, χωρίς να τεθεί σε λειτουργία ο διακόπτης λειτουργίας FI.
Η μονόπλευρη γείωση του ενδιάμεσου κυκλώματος δεν επιτρέπεται κατά τη λειτουργία μέσω μετασχηματιστή διαχωρισμού.

! ΚΙΝΔΥΝΟΣ ! 7.3

Τα K01 και K02 πρέπει να είναι αλληλοασφαλισμένα μεταξύ τους.

! ΚΙΝΔΥΝΟΣ ! 7.5

Στην περίπτωση βλάβης ο μηχανισμός κίνησης πρέπει να αποχωρισθεί από το δίκτυο παροχής!

ΠΡΟΣΟΧΗ ! 7.7

Επιτρέπονται μόνο συνδυασμοί ασφαλειών και αντιστάσεων σύμφωνα με τις οδηγίες.
Σε περίπτωση λάθος ασφάλειας ή λάθος θέση ρευματολήπτη (X3, X4, X5) μπορεί να καταστραφεί η μονάδα τροφοδοσίας.

! ΚΙΝΔΥΝΟΣ ! 7.8

Ολες οι εργασίες σύνδεσης και συναρμολόγησης πρέπει να γίνονται όσο η συσκευή δεν έχει ρεύμα. Λόγω της συνεχούς μαγνητικής διέγερσης υπάρχει επικίνδυνη τάση όσο περιστρέφεται ο δρομέας και ο κινητήρας δεν είναι συνδεδεμένος με τον ρευματοδότη ισχύος!

ΠΡΟΣΟΧΗ ! 7.9

Η σωστή ακολουθία των φάσεων των συνδέσεων κινητήρα πρέπει να τηρείται οπωσδήποτε.

! ΚΙΝΔΥΝΟΣ ! 7.10

Η πέδη στάσης δεν είναι πέδη εργασίας και πρέπει να τίθεται σε λειτουργία μόνο όταν ο άξονας είναι ακινητοποιημένος.

A.2.4 Español

Indicaciones de peligro incluidas en el manual

Observe las indicaciones de seguridad incluidas en el manual (PELIGRO, ATENCION) referentes a peligros para la vida y la salud y para prevenir daños materiales, así como las informaciones destacadas sobre el producto (Nota).

Todas las indicaciones de seguridad tienen un número consecutivo con referencia a los capítulos, p. ej. 1.1. En el anexo usted encontrará las traducciones respectivas en todos los idiomas oficiales de la UE.

¡PELIGRO! 1.1

El mantenimiento y la instalación de los componentes sólo serán realizados por personal cualificado y observando las normas para la prevención de accidentes y las instrucciones de instalación (EN 60204-1ª parte, prEN 50178).

¡PELIGRO! 1.2

Para que el producto funcione perfectamente y de forma segura es imprescindible que haya sido transportado, almacenado, instalado y montado de manera adecuada y que se maneje cuidadosamente.

¡ATENCION! 1.3

Los convertidores estáticos contienen componentes susceptibles a destrucción por carga electrostática y pueden destruirse fácilmente en caso de manipulación inadecuada.

¡PELIGRO! 1.4

Los componentes eléctricos no deben destruirse, ya que puede ser perjudicial para la salud.

¡PELIGRO! 4.1

El freno de parada no es un freno de trabajo y sólo se debe accionar con el eje parado.
Al cabo de 1000 frenados de emergencia
con un momento de inercia externo ≦ momento de inercia del motor es necesario encargar a la fábrica que controle el freno de parada.

¡ATENCION! 4.2

El anillo de retén radial no está hecho a prueba de presión por lo que no resulta apropiado para el montaje en engranajes.

¡ATENCION! 5.1, 7.6, 7.11

Está prohibido encender la tensión de red en el VM cuando la alimentación de 24 V del módulo está apagada o sin conectar, ya que ello podría dañar el VM.

¡ATENCION! 6.1

**En los motores puede haber temperaturas superficiales de hasta aprox. 100 ˚C.
Si fuese preciso, hay que prever una protección contra contacto accidental.**

¡ATENCION! 6.2

El extremo del árbol no debe estar sometido bajo ningún concepto a golpes o sacudidas, ya que ello puede dañar el codificador y el rodamiento de bolas.

¡PELIGRO! 6.3

**Si las chavetas están sueltas pueden salir despedidas y producir un accidente.
Los motores con ranura y chaveta sólo pueden ponerse en servicio cuando estén montados y con la chaveta asegurada.**

¡ATENCION! 6.4

El aire ambiental debe estar libre de concentraciones elevadas de polvo, ácidos, lejías, agentes corrosivos, sales, vapores metálicos, etc.

¡Queda prohibido exponer el módulo a los efectos de la humedad!

¡PELIGRO! 6.5

**En los bornes de la resistencia de carga hay tensiones que suponen peligro de muerte.
¡La resistencia de carga puede alcanzar temperaturas muy elevadas!**

¡ATENCION! 7.1

**Los módulos de convertidor estático se deben utilizar sólo en redes puestas a tierra.
No se admite su operación en redes que no estén puestas a tierra directamente (sistema IT), ya que se pueden sobrecargar los espacios de aire y de fuga en el módulo.**

¡PELIGRO! 7.2

Los módulos de convertidor estático se deben utilizar en redes puestas a tierra. Sólo se deben tomar medidas de protección admisibles conforme se especifica en prEN 50 178: ¡puesta a tierra de protección! No se admite su operación en instalaciones con interruptores de protección FI normales, ya que a través de la puesta a tierra pueden retornar a la red corrientes erróneas procedentes del circuito intermedio, sin que se dispare el interruptor de protección FI. Cuando se opera con un transformador de separación no está permitido contectar a tierra el circuito intermedio sólo por un lado.

¡PELIGRO! 7.3

¡K01 y K02 deben estar bloqueados entre sí!

¡PELIGRO! 7.5

¡En caso de error hay que separar el accionamiento de la red de alimentación!

¡ATENCION! 7.7

Son admisibles sólo combinaciones de fusible y resistencia de carga conforme a las instrucciones. En caso de fusible erróneo o posición de enchufe equivocada (X3, X4, X5) puede destruirse el módulo de alimentación.

¡PELIGRO! 7.8

¡Todos los trabajos de montaje y conexión se han de efectuar exclusivamente en estado desenergizado!

Debido a la excitación del imán permanente existe una tensión peligrosa en la toma de potencia cuando el rotor está en marcha y el motor sin conectar eléctricamente.

¡ATENCION! 7.9

Es obligatorio respetar la secuencia de fases correcta de las conexiones del motor.

¡PELIGRO! 7.10

El freno de parada no es un freno de trabajo y sólo se debe accionar con el eje parado.

A.2.5 Français

Indications de danger dans le manuel

Tenez compte des consignes de sécurité contenu es dans le manuel (DANGER, ATTENTION) relatives aux dangers pour la vie et la santé et pour éviter les dommages matériels, ainsi que les informations particulières sur le produit (Remarque).

Toutes les consignes de sécurité ont une numérotation en c ontinu en rapport avec les chapitres, par exemple 1.1. En annexe vous trouverez les traductions correspondantes dans toutes les langues officielles de la CEE.

! DANGER ! 1.1

La maintenance et l'installation des composants doivent uniquement être effectuées par du personnel qualifié et en respect des prescriptions en matière d'accidents de travail et des consignes d'installation (NE 60204 section 1, NE pr 50178).

! DANGER ! 1.2

Le fonctionnement parfait et sûr du prod uit est conditionné par un transport professionnel, un stockage, une implantation et un montage corrects ainsi qu'une manipulation soigneuse.

ATTENTION ! 1.3

Les convertisseurs d'entraînement contiennent des éléments présentant une sensibilité électrostatique, qui peuvent être aisément endommagés en cas de manipulation inappropriée.

! DANGER ! 1.4

Les composants électriques installés ne doivent pas être détruits en raison de l'éventuel danger pour la santé.

! DANGER ! 4.1

Le frein d'arrêt ne constitue en aucun cas un frein de travail.
Assurez-vous que l'axe est immobile avant de le manipuler. Au bout de 1000 arrêts d'urgence env. avec un moment d'inertie extérieur ≦ à celui du moteur, le frein d'arrêt doit être soumis à un contrôle dans les ateliers de son fabricant.

ATTENTION ! 4.2

L'anneau d'étanchéité de l'arbre n'étant pas étanche, il n'est donc pas approprié aux engrenages.

ATTENTION ! 5.1, 7.6, 7.11

Lorsque le module d'alimentation électrique 24 V est mis en hors service ou n'est pas connecté, le VM ne doit pas être mis sous tension. L'installation risquerait dans ce cas d'être endommagée.

ATTENTION ! 6.1

Os motores poderão apresentar temperaturas de superfície de até 100 ºC.
Caso necessário deverá colocar uma protecção contra contacto.

ATTENTION ! 6.2

Golpes e pancadas não deverão jamais atingir a extremidade ondulada. O transmissor giratório e o rolamento de esferas poderão ser danificados.

! DANGER ! 6.3

Risque de blessure lors de la projection de la clavette.
Les moteurs équipés de rainure et de clavette doivent être entraînés uniquement lorsqu'elles sont montées ou lorsque la clavette est bloquée.

ATTENTION ! 6.4

L'air environnant doit être dépourvue de grandes concentrations de poussière, d'acide, de lessive, de produits corrosifs, de sel, de vapeurs métalliques etc...

Un dégel du m odule n'est pas autorisée!

! DANGER ! 6.5

Les bornes de connexion de la résistance de charge sont soumises à des tensions présentant des dangers de mort. La résistance de charge peut atteindre des températures extrêmement élevées.

ATTENTION ! 7.1

Les modules convertisseurs ne doivent être utilisés que sur des réseaux mis à la terre. L'exploitation sur des réseaux non directeme nt mis à la terre (Réseau IT) est interdite, car les entrefers et les lignes de fuite dans le module pourraient être surchargés.

! DANGER ! 7.2

Les modules convertisseurs ne doivent être utilisés qu'en présence de réseaux mis à la terre. Seule mesure de protection autorisée conformément à la NE pr 50 178 : mise à la terre de protection ! L'utilisation sur des installations équipées de disjoncteurs de protection FI normaux est interdite, étant donné que des courants de défaut provenant du circuit intermédiaire peuvent refluer vers le réseau par l'intermédiaire de la terre sans déclencher le disjoncteur de protection FI. Une mise à la terre unilatérale du circuit intermédiaire est interdite durant le fonctionnement par l'intermédiaire d'un transformateur de séparation.

! DANGER ! 7.3

Le verrouillage réciproque de K01 et K02 doit être fiable.

! DANGER ! 7.5

Em caso de falha o accionamento deverá ser desconectado da rede de distribuição!

ATTENTION ! 7.7

Somente é permitido combinações de resistências auto-reguladoras de fusíveis conforme descrito no manual de instruções. Em caso de utilização de um fusível ou posição de ficha (X3, X4, X5) incorrectos, o MD poderá ser danificado.

! DANGER ! 7.8

Tous les travaux de montage et de raccordement ne doivent être effectués qu'en absence de tension. Du fait de l'excitation de l'aimant permanent, en présence d'un rotor en rotation ou d'un moteur non raccordé à l'alimentation électrique, la prise de puissance est soumise à une tension dangereuse !

ATTENTION ! 7.9

La succession de phases des raccords du moteur doit être impérativement respectée.

! DANGER ! 7.10

Le frein d'arrêt ne constitue en aucun cas un frein de travail. Assurez-vous que l'axe est immobile avant de le manipuler.

A.2.6 Italiano

Indicazioni di pericolo nel manuale

Osservare le indicazioni di sic urezza (PERICOLO, ATTENZIONE) contenute nel manuale relative ai pericoli anche mortali, alla salute e alle misure necessarie per evitare danni all'apparecchio, nonché le informazioni sul prodotto (Nota).

Tutte le indicazioni di sicurezza sono numerate in ordine crescente con riferimento al capitolo, come ad es. 1.1. Nell'appendice è riportata la traduzione corrispondente di tali norme di sicurezza, in tutte le lingue ufficiali dell'Unione Europea.

! PERICOLO ! 1.1

La manutenzione e installazione dei componenti vanno eseguite solamente da personale qualificato, in osservanza delle norme antinfortunistiche e d'installazione (EN 60204, parte 1 – prEN 50178).

! PERICOLO ! 1.2

Questo prodotto può funzionare in mod o sicuro e a regola d'arte solamente se il suo trasporto, magazzinaggio, installazione e montaggio sono avvenuti in modo appropriato e col presupposto di un corretto azionamento.

ATTENZIONE ! 1.3

Il convertitore di frequenza del motore contiene elementi sensibili alle cariche elettrostatiche, che possono venire distrutti in caso di interventi non professionali.

! PERICOLO ! 1.4

Le componenti elettriche non devono essere distrutte, prima dello smaltimento, per evitare possibili danni alla salute.

! PERICOLO ! 4.1

Il freno di arresto non è un freno d'esercizio e deve essere azionato solo quando l'asse è fermo. Dopo ca. 1000 frenate di EMERGENZA con un momento d'inerzia esterno ≦ al momento d'inerzia del motore è necessario un controllo del freno di arresto presso l'officina di produzione!

ATTENZIONE ! 4.2

La guarnizione ad anello dell'albero non è a tenuta di pressione e pertanto non adatta al montaggio con la trasmissione.

ATTENZIONE ! 5.1, 7.6, 7.11

Con l'alimentazione da 24 V del modulo non accesa o non collegata non deve essere accesa la tensione di rete sul VM, questa operazione potrebbe danneggiare il VM.

ATTENZIONE ! 6.1

Nei motori possono presentarsi temperature di superficie di fino a 100 °C.
In caso di necessità bisogna munirsi di una protezione contro le scariche.

ATTENZIONE ! 6.2

Colpi e battute non devono in nessun caso influenzare l'estremità dell'albero.
Il trasduttore di velocità angolare e il cuscinetto a sfere potrebbero danneggiarsi.

! PERICOLO ! 6.3

Pericolo di ferite a causa del possibile scaraventamento della linguetta.
I motori con cava e linguetta devono essere azionati solo se montati o con la linguetta bloccata.

ATTENZIONE ! 6.4

L'aria ambiente deve essere priva di polvere, acidi, soluzioni alcaline o corrosive, sale, vapori metallici, ecc., presenti in alte con centrazioni.

E' vietato immergere il modulo!

! PERICOLO ! 6.5

Ai capi dei morsetti della resistenza zavorra sono presenti tensioni letali.
La resistenza zavorra può diventare molto calda.

ATTENZIONE ! 7.1

I moduli del convertitore possono essere allacciati soltanto a reti con collegam ento di terra.
E' vietato allacciarli a reti che non siano direttamente collegate a terra (reti a tolleranza ISO), che potrebbero sovraccaricare le distanze di scarica e le vie di dispersione superficiale nel modulo.

! PERICOLO ! 7.2

I moduli del convertitore possono essere azionati solamente su reti con collegamento a terra.

Unica misura di protezione consentita secondo il prEN 50178: messa a terra protettiva! Non è consentito l'utilizzo su impianti dotati di normali interruttori di sicurezza per correnti di guasto, poiché le correnti di guasto possono scorrere dal circuito intermedio nella rete, attraverso il collegamento a terra, senza far scattare l'interruttore di sicurezza.

Non è consentita la messa a terra del circuito intermedio su un solo lato in caso di azionamento tramite il trasformatore di separazione.

! PERICOLO ! 7.3

K01 e K02 devono essere bloccati reciprocamente in maniera sicura!

! PERICOLO ! 7.5

In caso di guasto l'azionamento deve essere staccato dalla rete di alimentazione!

ATTENZIONE ! 7.7

Sono consentite soltanto combinazioni di fusibile e di resistenza zavorra conformi alle istruzioni. In caso di fusibile errato oppure di posizione sbagliata dei connettori (X3, X4, X5) il MA può essere danneggiato.

! PERICOLO ! 7.8

I lavori di allacciamento e montaggio vanno eseguiti solamente quando l'apparecchio è separato dalla rete di corrente.

A causa dell'eccitazione magnetica permanente – con il rotore in movimento e il motore non collegato elettricamente – sulla presa di potenza è presente una tensione pericolosa!

ATTENZIONE ! 7.9

Rispettare assolutamente la corretta successione di fase dei collegamenti del motore.

! PERICOLO ! 7.10

Il freno di arresto non è un freno d'esercizio e deve essere azionato solo quando l'asse è fermo.

A.2.7 Nederlands

Waarschuwingswenken in het handboek

Neemt u de in het handboek vermelde veiligheidswenken (GEVAAR, ATTENTIE) voor de gevaren van leven en gezondheid en ter voorkoming van schade, en de geaccentueerde informatie over het produkt (Tip).

Alle veiligheidswenken hebben een doorlopend nummer met betrekking op de hoofdstukken, b.v. 1.1. In het aanhangsel vindt u de bijbehorende vertalingen van deze veiligheidswenken in alle officiële talen van de EU.

! GEVAAR ! 1.1

Het onderhoud en de installatie van de componenten alleen door opgeleid personeel laten uitvoeren met inachtneming van de voorschriften ter voorkoming van ongevallen en de installatievoorschriften (EN 60204 deel 1, prEN 50178).

! GEVAAR ! 1.2

Het goed en veilig functioneren van het produkt stelt deskundig transport, goede opslag, opstelling en montage en zorgvuldige bediening voorop.

ATTENTIE ! 1.3

Aandrijfomzetters bevatten elektrostatisch gevaar lopende bouwelementen die door een ondeskundige behandeling gemakkelijk vernietigd kunnen worden.

! GEVAAR ! 1.4

Ingebouwde elektrische componenten mogen niet vernietigd worden omdat de gezondheid in gevaar gebracht zou kunnen worden.

! GEVAAR ! 4.1

De vastzetrem is geen bedrijfsrem en mag alleen met stilstaande as bediend worden.
Na ca. 1000 NOOD-UIT-rembewegingen met secundair traagheidsmoment ≦ traagheidsmoment van de motor is een controle van de vastzetrem door de fabrikant noodzakelijk!

ATTENTIE ! 4.2

De asafdichtingsring is niet drukdicht en daarom niet voor montage op de aandrijving geschikt.

ATTENTIE ! 5.1, 7.6, 7.11

Met uitgeschakelde of niet aangesloten 24 V-moduulvoeding mag de netspanning op de VM niet ingeschakeld worden, omdat daardoor de VM beschadigd zou kunnen worden.

ATTENTIE ! 6.1

Aan de motoren kunnen oppervlaktetemperaturen tot ca. 100 ˚C optreden.
Er dient, indien nodig, een bescherming tegen aanraking te worden aangebracht.

ATTENTIE ! 6.2

Op het aseinde mogen in geen geval slagen of stoten inwerken.
Draaigever en kogellager worden daardoor beschadigd.

! GEVAAR ! 6.3

Gevaar voor verwondingen door weggeslingerde inlegspie.
Motoren met spiebaan en inlegspie mogen slechts in ingebouwde toestand of met geborgde inlegspie lopen.

ATTENTIE ! 6.4

De omgevingslucht moet vrij zijn van hoge concentraties stof, zuur, logen, antiroestmiddelen, zout, metaaldampen enz.

Bevochtigen van het moduul is niet toegestaan!

! GEVAAR ! 6.5

Op de klemmen van de ballastweerstand staan levensgevaarlijke spanningen.
De ballastweerstand kan zeer heet worden.

ATTENTIE ! 7.1

Omzetmodulen mogen allen op geaarde netten gebruikt worden.
Het gebruik op niet direct geaarde netten (IT-net) is niet toegestaan, aangezien ventilatie- en kruipgangen in de moduul overbelast kunnen worden.

! GEVAAR ! 7.2

Omzetmodulen mogen alleen op geaarde netten gebruikt worden.

Alleen toegestane veiligheidsmaatregelen volgens prEN 50 178: Veiligheidsaarding!
Het gebruik op installaties met normale FI-veiligheidsschakelaars is niet toegestaan, aangezien foutstromen uit de tussenkring via aarde in het net kunnen terugstromen, zonder de FI-veiligheidsschakelaars in werking te laten treden.

Eenzijdige aarding van de tussenkring bij gebruik via scheidingstransformator is niet toegestaan.

! GEVAAR ! 7.3

K01 en K02 moeten veilig tegen elkaar vergrendeld zijn!

! GEVAAR ! 7.5

Als er een fout optreedt, moet de aandrijving van het voedingsnet gescheiden worden!

ATTENTIE ! 7.7

Alleen gecombineerde zekerings-stabilisatieweerstanden conform gebruiksaanwijzing zijn toegestaan.
Bij een verkeerde zekering of verkeerde stekkerpositie (X3, X4, X5) kan het VM worden beschadigd.

! GEVAAR ! 7.8

Alle aansluit- en montagewerkzaamheden mogen alleen in spanningsloze toestand geschieden!
Door de permanente magneetopwekking staat er bij de roterende rotor en elektrisch niet aangesloten motor op de vermogenscontactdoos een gevaarlijke spanning!

ATTENTIE ! 7.9

De juiste fasevolgorde van de motoraansluitingen moet beslist in acht genomen worden.

! GEVAAR ! 7.10

De vastzetrem is geen bedrijfsrem en mag alleen met stilstaande as bediend worden.

A.2.8 Português

Notas de perigo no manual

Considere as notas de segurança (PERIGO, ATENÇÃO) do manual acerca de perigo de morte e de ferimento e para evitar danos materiais e, considere as informações destacadas sobre o produto (NOTA).

Todas as notas de segurança levam um número corrente que se refere aos capítulos em questão, por ex. 1.1. A tradução das notas em todas as línguas oficiais da CE encontra-se no anexo.

!PERIGO! 1.1

A instalação e a manutenção devem ser realizadas somente por técnicos qualificados e levando-se em consideração as instruções para prevenção de acidentes e as instruções para instalação (EN 60204-parte 1, prEN 50178).

!PERIGO! 1.2

Premissas indispensáveis para o funcionamento impecável e seguro do produto são transporte, armazenamento, instalação e montagem competentes bem como o manejo correcto do mesmo.

ATENÇÃO! 1.3

Conversores de accionamento contêm componentes que poderão ser facilmente danificados através de energia electrostática caso os dispositivos não sejam tratados de acordo com as indicações

!PERIGO! 1.4

Os componentes eléctricos já instalados não deverão ser danificados porque podem causar danos pessoais.

!PERIGO! 4.1

O travão de parada não é travão de trabalho e só deve ser accionado com os eixos parados. Após aprox. 1000 retardações de PARADA DE EMERGÊNCIA com momento de inércia exterior ≦ momento de inércia do motor, é necessário um controlo do travão de parada na oficina do fabricante!

ATENÇÃO! 4.2

O anel de vedação ondular não é vedado anti-pressão, e portanto não é indicado para montagem no jogo de engrenagens.

ATENÇÃO! 5.1, 7.6, 7.11

Com o abastecimento modular de 24 V desligado ou não conectado, a tensão de rede no módulo de alimentação não deve ser ligada, caso contrário o módulo de alimentação pode ser danificado.

ATENÇÃO! 6.1

Os motores poderão apresentar temperaturas de superfície de até 100 ºC.
Caso necessário deverá colocar uma protecção contra contacto.

ATENÇÃO! 6.2

Golpes e pancadas não deverão jamais atingir a extremidade ondulada.
O transmissor giratório e o rolamento de esferas poderão ser danificados.

!PERIGO! 6.3

Perigo de ferimento caso as molas de ajuste saiam projectadas.
Motores com ranhuras e molas de ajuste apenas devem ser utilizados e postos a funcionar quando montados ou com molas devidamente seguras.

ATENÇÃO! 6.4

O ar ambiental deve estar livre duma elevada concentração de pó, ácido, lixívia, substâncias corrosivas, sal, vapores de metal, etc.

Evite de toda a maneira a formação de orvalho no módulo!

!PERIGO! 6.5

Nos bornes da resistência fixa encontram-se tensões de risco de morte.
A resistência fixa pode tornar-se superaquecida.

ATENÇÃO! 7.1

Os módulos conversores apenas podem ser ligados a redes ligadas à terra.
Não é permitida a ligação a redes não ligadas à terra (rede de tolerância ISO) porque isto poderia levar à sobrecarga das linhas de ar e das linhas de fuga no módulo.

!PERIGO! 7.2

Os módulos conversores só poderão ser conectados a redes ligadas à terra.

Única medida de protecção permitida segundo prEN 50 178: ligação à terra de protecção! Não é permitida a ligação a sistemas com interruptores de segurança FI normais, pois poderia acontecer que correntes de falha vindas do circuito intermédio atinjam a rede pela terra sem disparar o interruptor de segurança FI.

A ligação unilateral à terra do circuito intermédio através de um transformador de separação não é permitida.

!PERIGO! 7.3

K01 e K02 devem ser bem travados um contra o outro!

!PERIGO! 7.5

Em caso de falha o accionamento deverá ser desconectado da rede de distribuição!

ATENÇÃO! 7.7

Somente é permitido combinações de resistências auto-reguladoras de fusíveis conforme descrito no manual de instruções. Em caso de utilização de um fusível ou posição de ficha (X3, X4, X5) incorrectos, o MD poderá ser danificado.

!PERIGO! 7.8

Todos os trabalhos de conexão e montagem apenas devem ser realizados com o sistema desligado da tensão eléctrica!

Devido à excitação do íman permanente, com os rotores induzidos em rotação e com o motor electricamente não conectado, há uma tensão de grande risco na tomada de corrente.

ATENÇÃO! 7.9

E imprescindível manter a sequência de fases correcta das conexões do motor.

!PERIGO! 7.10

O travão de parada não é travão de trabalho e só deve ser accionado com os eixos parados.

A.2.9 Suomi

Käsikirjan varoitusohjeet

Ota huomioon käsikirjan hengenvaaraa ja terveysriskejä sekä tavaravahinkojen välttämistä koskevat turvallisuusohjeet (VAARA, HUOMIO), sekä korostetut tuotetta koskevat tiedot (Ohje).

Kaikilla turvallisuusohjeilla on kappaleisiin liittyvä, juokseva numero, esim. 1.1. Liitteestä löytyvät näiden turvallisuusohjeiden vastaavat käännökset kaikilla virallisilla EU-kielillä.

! VAARA ! 1.1

Komponenttien huollon ja asennuksen saa suorittaa ainoastaan koulutettu henkilökunta tapaturmantorjuntaohjeet ja asennusohjeet huomioon ottaen (EN 60204-osa1, prEN 50178).

! VAARA ! 1.2

Asianmukainen kuljetus, varastointi, sijoitus ja asennus sekä huolellinen käyttö on edellytyksenä tuotteen moitteettomalle ja varmalle toiminnalle.

HUOMIO ! 1.3

Käyttömuuntajissa on sähköstaattisesti vaarannettuja rakenneosia, jotka voivat helposti tuhoutua väärin käsiteltäessä.

! VAARA ! 1.4

Sisäänrakennettuja sähkökomponentteja ei saa tuhota terveysriskin takia.

! VAARA ! 4.1

Pidätinjarru ei ole käyttöjarru työskentelyn aikana, ja sen käyttö on sallittua ainoastaan, kun akseli on pysähtanyt.
Noin 1000 HÄTÄ-SEIS-jarrutuksen jälkeen
vierashitausmomentilla ≦ moottorin hitausmomentti täytyy pidätinjarru tarkistaa tehtaalla!

HUOMIO ! 4.2

Akselin tiivistysrengas ei ole painetiivis, ja sen vuoksi sitä ei voida käyttää vaihdeasennukseen.

HUOMIO ! 5.1, 7.6, 7.11

Kun 24-V-moduulijännite on kytketty pois tai sitä ei ole liitetty, huoltomoduulin verkkojännitettä ei saa kytkeä päälle, sillä huoltomoduuli voi silloin vahingoittua.

HUOMIO ! 6.1

Moottoreiden pintojen lämpötila saattaa olla n. 100 ˚C.
Tarvittaessa on asennettava kosketusuoja.

HUOMIO ! 6.2

Akselin päähän ei missään tapauksessa saa osua iskuja.
Se vahingoittaa kierrosanturia ja kuulalaakereita.

! VAARA ! 6.3

Ulossinkoutuvat sovituskiilat aiheuttavat onnettomuusvaaran.
Uralla ja sovituskiilalla varustettuja moottoreita saa käyttää vain sisään asennettuina tai sovituskiila varmistettuna.

HUOMIO ! 6.4

Ympäristöilman tulee olla vapaa hapoista, liuottimista, syövyttävistä aineista, suolasta, metallihöyryistä jne.
Moduulit eivät saa kostua!

! VAARA ! 6.5

Tasausresistorin liitäntänavoissa on hengenvaaralliset jännitteet.
Tasausresistori voi kuumeta erittäin kuumaksi.

HUOMIO ! 7.1

Vaihtosuuntainmoduuleja saa käyttää ainoastaan maadoitetuissa verkoissa.
Käyttö verkoissa, joita ei ole suoraan maadoitettu (IT-verkko) ei ole luvallista, sillä moduulin ilma- ja pintavälit voivat ylikuormittua.

! VAARA ! 7.2

Vaihtosuuntainmoduulien käyttö on luvallista ainoastaan maadoitetuissa verkoissa.

**Ainoastaan luvallinen suojatoimi prEN 50 178 mukaan: Suojamaadoitus!
Käyttö laitteistoissa, joissa on normaalit FI-suojakytkimet ei ole luvallista,
sillä välipiirin virhevirrat voivat virrata maaton kautta takaisin verkkoon,
ilman että ne laukaisevat FI-suojakytkintä.**

Välipiirin yksipuolinen maadoitus käytöllä eristysmuuntajan kautta ei ole luvallista.

! VAARA ! 7.3

K01 ja K02 täytyy olla varmasti toisiaan vastaan lukitut!

! VAARA ! 7.5

Vian yhteydessä on moottori irrotettava verkosta!

HUOMIO ! 7.7

**Vain ohjeen mukaiset sulake-tasausresistoriyhdistelmät ovat sallittuja.
Väärä sulake tai väärä pistokepaikka (X3, X4, X5) voi tuhota huoltomoduulin.**

! VAARA ! 7.8

**Kaikki liitäntä- ja asennustyöt on suoritettava ainoastaan jännitteetömässä tilassa.
Kestomagnetoinnin takia pyörivällä roottorilla ja elektrisesti liittämättömällä moottorilla
tehopistorasiassa on vaarallinen jännite!**

HUOMIO ! 7.9

Moottoriliitäntöjen oikea vaihejärjestys on ehdottomasti säilytettävä.

! VAARA ! 7.10

Pidätysjarru ei ole tarkoitettu työskentelyjarruksi, ja sen käyttö on sallittua ainoastaan, kun akseli ei liiku.

A.2.10 Svenska

Anvisning om risker i handboken

Beakta de säkerhetsanvisningar som ingår handboken (RISKER, OBSERVERA) över risker för liv och hälsa och hur sakskador undviks, samt de specificerade informationerna över produkten (Anvisning).

Alla säkerhetsanvisningarna är numrerade fortlöpande på samma sätt som kapitlen, t. ex. 1.1. I bilagan finns tillhörande översättningar över säkerhetsanvisningen i alla EU-språk.

! FARA ! 1.1

Underhåll och installation av komponenter endast av kvalificerad personal som skall beakta bestämmelserna över olycksfallsförebyggande (UVV VBG4, VDE 100, VDE 105) och bestämmelserna för installation (EN 60204-del 1, prEN 50178).

! FARA ! 1.2

Produktens perfekta och säkra drift förutsätter sakkunnig transport, riktig lagring, uppställning och montage samt noggrann manövrering.

OBSERVERA ! 1.3

Drivningsfrekvensomformare innehåller elektrostatiskt känsliga komponenter som lätt kan förstöras vid icke sakkunnig hantering.

! FARA ! 1.4

Inbyggda elektriska komponenter får på grund av möjliga hälsorisker inte förstöras.

! FARA ! 4.1

Parkeringsbromsen är ingen arbetsbroms och får endast manöveras när axeln står stilla. Efter ca. 1000 NÖD/FRÅN-bromsningar med externt tröghetsmoment ≦ motorns tröghetsmoment erfordras en provning av handbromsen i tillverkarfabriken!

OBSERVERA ! 4.2

Axeltätningen är inte trycktät, och därför inte lämplig för montering i växel.

OBSERVERA ! 5.1, 7.6, 7.11

Vid frånkopplad eller inte ansluten 24-V modulförsörjning får nätspänning inte tillkopplas på VM, då VM därigenom kan skadas.

OBSERVERA ! 6.1

På motorerna kan yttemperaturer upp till ca. 100 °C uppträda.
Vid behov skall ett beröringsskydd anordndas.

OBSERVERA ! 6.2

Under inga omständigheter får slag och stötar påverka axeländen.
Givare och kullager skadas därigenom.

! FARA ! 6.3

Skaderisk genom passfjädrar som slungas ut
Motorer med spår och passfjäder får endast drivas i inbyggt skick eller när passfjädern är säkrad.

OBSERVERA ! 6.4

Omgivningsluften skall vara fri från koncentration av syra, lut, korrosionsmedel, salt, metallångor osv.
Det är inte tillåtet med daggbildning på modulernaå!

! FARA ! 6.5

Livfarlig spänning ligger an mot ballastmotståndets plintar
Ballastmotståndet kan bli mycket hett.

OBSERVERA ! 7.1

Omriktningsmoduler får endast anslutas till jordade el-nät.
Drift med inte direkt jordade nät (IT-nät) är inte tillåten, då luft- och krypsträckor i modulen kan överbelastas.

! FARA ! 7.2

Omriktningsmoduler får endast anslutas till jordade el-nät.

Endast skyddsåtgärder enligt prEN 50 178: skyddsjordning!
Drift på anläggningar med normala FI-skyddskontakter är inte tillåtet, då läckström från mellankretsen kan komma tillbaka till nätet via jord, utan att utlösa FI-skyddskontaktenå.

Ensidig jordning av mellankretsen vid drift via delningstransformator är inte tillåten.

! FARA ! 7.3

K01 och K02 skall vara säkert låsta mot varandra!

! FARA ! 7.5

Vid ett fel måste drivningen separeras från försörjningsnätet!

OBSERVERA ! 7.7

Endast säkerhets-ballastmotstånd-kombinationer enligt instruktionen är tillåtna.
Med en felaktig säkring eller felaktig kontaktposition (X3, X4, X5) kan försörjningsmodulen förstöras.

! FARA ! 7.8

Anslutnings- och montagearbeten får endast genomföras i spänningsfritt tillstånd.
På grund av den ständigt aktiverade magneten ligger an farlig spänning an mot effektkontakten vid roterande rotorer och en icke elektriskt ansluten motor!

OBSERVERA ! 7.9

Riktig fasföljd hos motoranslutningarna skall ovillkorligen följas.

! FARA ! 7.10

Parkeringsbromsen är ingen körbroms och får endast manövreras när axlarna står stilla.

Your notes:

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Technische Änderungen vorbehalten

Ihr Ansprechpartner

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