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Servodyn-D

Servodyn-DM Configuration

VersionM **102**

Servodyn-D

Servodyn-D Configuration

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Your notes:



1 Safety instructions

The present manual contains all information required for the intended use of the products described.

It is designed for qualified technical staff with special training or relevant knowledge in the field of measuring, open- - and closed- -loop control systems.

1.1 Hazard warnings in the manual

Observe and comply with the safety instructions ('DANGER', 'CAUTION') in this manual regarding the risk of personal injury and for avoiding damage to equipment, as well as the highlighted information concerning the unit ('Note').

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 E.U. languages.

1.2 Qualified personnel

! DANGER !

The maintenance and installation of components is reserved to qualified electrical staff (VDE 1000-10) who observe the accident prevention regulations and installation instructions (EN 60204 Part 1, prEN 50178).

1.1



Unqualified interventions in the drive components or non-compliance with the warnings contained in this manual or attached to the components may result in severe injury or damage to property.

Therefore, only **qualified electrical staff** in accordance with VDE 1000-10 who have read this manual may perform the interventions permitted by this manual.

This refers to persons who

- are able to judge the work to be performed and recognize potential hazards due to their technical training, knowledge and experience and their knowledge of the relevant regulations.
- have many years of experience in comparable technologies and therefore have the same knowledge as if they had undergone technical training.

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For more information, please contact our training center.

1.3 Normal operation

Drive inverters are components designed for installation in metallic switch cabinets for industrial machinery and plants.

If additional precautions are taken, they may also be used for commercial applications.

- Before commissioning the drive inverters it must be ensured that they will be installed in a machine that complies with the provisions of the Machine Directive (89/392/EEC) and the EMC Directive (89/336/EEC).
- The actual inverters comply with the protection objectives of the Low-Voltage Directive (73/23/EEC) and the harmonized standards prEN 50178 (VDE 0160) and EN 60146-1-1 (VDE 0558-11).

When operated in accordance with the handling regulations and safety instructions described for project engineering, installation and normal use, the product normally does not pose any hazards in terms of damage to property or health risks.

1.2



! DANGER !

Proper transport, storage, setting-up, assembly and careful operation of this product are the prerequisites for its safe and reliable operation.

No elements of the inverters may be bent, and/or no insulation clearances may be changed. Do not touch any electronic components or contacts.

1.3

CAUTION !

Drive inverters contain components endangered by electrostatic discharge which may be destroyed by inappropriate handling.

1.4



! DANGER !

The built-in electrical components must not be destroyed, as this may involve health risks.



2 The fully digital inverter system Servodyn-D

2.1 Features of the inverter system

The Servodyn-D inverter system has a modular structure and comprises supply and drive modules as well as different functions and various interfaces.

The drive modules have a digital closed-loop control for the position, speed and current. Different motors can be operated with the same hardware:

- Synchronous motors type SF** for sinusoidal current with an integrated absolute encoder for speed and position control
- Synchronous motors type SR** for sinusoidal current with integrated resolver for speed and position control
- Asynchronous motors type DU** with integrated absolute encoder or gear encoder

When used in conjunction with synchronous motors, the system meets the highest demands on dynamics, speed setting range, synchronizing and positioning accuracy.

Advantages

- Modular design
- Compact design for 300 mm control cabinet depth
- Mechanics optimized for power output
- Inverters with backplane modules for cold module engineering
- Direct power supply connection
- Supply modules for supply-friendly infeed and regeneration ($\cos \phi = 1$ and power factor ~ 1)
- Three-phase modules of same construction with IGBT output stages for brushless synchronous and asynchronous motors
- Automatic commissioning via 'electronic rating plates' of drive modules and motors
- Position control in three-phase modules
- Integrated, redundant 2-channel safety structure with certificate

2.2 Construction of the inverter system

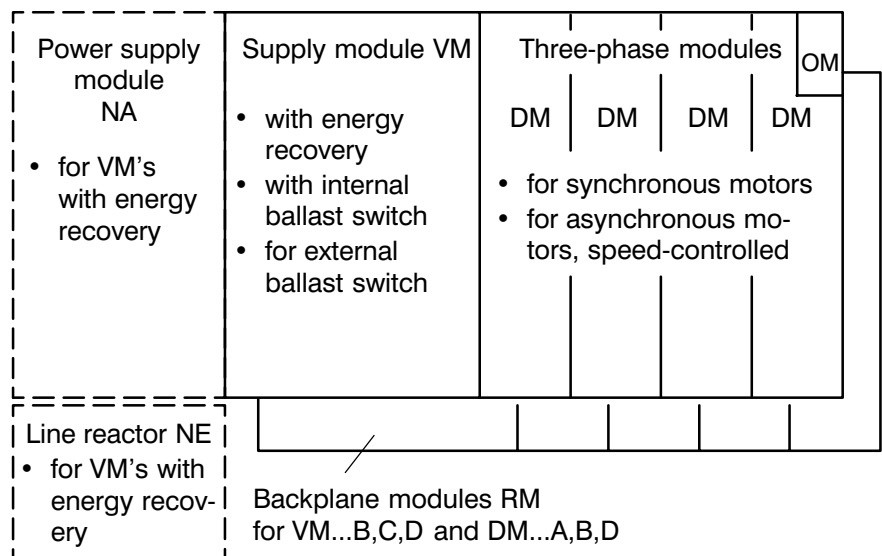
The Bosch drive system Servodyn-D has a modular construction and comprises the following components:

- Power supply modules
 - with internal or external ballast switch up to 16 kW VM...K
 - with energy recovery up to 57 kW VM...B,C,D
 - With suitable:
 - Line wiring module for VM...K NV
 - Power supply module for VM...B,C,D NA
 - Line reactor for VM...B,C,D NE

- Three-phase modules
 - up to 7 kW DM...K
 - up to 45 kW DM...A,B,D
 - With suitable:
 - Synchronous motors SF and SR
 - Asynchronous motors DU
 - Optional direct measuring system OM
 - Personality module for SERCOS interface PM
 - Memory card for SERCOS interface MC

- Backplane modules
 - for VM...B,C,D and DM...A,B,D RM

The modules are lined up and interconnected by the d.c. link and control lines.



The supply and three-phase modules installed on the backplane modules can also be operated in **cold-module technique** with RM...C.



2.2.1 Mechanical structure

The IGBT output stages used for all modules are available with two different mechanics, depending on the current output, which may be combined as necessary.

Compact mechanics without backplane module

Output stages for a **maximum current up to 35 A**:

- width in 50 mm modular dimension
- depth for 300 mm switch cabinet
- height 430 mm
- plug-in connections
- d.c. link connection through busbars
- supply module with internal/external ballast switch and integrated start-up circuit

Mechanics with backplane module

Output stages for a **maximum current up to 140 A** for installation with backplane module:

- width in 50 mm modular dimension
- depth for 300 mm switch cabinet
- height 521 mm
- inverter module can be plugged into the backplane module
- integrated d.c. link connection
- supply module with mains-friendly infeed and energy recovery

2.2.2 Functional design

Various functions can be selected for each type of mechanics to ensure that the performance is suitable for the interface.

SERCOS interface

Powerful processor board with 32-bit signal processor for fully digital position, speed and current control.

The SERCOS interface features, i.a., real-time processing, fault-resistant optical fibres and free combination of drives and controls of any manufacturer.

- **Cycle times**

Position controller: 500 μ s (servo)
1 ms (spindle)

Speed controller: 250 μ s

Current controller: 125 μ s

- **Personality module**

For inverter modules with SERCOS interface, the entire software is contained within the plug-in personality module. This includes: the operating system, inverter-specific and system-specific data, the module address for SERCOS interface and the setting for the transmitting power of the optical fibre.

Recommissioning after unit exchange is therefore possible without further auxiliary equipment.

- **Memory card**

The memory is a storage medium in cheque card format.

It contains a flash EPROM and its applications include archiving, transmission of system-specific parameters or operating system updates.

The memory card can be installed as a standard in all inverter modules with SERCOS interface.

The interface can be programmed by the NC or the standard serial interface using the DSS-D commissioning and service system.

Analog interface

Processor board with fully digital position, speed and current control by VeCon chip. The analog setpoint values have a resolution of 12 bits, for high demands alternatively even 15 bits.

- **Cycle times**

Speed controller: 62.5 μ s

Current controller: 62.5 μ s

Inverter modules with an analog interface contain an integrated complete software package. They are programmed through the standard serial interface using the DSS-D commissioning and service system.

**Motion control**

- **Positioning**
Processor board with 24V control inputs and fully digital position, speed and current control by VeCon chip in preparation:
Up to 32 positioning blocks with target position as well as acceleration and maximum speed parameters can be specified.
- **Electronic gear box / electronic shaft**
Processor board with CAN bus and fully digital position, speed and current control by VeCon chip in preparation:
Several motion control drives can be synchronized to one master with synchronous speed (electronic gear box) or at synchronous angles (electronic shaft).
A normal axis module or a direct encoder system can be used as master. Analog setpoint values are possible.
- **Single-axis cam disk**
Processor board with CAN bus and fully digital position, speed and current control by VeCon chip in preparation:
In synchronized operation, the motion control drive sequentially processes a motion profile stored in the drive in the form of a fixed allocation between the angle of the master encoder system and the path to be travelled. Analog setpoint values are possible.

CAN bus

Processor board with fully digital position, speed and current control by VeCon chip and CAN bus in preparation.

Profibus DP

Processor board with fully digital position, speed and current control by VeCon chip and Profibus with drive profile in preparation.

Redundant safety monitoring module RSU

For the following drives, an integrated, redundant 2-channel safety structure is in preparation:

- for axis modules with SERCOS interface
- in connection with a supply module capable of energy recovery
- a power supply module

The RSU module monitors and limits all axis movements and torques of the motors and dispenses with additional control devices at the machine. The concept will be coordinated with and certified by a technical supervisory board.

2.3 Function of the inverter system

Supply modules

The supply modules rectify the 3 x 380...415 V a.c. line voltage and adjust the d.c. link to 670 V.

In 4-quadrant operation, the energy generated by the braking of the motor is fed back into the supply system ($\cos \phi = 1$) in a supply-friendly manner or converted into heat by a ballast switch:

- VM...K : in compact mechanics with internal/external ballast switch, integrated charging circuit
- VM...B,C,D : with supply-friendly infeed and recovery, can be plugged into backplane module.

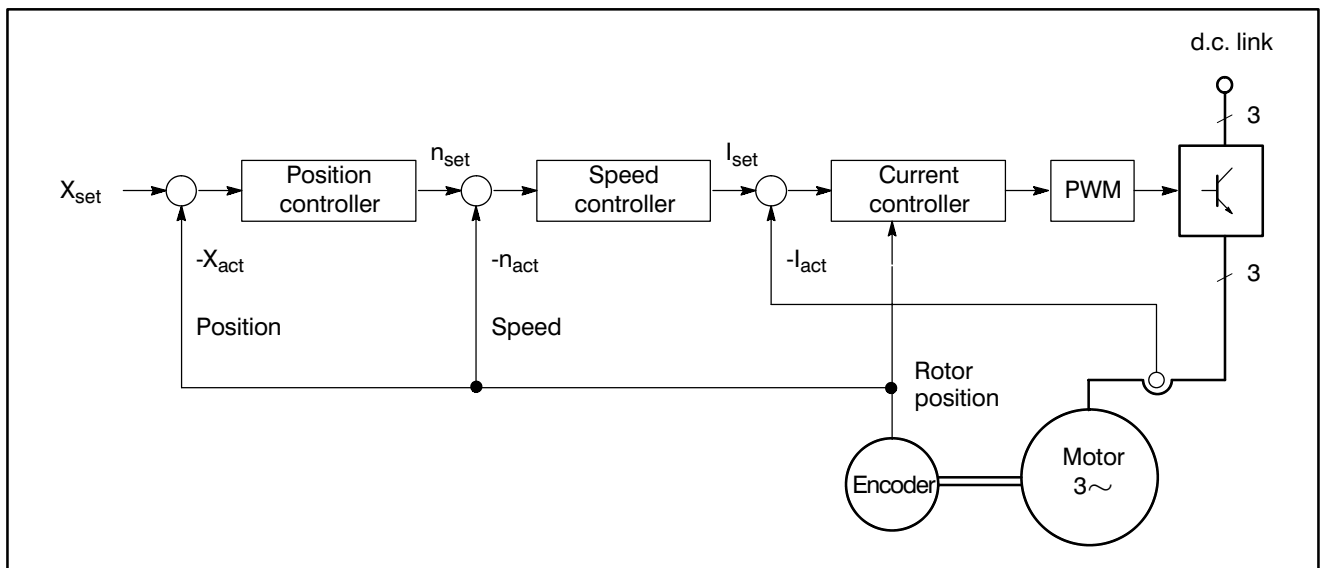
The 24 V supply is connected to the supply module where it is distributed to the three-phase modules.

Three-phase modules

The Bosch servo motors type SF and SR, asynchronous motors type DU or built-in motors with defined encoders are operated with the three-phase modules. The three-phase modules have the same hardware, however, their software is different.

The electronic rating plates of the IGBT inverter output stage and the connected motor contain all necessary drive data and automatically set the parameters for drive control of the motor-module combination used.

The position, speed and current controllers are fully digital and designed in a cascade structure.



System-specific parameters are changed and archived from a PC with an RS232 interface using the DSS-D commissioning and service system.

**Setpoint interface** **SERCOS interface**

SERCOS = **S**ERial **R**ealtime **C**OMmunication **S**ystem
according to EN 41 009

SERCOS interface is a serial realtime communication system between the control unit and the drives and was developed as a standardisation proposal in a joint VDW/ZVEI working committee (DIN IEC/TC 44).

SERCOS interface is defined as a ring structure of optical fibres. Each ring links an NC control unit with several drives.

The maximum number of drives is dependent on the required communication cycle time, the preselected operating data range and the data rate. Approximately 8 drives can be connected to an optical fibre ring at a cycle time of 1 ms. The number of drives per control unit can be increased by using several optical fibre rings.

SERCOS interface offers the following advantages:

- Ease of installation and commissioning
- Standardised connection system, procedures, formats and weighting facilitate interaction between control units and drives from various manufacturers.
- Fast response times; setpoints and actual values can be processed in the same cycle.
- High immunity to interference due to optical fibres
- Lowest possible number of optical fibres due to ring structure
- Various drive operating modes possible

Three-phase modules with SERCOS interface support the speed, position and interpolation interfaces.

 Analog interface

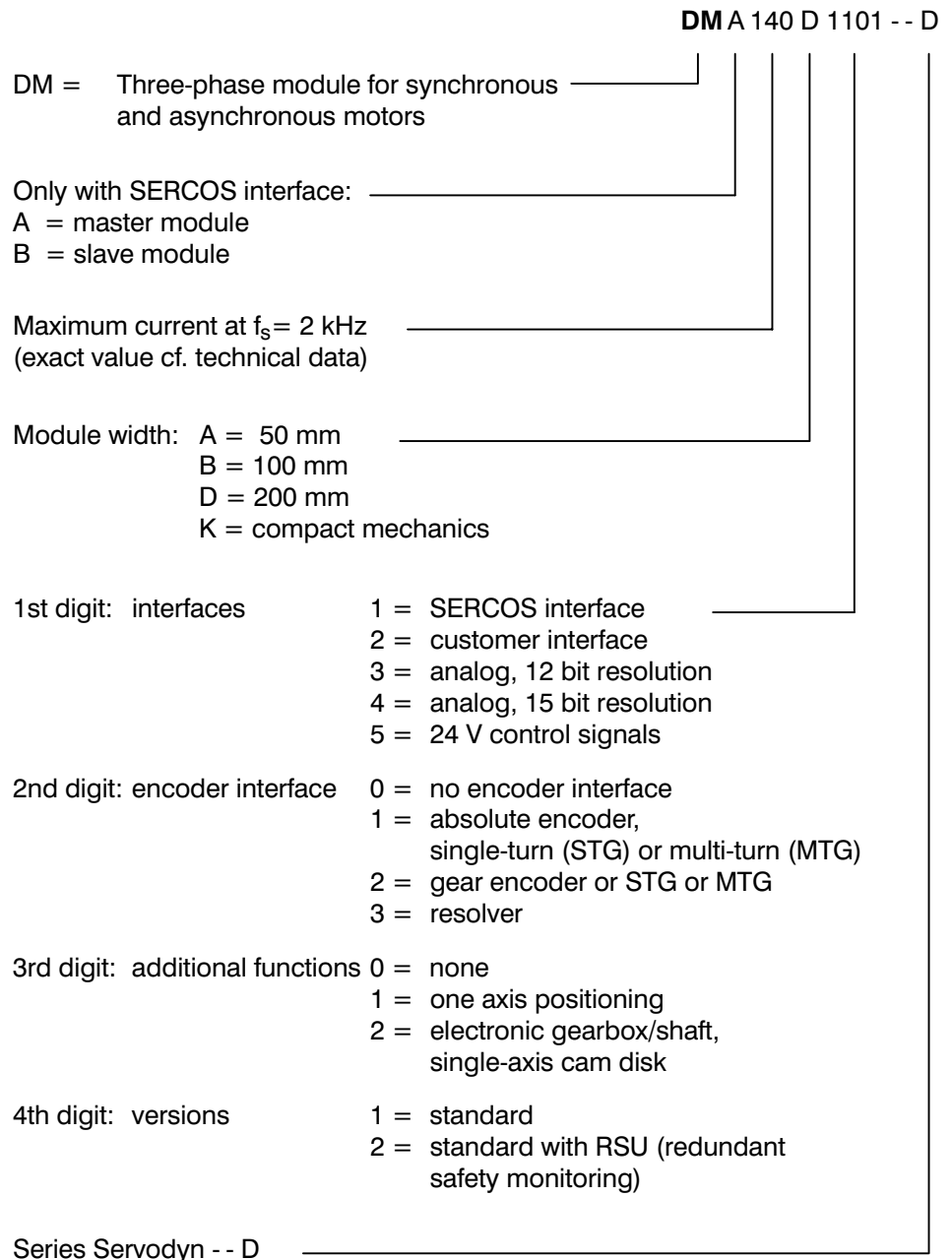
± 10 V speed interface with an optional resolution of 12 or 15 bits. Standard encoder simulation for transmission of the actual position values.

Your notes :



3 Drive functions

3.1 Overview of functions



3.2 Combination table

The combination table provides an overview of suitable interface, encoder interface, additional function and variant combinations. It shows the available modules including their designation and order number.

Designation / order number of three-phase modules

Setpoint interface	SERCOS interface (position and speed interface)		Analog interface (speed interface), as of 2nd quarter of 1997		
			12 bit resolution	15 bit resolution	
Encoder interface	Single-turn (STG) or Multi-turn (MTG)	Gear encoder or STG or MTG	Resolver	STG or MTG	Gear encoder or STG or MTG
Additional function	--	--	--	--	--
Variant	--	--	--	--	--

Compact mechanics

DM..4K	DM 4K 1101-D 1070 077 600	--	DM 4K 3301-D 1070 077 616	DM 4K 4101-D 1070 077 604	--
DM..8K	DM 8K 1101-D 1070 077 601	--	DM 8K 3301-D 1070 077 617	DM 8K 4101-D 1070 077 605	--
DM..15K	DM 15K 1101-D 1070 077 602	--	DM 15K 3301-D 1070 077 618	DM 15K 4101-D 1070 077 606	--
DM..30K	DM 30K 1101-D 1070 077 603	--	DM 30K 3301-D 1070 077 619	DM 30K 4101-D 1070 077 607	--

Mechanics for backplane module

DM..4A	DMA 4A 1101-D 1070 070 770	--	--	DMA 4A 4101-D 1070 078 596	--
DM..8A	DMA 8A 1101-D 1070 070 771	--	--	DMA 8A 4101-D 1070 078 597	--
DM..15A	DMA 15A 1101-D 1070 070 772	--	--	DMA 15A 4101-D 1070 078 598	--
DM..30A	DMA 30A 1101-D 1070 070 773	DMA 30A 1201-D 1070 077 086	DMA 30A 3301-D 1070 077 620	DMA 30A 4101-D 1070 077 608	DMA 30A 4201-D 1070 077 612
DM..45A	DMA 45A 1101-D 1070 070 774	DMA 45A 1201-D 1070 077 087	DMA 45A 3301-D 1070 077 621	DMA 45A 4101-D 1070 077 609	DMA 45A 4201-D 1070 077 613
DM..85B	DMA 85B 1101-D 1070 070 780	DMA 85B 1201-D 1070 077 088	DMA 85B 3301-D 1070 077 622	DMA 85B 4101-D 1070 077 610	DMA 85B 4201-D 1070 077 614
DM..140D	DMA 140D 1101-D 1070 070 782	DMA 140D 1201-D 1070 077 089	DMA 140D 3301-D 1070 077 623	DMA 140D 4101-D 1070 077 611	DMA 140D 4201-D 1070 077 615



	Motion Control (24V control signals), as of 2nd quarter of '97				
	Resolver	STG or MTG			
	Single- -axis positioning				
	--	--			
	DM 4K 5311-D 1070 078 616	DM 4K 5111-D 1070 078 608			
	DM 8K 5311-D 1070 078 617	DM 8K 5111-D 1070 078 609			
	DM 15K 5311-D 1070 078 618	DM 15K 5111-D 1070 078 610			
	DM 30K 5311-D 1070 078 619	DM 30K 5111-D 1070 078 611			
	--	--			
	--	--			
	--	--			
	DMA 30A 5311-D 1070 078 652	DM 30A 5111-D 1070 078 612			
	DMA 45A 5311-D 1070 078 653	DM 45A 5111-D 1070 078 613			
	DMA 85A 5311-D 1070 078 654	DM 85B 5111-D 1070 078 614			
	DMA 140A 5311-D 1070 078 655	DM 140D 5111-D 1070 078 615			

Your notes :



4 Drive design

4.1 General technical data

Operating temperature range	0 °C to +45 °C 46 °C to +55 °C with derating
Storage temperature range	-25 °C to +70 °C
Type of protection	IP20 according to EN 60 529
Climatic category	3K3 according EN 60 721
Installation altitude	≤ 1000 m above sea level, derating up to max. 3000 m above sea level

Servodyn modules must only be installed in switch cabinets which conform to protection standard IP 54 (with dust filters at air entries and exits). The surrounding air must be free from high levels of dust, acid, lye, corrosive materials, salt, metal vapours, etc.

CAUTION !


Drive components must only be transported in the intended packaging.

**Assembly, installation and commissioning
may only be carried out by qualified personnel.**

**Observe the hazard warnings in this manual and attached to the unit
to prevent injury to persons or damage to equipment.**

4.1

4.2 Procedure

 **Note** In accordance with EN 50 082, the availability of the system (machine) must be ensured even at supply voltage of $0.9 U_N$. This must be considered during configuration!

see section

	Servo motors type SF or SR	Asynchronous motors type DU
4.3.1	<input type="checkbox"/> SF motor with STG or MTG SR motor with resolver <input type="checkbox"/> Torque/spindle speed <input type="checkbox"/> Other versions, options <ul style="list-style-type: none"> <input type="checkbox"/> Vibration severity grade <input type="checkbox"/> Driving-end shaft extension <input type="checkbox"/> Holding brake <input type="checkbox"/> Surface ventilation 	<input type="checkbox"/> Power/torque/spindle speed <input type="checkbox"/> Other versions, options <ul style="list-style-type: none"> <input type="checkbox"/> Vibration severity grade <input type="checkbox"/> Flange accuracy <input type="checkbox"/> Driving-end shaft extension <input type="checkbox"/> Holding brake
3 4.1 4.3.2 4.4.1 4.5 4.6	Three-phase modules DM	
	<input type="checkbox"/> Select function: <ul style="list-style-type: none"> <input type="checkbox"/> Setpoint interface <input type="checkbox"/> Encoder interface <input type="checkbox"/> Motion Control <input type="checkbox"/> with/without RSU (2-channel redundant safety monitoring) <input type="checkbox"/> Via rated current/peak current, dependent on operating frequency and ambient temperature, specify size of module. <input type="checkbox"/> d.c. link connection option (for combination of both mechanics or for two- row module arrangement) <input type="checkbox"/> Plug braking module option	
4.7 4.7.2	Connecting lead / mating connector	
	<input type="checkbox"/> Power connection to the motor <ul style="list-style-type: none"> <input type="checkbox"/> Fixed length cable with integrated connectors: DM module → SF/SR motor, or <input type="checkbox"/> Cable by the metre + mating connector motor + assembly tool <input type="checkbox"/> Encoder connection <ul style="list-style-type: none"> <input type="checkbox"/> Fixed length cable with integrated connectors: DM module → SF/SR/DU motor, or <input type="checkbox"/> Cable by the metre + mating connector motor and module + assembly tool <input type="checkbox"/> Protective circuit for brake line for motors with holding brake <input type="checkbox"/> Optical fibres with connectors (only for SERCOS interface) <ul style="list-style-type: none"> <input type="checkbox"/> Control unit → module <input type="checkbox"/> Module → module <input type="checkbox"/> Module → control unit 	



Supply modules VM	
4.1 5.1	<input type="checkbox"/> Specify size of module via continuous rating/peak output <input type="checkbox"/> Internal or external ballast switch or energy recovery <input type="checkbox"/> Other versions, options <input type="checkbox"/> with/without RSU (redundant 2-channel safety monitoring)

Power supply module NA	
5.2.1	<input type="checkbox"/> Only for VM with energy recovery <input type="checkbox"/> Select same type size as for supply module VM <input type="checkbox"/> Other versions, options <input type="checkbox"/> integrated additional filter (if necessary with external mains filter)

Line wiring module NV	
5.2.2	<input type="checkbox"/> Optionally for VM with internal/external ballast switch <input type="checkbox"/> Select same type size as for supply module VM

Line reactor NE	
5.2.3	<input type="checkbox"/> Only for VM with energy recovery <input type="checkbox"/> Select same type size as for supply module VM

Mains filter	
5.2.4	<input type="checkbox"/> Design according to supply module output, delivery on request

Backplane modules RM	
6.1 6.2	<input type="checkbox"/> Only for VM...B,C,D and DM...A,B,D <input type="checkbox"/> various designs for VM master and DM master/slave <input type="checkbox"/> specify according to module width <input type="checkbox"/> Other versions, options <input type="checkbox"/> Cold module assembly <input type="checkbox"/> d.c. link connection (e.g. for combining both mechanics)

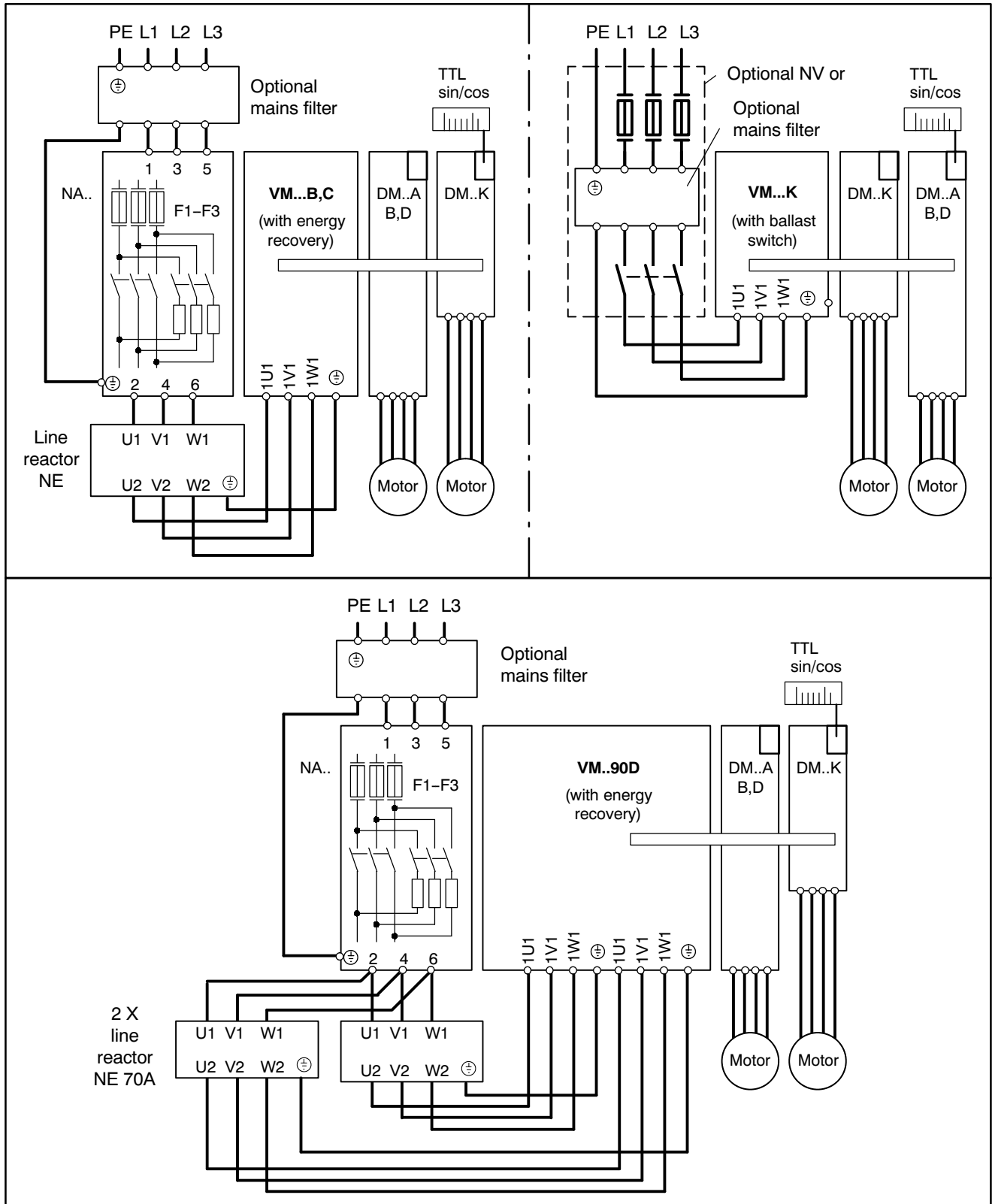
Personality module PM	
6.3	<input type="checkbox"/> One personality module for each supply module with energy recovery <input type="checkbox"/> One personality module for each three-phase module with SERCOS interface

Memory card MC	
6.4	<input type="checkbox"/> Optional for VM with energy recovery and/or for DM with SERCOS interface <input type="checkbox"/> With software for VM or SM or FO or without software

Commissioning and service system DSS-D	
6.5	<input type="checkbox"/> Necessary for commissioning with analog interface <input type="checkbox"/> Optional for commissioning with SERCOS interface

Option module OM	
6.6	<input type="checkbox"/> Specify input for direct measuring system

Servodyn-D drive set with and without energy recovery



4.3 Servo motors SF, SR

4.3.1 SF(R) motor design

To define the motor-module combination, a suitable motor and then the suitable three-phase module is selected.

- A servo motor is preselected using the S1 characteristic curves.
- If motor M_{max} is reached in the application, the preselection must be checked by calculating the rms torque and the mean speed. This requires the following information:
 - cycle time t_{total} of a processing cycle
 - interval t_i as part of the processing cycle
 - the required torque M_i in the respective interval

Preselect motor type SF(R) according to S1 characteristic curve.

$M_{max} (n_{max}) \leq M_{max \text{ motor}} (n_{max}) ?$

Yes

No

Calculate effective torque:

$$M_{rms} = \sqrt{\frac{\sum_i M_i^2 \cdot t_i}{t_{total}}}$$

Select larger motor

Calculate mean speed n_m :

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

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

Yes

No

Check whether smaller motor is possible, otherwise motor selection ends

Select larger motor

**4.3.2 Motor-module combination**

Different combinations on request if technically possible.

- = S1, cycle frequency 2 kHz
- ◐ = S1, cycle frequency up to 4 kHz
- = S1, cycle frequency up to 8 kHz

Servo motors SF, SR		Rating for maximum continuous load							
Type	I_0 [A _{rms}]*	DM.. 4K	DM.. 8K	DM.. 15K	DM.. 30K	DM.. 30A	DM.. 45A	DM.. 85B	DM.. 140D
SF(R)- -A5.0250.020	11				◐	■	■		
SF(R)- -A5.0460.020	21					□	◐	■	■
SF(R)- -A5.0700.020	35							◐	■
SF(R)- -A2.0013.030	0.9	■							
SF(R)- -A2.0020.030	1.3	■							
SF(R)- -A2.0026.030	1.7	■							
SF(R)- -A2.0041.030	2.7	◐	■						
SF(R)- -A3.0042.030	3.0	◐	◐	■					
SF(R)- -A3.0068.030	4.8		□	■	■				
SF(R)- -A3.0093.030	6.6			■	■	■			
SF(R)- -A4.0091.030	6.8			■	■	■			
SF(R)- -A4.0125.030	9.1			◐	◐	■			
SF(R)- -A4.0172.030	13				◐	■	■		
SF(R)- -A4.0230.030	16					◐	■	■	
SF(R)- -A5.0250.030	18					◐	◐	■	
SF(R)- -A5.0460.030	33							◐	■
SF(R)- -A5.0700.030	47							◐	■
SF(R)- -A2.0013.060	1.7	■							
SF(R)- -A2.0020.060	2.7	◐	◐						
SF(R)- -A2.0026.060	3.5	◐	◐	■					
SF(R)- -A2.0041.060	5.6			■	■				
SF(R)- -A3.0042.060	6.0			■	■				
SF(R)- -A3.0068.060	10			◐	◐	■	■		
SF(R)- -A3.0093.060	14				□	◐	■	■	
SF(R)- -A4.0091.060	14				□	◐	■	■	
SF(R)- -A4.0125.060	17					◐	◐	■	
SF(R)- -A4.0172.060	26						◐	■	■
SF(R)- -A4.0230.060	25						◐	■	■

* I_0 = standstill current, rms

4.4 Asynchronous motors DU

To define the motor-module combination, a suitable motor and then the suitable three-phase module is selected.

A type DU motor is preselected using the characteristic curve in the motor manual according to the following criteria:

- Required maximum speed
- Required output at maximum speed
- Required torque up to transition speed

4.4.1 Motor-module combination

- ◻ = S1, cycle frequency 4 kHz
- ◼ = S1, cycle frequency 4 - 8 kHz
- = S6-60%, cycle frequency 4 kHz
- = S6-60%, cycle frequency 4 - 8 kHz
- △ = S6-40%, cycle frequency 4 kHz
- ▲ = S6-40%, cycle frequency 4 - 8 kHz

Frame size	Asynchronous motors DU	Rated power P_N [kW]	Speed range $n_N - n_{max}$ [min ⁻¹]	Rated torque M_N [Nm]	Rated current I_N [A]	Motor-module combination				
						DM.. 30K	DM.. 30A	DM.. 45A	DM.. 85B	DM.. 140D
90	90 L	4.2	1800 - 12000 ¹⁾	22	11	◻ ○	◼ ● △	◼ ● ▲		
100	100 M	6.6	1800 - 12000 ²⁾	35	15.5		◻ ○	◼ ○ △	◼ ● ▲	
	100 L	9.0		48	20			◻ ○	◼ ● ▲	◼ ● ▲
	100 U	12		63.5	25				◼ ● ▲	◼ ● ▲
132	132 S	15	1500 - 9000 ³⁾	95.5	29				◼ ○ △	◼ ● ▲
	132 M	18.5		118	37			◻ ○	◼ ● ▲	◼ ● ▲
	132 L	22		140	42			◻ ○	◼ ● ▲	◼ ● ▲
160	160 S	30	1500 - 9000 ³⁾	191	51					◼ ● △
	160 M	37		235	63					◼ ● △
	160 L	45		286	76					◻ ○

1) Higher maximum speed option: 15,000 min⁻¹, with gear encoder 18,000 min⁻¹
 2) Higher maximum speed option: 15,000 min⁻¹
 3) Higher maximum speed option: 12,000 min⁻¹



4.5 Three-phase modules

4.5.1 Technical data: three-phase modules DM

Three-phase modules DM...K in compact mechanics

Module type	DM..4K		DM..8K		DM..15K		DM..30K	
Heat sink temperature for transition current values*	60°C ¹⁾	80°C ²⁾	60°C ¹⁾	80°C ²⁾	60°C ¹⁾	80°C ²⁾	60°C ¹⁾	80°C ²⁾
D.C. link voltage	670 VDC, regulated							
$f_s = 2$ kHz								
Rated current [A _{rms}]	2.1	5.3	2.2	4.7	4.8	10	7.8	16
Maximum current [A _{rms}]	7.1	7.1	11	11	18	17	34	25
$f_s = 4$ kHz								
Rated current [A _{rms}]	1.7	4.2	1.8	3.9	3.8	8.7	6.2	13
Maximum current [A _{rms}]	7.1	7.1	11	11	18	15	29	21
$f_s = 8$ kHz (ex factory)								
Rated current [A _{rms}]	0.8	1.9	1.0	2.4	1.6	5.8	3.0	8.2
Maximum current [A _{rms}]	7.1	7.1	10	7.3	15	11	19	13
Speed range	1 : 4 000 000							
Resolution of actual position value:								
Single-turn encoder (STG)	20 bit							
Multi-turn encoder (MTG)	32 bit							
Resolver	12 bit							
Possible connections direct position measuring system	Incremental encoder with factor 4, $f_{limit} = 1$ MHz Sine encoder with EXE and factor 20, $f_{limit} = 50$ kHz Sine/cosine encoder with interpolation factor 4096, $f_{limit} = 800$ kHz							
Power demand from 24 V power supply module [A]	0.89		0.89		0.89		1.03	
Max. power loss with $f_s = 4$ kHz [W]	96.5		97.3		116		149	
Mass [kg]	6.0							
Module width [mm]	50							

1) Operation with $\vartheta_U = 45^\circ\text{C}$ and $\vartheta_K = 60^\circ\text{C}$, high overload possible
 2) Operation with $\vartheta_U = 45^\circ\text{C}$ and $\vartheta_K = 80^\circ\text{C}$, high continuous load possible
 f_s = switching frequency; ϑ_U = ambient temperature;
 ϑ_K = heat sink temperature;
 * for transition current values, cf. page 4-10

Three-phase modules DM...A,B,D for backplane module

Module type	DM..4A		DM..8A		DM..15A		DM..30A		DM..45A		DM..85 B		DM..140D	
Heat sink temperature for transition current values*	60°C ¹⁾	80°C ²⁾	60°C ¹⁾	80°C ²⁾	60°C ¹⁾	80°C ²⁾	60°C ¹⁾	80°C ²⁾	60°C ¹⁾	80°C ²⁾	60°C ¹⁾	80°C ²⁾	60°C ¹⁾	80°C ²⁾
D.C. link voltage	670 VDC, regulated													
$f_s = 2$ kHz														
Rated current [A _{rms}]	3.3	5.6	3.3	6.8	7.4	15	11	21	12	27	27	55	50	101
Maximum current [A _{rms}]	5.6	5.6	11	11	18	17	35	30	53	43	98	74	141	118
$f_s = 4$ kHz														
Rated current [A _{rms}]	2.7	5.6	2.7	5.7	6.1	13	8.9	18	10	23	22	47	42	87
Maximum current [A _{rms}]	5.6	5.6	11	11	18	14	35	28	51	39	86	64	141	106
$f_s = 8$ kHz (ab Werk)														
Rated current [A _{rms}]	1.7	3.3	1.7	3.3	3.7	8.5	5.1	12	6.1	15	12	31	25	60
Maximum current [A _{rms}]	5.6	5.6	11	9.6	14	9.6	32	23	44	31	63	44	117	84
Speed range	1 : 4 000 000													
Resolution of actual position value:														
Single-turn encoder (STG)	20 bit													
Multi-turn encoder (MTG)	32 bit													
Resolver	12 bit													
Possible connections direct position measuring system	Incremental encoder with factor 4, $f_{limit} = 1$ MHz Sine encoder with EXE and factor 20, $f_{limit} = 50$ kHz Sine/cosine encoder with interpolation factor 4096, $f_{limit} = 800$ kHz													
Power demand from 24 V power supply module [A]	1.0	1.14		1.14		1.23		1.32		1.35		1.58		
Max. power loss with $f_s = 4$ kHz [W]	94.3	97.7		185		188		238		453		855		
Mass [kg]	7.3										11.5		19.3	
Module width [mm]	50										100		200	
Backplane modules														
Type	RMA/DM8				RMA/DM 30				RMA/DM 45		RMB/DM		RMD/DM	
Number of fans	--				1				2		2		2	
in cold-module technique	RMA/DMC										RMB/DMC		RMD/DMC	

1) Operation with $\vartheta_U = 45^\circ\text{C}$ and $\vartheta_K = 60^\circ\text{C}$, high overload possible

2) Operation with $\vartheta_U = 45^\circ\text{C}$ and $\vartheta_K = 80^\circ\text{C}$, high continuous load possible

f_s = switching frequency; ϑ_U = ambient temperature; ϑ_K = heat sink temperature

* Transition current values

Depending on the heat sink and ambient temperature, the module automatically limits the **maximum current** to the thermal limit of the power semiconductor.

The maximum admissible current is available at an ambient temperature of 45°C and a heat sink temperature of 60°C .

The maximum admissible **rated current** is available at the thermal limit of the heat sink of 80 °C with respect to an ambient temperature of 45 °C. The maximum current is reduced for protecting the power semiconductor. There is a smooth transition between the transition current values for $\vartheta_K = 60^\circ\text{C}$ and 80°C .

4.6 Plug braking

Synchronous motors type SF, SR can be braked immediately using the plug braking option if the motors cannot be actively braked due to an operating voltage or control failure.

For each motor, one plug braking module is used.

Motor type	Resistance R_x [Ohm]	Minimum energy in short-time operation [Ws]	Order no.
SF(R)- -A2	1.0	785	1070 914 767
SF(R)- -A3.030 SF(R)- -A3.0042.060	5.6	261	1070 913 546
SF(R)- -A3.0068.060 SF(R)- -A3.0093.060	3.3	785	1070 913 547
SF(R)- -A4.030	1.0	785	1070 914 767
SF(R)- -A4.0091.060 SF(R)- -A4.0125.060	3.3	785	1070 913 547
SF(R)- -A4.0172.060 SF(R)- -A4.0230.060 SF(R)- -A5.020 SF(R)- -A5.030	1.0	4085	1070 913 862

R_x (+10%)	Each module has 3 resistors. For individual resistors, refer to table above.
Conductor cross-section	Max 4 mm ²
Test voltage	2500 V AC
Ambient temperature	max. 55°C
Installation	on 35 mm top hat rail to DIN
Type of protection	IP 20

4.7 Leads

4.7.1 Motor connection leads

The following encoder and power lead designs are available for motor connection:

- made-to-measure leads with integrated connectors or
- cable by the metre, individual mating connectors including crimp contacts and the required tool

Encoder leads, with integrated connectors

Motor type	Encoder system	No of cores	Mass [kg/m]	Order no. for 5 m length
SF	ECN (Single-turn)	16 cores	0.16	1070 917 094
	EQN (Multi-turn)			
SR	Resolver	18 cores	0.18	
DU	RCN (Single-turn)	16 cores	0.16	1070 917 094
	Gear encoder	18 cores	0.18	

Other lead lengths and missing order numbers on request.

Technical data power leads:

- Outer sheath PUR 11Y (polyurethane) to DIN 0250 part 818
- Standards:
DIN VDE 0472 (e.g. oil resistance Part 803, inflammability Part 804- -Test type B)
DIN VDE 0281, 0295, 0432
- Colour grey, similar to RAL 7001, with imprinted Bosch order no.
- Bending radius at -30°C to 90°C:
fixed installation: 7 x outer diameter
flexible: 10 x outer diameter

All leads are suited to trailing cable:

- Acceleration $\leq 5 \text{ m/sec}^2$
- Speed $\leq 100 \text{ m/min}$



Note The technical data are for engineering reference only.
No responsibility is assumed for the suitability for the intended application which is to be verified by the user.

**Power leads, with integrated connectors**

Synchronous motors		Lead cross section		Mass	Inverter (cf. page 4-7)	Order no. (unshielded, with connectors, 5 m long)
Connect- or size	Type	Motor [mm ²]	Brake [mm ²]	[kg/m]		
1	SF(R)- -A2... SF(R)- -A3...030 SF(R)- -A3.0042.060 SF(R)- -A3.0068.060 SF(R)- -A4.0091.030 SF(R)- -A4.0125.030 SF(R)- -A4.0172.030	4 x 1.5	2 x 1.5	0.20	DM...K	1070 917 085
	DM...A,B,D					
1.25	SF(R)- -A3.0093.060 SF(R)- -A4.0230.030	4 x 2.5	2 x 1.5	0.27	DM...K DM...A,B,D	
	SF(R)- -A5.0250.020	4 x 1.5	2 x 1.5	0.20	DM...K DM...A,B,D	1070 917 086
	SF(R)- -A4.0091.060 SF(R)- -A4.0125.060	4 x 2.5	2 x 1.5	0.27	DM...K DM...A,B,D	1070 917 087
	SF(R)- -A5.0460.020 SF(R)- -A5.0250.030	4 x 4.0	2 x 1.5	0.29	DM...A,B,D	1070 917 088
1.5	SF(R)- -A4.0172.060 SF(R)- -A4.0230.060	4 x 6.0	2 x 1.5	0.49	DM...A,B,D	1070 917 089
	SF(R)- -A5.0700.020 SF(R)- -A5.0460.030	4 x 10	2 x 1.5	0.67	DM...A,B,D	1070 917 090
	SF(R)- -A5.0700.030	4 x 16	2 x 1.5	0.94	DM...A,B,D	

Lead cross section to EN 60 204 part 1/1993, table 5,
wiring system B2 in cable duct at ambient temperature of 40 °C.
Other lead lengths and missing order numbers on request.

4.7.2 Protective circuit for holding brake

Capacitive influences on the 24 V lead for the holding brake may cause a delay in the brake disengagement.

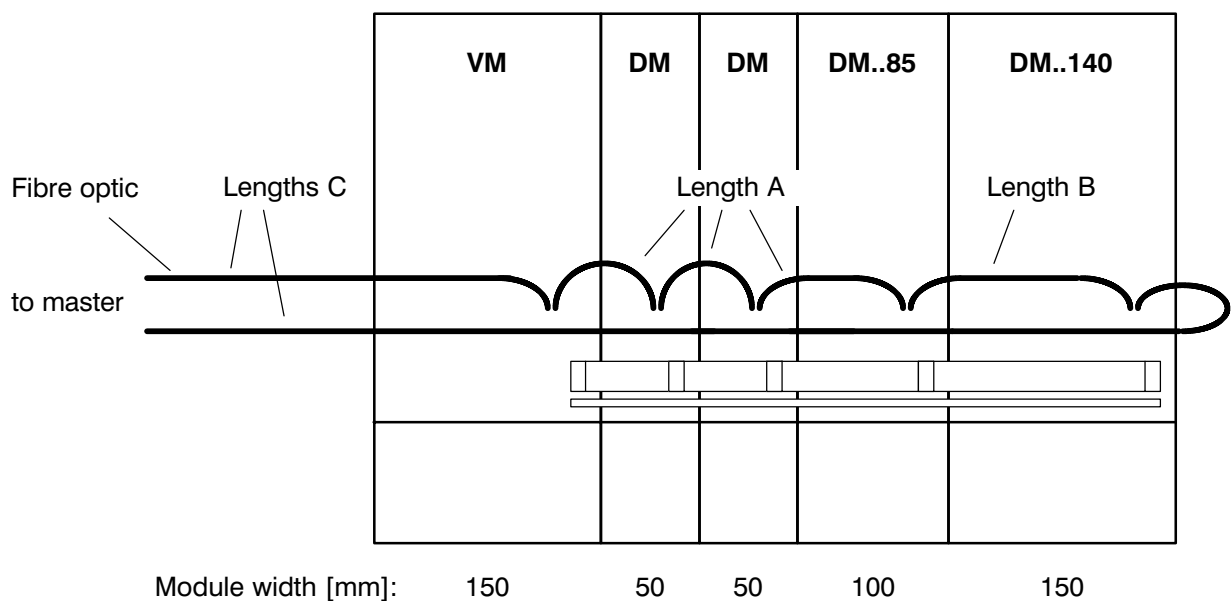
In order to avoid such interferences, please use the protective circuit (RC element) designed for this purpose:

- Protective circuit for DM..A,B,D
to be installed at the terminal strip
- Protective circuit for DM..K
with additional point- -to- -point terminal which is to be plugged onto the module.

4.7.3 Fibre optics for SERCOS interface

The fibre optics are used to interconnect all inverter modules with SERCOS interfaces and to close the circuit with a control or a PC as master.

For each three-phase module, one fibre optic is used for connecting the module to the left-hand neighbouring module. The first DM module of the set and the last DM module are connected to the master.



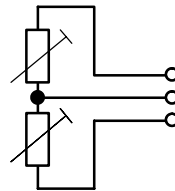
Ready line, double-ended with connectors:

Lengths		Usage	Order no. :
A	23 cm	DM 4...85 (without strain-relief clamp)	1070 917 886
B	33 cm	DM 140 (without strain-relief clamp)	1070 917 884
C	2 m	Connection to master (with strain-relief clamp)	1070 917 885
	5 m		1070 917 887

4.8 Operation of built-in motors

Conditions for operating a built-in motor:

- Two NTC resistors (2 x order no. 1070 918 643) are integrated in the winding overhangs U and V of the stator winding for temperature monitoring.



- One motor encoder specific for the installation facilities:
 - Single-turn encoder RCN 1313** with electronic rating plate, order no. 1070 918 678 (cf. section 4.8.1)
 - Gear encoder KWG2EP** with electronic rating plate, Messrs. VS- -Sensorik (cf. section 4.8.2)

Encoder type	Gear type	
	Module m	Number of teeth
KWG2EP-13K	0.3	256
KWG2EP-13G	0.3	512
KWG2EP-15K	0.5	256
KWG2EP-15K	0.5	512

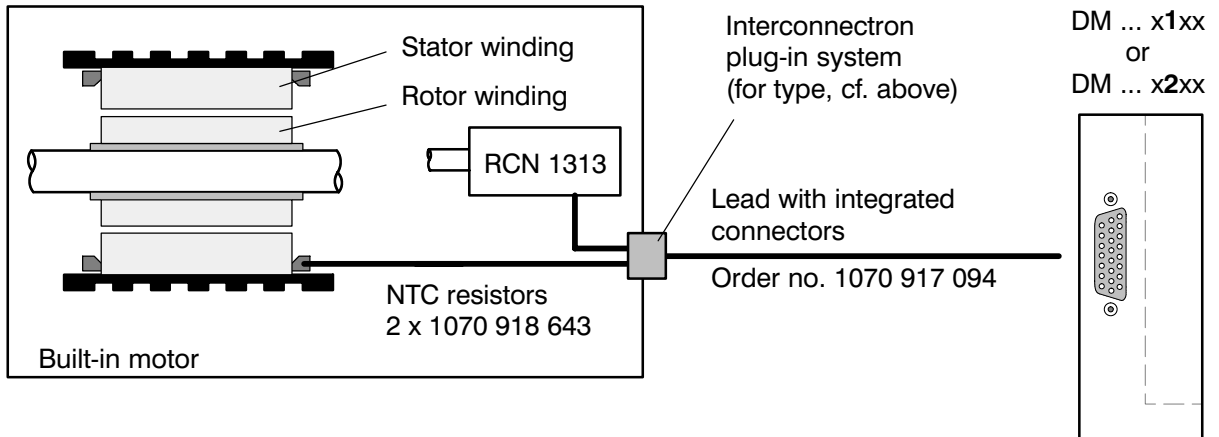
Address: VS Sensorik GmbH,
Max-Planck-Str. 3, D-85716 Unterschleißheim,
Phone: (+89) 3 10 50 16, Facsimile (+89) 3 10 33 83

- Gear encoder MiniCoder GEL244K** without electronic rating plate, Messrs. Lenord & Bauer, in connection with an electronic rating plate adaptor (cf. section 4.8.3)

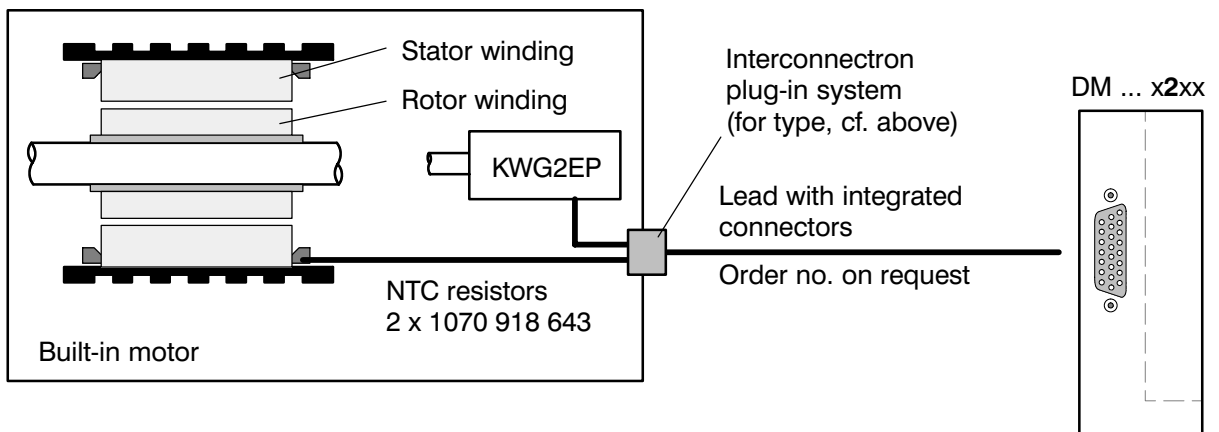
Address: Lenord & Bauer
Dohlenstr. 32, D-46145 Oberhausen
Phone: (+208) 99 63-0, Facsimile: (+208) 67 62 92

- Plug-in encoder system, Messrs. Interconnectron, Deggendorf, type:
 - SEA B 17A MR EN 000 02 (90° offset), or
 - SEF A 17A MR EN 000 03 (straight)

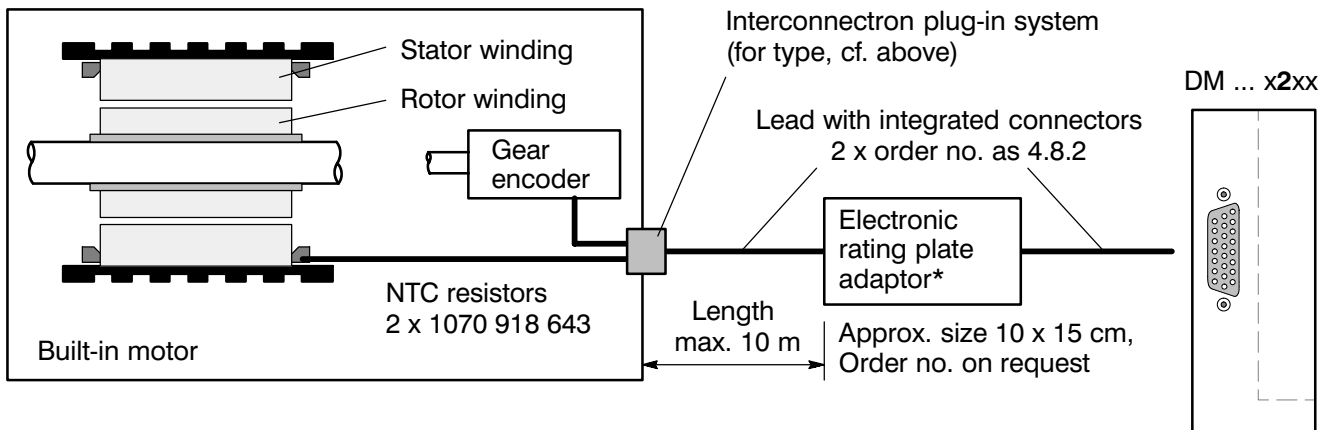
4.8.1 Built-in motor with single-turn encoder type RCN 1313 (STG)



4.8.2 Built-in motor with gear encoder type KWG2EP



4.8.3 Built-in motor with gear encoder type MiniCoder GEL 244K



* Electronic rating plate adaptor only with analog interface;
with SERCOS interface, data storage in the inverter, and
lead 1 x order no. as 4.8.2



5 Mains supply

5.1 Supply module

5.1.1 Supply module VM design

Supply modules must be designed for the required rated power. A corresponding reserve should be provided for process-related, short-time overloads.

Design for rated power

The rated power is preset by the rms rated current of the module and the rated voltage at the installation site (see Technical Data in section 5.1.2).



Note For supply voltage which deviates from 400 V a.c., observe the variant values for the rated power!

1. Calculate required rated power per axis:

Asynchronous motors with spindle characteristic curve (load at high speed):

$$P_N = \frac{P_W}{0.8}$$

P_N = Rated power
 P_W = Shaft output according to motor characteristic curve
 0.8 = total efficiency

Servo motors type SF, SR with spindle characteristic curve (load at rated speed):

$$P_W = \frac{M_N [\text{Nm}] \cdot 2\pi \cdot n_N [\text{min}^{-1}]}{60} \quad [\text{W}]$$

$$P_N = \frac{P_W}{0.8}$$

M_N = Torque at n_N according to motor characteristic curve
 n_N = Rated speed according to motor data

Servo motors type SF, SR with servo characteristic curve

$$P_W = \frac{M [\text{Nm}] \cdot 2\pi \cdot n [\text{min}^{-1}]}{60} \quad [\text{W}]$$

$$P_N = \frac{P_W}{0.8}$$

M = Torque at n according to motor characteristic curve
 n = Operating speed of application

- Rated power of supply module:

Take into account simultaneity factor $K_1 \dots K_n$ per axis. A factor of approximately 0.8 per axis can be assumed.

$$P_{NVM} = K_1 \cdot P_{Naxis1} + K_2 \cdot P_{Naxis2} + \dots + K_n \cdot P_{Naxis n}$$

- Select supply module:

The supply module must reach the calculated rated power P_{NVM} . Select the suitable supply module from the data table on page 5-5, taking into consideration the ambient temperature and the installation altitude.

In cases of heavy load it should also be checked whether the peak output made available by the supply module is sufficient.

Design for peak output

The peak output for process-related, short-time overloads is limited by the **preloading** of the power section: if, for example, the power section was preloaded with the rated rms power, no further overload is possible (peak output = rated power).



Note

For supply voltage which deviates from 400 V a.c., observe the variant values for the peak output!

- Calculate required peak output per axis:

Asynchronous motors:

$$P_{\max} = \sqrt{3} \cdot I_{\max} \cdot U_N \cdot 0.9$$

P_{\max} = Peak output

I_{\max} = Maximum current of module according to section 4.4.1

U_N = Motor voltage
(DU motors: $U_N = 415$ V)

0.9 = $\cos \phi$

**Servo motors:**

$$P_{\max} = \frac{M_{\max} [\text{Nm}] \cdot 2\pi \cdot n [\text{min}^{-1}]}{60 \cdot 0.8} \quad [\text{W}]$$

M_{\max} = Max. torque with n_0
according to motor characteristic curve

n = Operating speed of application

0.8 = Total efficiency

2. Establish peak output of supply module:

When specifying the required peak output of the supply module, it is vital that the actual simultaneity factor is $K_1 \dots K_n$ is taken into account. This is because a simultaneous occurrence of the peak outputs of all axes can generally be avoided through appropriate programming of the movement sequence.

However, if the supply module should reach its peak output, an overload can be avoided through a programmable reduction of the current limit in the axes.

$$P_{\max\text{VM}} = K_1 \cdot P_{\max\text{axis}1} + K_2 \cdot P_{\max\text{axis}2} + \dots + K_n \cdot P_{\max\text{axis}n}$$

**Note**

The simultaneity factors must be known before the peak output can be calculated.

		VM...K with ballast switch		VM...B,C,D with mains- friendly energy recovery			
Module type	Unit	VM..20K		VM..35B	VM..70C	VM..90D	
Connection voltage	V AC	3 x 380 ... 415 ± 10%, 48 ... 62 Hz					
Rated voltage	V AC	400, 50 Hz					
D.c. link voltage	V DC	670, regulated					
Rated current I _N (d.c. link) with $\vartheta_U = 45^\circ\text{C}$	A	23		34	66	80	
Rated power P _N with $\vartheta_U = 45^\circ\text{C}$	kW	16		24	47	57	
Peak output	kW	20		34.6	70	97	
Ballast switch		internal	external	-	-	-	
Max. one- time braking energy	Ws	6500	58000	-	-	-	
Max. continuous braking power	W	400	1000	-	-	-	
Power demand from 24 V power supply	A	24 V DC according to EN 61 131					
		1.0		2.3	2.7	3.1	
Max. power loss	W	220		460	800	970	
Mass	kg	15.0		11.1	14.3		
Module width	mm	100			150	200	
Backplane modules Type		not necessary		RMB/VM	RMC/VM	RMD/VM	
in cold- module technique		-		RMB/VMC	RMC/VMC	RMD/VMC	
Personality module PM		-		PM VM			
Power supply module NA		(optional)		NA..35	NA..70	NA..90	
Rated power with $\vartheta_U = 45^\circ\text{C}$	kW	-		24	47	62	
Line reactor NE		not necessary		NE 35	NE70	NE70/1	2 x NE 70
Rated power with $\vartheta_U = 45^\circ\text{C}$	kW	-		24	41.7	47	62
Max. power loss	W	-		150	200	210	300

 ϑ_U = ambient temperature

5.1.3 24 V power supply

The supply module must be supplied by an external 24V d.c. load power supply module in accordance with EN 61 131 (mean value 20.4 -- 28.8 V).

5.1

CAUTION!

**The 24V d.c. must conform to the requirements of 'safety separation'.
 It is particularly important that the requirements of overvoltage category III are observed.**

- The supply module provides the logic and driver supply of the inverter module and the ventilation of the backplane modules via module cross connection X820.
- The 24V is supplied to the module outputs at the inverter modules through appropriate wiring from the VM.

A maximum of 14A can be looped through from the 24 V supply of the VM, i.e. the number of three-phase modules is limited by the 24V current input.

Module type	Backplane module	24 V current input
VM..20K	--	1.0 A
VM..35B	RMB/VM	2.3 A
VM..70C	RMC/VM	2.7 A
VM..90D	RMD/VM	3.1 A
DM..4K	--	0.89 A
DM..8K	--	0.89 A
DM..15K	--	0.89 A
DM..30K	--	1.03 A
DM..4A	RMA/DM8	1.0 A
DM..8A	RMA/DM8	1.14 A
DM..15A	RMA/DM30	1.14 A
DM..30A	RMA/DM30	1.23 A
DM..45A	RMA/DM45	1.32 A
DM..85B	RMB/DM	1.35 A
DM..140D	RMD/DM	1.58 A
Total of one drive set		max. 14 A



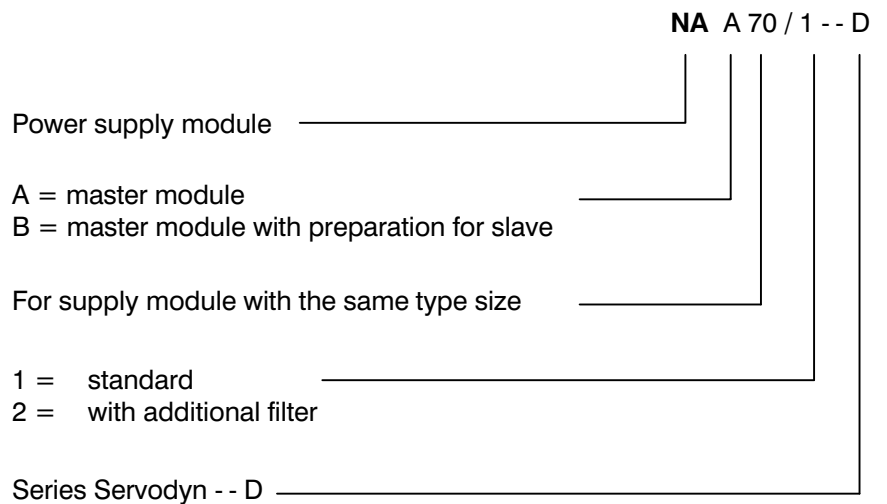
5.2 Line connection

- A **VM with energy recovery** is connected to the supplying mains via a power supply module NA and a line reactor NE.
- A **VM with internal/external ballast switch** is connected to the supplying mains via a mains contactor and a fused switch disconnector.
The line wiring module NV may be used alternatively.

5.2.1 Power supply module NA

The power supply module is selected according to the type size of the supply module with energy recovery and is available in the following variants:

- **Standard range** **NA ...1--D**
- **With additional filter** **NA ...2--D**
A power supply module with additional filter is only needed in connection with an external mains filter if the interference limits in the mains supply cable must be complied with, in accordance with postal provision 46/92.



Module type	Unit	NA A35...-D	NA A70...-D	NA A90...-D
for supply module		VM..35B	VM..70C	VM..90D
Connection voltage	V AC	3 x 380...415 ± 10%		
Rated voltage	V AC	400		
System frequency	Hz	48...62		
Rated power with $\vartheta_U = 45^\circ\text{C}$	kW	34.6	62	62
Fused switch disconnector GR00		Jean Müller M00üf01, high-speed		
		63 A/660 V	100 A/660 V	125 A/660 V
Power contactor		Integrated		
Charging connection		Integrated		
Electronic functioning		Transforming of synchronisation voltage, coding		
Cooling		Natural convection		
Mass	kg	8.4	8.4	8.4

ϑ_U = ambient temperature

**5.2.2 Line wiring module NV (option)**

The NV is selected with internal/external ballast switch depending on the type size of the supply module. The NV module is available in different designs and can be used for one or two VM's or as a special design.

NV 20 / 1 F -- D

Line wiring module

For supply module with the same type size

1 = for 1 VM 20 K

3 and more: special designs

F = with mains filter

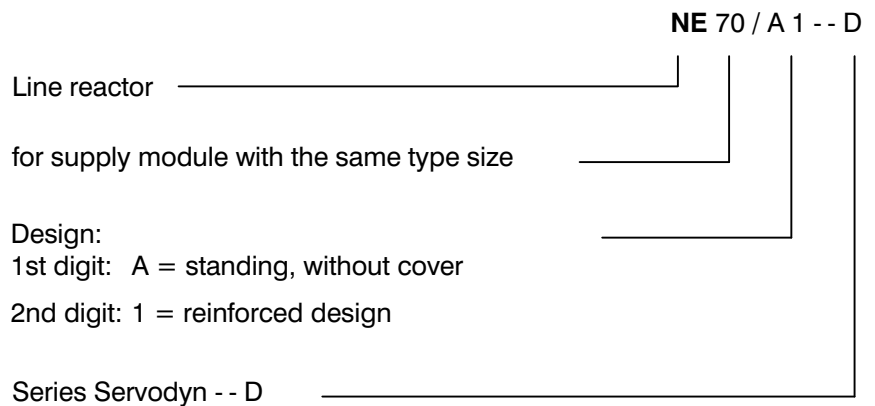
Series Servodyn -- D

Module type	Unit	NV 20/1F --D	NV 20/3F --D
for supply module		1 x VM 20K	2 x VM 20K
Connection voltage	V AC	3 x 380...415 ± 10%	
Rated voltage	V AC	400	
System frequency	Hz	48...62	
Rated power with $\vartheta_U = 45^\circ\text{C}$	kW	24	24
Fused switch disconnector GR00		Jean Müller M00üf2, high-speed	
		35 A/660 V	35 A/660 V
Power contactor		Integrated	
Mains filter		Integrated	
Cooling		Natural convection	
Mass	kg		

ϑ_U = ambient temperature

5.2.3 Line reactor NE

The line reactor type NE is installed between the power supply module and the supply module with energy recovery. It decouples the d.c. link from the mains power supply.



Type	Unit	NE 35/A	NE 70/A	NE 70/A1	2 x NE 70/A*
for supply module		VM..35B	VM..70C		VM..90D
Connection voltage	V AC	3 x 380...415 ± 10%			
Rated voltage	V AC	400			
System frequency	Hz	48...62			
Rated power with $\vartheta_U = 45^\circ\text{C}$	kW	24	41.7	47	62
Inductance	mH	10	0.7	0.7	2 x 0.7
Max. power loss	W	150	200	210	300
2 connecting leads	m	length 1 m each			
Mass	kg	15	23	25	2 x 23

ϑ_U = ambient temperature

* For VM..90D, two NE 70/A must be connected as shown in the circuit diagram on page 4-5.

5.2.4 External mains filter

A mains filter in the mains supply cable must be provided so that limit classes A/B for interference can be complied with in accordance with DIN VDE 0875 (EN 55 011, EN 55 014). A power supply module with additional filter must be employed if postal provision 46/92 is also to be complied with. The filter size must correspond to the supply module output.



6 Accessories, options

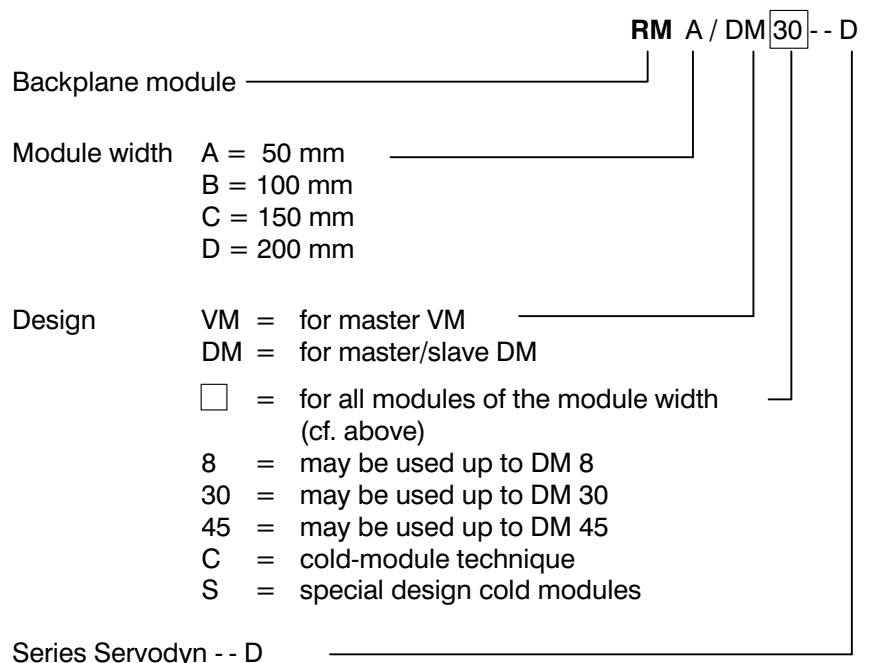
6.1 Backplane modules RM

Backplane modules are necessary for supply modules type VM...B,C,D and for three-phase modules type DM...A,B,D.

They are selected according to the DM module used and according to the module width:

Inverter modules	Backplane modules		Design Number of fans (standard design)	Width
	Standard	Cold module		
VM..35B	RMB/VM	RMB/VMC	1	100 mm
VM..70C	RMC/VM	RMC/VMC	2	150 mm
VM..90D	RMD/VM	RMD/VMC	2	200 mm
DM..4A DM..8A	RMA/DM8	RMA/DMC	--	50 mm
DM..15A DM..30A	RMA/DM30		1	
DM..45A	RMA/DM45		2	
DM..85B	RMB/DM	RMB/DMC	2	100 mm
DM..140D	RMD/DM	RMD/DMC		200 mm

Type designation



Cold module assembly

For cold module assembly, the inverter modules are installed so that the heat sinks protrude through the mounting plate and thus from the switch cabinet.

Cold module assembly guarantees almost complete heat loss outside of the switch cabinet. This means that the temperature inside the switch cabinet remains within permissible limits even without additional ventilation or cooling measures.

Special design

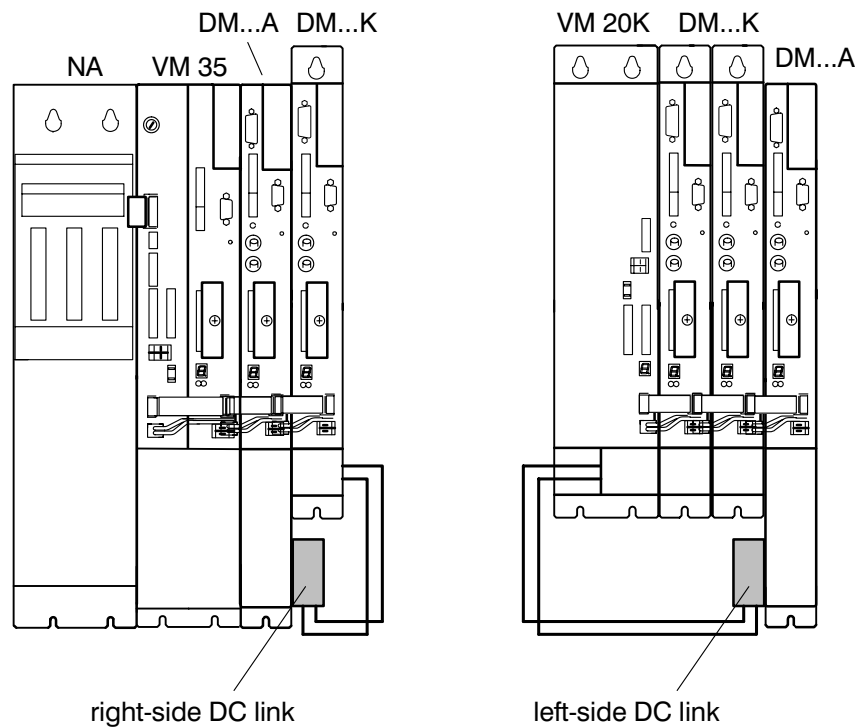
The cold module special design includes an assembly kit without seal to the switch cabinet interior space. Therefore, it can only be used if a closed ventilation duct is available outside the switch cabinet for cooling the modules.

6.2 D.C. link connection

The d.c. link connection (DC link) makes available an externally accessible d.c. link terminal, via which the d.c. link can be flexibly extended. Two versions are available, for left-side and right-side mounting on the backplane modules terminal block.

Module combination

For combining modules with compact mechanics and backplane modules, the d.c. link connection is exclusively made via the d.c. link connection option.



Two-row module arrangement

Using the d.c. link connection option, **DM..A,B,D** with backplane module can be operated in two rows on top of each other at one d.c. link. **DM...K** can also be extended directly with a flexible lead without d.c. link. In this case, two additional side panels must be ordered as protection against accidental contact at both ends of the second module row for covering the d.c. link.

For extending the signal cross-link X810, a lead with integrated connectors with a length of 200 mm is available.

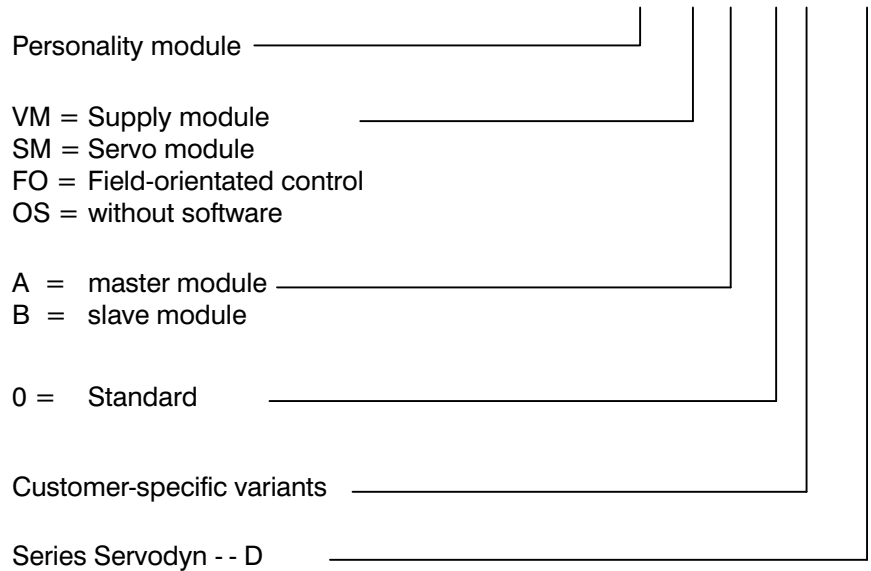
6.3 Personality module

For the following inverter modules, a separate personality module must be ordered and plugged into the inverter:

Inverter module	Personality module	Used for
VM...B,C,D	PM VMA..- -D	▶ supply module
DM...K and DM...A,B,C with SERCOS interface	PM SMA..- -D	▶ synchronous motor SF
	PM FOA..- -D	▶ asynchronous motor DU or ▶ synchronous motor SF without field-weakening range, but with full spindle functionality

Type designation

PM VM A / 0 00 -- D





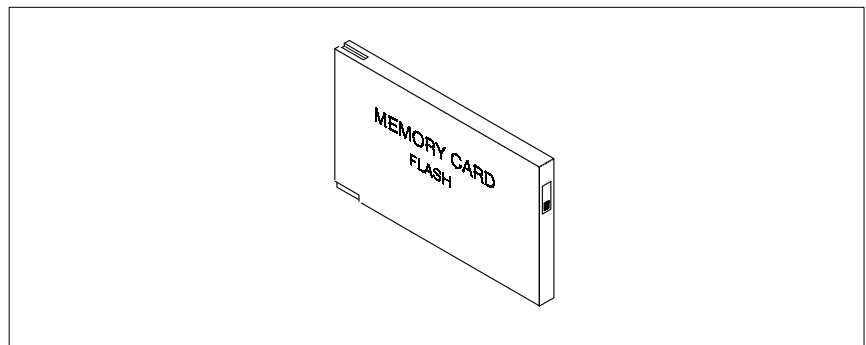
6.4 Memory card

The Memory card is a storage medium that may be used, e.g., for software updates. It is suitable for:

- supply modules with energy recovery type VM...B,C,D
- DM...K and DM...A,B,C with SERCOS interface

The following Memory cards containing the complete software and factory-set parameters are available:

- VM for supply modules
- SM with Servo functionality
- FO with spindle functionality
- OS without software



MC VM x.xx A 00

Memory Card

VM = Supply module

SM = Servo module

FO = Field-orientated control

OS = without software

Software version

A = Standard

Customer-specific variants

6.5 Commissioning and service system DSS-D

The DSS is a program for commissioning, diagnostics and services of the three-phase modules:

- for DM with analog interface **necessary**
- for DM with SERCOS interface **optional**, because commissioning is also possible via the SERCOS interface master.

The following functions are included in the DSS- -S:

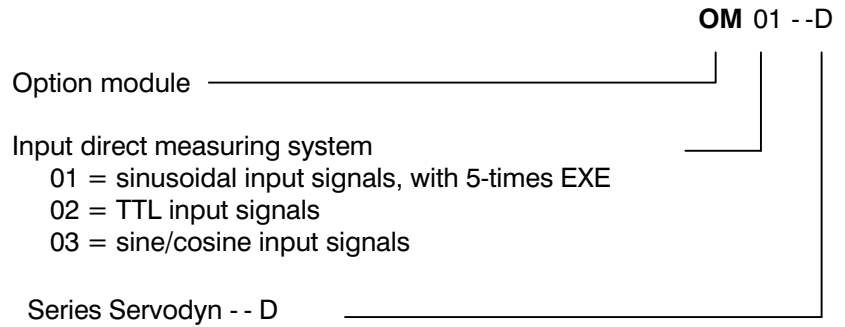
- Drive parameter setting
- Parameter archivation
- Software-Download
- Operating data display
- Status and diagnostics information display
- Setpoint value generator
- Oscillography
- Master with start- -up and enable/disable function

Conditions for using the DSS- -D:

- IBM-compatible PC with free COM interface
- Windows version 3.1 (3.11) or higher
- 4MB RAM
- 10MB fixed disk memory available

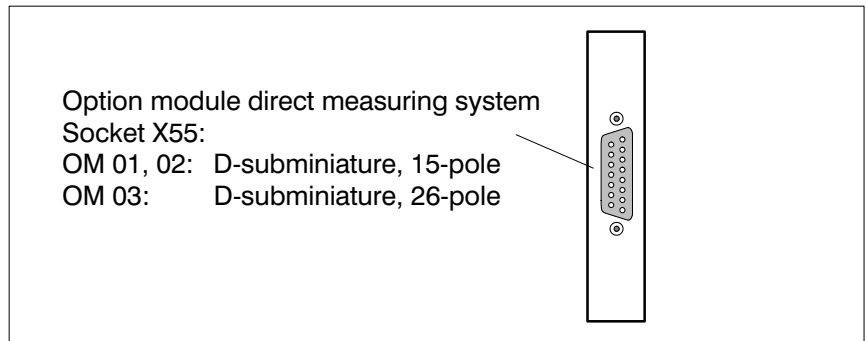


6.6 Option modules direct measuring system



The following direct positional measuring systems can be connected to the DM modules via the option module 'Direct Measuring System'.

- Incremental measuring systems with sinusoidal current signals
- Digital incremental measuring systems
- Incremental measuring systems with distance-coded signals



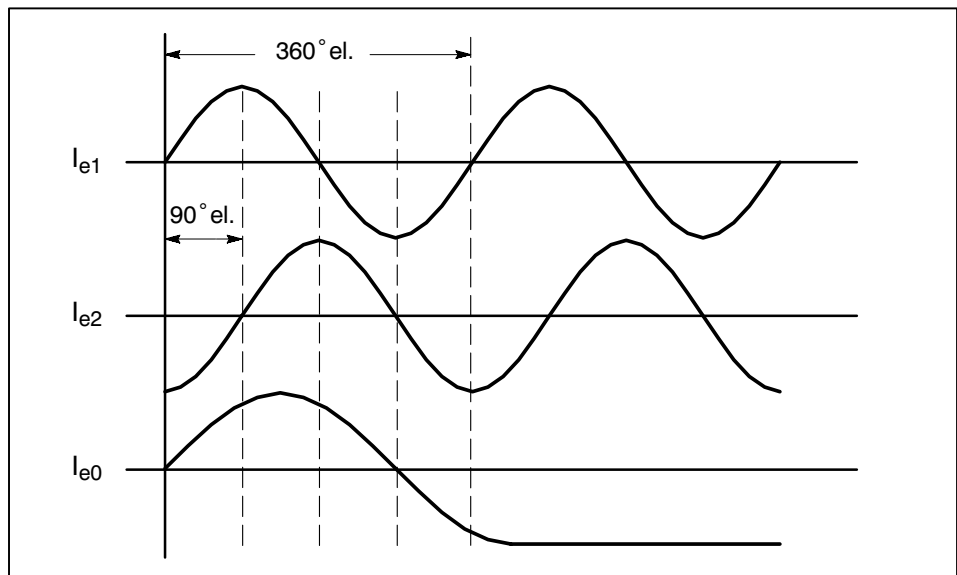
6.6.1 OM 01--D for incremental measuring systems with sinusoidal current signals

Option module with integrated **EXE with 5-times interpolation**. Encoders with sinusoidal output signals (Heidenhain quasi-standard $11 \mu A_{pp}$) can be connected to the inputs.

Technical data

- Input for measuring system with +5 V power supply and sinusoidal current signals $7...16 \mu A_{pp}$
- Signal input: Difference amplifier
- Power supply: +5 V +1%/- -5%
- max. permissible power input of the measuring system: $\leq 300 \text{ mA}$
- EXE separation factor: 5-times interpolation
- Pulse multiplication: programmable x1, x2, x4
- max. input frequency $\leq 50 \text{ kHz}$
- Measuring system monitoring: Response to input signals in channels I_{e1} or $I_{e2} \leq 4.3 \mu A$
- max. cable length: $\leq 20 \text{ m}$, or shorter if required by manufacturer
- Pin assignment see manual "Interface Conditions"

Signal diagram for measuring system with sinusoidal current signals



**Permissible measuring systems**

In principle, Heidenhain measuring systems can be connected subject to the following conditions:

- Measuring system for 5 V power supply from option module
- Sinusoidal current signals 7...16 μA_{pp}
- Power input $\leq 300 \text{ mA}$
- Max. Output frequency 50 kHz

Recommended types

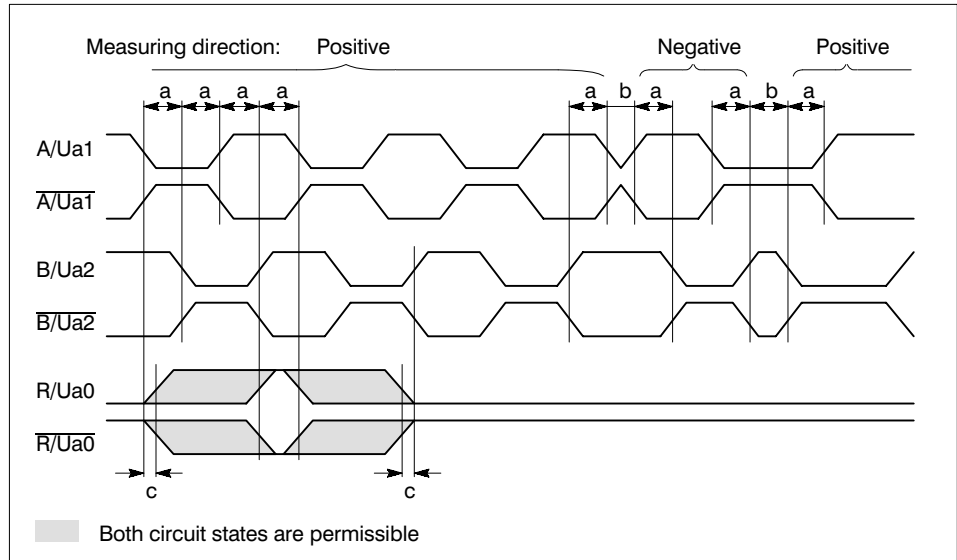
Owing to frequent modifications and the increasing range of types, the following list is intended as a guide only.
Other measuring systems are available on request.

- Angular position measuring systems**
 - RON 255, RON 705, RON 706, ROD 250, ROD 700
- Linear measuring systems**
 - LS103, LS107, LS405, LS406, LS704

6.6.2 OM 02- -D for digital incremental measuring systems**Technical data**

- Input for measuring system with +5 V power supply and square-wave signal output with line driver to RS422
- Signal input: Differential signal amplifier, $R_i \approx 120 \Omega$
- Power supply: +5 V $\pm 3 \%$, regulated via sensor leads
- max. permissible power input of the measuring system: $\leq 300 \text{ mA}$
- Pulse multiplication: programmable x1, x2, x4
- max. input frequency $\leq 1 \text{ MHz}$
- min. flank clearance a between active counting pulses $\geq 150 \text{ ns}$
- min. flank clearance b with spindle reverse: $\geq 0 \text{ ns}$
- min. safety clearance c for reference signal: $\geq 100 \text{ ns}$
- Measuring system monitoring: a) for cophasal state of channels UA1, UA2 or UA0 $\geq 1.2 \mu\text{s}$
b) Evaluation of $\overline{\text{UAS}}$
- max. cable length $\leq 50 \text{ m}$, or shorter if required by manufacturer
- Pin assignment see manual "Interface Conditions"

Signal diagram for digital measuring system



Permissible measuring systems

In principle, Heidenhain measuring systems can be connected subject to the following conditions:

- Measuring system for 5 V power supply from option module
- Square-wave signal output
- Line driver to RS 422
- Power input ≤ 300 mA
- Min. flank clearance between active counting pulses ≥ 150 ns

Permissible pulse shape electronics (EXE)

Heidenhain EXEs can also be connected subject to the following conditions:

- Power supply: 5 V from option module or 230 V a.c. external
- Square-wave signal output
- Line driver to RS 422
- Max. power input for measuring system **and** EXE with 5V supply: ≤ 300 mA
- Min. flank clearance between active counting pulses ≥ 150 ns

Recommended types

Owing to frequent modifications and the increasing range of types, the following list is intended as a guide only.

Other measuring systems are available on request.

Angular position measuring systems

- Angular position measuring systems for direct connection: RON 275, ROD 271



- Angular position measuring systems via pulse shape electronics EXE 602E, EXE 604C (+5 V):
RON 255, RON 705, RON 706, ROD 250, ROD 700
- Angular position measuring systems via pulse shape electronics (230 V):
see Heidenhain recommendations

□ **Linear measuring systems**

- Linear measuring systems for direct connection:
LS323, LS623
- Linear measuring systems via pulse shape electronics EXE602E, EXE604C (+5 V):
LS103, LS107, LS405, LS406, LS704
- Linear measuring systems via pulse shape electronics (230 V):
see Heidenhain recommendations

□ **Pulse shape electronics (EXE)**

- With 5 V supply from option module:
EXE602E, EXE604C
- With external 230 V supply:
EXE702, EXE816



Note **Measuring systems and EXEs must be combined in accordance with the manufacturers' instructions.**
Measuring systems and EXEs with internal monitoring are preferred.

6.6.3 OM 03- -D for incremental and distance-coded measuring systems

The OM 03 option module provides for the connection of direct measuring systems with 1 V_{pp} signals and additionally supports measuring systems with an EnDat or I²C interface.

Technical data

- Interpolation resolution 12 bit
- Signal input: Differential signal amplifier, R_i ≈ 120 Ω
- Power supply: +5 V ±3 %, regulated via sensor leads
- max. permissible power input of the measuring system: ≤ 300 mA
- max. input frequency: ≤ 500 kHz
- Measuring system monitoring: UA and UB ≥ 0.2 V_{pp}
- Serial interface: Line driver and receiver according to RS 422/485
- Transmission rate: EnDat: approx. 500 kBaud
I²C: approx. 80 kBaud
- max. cable length: ≤ 100 m
- Pin assignment see manual "Interface Conditions"

Permissible measuring systems

In principle, different measuring systems can be connected to the OM 03 e.g.:

- High- -resolution rotary encoder with EnDat interface
- Linear scales with EnDat interface
- Gear encoders with I²C interface

All measuring systems must meet the following interface requirements:

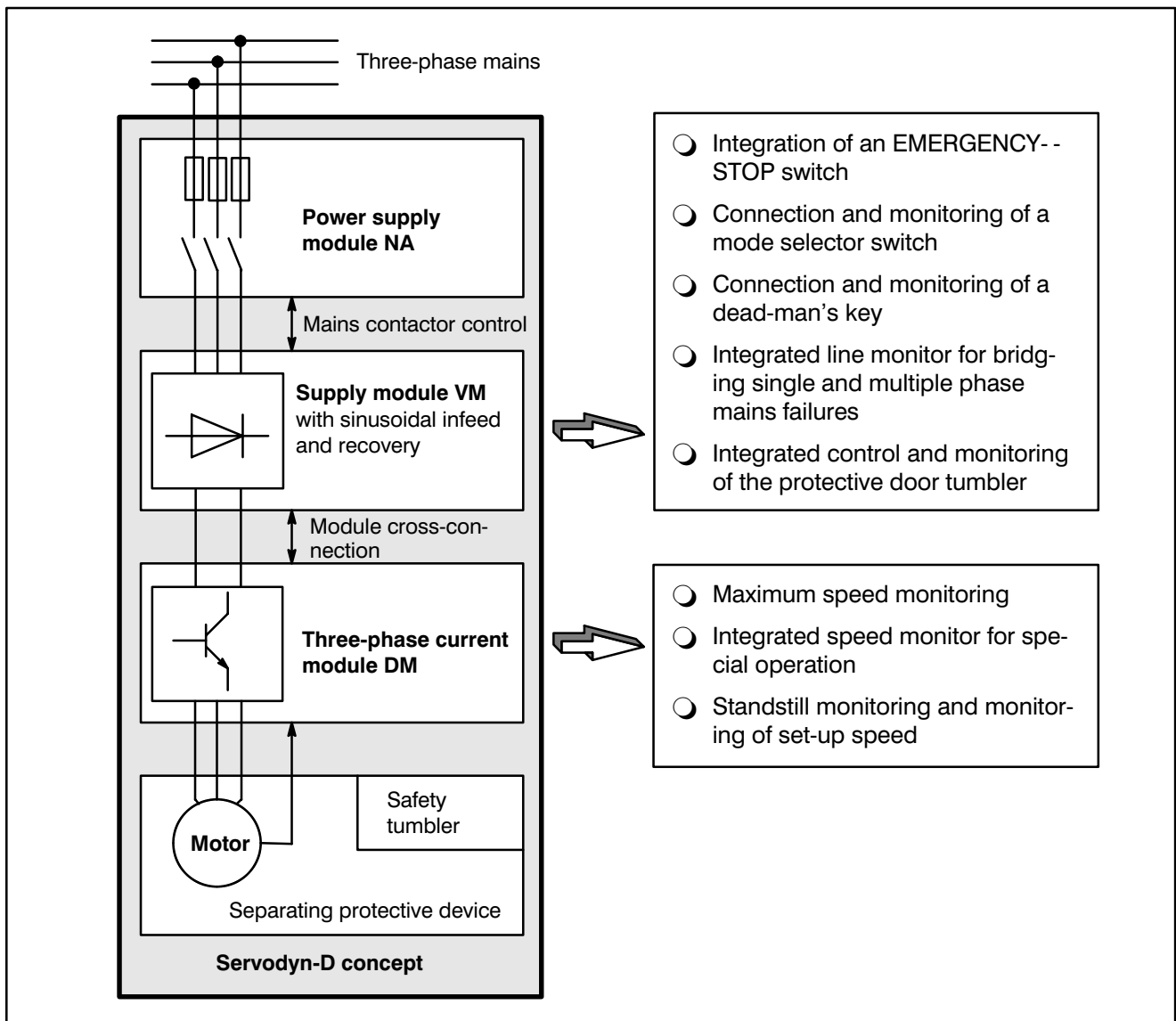
- Measuring system for 5 V power supply from option module
- Incremental signals 1 V_{pp}
- Power input ≤ 300 mA
- Signal frequency ≤ 500 kHz
- Line length ≤ 100 m
- EnDat or I²C interface
Line driver and receiver according to RS 422/485
- Dual code for EnDat interface

6.7 Redundant safety monitoring RSU (under preparation)

The integrated redundant 2-channel safety structure monitors and limits all axis movements and torques of the motors. It is available:

- for axis modules with SERCOS interface
- in connection with supply modules capable of energy recovery, and
- power supply module

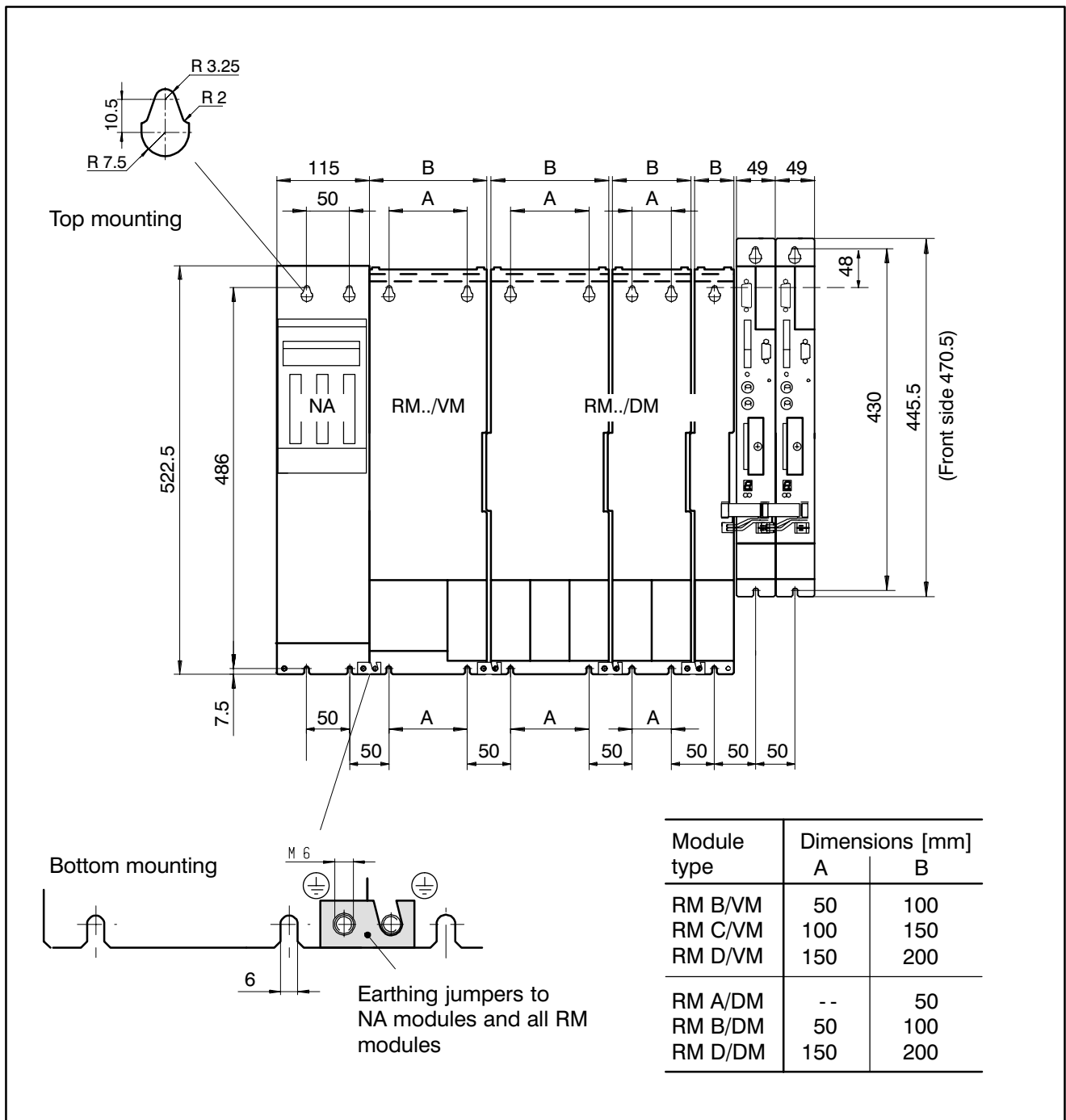
This concept was coordinated with a technical supervisory board so that additional monitoring facilities are not necessary.



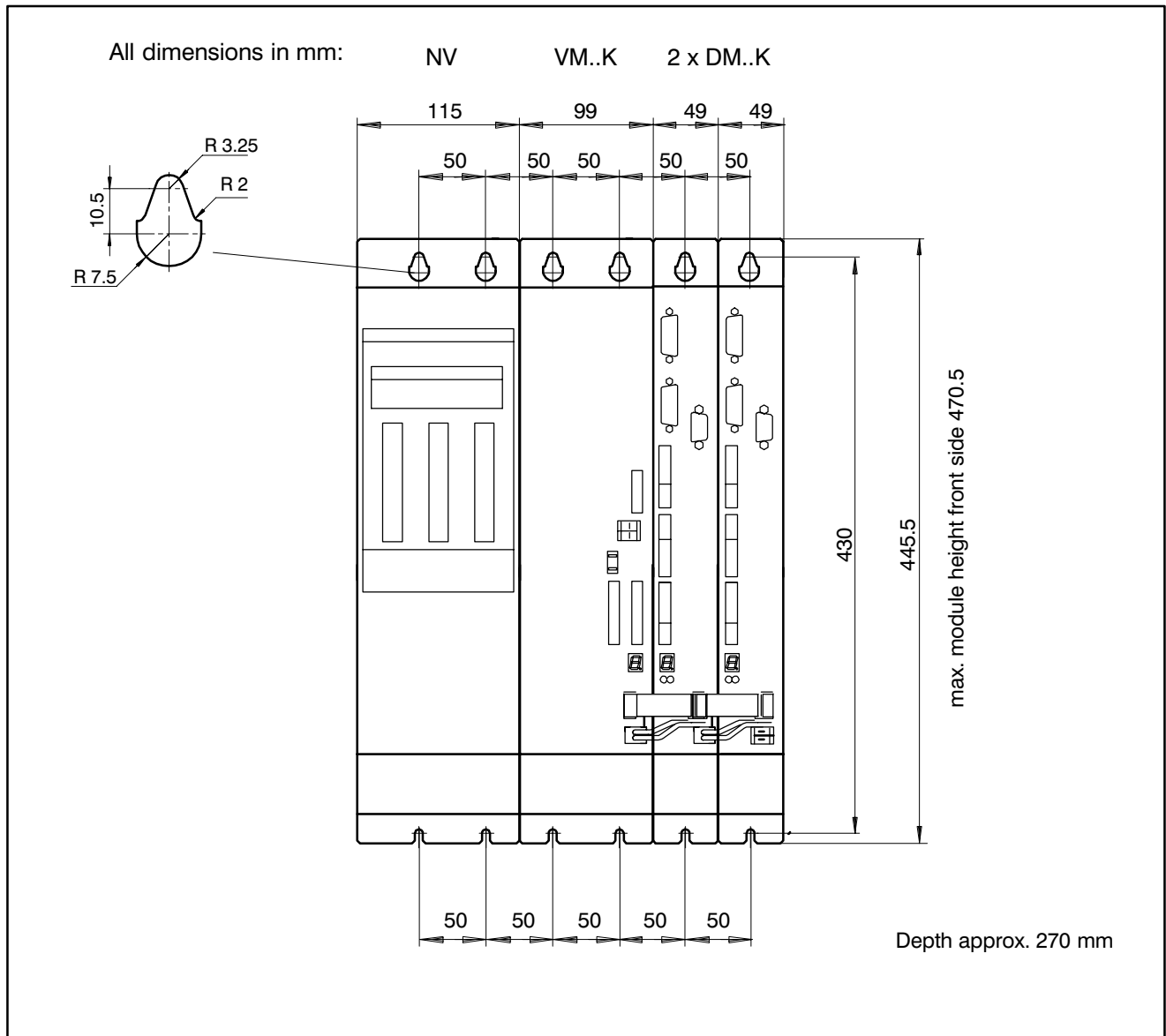
Your notes :

7 Dimensioned drawings

7.1 Dimensioned drawing for switch cabinet installation

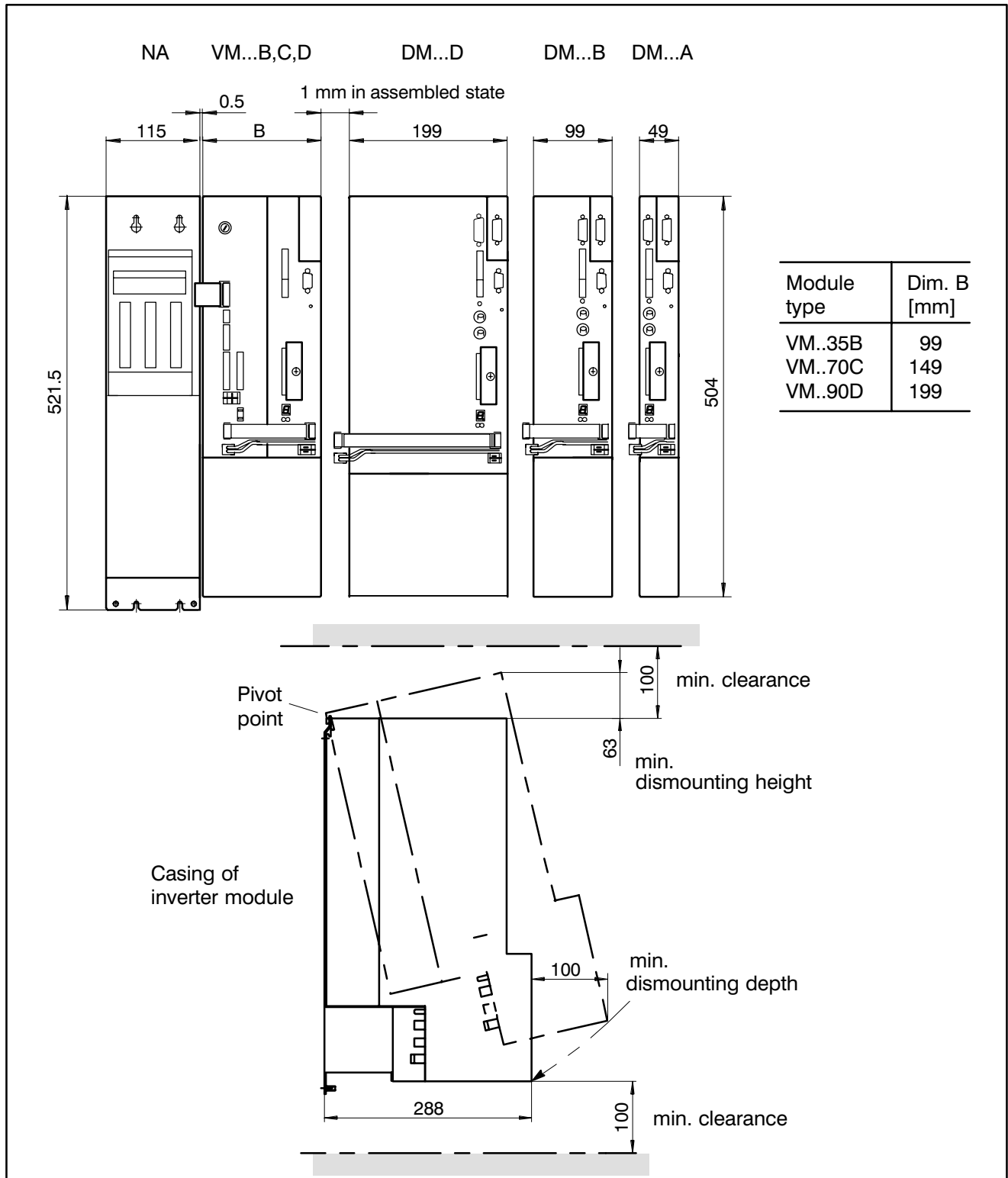


**7.2 Dimensioned drawing, line wiring module NV,
supply module VM..K, three-phase modules DM..K**

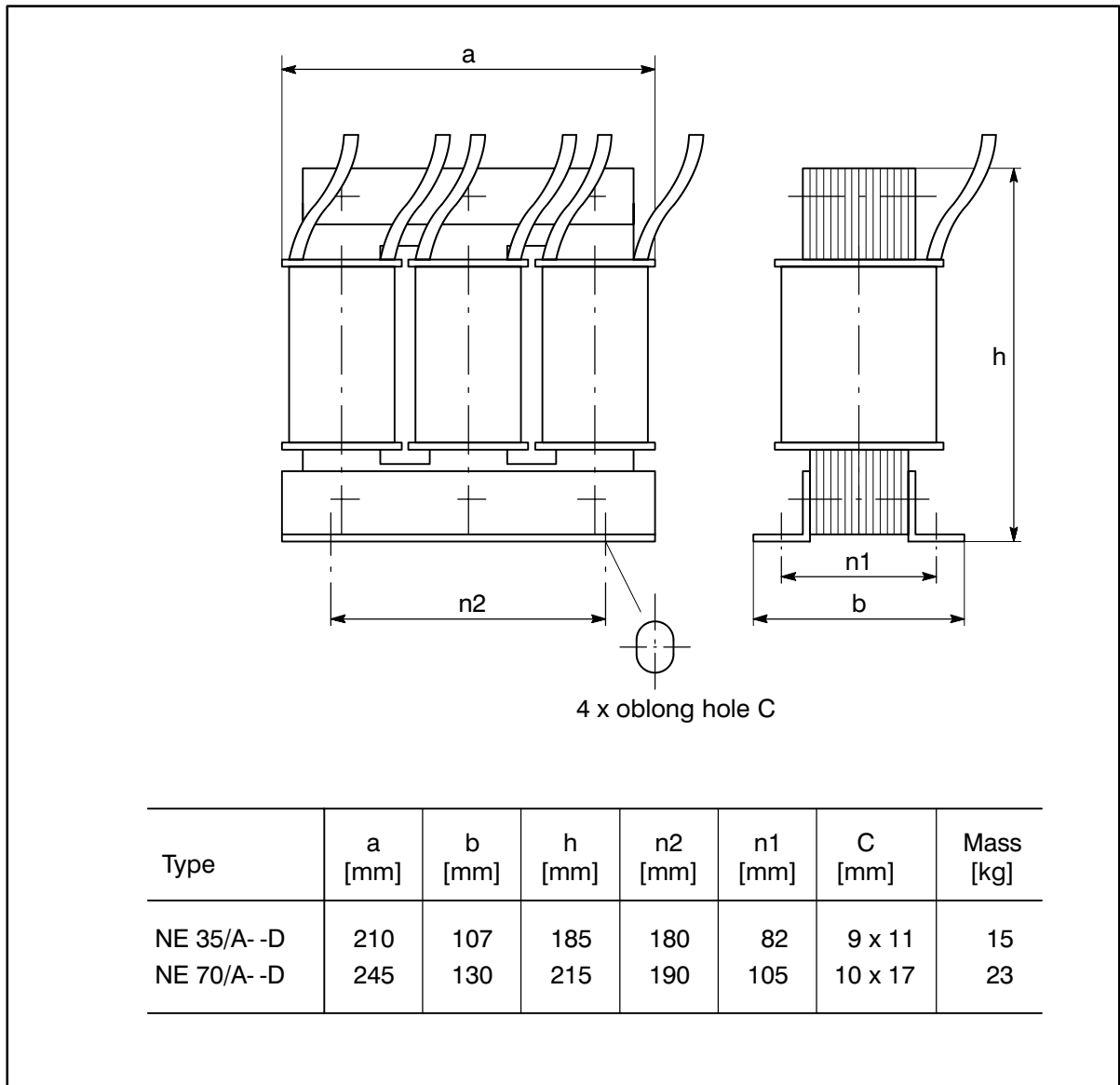


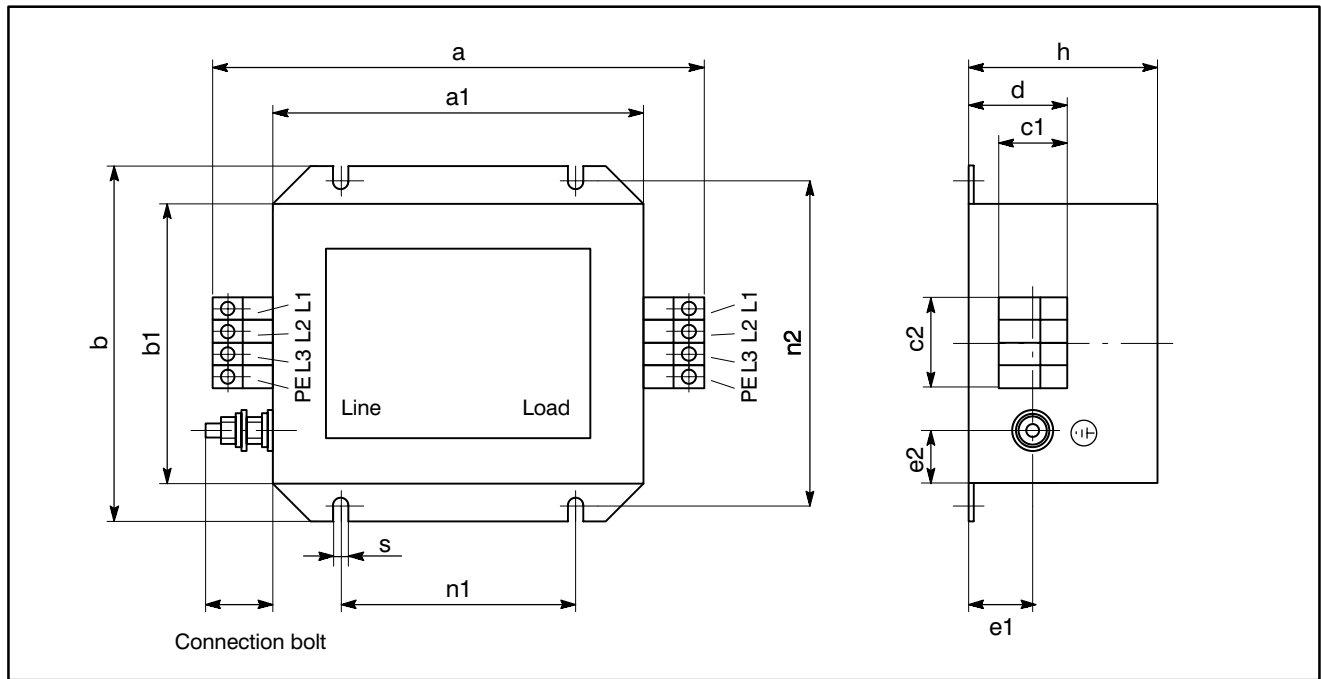


**7.3 Dimensioned drawing, power supply module NA,
supply modules VM..B,C,D, three-phase modules DM..A,B,D**



7.4 Dimensioned drawing, line reactor NE

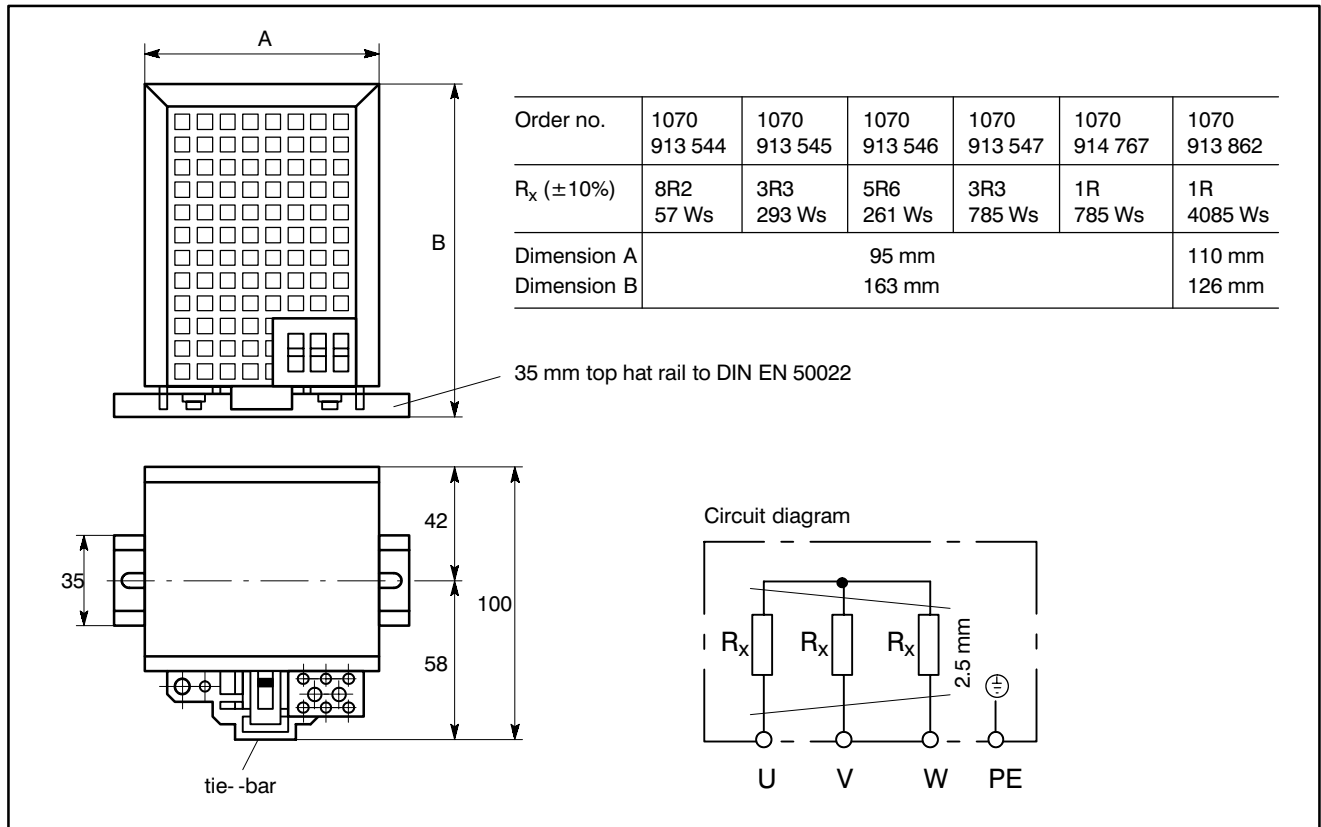


**7.5 Dimensioned drawing, mains filter**

Mains filter 3 x 400 V, Limit class A (industrial applications)

Rated current [A]	16	25	36	50	80
Order no.	1070 918 475	1070 918 476	1070 918 477	1070 918 478	1070 918 479
Dimensions					
a [mm]	163 max.		216 max.		300 max.
a1 [mm]	141 max.		166 max.		221 max.
b [mm]	113 max.		156 max.		171 max.
b1 [mm]	86 max.		126 max.		141 max.
h [mm]	81 max.		91 max.		141 max.
n1 [mm]	70 ±0.2		80 ±0.2		115 ±0.2
n2 [mm]	100 ±0.3		140 ±0.3		155 ±0.3
s [mm]	5.5 ±0.1		6.6 ±0.2		6.6 ±0.2
c1 [mm]	20.5 ±0.5		31 ±0.5		--
c2 [mm]	41 max.				--
d [mm]	36 ±1		46 ±1		--
e1 [mm]	25 ±1		30 ±1		62 ±0.5
e2 [mm]	12.5 ±1		22.5 ±1		18 ±0.5
Terminal connector	4 mm ²		10 mm ²		25 mm ²
Connection bolt [mm]	22.5 ±1, M6				32 ±1, M10

7.6 Dimensioned drawing, plug braking modules





8 Order numbers

8.1 Drive components

Designation		Order no.
Three phase modules	Various functionalities	cf. overview section 3.2
Supply modules	VM A 20KB 001 -- D	1070 077 300
	VM A 20KE 001 -- D	1070 077 624
	VM A 35BR 001 -- D	1070 070 785
	VM A 70CR 001 -- D	1070 070 783
	VM A 90DR 001 -- D	1070 070 784
Power supply modules	NA A35/1 -- D	1070 075 122
	NA A35/2 -- D	1070 075 125
	NA A70/1 -- D	1070 075 123
	NA A70/2 -- D	1070 075 126
	NA A90/1 -- D	1070 077 777
	NA A90/2 -- D	1070 077 776
Line wiring modules	NV 20/1F -- D	1070 078 431
	NV 20/3F -- D	1070 077 941
Line reactors	NE 35/A -- D	1070 917 639
	NE 70/A -- D	1070 917 638
	NE 70/A1 -- D	
Backplane modules	RM B/VM -- D	1070 075 830
	RM C/VM -- D	1070 075 115
	RM A/DM 8 -- D	1070 077 135
	RM A/DM 30 -- D	1070 075 544
	RM A/DM 45 -- D	1070 070 962
	RM B/DM -- D	1070 070 963
	RM D/DM -- D	1070 070 965
	RM C/VM S -- D	1070 075 248
	RM A/DM S -- D	1070 075 244
	RM B/DM S -- D	1070 075 245
Personality modules	PM VMA/000 -- D	1070 075 250
	PM SMA/000 -- D	1070 075 254
	PM FOA/000 -- D	1070 075 255
Memory card, 1 MB	MC VM x.xx A00 -- D	1070 077 559
	MC SM x.xx A00 -- D	1070 078 557
	MC FO x.xx A00 -- D	1070 078 558
	MC OS -- D	1070 917 668

8.2 Accessories

Designation	Order no.	
External ballast switch for VM..20KE	1070 914 826	
Motor connection leads, made-to-measure a) encoder leads b) power leads	cf. section 4.7.1	
Protective circuit for DM...A,B,D DM...K, with point-to-point terminal	1070 917 448 1070 078 595	
Plug braking modules	cf. section 4.6	
Optical fibres for SERCOS interface, made-to-measure	cf. section 4.7.3	
DC link connection right-side left-side	1070 075 903 1070 075 004	
Signal cross link X 810, Extension 200 mm	1070 077 661	
24 V cross link X 820, 2m extension	1070 077 660	
Side panel for DC link cover DM..K/VM..K	1070 075 946	
Mains filter 3 x 440 V (Class A = Industrial sphere, Class B = domestic sphere)	16 A class A 25 A class A 36 A class A 50 A class A 80 A class A Class B on request	1070 918 475 1070 918476 1070 918 477 1070 918 478 1070 918 479
Commissioning and service system DSS -- D	1070 078 607	

8.3 Options

Designation	Order no.	
Option modules direct measuring system:	OM 01 --D OM 02 --D OM 03 --D	1070 070 937 1070 070 939 1070 075 261
Mating connector for	OM 01 and OM 02 OM 03	1070 077 203 1070 077 197

A Annex

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A.2 Safety instructions

A.2.1 Dansk

Farehenvísninger i håndbogen.

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

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



! FARE !

1.1

Vedligeholdelse og installering af komponenterne må kun udføres af elektrofagfolk (VDE 1000-10) under overholdelse af de ulykkesforebyggende forskrifter og installationsforskrifterne (EN 60204-del1, 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.

ADVARSEL !

4.1

Drevkomponenter må kun transporteres i den dertil beregnede emballage. Montage, installation og idrifttagning skal udføres af dertil uddannet personale. Overhold advarselshenvísningerne i håndbogen og på maskinen, for således at forebygge personskade eller materielle skader.

ADVARSEL !

5.1

24 V DC skal opfylde kravene i "Sikker adskillelse".
På primærsiden skal kravene i henhold til overspændingskategori III overholdes.

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.

ACHTUNG !

4.1

Antriebskomponenten dürfen nur in den dafür vorgesehenen Verpackungen transportiert werden.

Montage, Installation und Inbetriebnahme
müssen von qualifiziertem Personal ausgeführt werden.

Beachten Sie die im Handbuch und am Gerät angebrachten Warnhinweise,
um Körperverletzung oder Sachschaden vorzubeugen.

ACHTUNG !

5.1

Die 24 V DC müssen den Anforderungen der 'Sicheren Trennung' genügen.
Primärseitig sind die Anforderungen gemäß Überspannungskategorie III zu beachten.

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”).

Όλες 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 Ένωσης.

! ΚΙΝΔΥΝΟΣ !**1.1**

Η συντήρηση και η εγκατάσταση των στοιχείων πρέπει να γίνεται μόνο από ειδικευμένους ηλεκτρολόγους (**VDE 1000-10**) με βάση τους κανονισμούς προστασίας από ατυχήματα και τους κανονισμούς εγκατάστασης (**EN 60204-Μέρος1, prEN 50178**).

**! ΚΙΝΔΥΝΟΣ !****1.2**

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

**ΚΙΝΔΥΝΟΣ !****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.

**ΠΡΟΣΟΧΗ !****4.1**

Τα εξαρτήματα του μηχανισμού κίνησης επιτρέπεται να μεταφέρονται μόνο στις προβλεπόμενες συσκευασίες. Η συναρμολόγηση, η εγκατάσταση και η έναρξη λειτουργίας πρέπει να εκτελεστούν από εξειδικευμένο προσωπικό.

Προσέξτε τις προειδοποιητικές υποδείξεις που υπάρχουν στο εγχειρίδιο και στην μηχανή, ώστε να αποφύγετε τραυματισμούς και ζημιές.

ΠΡΟΣΟΧΗ !

5.1

Τα 24 V συνεχές πρέπει να ικανοποιούν τις απαιτήσεις του «Ασφαλούς διαχωρισμού».
Από την πλευρά του πρωτεύοντος πρέπει να τηρούνται οι απαιτήσεις σύμφωνα με την κατηγορία υπέρτασης
III.

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 debe realizarlo únicamente personal especializado en electrónica (VDE 1000- -10) y deberán tenerse en cuenta las prescripciones de prevención de accidentes y las prescripciones de instalación (EN 60204-parte1, 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.

¡ATENCIÓN!

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.



¡ATENCIÓN!

4.1

**Los componentes del accionamiento deben transportarse únicamente en el embalaje previsto.
El montaje, la instalación y la puesta en funcionamiento
deben ser efectuados por personal cualificado.**

**Observe las advertencias señaladas en el manual y en el equipo para prevenir
daños personales o materiales.**

¡ATENCIÓN!

5.1




**Los 24 V CC deben satisfacer las exigencias de la “separación segura”.
En el primario se deben observar las exigencias conforme al catálogo de sobretensión III.**

A.2.5 Français

Indications de danger dans le manuel

Tenez compte des consignes de sécurité contenues 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 continu en rapport avec les chapitres, par exemple 1.1. En annexe vous trouverez les traductions correspondantes dans toutes les langues officielles de la CEE.

	<p style="text-align: center;">! DANGER !</p> <p style="text-align: right;">1.1</p> <p style="text-align: center;">Entretien et installation des composants uniquement par des spécialistes en électricité (VDE 1000-10), conformément aux prescriptions de prévention des accidents et aux consignes d'installation (NE 60204 partie 1, NE pr 50178).</p>
	<p style="text-align: center;">! DANGER !</p> <p style="text-align: right;">1.2</p> <p style="text-align: center;">Le fonctionnement parfait et sûr du produit est conditionné par un transport professionnel, un stockage, une implantation et un montage corrects ainsi qu'une manipulation soignée.</p>
	<p style="text-align: center;">ATTENTION !</p> <p style="text-align: right;">1.3</p> <p style="text-align: center;">Les convertisseurs d'entraînement contiennent des éléments présentant une sensibilité électrostatique, qui peuvent être aisément endommagés en cas de manipulation inappropriée.</p>
	<p style="text-align: center;">! DANGER !</p> <p style="text-align: right;">1.4</p> <p style="text-align: center;">Les composants électriques installés ne doivent pas être détruits en raison de l'éventuel danger pour la santé.</p>
	<p style="text-align: center;">ATTENTION !</p> <p style="text-align: right;">4.1</p> <p style="text-align: center;">Os componentes de accionamento só poderão ser transportados nas embalagens previstas. Montagem, instalação e colocação em funcionamento deverão ser efectuadas por pessoal qualificado.</p> <p style="text-align: center;">Observar os avisos de perigo nos manuais e na máquina, afim de evitar ferimentos ou danos materiais.</p>

ATTENTION !

5.1

24 V DC deve ser suficiente para as exigências de «separação segura». Em primeiro lugar, deve-se observar as exigências conforme a categoria de sobretensão III.

A.2.6 Italiano**Indicazioni di pericolo nel manuale**

Osservare le indicazioni di sicurezza (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 l'installazione delle componenti deve essere effettuata solo da elettricisti specializzati (VDE 1000-10) e nel rispetto delle prescrizioni contro gli infortuni e per le installazioni (EN 60204-parte 1, prEN 50178).

**! PERICOLO !**

1.2

Questo prodotto può funzionare in modo sicuro e a regola d'arte solamente se il suo trasporto, immagazzinaggio, 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 .

ATTENZIONE !

4.1

I componenti dell'azionamento devono essere trasportati soltanto negli imballaggi
appositamente previsti.

Il montaggio, l'installazione e la messa in funzione devono essere effettuati soltanto
da personale qualificato.

Osservare le indicazioni di avvertimento riportate nel manuale e sull'apparecchio per evitare
lesioni a persone oppure danni materiali.

ATTENZIONE !

5.1

I 24 V DC devono soddisfare le esigenze della «Disinserzione senza rischi».
Prima di tutto sono da osservare le esigenze conformi alla classe di sovratensione III.

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) in acht.

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

Onderhoud en installatie van de componenten enkel door een elektrotechnisch vakman (VDE 1000-10), met inachtneming van de voorschriften ter voorkoming van ongevallen en de installatievoorschriften (EN 60204-deel 1, prEN 50178), laten uitvoeren.

**! 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

Aandrijfmotoren 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.

**ATTENTIE !**

4.1

Aandrijvingscomponenten mogen slechts in de daarvoor bestemde verpakkingen getransporteerd worden.
Montage, installatie en inbedrijfstelling moeten door geschoold personeel worden uitgevoerd.
Neem de waarschuwingen in het handboek en op de machine zelf in acht, om lichamelijk letsel en materiële schade te voorkomen.

ATTENTIE !

5.1

De 24 V DC moeten aan de eisen van de „veilige scheiding” voldoen.
Aan de primaire zijde moeten de vereisten overeenkomstig overspanningscategorie III in acht worden genomen.

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 manutenção e a instalação dos componentes só deverão ser levadas a cabo por pessoal competente na área da electricidade (VDE 1000-10) e obedecendo tanto às normas de prevenção contra acidentes como às normas de instalação (EN 60204-Teil1, 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.

CUIDADO !

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.

**ATENÇÃO !**

4.1

Os componentes de accionamento só poderão ser transportados nas embalagens previstas. Montagem, instalação e colocação em funcionamento deverão ser efectuadas por pessoal qualificado.

Observar os avisos de perigo nos manuais e na máquina, afim de evitar ferimentos ou danos materiais.

ATENÇÃO !

5.1




O 24 V DC deve ser suficiente para as exigências de «separação segura». Em primeiro lugar, deve-se observar as exigências conforme a categoria de sobretensão III.

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.

	<p style="text-align: center;">! VAARA !</p> <p style="text-align: right;">1.1</p> <p>Komponenttien huolto ja asennus on annettava sähköalan ammattilaisen tehtäväksi (VDE 1000-10) ja tapaturmantorjunta- - sekä asennusohjeet huomioiden (EN 60204-osa1, prEN 50178).</p>
	<p style="text-align: center;">! VAARA !</p> <p style="text-align: right;">1.2</p> <p>Asianmukainen kuljetus, varastointi, sijoitus ja asennus sekä huolellinen käyttö on edellytyksenä tuotteen moitteettomalle ja varmalle toiminnalle.</p>
	<p style="text-align: center;">HUOMIO !</p> <p style="text-align: right;">1.3</p> <p>Käyttömuuntajissa on sähköstaattisesti vaarannettuja rakenneosia, jotka voivat helposti tuhoutua väärin käsiteltäessä.</p>
	<p style="text-align: center;">! VAARA !</p> <p style="text-align: right;">1.4</p> <p>Sisäänrakennettuja sähkökomponentteja ei saa tuhota terveysriskin takia.</p>
	<p style="text-align: center;">HUOMIO !</p> <p style="text-align: right;">4.1</p> <p>Moottorikomponentteja saa kuljettaa vain kuljetukseen tarkoitetuissa pakkauksissa. Ammattitaitoisten työntekijöiden tulee suorittaa asennus, sähköasennus ja käyttöönotto. Huomioi käsikirjassa mainitut ja laitteeseen kiinnitetyt varoitukset, jotta loukkaantumiset ja aineelliset vahingot voidaan välttää.</p>
	<p style="text-align: center;">HUOMIO !</p> <p style="text-align: right;">5.1</p> <p>24 V DC tulee vastata "turvallisen erotuksen" vaatimuksia. Primääripuolella on noudatettava ylijänniteluokan III vaatimuksia.</p>

A.2.10 Svenska**Anvisning om risker i handboken**

Beakta de säkerhetsanvisningar som ingår i 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 komponenterna får endast genomföras av behörig elektriker (VDE 1000-10) med beaktande av de olycksfallsförebyggande bestämmelserna och installationsbestämmelserna (EN 60204-Teil1, 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.

**OBSERVERA !****4.1**

Drivningskomponenterna får endast transporteras i avsedda förpackningar. Montage, installation och idrifttagande skall utföras av kvalificerad personal. Beakta varningsanvisningarna som i handboken och som är placerade på apparaten för att undvika kroppsskador eller sakskador.

OBSERVERA !**5.1**

24 V DC måste räcka för kraven på "säker delning". På primärsidan skall kraven enligt överspänningskategori III beaktas.

Ihre Notizen :

