HEIDENHAIN

Technical Manual

Inverter Systems and Motors

for the Contouring Controls

TNC 410 M
TNC 426 M
TNC 430 M
iTNC 530
MANUALplusM
MANUALplus 4110
CNC PILOT 4290

April 2008

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Foreword

This Technical Manual has been written for all machine tool manufacturers. It contains all of the information necessary for the mounting and electrical installation of HEIDENHAIN inverter systems and HEIDENHAIN motors.

With each update, you will receive a set of supplementary pages free of charge. Always sort these pages into your Technical Manual immediately. In this way, your manual will always be up-to-date.

You can use extracts from this manual to supplement your machine documentation. If you increase the size of the manual format (17 cm x 24 cm) by the factor 1.225, you will have DIN A4 format.

No documentation can be perfect. To stay up to date, documentation must change constantly. It is also thrives on your comments and suggestions for improvement. Please help us by telling us your ideas.

DR. JOHANNES HEIDENHAIN GmbH
E/P Department
Dr.-Johannes-Heidenhain-Str. 5
83301 Traunreut

1 Update Information No. 1

1.1 Compact Inverters

- New compact inverters
  - UE 211B: Continuous load on axes: 2 x 7.5 A; 1 x 15 A
    Continuous load on spindle: 20 A
  - UE 241B: Continuous load on axes: 2 x 7.5 A; 1 x 23 A
    Continuous load on spindle: 31 A
- New connections on the bottom of the UE 2xxB compact inverter. These connections are reserved for future applications and must not be wired.
- New sliding switch on the front of the UE 2xxB compact inverter. This enables the spindle unit of the compact inverters to be used as an axis.

1.2 Modular Inverters

- New UV 120 regenerative power supply unit with KDR 120 commutation reactor
  UV 120: DC-link full-load power: 22 kW
- New line filters for UV 120 and UV 140
  Note the dimensions of the new line filter!
- New UP 110 braking resistor module
  The UP 110 braking resistor module is required so that, if the power supply from the UV 120 and UV 140 power supply modules fails, the braking energy from the motors can be dissipated.

1.3 Motors

- New synchronous motors QSY 96G, QSY 112D, the QSY 116 series, and QSY 155

Designation	Stall torque M_0	Rated speed n_N
QSY 96G	5.2 Nm	4500 rpm
QSY 116C	5.2 Nm	3000 rpm
QSY 116E	7.2 Nm	3000 rpm
QSY 116J	10.0 Nm	3000 rpm
QSY 155A	8.3 Nm	3000 rpm
QSY 155B	12.2 Nm	3000 rpm
QSY 155D	21.6 Nm	3000 rpm
QSY 155F	26.1 Nm	3000 rpm
QSY 112D	72.0 Nm	2000 rpm

- New QAN 164B asynchronous motor
  - Rated speed n_N: 1350 rpm
  - Power rating P_N: 31.5 kW
- This Technical Manual lists the input values for the machine parameters of the current controller of the TNC and MANUALplusM for HEIDENHAIN motors.

1.4 Replacing Instructions

Page	Change	Remove Page	Insert Page
Title	New date of issue	August 99	April 2000
Chapter 1	Update Information	–	Update Info. 1
Chapter 2	■ Printing errors corrected ■ Documentation of changes in the variants ■ UE 211B, UE 241B have been added ■ UV 120, KDR 120 have been added ■ New line filter ■ UP 110 has been added	Entire chapter	Entire chapter
Chapter 3	First issue of the chapter	Entire chapter	Entire chapter
Chapter 4	Printing errors corrected	Entire chapter	Entire chapter
Chapter 5	■ Printing errors corrected ■ UE 211B, UE 241B have been added	Entire chapter	Entire chapter
Chapter 6	■ Printing errors corrected ■ UV 120, KDR 120 have been added ■ New line filter ■ UP 110 has been added	Entire chapter	Entire chapter
Chapter 7	Description changed ■ QSY 96G, QSY 112D, QSY 116 series and QSY 155 have been added ■ QAN 164B has been added ■ New input values for current controller	Entire chapter	Entire chapter
Chapter 8	Subject Index	Entire chapter	Entire chapter

1 Update Information No. 2

1.1 Compact inverter

- Length of ribbon cable delivered with the UE 2xxB changed

1.2 Modular Inverters

- New EPCOS 35 A line filter added for the regenerative UV 120 power supply unit
- New connections on the bottom of the UM 1xx power module. These connections are reserved for future applications and must not be wired.
- If disturbances in the line power supply net occur with the regenerative power supply units even though HEIDENHAIN commutating reactors and line filters are being used, the new three-phase current capacitor must be used.

1.3 Motors

- QSY 96A has been added
- Power and torque characteristic for QAN 134D has been added
- Machine parameters for the current controller for QAN 134D have been added
- New power cable with UL certification

1.4 Replacing Instructions

Page	Change	Remove Page	Insert Page
Title	New date of issue	August 99	February 2001
Chapter 1	Update Information	–	Update Info. 2
Chapter 2	■ Printing errors corrected ■ New Id. Nr. for the UE 2xxB ribbon cable ■ UE 2xxB power consumption corrected ■ EPCOS 35 A line filter added, FINMOTOR removed ■ Selection tables for ribbon cables and covers revised	Entire chapter	Entire chapter
Chapter 3	■ Printing errors corrected ■ Selection of the braking resistor	Entire chapter	Entire chapter
Chapter 4	■ Printing errors corrected ■ Demands of the line power supply ■ New three-phase current capacitor ■ PW 210 mounting instructions modified	Entire chapter	Entire chapter
Chapter 5	■ Printing errors corrected	Entire chapter	Entire chapter
Chapter 6	■ Printing errors corrected ■ EPCOS 35 A line filter added, FINMOTOR removed ■ Notes for connecting the motor brake ■ New connections for the power modules	Entire chapter	Entire chapter
Chapter 7	■ Printing errors corrected ■ Notes for connecting the motor brake ■ New power cable with UL certification ■ QSY 96A has been added ■ Terminal box illustration corrected ■ Rotatable flange sockets modified ■ Power and torque characteristic for QAN 134D has been added ■ Input values for the current controller on the QAN 134D have been added	Entire chapter	Entire chapter
Chapter 8	Subject Index	Entire chapter	Entire chapter

1 Update Information No. 3

1.1 General Information

- New SM 110 voltage protection module for use with synchronous spindle motors
- Temperature sensor on the PW 1x0
- Double-row configuration of the HEIDENHAIN inverter system

1.2 Compact Inverters

- UE 241B no longer available
- New regenerative compact inverters
  - UR 230: Continuous load on axes: 2 x 7.5 A
    Continuous load on spindle: 25 A
  - UR 240: Continuous load on axes: 3 x 7.5 A
    Continuous load on spindle: 35 A
  - UR 242: Continuous load on axes: 3 x 7.5 A; 1 x 25 A
    Continuous load on spindle: 35 A
- New connections for controlling the motor brakes: X344, X392 and X393

1.3 Modular Inverter

- New UV 150 regenerative power supply unit with KDR 150 commutation reactor
  UV 150: DC-link full-load power: 50 kW
- New UM 115 power module
- New variants of the UV 1xx power units
- Current consumptions from the 15-V and 24-V power supply of the inverter system must be inspected
- New connections for controlling the motor brakes: X344 and X392

1.4 Motors

- QSY 96, QSY 116, QSY 155 with EQN 1325 absolute multiturn rotary encoder
- New QSY 155B synchronous motors with n_N = 2000 rpm and QSY 155C

Designation	**Stall torque M_0**	**Rated speed n_N**
QSY 155B	13 Nm	2000 rpm
QSY 155C	17.7 Nm	3000 rpm

- Input values for the digital current controller

1.5 Replacing Instructions

Page	Change	Remove Page	Insert Page
Title	New date of issue	February 99	July 2002
Chapter 1	Update Information	–	Update Info. 3
Chapter 2	■ Printing errors corrected ■ UE 241 B removed ■ UR 2xx, UV 150, KDR 150 and UM 115 added ■ Continuous load and short term rating for different PWM frequencies ■ Peak performances for 0.2 s ■ Current consumption of the 15-V and 24-V supply ■ Covers included in the items supplied with the compact inverters ■ Selection tables for ribbon cables and covers revised ■ SM 110 voltage protection module added ■ Double-row configuration of inverter systems	Entire chapter	Entire chapter
Chapter 3	■ Performance overview of a drive system added	Entire chapter	Entire chapter
Chapter 4	■ Note on radio interferences ■ Cross sections of the power cables ■ HEIDENHAIN recommends use of the three-phase current capacitor ■ Note on leakage current	Entire chapter	Entire chapter
Chapter 5	■ Printing errors corrected ■ UE 241B removed ■ UR 2xx added ■ New connections for controlling the motor brakes: X344, X392 and X393 ■ Line fuse for UE 2xx, UV 102, UE 2xxB ■ Temperature switch on the PW 110B ■ Additional voltage to X70, X71, X72 ■ Tightening torque of the electrical screw connections added ■ Dimensions only in mm	Entire chapter	Entire chapter
Chapter 6	■ New connections for controlling the motor brakes: X344 and X392 ■ Printing errors corrected ■ Line fuse for UV 1x0 ■ Temperature switch on the PW 110B ■ Additional voltage to X70, X71, X72 ■ Tightening torque of the electrical screw connections added ■ Dimensions only in mm	Entire chapter	Entire chapter

Page	Change	Remove Page	Insert Page
Chapter 7	■ Printing errors corrected ■ Bend radii of the power and encoder cables ■ Calculation of the maximum torque of a drive ■ Pin layout for speed encoders with EnDat interface ■ Note on differences between internal connections, ID label and motor tables of QAN 30 and QAN 4S ■ Power modules for QAN 3M: UM 111B, UM 121B ■ Turning radius for connectors changed ■ Incorrect assignment for the fan connection on QAN 104 and QSY 112D ■ QSY 96, QSY 116, QSY 155 with EQN 1325 absolute multiturn rotary encoder added ■ QSY 155B (n_N = 2000 rpm) and QSY 155C added ■ Specifications for QSY 155B revised ■ Characteristic curves revised ■ Bearing service life for QSY 041B, QSY 071B, QSY 090B, QSY 093B and QSY 112 series ■ Bearing service life for QAN 104, QAN 134 and QAN 164B ■ Dimensions only in mm ■ Input values for the digital current controller	Entire chapter	Entire chapter
Chapter 8	Keyword index	Entire chapter	Entire chapter

1 Update Information No. 4

1.1 General Information

- New axis-enabling module (Id. Nr. 341 518-01) that allows you to switch off power modules in modular inverter systems group-by-group. The axis-enabling module is mounted onto the power module and separates the unit bus. All power modules that are connected after the axis-enabling module to the unit bus are switched of via X72 of the unit bus, and no longer via X72 of the UV(R) 1x0.

1.2 Modular Inverter

- New variant of the UV 140 power supply unit (Id. Nr. 335 009-04) with improved PCB and improved housing.
- New UVR 150 power supply unit (Id. Nr. 384 708-01) with new power supply unit and additional connections for supplying the CC 42x with +5 V and 0 V.

1.3 Motors

- New QSY 116J EcoDyn, QSY 155B EcoDyn, QSY 155C EcoDyn, QSY 155F EcoDyn synchronous motors
  The following NC software versions are required for controlling these motors in the EcoDyn operating mode:
  - iTNC 530: 340 420-06 and later
  - MANUALplus 4110: 354 809-11 and later
  - CNC PILOT 4290: 340 460-14, 362 796-10 and later

Designation	Stall torque M_0	Rated speed n_N
QSY 116J EcoDyn	10.0 Nm	3000 rpm
QSY 116J EcoDyn	13.0 Nm	3000 rpm
QSY 155C EcoDyn	17.7 Nm	3000 rpm
QSY 155C EcoDyn	21.6 Nm	3000 rpm
QSY 155C EcoDyn	26.1 Nm	3000 rpm

- New QAN 200M, QAN 200L, QAN 200U asynchronous motors

Designation	Rated speed n_N	Rated power output P_N
QAN 200M	1500 rpm	5.5 kW
QAN 200M	1500 rpm	7.5 kW
QAN 200M	1500 rpm	10 kW

1.4 Replacing Instructions

Page	Change	Remove Page	Insert Page
Title	New date of issue	May 2002	March 2003
Chapter 1	Update Information	–	Update Info. 4
Chapter 2	Corrective action, UVR 150 has been added, new UV 140 variant, cover length has been added , axis-enabling module has been added	Entire chapter	Entire chapter
Chapter 3	UVR 150 has been added	Entire chapter	Entire chapter
Chapter 4	UVR 150 has been added, corrective action	Entire chapter	Entire chapter
Chapter 5	Corrective action, PW 210 dimension drawing has been revised	Entire chapter	Entire chapter
Chapter 6	Corrective action, UVR 150 has been added, PW 210 dimension drawing has been revised	Entire chapter	Entire chapter
Chapter 7	Corrective action, QAN 200, QSY 116J, QSY 155B EcoDyn, QSY 155C EcoDyn, QSY 155D EcoDyn, QSY 155F EcoDyn have been added	Entire chapter	Entire chapter
Chapter 8	Keyword index	Entire chapter	Entire chapter

1 Update Information No. 5

1.1 Overview

- New diagnosable compact inverters, power supply units and modular inverters.
- Improvement of various compact inverters, power supply units and modular inverters.
- Possibility of coupling power supply units for increasing the dc-link power (separate dc-links).
- New motors.
- Diagnosability of motors with EnDat interface.
- Improvement of the navigation through the Manual by QuickLinks for the overviews of inverter systems, accessories and motors.

1.2 Compact Inverters

1.2.1 Non-Regenerative Compact Inverters

- New compact inverter UE 110, rated power output 10 kW
  - Continuous load on axes (at f_{PWM} = 3.3 kHz): 3 x 6 A
  - Continuous load on spindle (at f_{PWM} = 3.3 kHz): 24 A
- New compact inverter UE 112, rated power output 10 kW
  - Continuous load on axes (at f_{PWM} = 3.3 kHz): 3 x 6 A, 1 x 9 A
  - Continuous load on spindle (at f_{PWM} = 3.3 kHz): 24 A

1.2.2 Regenerative Compact Inverters

- The following compact inverters were improved:

Designation (new)	Designation (old)	Improvement	Rated power output of dc-link
UR 230D	UR 230	■ New, more powerful power supply unit with separate 5-V connection on the front panel (X74). ■ Additional features for diagnostic functions.	22 kW
UR 240D	UR 240	■ New, more powerful power supply unit with separate 5-V connection on the front panel (X74). ■ Additional features for diagnostic functions.	22 kW
UR 242D	UR 242	■ New, more powerful power supply unit with separate 5-V connection on the front panel (X74). ■ Additional features for diagnostic functions.	22 kW

1.3 Modular Inverters

1.3.1 Non-Regenerative Power Supply Units

- The following non-regenerative power supply units were improved:

Designation (new)	Designation (old)	Improvement	Rated power output of dc-link
UV 130D	UV 130	■ New, more powerful power supply unit with separate 5-V connection on the front panel (X74). ■ Additional features for diagnostic functions.	30 kW

1.3.2 Regenerative Power Supply Units

- New power supply unit UVR 130D, rated power output 30 kW
  - Diagnosable
  - Load capacity of 5 V = 20 A, with separate connecting terminals (X74)
  - Load capacity of 15 V = 2.0 A
  - Load capacity of 24 V = 4.0 A
- The following regenerative power supply units were improved:

Designation (new)	Designation (old)	Improvement	Rated power output of dc-link
UVR 120D[a]	UV 120	■ New, more powerful power supply unit with separate 5-V connection on the front panel (X74). ■ Additional features for diagnostic functions.	22 kW
UVR 140D[a]	UV 140	■ New, more powerful power supply unit with separate 5-V connection on the front panel (X74). ■ Additional features for diagnostic functions.	45 kW
UVR 150D[a]	UVR 150	■ New, more powerful power supply unit with separate 5-V connection on the front panel (X74). ■ Additional features for diagnostic functions. ■ Increased rated power.	55 kW (up to now 50 kW)

a. Available as of the beginning of 2005.

1.3.3 Inverters

- The following inverters were improved:

Designation (new)	Designation (old)	Improvement	Continuous load at f_{PWM} = 5 kHz (axis/spindle)
UM 111D	UM 111	■ Additional features for diagnostic functions. ■ Higher maximum current values.[a]	7.5 A
UM 111BD	UM 111B	■ Module width only 50 mm. ■ Additional features for diagnostic functions. ■ Higher maximum current values.[a]	15 A/20 A
UM 112D	UM 112	■ Additional features for diagnostic functions. ■ Higher rated current values. ■ Higher maximum current values.[a]	25 A/34 A (up to now 23 A/ 31 A)
UM 113D	UM 113	■ Additional features for diagnostic functions. ■ Higher rated current values. ■ Higher maximum current values.[a]	40 A/56 A (up to now 32 A/ 50 A)
UM 114D	UM 114	■ Additional features for diagnostic functions. ■ Higher rated current values. ■ Higher maximum current values.[a]	60 A/90 A (up to now 48 A/ 75 A)
UM 115D	UM 115	■ Additional features for diagnostic functions. ■ Higher rated current values. ■ Higher maximum current values.[a]	96 A/125 A (up to now 70 A/ 100 A)
UM 121D	UM 121	■ Additional features for diagnostic functions. ■ Higher maximum current values.[a]	2x 7.5 A
UM 121BD	UM 121B	■ Additional features for diagnostic functions. ■ Higher maximum current values.[a]	2x 15 A/1x 20 A

Designation (new)	Designation (old)	Improvement	Continuous load at f_{PWM} = 5 kHz (axis/spindle)
UM 122D	UM 122	■ Additional features for diagnostic functions. ■ Higher rated current values. ■ Higher maximum current values.[a]	2x 25 A/1x 34 A (up to now 2x 23 A/ 1x 31 A)

a. As of mid-2005 (depending on software). Information available from HEIDENHAIN.

1.4 Accessories

- New **ZKF 110 dc-link filter** for use with linear motors or torque motors
  - Rated power: 30 kW
  - Max. power during S6-20% cycle: 67 kW
  - Max. leakage current < 1.3 A
- New **ZKF 120 dc-link filter** for use with linear motors or torque motors
  - Rated power: 30 kW
  - Max. power during S6-20% cycle: 67 kW
  - Max. leakage current < 6 A
  - Modular design
- New **ZKF 130 dc-link filter** for use with linear motors or torque motors
  - Rated power: 55 kW
  - Max. power during S6-20% cycle: 100 kW
  - Max. leakage current< 6 A
  - Modular design
  - Integrated cooling (fan)
  - Unit bus interface (X79)
- New **adapter module** for coupling the power supply units
  - Modular design
  - Integration of the supply bus (X69) in the monitoring system
- New **KDR 130B commutating reactor**
  - Rated current: 3 x 40.5 A
  - Thermally permissible continuous current: 3 x 45 A

1.5 Motors

1.5.1 Synchronous Motors

Designation	Stall torque M_0	Rated speed n_N
QSY 130C EcoDyn	6 Nm	3000 rpm
QSY 130E EcoDyn	9 Nm	3000 rpm
QSY 190C EcoDyn	28 Nm	3000 rpm
QSY 190D EcoDyn	38 Nm	3000 rpm
QSY 190F EcoDyn	47.6 Nm	3000 rpm
QSY 190K EcoDyn	62.5 Nm	3000 rpm

1.5.2 Asynchronous Motors

Designation	Rated speed n_N	Rated power output P_N
QAN 260M	1500 rpm	15.5 kW
QAN 260L	1500 rpm	20.0 kW
QAN 260U	1500 rpm	24 kW
QAN 260W	750 rpm	12 kW
QAN 320M	1500 rpm	32 kW
QAN 320W	750 rpm	18 kW

1.6 Technical Manual Documentation

- Overviews with brief information and QuickLinks for accessing the following subjects:
  - Inverter Systems (Chapter 2.2)
  - Motors (Chapter 7.2)
- Introduction of QuickLinks in the component specifications in Chapter 2, "Introduction," for accessing the respective subjects.
- Expansion of Chapter 4, "Mounting and Operating Conditions."
- Various connection overviews for inverter systems were added to Chapter 4, "Mounting and Operating Conditions."
- Expansion of connection overviews and dimensional drawings. Similar components are illustrated in separate overviews.
- Some changes were made to the structure of the Technical Manual.

1.7 Replacing Instructions

Note

Due to the comprehensive changes to the Technical Manual for Inverter Systems and Motors, it is not possible to replace the old pages with the new.

1 Update Information No. 6

1.1 General Information

Chapter 4 – Mounting and Operating Conditions – was expanded:

- Connection and adjustment to different types of networks
- Use of climate control units
- Connection requirements when water cooling is used
- The power connection of regenerative and non-regenerative inverter systems was revised
- Requirements for supply lines and bus cable

1.2 Power Supply Units

- New regenerative power supply units
  - UVR 160 D: Rated power output of 80 kW
Air cooling
  - UVR 160 DW: Rated power output of 80 kW
Water cooling
- UV 106 B power supply unit as a replacement for the UV 106

1.3 Power Modules

- New power module
  - UM 116 DW: Water cooling

1.4 Motors

- New QAN 200 UH and QAN 260 UH hollow-shaft motors

Designation	Rated power output P_N	Rated speed n_N
QAN 200 UH	10 kW	1500 rpm
QAN 260 UH	22 kW	1500 rpm

- New QAN 320L asynchronous motor
  - Rated speed n_N: 1500 rpm
  - Rated power output P_N: 40 kW
- Terminal box of the motors of the QAN 320 series revised since August 2006.

■ Siemens synchronous motors added

Designation	Rated power output P_N	Rated speed n_N
1FK7042-5AF71	0.82 kW	3000 rpm
1FK7060-5AF71	1.48 kW	3000 rpm
1FK7063-5AF71	2.30 kW	3000 rpm
1FK7080-5AF71	2.14 kW	3000 rpm
1FK7083-5AF71	3.30 kW	3000 rpm
1FK7100-5AF71	3.77 kW	3000 rpm
1FK7101-5AF71	4.87 kW	3000 rpm
1FK7103-5AF71	4.40 kW	3000 rpm

■ Siemens motors with hollow shaft added

Designation	Rated power output P_N	Rated speed n_N
1PM6105-2DF81	7.50 kW	1500 rpm
1PM6133-2DF81	11.0 kW	1500 rpm

1.5 Accessories

- EPCOS 120 A line filter with integrated three-phase capacitor
- KDR 160 commutating reactor with a rated current of 3 x 117 A
- SM 130 voltage protection module for maximum phase currents of 300 A
- Coolant connection for components with water cooling

1.6 Replacing Instructions

Page	Change	Remove Page	Insert Page
Title	New date of issue	November 2004	April 2007
Chapter 1	Update Information	–	Update Info. 6
Chapter 2	■ Revised completely	Entire chapter	Entire chapter
Chapter 3	Page numbering changed	Entire chapter	Entire chapter
Chapter 4	■ Revised completely	Entire chapter	Entire chapter
Chapter 5	Description changed ■ UV 106 B	Entire chapter	Entire chapter
Chapter 6	Description changed ■ UVR 160 DW, UVR 160 D, UM 116 DW	Entire chapter	Entire chapter
Chapter 7	Description changed ■ QAN 200 UH, QAN 260 UH ■ QAN 320 L ■ 1FK7042, 1FK7060, 1FK7063, 1FK7080, 1FK7083, 1FK7100, 1FK7103 ■ 1PM6105, 1PM6133	Entire chapter	Entire chapter
Chapter 8	Keyword index	Entire chapter	Entire chapter

1 Update Information No. 7

1.1 General Information

Chapter 4 – Mounting and Operating Conditions – was expanded:

- **Check list**
  Anyone connecting a machine with a HEIDENHAIN inverter system must take note of the information presented there. The revised version of Chapter 4 is available for downloading from the FileBase.

1.2 Accessories

- **New axis-release module**
  An axis-release module is used to switch a group of axes on and off independently of other axes. The new axis-release module makes it possible to address both axes and spindles as "axis groups." The selection is made using jumpers.
  ID number of the new axis-release-module: ID 573 732-02
  It replaces the previous axis-release module (ID 341 518-02). The new axis-release module is compatible in its functions to its predecessor, but the installation differs. Comprehensive mounting instructions are included with the new axis-release module.
- **VAL-MS surge voltage arrester**
  The VAL-MS 230/FM single-pole surge voltage protector from Phoenix serves to protect the machine from overvoltages on the conductors, and separates the protection element from the mains when it has become overloaded due to high-energy surge voltages. Three surge arresters are necessary for a machine tool connected to three-phase line power. The surge arrester is also equipped with a double-throw switch as a remote indicator switch.

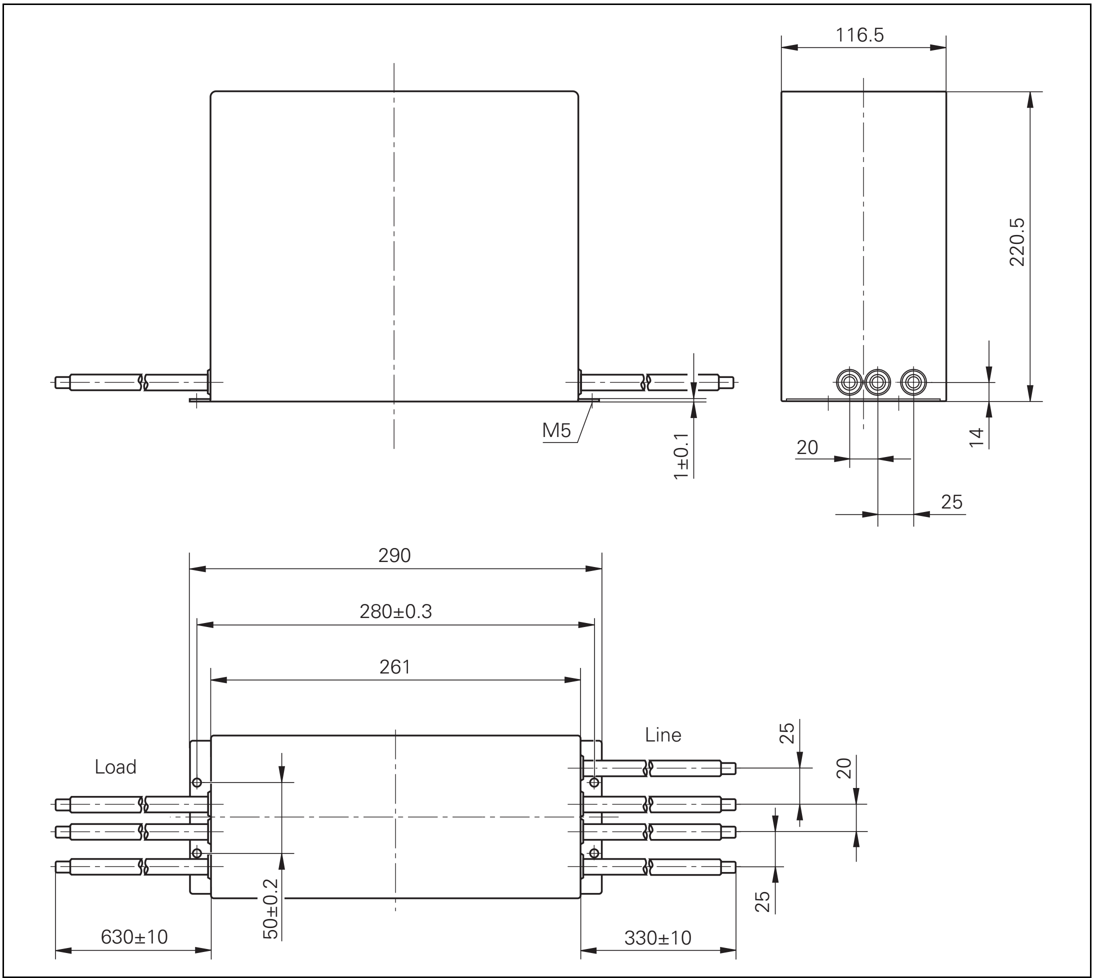
Specifications	**Surge voltage arrester Phoenix VAL-MS 230/FM**
IEC test class	II
EN type	T2
Rated voltage	230 V
Rated frequency	50 Hz/60 Hz
Arrester rated voltage (L-N)	275 Vac
Nominal discharge surge current	20 kA
Max. discharge surge current	40 kA
Module width	Approx. 17.7 mm
ID	648 720-xx

Note

Please also refer to the manufacturer's data sheet. There you will find further specifications and information regarding the surge voltage arrester.

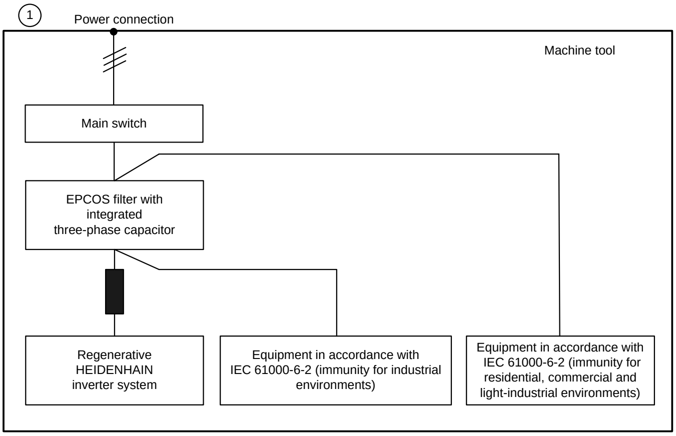
■ EPCOS 80 A line filter with integrated three-phase capacitor

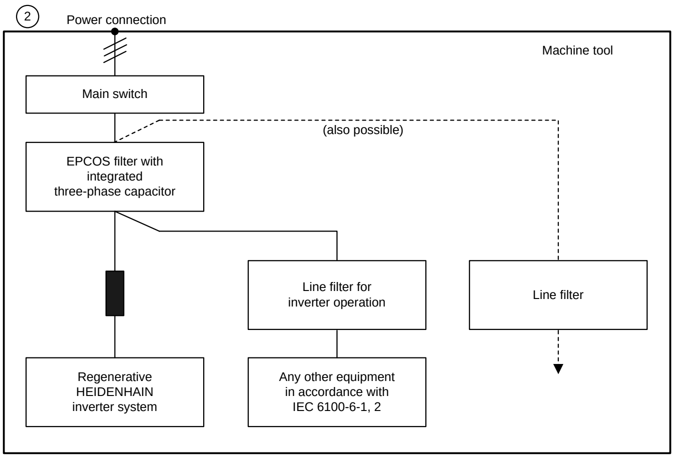
Specifications	EPCOS 80 A line filter
Suitable for	UV 140, UVR 150, UVR 130 D, UVR 140 D, UVR 150 D
Rated voltage	3 x 480 V
Rated frequency	50 Hz/60 Hz
Rated current	3 x 80 A
Power loss	Approx. 75 W
Degree of protection	IP 20
Weight	11 kg
Capacity	3 x 32 µA
ID	640 908-xx



Line filters

HEIDENHAIN offers Epcos line filters with integrated three-phase capacitor. The following filter arrangements are allowed when using these filters and for connecting other devices:





The illustrated filter arrangements comply with all environment requirements for radio interference suppression as per EN 55011 Limit Class A for industrial networks.

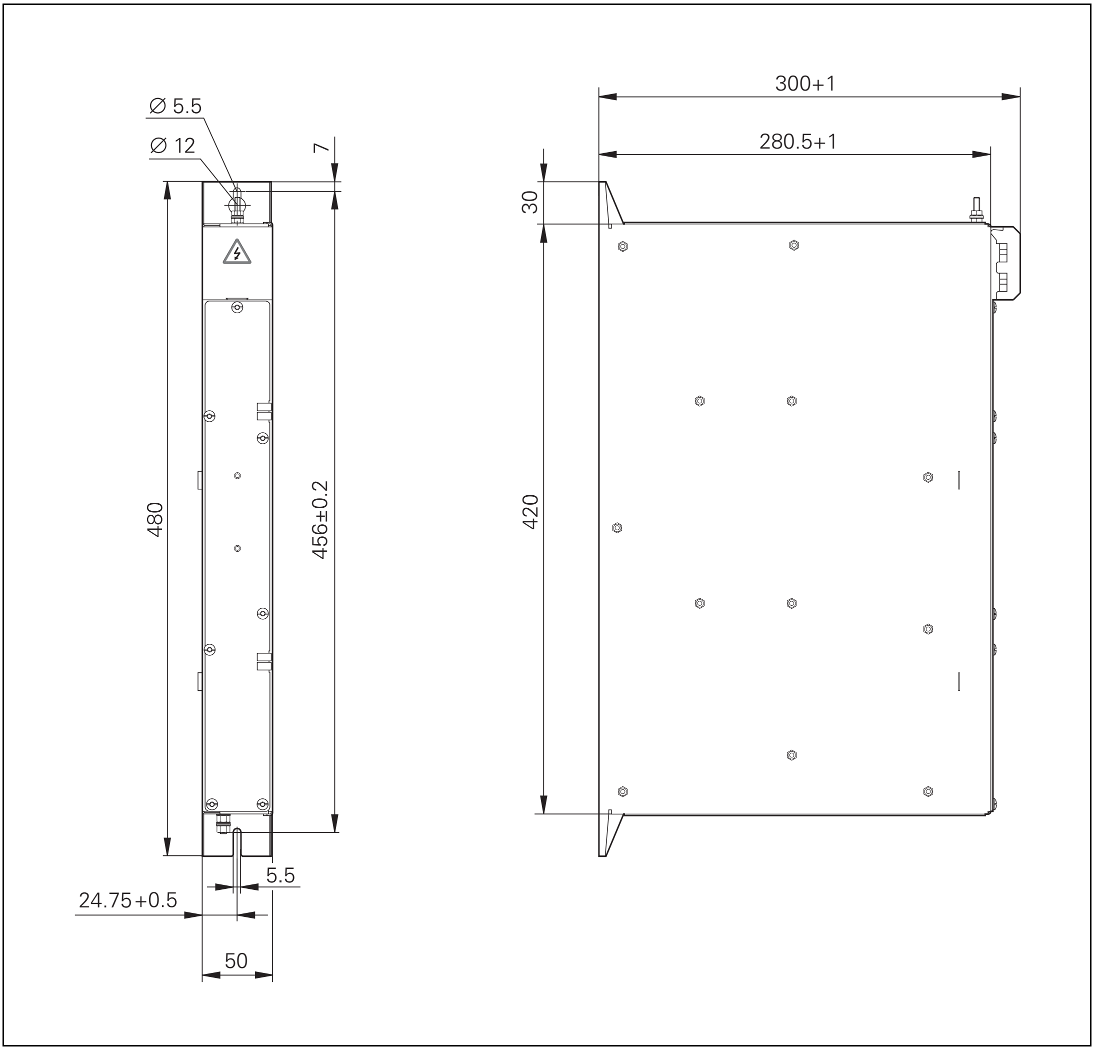
Note

If you want to connect additional consumers, you must ensure that the line filters are designed for correspondingly high currents.

■ **CMH 120 capacitor module**

For maintaining the dc-link voltage during a power failure. This is necessary, for example, to perform LIFTOFF completely even if direct drives are used. Several CMH modules can be connected in parallel in order to increase capacitance.

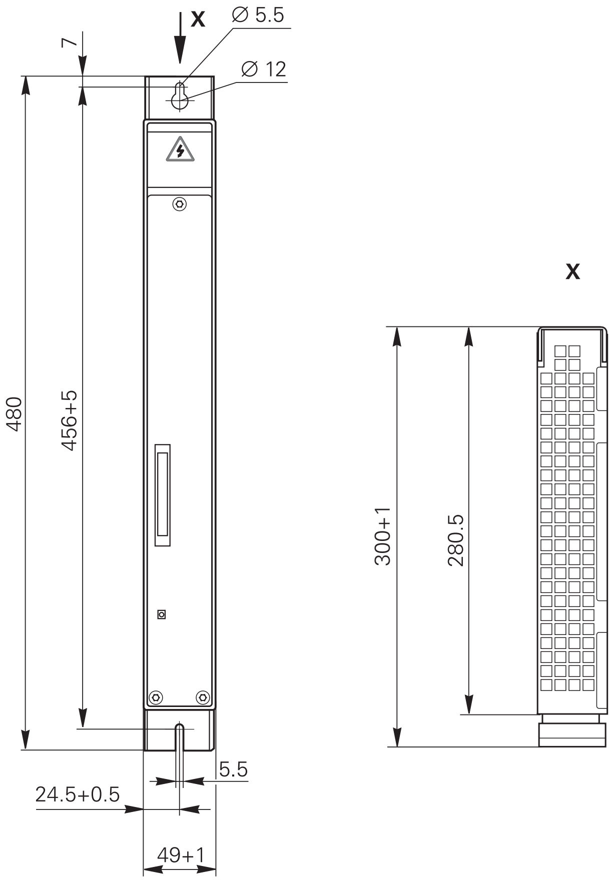
Specifications	CMH 120
DC-link voltage	Max. 850 V
Capacitance	10.0 mF
Module width	50 mm
Degree of protection	IP 20
ID	591 116-xx



■ **UP 120 braking resistor module**

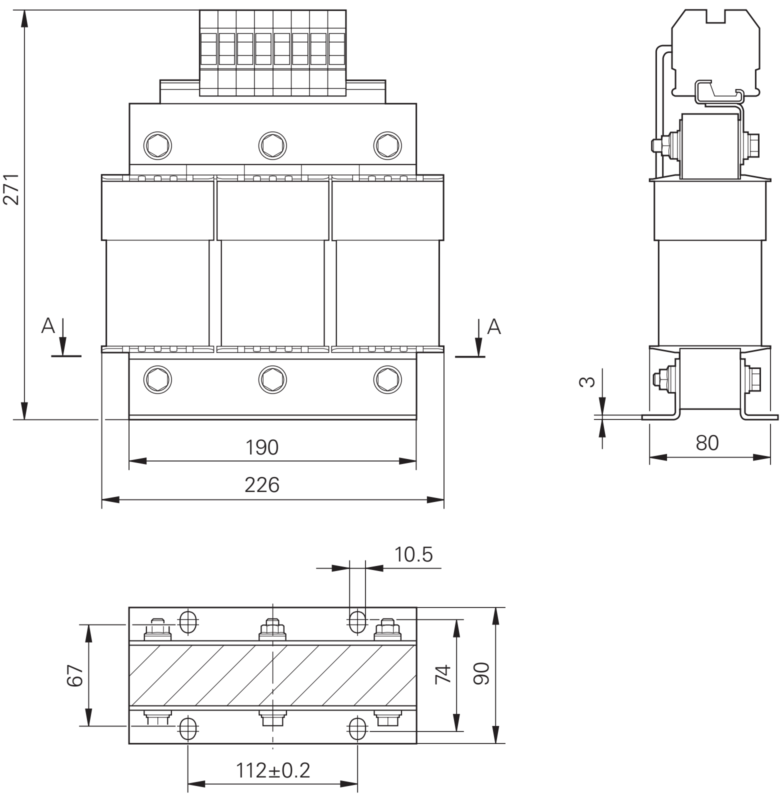
For powerful, regenerative inverter systems that use a UVR 160D (W) supply unit, usually two UP 110 were connected in parallel. With the UP 120, there is a powerful braking resistor module available now that can replace the two UP 110.

Specifications	UP 120
Switching voltage	740 V
Power	150 kW (for 2 s)
Resistance	3.6 Ω
Degree of protection	IP 20
Weight	7.2 kg
ID	605 731-xx



- **KDR 130C commutating reactor**
In contrast to the KDR 130B, the primary and secondary connecting lines are now placed on terminals and separate lines are used for further connection. The terminals are suitable for lines with a cross section up to 16 mm^2. The specifications are the same as for the KDR 130B.

Specifications	**KDR 130 C**
Rated voltage	3 x 400 V
Rated frequency	50 Hz/60 Hz
Thermally permissible continuous current	3 x 45 A
Rated current	3 x 40.5 A
Power loss	Approx. 250 W
Degree of protection	IP 00
Weight	Approx. 15 kg
ID	646 271-xx

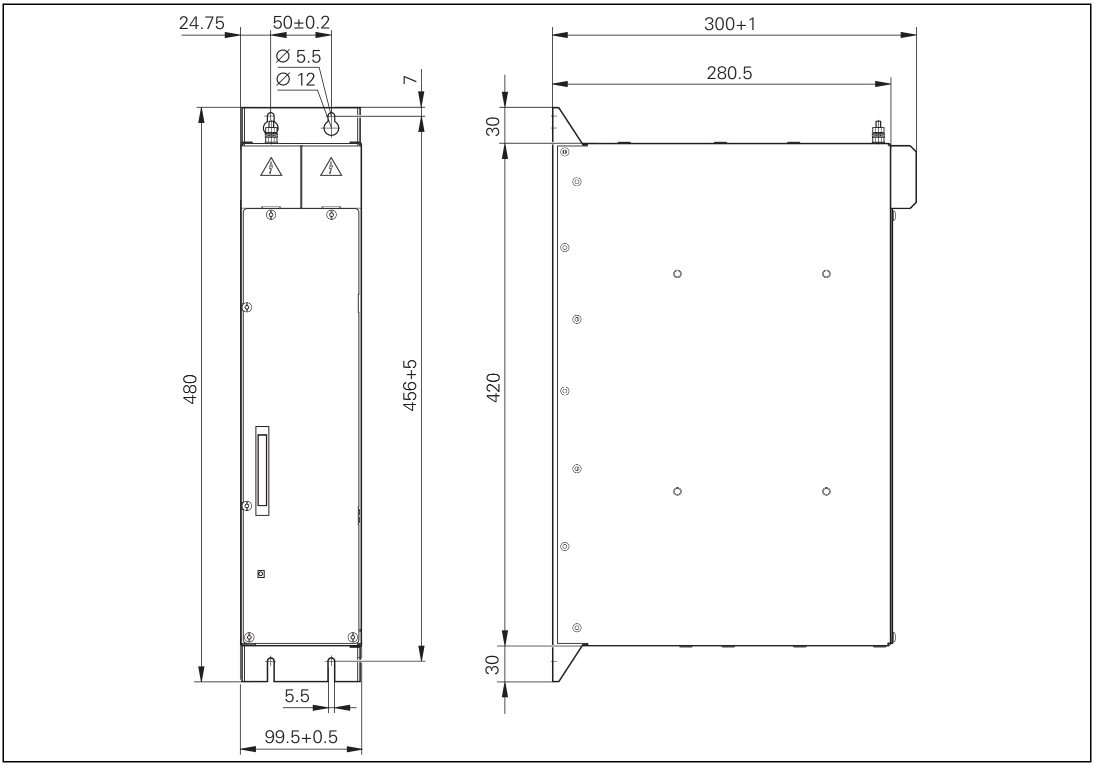


ZKF 140 dc-link filter

The ZKF 140 must be connected with the UVR 1xxD supply unit via the X79 unit bus. When choosing the ZKF, ensure that its rated power is at least as high as the connected torque or linear motors.

Specifications	ZKF 140
Rated power	80 kW
Peak power S6-40%	110 kW[a]
Peak power S6-20%	140 kW[b]
Peak power	160 kW[c]
Max. leakage current	< 6.0 A
Current consumption[d] 24 V	 440 mA
Integral cooling	Yes
Degree of protection	IP 20
Weight	Approx. 15 kg
ID	597 954-01

a. 40% cyclic duration factor for duty cycle time of 10 minutes (S6-40%)
b. 20% cyclic duration factor for duty cycle time of 10 minutes (S6-20%)
c. 4 s cyclic duration factor for duty cycle time of 20 s
d. After making your selection, check the current consumption of the 15 V[*1] and the 24 V[*1] supply of the entire modular inverter system. See page 2 – 54.



1.3 Compact Inverters

- **New UE 21xD diagnosable compact inverters**
  These compact inverters are equipped with a 5-V power pack for supplying the MC/CC. The power pack provides up to 16 A. The X74 connecting terminal for an additional supply of 5 V to the MC/CC is new.
  The UV 105 power supply unit for MC/CC is no longer necessary in combination with these compact inverters!

Specifications

Specifications, nonregenerative compact inverters	UE 210D		UE 211D		
	3 axes	Spindle/axis	2 axes	1 axis	Spindle/axis
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)				
DC-link voltage	565 V– (with supply voltage of 400 V)				
DC-link power Rated power Peak power[a] Peak power[b]	 15 kW 23 kW 40 kW		 15 kW 23 kW 40 kW		
Power loss	Approx. 475 W		Approx. 525 W		
Rated current at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 9.0 A 8.3 A 7.5 A 6.3 A 5.5 A 4.6 A	 24.0 A/18.0 A 22.0 A/16.5 A 20.0 A/15.0 A 16.8 A/12.6 A 14.6 A/11.0 A 12.2 A/9.1 A	 9.0 A 8.3 A 7.5 A 6.3 A 5.5 A 4.6 A	 18.0 A 16.5 A 15.0 A 12.6 A 11.0 A 9.1 A	 24.0 A/18.0 A 22.0 A/16.5 A 20.0 A/15.0 A 16.8 A/12.6 A 14.6 A/11.0 A 12.2 A/9.1 A
Current for S6-40%[c] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz		 36.0 A / - - 33.0 A / - - 30.0 A / - - 25.2 A / - - 21.9 A / - - 18.3 A / - -			 36.0 A / - - 33.0 A / - - 30.0 A / - - 25.2 A / - - 21.9 A / - - 18.3 A / - -
Maximum current[d] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 18.0 A 16.5 A 15.0 A 12.6 A 11.0 A 9.1 A	 36.0 A 33.0 A 30.0 A 25.2 A 21.9 A 18.3 A	 18.0 A 16.5 A 15.0 A 12.6 A 11.0 A 9.1 A	 36.0 A 33.0 A 30.0 A 25.2 A 21.9 A 18.3 A	 36.0 A 33.0 A 30.0 A 25.2 A 21.9 A 18.3 A
Integral braking resistor[e]	1 kW / 27 kW		1 kW / 27 kW		
Load capacity +5 V	16 A		16 A		
Degree of protection	IP 20		IP 20		
Weight	Approx. 20 kg		Approx. 20 kg		
ID	558 302-xx		558 303-xx		

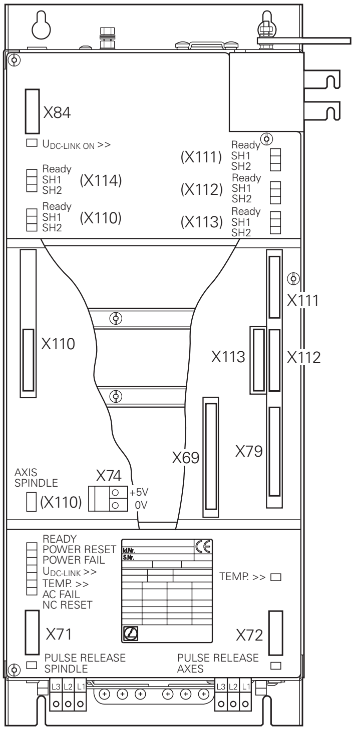
a. 40% cyclic duration factor for duty cycle time of 10 minutes (S6-40%)
b. 4 s cyclic duration factor for duty cycle time of 20 s
c. Spindle: 40% cyclic duration factor for duty cycle time of 10 minutes (S6-40%)
d. Axes: 0.2 s cyclic duration factor for duty cycle time of 10 s with 70% rated current preload
Spindle: 10 s cyclic duration factor for duty cycle time of 60 s with 70% rated current preload
e. 1st value: Continuous power
2nd value: 1.5% cyclic duration factor for duty cycle time of 120 s

Specifications, nonregenerative compact inverters	UE 212D		
	3 axes	1 axis	Spindle/axis
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)		
DC-link voltage	565 V– (with supply voltage of 400 V)		
DC-link power Rated power Peak power[a] Peak power[b]	 15 kW 23 kW 40 kW		
Power loss	Approx. 595 W		
Rated current at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 9.0 A 8.3 A 7.5 A 6.3 A 5.5 A 4.6 A	 18.0 A 16.5 A 15.0 A 12.6 A 11.0 A 9.1 A	 24.0 A/18.0 A 22.0 A/16.5 A 20.0 A/15.0 A 16.8 A/12.6 A 14.6 A/11.0 A 12.2 A/9.1 A
Current for S6-40%[c] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz			 36.0 A / - - 33.0 A / - - 30.0 A / - - 25.2 A / - - 21.9 A / - - 18.3 A / - -
Maximum current[d] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 18.0 A 16.5 A 15.0 A 12.6 A 11.0 A 9.1 A	 36.0 A 33.0 A 30.0 A 25.2 A 21.9 A 18.3 A	 36.0 A 33.0 A 30.0 A 25.2 A 21.9 A 18.3 A
Integral braking resistor[e]	1 kW / 27 kW		
Load capacity +5 V	16 A		
Degree of protection	IP 20		
Weight	Approx. 20 kg		
ID	558 304-xx		

a. 40% cyclic duration factor for duty cycle time of 10 minutes (S6-40%)
b. 4 s cyclic duration factor for duty cycle time of 20 s
c. Spindle: 40% cyclic duration factor for duty cycle time of 10 minutes (S6-40%)
d. Axes: 0.2 s cyclic duration factor for duty cycle time of 10 s with 70% rated current preload
   Spindle: 10 s cyclic duration factor for duty cycle time of 60 s with 70% rated current preload
e. 1st value: Continuous power
   2nd value: 1.5% cyclic duration factor for duty cycle time of 120 s

Connection overview of UE 210D

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



X31 Power supply for inverter

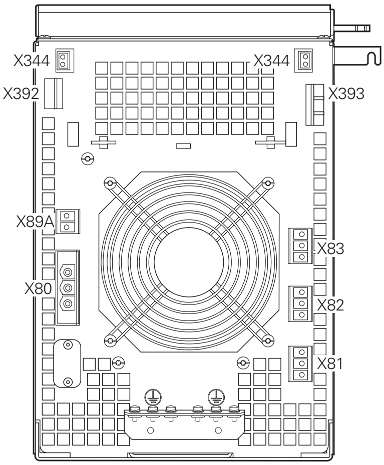
X70 Main contactor

X110 to
X113 PWM connection for axes/spindle

X69 Power supply for control
X79 Unit bus

Sliding switch:
AXIS: X110 is used as axis
SPINDLE: X110 is used as spindle

X71 Safety relay for spindle
X72 Safety relay for axes



X344 24-V supply for motor holding brake
X392 Motor holding brake (X110)
X393 Motor holding brake (X111 to X113)

X89B Internal braking resistor
X89A PW 21x or PW 1x0(B) external braking resistor

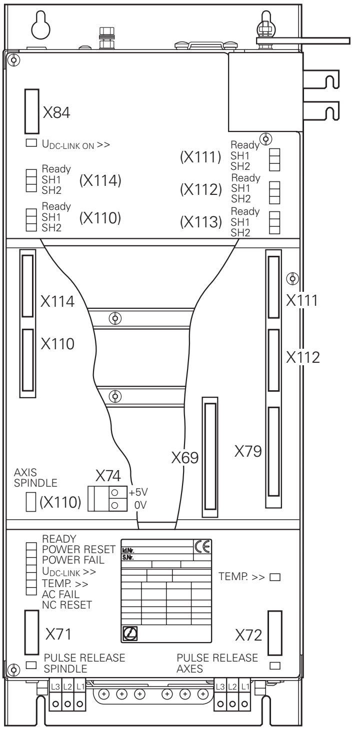
X83 Motor connection for axis 3 (7.5 A)
X80 Motor connection for spindle (20 A)
X82 Motor connection for axis 2 (7.5 A)
X81 Motor connection for axis 1 (7.5 A)

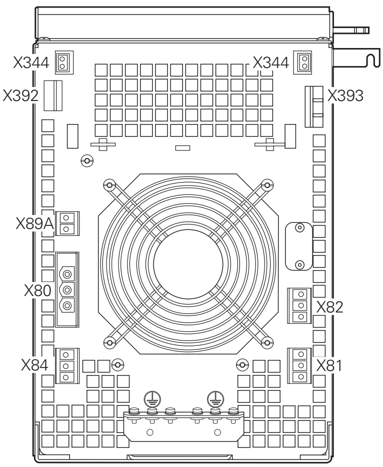
⏚ Ground

Connection overview of UE 211D

Danger

Do not engage or disengage any connecting elements while the unit is under power!





X31 Power supply for inverter

X70 Main contactor

X110 to
X114 PWM connection for axes/spindle

X69 Power supply for control
X79 Unit bus

Sliding switch:
AXIS: X110 is used as axis
SPINDLE: X110 is used as spindle

X71 Safety relay for spindle
X72 Safety relay for axes

X344 24-V supply for motor holding brake
X392 Motor holding brake (X110, X114)
X393 Motor holding brake (X111, X113)

X89B Internal braking resistor
X89A PW 21x or PW 1x0(B) external braking resistor

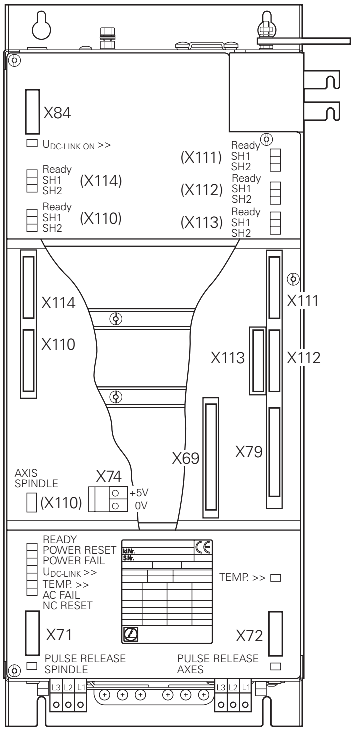
X80 Motor connection for spindle (20 A)
X82 Motor connection for axis 2 (7.5 A)
X84 Motor connection for axis 3 (15 A)
X81 Motor connection for axis 1 (7.5 A)

⏚ Ground

Connection overview of UE 212D

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X31 Power supply for inverter

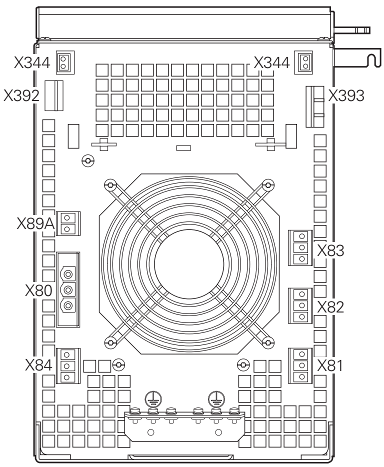
X70 Main contactor

X110 to
X114 PWM connection for axes/spindle

X69 Power supply for control
X79 Unit bus

Sliding switch:
AXIS: X110 is used as axis
SPINDLE: X110 is used as spindle

X71 Safety relay for spindle
X72 Safety relay for axes



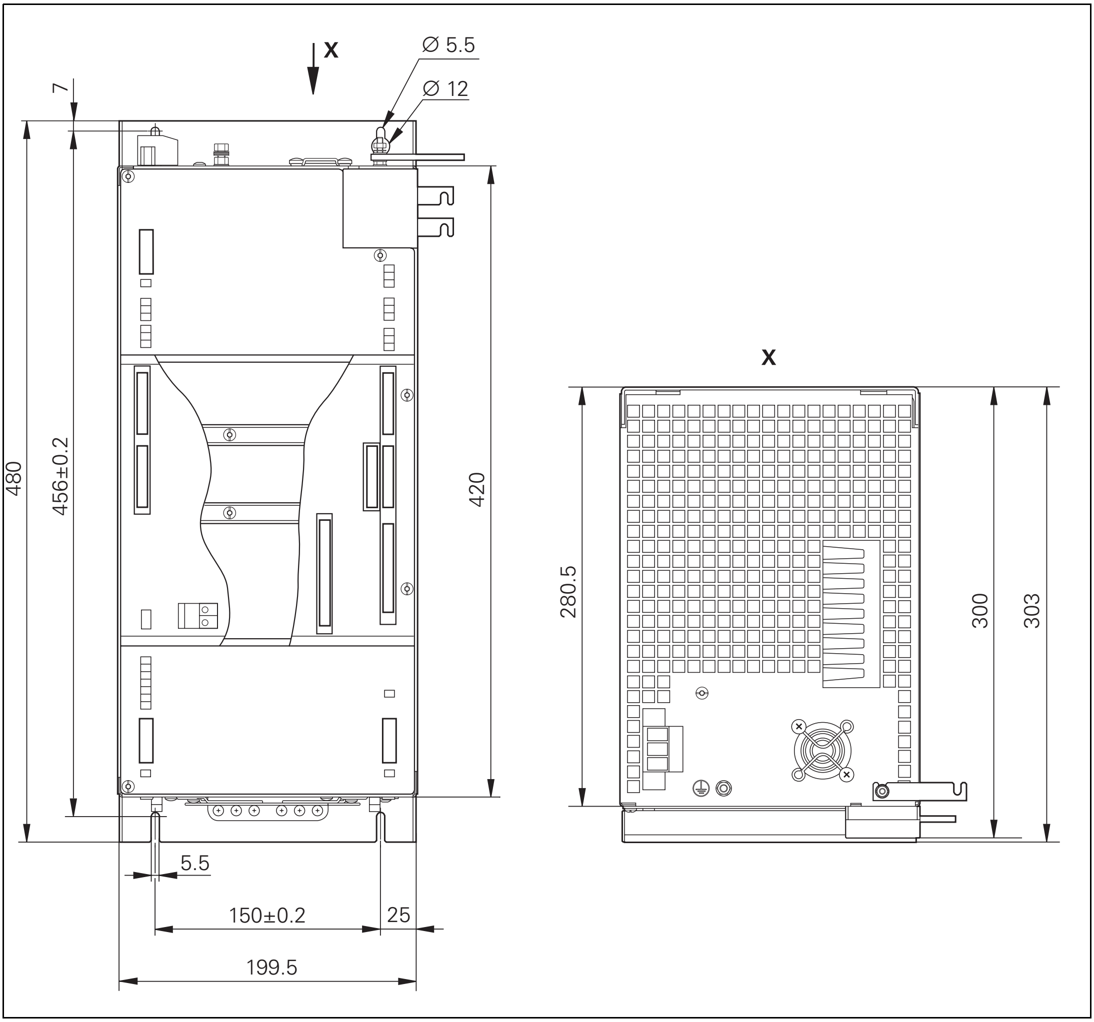
X344 24-V supply for motor holding brake
X392 Motor holding brake (X110, X114)
X393 Motor holding brake (X111 to X113)

X89B Internal braking resistor
X89A PW 21x or PW 1x0(B) external braking resistor

X83 Motor connection for axis 3 (7.5 A)
X80 Motor connection for spindle (20 A)
X82 Motor connection for axis 2 (7.5 A)
X84 Motor connection for axis 4 (15 A)
X81 Motor connection for axis 1 (7.5 A)

⏚ Ground

Dimensions of UE 21xD



1.4 Motors

Appropriate storage of motors

If motors are stored for an extended period of time, the motors must be turned – either by hand or by supplying them with a power suitable for low rotational speeds – for at least one minute at intervals of no more than 12 months. The motor shaft must not be touched without wearing gloves in order to prevent corrosion.

Please keep the following in mind when putting into operation motors that received maintenance at regular intervals:

- The motor must be subjected to an insulation test before use.
- The motor must be run-in slowly by increasing the speed in steps of 1500 rpm up to the maximum speed and maintaining each speed for 10 minutes.

If motors have been stored for more than two years without maintenance, the motor should be returned to the manufacturer for inspection before it is used.

Warning

Inappropriate storage of motors causes service costs!

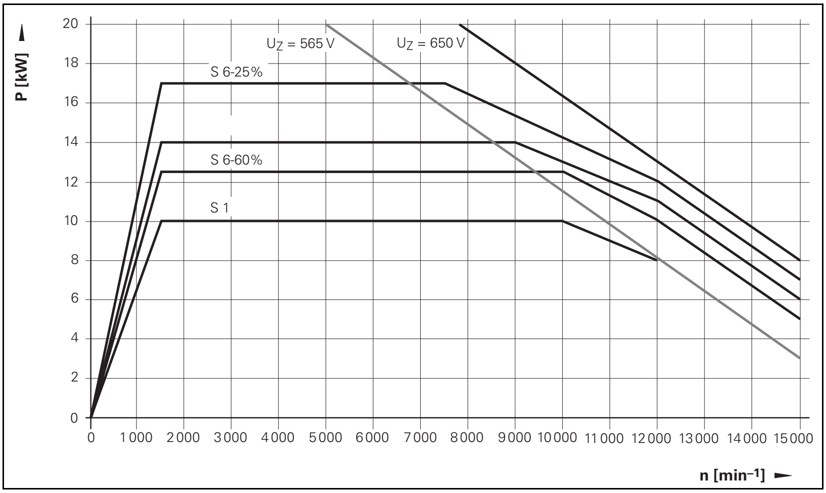
■ **New QAN 200UH/15000 hollow shaft motor**

The new hollow shaft motor has special spindle bearings which permit a maximum speed (= continuous speed) of 15000 rpm.

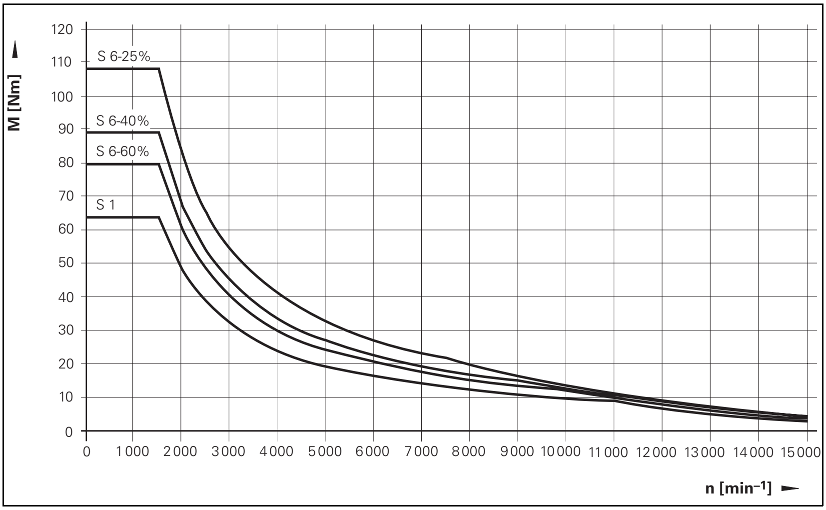
	QAN 200UH/15000
Fan	+
Holding brake	–
Rated voltage U_N	330 V
Rated power output P_N	10 kW
Rated speed n_N	1500 min^{-1}
Rated torque M_N (105 K)	63.7 Nm
Rated current I_N (105 K)	25.0 A
Efficiency η	0.85
Maximum speed n_{max} with spindle bearing	15000 min^{-1}
Maximum current I_{max}	44 A
Pole pairs PP	2
Weight m	83 kg
Rotor inertia J	0.0405 kgm^2
ID	536 257-43
Fan	
Rated voltage for fan U_L	3 x 400 V
Rated current for fan I_L	0.2 A
Frequency f_L	50 Hz/60 Hz

Operating mode	S1	S6-60%	S6-40%	S6-25%
Speed n	1500 min^{-1} 11000 min^{-1} 12000 min^{-1} 15000 min^{-1}	1500 min^{-1} 9800 min^{-1} 12000 min^{-1} 15000 min^{-1}	1500 min^{-1} 9000 min^{-1} 12000 min^{-1} 15000 min^{-1}	1500 min^{-1} 7500 min^{-1} 12000 min^{-1} 15000 min^{-1}
Power P	10 kW 10 kW 8.0 kW 4.0 kW	12.5 kW 12.5 kW 10.0 kW 5.0 kW	14.0 kW 14.0 kW 11.0 kW 6.0 kW	17.0 kW 17.0 kW 12.0 kW 7.0 kW
Torque M	63.9 Nm 8.7 Nm 6.4 Nm 2.5 Nm	79.8 Nm 11.9 Nm 8.0 Nm 3.2 Nm	89.4 Nm 19.1 Nm 8.8 Nm 3.8 Nm	108.6 Nm 21.7 Nm 9.5 Nm 4.6 Nm
Current I (for 1500 min^{-1})	25 A	29 A	32 A	37 A

Power characteristic curve



Torque characteristic curve

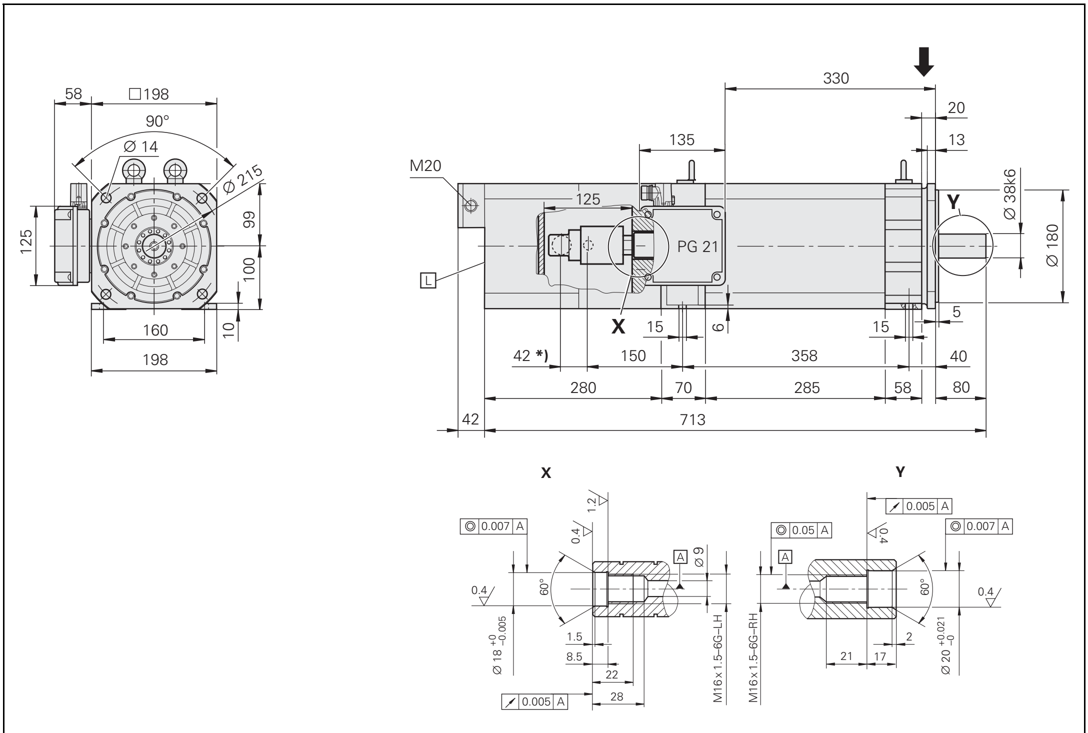


Dimensions

Note

All dimensions are in millimeters [mm].

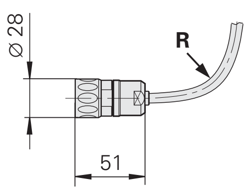
QAN 200UH/15000



L = Air outlet on both sides

*) = Coolant connection on right side (e.g. Deublin 1109-020-188)

Connector for speed encoder



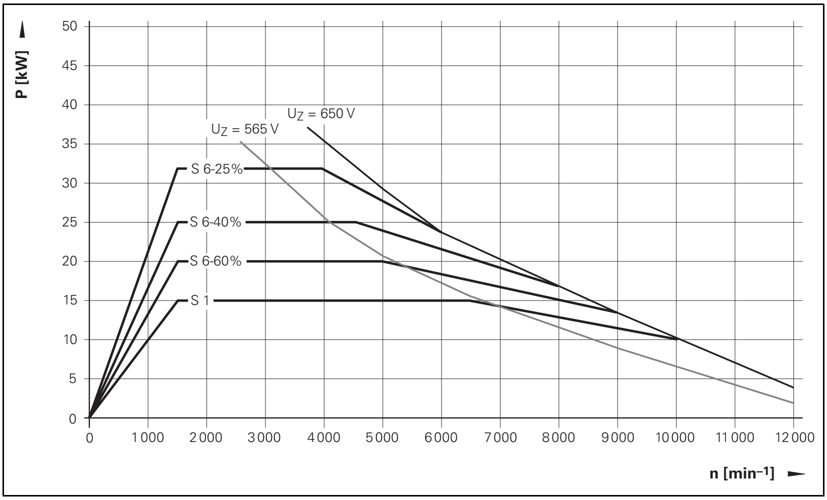
- **New QAN 260M/12000 und QAN 260L/12000 asynchronous motors**
  The new asynchronous motors have special spindle bearings which permit a maximum speed (= continuous speed) of 12000 rpm.

	QAN 260M/12000	QAN 260L/12000
Fan	+	+
Holding brake	–	–
Rated voltage U_N	348 V	331 V
Rated power output P_N	15 kW	20 kW
Rated speed n_N	1500 min^{-1}	1500 min^{-1}
Rated torque M_N (105 K)	95.5 Nm	127.3 Nm
Rated current I_N (105 K)	35.0 A	46.0 A
Efficiency η	0.85	0.85
Maximum speed n_{max} with spindle bearing	12000 min^{-1}	12000 min^{-1}
Maximum current I_{max}	70 A	96 A
Pole pairs PP	2	2
Weight m	112 kg	135 kg
Rotor inertia J	0.0700 kgm^2	0.0920 kgm^2
ID	510 019-33	510 020-33
Fan		
Rated voltage for fan U_L	3 x 400 V	3 x 400 V
Rated current for fan I_L	0.35 A	0.35 A
Frequency f_L	50 Hz/60 Hz	50 Hz/60 Hz

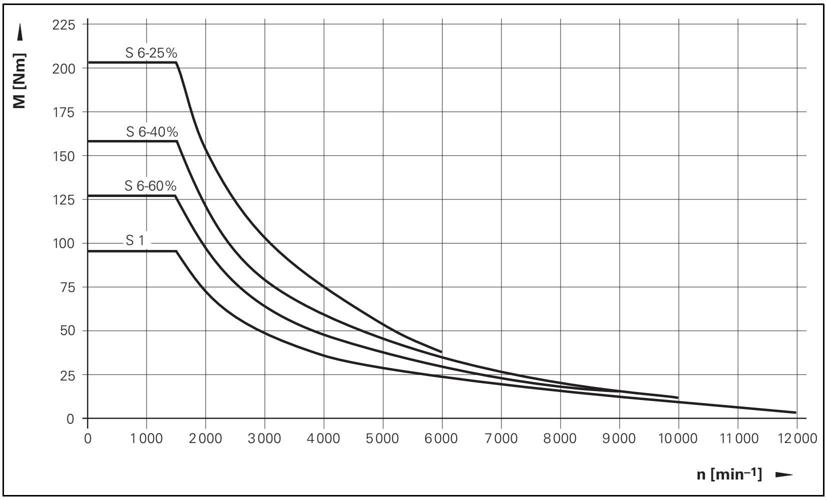
Power and torque characteristics for QAN 260M, QAN 260M/12000

Operating mode	S1	S6-60%	S6-40%	S6-25%
Speed n	1500 min^{-1} 6500 min^{-1} 10000 min^{-1} 12000 min^{-1}	1500 min^{-1} 5000 min^{-1} 9000 min^{-1} - - -	1500 min^{-1} 4500 min^{-1} 8000 min^{-1} - - -	1500 min^{-1} 4000 min^{-1} 6000 min^{-1} - - -
Power P	15.0 kW 15.0 kW 10.0 kW 4.0 kW	20.0 kW 20.0 kW 13.5 kW - - -	25.0 kW 25.0 kW 16.8 kW - - -	32.0 kW 32.0 kW 23.7 kW - - -
Torque M	95.5 Nm 22.0 Nm 9.5 Nm 3.2 Nm	127.3 Nm 38.2 Nm 14.3 Nm - - -	159.2 Nm 53.1 Nm 20.1 Nm - - -	203.7 Nm 76.4 Nm 37.7 Nm - - -
Current I (for 1500 min^{-1})	35.0 A	43.3 A	52.3 A	65.0 A

Power characteristic curve



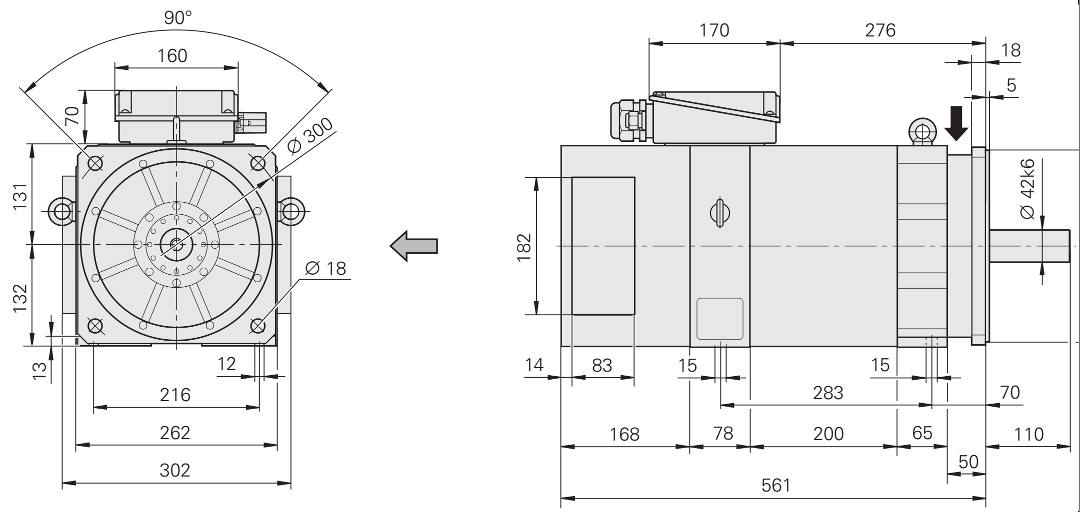
Torque characteristic curve



Dimensions

> **Note**
>
> All dimensions are in millimeters [mm].

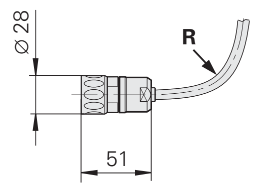
QAN 260M/12000



Air current of the fan

Fixed bearing

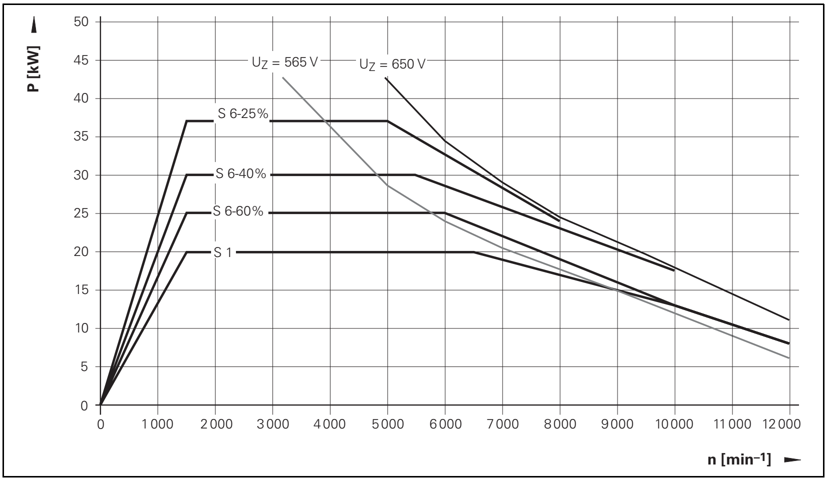
Connector for speed encoder



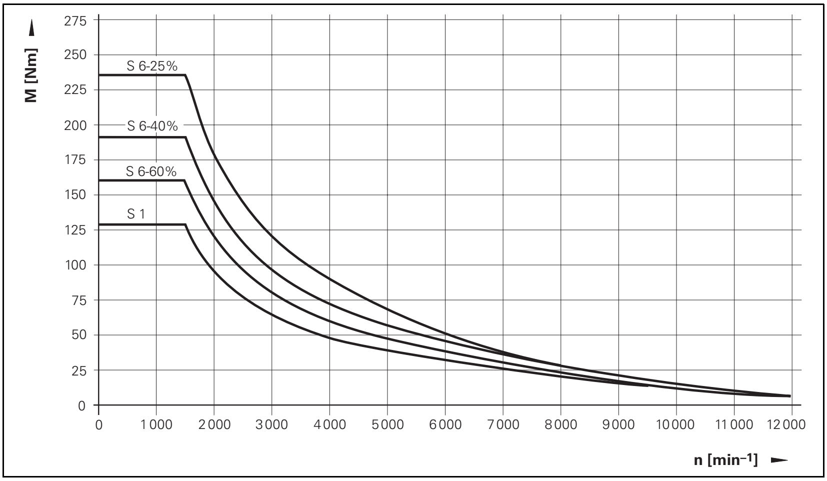
Power and torque characteristics for QAN 260L, QAN 260L/12000

Operating mode	S1	S6-60%	S6-40%	S6-25%
Speed n	1500 min^{-1} 6500 min^{-1} 10000 min^{-1} 12000 min^{-1}	1500 min^{-1} 6000 min^{-1} 10000 min^{-1} 12000 min^{-1}	1500 min^{-1} 5500 min^{-1} 10000 min^{-1} - - -	1500 min^{-1} 5000 min^{-1} 8000 min^{-1} - - -
Power P	20.0 kW 20.0 kW 13.0 kW 8.0 kW	25.0 kW 25.0 kW 16.0 kW 8.0 kW	30.0 kW 30.0 kW 17.5 kW - - -	37.0 kW 37.0 kW 24.0 kW - - -
Torque M	127.3 Nm 29.4 Nm 12.4 Nm 6.4 Nm	159.2 Nm 39.4 Nm 15.3 Nm 6.4 Nm	191.0 Nm 52.1 Nm 16.7 Nm - - -	235.5 Nm 70.7 Nm 28.6 Nm - - -
Current I (for 1500 min^{-1})	46.0 A	56.0 A	65.0 A	79.0 A

Power characteristic curve



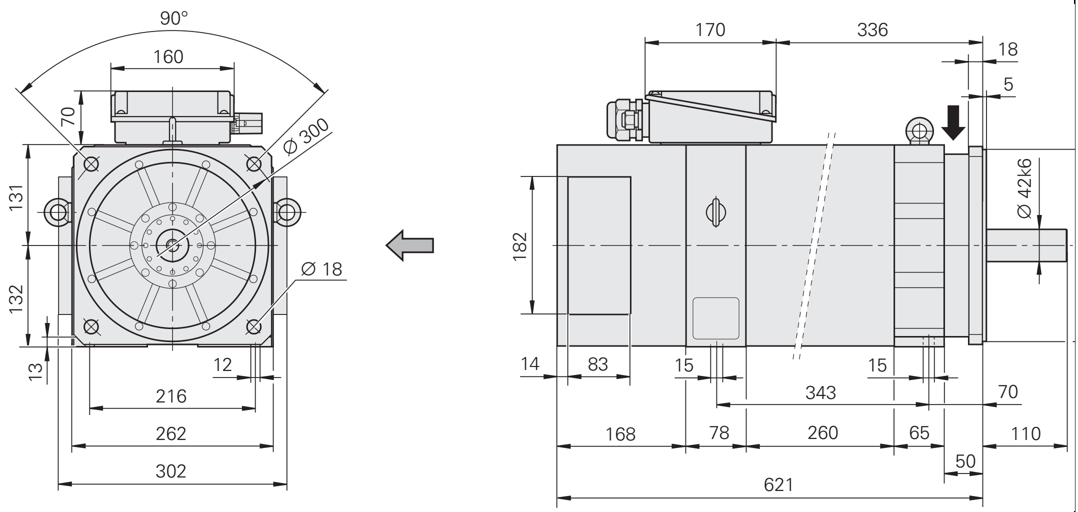
Torque characteristic curve

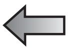


Dimensions

> **Note**
>
> All dimensions are in millimeters [mm].

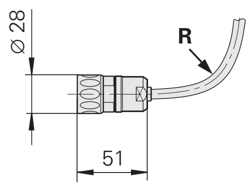
QAN 260L/12000





Air current of the fan

Fixed bearing

Connector for speed encoder


2 Overview of Inverters and Accessories

2 Overview of Inverters and Accessories

2.1 General Information

This Technical Manual describes all of the inverter components and motors that are necessary for a complete HEIDENHAIN drive system.

The drive systems can be used in connection with the HEIDENHAIN iTNC 530, TNC 4xx M contouring controls and the CNC PILOT 4290, MANUALplus 4110 lathe controls.
You will find the specifications for the controls in the corresponding Technical Manuals.

2.1.1 Designation of Inverter Systems

The inverter components are designated according to the system described below:

Designation code	
UM 121 B D	Meaning of the designation
D	Optional: Module with electronic ID label[a]
121 B	Module name
UM	Module type - UE Non-regenerative compact inverter - UR Regenerative compact inverter - UV Non-regenerative power supply unit (except for UV 120 and UV 140) - UVR Regenerative power supply unit - UM Inverter module (power module with IGBTs)

a. See "Electronic ID Labels" on page 7 – 4.

2.1.2 Electronic ID Labels

All inverter components of type D, as well as new motors with EnDat interface, are equipped with electronic ID labels which ensure automatic recognition and integration of these components by the control. When the control is first started, it already recognizes the motors, inverters and power supply units in the system and adapts the machine parameters automatically to the respective requirements. Each further time the control starts up, the data are read out again and compared to the entries in the machine parameters.

This data is stored in the electronic ID labels:

- Designation of unit
- Part number (ID)
- Serial number (SN)

2.2 Overview of Inverter Systems

2.2.1 Non-Regenerative Compact Inverters

Overview of non-regenerative compact inverters	Axis number	Axis current (in A) at 5 kHz	Spindle (in A) at 5 kHz	Rated power
■ **UE 110 – (page 2 – 11)**	3 + spindle	6[a]	24[a]	10 kW
■ **UE 112 – (page 2 – 11)**	4 + spindle	6 / 9 [a]	24[a]	10 kW
■ **UE 210 – (page 2 – 14)**	3	7.5	19	13 kW
■ **UE 212 – (page 2 – 14)**	4	7.5 / 14	19	13 kW
■ **UE 230 – (page 2 – 14)**	2	7.5	31	20 kW
■ **UE 240 – (page 2 – 14)**	3	7.5	31	20 kW
■ **UE 242 – (page 2 – 14)**	4	7.5 / 23	31	20 kW
■ **UE 210B – (page 2 – 16)**	4	7.5 / 15	20	15 kW
■ **UE 211B – (page 2 – 16)**	4	7.5 / 15 / 15	20	15 kW
■ **UE 212B – (page 2 – 17)**	5	7.5 / 15 / 15	20	15 kW
■ **UE 230B – (page 2 – 17)**	3	7.5 / 23	31	22 kW
■ **UE 240B – (page 2 – 18)**	4	7.5 / 23	31	22 kW
■ **UE 242B – (page 2 – 18)**	5	7.5 / 23 / 23	31	22 kW

a. Data for a PWM frequency of 3.33 kHz

2.2.2 Regenerative Compact Inverters

Overview of regenerative compact inverters	Axis number[a]	Axis current (in A)[b]	Spindle 1/2/3 (in A)[b]	Rated power
■ **UR 230 – (page 2 – 21)**	2 / 1	7.5 / 25	35 / – / –	22 kW
■ **UR 230D – (page 2 – 21)**	2 / 1	7.5 / 25	35 / – / –	22 kW
■ **UR 240 – (page 2 – 22)**	3 / 1	7.5 / 25	10 / 35 / –	22 kW
■ **UR 240D – (page 2 – 22)**	3 / 1	7.5 / 25	10 / 35 / –	22 kW
■ **UR 242 – (page 2 – 23)**	3 / 1 / 1	7.5 / 25 / 25	10 / 35 / 35	22 kW
■ **UR 242D – (page 2 – 24)**	3 / 1 / 1	7.5 / 25 / 25	10 / 35 / 35	22 kW

a. Depending on setting of operating mode switch (axis/spindle)
b. Data for a PWM frequency of 5 kHz

2.2.3 Non-Regenerative Power Supply Units

Non-regenerative power supply units	Load capacity (in A)			Rated power
	5 V	15 V *1	24 V *1	
■ **UV 130 – (page 2 – 36)**	8.5	1.5	2.0	30 kW
■ **UV 130D – (page 2 – 36)**	29	3.5	4.0	30 kW

2.2.4 Regenerative Power Supply Units

Regenerative power supply units	Load capacity (in A)			Rated power
	5 V	15 V *1	24 V *1	
■ **UV 120 – (page 2 – 39)**	8.5	1.5	2.0	22 kW
■ **UVR 120D – (page 2 – 39)**	29	3.5	4.0	22 kW
■ **UVR 130D – (page 2 – 39)**	29	3.5	4.0	30 kW
■ **UV 140 – (page 2 – 40)**	8.5	1.5	2.0	45 kW
■ **UVR 140D – (page 2 – 40)**	29	3.5	4.0	45 kW
■ **UVR 150 – (page 2 – 40)**	8.5	1.5	2.0	50 kW
■ **UVR 150D – (page 2 – 40)**	29	3.5	4.0	55 kW
■ **UVR 160D – (page 2 – 41)**	29	3.5	4.0	80 kW
■ **UVR 160DW – (page 2 – 41)**	29	3.5	4.0	80 kW

2.2.5 Inverter Modules

Inverter modules	Rated current in A[a]	
	Axis	Axis/Spindle[b]
1 axis		
■ **UM 111 – (page 2 – 44)**	7.5	
■ **UM 111D – (page 2 – 44)**	7.5	
1 axis/spindle		
■ **UM 111B – (page 2 – 44)**	–	15 / 20
■ **UM 111BD – (page 2 – 45)**	–	15 / 20
■ **UM 112 – (page 2 – 45)**	–	23 / 31
■ **UM 112D – (page 2 – 45)**	–	25 / 34
■ **UM 113 – (page 2 – 46)**	–	32 / 50
■ **UM 113D – (page 2 – 46)**	–	40 / 56
■ **UM 114 – (page 2 – 46)**	–	48 / 75
■ **UM 114D – (page 2 – 47)**	–	60 / 90
■ **UM 115 – (page 2 – 47)**	–	70 / 100
■ **UM 115D – (page 2 – 47)**	–	96 / 125
■ **UM 116DW – (page 2 – 48)**	–	150 / 211
2 axes		
■ **UM 121 – (page 2 – 49)**	7.5	7.5 / –
■ **UM 121D – (page 2 – 49)**	7.5	7.5 / –
1 axis—1 axis/spindle		
■ **UM 121B – (page 2 – 49)**	15	15 / 20
■ **UM 121BDa – (page 2 – 50)**	15	15 / 20
■ **UM 122 – (page 2 – 50)**	23	23 / 31
■ **UM 122Da – (page 2 – 50)**	25	25 / 34

a. Data for a PWM frequency of 5 kHz
b. Depending on setting of operating mode switch (axis/spindle)

2.2.6 Accessories

Further components—which are described in the corresponding chapters—might be necessary for a complete inverter system.

Overview of accessories
■ PW 21x, PW 110(B), PW 120 Braking Resistors – (page 2 – 61)
■ UP 110 Braking Resistor Module – (page 2 – 67)
■ Line Filters – (page 2 – 70)
■ Three-Phase Capacitor – (page 2 – 74)
■ KDR 1x0(B) Commutating Reactor – (page 2 – 76)
■ ZKF 1x0 DC-Link Filter – (page 2 – 83)
■ SM 1xx Voltage Protection Module – (page 2 – 89)
■ Coolant Connection – (page 2 – 93)
■ Adapter Module – (page 2 – 94)
■ Axis-Enabling Module – (page 2 – 97)

2.3 Compact Inverters

Compact inverters are available for up to 4 axes plus spindle or up to five axes.

2.3.1 Components of the Compact Inverter

For operation with the non-regenerative HEIDENHAIN **UE 1xx** compact inverters, you need the following components:

- UE 1xx compact inverter
- Toroidal cores for interference suppression

For operation with the non-regenerative HEIDENHAIN **UE 2xx** compact inverters, you need the following components:

- UE 2xx compact inverter
- PW 21x (or PW 110(B), PW 120) braking resistor (optional)
- Toroidal cores for interference suppression
- UV 102 power module (only LE 426 M)

For operation with the non-regenerative HEIDENHAIN **UE 2xxB** compact inverters, you need the following components:

- UE 2xxB compact inverter
- PW 21x (or PW 110(B)) braking resistor (optional)
- Toroidal cores for interference suppression
- One UM 111D power module (optional)
- Ribbon cables for PWM signals and supply voltage (and optional unit bus)
- Covers for the ribbon cables

For operation with the regenerative HEIDENHAIN **UR 2xx** compact inverters, you need the following components:

- UR 2xx compact inverter
- Commutating reactor
- 120
- EPCOS 35 A line filter
- UP 110 braking resistor module (optional)
- One UM 111D power module (optional)
- In conjunction with direct drives (only via additional power module): One ZKF 1xx
- Ribbon cables for PWM signals and supply voltage (and optional unit bus)
- Covers for the ribbon cables

2.3.2 UE1xx Compact Inverter

With UE 1xx compact inverters, the power electronics for all of the axes and the spindle, as well as the power supply for the control are all contained in a single unit. The UE 1xx models are non-regenerative compact inverters with integral braking resistor.
The PWM signals are transferred via external 20-line ribbon cables.

UE 112

> **Note**
>
> It is not possible to connect an external braking resistor or an additional UM xxx inverter module to the UE 1xx compact inverters.

Specifications, non-regenerative compact inverters	**UE 110**		**UE 112**		
	3 axes	**Spindle**	**3 axes**	**1 axis**	**Spindle**
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz) 3 x 480 V~ ± 10% (50 Hz to 60 Hz)				
DC-link voltage	565 V– (with supply voltage of 400 V) 678 V– (with supply voltage of 480 V)				
DC-link power Rated power Peak power[a] Peak power[b]	 10 kW 15 kW 20 kW		 10 kW 15 kW 20 kW		
Power loss	Approx. 450 W		Approx. 450 W		
Rated current at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	6.0 A 5.5 A 5.0 A 4.2 A 3.65 A 3.0 A	24.0 A 22.0 A 20.0 A 16.8 A 14.6 A 12.2 A	6.0 A 5.5 A 5.0 A 4.2 A 3.65 A 3.0 A	9.0 A 8.3 A 7.5 A 6.3 A 5.5 A 4.6 A	24.0 A 22.0 A 20.0 A 16.8 A 14.6 A 12.2 A
Current for S6-40%[c] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz		36.0 A 33.0 A 30.0 A 25.2 A 21.9 A 18.3 A			36.0 A 33.0 A 20.0 A 16.8 A 14.6 A 12.2 A
Maximum current[d] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	12.0 A 11.0 A 10.0 A 8.4 A 7.3 A 6.0 A	36.0 A 33.0 A 30.0 A 25.2 A 21.9 A 18.3 A	12.0 A 11.0 A 10.0 A 8.4 A 7.3 A 6.0 A	18.0 A 16.5 A 15.0 A 12.6 A 11 A 9.2 A	36.0 A 33.0 A 30.0 A 25.2 A 21.9 A 18.3 A
Int. braking resistor[e]	1 kW / 27 kW		1 kW / 27 kW		
Load capacity +5 V at X69	10 A		10 A		
Degree of protection	IP 20		IP 20		
Weight	Approx. 20 kg		Approx. 20 kg		
ID	375 713-xx		375 715-xx		
Connection overview	Page 5–4				
Connection	Page 4–31, Page 5–48				
Dimensions	Page 5–72				

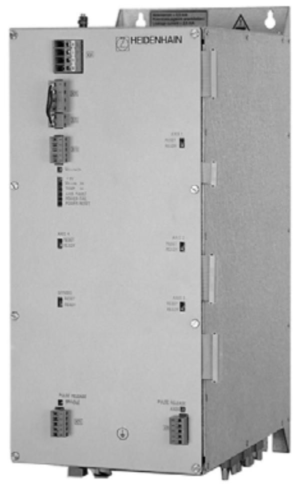
a. 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. 4 s cyclic duration factor for duration of 20 s
c. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
d. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;
e. 1st value: Continuous power
2nd value: 1.5% cyclic duration factor for duration of 120 s

Changes to UE 110	
375 713-02	UE 110 initial version

Changes to UE 112	
375 715-02	UE 112 initial version

2.3.3 UE 2xx Compact Inverter

With the non-regenerative UE 2xx compact inverters, the power electronics for all of the axes and the spindle, as well as the power supply for the control are all contained in a single unit. The PWM signals are transferred via **internal** 20-line ribbon cables.
If you are using an LE 426 M, you will require in addition the UV 102 power supply unit.



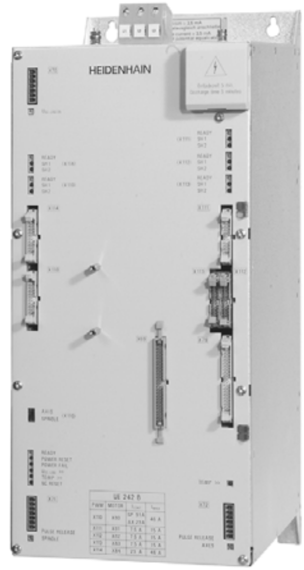
UE 212

Specifications, non-regenerative compact inverters	**UE 210**	**UE 212**	**UE 230**	**UE 240**	**UE 242**
Power supply	3 x 400 V~ ± 10% 50 Hz to 60 Hz				
Power consumption Rated power Peak power	13 kW 18 kW		20 kW 27.5 kW		
Power loss	Approx. 435 W	Approx. 555 W	Approx. 510 W	Approx. 580 W	Approx. 760 W
DC-link voltage	565 V– (with supply voltage of 400 V)				
Rated current 3 axes 1 axis spindle	7.5 A – 19 A	7.5 A 14 A 19 A	2 x 7.5 A – 31 A	7.5 A – 31 A	7.5 A 23 A 31 A
Maximum current[a] 3 axes 1 axis Spindle	15 A – 28.5 A	15 A 28.5 A 28.5 A	2 x 15 A – 46 A	15 A – 46 A	15 A 46 A 46 A
Integral braking resistor[b]	1 kW / 23 kW		–	–	–
Degree of protection	IP 20				
Weight	20 kg		23 kg		
ID	313 500-xx	313 501-xx	329 037-xx	313 502-xx	313 503-xx
Connection overview	Page 5–5	Page 5–6	Page 5–7	Page 5–8	Page 5–9
Connection	Page 4–31, Page 5–42				
Dimensions	Page 5–73				

a. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
b. 1st value: Continuous power
2nd value: 0.4% cyclic duration factor for duration of 120 s

2.3.4 UE 2xxB Compact Inverter

With the non-regenerative UE 2xx B compact inverters, the power electronics for all of the axes and the spindle, as well as the power supply for the control are all contained in a single unit. An additional UM 111D power module of the modular inverter system can be connected via conductor bar.
The PWM signals are transferred via **external** 20-line ribbon cables.



UE 242B

Specifications, non-regenerative compact inverters	UE 210B		UE 211B		
	3 axes	Spindle/Axis	2 axes	1 axis	Spindle/Axis
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)				
DC-link voltage	565 V– (with supply voltage of 400 V)				
DC-link power Rated power Peak power[a] Peak power[b]	15 kW 23 kW 40 kW		15 kW 23 kW 40 kW		
Power loss	Approx. 475 W		Approx. 525 W		
Rated current at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	9.0 A 8.3 A 7.5 A 6.4 A 5.3 A 4.5 A	24.5 A/18.4 A 22.5 A/16.9 A 20.0 A/15.0 A 17.0 A/12.8 A 14.5 A/10.9 A 12.0 A/9.0 A	9.0 A 8.3 A 7.5 A 6.4 A 5.3 A 4.5 A	18.4 A 16.9 A 15.0 A 12.8 A 10.9 A 9.0 A	24.5 A/18.4 A 22.5 A/16.9 A 20.0 A/15.0 A 17.0 A/12.8 A 14.5 A/10.9 A 12.0 A/9.0 A
Current for S6-40%[c] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz		30.0 A / - - 30.0 A / - - 30.0 A / - - 25.5 A / - - 21.8 A / - - 18.0 A / - -			30.0 A / - - 30.0 A / - - 30.0 A / - - 25.5 A / - - 21.8 A / - - 18.0 A / - -
Maximum current[d] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	15.0 A 15.0 A 15.0 A 12.8 A 10.6 A 9.0 A	30.0 A 30.0 A 30.0 A 25.5 A 21.8 A 18.0 A	15.0 A 15.0 A 15.0 A 12.8 A 10.6 A 9.0 A	30.0 A 30.0 A 30.0 A 25.5 A 21.8 A 18.0 A	30.0 A 30.0 A 30.0 A 25.5 A 21.8 A 18.0 A
Integral braking resistor[e]	1 kW / 27 kW		1 kW / 27 kW		
Load capacity +5 V	8.5 A		8.5 A		
Degree of protection	IP 20		IP 20		
Weight	Approx. 20 kg		Approx. 20 kg		
ID	337 042-xx		337 043-xx		
Connection overview	Page 5–10		Page 5–11		
Connection	Page 4–31, Page 5–54				
Dimensions	Page 5–74				

a. 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. 4 s cyclic duration factor for duration of 20 s
c. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
d. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
   Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;
e. 1st value: Continuous power
   2nd value: 1.5% cyclic duration factor for duration of 120 s

Specifications, non-regenerative compact inverters	UE 212B			UE 230B	
	3 axes	1 axis	Spindle/Axis	2 axes	Spindle/Axis
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)				
DC-link voltage	565 V– (with supply voltage of 400 V)				
DC-link power					
Rated power	15 kW			22 kW	
Peak power[a]	23 kW			30 kW	
Peak power[b]	40 kW			45 kW	
Power loss	Approx. 595 W			Approx. 520 W	
Rated current at a PWM frequency of 3333 Hz	9.0 A	18.4 A	24.5 A/18.4 A	9.0 A	38.0 A/28.2 A
4000 Hz	8.3 A	16.9 A	22.5 A/16.9 A	8.3 A	35.0 A/26.0 A
5000 Hz	7.5 A	15.0 A	20.0 A/15.0 A	7.5 A	31.0 A/23.0 A
6666 Hz	6.4 A	12.8 A	17.0 A/12.8 A	6.4 A	26.0 A/19.3 A
8000 Hz	5.3 A	10.9 A	14.5 A/10.9 A	5.3 A	22.5 A/16.7 A
10000 Hz	4.5 A	9.0 A	12.0 A/9.0 A	4.5 A	19.0 A/14.1 A
Current for S6-40%[c] at a PWM frequency of 3333 Hz			30.0 A / - -		46.0 A / - -
4000 Hz			30.0 A / - -		46.0 A / - -
5000 Hz			30.0 A / - -		46.0 A / - -
6666 Hz			25.5 A / - -		38.6 A / - -
8000 Hz			21.8 A / - -		33.4 A / - -
10000 Hz			18.0 A / - -		28.2 A / - -
Maximum current[d] at a PWM frequency of 3333 Hz	15.0 A	30.0 A	30.0 A	15.0 A	46.0 A
4000 Hz	15.0 A	30.0 A	30.0 A	15.0 A	46.0 A
5000 Hz	15.0 A	30.0 A	30.0 A	15.0 A	46.0 A
6666 Hz	12.8 A	25.5 A	25.5 A	12.8 A	38.6 A
8000 Hz	10.6 A	21.8 A	21.8 A	10.6 A	33.4 A
10000 Hz	9.0 A	18.0 A	18.0 A	9.0 A	28.2 A
Integral braking resistor[e]	1 kW / 27 kW			–	
Load capacity +5 V	8.5 A			8.5 A	
Degree of protection	IP 20			IP 20	
Weight	Approx. 20 kg			Approx. 23 kg	
ID	337 044-xx			337 038-xx	
Connection overview	Page 5–12			Page 5–13	
Connection	Page 4–31 , Page 5–54				
Dimensions	Page 5–74				

a. 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. 4 s cyclic duration factor for duration of 20 s
c. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
d. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;
e. 1st value: Continuous power
2nd value: 1.5% cyclic duration factor for duration of 120 s

Specifications, non-regenerative compact inverters	UE 240B		UE 242B		
	3 axes	Spindle/Axis	3 axes	1 axis	Spindle/Axis
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)				
DC-link voltage	565 V– (with supply voltage of 400 V)				
DC-link power Rated power Peak power[a] Peak power[b]	 22 kW 30 kW 45 kW		 22 kW 30 kW 45 kW		
Power loss	Approx. 590 W		Approx. 770 W		
Rated current at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	9.0 A 8.3 A 7.5 A 6.4 A 5.3 A 4.5 A	38.0 A/28.2 A 35.0 A/26.0 A 31.0 A/23.0 A 26.0 A/19.3 A 22.5 A/16.7 A 19.0 A/14.1 A	9.0 A 8.3 A 7.5 A 6.4 A 5.3 A 4.5 A	28.2 A 26.0 A 23.0 A 19.3 A 16.7 A 14.1 A	38.0 A/28.2 A 35.0 A/26.0 A 31.0 A/23.0 A 26.0 A/19.3 A 22.5 A/16.7 A 19.0 A/14.1 A
Current for S6-40%[c] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz		46.0 A / - - 46.0 A / - - 46.0 A / - - 38.6 A / - - 33.4 A / - - 28.2 A / - -			46.0 A / - - 46.0 A / - - 46.0 A / - - 38.6 A / - - 33.4 A / - - 28.2 A / - -
Maximum current[d] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	15.0 A 15.0 A 15.0 A 12.8 A 10.6 A 9.0 A	46.0 A 46.0 A 46.0 A 38.6 A 33.4 A 28.2 A	15.0 A 15.0 A 15.0 A 12.8 A 10.6 A 9.0 A	46.0 A 46.0 A 46.0 A 38.6 A 33.4 A 28.2 A	46.0 A 46.0 A 46.0 A 38.6 A 33.4 A 28.2 A
Load capacity +5 V	8.5 A		8.5 A		
Degree of protection	IP 20		IP 20		
Weight	Approx. 23 kg		Approx. 23 kg		
ID	337 039-xx		337 041-xx		
Connection overview	Page 5–14		Page 5–15		
Connection	Page 4–31, Page 5–54				
Dimensions	Page 5–74				

a. 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. 4 s cyclic duration factor for duration of 20 s
c. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
d. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;

Changes to UE 210B	
337 042-02	UE 210 B initial version

Changes to UE 211B	
337 043-02	UE 211 B initial version

Changes to UE 212B	
337 044-02	UE 212 B initial version

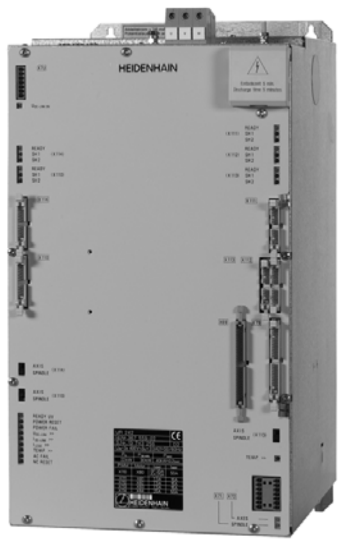
Changes to UE 230B	
337 038-02	UE 230 B initial version
337 038-03	New connections for motor brakes and sliding switches

Changes to UE 240B	
337 039-02	UE 240 B initial version
337 039-03	New connections for motor brakes and sliding switches

Changes to UE 242B	
337 041-02	UE 240 B initial version
337 041-03	New connections for motor brakes and sliding switches

2.3.5 UR 2xx(D) Compact Inverter

With the regenerative UR 2xx(D) compact inverters, the power electronics for all of the axes and the spindle, as well as the power supply for the control are all contained in a single unit. An additional UM 111(D) power module of the modular inverter system can be connected via conductor bar. The PWM signals are transferred via external 20-line ribbon cables.



UR 242

> **Warning**
>
> Direct drives (linear motors, torque motors) must not be connected directly to regenerative UR 2xx(D) compact inverters →Danger of destruction! Direct drives may be used only in conjunction with an additional power module, e.g. the UM 111D, which is connected to the dc-link of the UR 2xx(D) via a ZKF 1xx.

Specifications, regenerative compact inverters	UR 230		UR 230D[a]	
	2 axes	Spindle/Axis	2 axes	Spindle/Axis
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)			
DC-link voltage	650 V–			
DC-link power Rated power Peak power[b] Peak power[c]	 22 kW 30 kW 40 kW		 22 kW 30 kW 40 kW	
Power loss	Approx. 680 W		Approx. 750 W	
Rated current at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	9.0 A 8.3 A 7.5 A 6.4 A 5.3 A 4.5 A	42.5 A/30.4 A 39.5 A/28.3 A 35.0 A/25.0 A 29.5 A/21.1 A 25.0 A/17.9 A 21.5 A/15.4 A	9.0 A 8.3 A 7.5 A 6.3 A 5.5 A 4.6 A	42.5 A/30.0 A 38.5 A/27.5 A 35.0 A/25.0 A 29.5 A/21.0 A 25.0 A/18.3 A 21.5 A/15.3 A
Current for S6-40%[d] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz		50.0 A / - - 50.0 A / - - 50.0 A / - - 42.0 A / - - 36.0 A / - - 31.0 A / - -		60.0 A / - - 55.0 A / - - 50.0 A / - - 42.0 A / - - 36.5 A / - - 30.5 A / - -
Maximum current[e] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	15.0 A 15.0 A 15.0 A 12.8 A 10.6 A 9.0 A	50.0 A 50.0 A 50.0 A 42.0 A 36.0 A 31.0 A	18.0 A 16.5 A 15.0 A 12.6 A 11.0 A 9.2 A	60.0 A 55.0 A 50.0 A 42.0 A 36.5 A 30.5 A
Load capacity +5 V	8.5 A		16 A	
Degree of protection	IP 20		IP 20	
Weight	Approx. 22.5 kg		Approx. 22.5 kg	
ID	362 593-xx		536 561-xx	
Connection overview	Page 5–16		Page 5–17	
Connection	Page 4–30, Page 5–55			
Dimensions	Page 5–75			

a. Available since the beginning of 2005
b. 40% cyclic duration factor for duration of 10 minutes (S6-40%)
c. 0.2 s cyclic duration factor for duration of 5 s
With UR xxxD: 4 s cyclic duration factor for duration of 20 s
d. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
e. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;

Specifications, regenerative compact inverters	UR 240		UR 240D[a]	
	3 axes/spindle	Spindle/Axis	3 axes/spindle	Spindle/Axis
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)			
DC-link voltage	650 V–			
DC-link power Rated power Peak power[b] Peak power[c]	 22 kW 30 kW 40 kW		 22 kW 30 kW 40 kW	
Power loss	Approx. 750 W		Approx. 750 W	
Rated current at a PWM frequency of3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	9.0 A/12.0 A 8.3 A/11.1 A 7.5 A/10.0 A 6.4 A/8.5 A 5.3 A/7.1 A 4.5 A/6.0 A	42.5 A/30.4 A 39.5 A/28.3 A 35.0 A/25.0 A 29.5 A/21.1 A 25.0 A/17.9 A 21.5 A/15.4 A	9.0 A/12.0 A 8.3 A/11.1 A 7.5 A/10.0 A 6.3 A/8.5 A 5.5 A/7.1 A 4.6 A/6.0 A	42.0 A/30.0 A 38.5 A/27.0 A 35.0 A/25.0 A 29.4 A/21.0 A 25.6 A/18.3 A 21.4 A/15.3 A
Current for S6-40%[d] at a PWM frequency of3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz		50.0 A / - - 50.0 A / - - 50.0 A / - - 42.1 A / - - 35.7 A / - - 30.7 A / - -	- - / 18.0 A - - / 16.5 A - - / 15.0 A - - / 12.6 A - - / 11.0 A - - / 9.2 A	60.0 A / - - 55.0 A / - - 50.0 A / - - 42.0 A / - - 36.5 A / - - 30.5 A / - -
Maximum current[e] at a PWM frequency of3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	15.0 A 15.0 A 15.0 A 12.8 A 10.6 A 9.0 A	50.0 A 50.0 A 50.0 A 42.1 A 35.7 A 30.7 A	18.0 A 16.5 A 15.0 A 12.6 A 11.0 A 9.2 A	60.0 A 55.0 A 50.0 A 42.0 A 36.5 A 30.5 A
Load capacity +5 V	8.5 A		16 A	
Degree of protection	IP 20		IP 20	
Weight	Approx. 22.5 kg		Approx. 22.5 kg	
ID	367 558-xx		536 564-xx	
Connection overview	Page 5–18		Page 5–19	
Connection	Page 4–30, Page 5–55			
Dimensions	Page 5–75			

a. Available since the beginning of 2005
b. 40% cyclic duration factor for duration of 10 minutes (S6-40%)
c. 0.2 s cyclic duration factor for duration of 5 s
   With UR xxx D: 4 s cyclic duration factor for duration of 20 s
d. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
e. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
   Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;

Specifications, regenerative compact inverters	UR 242		
	3 axes/spindle	1 axis/spindle	Spindle/Axis
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)		
DC-link voltage	650 V–		
DC-link power Rated power Peak power[a] Peak power[b]	 22 kW 30 kW 40 kW		
Power loss	Approx. 930 W		
Rated current at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 9.0 A/12.0 A 8.3 A/11.1 A 7.5 A/10.0 A 6.4 A/8.5 A 5.3 A/7.1 A 4.5 A/6.0 A	 30.4 A/42.5 A 28.3 A/39.5 A 25.0 A/35.0 A 21.1 A/29.5 A 17.9 A/25.0 A 15.4 A/21.5 A	 42.5 A/30.4 A 39.5 A/28.3 A 35.0 A/25.0 A 29.5 A/21.1 A 25.0 A/17.9 A 21.5 A/15.4 A
Current for S6-40%[c] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 - - / 15.0 A - - / 15.0 A - - / 15.0 A - - / 12.8 A - - / 10.6 A - - / 9.0 A	 - - / 50.0 A - - / 50.0 A - - / 50.0 A - - / 42.0 A - - / 36.0 A - - / 31.0 A	 50.0 A / - - 50.0 A / - - 50.0 A / - - 42.1 A / - - 35.7 A / - - 30.7 A / - -
Maximum current[d] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 15.0 A 15.0 A 15.0 A 12.8 A 10.6 A 9.0 A	 50.0 A 50.0 A 50.0 A 42.0 A 36.0 A 31.0 A	 50.0 A 50.0 A 50.0 A 42.1 A 35.7 A 30.7 A
Load capacity +5 V	8.5 A		
Degree of protection	IP 20		
Weight	Approx. 22.5 kg		
ID	367 559-xx		
Connection overview	Page 5–20		
Connection	Page 4–30, Page 5–55		
Dimensions	Page 5–75		

a. 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. 0.2 s cyclic duration factor for duration of 5 s
c. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
d. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;

Specifications, regenerative compact inverters	UR 242D[a]		
	3 axes/spindle	1 axis/spindle	Spindle/Axis
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)		
DC-link voltage	650 V–		
DC-link power Rated power Peak power[b] Peak power[c]	 22 kW 30 kW 40 kW		
Power loss	Approx. 930 W		
Rated current at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 9.0 A/12.0 A 8.3 A/11.1 A 7.5 A/10.0 A 6.3 A/8.5 A 5.5 A/7.1 A 4.6 A/6.0 A	 30.0 A/42.0 A 27.5 A/38.5 A 25.0 A/35.0 A 21.0 A/29.4 A 18.3 A/25.6 A 15.3 A/21.4 A	 42.0 A/30.0 A 38.5 A/27.5 A 35.0 A/25.0 A 29.4 A/21.0 A 25.6 A/18.3 A 21.4 A/15.3 A
Current for S6-40%[d] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 - - / 18.0 A - - / 16.5 A - - / 15.0 A - - / 12.6 A - - / 11.0 A - - / 9.2 A	 - - / 60.0 A - - / 55.0 A - - / 50.0 A - - / 42.0 A - - / 36.5 A - - / 30.5 A	 60.0 A / - - 55.0 A / - - 50.0 A / - - 42.0 A / - - 36.5 A / - - 30.5 A / - -
Maximum current[e] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 18.0 A 16.5 A 15.0 A 12.6 A 11.0 A 9.2 A	 60.0 A 55.0 A 50.0 A 42.0 A 36.5 A 30.5 A	 60.0 A 55.0 A 50.0 A 42.0 A 36.5 A 30.5 A
Load capacity +5 V	16 A		
Degree of protection	IP 20		
Weight	Approx. 22.5 kg		
ID	536 565-xx		
Connection overview	Page 5–21		
Connection	Page 4–30, Page 5–55		
Dimensions	Page 5–75		

a. Available since the beginning of 2005
b. 40% cyclic duration factor for duration of 10 minutes (S6-40%)
c. 4 s cyclic duration factor for duration of 20 s
d. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
e. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;

Changes to UR 230	
362 593-02	Initial version

Changes to UR 230D	
536 561-01	Initial version

Changes to UR 240	
367 558-02	Initial version

Changes to UR 240D	
536 564-01	Initial version

Changes to UR 242	
367 559-02	Initial version

Changes to UR 242D	
536 565-01	Initial version

2.3.6 UV 106 B Power Supply Unit

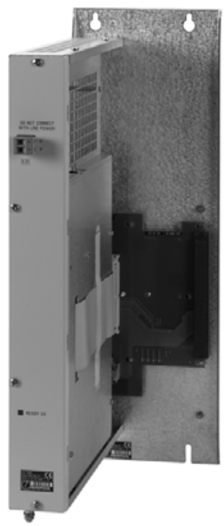
UV 106 B power supply unit for analog HEIDENHAIN contouring controls

The **UV 106 B** power supply unit was designed so that the iTNC 530 could be used with a compact, coordinated system for analog nominal shaft-speed interfaces (+/– 10 V).

It supplies the iTNC 530 with the power necessary for operation.

The **UV 106 B** (ID 546 581-01) is being introduced as a replacement for the **UV 106** (ID 366 572-11).

ID 546 581-01	UV 106 B



UV 106 B

Specifications	UV 106 B
Power supply (at X31)	400 V~ ± 10%[a] 50 Hz
Protection	6.3 A (gR) Siemens Sitor type or 6.3 A (gRL) Siba type
Load capacity (5 V)	20 A
Power consumption	Max. 400 W
Degree of protection	IP 20
Module width	159 mm
Weight	4 kg
ID	546 581-xx
Connection overview	Page 5–27
Connection	Page 5–64
Dimensions	Page 5–76

a. An isolating transformer is not necessary for connecting the UV 106 B

The UV 106 B power supply unit only runs as of software version 340 49x-01 or higher. Pure analog MC 420, MC 422 B or MC 422 C control is only possible together with the UV 106 B power supply unit.

Changes to the UV 106 B	
546 581-01	UV 106 B initial version

2.3.7 UV 105 Power Supply Unit

The power supply for the main computer and controller unit—and therefore also for the connected encoders—is usually covered by the compact inverter or the power supply unit of the modular inverter systems.

If several encoders with a high current consumption (e.g. encoders with EnDat interface) or a dual-processor control with a UE 2xx B compact inverter are connected, however, an additional power supply source might become necessary. The UV 105 power supply unit is used for this purpose.

The UV 105 is connected to the control via a ribbon cable and a 5-V terminal.

The cover for the cable is included in the items supplied.

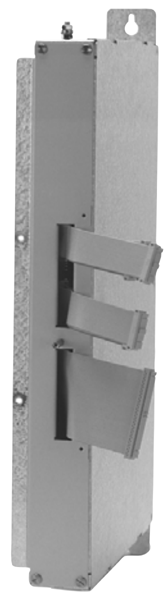
UV 105

Specifications	**UV 105**
Power supply	400 V~ ± 10% 50 Hz to 60 Hz
Load capacity (5 V)	20 A
Power consumption	Approx. 200 W
Degree of protection	IP 20
Module width	50 mm
Weight	4 kg
ID	344 980-xx
Connection overview	Page 5–28
Connection	Page 4–30, Page 4–31, Page 5–65
Dimensions	Page 5–77

Changes to UV 105	
344 980-01	UV 105 initial version
344 980-02	Modification for double-row configuration
344 980-12	Version only for HEIDENHAIN inverters
344 980-13	Version for HEIDENHAIN and non-HEIDENHAIN inverters
344 980-14	Leads and ribbon cables elongated

2.3.8 UV 102 Power Supply Unit

The UV 102 power supply unit is necessary if you are using a UE 2xx (not UE 2xx B) compact inverter with an LE 426 M. It supplies the power to the LE 426 M and leads the external PWM connections of the logic unit to the UE 2xx compact inverter.



UV 102

Specifications	**UV 102**
Power supply	3 x 400 V~ ± 10% 50 Hz to 60 Hz
Power consumption	Approx. 100 W
Degree of protection	IP 20
Weight	3 kg
ID	317 559-02
Connection overview	Page 5–29
Connection	Page 5–68
Dimensions	Page 5–78

2.3.9 Toroidal Cores

To suppress occurrence of interference, toroidal cores must be mounted in the motor leads and in the voltage supply lead if you are using non-regenerative compact inverters. If you are using the UE 21x, you must also integrate toroidal cores in the lead to the braking resistor.

Terminal on the compact inverter	Toroidal core
Power supply (X31)	∅ 87 mm (309 694-02)
Braking resistor (X89)[a]	∅ 42 mm (309 694-01)
Axes 1 to 3 (X81 to X83)	∅ 42 mm (309 694-01)
Axis 4 (X84)	∅ 59 mm (309 694-03)
Spindle (X80)	∅ 59 mm (309 694-03)

a. only for UE 21x

2.3.10 Ribbon Cables and Covers (Only for UE 2xxB, UR 2xx)

50-line ribbon cable (power supply to the control)

The 50-line ribbon cable connects the UE 2xxB or UR 2xx to the control and is responsible for the power supply. It is supplied with the compact inverter (length 300 mm, ID 325 816-01).

20-line ribbon cable (PWM signals)

The 20-line ribbon cable connects the PWM outputs of the control with the PWM connections on the compact inverter. One 20-line ribbon cable is required for each axis/spindle. The 20-line ribbon cables for the connections on the compact inverter are supplied with the compact inverter (length 200 mm, ID 250 479-08; length 400 mm, ID 250 479-10). If you are using an additional UM 111D power module, you will need an additional 20-line ribbon cable:

PWM connection on the UM 111D power module	Length of the 20-line ribbon cable	ID
X111, X112	100 mm	250 479-07

40-line ribbon cable (unit bus)

The 40-line ribbon cable serves as the unit bus. It is required if an additional UM 111 D power module is being operated with the compact inverter.

Unit bus connection	Length of the 40-line ribbon cable	ID
X79	50 mm	325 817-09
	100 mm	325 817-10

Ribbon cable covers

The ribbon cables must be covered to protect them against interference.

The covers for the LE 4xx M and CC 42x are supplied with the LE 4xx M and CC 42x, respectively.
The cover for the compact inverter is included in the items supplied (197.5 mm, ID 325 808-07).
The plastic lateral termination cap has the ID 325 810-01.

If you are using an additional power module, the cover for this module must be ordered separately:

Additional power module	**Length of the cover**	**ID**
Depending on the width of the power module	50 mm	329 031-05
	100 mm	329 031-10

2.4 Modular Inverter

2.4.1 Components of the Modular Inverter

For operation with the modular **non-regenerative** HEIDENHAIN inverters, the following components are required:

- UV(R) 130(D) power supply unit
- UM 1xx(B)D power modules, depending on version
- PW 21x (or PW 110(B), PW 120) braking resistor
- Ribbon cables for PWM signals, unit bus and power supply
- Covers for the ribbon cables

For operation with the modular HEIDENHAIN **regenerative** inverters, the following components are required:

- UV(R) 1x0(D) power supply unit
- KDR 1x0 commutating reactor
- Line filters
- UP 110 braking resistor module (optional)
- UM 1xx(B)D power modules, depending on version
- Ribbon cables for PWM signals, unit bus and power supply
- Covers for the ribbon cables

2.4.2 UV 130(D) Power Supply Unit

The non-regenerative UV 130(D) power supply units supply the dc-link voltage as well as the power for the electronics of the control and power modules.
During braking, the motors feed energy into the dc-link. This energy is converted into heat by the UV 130(D) through the PW 210 or PW 1x0(B) braking resistor.

UV 130

Specifications, non-regenerative power supply units	UV 130	UV 130 D
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)	
DC-link power Rated power Peak power[a] Peak power[b]	 30 kW 40 kW 50 kW	 30 kW 40 kW 60 kW
Power loss	Approx. 140 W	Approx. 140 W
DC-link voltage	565 V– (at 400 V power supply)	
Current consumption 15 V[*1] 24 V[*1]	 240 mA 410 mA	 240 mA 410 mA
Current load[c] 15 V[*1] 24 V[*1]	 1.5 A 2.0 A	 3.5 A 4.0 A
Load capacity +5 V	8.5 A	29 A
Degree of protection	IP 20	
Weight	Approx. 9.8 kg	
ID	324 998-xx	389 311-xx
Connection overview	Page 6–6	Page 6–7
Connection	Page 4–31, Page 6–53	
Dimensions	Page 6–85	

a. 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. 4 s cyclic duration factor for duration of 20 s
c. After making your selection, check the current consumption of the 15 V[*1] and the 24 V[*1] supply of the entire modular inverter system. See page 2 – 54.

Changes to UV 130	
324 998-01	Initial version
324 998-02	Revision
324 998-03	Revision

Changes to the UV 130 D	
389 311-01	Initial version (UV 130 with new power supply unit and additional features for diagnostic functions)

2.4.3 UV(R) 1x0(D) Power Supply Unit

The regenerative UV(R) 1x0(D) power supply units supply the dc-link voltage as well as the power for the electronics of the control and power modules.
During braking, the motors feed energy into the dc-link. The UVR 1x0 D returns this energy to the power line.
The UVR 1x0(D) can be driven only with commutating reactor and line filter.

UVR 140 D

Specifications, regenerative power supply units	**UV 120**	**UVR 120 D**	**UVR 130 D**
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)		
DC-link power Rated power Peak power[a] Peak power	 22 kW 30 kW 40 kW[b]		 30 kW 45 kW 60 kW[c]
Power loss	Approx. 300 W		Approx. 370 W
DC-link voltage	650 V–		
Current consumption[d] 15 V*1 24 V*1	 270 mA 310 mA		
Current load 15 V*1 24 V*1	 1.5 A 2.0 A	 3.5 A 4.0 A	
Load capacity +5 V	8.5 A	29 A	
Degree of protection	IP 20		
Weight	Approx. 12.0 kg		Approx. 12.5 kg
ID	344 504-xx	390 188-xx	377 639-xx
Connection overview	Page 6–4	Page 6–5	Page 6–8
Connection	Page 4–30, Page 6–59		
Dimensions	Page 6–86		

a. 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. 4 s cyclic duration factor for duration of 20 s
c. 0.2 s cyclic duration factor for duration of 5 s
d. After making your selection, check the current consumption of the 15 V*1 and the 24 V*1 supply of the entire modular inverter system. See page 2 – 54.

Specifications, regenerative power supply units	UV 140	UVR 140 D	UVR 150	UVR 150 D
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)			
DC-link power Rated power Peak power[a] Peak power	 45 kW 65 kW 80 kW[b]		 50 kW 75 kW 110 kW[c]	 55 kW 80 kW 110 kW[c]
Power loss	Approx. 570 W		Approx. 640 W	
DC-link voltage	650 V–			
Current consumption[d] 15 V[*1] 24 V[*1]	 380 mA 310 mA		 400 mA 540 mA	
Current load 15 V[*1] 24 V[*1]	 1.5 A 2.0 A	 3.5 A 4.0 A	 1.5 A 2.0 A	 3.5 A 4.0 A
Load capacity +5 V	8.5 A	29 A	8.5 A	29 A
Degree of protection	IP 20			
Weight	Approx. 20.0 kg			
ID	335 009-xx	390 281-xx	384 708-xx	390 421-xx
Connection overview	Page 6–9	Page 6–10	Page 6–12	Page 6–13
Connection	Page 4–30, Page 6–59			
Dimensions	Page 6–87			

a. 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. 4 s cyclic duration factor for duration of 20 s
c. 0.2 s cyclic duration factor for duration of 5 s
d. After making your selection, check the current consumption of the 15 V[*1] and the 24 V[*1] supply of the entire modular inverter system. See page 2 – 54.

Specifications, regenerative power supply units	**UVR 160 D**	**UVR 160 DW**
	Air cooling	**Water cooling**
Power supply	3 x 400 V~ ± 10% (50 Hz to 60 Hz)	3 x 400 V~ ± 10% (50 Hz to 60 Hz)
DC-link power Rated power Peak power[a] Peak power[b]	 80 kW 110 kW 160 kW	 80 kW 110 kW 160 kW
Power loss	Approx. 930 W	
DC-link voltage	650 V–	
Current consumption[c] 15 V*1 24 V*1	 400 mA 1.2 A	 400 mA 0.2 A
Current load 15 V*1 24 V*1	 3.5 A 4.0 A	 3.5 A 4.0 A
Load capacity +5 V	29 A	29A
Degree of protection	IP 20	
Module width	250 mm	200 mm
Weight	Approx. 25.0 kg	Approx. 20.0 kg
ID	530 341-xx	560 106-xx
Accessories	- - -	- - -
Connection overview	Page 6–15	Page 6–14
Connection	Page 4–30, Page 6–59	
Dimensions	Page 6–89	Page 6–88

a. 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. 4 s cyclic duration factor for duration of 20 s
c. After making your selection, check the current consumption of the 15 V*1 and the 24 V*1 supply of the entire modular inverter system. See page 2 – 54.

Changes to the UVR 120 D	
390 188-01	Initial version (UV 120 with new power supply unit and additional features for diagnostic functions)

Changes to the UVR 130 D	
377 639-01	Initial version

Changes to UV 140	
335 009-01	Initial version
335 009-02	Revision
335 009-03	Power supply revised (grounding safety)
335 009-04	Input/output unit and housing revised

Changes to the UVR 140 D	
390 281-01	Initial version (UV 140 with new power supply unit and additional features for diagnostic functions)

Changes to UV 150	
361 170-02	Initial version

Changes to UVR 150	
366 320-01	Initial version (UV 150 with new power supply unit)
384 708-01	Power supply revised (diagnostic function)

Changes to UVR 150D	
390 421-01	Initial version (UVR 150 with additional features for diagnostic functions and increased rated load)

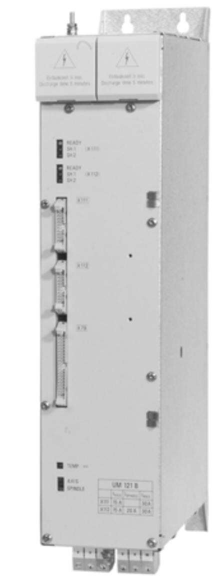
Changes to UV 120	
344 504-01	Initial version
344 504-02	Power supply revised (grounding safety)

Changes to the UVR 160 D	
530 341-01	Initial version

Changes to the UVR 160 DW	
560 106-01	Initial version

2.4.4 UM 1xx(B)(D) Power Modules

The power modules differ in the number of axes and the permissible maximum currents. They can be combined at random. The PWM signals are transferred from the control via external 20-line ribbon cables.



UM 121BD

Specifications	UM 111	UM 111D	UM 111B	
	Axis	Axis	Axis	Spindle
Rated current at a PWM frequency of				
3333 Hz	9.0 A	9.0 A	18.4 A	24.5 A
4000 Hz	8.3 A	8.3 A	16.9 A	22.5 A
5000 Hz	7.5 A	7.5 A	15.0 A	20.0 A
6666 Hz	6.4 A	6.4 A	12.8 A	17.0 A
8000 Hz	5.3 A	5.3 A	10.9 A	14.5 A
10000 Hz	4.5 A	4.5 A	9.0 A	12.0 A
Current for S6-40%[a] at a PWM frequency of 3333 Hz				30.0 A
4000 Hz				30.0 A
5000 Hz				30.0 A
6666 Hz				25.6 A
8000 Hz				21.8 A
10000 Hz				18.0 A
Maximum current[b] at a PWM frequency of				
3333 Hz	15.0 A	18.0 A[c]	30.0 A	
4000 Hz	15.0 A	16.5 A[c]	30.0 A	
5000 Hz	15.0 A	15.0 A	30.0 A	
6666 Hz	12.8 A	12.6 A	25.6 A	
8000 Hz	10.6 A	11.0 A	21.8 A	
10000 Hz	9.0 A	9.2 A	18.0 A	
Power loss	Approx. 70 W		Approx. 120 W	Approx. 160 W
Current consumption[d]				
15 V[*1]	120 mA		150 mA	
24 V[*1]	80 mA		170 mA	
Degree of protection	IP 20			
Weight	Approx. 5.5 kg			
ID	325 000-xx	392 318-xx	336 948-xx	
Connection overview	Page 6–27	Page 6–28	Page 6–29	
Connection	Page 4–34 , Page 6–68			
Dimensions	Page 6–91		Page 6–92	

a. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;
c. Since 2005 (depending on software), before that only the same value as at 5 kHz was possible.
Information available from HEIDENHAIN.
d. After making your selection, check the current consumption of the 15 V[*1] and the 24 V[*1] supply of the entire modular inverter system. See page 2 – 54.

Specifications	UM 111BD		UM 112		UM 112D	
	Axis	Spindle	Axis	Spindle	Axis	Spindle
Rated current at PWM frequency of						
3333 Hz	17.5 A	24.0 A	28.2 A	38.0 A	29.5 A	40.0 A
4000 Hz	16.5 A	22.0 A	26.0 A	35.0 A	27.7 A	37.0 A
5000 Hz	15.0 A	20.0 A	23.0 A	31.0 A	25.0 A	34.0 A
6666 Hz	12.5 A	17.0 A	19.3 A	26.0 A	21.0 A	28.5 A
8000 Hz	10.9 A	15.0 A	16.7 A	22.5 A	18.5 A	25.0 A
10000 Hz	9.0 A	12.0 A	14.1 A	19.0 A	15.5 A	21.0 A
Current at S6-40%[a] at a PWM frequency of						
3333 Hz		35.0 A[b]		46.0 A		59.0 A[b]
4000 Hz		33.0 A[b]		46.0 A		55.0 A[b]
5000 Hz		30.0 A		46.0 A		50.0 A
6666 Hz		25.0 A		38.6 A		42.0 A
8000 Hz		22.0 A		33.4 A		37.0 A
10000 Hz		18.0 A		28.2 A		31.0 A
Maximum current[c] at a PWM frequency of						
3333 Hz	35.0 A[b]		46.0 A		59.0 A[b]	
4000 Hz	33.0 A[b]		46.0 A		55.0 A[b]	
5000 Hz	30.0 A		46.0 A		50.0 A	
6666 Hz	25.0 A		38.6 A		42.0 A	
8000 Hz	22.0 A		33.4 A		37.0 A	
10000 Hz	18.0 A		28.2 A		31.0 A	
Power loss	Approx. 120 W	Approx. 160 W	Approx. 180 W	Approx. 270 W	Approx. 180 W	Approx. 270 W
Current consumption[d]						
15 V[*1]	150 mA		170 mA		140 mA	
24 V[*1]	170 mA		170 mA		170 mA	
Degree of protection	IP 20					
Weight	Approx. 5.5 kg		Approx. 9 kg		Approx. 5.5 kg	
ID	513 035-xx		325 001-xx		519 971-xx	
Connection overview	Page 6–30		Page 6–31		Page 6–32	
Connection	Page 4–34 , Page 6–68					
Dimensions	Page 6–91		Page 6–92			

a. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. Since 2005 (depending on software), before that only the same value as at 5 kHz was possible.
Information available from HEIDENHAIN.
c. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;
d. After making your selection, check the current consumption of the 15 V[*1] and the 24 V[*1] supply of the entire modular inverter system. See page 2 – 54.

Specifications	UM 113		UM 113D		UM 114	
	Axis	Spindle	Axis	Spindle	Axis	Spindle
Rated current at PWM frequency of						
3333 Hz	39.0 A	61.0 A	47.0 A	67.0 A	58.4 A	91.5 A
4000 Hz	36.2 A	56.5 A	44.0 A	62.0 A	54.4 A	85.0 A
5000 Hz	32.0 A	50.0 A	40.0 A	56.0 A	48.0 A	75.0 A
6666 Hz	26.9 A	42.0 A	33.5 A	47.0 A	40.3 A	63.0 A
8000 Hz	23.0 A	36.0 A	29.5 A	41.0 A	34.6 A	54.0 A
10000 Hz	19.5 A	30.5 A	24.5 A	34.0 A	29.4 A	46.0 A
Current at S6-40%[a] at a PWM frequency of						
3333 Hz		64.0 A		88.0 A[b]		96.0 A
4000 Hz		64.0 A		82.0 A[b]		96.0 A
5000 Hz		64.0 A		75.0 A		96.0 A
6666 Hz		53.8 A		63.0 A		81.0 A
8000 Hz		46.0 A		55.0 A		69.0 A
10000 Hz		39.0 A		46.0 A		59.0 A
Maximum current[c] at a PWM frequency of						
3333 Hz	64.0 A		94.0 A[b]		96.0 A	
4000 Hz	64.0 A		88.0 A[b]		96.0 A	
5000 Hz	64.0 A		80.0 A		96.0 A	
6666 Hz	53.8 A		67.0 A		81.0 A	
8000 Hz	46.0 A		59.0 A		69.0 A	
10000 Hz	39.0 A		49.0 A		59.0 A	
Power loss	Approx. 280 W	Approx. 430 W	Approx. 280 W	Approx. 430 W	Approx. 420 W	Approx. 650 W
Current consumption[d]						
15 V[*1]	170 mA		170 mA		250 mA	
24 V[*1]	250 mA		440 mA		440 mA	
Degree of protection	IP 20					
Weight	Approx. 9.0 kg				Approx. 12.0 kg	
ID	325 002-xx		518 703-xx		325 005-xx	
Connection overview	Page 6–33		Page 6–34		Page 6–35	
Connection	Page 4–34 ,Page 6–68					
Dimensions	Page 6–93					

a. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. Since 2005 (depending on software), before that only the same value as at 5 kHz was possible.
Information available from HEIDENHAIN.
c. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;
d. After making your selection, check the current consumption of the 15 V[*1] and the 24 V[*1] supply of the entire modular inverter system. See page 2 – 54.

Specifications	UM 114D		UM 115		UM 115D	
	Axis	Spindle	Axis	Spindle	Axis	Spindle
Rated current at PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 70.0 A 66.0 A 60.0 A 50.5 A 44.0 A 36.5 A	 108.0 A 99.0 A 90.0 A 76.0 A 66.0 A 55.0 A	 85.4 A 79.1 A 70.0 A 58.5 A 50.4 A 42.7 A	 122.0 A 113.0 A 100.0 A 84.0 A 72.0 A 61.0 A	 115.0 A 106.0 A 96.0 A 80.0 A 70.0 A 59.0 A	 150.0 A 138.0 A 125.0 A 105.0 A 92.0 A 76.0 A
Current at S6-40%[a] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz		 125.0 A[b] 116.0 A[b] 105.0 A 88.0 A 77.0 A 64.0 A		 140.0 A 140.0 A 140.0 A 117.6 A 100.8 A 85.4 A		 180.0 A[b] 165.0 A[b] 150.0 A 126.0 A 110.0 A 92.0 A
Maximum current[c] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 140.0 A[b] 132.0 A[b] 120.0 A[b] 101.0 A 88.0 A 73.0 A		 140.0 A 140.0 A 140.0 A 117.6 A 100.8 A 85.4 A		 230.0 A[b] 211.0 A[b] 192.0 A 161.0 A 141.0 A 117.0 A	
Power loss	Approx. 420 W	Approx. 650 W	Approx. 610 W	Approx. 870 W	Approx. 610 W	Approx. 870 W
Current consumption[d] 15 V[*1] 24 V[*1]	 360 mA 440 mA		 440 mA 460 mA			
Degree of protection	IP 20					
Weight	Approx. 12.0 kg		19.0 kg			
ID	510 509-xx		359 385-xx		387 852-xx	
Connection overview	Page 6–36		Page 6–37		Page 6–38	
Connection	Page 4–34 ,Page 6–68					
Dimensions	Page 6–93		Page 6–94			

a. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. Since 2005 (depending on software), before that only the same value as at 5 kHz was possible.
Information available from HEIDENHAIN.
c. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;
d. After making your selection, check the current consumption of the 15 V[*1] and the 24 V[*1] supply of the entire modular inverter system. See page 2 – 54.

Specifications	UM 116DW Water cooling	
	Axis	Spindle
Rated current at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 175.0 A 165.0 A 150.0 A 126.0 A 110.0 A 91.0 A	 250.0 A 231.0 A 211.0 A 176.0 A 154.0 A 128.0 A
Current at S6-40%[a] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz		 275.0 A[b] 253.0 A[b] 230.0 A 193.0 A 169.0 A 140.0 A
Maximum current[c] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 350.0 A[b] 330.0 A[b] 300.0 A 252.0 A 221.0 A 183.0 A	
Power loss	Approx. 1115 W	Approx. 1560 W
Current consumption[d] 15 V[*1] 24 V[*1]	 520 mA 200 mA	
Degree of protection	IP 20	
Weight	Approx. 24.0 kg	
ID	369 629-xx	
Connection overview	Page 6–39	
Connection	Page 4–34, Page 6–68	
Dimensions	Page 6–95	

a. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
b. Since 2005 (depending on software), before that only the same value as at 5 kHz was possible.
Information available from HEIDENHAIN.
c. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;
d. After making your selection, check the current consumption of the 15 V[*1] and the 24 V[*1] supply of the entire modular inverter system. See page 2 – 54.

Specifications	UM 121	UM 121D	UM 121B[a]	
	Axes	Axes	Axis	Spindle
Rated current at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 9.0 A 8.3 A 7.5 A 6.4 A 5.3 A 4.5 A	 9.0 A 8.3 A 7.5 A 6.4 A 5.3 A 4.5 A	 18.4 A 16.9 A 15.0 A 12.8 A 10.9 A 9.0 A	 24.5 A 22.5 A 20.0 A 17.0 A 14.5 A 12.0 A
Current at S6-40%[b] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz				 30.0 A 30.0 A 30.0 A 25.6 A 21.8 A 18.0 A
Maximum current[c] at a PWM frequency of 3333 Hz 4000 Hz 5000 Hz 6666 Hz 8000 Hz 10000 Hz	 15.0 A 15.0 A 15.0 A 12.8 A 10.6 A 9.0 A	 18.0 A[d] 16.6 A[d] 15.0 A 12.8 A 10.6 A 9.0 A	 30.0 A 30.0 A 30.0 A 25.6 A 21.8 A 18.0 A	
Power loss	Approx. 140 W		2 axes: Approx. 240 W 1 axis, 1 spindle: Approx. 280 W	
Current consumption[e] 15 V[*1] 24 V[*1]	 200 mA 160 mA		 250 mA 170 mA	
Degree of protection	IP 20			
Weight	Approx. 5.5 kg			
ID	325 003-xx	392 319-xx	336 949-xx	
Connection overview	Page 6–40	Page 6–41	Page 6–42	
Connection	Page 4–34, Page 6–68			
Dimensions	Page 6–91		Page 6–92	

a. For this power module only the lower PWM connection can be used to control the spindle
b. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
c. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;
d. Since 2005 (depending on software), before that only the same value as at 5 kHz was possible.
Information available from HEIDENHAIN.
e. After making your selection, check the current consumption of the 15 V[*1] and the 24 V[*1] supply of the entire modular inverter system. See page 2 – 54.

Specifications	UM 121BD[a]		UM 122[a]		UM 122D[a]	
	Axes	Spindle	Axis	Spindle	Axis	Spindle
Rated current at PWM frequency of						
3333 Hz	17.5 A	24.5 A	28.2 A	38.0 A	29.5 A	40.0 A
4000 Hz	16.5 A	22.5 A	26.0 A	35.0 A	27.7 A	37.0 A
5000 Hz	15.0 A	20.0 A	23.0 A	31.0 A	25.0 A	34.0 A
6666 Hz	12.8 A	17.0 A	19.3 A	26.0 A	21.0 A	28.5 A
8000 Hz	10.9 A	14.5 A	16.7 A	22.5 A	18.5 A	25.0 A
10000 Hz	9.0 A	12.0 A	14.1 A	19.0 A	15.5 A	21.0 A
Current at S6-40%[b] at a PWM frequency of						
3333 Hz		35.0 A[c]		46.0 A		59.0 A[c]
4000 Hz		33.0 A[c]		46.0 A		55.0 A[c]
5000 Hz		30.0 A		46.0 A		50.0 A
6666 Hz		25.6 A		38.6 A		42.0 A
8000 Hz		21.8 A		33.4 A		37.0 A
10000 Hz		18.0 A		28.2 A		31.0 A
Maximum current[d] at a PWM frequency of						
3333 Hz	35.0 A[c]		46.0 A		59.0 A[c]	
4000 Hz	33.0 A[c]		46.0 A		55.0 A[c]	
5000 Hz	30.0 A		46.0 A		50.0 A	
6666 Hz	25.6 A		38.6 A		42.0 A	
8000 Hz	21.8 A		33.4 A		37.0 A	
10000 Hz	18.0 A		28.2 A		31.0 A	
Power loss	2x axis: approx. 240 W 1 axis, 1 spindle: approx. 280 W		2x axis: approx. 360 W 1 axis, 1 spindle: Approx. 450 W		2x axis: approx. 460 W 1x axis, 1x spindle: approx. 490 W	
Current consumption[e] 15 V[*1] 24 V[*1]	220 mA 140 mA		290 mA 330 mA		240 mA 285 mA	
Degree of protection	IP 20					
Weight	Approx. 5.5 kg		Approx. 9.0 kg		Approx. 5.5 kg	
ID	513 037-xx		325 004-xx		519 972-xx	
Connection overview	Page 6–43		Page 6–44		Page 6–45	
Connection	Page 4–34 ,Page 6–68					
Dimensions	Page 6–92					

a. For this power module only the lower PWM connection can be used to control the spindle.
b. Spindle: 40% cyclic duration factor for duration of 10 minutes (S6-40%)
c. Since 2005 (depending on software), before that only the same value as at 5 kHz was possible.
Information available from HEIDENHAIN.
d. Axes: 0.2 s cyclic duration factor for duration of 10 s with 70% rated current preload;
Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload;
e. After making your selection, check the current consumption of the 15 V[*1] and the 24 V[*1] supply of the entire modular inverter system. See page 2 – 54.

Changes to UM 111	
325 000-01	Initial version
325 000-02	New connections for motor brakes

Changes to the UM 111D	
392 318-01	Initial version (UM 111 with additional features for diagnostic functions)

Changes to the UM 111B	
336 948-02	Initial version
336 948-03	New connections for motor brakes

Changes to the UM 111BD	
513 035-01	Initial version

Changes to UM 112	
325 001-01	Initial version
325 001-02	New connections for motor brakes

Changes to the UM 112D	
519 971-01	Initial version

Changes to UM 113	
325 002-01	Initial version
325 002-02	New connections for motor brakes
325 002-03	Improvement (IGBT)

Changes to the UM 113D	
518 703-01	Initial version

Changes to UM 114	
325 005-01	Initial version
325 005-02	New connections for motor brakes
325 005-12	Improvement (IGBT)

Changes to the UM 114D	
510 509-01	Initial version

Changes to UM 115	
359 385-01	Initial version

Changes to the UM 115 D	
387 852-01	Initial version (UM 115 with additional features for diagnostic functions and increased continuous load)

Changes to the UM 116 DW	
369 629-01	Initial version

Changes to UM 121	
325 003-01	Initial version
325 003-02	New connections for motor brakes

Changes to the UM 121 D	
392 319-01	Initial version (UM 121 with additional features for diagnostic functions)

Changes to the UM 121 B	
336 949-02	Initial version
336 949-03	New connections for motor brakes

Changes to the UM 121 BD	
513 037-01	Initial version

Changes to UM 122	
325 004-01	Initial version
325 004-02	New connections for motor brakes

Changes to the UM 122 D	
519 972-01	Initial version

2.4.5 Current Consumption of the Entire Inverter System

The current consumption by the power modules from the 15 V[*1] and 24 V[*1] supply unit strongly depends on their performance. If several high-performance power modules are used, the maximum permissible current for the supply unit can be exceeded. Therefore the current consumption must be controlled separately for the 15 V[*1] and 24 V[*1] supply units, especially when the UVR 150(D) is used with a UM 115(D). The intrinsic needs of the supply unit must also be taken into account. The current consumption of the individual components is listed in the specifications table. The data specified for current consumption apply for PWM frequencies up to 5 kHz. For PWM frequencies from 5 kHz to 10 kHz, the given values must be multiplied by the following factor:

$$\sqrt{\frac{f}{5kHz}}$$

The following limit values apply:

Power supply units	**15 V[*1] supply**	**24 V[*1] supply**
UV 120, UV 130, UV 140, UV 150	Max. 1.5 A	Max. 2.0 A
UVR 120 D, UVR 130 D, UVR 140 D, UVR 150 D, UVR 160 D(W)	Max. 3.5 A	Max. 4.0 A

Note

The two voltages of 15 V[*1] and 24 V[*1] are supply voltages with basic isolation.

If the total current consumption exceeds **one** limit value, please contact HEIDENHAIN.

Example:

Device	**15 V[*1] supply**	**24 V[*1] supply**
UVR 140D	0.38 A	0.31 A
UM 114D	0.36 A	0.44 A
UM 121BD	0.25 A	0.14 A
UM 121D	0.20 A	0.16 A
UM 111D	0.12 A	0.08 A
Total	1.29 A	1.13 A

2.4.6 Ribbon Cables and Covers

50-line ribbon cable (power supply to the control)

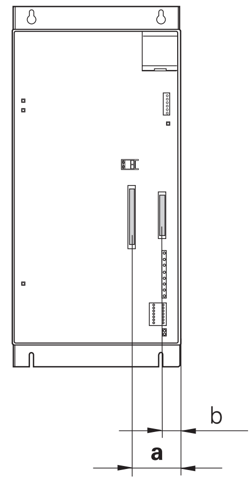
The 50-line ribbon cable connects the UV(R) 1x0(D) with the control and serves as voltage supply. This cable is only required once.

Ribbon cable length	ID
300 mm	325 816-01
400 mm	325 816-02
500 mm	325 816-03
600 mm[a]	325 816-04
700 mm[a]	325 816-05
800 mm[a]	325 816-06

a. With lengths of 600 mm and longer, the ribbon cable is led doubled to increase the line cross section.

How to select the cable length:

- Add the widths of all modules (including UP 110) between
  - UV(R) 1x0(D) and LE 4xx M or CC 42x
  - UV(R) 1x0(D) and UV 105
- UV 130: Add 130 mm to the width and select the next-longer cable length from the table.
- UV(R) 1x0(D): Add 70 mm to the width and select the next-longer cable length from the table.



Device	**Distance *a***	**Distance *b***
UV 120, UVR 120 D, UV 130 D, UV 140, UVR 140 D, UVR 150, UVR 150 D, UVR 160 D(W)	Approx. 50 mm	Approx. 15 mm
UV 130	Approx. 132 mm	Approx. 82 mm

20-line ribbon cable (PWM signals)

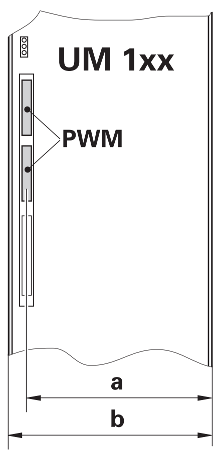
The 20-line ribbon cable connects the PWM outputs of the control with the corresponding UM 1xx(D) power modules. One 20-line ribbon cable is required for each axis or spindle.

Ribbon cable length	ID
100 mm	250 479-07
200 mm	250 479-08
300 mm	250 479-09
400 mm	250 479-10
500 mm	250 479-11
600 mm	250 479-12
700 mm	250 479-13

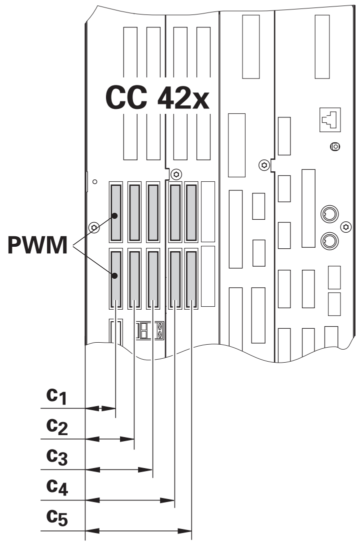
How to select the cable length:

- See the table for distance *a* of the PWM input on the power module.
- Add the widths *b* of all modules (including UP 110 and UV 105) between the corresponding power module and the LE 4xx M or CC 42x.
- Then add the distance c_n of the PWM output on the LE 4xx M or CC 42x.
- Select the next-longer cable length, unless there is an exact match.

Power module	Distance *a*	Module width *b*
UM 111, UM 111 D, UM 111 BD, UM 121, UM 121 D	Approx. 40 mm	50 mm
UM 111 B, UM 121 B, UM 121 BD	Approx. 85 mm	100 mm
UM 112, UM 112 D, UM 113, UM 113 D, UM 114, UM 114 D, UM 122, UM 122 D	Approx. 90 mm	100 mm
UM 115, UM 115 D	Approx. 140 mm	150 mm
UM 116 DW	Approx. 190 mm	200 mm



	c_1	c_2	c_3	c_4	c_5	c_6
LE 4xx M	22 mm	36 mm	50 mm	64 mm	–	–
LE 4xx M	27 mm	41 mm	55 mm	69 mm	83 mm	–
CC 422 / 6 control loops	22 mm	38 mm	55 mm	–	–	–
CC 422 / 10 control loops	28 mm	42 mm	56 mm	71 mm	82 mm	–
CC 422 / 12 control loops	28 mm	42 mm	56 mm	71 mm	82 mm	94 mm
CC 424 / 6 control loops	22 mm	38 mm	55 mm	72 mm	89 mm	–



40-line ribbon cable (unit bus)

The 40-line ribbon cable connects the UV(R) 1x0(D) with all of the UM 1xx(D) power modules (and the UP 110 braking resistor module, if present), making the unit bus. This cable is only required once.

Ribbon cable length	ID
300 mm	325 817-01
400 mm	325 817-02
500 mm	325 817-03
600 mm	325 817-04
700 mm	325 817-05

How to select the cable length:

▶ Add the widths of all modules (including UP 110) between

- UV(R) 1x0(D) and LE 4xx M or CC 42x
- UV(R) 1x0(D) and UV 105

▶ UV 130: Add 80 mm to the width and select the next-longer cable length from the table.

▶ UVR 1x0 D: Select the next-longer cable length, unless there is an exact match.

Ribbon cable covers

The ribbon cables must be covered to protect them against interference.

A cover is supplied as an accessory with the UV(R) 1x0(D) (ID 329 031-03, length 296 mm), which protects the following modules:

- UV(R) 1x0(D)
- One UM 115(D) (width 150 mm) **or**
- One UM 1xx(D) (width 100 mm) and one UM 1xx(D) (width 50 mm)

The covers for the LE 4xx M and CC 42x are supplied with the LE 4xx M and CC 42x, respectively.

If further power modules and the UP 110 resistor module are used, the corresponding covers must be ordered separately:

Width of the cover	**ID**
50 mm	329 031-05
100 mm	329 031-10
150 mm	329 031-15
200 mm	329 031-20

How to select the covers:

▶ Add the widths of all modules (including UP 110) between

- UV(R) 1x0(D) and LE 4xx M or CC 42x
- UV 130 and UV 105

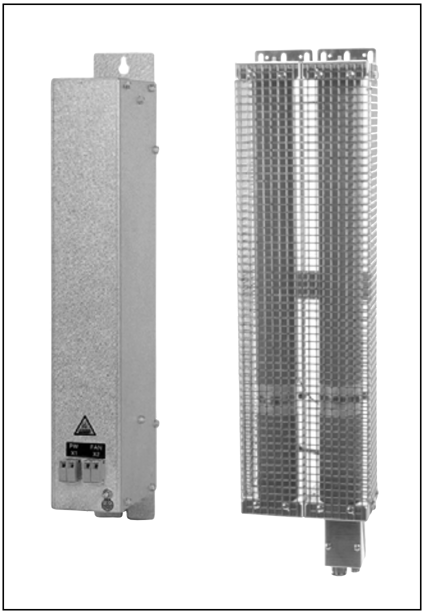
▶ Subtract 150 mm from this total width (cover included with the UV(R) 1x0(D)).

▶ Select the appropriate cover from the table in order to cover the remaining width.

2.5 Accessories for Compact Inverters and Modular Inverters

2.5.1 PW 21x, PW 110(B), PW 120 Braking Resistors

The PW braking resistors convert the energy fed back into the dc-link during braking into heat.
The PW 110(B) and PW 120 have a cooling fan, the PW 21x cools only through heat radiation.
Either one PW x10(B) or two PW 120 switched in series can be connected to the UE 2xx compact inverters.
Either one PW 21x, one PW 1x0(B), two PW 210 in parallel or two PW 110 B in parallel can be connected to the UE 2xx B compact inverters and UV 130 power supply unit.



Specifications	PW 210	PW 211
Continuous power	2 kW (4 kW)[a]	2 kW
Peak power[b]	27 kW (54 kW)[a]	49 kW
Resistance	18 Ω (9 Ω)	10 Ω
Degree of protection	IP 20	IP 20
Weight	5.5 kg	5.5 kg
ID	333 081-01	366 426-01
Connection	Page 5–45, Page 5–61, Page 6–57	
Mounting attitude	Page 4–24	

a. When two PW 210 are connected in parallel
b. 1.5% cyclic duration factor for duration of 120 s

Specifications	PW 110B	PW 120
Continuous power	2 kW	4 kW
Peak power[a]	27 kW	49 kW
Power consumption by the fan	2.5 W	2.4 W
Resistance	18 Ω	10 Ω
Degree of protection	IP 20	IP 20
Weight	6 kg	11 kg
ID	348 945-01	333 000-01
Connection	Page 5–45, Page 5–61, Page 6–57	
Mounting attitude	Page 4–24	

a. PW 110B: 1.5% cyclic duration factor for duration of 120 s
PW 120: 2% cyclic duration factor for duration of 120 s

Danger

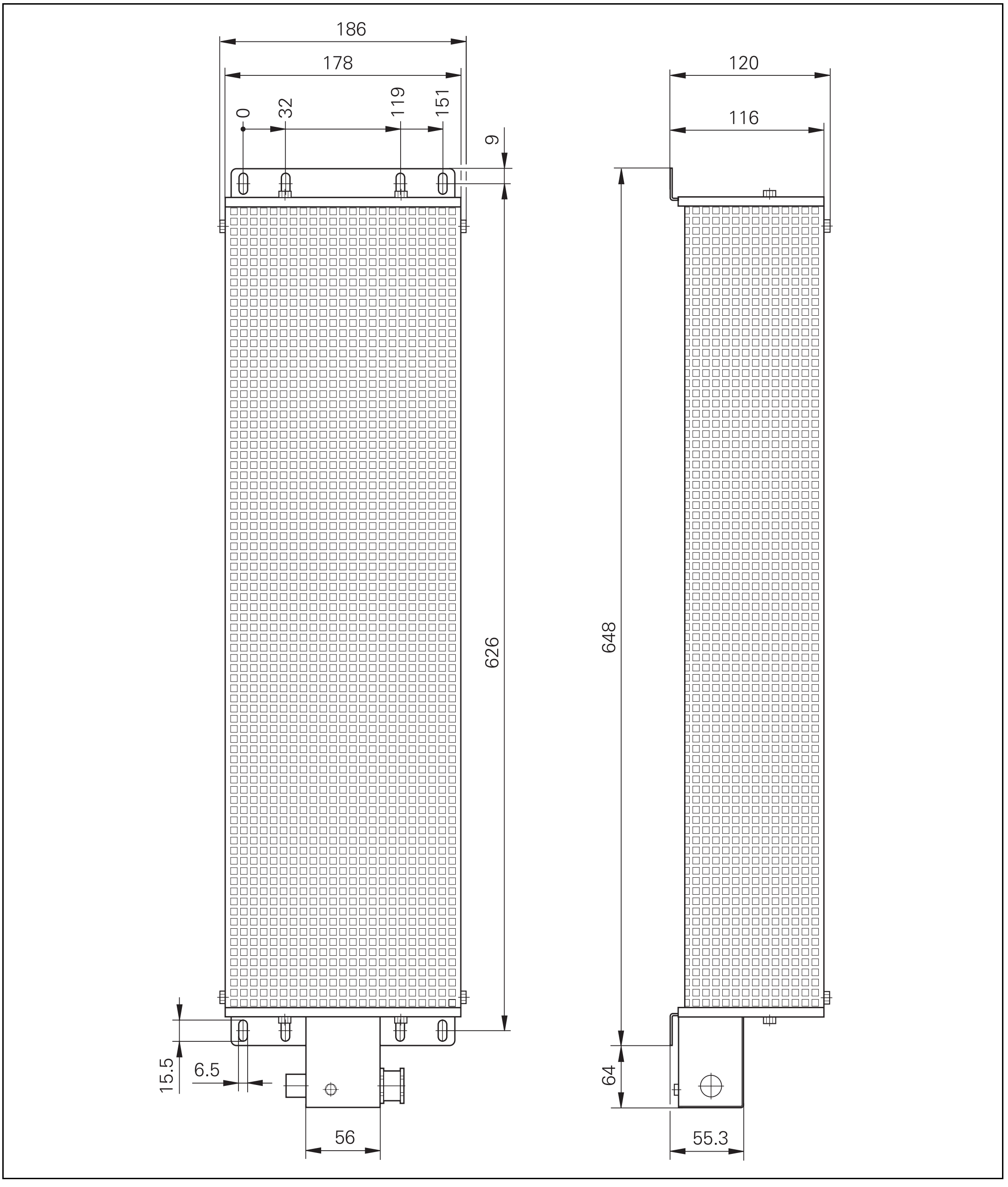
Mount the PW xxx braking resistors in a way that prevents the ingress of splashing water (coolant). At the same time, a cover must be mounted to make personal contact with the braking resistors impossible. The surface of the braking resistor can attain temperatures of up to > 150 °C!

Note

The lines between the compact inverter/power supply unit and the braking resistor may have a length of 15 m.

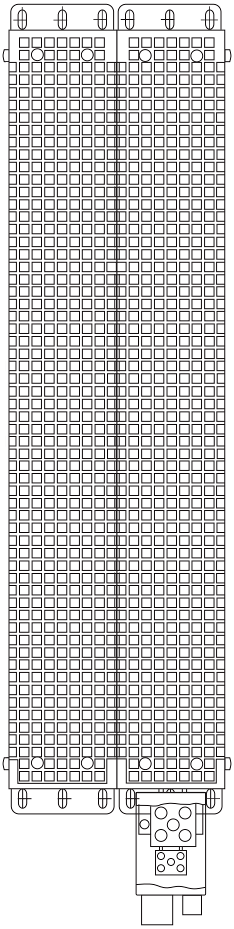
Changes to PW 110	
313 511-01	Initial version
348 945-01	Temperature switch added (PW 110 B)

Dimensions of PW 21x



Connection overview of PW 21x braking resistor

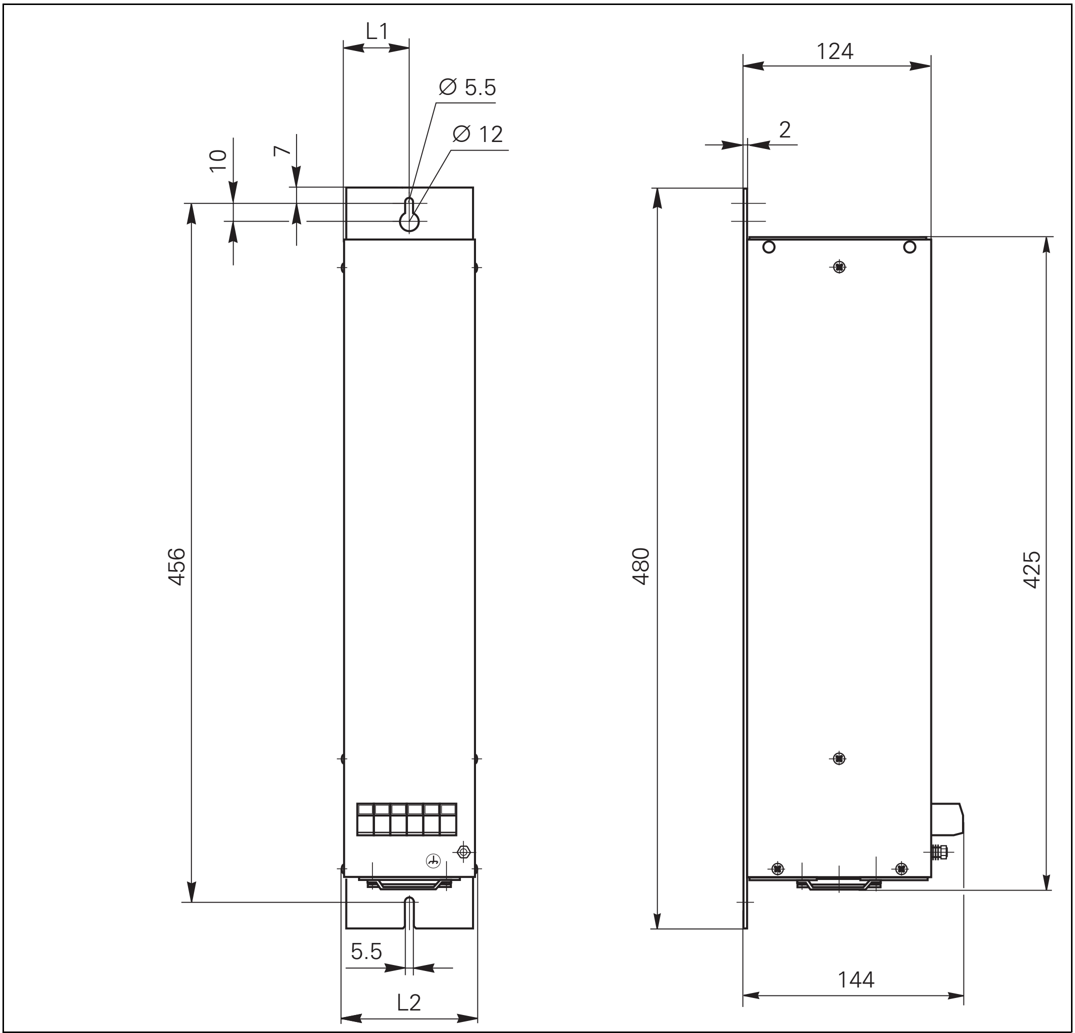
> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



RB1, RB2 Power supply unit

T1, T2 Temperature switch

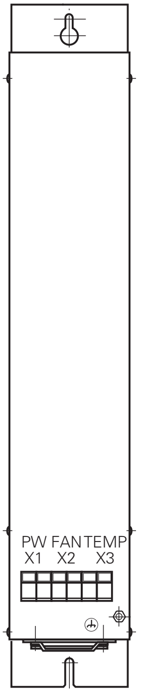
Dimensions of PW 1x0(B)



Value	PW 110(B)	PW 120
L1	38.5	62.5
L2	77	125

Connection overview of PW 1x0(B) braking resistor

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



X1 UV 130 power supply module
X2 Supply voltage for the fan of the braking resistor
X3 Temperature switch

2.5.2 UP 110 Braking Resistor Module

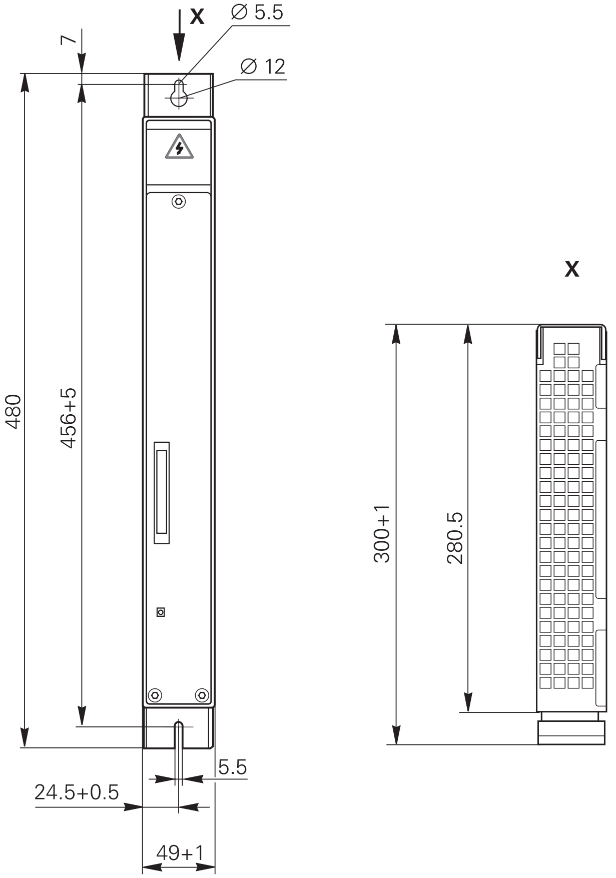
In the energy-recovery inverter, the braking energy of the motors is normally returned to the line power. If in an exceptional case the line power is interrupted, the braking energy cannot be returned. This can lead to an excessive dc-link voltage that might switch off the inverter and let the motors coast without control. To prevent damage to the machine and workpiece resulting from uncontrolled machine movement, the energy should be dissipated with the UP 110 braking resistor module.

In specific cases, a brake integrated in the motor can be sufficient, or coasting to a stop can be considered noncritical (e. g. spindle coasting to a stop while the protective doors are closed). However, it must be considered for each individual application whether this is sufficient.

UP 110

Specifications	**UP 110**
Switching voltage	740 V
Power	60 kW (for 2 s)
Resistance	9 Ω
Degree of protection	IP 20
Weight	7 kg
ID	341 516-01
Connection	Page 4–36, Page 5–69, Page 6–66

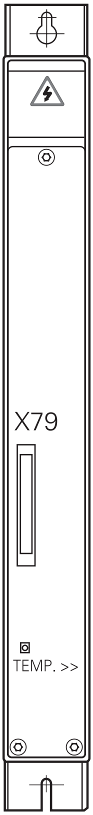
Dimensions of UP 110 braking resistor module



Connection overview of UP 110 braking resistor module

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X79 Unit bus

TEMP. >>
Warning signal for excessive temperature of braking resistor

2.5.3 Line Filters

If you are using regenerative inverter systems, you must use a line filter in addition to the commutating reactor. Line filters suppress interference and ensure EMC-compatible energy recovery. The line filter must be connected between the power line and the commutating reactor.

The size of the line filter depends on the power module used.

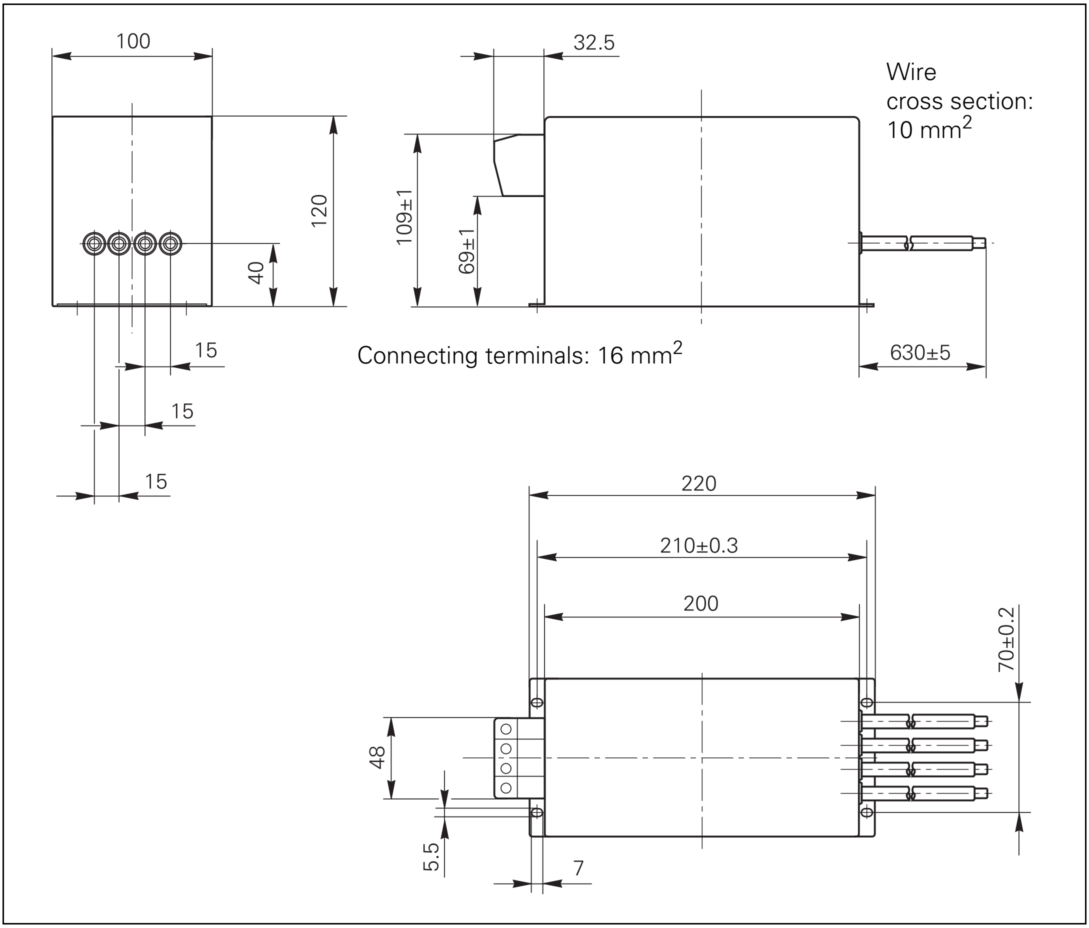
	
EPCOS 3 line filter5 A	**EPCOS 12 line filter0 A**

Specifications	**EPCOS 35 A line filter**	**EPCOS 80 A line filter**
suitable for	UR 2xx(D), UV 120, UVR 120 D	UV 140, UVR 150, UVR 130 D, UVR 140 D, UVR 150 D
Rated voltage	3 x 400 V	3 x 400 V
Rated frequency	50 Hz/60 Hz	50 Hz/60 Hz
Rated current	3 x 35 A	3 x 80 A
Power loss	Approx. 50 W	Approx. 75 W
Degree of protection	IP 20	IP 20
Weight	5 kg	11 kg
ID	340 691-01	340 651-01
Connection	Page 4–30	

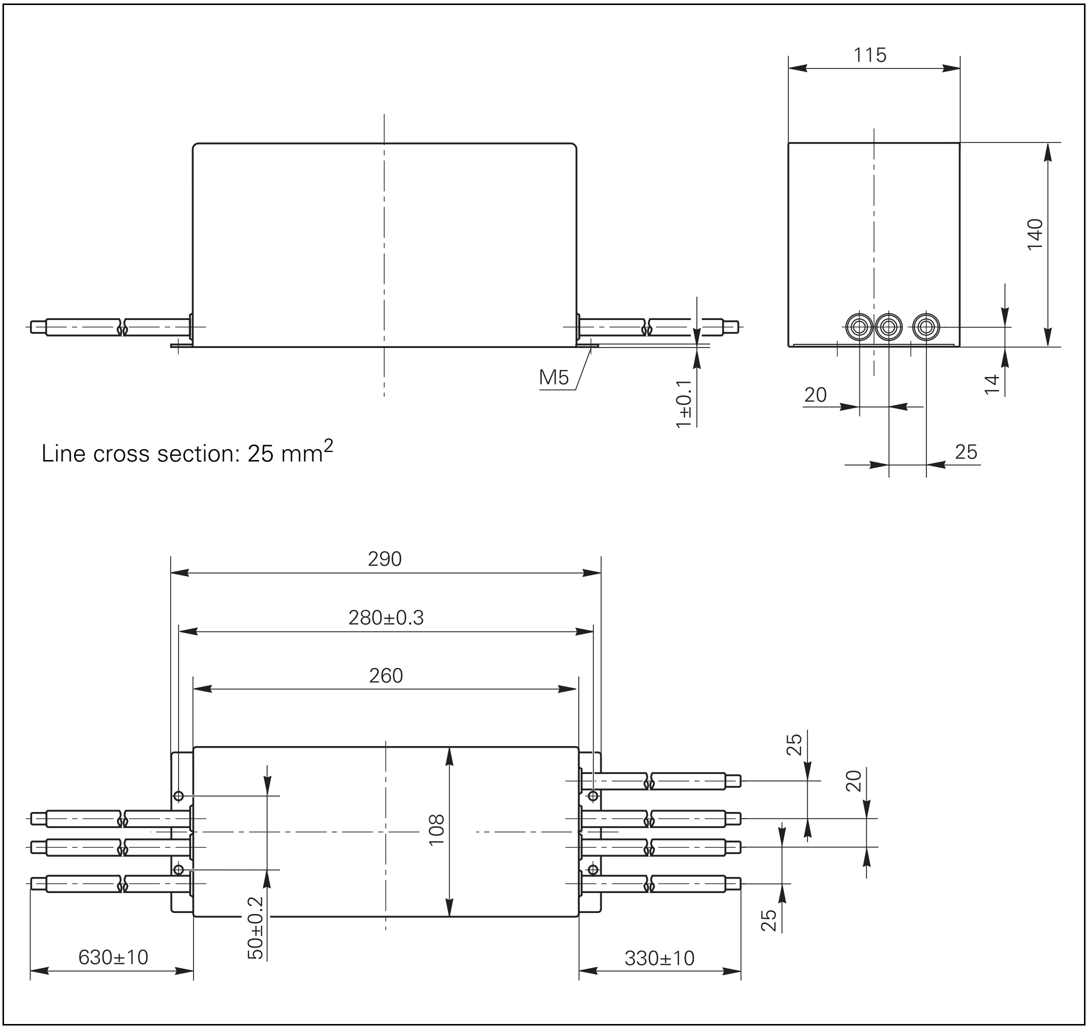
Specifications	**Line Filters EPCOS 120 A**[a]
suitable for	UVR 160D(W)
Rated voltage	3 x 400 V
Rated frequency	50 Hz/60 Hz
Rated current	3 x 120 A
Power loss	Approx. 115 W
Degree of protection	IP 20
Weight	13.5 kg
ID	575 292-01
Connection	Page 4–30

a. With integrated three-phase capacitor

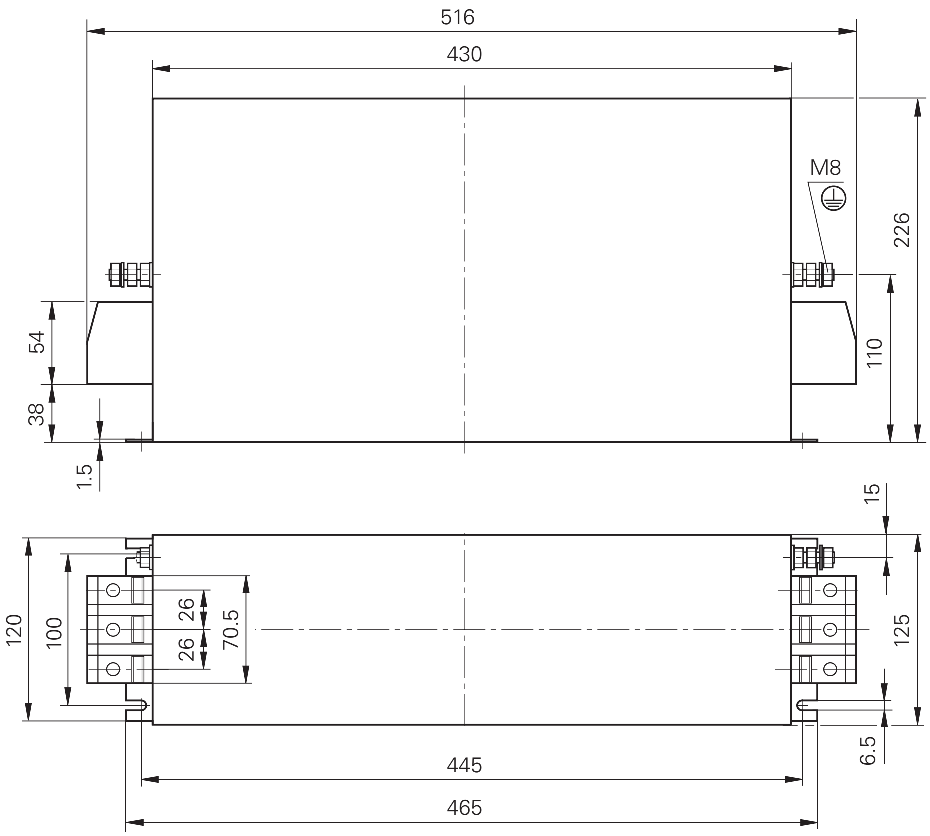
Dimensions of EPCOS 35 A line filter



Dimensions of EPCOS 80 A line filter



Dimensions of EPCOS 120 A line filter



Line cross section: 50 mm^2

2.5.4 Three-Phase Capacitor

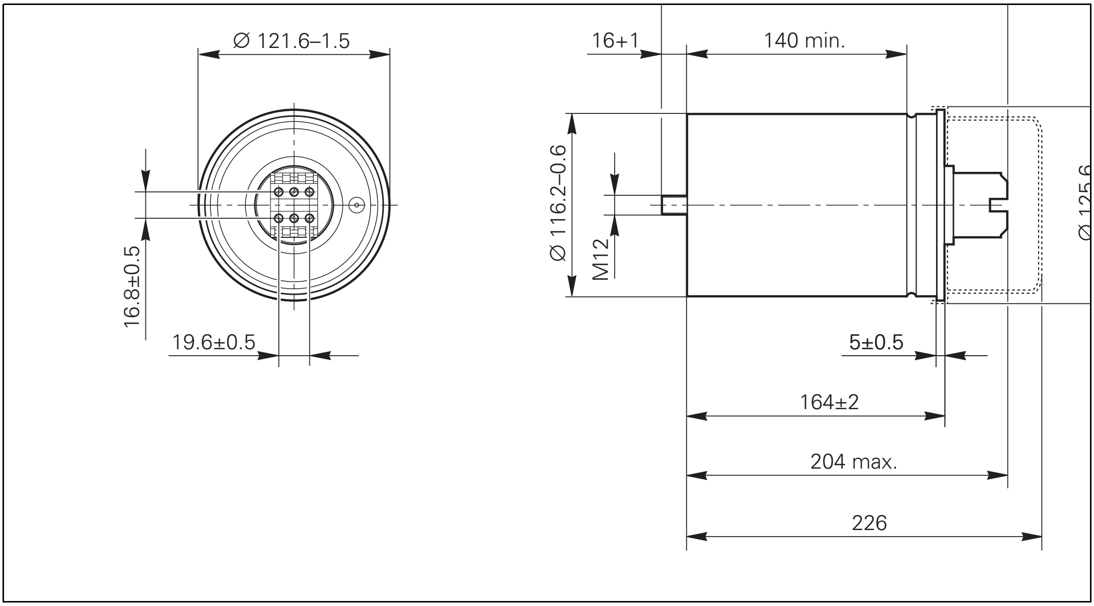
If you are using regenerative inverter systems, we basically recommend that you use a three-phase capacitor. The three-phase capacitor suppresses low-frequency interference (current ripple) during energy infeed to and recovery from the power line. It must be connected between the line filter and the commutating reactor.

Three-phase capacitor

Specifications	**Three-Phase Capacitor**
Phase-to-phase voltage	525
Capacity	3 x 32 µF
Charging and discharging resistors [a]	3 x 620 kΩ (PR03)
Discharge period (5 τ)	Approx. 100 s
Degree of protection	IP 00
Weight	Approx. 1.3 kg
ID	348 993-01
Connection	Page 4–30

a. Included in items supplied.

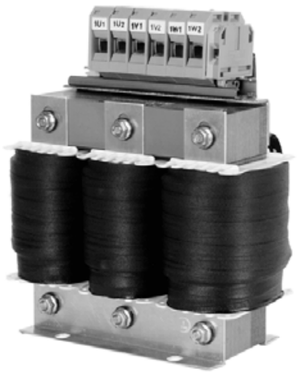
Dimensions of three-phase current capacitor



2.5.5 KDR 1x0(B) Commutating Reactor

The regenerative UVR 1x0 D power supply units and UR 2xx compact inverters must be connected to the main power line via the KDR 1x0(B) commutating reactor and the line filter.
The commutating reactor serves as a power storage device for the step-up converter.

The size of the commutating reactor depends on the power module used.



KDR 140

KDR 160

Specifications	KDR 120	KDR 130 B	KDR 140	KDR 150	KDR 160
Rated voltage	3 x 400 V	3 x 400 V	3 x 400 V	3 x 400 V	3 x 400 V
Rated frequency	50 Hz/60 Hz	50 Hz/60 Hz	50 Hz/60 Hz	50 Hz/60 Hz	50 Hz/60 Hz
Thermally permissible continuous current	3 x 35 A	3 x 45 A	3 x 70 A	3 x 80 A	3 x 130 A
Rated current	3 x 31.5 A	3 x 40.5 A	3 x 63 A	3 x 72 A	3 x 117 A
Power loss	Approx. 200 W	Approx. 250 W	Approx. 340 W	Approx. 350 W	Approx. 525 W
Degree of protection	IP 00	IP 00	IP 00	IP 00	IP 00
Weight	Approx. 11 kg	Approx. 15 kg	Approx. 22 kg	Approx. 23 kg	Approx. 57 kg
ID	344 505-01	511 048-01	333 068-01	355 253-01	573 265-01
Connection	Page 4–30				

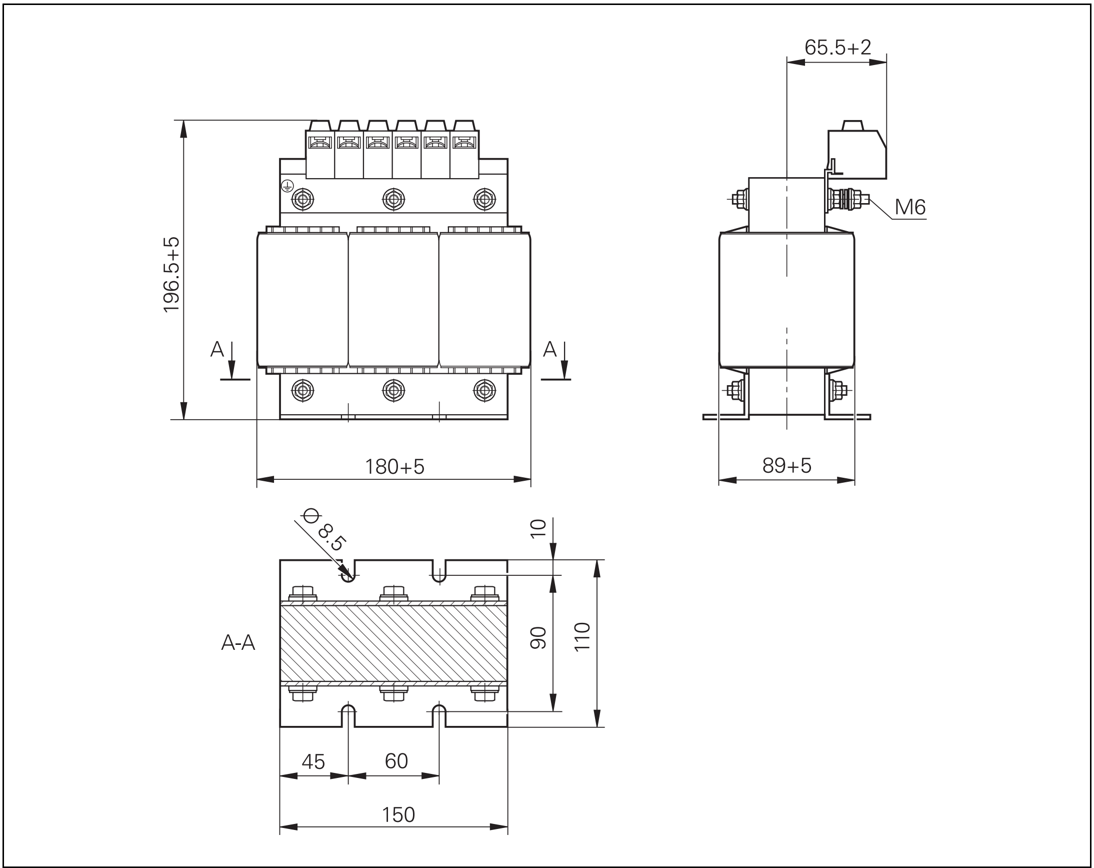
Warning

If a machine is required to comply with **UL requirements,** an air current of at least 10 m/s must be applied to the commutating reactors. This prevents the temperature on the surface from exceeding the max. permissible value of 105 °C.

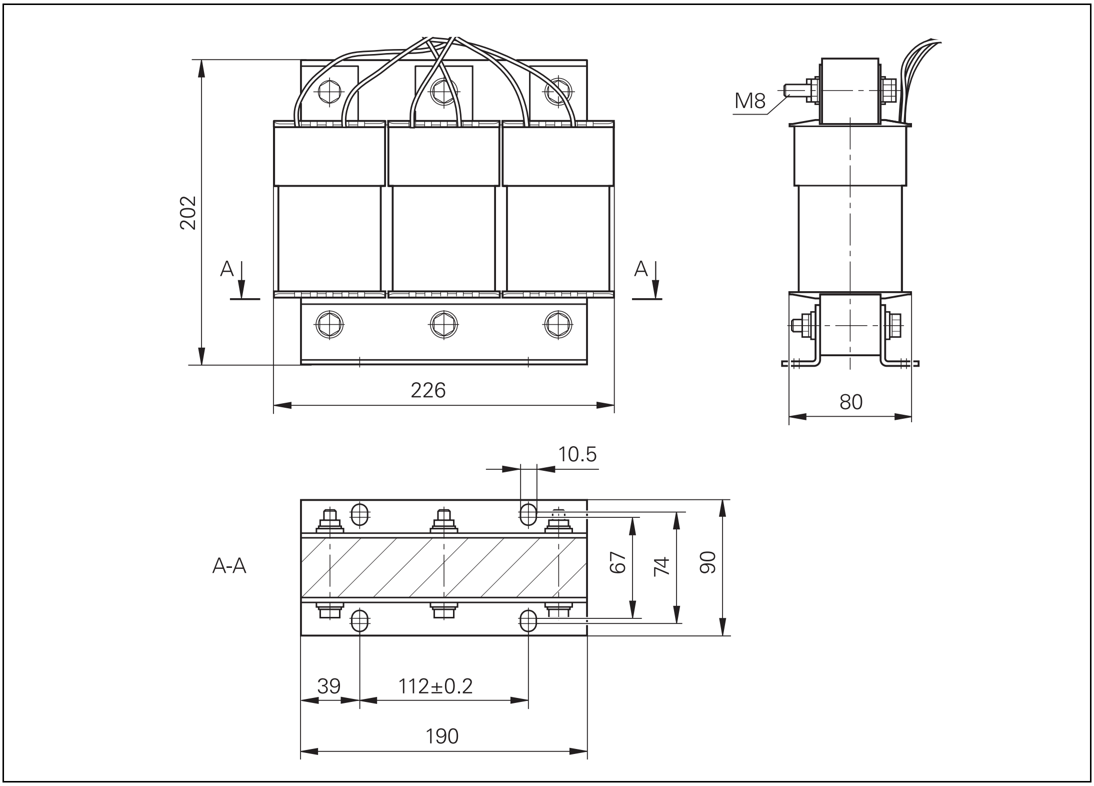
Danger

To ensure conformity with IP 10 required by the VDE for the installation of the **KDR 160** in the electrical cabinet, the included heat shrink tubings must be used. The heat shrink tubings must be slid onto the connecting terminals. The shrinking process must prevent the heat shrink tubing from being displaced.

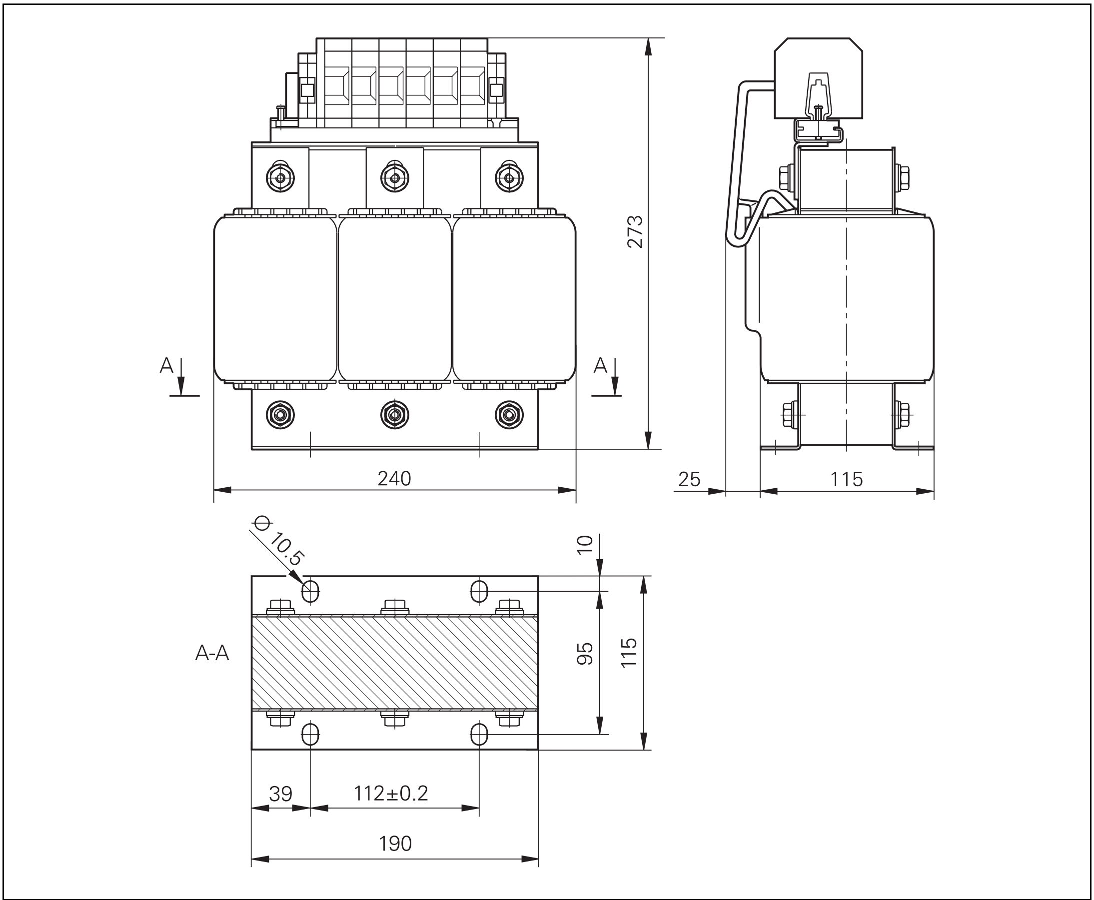
Dimensions of
KDR 120



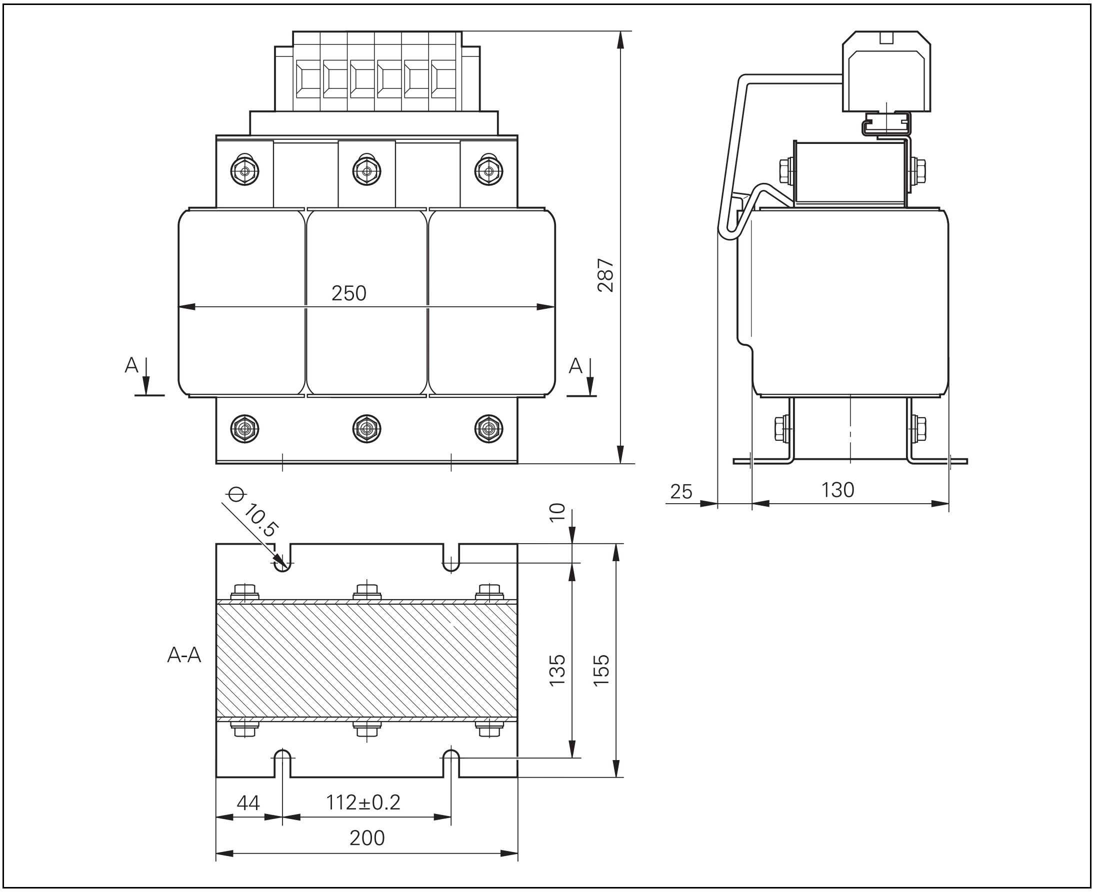
Dimensions of
KDR 130 B



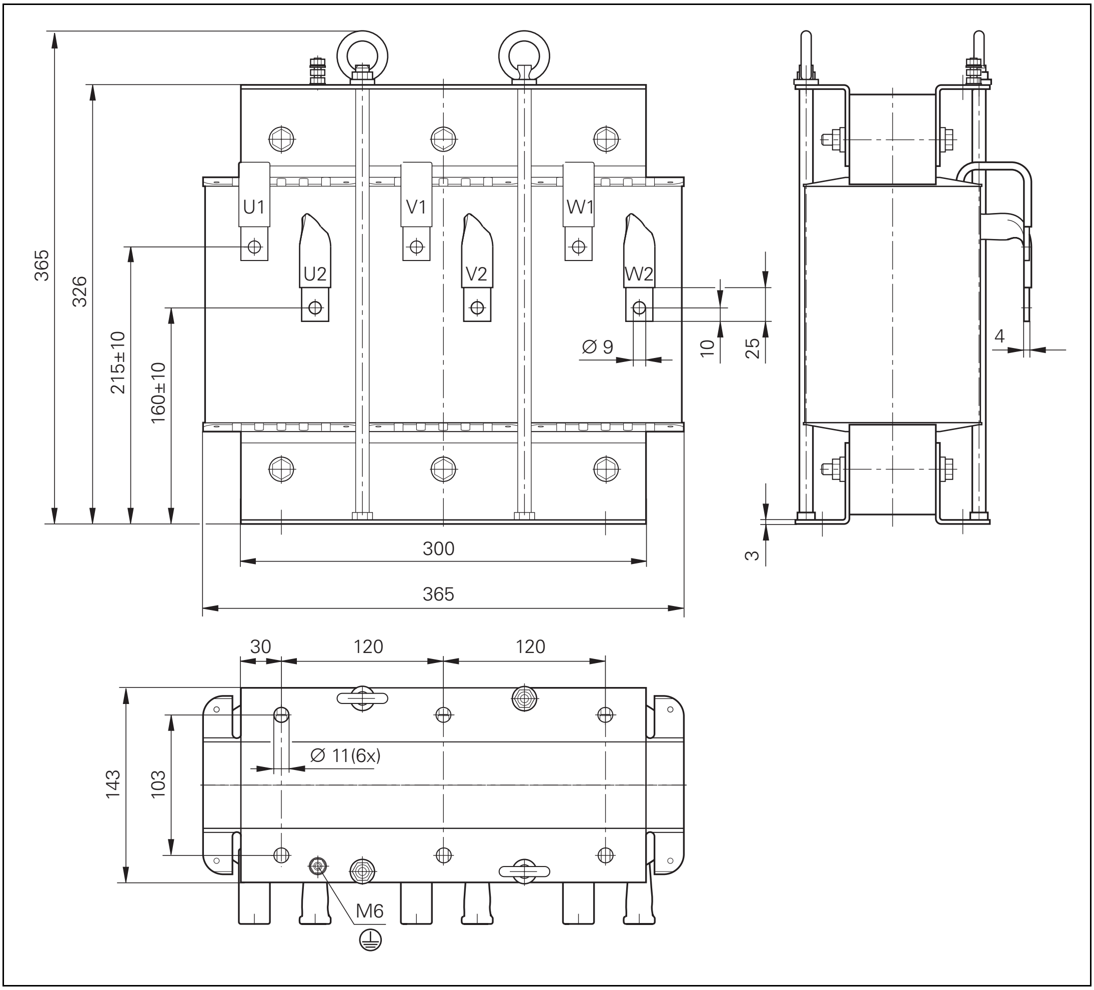
Dimensions of
KDR 140



Dimensions of KDR 150



Dimensions of KDR 160



2.5.6 ZKF 1x0 DC-Link Filter

Direct drives (linear motors, torque motors) used with regenerative inverter systems result in voltage peaks, which might destroy the drive. If you are using direct drives in conjunction with the regenerative UVR 1xx(D) and UR 2xx(D) inverters, you must therefore use the ZKF 1xx dc-link filter.

ZKF 110

ZKF 130

Specifications	**ZKF 110**	**ZKF 120**	**ZKF 130**
Rated power	30 kW	30 kW	55 kW
Peak power S6-40%	47 kW[a]	47 kW[a]	80[a] kW
Peak power S6-20%	67 kW[b]	67 kW[b]	100[b] kW
Peak power	110 kW[c]	110 kW[c]	110[c] kW
Max. leakage current	<1.3 A	<6.0 A	<6.0 A
Current consumption[d] 24 V	–	–	440 mA
Integral cooling	–	–	X
Degree of protection	IP 20	IP 20	IP 20
Weight	Approx. 10 kg	Approx. 12 kg	Approx. 13 kg
ID	385 764-01	391 232-01	531 388-01
Connection	Page 4–34 , Page 6–77		

a. 40% cyclic duration factor for duration of 10 min (S6-40%)
b. 20% cyclic duration factor for duration of 10 min (S6-20%)
c. 4 s cyclic duration factor for duration of 20 s
d. After making your selection, check the current consumption of the 15 V[*1] and the 24 V[*1] supply of the entire modular inverter system. See page 2 – 54.

Warning

The ZKF 110 differs from the ZKF 120 only in its maximum leakage current. If you are using the ZKF 110, a HEIDENHAIN technician must check on site whether the leakage current is less than 1.3 A. With the ZKF 120, this verification is not necessary because a leakage current of 6 A is sufficient in any case.

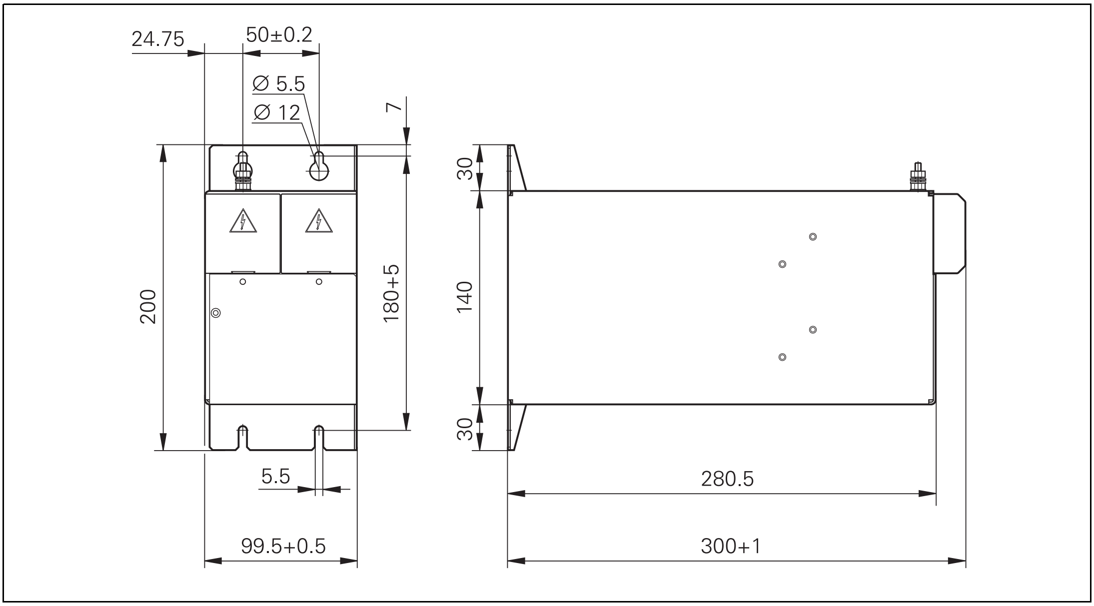
Warning

The total power of the direct drives must not exceed the power of the filter.

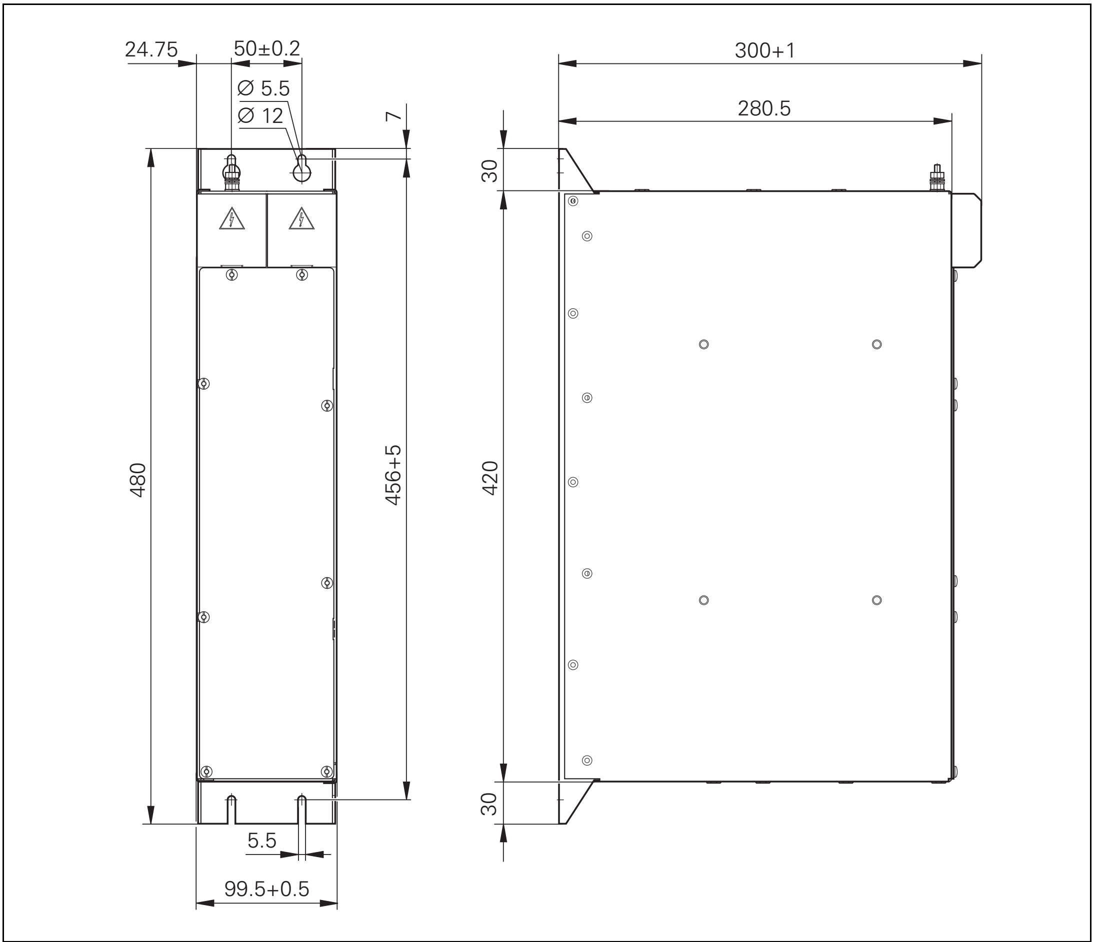
Warning

A dc-link filter is not permitted for non-HEIDENHAIN inverters!

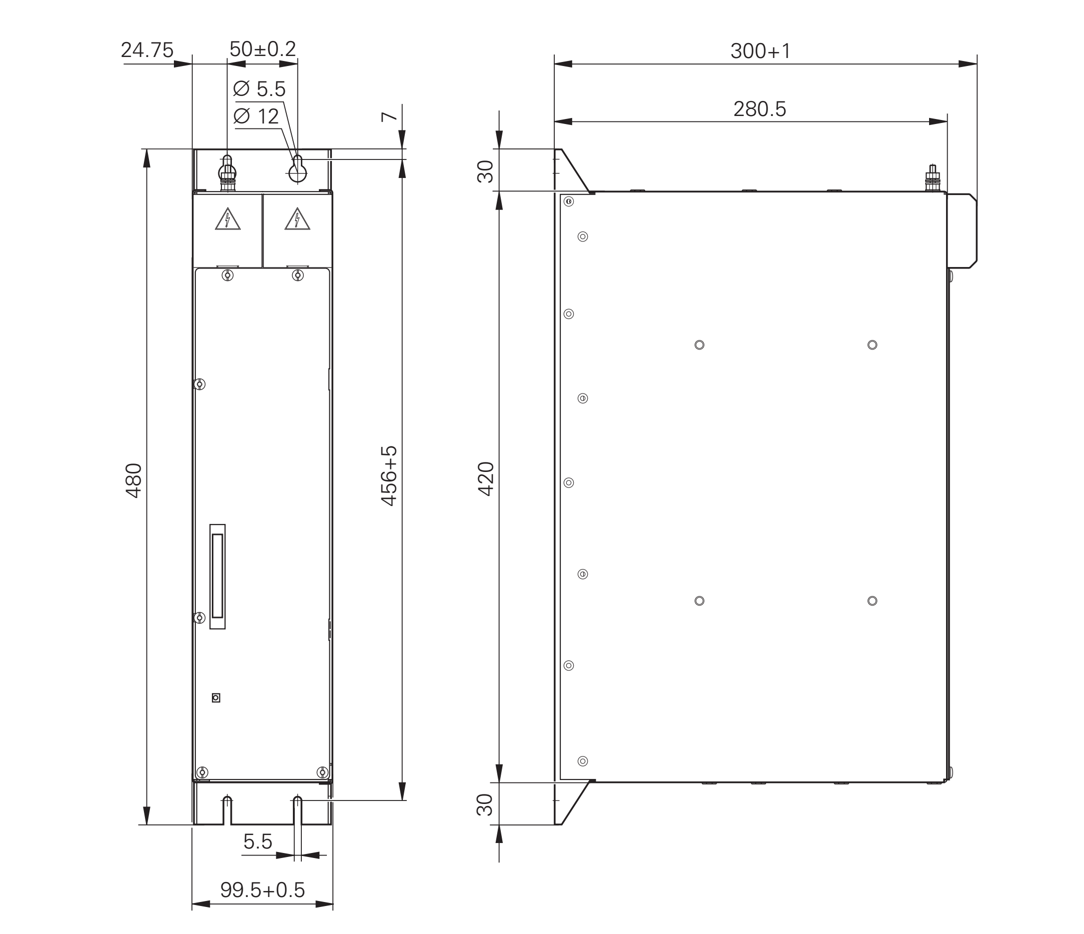
Dimensions of ZKF 110 dc-link filter



Dimensions of ZKF 120 dc-link filter



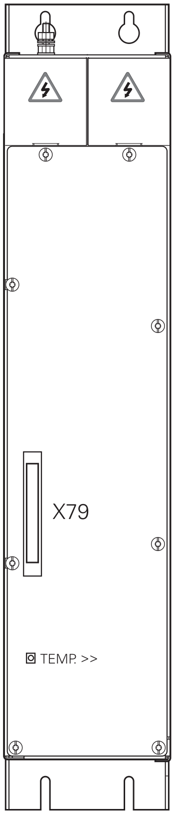
Dimensions of ZKF 130 dc-link filter



Connection overview of ZKF 130 dc-link filter

Danger

Do not engage or disengage any connecting elements while the unit is under power!



Conductor bar	Connection of dc-link voltage Uz
X79	Unit bus
TEMP. >>	Warning signal for excessive temperature of ZKF

2.5.7 SM 1xx Voltage Protection Module

If synchronous motors or direct drives, such as synchronous spindles or torque motors, are operated in the field weakening range (for example, as spindle drives), a power interruption (e.g. power failure) can result in a voltage increase at the power connections of the motor. The voltage increase can damage the inverters and the motor. To prevent this, a voltage protection module must be inserted in the motor lead between the motor and the inverter. If an error occurs, the SM 1xx will short-circuit the motor phases. The released braking energy is converted into heat.

The following formula can be used to decide whether an SM 1xx voltage protection module must be used:

$$N_{max} = \frac{850\ V \cdot N_{noml}}{U0 \cdot \sqrt{2}}$$

The result N_{max} means: If the motor is operated at a speed greater than speed $N_{max,}$ a voltage protection module must be used.

The short-circuit current of the motor (given in the motor data) is decisive for the selection of the SM 1xx voltage protection module.

The maximum short-circuit current I_K of a motor can be calculated according to the following formula and must be less than the maximum phase current of the SM 1xx:

$$I_K = \frac{U0}{\sqrt{3} \cdot XL}$$

Where: XL = Xstr1 + XH
When Xstr1 = 0, then XL = XH.

Choosing between SM 110 and SM 130:

- When I_K < 63 A, then SM 110.
- When 63 A < I_K < 300 A, then SM 130.

The following data can be found in the motor table of the control:
U0: No-load voltage [V],
Xstr1: Stator leakage reactance [Ω] ,
XL: Inductive reactance [Ω] , (Note: In the motor table the value is expressed in [mΩ]),
XH: Magnetizing reactance [Ω] (Note: In the motor table the value is expressed in [mΩ]).
(Note: The data is not always expressed in the basic unit in the motor table. In the above-mentioned formula, however, you must enter the data in the basic unit of measure.)

Warning

The maximum cable length between the SM 1xx and the inverter is 1 m.

Select the cross section of the grounding conductor (yellow/green) at the voltage protection module so that the cross section of the grounding conductor is not less than half the cross section of the leads to the SM 1xx (e. g. leads = 40 mm^2 , then the grounding conductor = 20 mm^2). However, a cross section of at least 10 mm^2 is required for the grounding conductor.

Warning

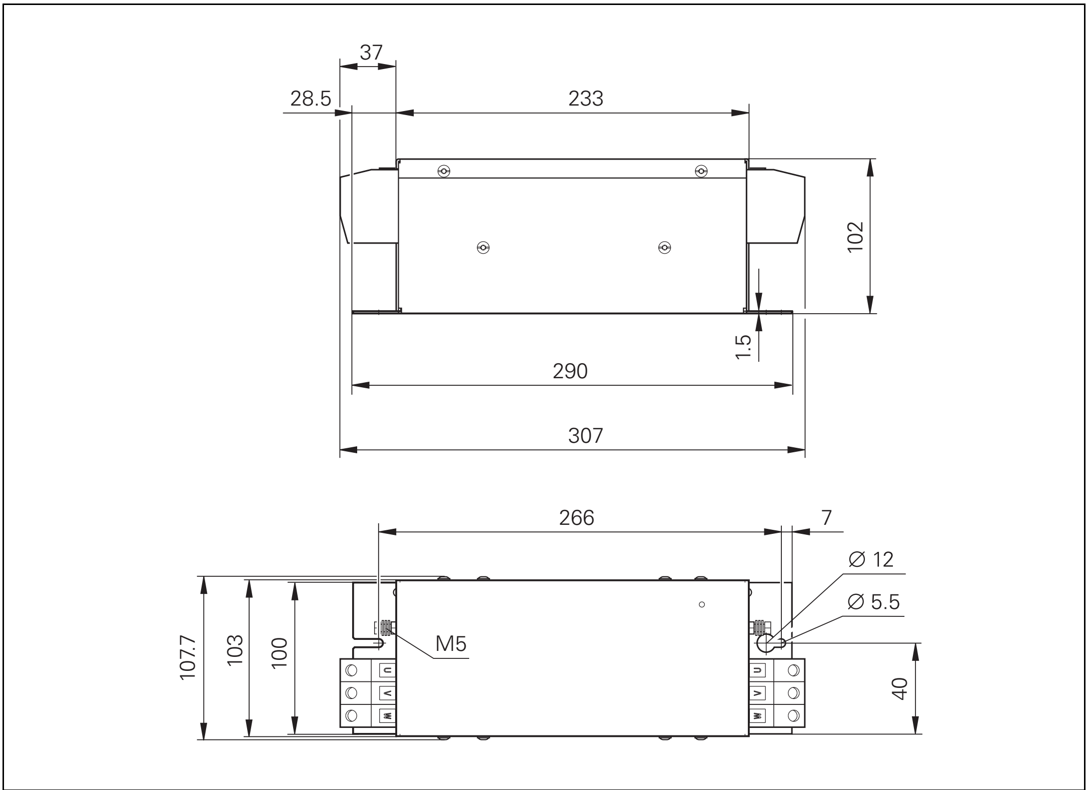
Due to the high power, the **SM 130** features a temperature switch. The switch must be evaluated in the EMERGENCY STOP chain. The switch opens at temperatures above 60 °C. This makes it possible to prevent a subsequent switch-on temporarily.

Warning

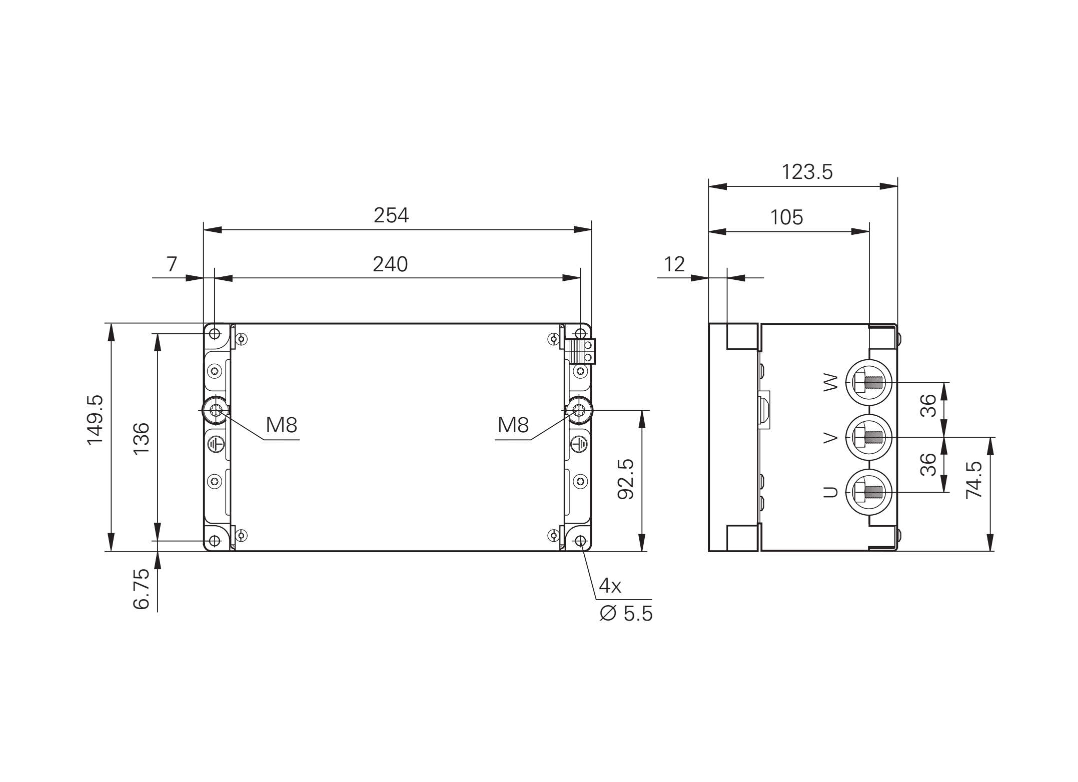
With the **SM 130,** the three motor phases are connected to three screws located in the housing of the **SM 130.** Use only insulated terminals for the connection. The tightening torque for the screws is approximately 9 Nm.

Specifications	**SM 110**	**SM 130**
		
Switching voltage	830 V	830 V
Maximum phase current	3 x 63 A	3 x 300 A
Maximum braking time at maximum phase current	10 s	
Minimum duration between braking procedures	5 min	
Degree of protection	IP 20	IP 20
Weight	Approx. 2.1 kg	Approx. 6.3 kg
ID	368 453-01	540 739-01
Connection	Page 4–34	Page 4–34

Dimensions of SM 110 voltage protection module



Dimensions of SM 130 voltage protection module



2.5.8 Coolant Connection

One packaging unit consists of:

- 1 pressure hose, length 3 m
- 1 coupling joint for connecting the pressure hose to the distributor block

ID 584 862-01

Pressure hose

Coupling joint

Note

Two packaging units must be ordered for cooling one inverter with water.

2.5.9 Adapter Module

In modular regenerative inverter systems an additional power supply unit may become necessary if you are using inverters or motors with a high power demand. The adapter module makes it possible to connect this power supply unit to the present inverter system. This enables you to use one power supply unit for a high-performance spindle for example, and the other power supply unit for the axes.

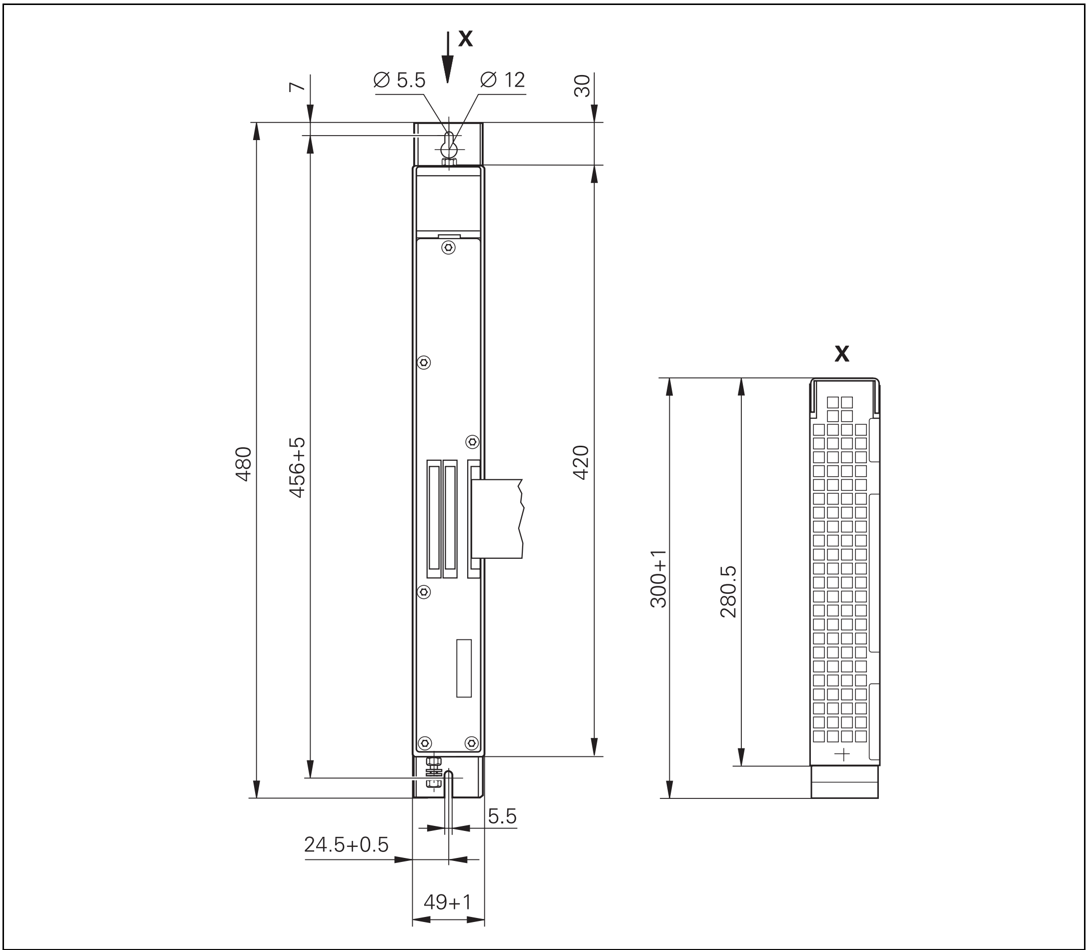
The two power supply units are coupled via the supply bus (X69a/X69b – X69), and are then also monitored by the system.

This results in two **separate** supply systems whose power modules operate independently of each other, but are monitored by the control.

Adapter module

Specifications	Adapter module
Weight	3 kg
ID	352 762-01
Connection	Page 4–36 , Page 6–79

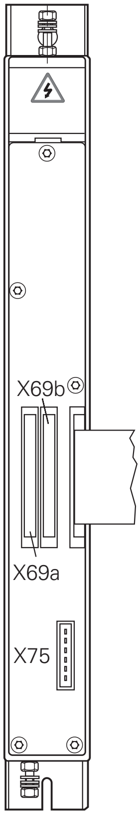
Dimensions of the adapter module



Connection overview of adapter module

Danger

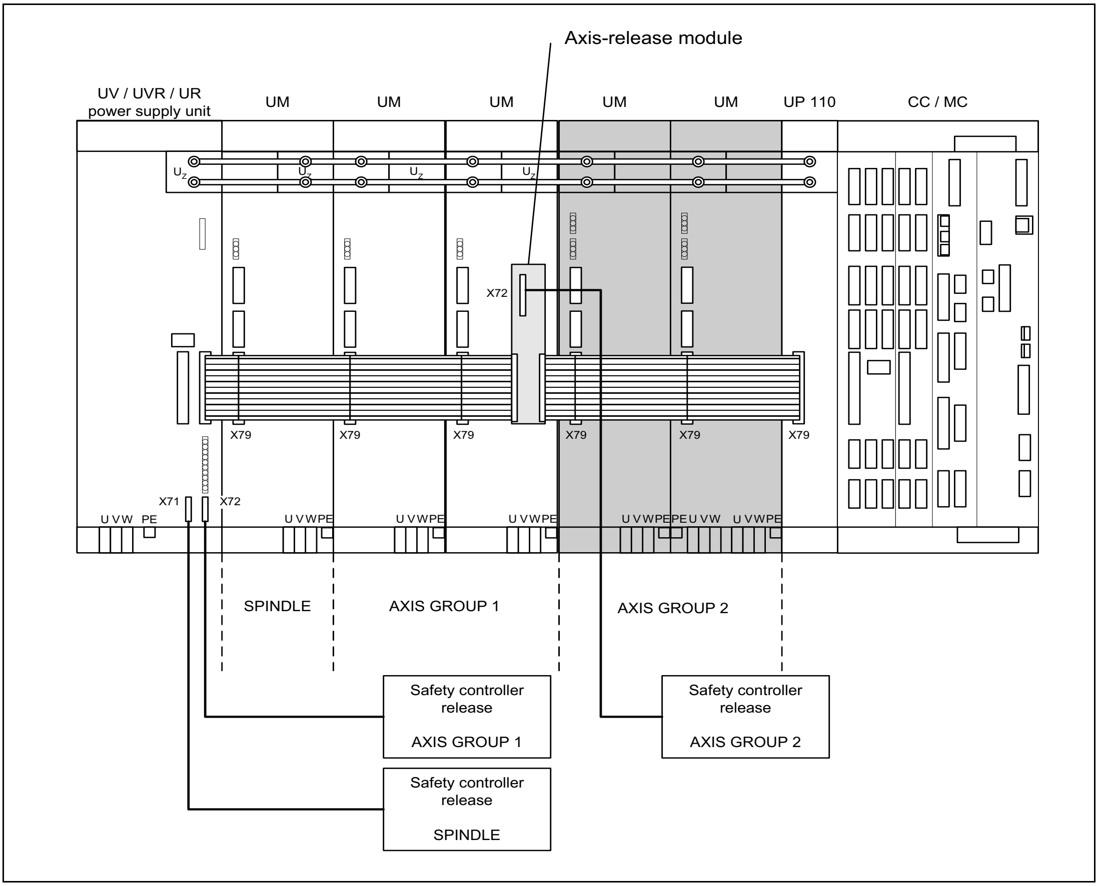
Do not engage or disengage any connecting elements while the unit is under power!



X69a – X69b	Supply bus from the power supply units
Ribbon cable	to X69 on the control
X75	Service connector (exclusively for service purposes)

2.5.10 Axis-Enabling Module

If no axis-enabling module is used (ID 341 518-02), all axis power modules are switched off simultaneously via X72 of the UV(R) 1x0(D). The axis-enabling module makes it possible to switch off power modules group by group.
The module—instead of the mounting pins for the covers— is screwed onto the front panel of a power module.
The axis-enabling signal is transmitted via a line in the unit bus from power module to power module. This line is interrupted through the axis-enabling module so that all the power modules that are connected to the axis-enabling module are switched off. All other power modules are switched off via X72 of the UV(R) 1x0(D).

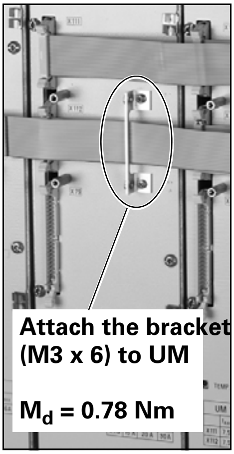


The unit bus requires a 40-line ribbon cable which connects the UV(R) 1x0(D) power supply unit with the axis-enabling module and the power modules to be switched off via UV(R) 1x0(D).
A further 40-line ribbon cable connects the axis-enabling module with the power modules to be switched off via the axis-enabling module.

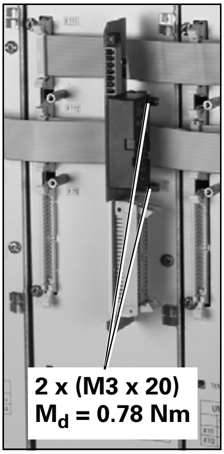
The width of the covers required for the ribbon cables for the modular inverter system is reduced by the width of the axis-enabling module (50 mm). Suitable covers are included with the modular inverter system.

Mounting instructions:

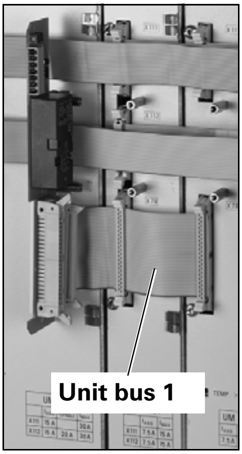
1.



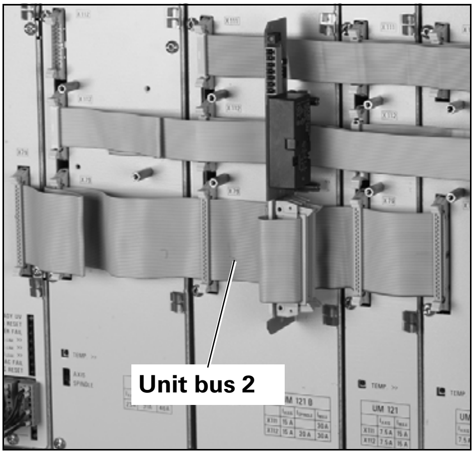
2.



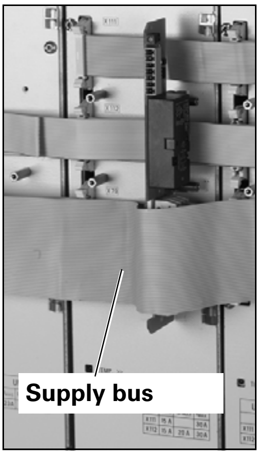
3.



4.



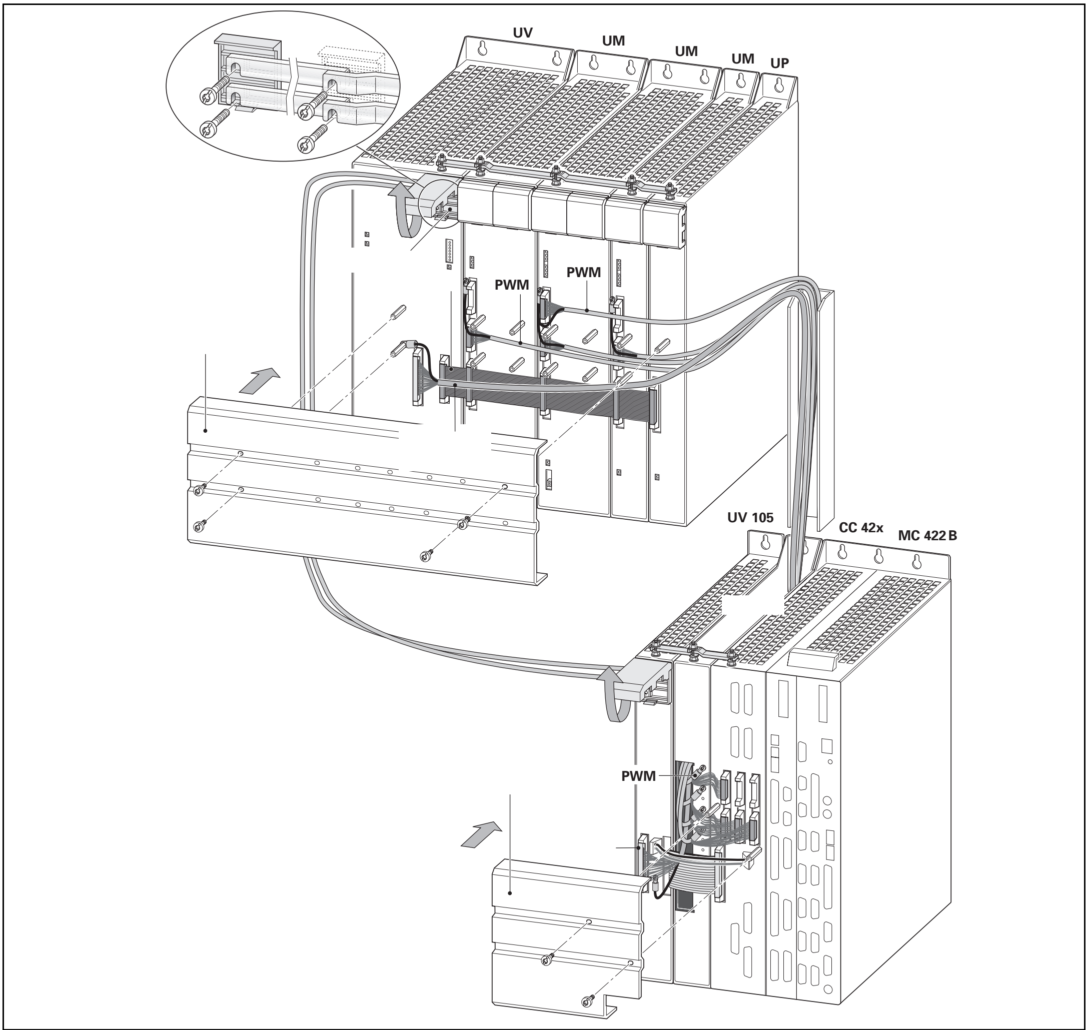
5.



6.

2.5.11 Double-Row Configuration of HEIDENHAIN Components

The inverter components connected to the MC 422 or CC 42x can be set up in a double-row configuration with the installation kit.
The installation kit includes the housing, covers for the cable, a grounding bar and the screws for the shielded connections of the round cables. The dc-link voltage can be led from one row to another with two leads. For more information on double-row configuration, see Page 6–52.

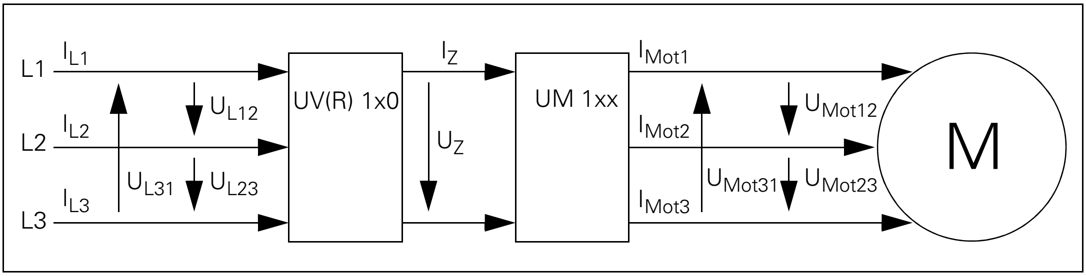


Components	ID
Installation kit	361 452-01
PWM cable (round)	360 888-xx
Cable for supply voltage (round)	361 508-xx
Blue lead for dc-link voltage	365 691-xx
Red lead for dc-link voltage	365 692-xx

3 Selection of Motors and Inverters

3 Selection of Motors and Inverters

3.1 Performance Overview of a Complete Drive System



Power assumed by the power supply: $P_L = \sqrt{3} \cdot U_{L12} \cdot I_{L1}$

DC-link power: $P_Z = U_Z \cdot I_Z$

Power fed into the motor: $P_{\text{Mot. el.}} = \sqrt{3} \cdot U_{\text{Mot12}} \cdot I_{\text{Mot1}} \cdot \cos\varphi$

Power supplied by the motor: $P_{\text{Mot}} = P_{\text{Mot. el.}} \cdot \eta_{\text{Mot}}$

3.2 Selection of the Axis Motor

Procedure

Selection of a synchronous motor and the proper inverter:

- Calculation of the static moment from the sum of
  - Frictional moment (with horizontal axes)
  - Moment for overcoming the force of gravity (for vertical axis)
  - Machining moment
- Calculation of the desired speed of the motor
- Preselection of the motor according to
  - Stall torque of the motor ≥ static moment
  - Rated speed of the motor ≥ desired speed
- Preselection of the inverter according to
  - Rated current of the inverter ≥ continuous stall current of the motor
- Calculation of the external moment of inertia
  - Moment of inertia of the table
  - Moment of inertia of the ball screw
  - Moment of inertia of the gearwheel on the ball screw
  - Moment of inertia of the gearwheel on the motor
- Calculation of the total moment of inertia from
  - External moment of inertia
  - Moment of inertia of the motor
- Checking the ratio of external moment of inertia to the moment of inertia of the motor
- Calculation of the acceleration moment
- Comparison of the acceleration moment with the
  - Maximum moment of the inverter
  - Maximum moment of the motor
- Calculation of the effective moment at a given load cycle
- Comparison of the effective moment at a given load cycle with the rated torque of the motor

Mathematical formulas for calculation

Data	Formulas	Variable
Frictional moment M_R	$M_R = \frac{m \cdot g \cdot \mu \cdot h \cdot \cos\alpha}{2 \cdot \pi \cdot i \cdot \eta}$	m: Mass [kg] g: Acceleration of gravity [m/s^2] μ: Coefficient of friction [-] h: Ball screw pitch [m] α: Axis angle [°] (0° = horizontal axis) i: Gear ratio [-] ($n_{motor}/n_{ball\ screw}$) η Efficiency [-]
Moment for overcoming the force of gravity M_G	$M_G = \frac{m \cdot g \cdot h \cdot \sin\alpha}{2 \cdot \pi \cdot i \cdot \eta}$	m: Mass [kg] g: Acceleration of gravity [m/s^2] h: Ball screw pitch [m] α: Axis angle [°] (90° = vertical axis) i: Gear ratio [-] ($n_{motor}/n_{ball\ screw}$) η Efficiency [-]
Machining moment M_B	$M_B = \frac{F_B \cdot h}{2 \cdot \pi \cdot i \cdot \eta}$	F_B: Machining force [N] h: Ball screw pitch [m] i: Gear ratio [-] ($n_{motor}/n_{ball\ screw}$) η Efficiency [-]
Static moment M_{Stat}	$M_{Stat} = M_R + M_G + M_B$	M_R: Frictional moment [Nm] M_G: Moment for overcoming the force of gravity [Nm] M_B: Machining moment [Nm]
Desired speed of the motor n_S	$n_S = \frac{v_{max} \cdot i}{h}$	v_{max}: Rapid traverse [m/min] i: Gear ratio [-] ($n_{motor}/n_{ball\ screw}$) h: Ball screw pitch [m]
Selection of the motor	$M_{0Motor} \geq M_{Stat}$ $n_{NMotor} \geq n_S$	M_{0Motor}: Stall torque of the motor M_{Stat}: Static moment n_{NMotor}: Rated speed of the motor n_S: Desired speed of the motor
Modular inverter: Selection of the power module **Compact inverter:** Selection of the axis unit	$I_{NU} \geq I_{0Motor}$	I_{NU}: Rated current of the inverter I_{0Motor}: Continuous stall current of the motor

Data	Formulas	Variable
Moment of inertia of the table J_T	$J_T = m \cdot \left(\frac{h}{2 \cdot \pi}\right)^2$	m: Table mass [kg] h: Ball screw pitch [m]
Moment of inertia of the ball screw J_S	$J_S = \frac{d_S^4 \cdot \pi \cdot l \cdot \rho}{32}$	d_S: Diameter of the ball screw [m] l: Length of the ball screw [m] ρ: Density of the ball screw material [kg/m^3]
Moment of inertia of the gearwheel on the ball screw J_{GS}	$J_{GS} = \frac{d_{GS}^4 \cdot \pi \cdot l \cdot \rho}{32}$	d_{GS}: Diameter of the gearwheel on the ball screw [m] l: Length of the gearwheel on the ball screw [m] ρ: Density of the gearwheel material [kg/m^3]
Moment of inertia of the gearwheel on the motor J_{GM}	$J_{GM} = \frac{d_{GM}^4 \cdot \pi \cdot l \cdot \rho}{32}$	d_{GM} = Diameter of the gearwheel on the ball screw [m] l = Length of the gearwheel on the ball screw [m] ρ: Density of the gearwheel material [kg/m^3]
External moment of inertia J_F	$J_F = \frac{J_T + J_S + J_{GS}}{i^2} + J_{GM}$	J_T: Moment of inertia of the table [kgm^2] J_S: Moment of inertia of the ball screw [kgm^2] J_{GS}: Moment of inertia of the gearwheel on the ball screw [kgm^2] i = Gear ratio ($n_{motor}/n_{ball\ screw}$) J_{GM}: Moment of inertia of the gearwheel on the motor [kgm^2]
Total moment of inertia of the machine slide with motor J_{tot}	$J_{tot} = \frac{J_T + J_S + J_{GS}}{i^2} + J_{GM} + J_M$	J_T: Moment of inertia of the table [kgm^2] J_S: Moment of inertia of the ball screw [kgm^2] J_{GS}: Moment of inertia of the gearwheel on the ball screw [kgm^2] i = Gear ratio ($n_{motor}/n_{ball\ screw}$) J_{GM}: Moment of inertia of the gearwheel on the motor [kgm^2] J_M: Moment of inertia of the motor [kgm^2]
Ratio of external moment of inertia to the moment of inertia of the motor	$0.5 \leq \frac{J_F}{J_M} \leq 2$	J_F: External moment of inertia [kgm^2] J_M: Moment of inertia of the motor [kgm^2] **This ratio ensures a stable control response!**

Data	Formulas	Variable
Acceleration moment M_{acc}	$$M_{acc} = \frac{J_{tot} \cdot 2 \cdot \pi \cdot n_M}{60 \cdot \eta \cdot t_{acc}}$$	J_{tot}: Total moment of inertia [kgm^2] n_M: Desired speed of the motor [min^{-1}] η Efficiency of the motor [-] t_{acc}: Desired acceleration time [s]
Maximum moment of the motor M_{Mmax}	M_{Mmax} from data sheet Or $$M_{Mmax} = 3 \cdot M_0$$	M_0: Stall torque of the motor [Nm]
Maximum moment of the inverter M_{Umax}	$$M_{Umax} = \frac{M_{Mmax}}{I_{Mmax}} \cdot I_{Umax}$$ Or $$M_{Umax} = 0.8 \cdot \frac{M_{MN}}{I_{MN}} \cdot I_{Umax}$$	M_{Mmax}: Maximum moment of the motors [Nm] I_{Mmax}: Maximum current of the motor [A] I_{Umax}: Maximum current of the inverter [A] M_{MN}: Rated torque of the motor [Nm] I_{MN}: Rated current of the motor [A]
Comparison of the acceleration moment with the maximum moment of the motor and inverter	$$M_{Mmax} > M_{acc}$$ $$M_{Umax} > M_{acc}$$	M_{Mmax}: Maximum moment of the motors [Nm] M_{acc}: Acceleration moment [Nm] M_{Umax}: Maximum moment of the inverter [Nm]
Weighting factors K_B, K_{Pos}, K_{acc}	$$K_B = \frac{t_B}{t_{tot}}$$ $$K_{Pos} = \frac{t_{Pos}}{t_{tot}}$$ $$K_{acc} = \frac{t_{acc}}{t_{tot}}$$ **Note:** $$K_B + K_{Pos} + K_{acc} = 1$$	t_B: Machining time t_{tot}: Total running time t_{Pos}: Time for positioning operations t_{acc}: Time for acceleration **All times must be given in the same unit of measure!**

Data	Formulas	Variable
Effective moment at a given load cycle M_{eff}	M_{Stat}: Static moment [Nm] K_B: Weighting factor for machining operations [-] M_R: Frictional moment [Nm] M_G: Moment for overcoming the force of gravity [Nm] K_{Pos}: Weighting factor for positioning operations [-] M_{acc}: Acceleration moment [Nm] K_{acc}: Weighting factor for acceleration operations [-]	
$$M_{eff} = \sqrt{(M_{Stat})^2 \cdot K_B + (M_R + M_G)^2 \cdot K_{Pos} + (M_R + M_G + M_{acc})^2 \cdot K_{acc}}$$		
Comparison of the effective moment at a given load cycle with the rated torque of the motor	$M_{MN} \geq M_{eff}$	M_{MN}: Rated torque of the motor [Nm] M_{eff}: Effective moment at a given load cycle [Nm]

Maximum torque of a drive

If the power module is not powerful enough, the maximum torque of the motor cannot be reached because the required current is being limited by the power module. The maximum torque M_{max} achievable by the drive can be calculated.

Synchronous motors:

$$M_{max} = \frac{M_{Nmot}}{I_{Nmot}} \cdot I_{Ndrv}$$

Asynchronous motors:

$$M_{max} = \frac{60 \cdot P_{max}}{2 \cdot \pi \cdot n}$$

$$P_{max} = P_{Nmot} \cdot \frac{I_{qmax}}{I_{qN}}$$

$$I_{qmax} = \sqrt{I_{max}^2 - I_{0mot}^2}$$

$$I_{qN} = \sqrt{I_{Ndrv}^2 - I_{0mot}^2}$$

M_{Nmot}: Rated torque of the motor in Nm
I_{Nmot}: Rated current of the motor in A
I_{Ndrv}: Rated current of the power module in A
n: Motor speed in rpm
P_{Nmot}: Power rating of the motor in W
I_{max}: Lesser value between the maximum current of the motor and the maximum current of the power module in A
I_{0mot}: No-load current of the motor

3.3 Selection of the Spindle Motor

Procedure

▶ Selection of the spindle motor for required torque and speed

3.4 Selection of the Inverter

Procedure

Modular inverter:

The power modules were already selected together with the axis motors. The power supply unit must still be selected.

- Calculation of the dc-link power
- Selecting the power supply unit

Compact inverter:

The number of axes and the requirement for current determine the compact inverter. It remains to be examined whether the dc-link power of the selected compact inverter suffices.

Mathematical formulas for calculation

Data	Formulas	Variable
DC-link power P_{DC}	$P_{DC} = \frac{P_{NS}}{\eta_S} + \frac{\Sigma P_{NA}}{\eta_A} \cdot F_{Mratio}$	P_{NS}: Power rating of the spindle motor [W] η_S: Efficiency of the spindle motor [-] ΣP_{NA}: Sum of the power ratings of the axis motors [W] η_A: Efficiency of the feed motors [-], unless indicated otherwise $\eta_A = 1$ F_{Mratio}: Ratio of mean power to rated power of the feed motors.
Selection of the power supply unit or examination of the compact inverter	$P_{DC} \leq P_{NU}$	P_{DC}: DC-link power [W] P_{NU}: Rated power of the power supply unit or the compact inverter [W]

3.5 Selection of the Braking Resistor

Procedure

- Calculation of braking power
- Calculation of braking power with a specified alternation of load
- Calculation of braking energy
- Selection of the braking resistor according to
  - Peak performance of the braking resistor
  - Reliable mean value of the braking power
  - Maximum braking energy of the braking resistor

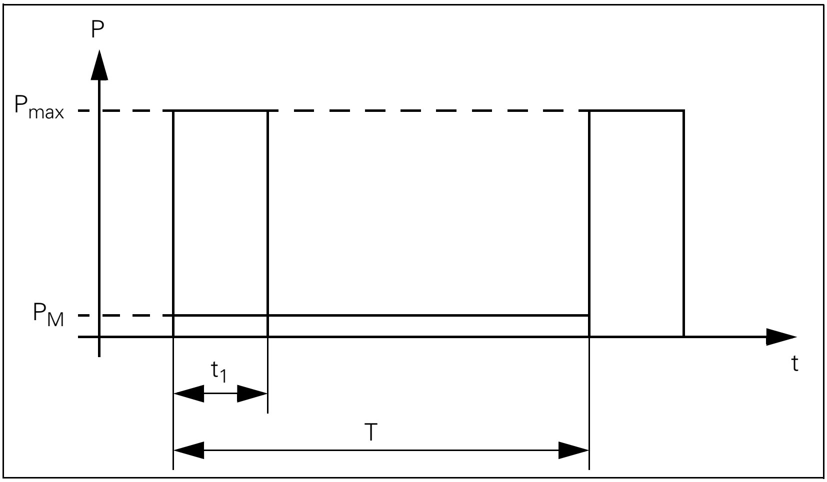
Mathematical formulas for calculation

Data	Formulas	Variable
Braking power P_{Br}	$P_{Br} = \frac{2 \cdot \pi \cdot M_{Br} \cdot n_{max}}{60}$	M_{Br}: Braking moment [Nm] n_{max}: Maximum speed at which braking occurs [rpm]
Braking energy E_{Br}	$E_{Br} = 2 \cdot J \cdot \pi^2 \cdot \left[\left(\frac{n_2}{60}\right)^2 - \left(\frac{n_1}{60}\right)^2\right]$	J: Moment of inertia, including the motor [kgm^2] n_2: Desired speed of the brakes [rpm] n_1: Desired speed after braking [rpm]
Mean value of the braking power with a specified alternation of load P_M	$P_M = P_{Br} \cdot \frac{t_1}{T}$	P_{Br}: Braking power [W] t_1: Load time [s] T: Cycle duration [s]
Selection of the braking resistor	$P_{Br} \leq P_{max}$ $P_M \leq P_{Mzul}$ $E_{Br} \leq E_{max}$	P_{max}: Peak performance of the braking resistor [W] P_{Mzul}: Permissible mean value of the braking performance according to the diagram as a function of E_{Br} [W] (see example on page 3 – 16) E_{max}: Maximum braking energy of the braking resistor [Ws]

Example of a braking with load time t_1 and cycle duration T. P_M is the mean value of the braking performance in this load alternation.

Since $E = P \cdot t$, the enclosed areas must be of equal size:

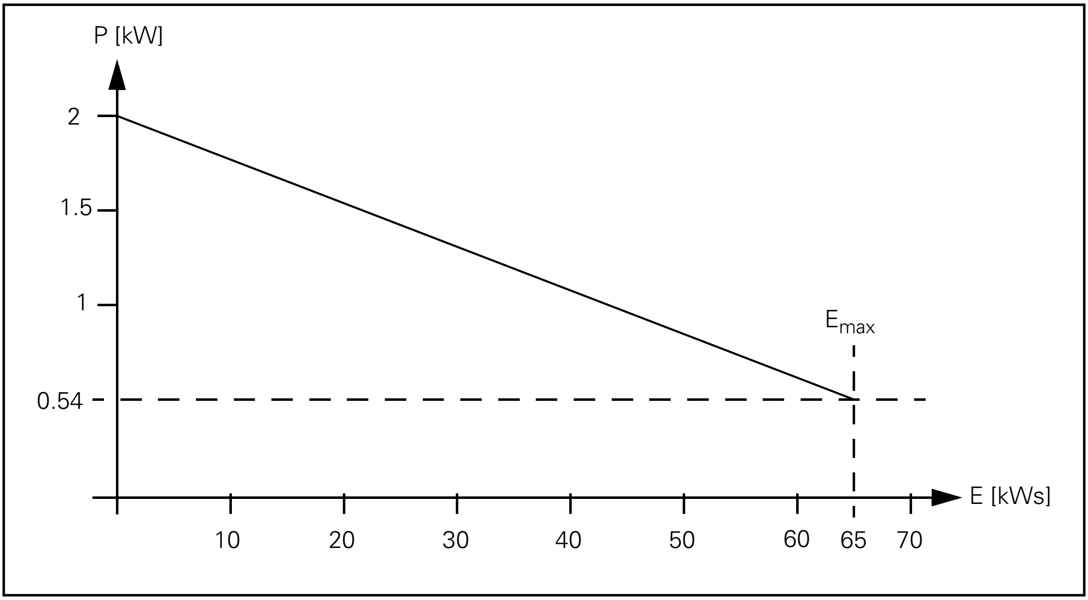
$$P_M = P_{max} \cdot \frac{t_1}{T}$$



PW 210

t_1	T	P_{max}	E_{max}
0.37 s	5 s	27 kW	10 kWs
0.7 s	10 s	27 kW	18.9 kWs
1.1 s	20 s	27 kW	29.7 kWs
1.5 s	50 s	27 kW	40.5 kWs
2.4 s	120 s	27 kW	65 kWs

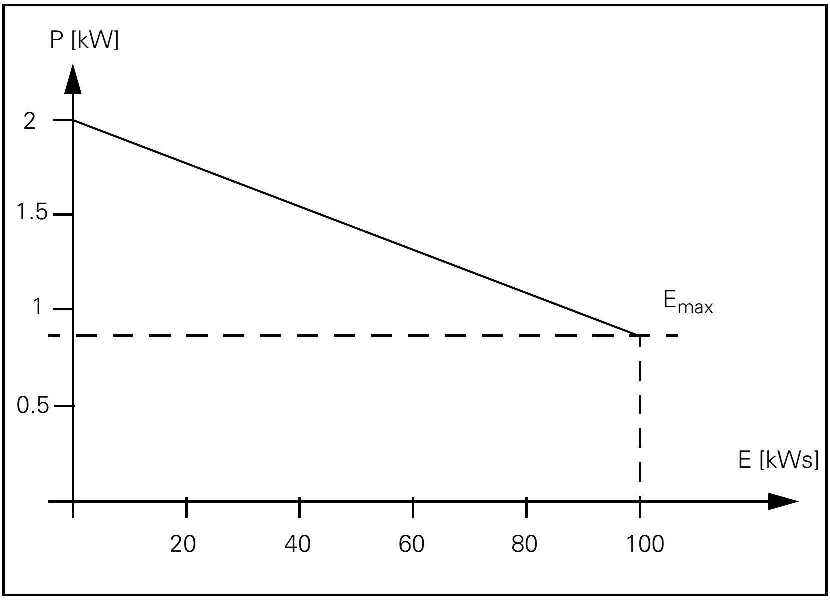
Permissible mean value of the braking performance P_{Mzul} as a function of the braking energy E:



PW 211

t_1	T	P_{max}	E_{max}
0.19 s	5 s	49 kW	10 kWs
0.40 s	10 s	49 kW	19.6 kWs
0.69 s	20 s	49 kW	33.8 kWs
1.15 s	50 s	49 kW	56.4 kWs
2.0 s	120 s	49 kW	100 kWs

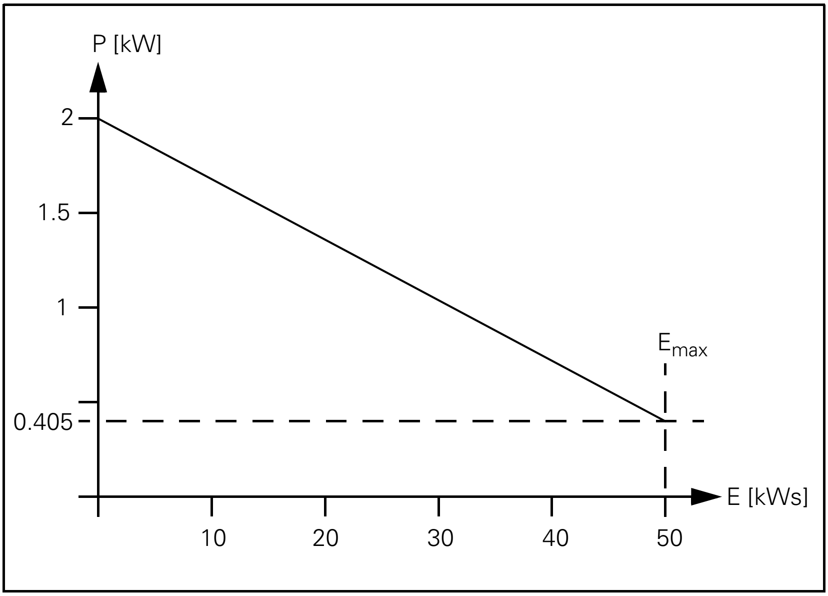
Permissible mean value of the braking performance P_{Mzul} as a function of the braking energy E:



PW 110(B)

t_1	T	P_{max}	E_{max}
0.37 s	5 s	27 kW	10 kWs
0.6 s	10 s	27 kW	16.2 kWs
0.9 s	20 s	27 kW	24.3 kWs
1.3 s	50 s	27 kW	35.1 kWs
1.8 s	120 s	27 kW	50 kWs

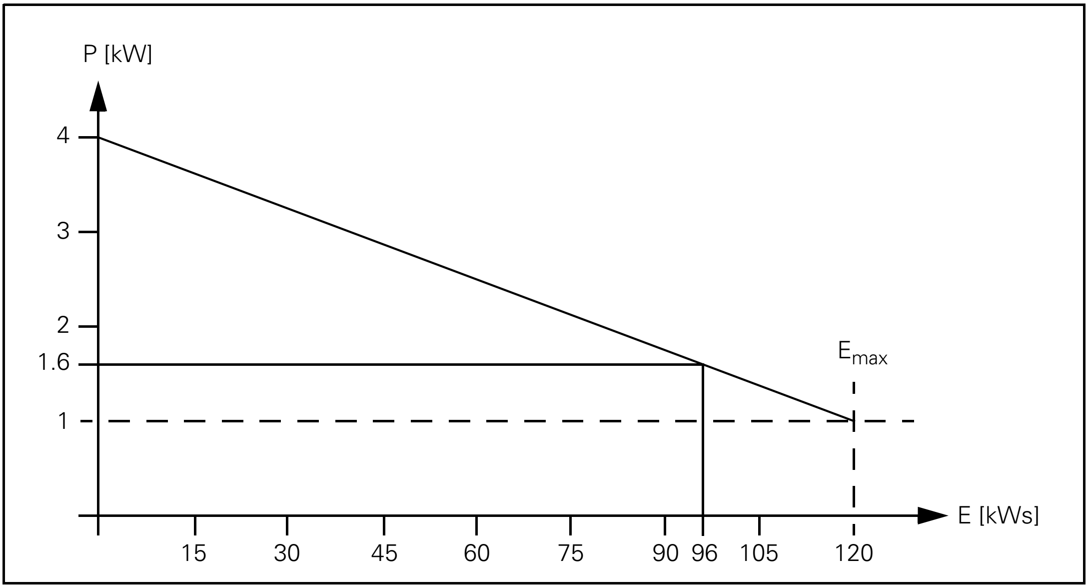
Permissible mean value of the braking performance P_{Mzul} as a function of the braking energy E:



PW 120

t_1	T	P_{max}	E_{max}
0.37 s	5 s	49 kW	18 kWs
0.7 s	10 s	49 kW	34.3 kWs
1.1 s	20 s	49 kW	53.9 kWs
1.5 s	50 s	49 kW	73.5 kWs
2.4 s	120 s	49 kW	120 kWs

Permissible mean value of the braking performance P_{Mzul} as a function of the braking energy E:



Example:
With the calculated braking energy E_{Br} = 96 kWs, the permissible mean value of the braking performance P_{Mzul} = 1.6 kW, meaning $P_M \leq 1.6$ kW.

4 Mounting and Operating Conditions

4 Mounting and Operating Conditions

4.1 General Information

Warning

Keep the following in mind during mounting and electrical installation:

- National regulations for power installations
- Interference and noise immunity
- Conditions of operation
- Mounting attitude

4.1.1 Trained Personnel

In the "Technical Manual for Inverters and Motors," "trained personnel" means persons who are familiar with the installation, mounting, commissioning and operation of HEIDENHAIN inverter systems and motors. Furthermore, electrical engineering work on the system may be carried out only by trained electrical engineering technicians or persons trained specifically for the respective application.

Basically, persons who perform work on HEIDENHAIN inverter systems and motors must meet the following requirements:

- They must have been trained or instructed in the standards of safety engineering.
- They must be familiar with the use of appropriate safety equipment (clothing, measuring systems).
- They should be skilled in first-aid practice.

4.1.2 Meaning of the Used Symbols

Danger

Failure to comply with this information could result in most serious or fatal injuries or in substantial material damage.

Warning

Failure to comply with this information could result in injuries and interruptions of operation, including material damage.

Note

Tips and important information about standards and regulations as well as for better understanding of the document.

4.1.3 General Safety Precautions

The inverter systems from HEIDENHAIN comply with the safety regulations for the electrical equipment of machines in accordance with EN 60204.

Danger

- During the operation of electrical equipment certain parts can inevitably be under power.
- Work on HEIDENHAIN inverter systems and motors may only be performed by trained personnel.
- The personnel must be familiar with the "Technical Manual for Inverter Systems and Motors" and must keep it somewhere well visible and easily accessible.
- The personnel must be familiar with the safety precautions and warnings in the "Technical Manual for Inverter Systems and Motors."
- The faultless and safe operation of HEIDENHAIN inverter systems requires proper transport as well as professional mounting, installation and commissioning. Furthermore, careful maintenance and professional servicing of the HEIDENHAIN components must be ensured.
- HEIDENHAIN warns that the motors operated by inverter systems may cause hazardous movements of the machine axes.
- Ensure that the main switch of the control or machine is switched off when you engage or disengage connecting elements or connection clamps. Before you start working, ensure that the system is not under power.

4.1.4 General Electrical Protective Measures

Danger

- With HEIDENHAIN inverter systems, the leakage current (current at the equipment grounding conductor) is sometimes higher than 3.5 mA.
- The equipment grounding conductor must therefore have a cross section of at least 10 mm^2 according to IEC 61800-5-1.

Warning

HEIDENHAIN performs a voltage test according to EN 60204 on the inverters. If you want to perform this test on the entire system, you must disconnect the power connection of the HEIDENHAIN inverter system in order to prevent damage.

4.1.5 Intended Area of Application

Availability of this product is limited according to IEC 61800-3. This product can cause radio interferences in residential areas. This would require the operator to ensure that appropriate measures are taken.

4.1.6 Degree of Protection (IP Code)

This refers to the amount of protection afforded by the housing against penetration of solid foreign bodies and/or water. The IP code indicates the degree of protection.

First number	Protection against pene tration of solid foreign bodies	Second number	Protection against pene tration of water with disruptive effect
0	No protection	0	No protection
1	≥ 50.0 mm	1	Drops of water falling vertically
2	≥ 12.5 mm	2	Drops of water from angles up to 15°
3	≥ 2.5 mm	3	Spray water
4	≥ 1.0 mm	4	Splash water
5	Dust-protected	5	Water jets
6	Dust-proof	6	Powerful water jets
		7	Temporary immersion
		8	Continuous immersion

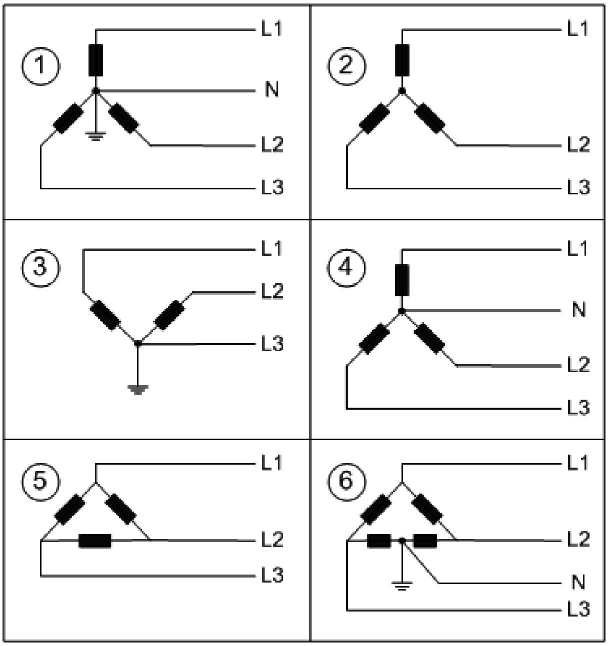
Device	Degree of protection (IP code)
UE 2xx, UE 1xx, UE 2xxB, UR 2xx(D)	IP 20
PW 1x0(B), PW 21x	IP 20
UV 102, UV 105	IP 20
UV 120, UV 130(D), UV 140, UVR 140(D), UVR 150(D), UVR 160D(W)	IP 20
KDR 120, 140, 130B, 150, 160	IP 00
Line filters	IP 20
UP 110	IP 20
UM 1xx	IP 20
QAN asynchronous motors	IP 54
QSY synchronous motors	IP 65 (shaft bore: IP 64)

4.1.7 Connection to Different Types of Networks

Distribution systems – types of networks

HEIDENHAIN power supply units (UV, UVR, UR, UE) and their accessories (line filter, KDR) can only be used in symmetrical three-phase networks with a grounded and loadable star point, unless the line voltage is adjusted separately. These are TN networks with a voltage of 3 x 400 V; 50 to 60 Hz (± 10%). Other power supply networks (e. g. TT, IT networks) must be adjusted via an isolating transformer, and other supply voltages must be adjusted via an autotransformer (see "Adjustment to Different Types of Networks" on page4 – 32).

The following illustrations show some of the possible types of networks:



- 1: Symmetrical three-phase network with a grounded, loadable star point (= TN network). An isolating transformer for adjusting the line voltage is not necessary.
- 2: Symmetrical three-phase network without a star point (= IT network). The use of an isolating transformer is absolutely necessary. The star point must be grounded on the secondary side.
- 3: Asymmetrical three-phase network with a grounded external line. The use of an isolating transformer is absolutely necessary. The star point must be grounded on the secondary side.
- 4: Symmetrical three-phase network with a non-grounded star point (9 = TT network). The use of an isolating transformer is absolutely necessary. The star point must be grounded on the secondary side.
- 5: Symmetrical three-phase network without a star point. The use of an isolating transformer is absolutely necessary. The star point must be grounded on the secondary side.
- 6: Asymmetrical three-phase network with midpoint tap. The use of an isolating transformer is absolutely necessary. The star point must be grounded on the secondary side.

TN network

TN networks provide a low-impedance galvanic connection between the reference ground potentials of the power source and the grounding conductor potential of the electric consuming device (VDE 0100 Part 300). This means that direct connection of the inverter system is possible (without fault-current circuit breaker and isolating transformer) and, in the event of an error, proper electrical separation can be ensured by means of standard measures (e.g. fuse).

Should you want for a specific reason to use a fault-current circuit breaker, you must use an AC/DC-universal fault-current circuit breaker Type B with a fault current of 300 mA. When using a fault-current circuit breaker, you must ensure that the grounding conductor of the inverter system is properly grounded and has a large enough cross section (min. 10 mm²).

If a low-impedance reference ground potential cannot be guaranteed by the power supply company, the inverter system must be connected in the same way as in a TT or IT network. This is due to the resulting asymmetries between the external lines and the star point, and makes the use of an isolating transformer absolutely necessary.

Warning

Type A and Type AC fault-current circuit breakers must not be used.

TT and IT networks

For TT and IT networks, power supply companies require the inverters to be connected via fault-current circuit breakers or isolating transformers because a ground connection at the generator is not always provided (VDE 0100 Part 300). This is necessary because the line power must be quickly disconnected and all of the system's parts must be free of hazardous voltage when an error occurs (IEC 61800-5-1). This can only be ensured if appropriate measures are taken.

Appropriate protective measures are AC/DC-universal fault-current circuit breakers (Type B, switching threshold 300 mA, with frequency evaluation, available up to a rated current of 63 A) or an isolating transformer. In addition, the machine must have its own connection to ground (central grounding point).

The network requirements allow the use of a fault-current circuit breaker for the HEIDENHAIN compact inverters and the modular inverter systems up to 30 kW (e.g. UVR 120 D, UVR 130D; VDE 0100 Part 300). When connecting the inverter system, you must ensure that the grounding conductor of the inverter system is properly grounded and has a large enough cross section (min. 10 mm²).

If, however, the inverter systems for 45 kW and higher (e.g. UVR 140 D at max. load, UVR 150D, UVR 160D(W)) are used, the rated current of 63 A of the fault-current circuit breaker is exceeded. In this case an isolating transformer must be used. For connection and dimensions, see "Isolating transformer" on page 8.

Warning

Type A and Type AC fault-current circuit breakers must not be used.

Isolating transformer

If an isolating transformer is required, it must be wired on the secondary side in the Y circuit. The isolating transformer's star point on the secondary side must be connected to the grounding conductor potential and must be connected to the grounding conductor of the inverter system.

The following dimensions are recommended:

Power supply unit	Rated power output of the isolating transformer	Short-circuit voltage
UV 140, UVR 140 D	$S_N \geq 58.3$ kVA	$U_K \leq 3$ %
UVR 150	$S_N \geq 65$ kVA	$U_K \leq 3$ %
UVR 150 D	$S_N \geq 71.5$ kVA	$U_K \leq 3$ %
UVR 160 D(W)	$S_N \geq 105$kVA	$U_K \leq 3$ %

4.1.8 Adjusting the Line Voltage by Means of a Transformer

If no line power of 400 V~ ±10% is available, an autotransformer can be used for adjusting the line voltage.

Unit	Rated power output of the autotransformer
UE 11x[a]	$S_N \geq 15.0$ kVA
UE 21x	$S_N \geq 19.5$ kVA
UE 21xB	$S_N \geq 22.5$ kVA
UE 230, UE 24x	$S_N \geq 30.0$ kVA
UE 230B, UE 24xB	$S_N \geq 33.0$ kVA
UV 120, UVR 120 D, UR 2xx	$S_N \geq 28.6$ kVA
UV 130, UV130 D	$S_N \geq 45.0$ kVA
UVR 130D	$S_N \geq 39.0$ kVA
UV 140, UVR 140 D	$S_N \geq 58.5$ kVA
UVR 150	$S_N \geq 65.0$ kVA
UVR 150D	$S_N \geq 71.5$ kVA
UVR 160D(W)	$S_N \geq 105$ kVA

a. The inverters can be operated up to a line voltage of 480 V~ +6%.

4.1.9 Overvoltage Protector

It may become necessary to insert an overvoltage protector in the supply voltage path (preferably in front of the line filter) in order to protect the inverters against overvoltage from the power line and against the resulting overvoltage damage.
Notes for the connection see page 4 – 30.

HEIDENHAIN recommends using an overvoltage protector which limits the voltage peaks from the power line to 2500 V.

Modules, such as the FLT-CP-3C-350 from the company Phoenix Contact, are suitable for this purpose.

☞ **Note**

If a machine is required to comply with UL requirements, an overvoltage protector (such as mentioned above) **must** be inserted.

4.1.10 Cross Sections of the Power Cables

IEC 204-1 is valid for the dimensions of leads and cables.

A permissible current load value I_Z is assigned to each cable cross section. This permissible current load value must be corrected with two factors:

- Correction factor C_1 for increased ambient air temperature
  - C_1 = 0.91 for +45 °C
  - C_1 = 0.82 for +50 °C
  - C_1 = 0.71 for +55 °C
- Correction factor C_2 = 1.13 for insulation material at an increased operating temperature of +90 °C

The following tables are valid for

- An ambient temperature of +40 °C
- An operating temperature of +90 °C (only H07 V2-K and Lapp Ölflex-Servo-FD 795 P single conductors)
- Installation type B1
  Conductor in the installation armor and installation channels to be opened.
- Installation type B2
  Cables and leads in the installation armor and installation channels to be opened.
- Installation types C and E
  Cables and leads on walls and on open cable racks.

Cable cross section	**Permissible current load with installation type B1**		**Permissible current load with installation type B2**
	Single conductor Standard PVC	**Single conductor H07 V2-K**	**Cable Lapp Ölflex-Servo-FD 795 P**
1.0 mm^2	10.4 A	11.7 A	10.8 A
1.5 mm^2	13.5 A	15.2 A	13.8 A
2.5 mm^2	18.3 A	20.6 A	18.6 A
4.0 mm^2	25.0 A	28.2 A	26.0 A
6.0 mm^2	32.0 A	36.1 A	32.8 A
10.0 mm^2	44.0 A	49.7 A	45.2 A
16.0 mm^2	60.0 A	67.8 A	59.9 A
25.0 mm^2	77.0 A	87.0 A	75.7 A
35.0 mm^2	97.0 A	109.6 A	93.8 A
50.0 mm^2	–	–	111.2
70.0 mm^2	–	–	140.1

Cable cross section	Permissible current load with installation types C and E		
	Single conductor Standard PVC	**Single conductor H07 V2-K**	**Cable Lapp Ölflex-Servo-FD 795 P**
35.0 mm^2	104.0 A	117.5 A	117.5 A
50.0 mm^2	123.0 A	139.0 A	139.0 A
70.0 mm^2	155.0 A	175.1 A	175.1 A
95.0 mm^2	192.0 A	217.0 A	217.0 A
120.0 mm^2	221.0 A	249.7 A	249.7 A

Cable bundling is not taken into account in the tables. Please consult IEC 204-1.

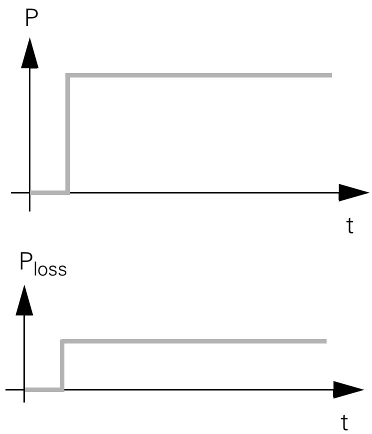
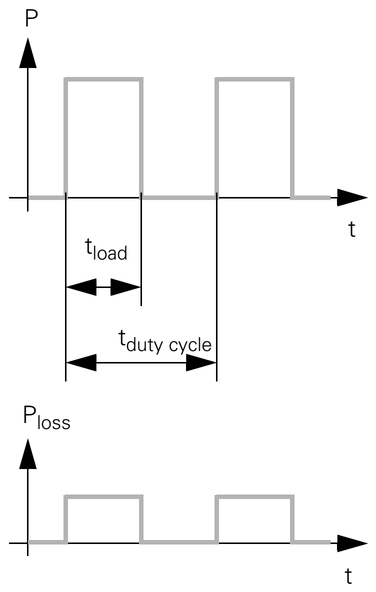
Example

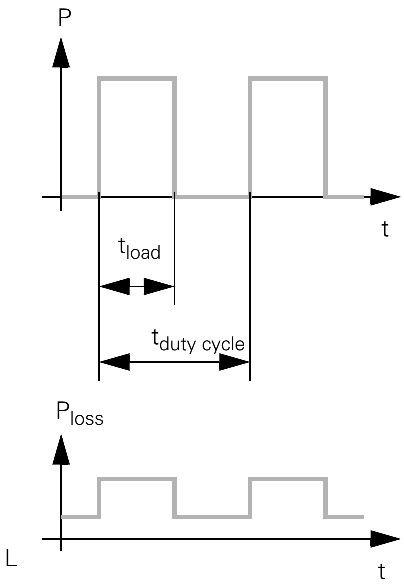
H07 V2-K single conductor with a cross section of 16 mm^2 and installation type B2 at an ambient temperature of +50 °C:

Permissible current load at +40 °C (according to table): 67.8 A
Correction factor for ambient temperature of +50 °C: 0.82

Permissible current load (+50 °C) = C1 · permissible current load (+40 °C)
Permissible current load (+50 °C) = 0.82 · 67.8 A = 55.6 A

4.1.11 Operating Modes

Operating mode	Description	
S1	Continuous duty at constant load	
S3	Intermittent periodic duty	

Operating mode	Description	
S6	Continuous duty with intermittent load	

4.2 EMC—Electromagnetic Compatibility

4.2.1 Valid Regulations

The inverter systems and motors comply with the following standards based on European Community EMC directive No. 89/336/EEC:

- Power line disturbance and radio interference suppression Class A according to EN 55022
- Power line disturbance and radio interference suppression Class A according to EN 55011
- Radio interference and immunity to interference according to IEC 61800-3

The inverter systems and motors are intended for operation in industrially-zoned areas.

Protect your equipment from interference by observing the following rules and recommendations.

4.2.2 Likely Sources of Interference

Interference is mainly produced by capacitive and inductive coupling from electrical conductors or from device inputs/outputs, such as:

- Strong magnetic fields from transformers or electric motors
- Relays, contactors and solenoid valves
- High-frequency equipment, pulse equipment and stray magnetic fields from switch-mode power supplies
- Power lines and leads to the above equipment

4.2.3 Power Supply Stability, Requirements

Since the regenerative power supply units from HEIDENHAIN use sine commutation, there is no interference in the frequency range up to 2.5 kHz. To keep interference in the frequency range above 2.5 kHz to a minimum, the power supply stability must meet the following requirements:

Regenerative power supply units	**Minimum short-circuit current**[a]	**Minimum short-circuit power**
UV 120, UVR 120D, UR 2xxD	$I_{SC} = 50 * I_N = 1600$ A	$S_K = 1.10$ MVA
UVR 130D	$I_{SC} = 50 * I_N = 2200$ A	$S_K = 1.50$ MVA
UV 140, UVR 140D	$I_{SC} = 50 * I_N = 3300$ A	$S_K = 2.15$ MVA
UVR 150	$I_{SC} = 50 * I_N = 3700$ A	$S_K = 2.60$ MVA
UVR 150D	$I_{SC} = 50 * I_N = 4000$ A	$S_K = 2.86$ MVA
UVR 160D(W)	$I_{SC} = 50 * I_N = 5800$ A	$S_K = 4.00$ MVA

a. This value applies only in conjunction with HEIDENHAIN three-phase capacitors.

4.2.4 CE Marking

Machine tool builders, system and facility installers are responsible for EMC compliance. Systems, machines and complete drives with frequency inverters must therefore bear the CE mark. The HEIDENHAIN components all bear the CE mark.

4.2.5 Interference and Noise Immunity

The fast switching processes and high coupling capacitance of variable-speed three-phase motors with frequency inverters result in substantial interference to ground. This interference is not only spread along the lines, but it is also radiated and must therefore be suppressed by taking adequate measures.

Conducted interference

Conducted interference includes both high-frequency interference from the PWM operation (pulse-width modulation) of the inverter system and power line disturbance due to non-sinusoidal current drain (not with HEIDENHAIN regenerative inverter systems) from the power line, e.g. through commutation notches in the power rectifier. This type of interference is spread mainly through the power line. Appropriate protective measures must therefore be taken. See “Protective Measures” on page 16

Radiated interference

Radiated interference is high-frequency interference spreading in the form of electromagnetic waves. They are primarily radiated from the motor cable, but also from the inverter housing and from the motor itself. These waves are taken up by electric consuming devices and their connecting leads, and then fed back into the power line as interference current. Appropriate protective measures must therefore be taken. See “Protective Measures” on page 16

4.2.6 Noise Immunity

External electromagnetic influences must not affect the functioning and operational reliability of the inverter system. This includes conducted interference that affects the power input, and radiated interference that may be caused by the inverter itself (self-induced interference). Appropriate protective measures must therefore be taken. See “Protective Measures” on page 16

4.2.7 Protective Measures

General information

- Keep a minimum distance of 20 cm from the control and its leads to interfering equipment.
- A minimum distance of 10 cm from the control and its leads to cables that carry interference signals. For cables in metallic ducting, adequate decoupling can be achieved by using a grounded separation shield.
- Shielding according to EN 50 178.
- Use potential compensating lines with a minimum cross section of 10 mm^2.
- Use only genuine HEIDENHAIN cables, connectors and couplings.
- Use HEIDENHAIN covers for the ribbon cables between the inverter units in modular inverter systems.

Compact Inverters UE 1xx UE 2xx UE 2xxB

- Integration of toroidal cores in the motor leads (X80 to X84).
- Integration of one toroidal core in the voltage supply lead (X31).
- **Only UE 21x:** Integration of toroidal cores in the braking resistor leads.

These measures serve to suppress conducted interference (power line disturbance according to EN 55011 / 55022 Class A). The toroidal cores are included in the items supplied with the compact inverters.

Regenerative inverter systems

- A suitable HEIDENHAIN commutating reactor must be used.
- A line filter from HEIDENHAIN must be used.
- We recommend that you use a HEIDENHAIN three-phase capacitor to ensure additional interference suppression if you are using a line filter.

Note

High-frequency disturbances in the power line may occur with other commutating reactors or line filters.

Motors

- If the described EMC protective measures are taken, the HEIDENHAIN motors can be operated with cable lengths up to **15 m.** If greater cable lengths are required, it might be necessary to take additional measures for interference suppression.
- The shield of the line for the holding brake is to be kept as close as possible (< 30 mm) to ground. The best solution is to fasten the shield with a metal clamp directly onto the sheet-metal housing of the electrical cabinet.

4.3 Leakage Current from the Inverter Housing to the Grounding Connection

HEIDENHAIN inverters are electronic equipment with a leakage current greater than 3.5 mA (from the housing to ground). Therefore a sticker with the following warning is on the inverter components:

Ableitstrom > 3.5 mA
Potenzialausgleich anschließen!

Leakage current > 3.5 mA
Connect potential equalization!

Danger

Since persons must not be exposed to leakage currents greater than 3.5 mA, the following must be ensured for protective grounding according to IEC 61800-5-1 "Adjustable Speed Electric Power Drive Systems"):

- Power connection with clamping:
  The cable for the grounding connection must have a line cross section greater than half that of an external line, but at least (≥) ∅ 10 mm^2.
- Power connection with connector:
  A second grounding conductor with a line cross section greater than half that of an external line, but at least (≥) ∅ 10 mm^2, along with the grounding conductor of the connector, must be firmly grounded.

This means that in both cases a clamped grounding connection must be installed.

If more than one piece of equipment is connected to the same grounding connection, the leakage currents add up. Therefore the commissioner must ensure that the grounding connection is of sufficient low-impedance.

Danger

HEIDENHAIN recommends placing a sign on the outside of the electrical cabinet with a warning and a connection recommendation for the grounding conductor.

4.4 Environmental Conditions

4.4.1 Heat Generation and Cooling

Warning

The permissible ambient temperature for operation of the inverter systems is between 0 °C and 40 °C. Any deviation from this will impair the operating safety.

The following measures can ensure adequate heat removal:

- Provide sufficient space for air circulation.
- An integrated ventilation system must remove the warm air and introduce cooling air, while ensuring that the permissible degree of contamination of the cooling air is not exceeded (See “Contamination” on page 21). If this is not possible, a heat exchanger must be provided to avoid failures. HEIDENHAIN recommends that these units (with separate internal and external cooling circuit) always be installed for reasons of operational safety.
- Exit air from cooling systems of other devices must not be introduced into the unit.
- The warm air should flow over surfaces that have good thermal conductivity to the external surroundings.
- For a closed steel housing without assisted cooling, the figure for heat conduction is 3 W/m^2 of surface per °C air temperature difference between inside and outside.
- Use of a cooler.

4.4.2 Humidity

Permissible humidity

- Maximum 75% in continuous operation
- Maximum 95% for not more than 30 days a year (equally distributed)

In tropical areas it is recommended that the devices not be switched off, so that condensation is avoided on the circuit boards.

4.4.3 Climate Control Units

If you use climate control units, then the regulations under IEC 61800-1:1997 must be followed (and where applicable, the German version EN 61800-1:1998 as well).

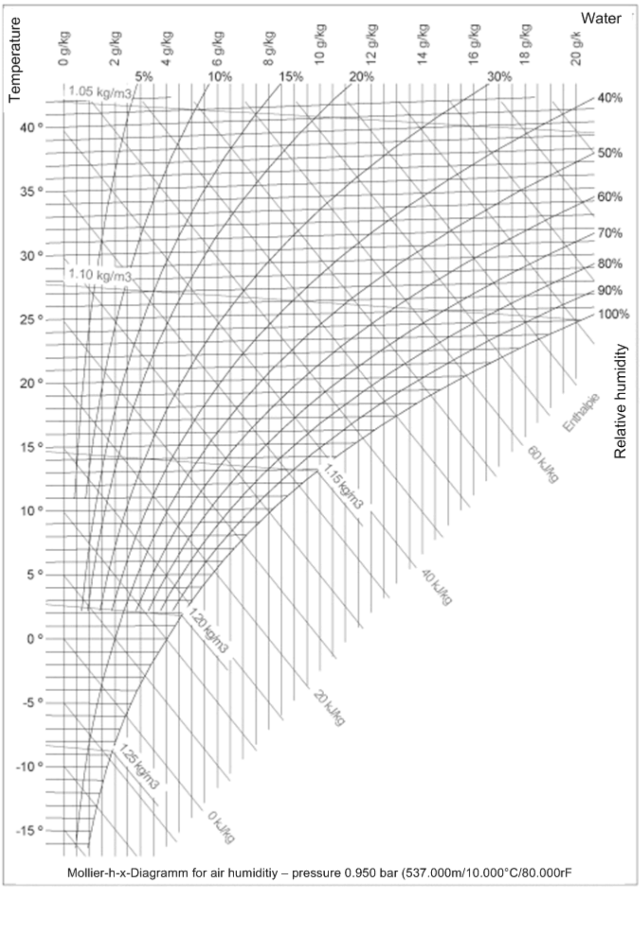
Errors with serious consequences for the electronic components in the electrical cabinet are repeatedly made when climate control units are used.

Warning

By cooling the air, the relative humidity in the electrical cabinet increases, which can lead to the formation of condensation on the cooler surfaces of the inverters. Under certain circumstances, this condensation can lead to flashovers and destruction of the electronic components.

If the temperature without cooling in the electrical cabinet is +40 °C and the relative humidity is 50%, then condensation already forms when the air is cooled to approx. +27 °C.

The Mollier h-x diagram helps to illustrate the changes that occur in the humid air.

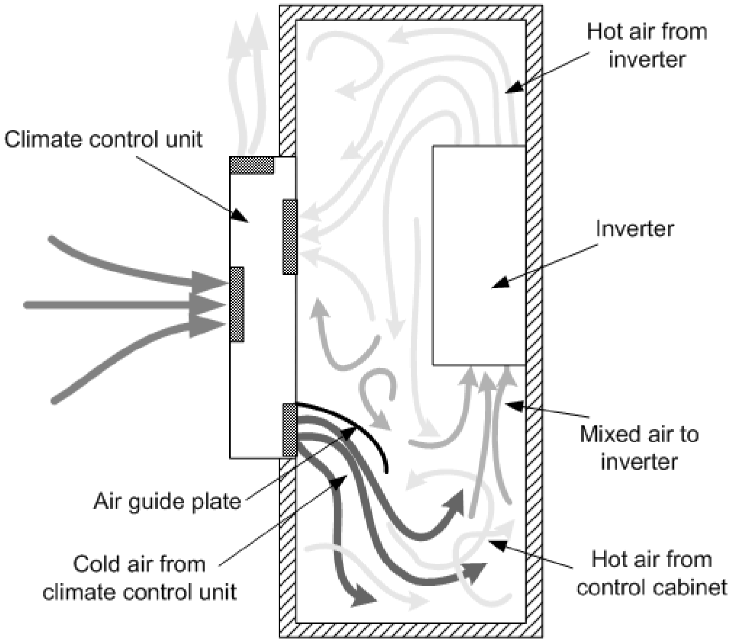


Mollier-h-x-Diagramm for air humiditiy – pressure 0.950 bar (537.000m/10.000°C/80.000rF

The following must be considered when positioning the climate control unit:

- The position of the climate control unit in the electrical cabinet must be selected such that under no circumstances is the warm air from the inverters sucked directly into the climate control unit.
- The position of the climate control unit must ensure that the cold air is not sucked into the inverters before it mixes with the warm air in the electrical cabinet. This can be ensured with air guide plates.
- There must be sufficient room between the climate control unit and the inverter components for the air in the electrical cabinet to become mixed.
- The climate control unit should be positioned lower than the inverters, and not at the same height as the inverters, and under no circumstances above them.

Correct placement with resulting airflow when using a climate control unit:



The following must be considered for the settings of the climate control unit:

- In order to utilize the maximum power of the inverters, the cold air that flows into the inverters should not exceed +40 °C. However, the temperature should also not be too low, otherwise condensation can form on the inverter components.
- If the temperature sensor that regulates the climate control unit is located within the unit (at the point where the warm air from the electrical cabinet is sucked in), then the activation temperature of the climate control unit should be set to +35 °C.
  The switching hysteresis must not exceed 5 °C.

In order to avoid condensation, the electrical cabinet should be as air-tight as possible. Within a closed system the climate control unit can release the condensation, thereby reducing the relative humidity inside the electrical cabinet. When the machine is switched off, e.g. with an emergency stop at night, the climate control unit should continue to operate in order to prevent condensation when the machine is switched on again.

If you have difficulties mounting the climate control unit, contact the manufacturer.

4.4.4 Mechanical Vibration

Permissible vibration:	± 0.075 mm, 10 to 41 Hz 5 m/s^2, 41 Hz to 500 Hz
Permissible shock:	50 m/s^2, 11 ms

4.4.5 Contamination

Contamination level 2 in accordance with IEC 61800-5-1 is permissible.

Warning

HEIDENHAIN cannot provide any warranty for inverter failures caused by impermissible contamination. The deposition of dust from the ambient air, precipitation of chemical contamination contained in the air or the natural formation of dew after switching off the machine can form a conductive layer on the inverter's live parts and may cause flashovers resulting in corresponding damage.

HEIDENHAIN recommends providing the machine tool with suitable equipment so as to prevent operation while the door of the electrical cabinet is open. Corresponding information should be provided for the end user to be made aware of the risk of working as well as increasing the contamination when the door of the electrical cabinet is open.

4.5 Water Cooling

Keep the following in mind when mounting and operating water-cooled HEIDENHAIN inverter components and water-cooled HEIDENHAIN power modules:

- The tightening torque for connecting the hose to the coupling joint on the HEIDENHAIN components is max. 20 Nm. The hose and the coupling joint must be steadied from each side by using two wrenches (WAF 22).
- The bend radius of the coolant hose is greater than 100 mm.
- Use a closed cooling circuit.
- The following applies for the temperature of the coolant: 20 °C < coolant/ water < 40 °C.

Warning

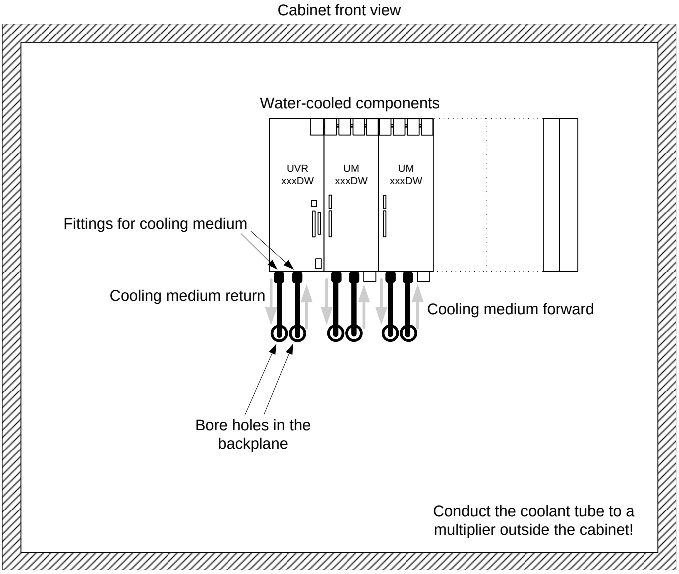
The temperature of the coolant must be no more than 5 °K lower than the ambient temperature of the components to be cooled in order to avoid condensation in the electronic components.

- Maximum coolant pressure = 5 bars. A pressure reducer can be used if required.
- Minimum flow rate of coolant = 3 l/min. HEIDENHAIN recommends a flow rate of 6 l/min.
- If required, filters should be used to prevent the coolant from being contaminated. The filter fineness must be < 100 µm.
- The pH value of the coolant should be approx. 7 to ensure that the service life of the coolant hoses is not impaired.
- If water is used as a coolant, corrosion protection must be used. HEIDENHAIN recommends using, for example, Waterdos CAN11 with a ratio of 1 % to 2 % to protect the coolant from corrosion.
- The diameter of the hole for leading the hose through the rear wall of the electrical cabinet must be > 28 mm. Make sure that the coolant hose is not damaged by the edges of the hole (use plastic ducts if required).
- Ensure that the coolant hose does not rest on sharp edges in order to prevent damage to the hose. A permanently safe operation of the water cooling system can only be ensured if this is adhered to.

Danger

Check the complete cooling circuit for tightness before putting the components into service (max. pressure of coolant = 5 bar)!

The following figure illustrates the connection of the water cooling system to the corresponding components:



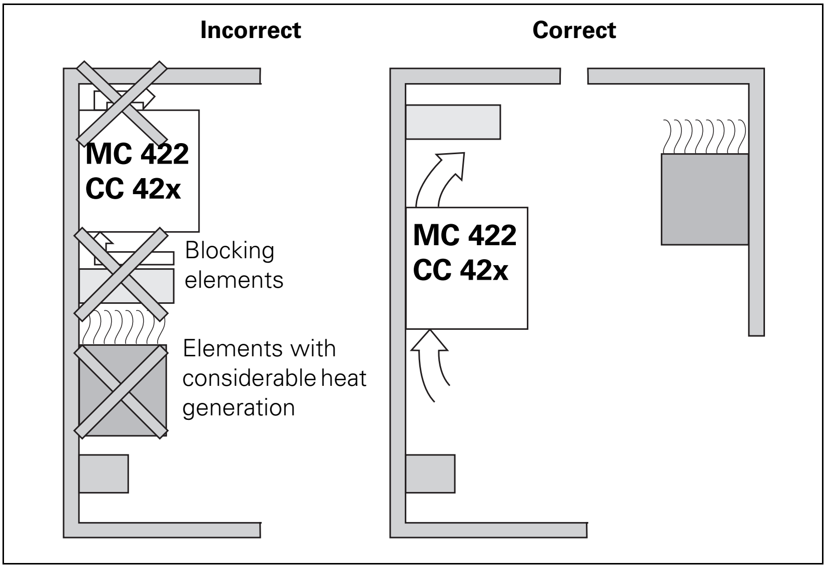
4.6 Mounting Attitude

4.6.1 General Information

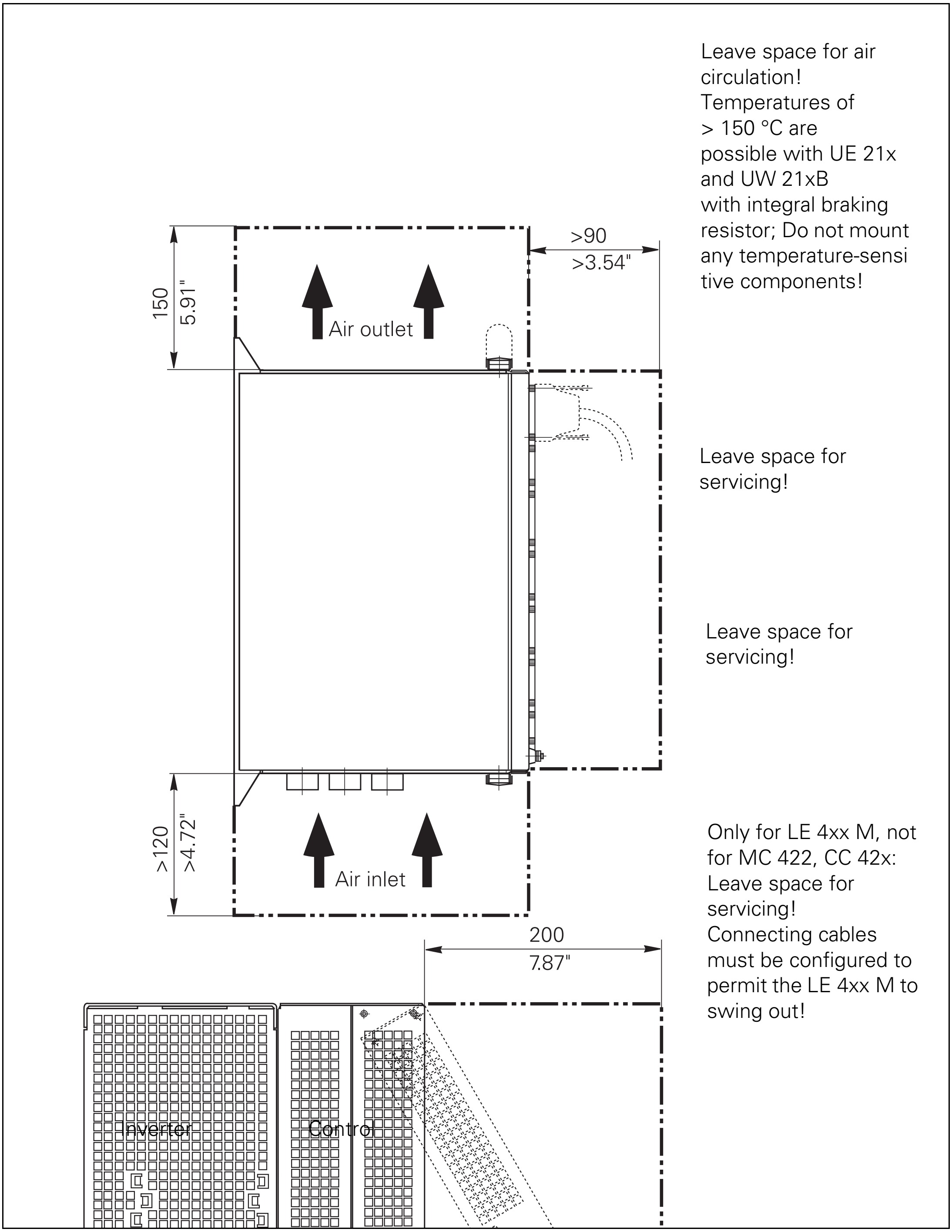
Warning

When mounting, please observe the following:

- Proper minimum clearance
- Space requirements
- Appropriate length of connecting cables
- Professional mounting in connection with other elements in the electrical cabinet (see drawing)



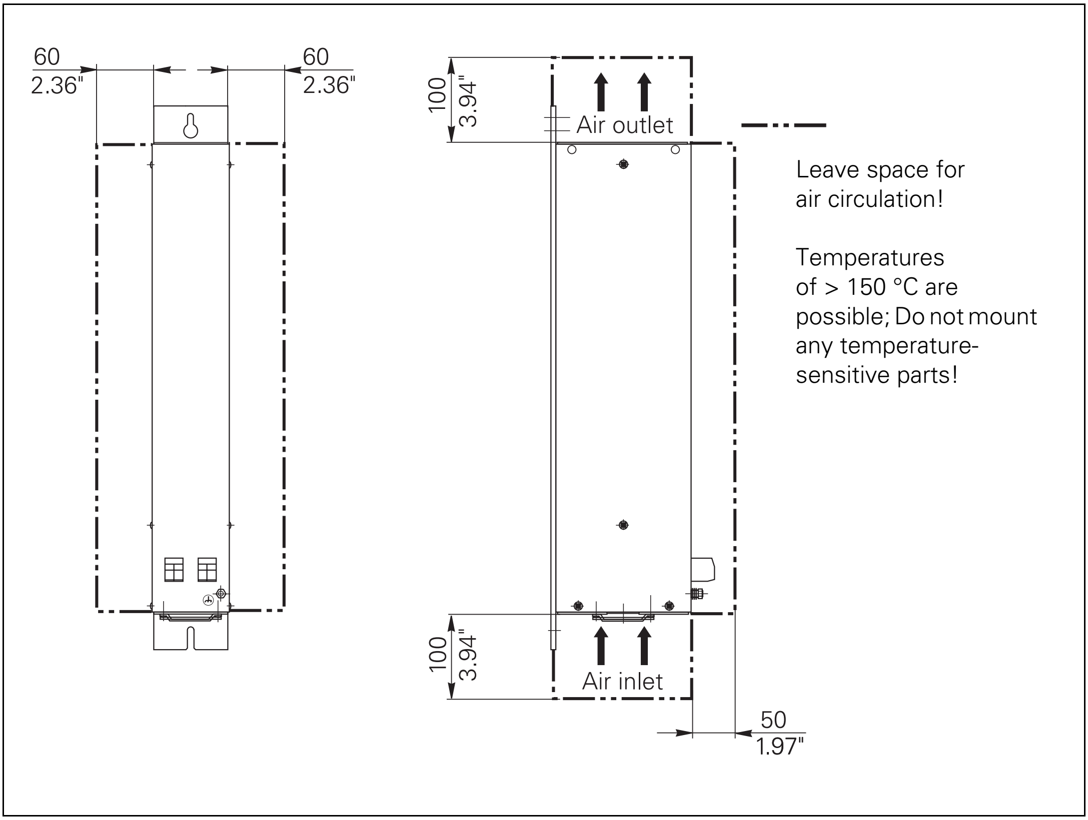
4.6.2 Mounting Attitude of the HEIDENHAIN Inverter



4.6.3 Mounting Attitude of the PW 1x0(B) Braking Resistor

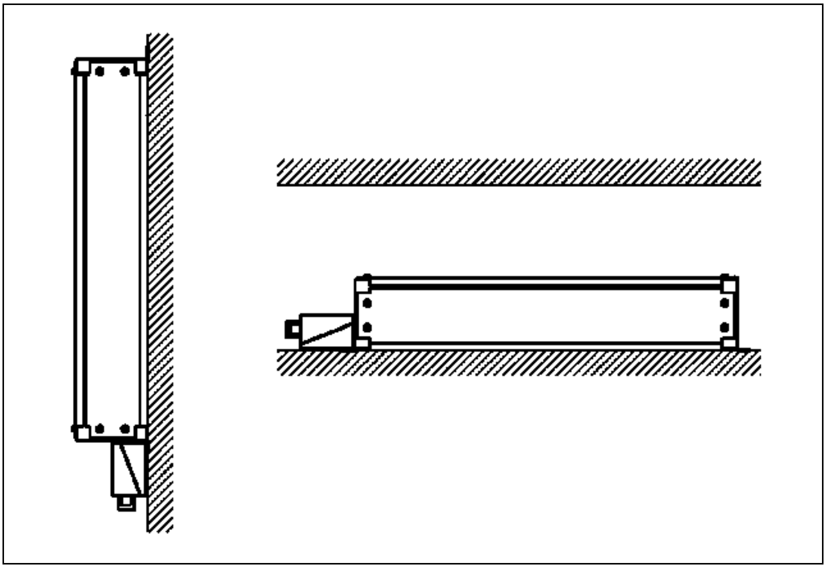
Danger

Because a very large amount of heat might be generated, the PW 1x0(B) braking resistor should be mounted outside the electrical cabinet in a vertical position (with the fan at the bottom.) Mount the PW 1x0(B) braking resistor in a way that prevents the ingress of splashing water (coolant) and makes unintentional personal contact impossible.

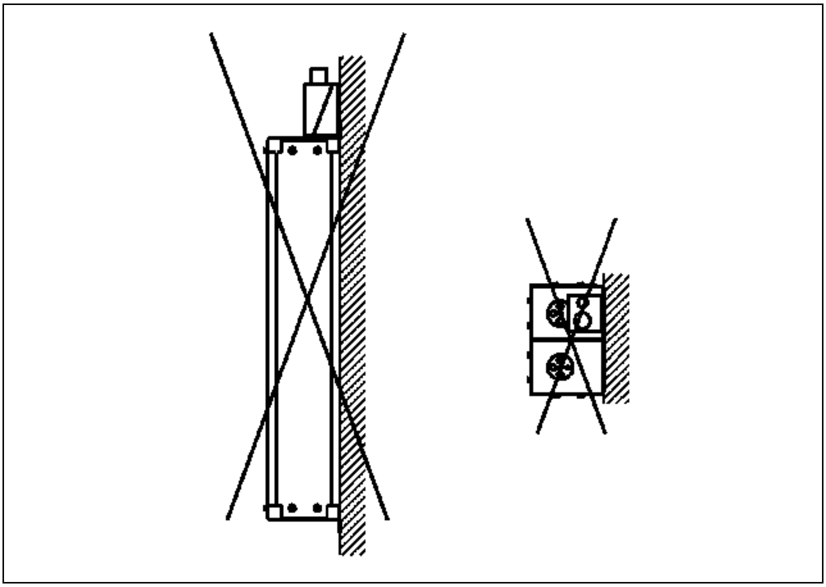


4.6.4 Mounting Attitude of the PW 21x Braking Resistor

Because a very large amount of heat might be generated, the PW 21x should be mounted outside the electrical cabinet, either in a vertical (connections at bottom) or a horizontal (connections at rear) position.

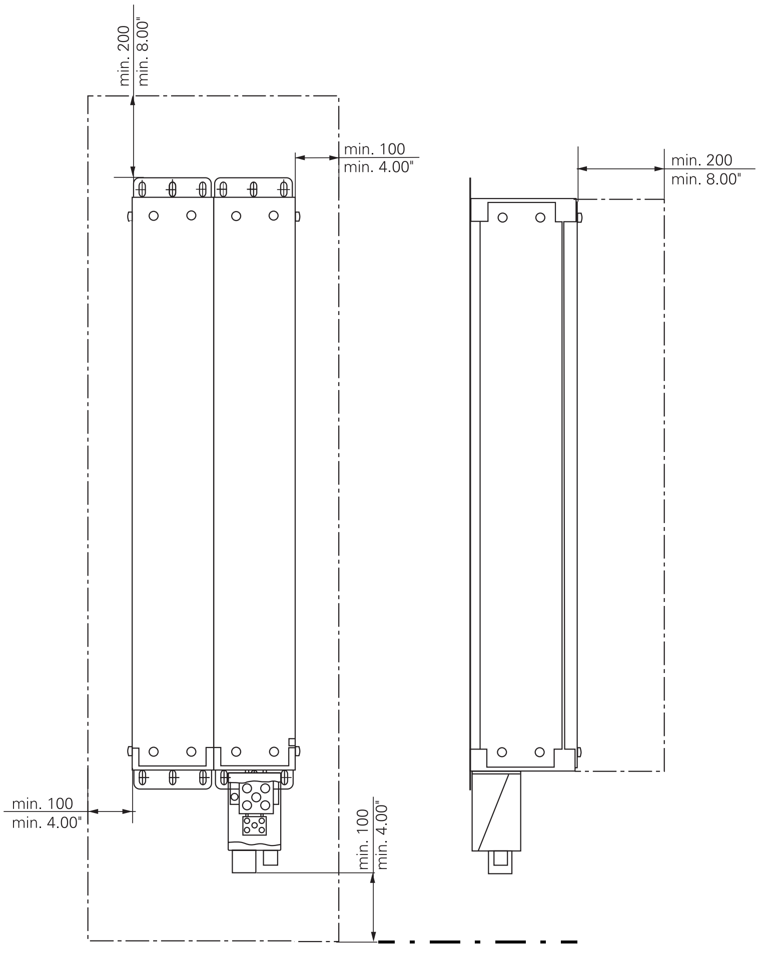


The braking resistor must not be positioned so that the connections face upwards, since the heat produced rises.



Danger

Mount the PW 21x braking resistor in a way that prevents the ingress of splashing water (coolant). At the same time, a cover must be mounted to make personal contact with the braking resistor impossible.

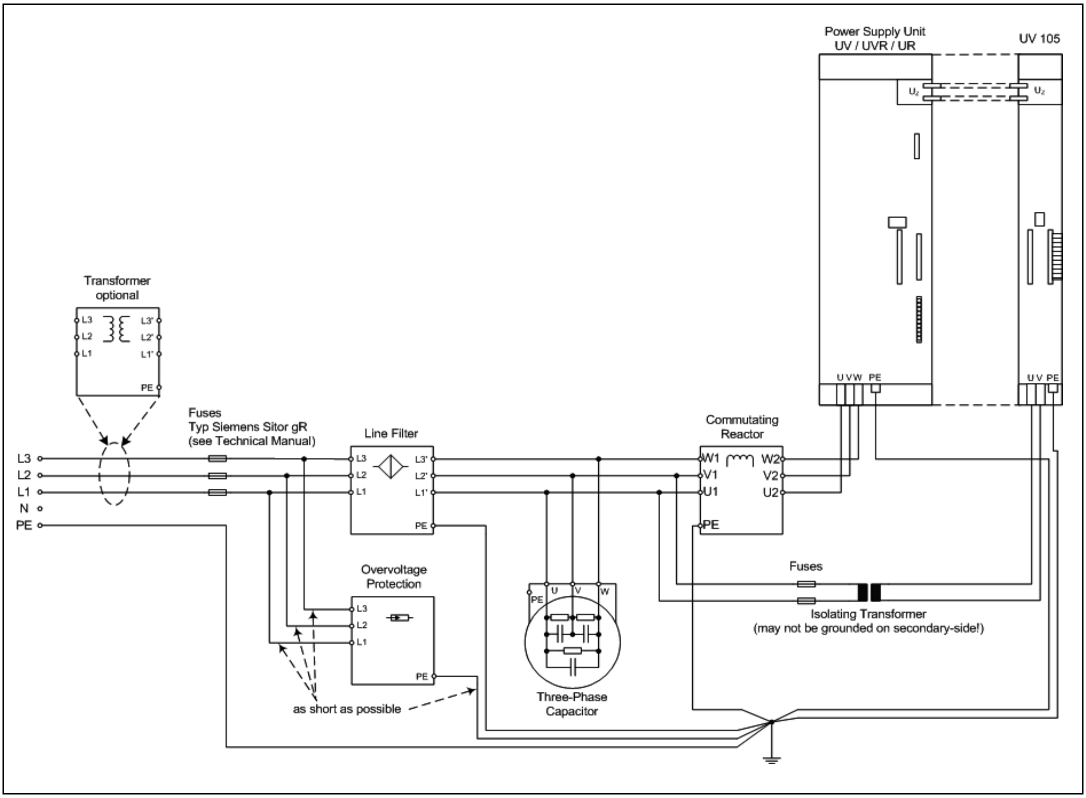


Leave space for air circulation!

Temperatures of > 150 °C are possible; Do not mount any temperature-sensitive

4.7 Connection Overviews

4.7.1 Power Connection of Regenerative Inverter Systems



Standard

A line filter and commutating reactor are required for connecting regenerative inverter systems. The use of a three-phase capacitor for additional mains interference suppression is recommended. If you are using an UV 105 as an additional 5-V power supply, you must connect it through an isolating transformer via separate fuses.

Details for connecting the UV 105 see page 6 – 72.

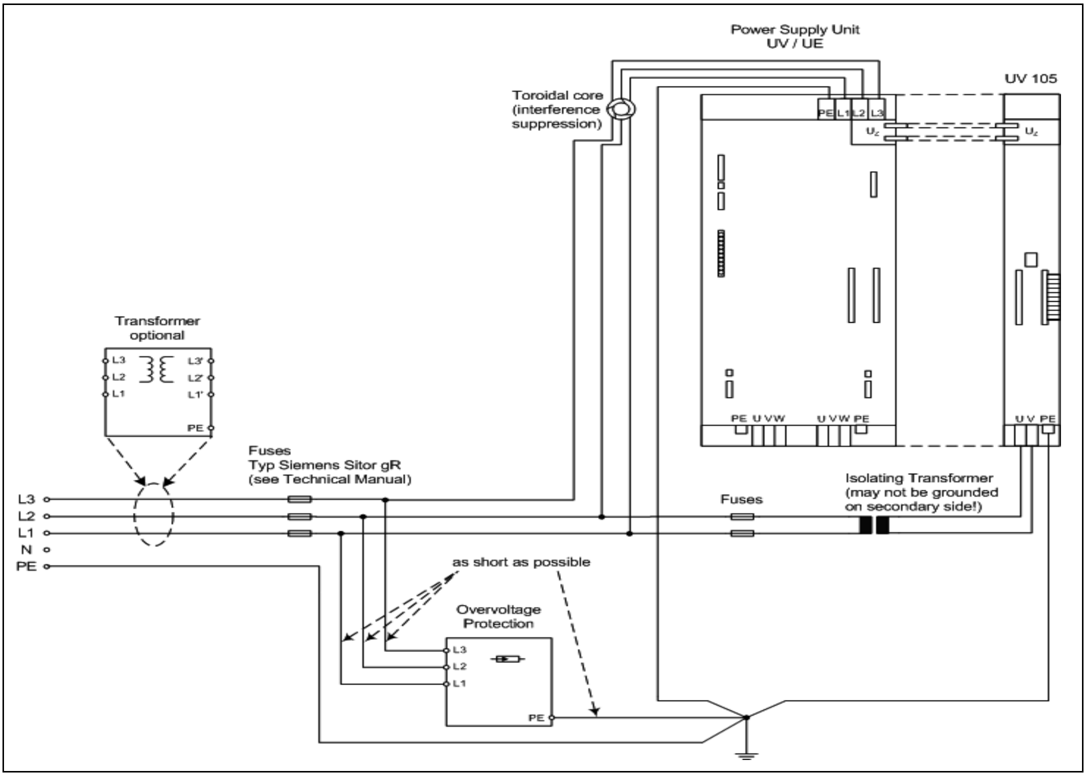
UL certification

In addition to the above-mentioned components, an overvoltage protector is required for compliance with UL requirements. See “Overvoltage Protector” on page 9

Autotransformer

If the available supply voltage (L1, L2, L3, N) differs from the supply voltage specified for the modules, an autotransformer is required to adjust the voltages (see connection overview above). It must comply at least with the connection specifications of the subsequent compact inverter.

4.7.2 Power Connection of Non-Regenerative Inverter Systems



Standard

The toroidal cores included in the items supplied must be mounted when connecting non-regenerative inverter systems of the UE series. The procedure for mounting the toroidal cores is described in Chapter see page 5 – 38.
If you are using an UV 105 as an additional 5-V power supply, you must connect it through an isolating transformer via separate fuses.

Details for connecting the UV 105 see page 6 – 72.

UL certification

In addition to the above-mentioned components, an overvoltage protector is required for compliance with UL requirements. See “Overvoltage Protector” on page 9

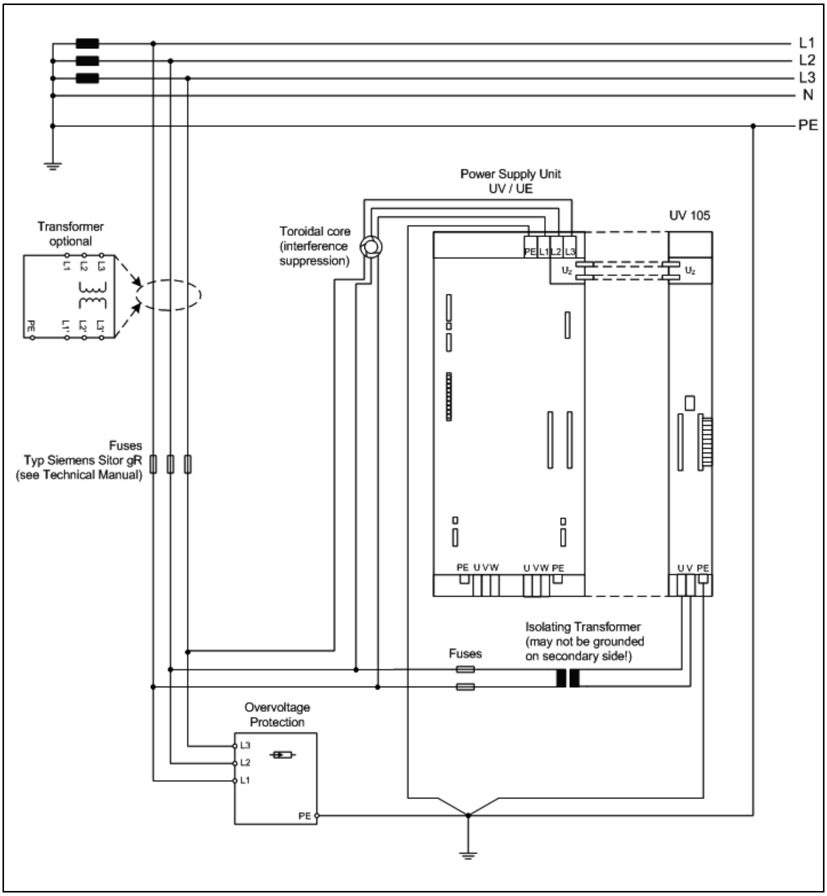
Autotransformer

If the available supply voltage (L1, L2, L3, N) differs from the supply voltage specified for the modules, an autotransformer is required to adjust the voltages (see connection overview above). It must comply at least with the connection specifications of the subsequent compact inverter.

4.7.3 Adjustment to Different Types of Networks

The following basic circuit diagrams illustrate the connection of non-regenerative inverter systems. The same procedure also applies for adjusting regenerative inverter systems to different types of networks (also with respect to the circuit of the isolating transformer where necessary). See also the information provided in “Connection to Different Types of Networks" on page4 – 6 and “Adjusting the Line Voltage by Means of a Transformer" on page4 – 8.

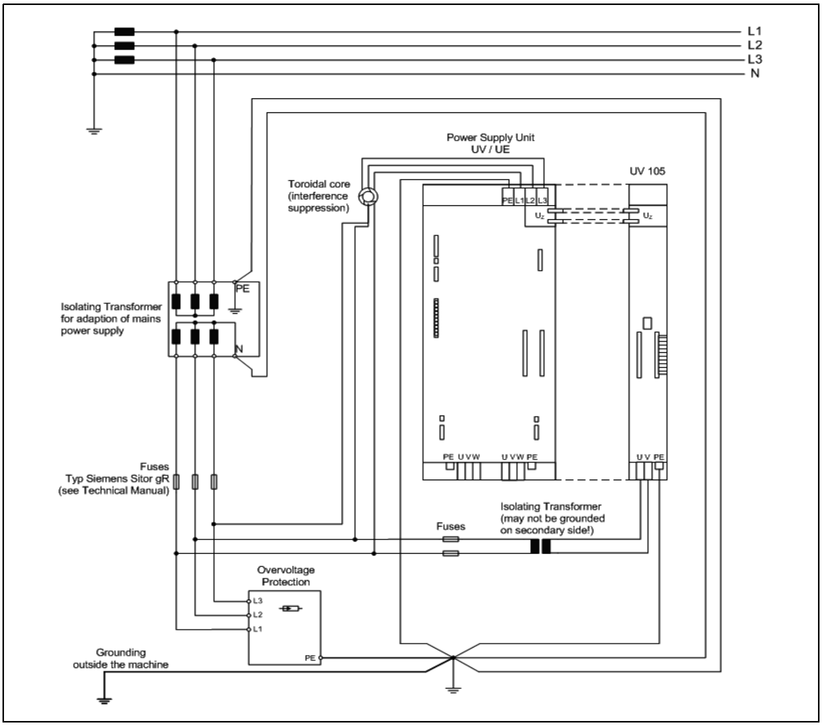
The HEIDENHAIN inverter systems can be directly connected to TN networks, without need for an isolating transformer.



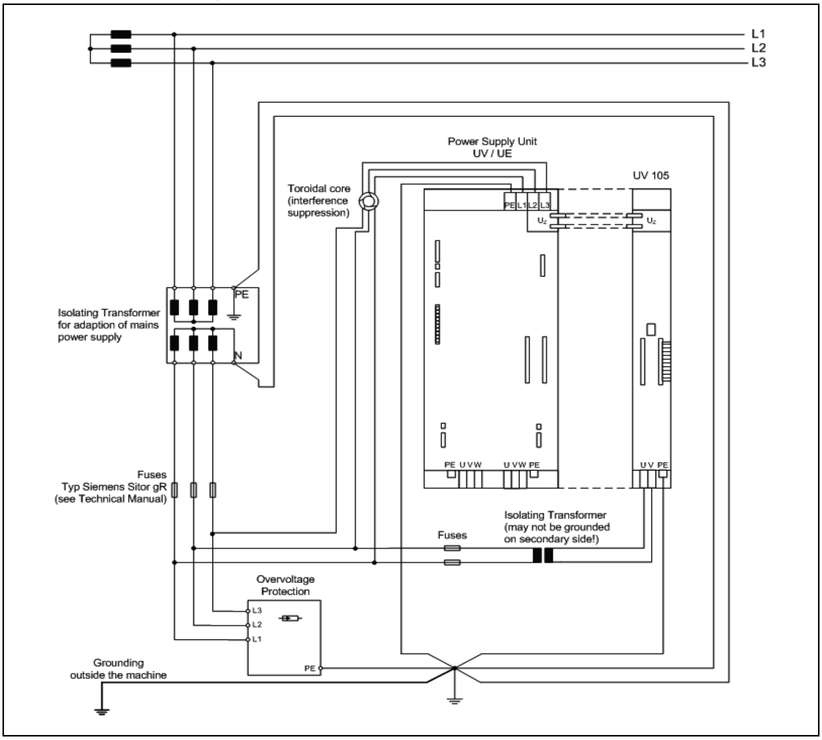
Danger

All other networks (e.g. with grounded external line, asymmetrical networks) require an isolating transformer for adjusting the line voltage, even if these networks are not explicitly mentioned here. The star point must then be connected to ground via a central grounding point outside the machine.

The HEIDENHAIN inverter systems must be connected to all other networks only via an isolating transformer. The basic circuit diagram illustrates the connection to a TT network:



The basic circuit diagram illustrates the connection to an IT network:



4.7.4 Arranging the Inverter Modules

The following connection overview illustrates the combination of different types of drives in an inverter system. The arrangement of the inverter modules also depends on the combination used.

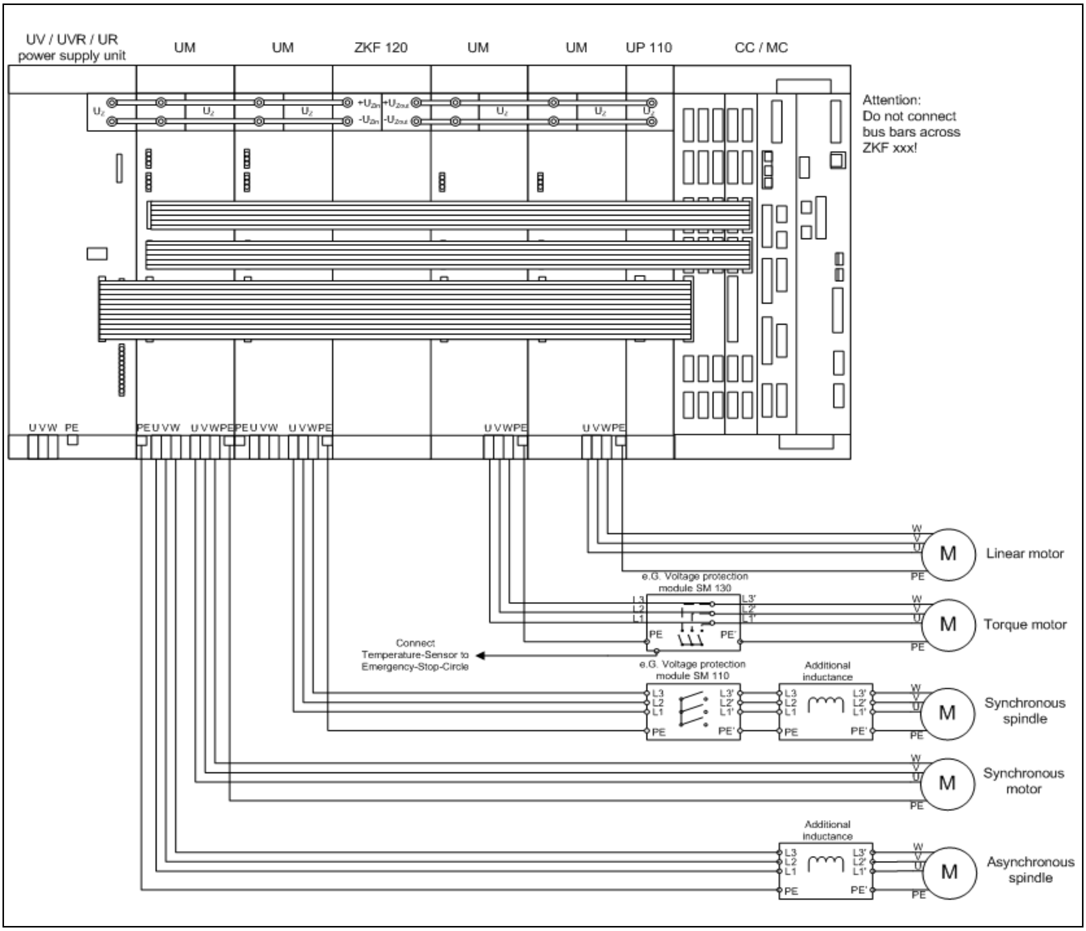
The following guidelines should be observed:

- The inverter modules for the most powerful motors (e.g. spindle, axis 1, axis 2, etc.) must be placed next to the right of the power supply module.
- If you want to connect motors requiring a dc-link filter (linear motors, torque motors, special synchronous spindle motors), first of all ensure that the ZKF dc-link filter's maximum permissible load is not exceeded. The dc-link filter is inserted next to the left of the inverters in the dc-link and connected.

Depending on the application, there are the following possibilities:

Arrangement with the ZKF 120

In this application, a ZKF 120 was inserted after the high-performance modules for the spindles in order to connect two direct drives.

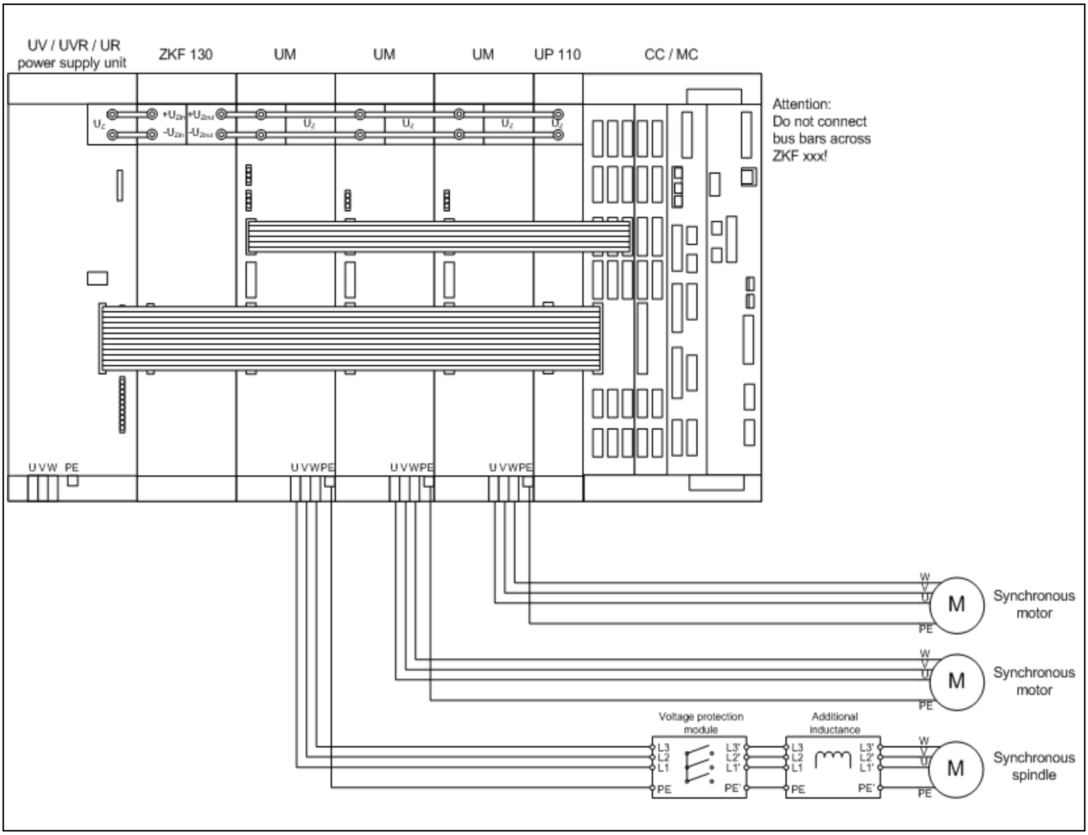


Voltage protection module

For information on the use of an SM 1xx voltage protection module, see page 2 – 89.

Arrangement with the ZKF 130

In this application, a ZKF 130 was placed next to the power supply module, because a high-performance synchronous spindle motor requiring a dc-link filter was used. In this application the total system power must not exceed the max. permissible power of the ZKF 130.



Additional inductance

Motors

- whose self-inductance is insufficient for operation require additional inductance (e.g. series reactors) to ensure proper servo control. The formulas and values required for calculating the additional inductance can be found in the Technical Manual for the control (e.g. Technical Manual for the iTNC 530).
- with cable lengths over 15 m may require additional inductance for noise suppression.

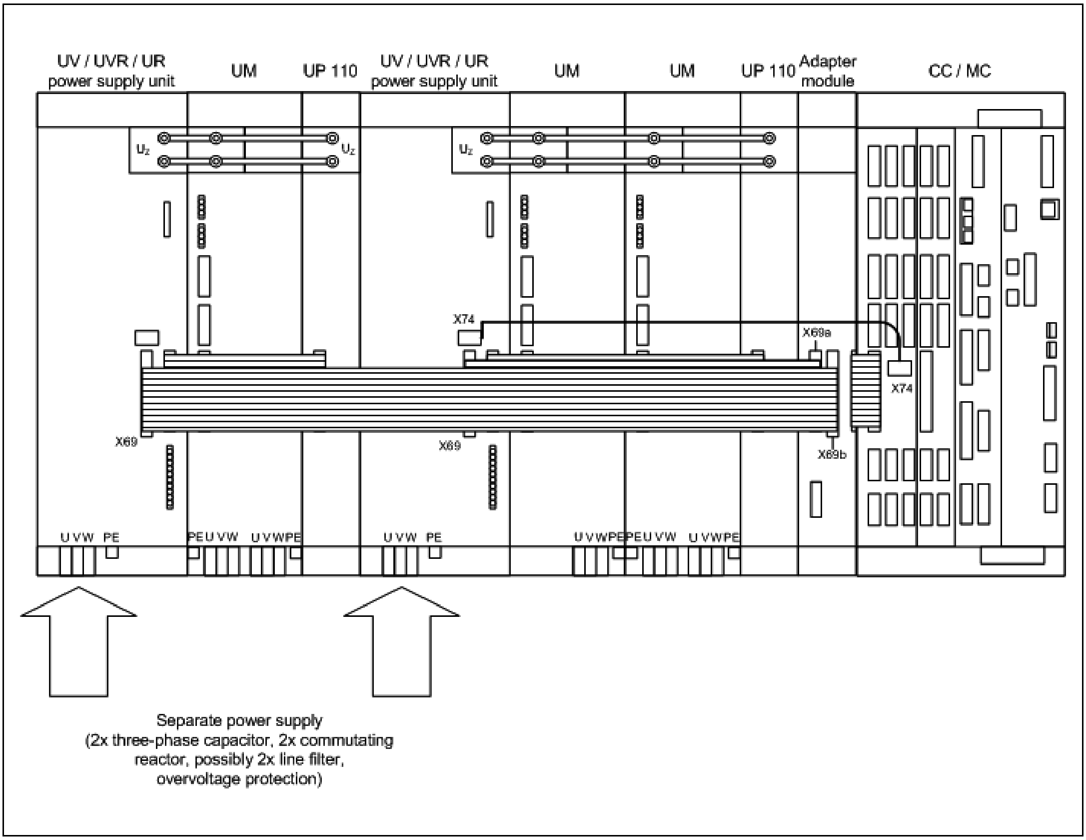
Voltage protection module

For information on the use of an SM 1xx voltage protection module, see page 2 – 89.

4.7.5 Arranging Additional Modules

Increased power demand in modular regenerative inverter systems may make it necessary to use two power supply modules. In this case, an adapter module is required for connecting the supply bus of the power supply modules to the control.

Details for connecting the adapter module and two power supply units can be found on page Page 6–79.



4.8 +5 V Power Supply and Bus Cable

Warning

The following constraints apply to supply lines and bus cables:

- Maximum length for unit bus cable (X79) is 1 m each, starting from X79 of the inverter.
- Maximum length for supply bus cable (X69) is 5 m.
- Maximum length for PWM cable (X111/X112) is 5 m.
- Maximum length for +5 V litz wires (X74): Line drop < 100 mV. Ensure that the cross section of the litz wires for the +5 V supply is large enough.
- The current consumption (+5 V) of the consumers can be found in the Specifications.
- The terminals for the +5 V litz wires (X74) are suitable for a maximum cross section of 4 mm^2. If the cross sections are larger, corresponding terminal pins must be used.

Example for calculating the cross section of the +5 V litz wires (X 74):

Components used	Current consumption	
MC 422B (single-processor with position inputs)		5.2 A
CC 422 (6 control loops)		1.5 A
6 x ERN (speed)	6 x 0.2 A =	1.2 A
3 x LS (axes, position)	3 x 0.15 A =	0.45 A
2 x ROD (axes, position)	2 x 0.2 A =	0.4 A
	Total:	**8.75 A**

R = U / I = 0.1 V / 8.75 A = 0.0114 ohms

where rho of copper = 0.0179 (ohm x mm^2) / m
and the required wire length: l = 3 m

R = (rho x l) / A;
A = (rho x l) / R = (0.0179 (ohm x mm^2) / m x 3m) / 0.0114 ohms = 4.7 mm^2
This results in a required cross section of 4.7 mm^2 for the 5-V litz wires.

Warning

HEIDENHAIN generally recommends connecting the litz wires for the 5-V supply to terminal X74. If you want to use the ribbon cable anyway, the following constraints apply:

- The ribbon cable may be subjected to a maximum load of 10 A.
- The line drop along the ribbon cable must be less than 100 mV.
- The ribbon cable has 10 litz wires each with a cross section of 0.14 mm^2. This results in a total cross section of 1.4 mm^2.

Example 1 of using the ribbon cable for the +5-V supply:

Components used	Current consumption	
MC 422B (single-processor without position inputs)		4.7 A
CC 424 (6 control loops)		2.5 A
6 x ERN (speed)	6 x 0.2 A =	1.2 A
4 x LC (absolute linear encoders)	4 x 0.3 A =	1.2 A
2 x RCN (absolute angle encoders)	2 x 0.35 A =	0.7 A
	Total:	**10.3 A**

This results in a current consumption > 10 A. The ribbon cable alone does not suffice for the +5-V supply. In addition, the litz wires must be used for supplying the power of +5 V.

Example 2 of using the ribbon cable for the +5-V supply:

Components used	Current consumption	
MC 422B (single-processor without position inputs)		4.7 A
CC 424 (6 control loops)		2.5 A
6 x ERN (speed)	6 x 0.2 A =	1.2 A
4 x LS (incremental linear encoders)	4 x 0.15 A =	0.6 A
2 x RON (incremental angle encoders)	2 x 0.2 A =	0.4 A
	Total:	**9.4 A**

This results in a current consumption < 10 A. This means that the ribbon cable alone suffices for the +5 V supply. However, the maximum permissible line drop of 100 mV must also be taken into account.

The length of the ribbon cable is: l = 0.5 m
The length must be doubled because the cable is led to the inverter and then back.
R = (rho x l) / A = (0.0179 (ohm x mm^2) / m x 2 x 0.5m) / 1.4 mm^2 = 0.013 ohms
U = R x I = 0.013 ohms x 9.4 A = 0.122 V = 122 mV

This results in a line drop > 100 mV. The ribbon cable alone does not suffice for the +5-V supply. In addition, the litz wires must be used for supplying the power of +5 V.

Example 3 of using a ribbon cable with a length > 0.6 m:
If ribbon cables with a length greater than 600 are used, the cable is led doubled and the available cross section doubles as a result.
The length of the ribbon cable is: l = 0.7 m
R = (rho x l) / A = (0.0179 (ohm x mm^2) / m x 2 x 0.7m) / 2.8 mm^2 = 0.009 ohms
U = R x I = 0.009 ohms x 9.4 A = 0.085 V = 85 mV

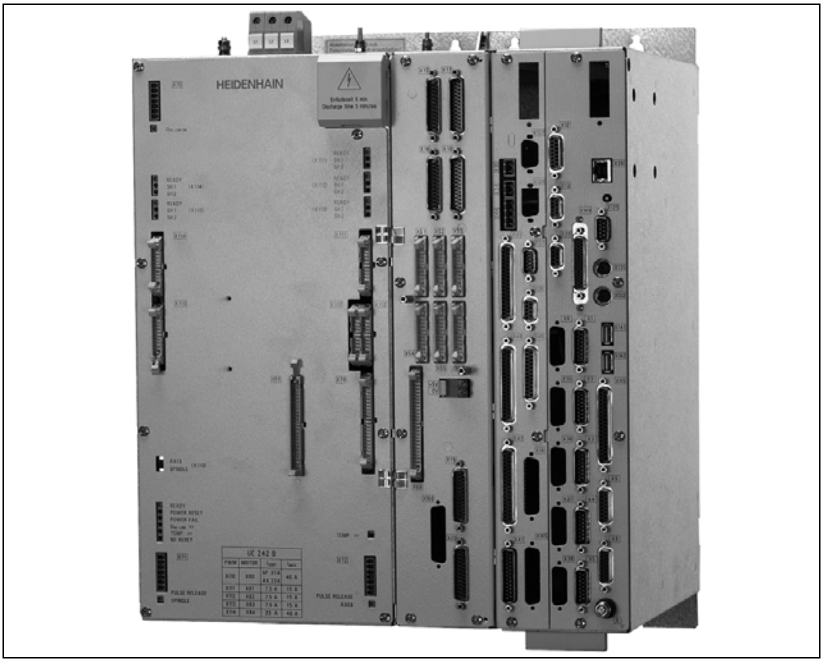
The ribbon cable would suffice in this case.

5 Compact Inverters

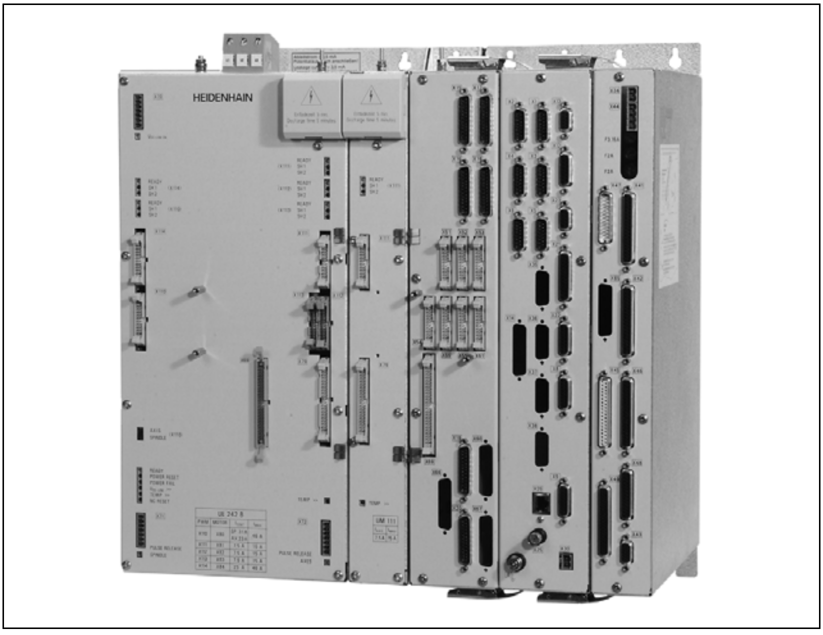
5 Compact Inverters

5.1 Connection Overview

UE 242B with MC 422 and CC 422

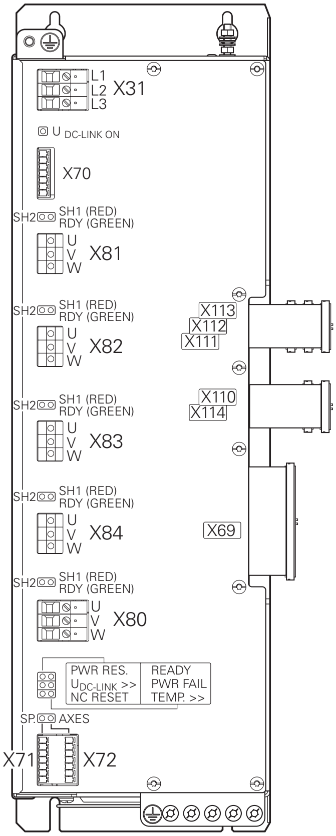


LE 426 M with UE 2xx B compact inverter and UM 111 power module



5.1.1 UE 110/UE 112 Compact Inverter

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



X31 Power supply for inverter
(L1, L2, L3)

X70 Main contactor

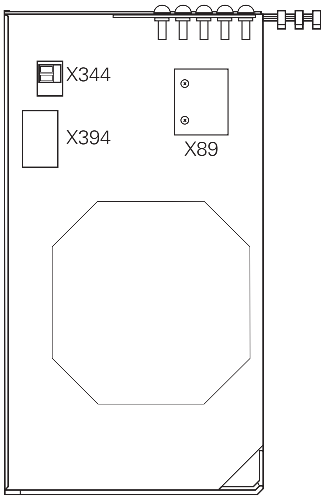
X81 Motor connection for axis 1 (to X111)
(6 A at 3.3 kHz PWM frequency)

X82 Motor connection for axis 2 (to X112)
(6 A at 3.3 kHz PWM frequency)

X83 Motor connection for axis 3 (to X113)
(6 A at 3.3 kHz PWM frequency)
X84 Motor connection for axis 4 (to X114)
(9 A at 3.3 kHz PWM frequency)
(only UE 112)
X69 Supply bus

X80 Motor connection for spindle (to X110)
(24 A at 3.3 kHz PWM frequency)

X71 Safety relay for spindle
X72 Safety relay for axes



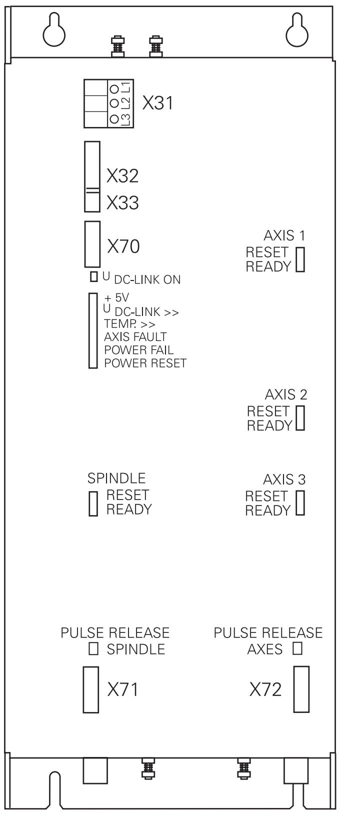
X344 24-V input for motor brake output

X394 24-V brake outputs

⏚ Equipment ground

5.1.2 UE 210 Compact Inverter

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!

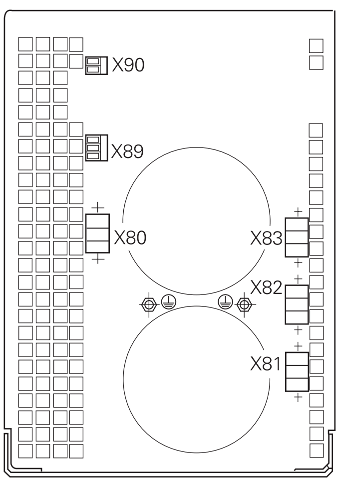


X31 Power supply for inverter

X32 Output for power supply (L1, L2, $+U_Z$, $-U_Z$)
X33 Power supply for supply unit (L1, L2)

X70 Main contactor

X71 Safety relay for spindle
X72 Safety relay for axes



X90 24-V output

X89 Braking resistor

X80 Motor connection for spindle (19 A)
X83 Motor connection for axis 3 (7.5 A)

X82 Motor connection for axis 2 (7.5 A)

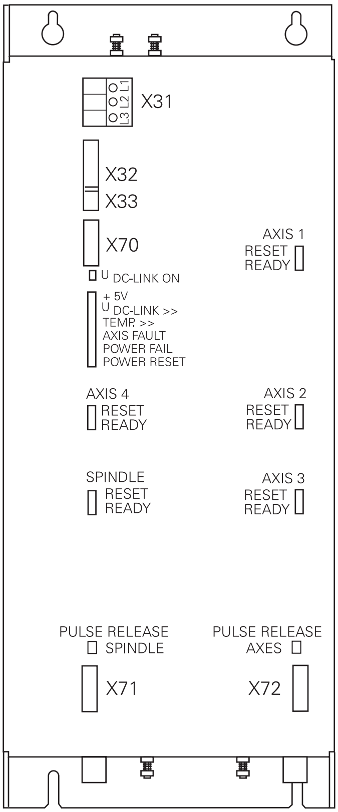
X81 Motor connection for axis 1 (7.5 A)

⏚ Equipment ground

5.1.3 UE 212 Compact Inverter

Danger

Do not engage or disengage any connecting elements while the unit is under power!

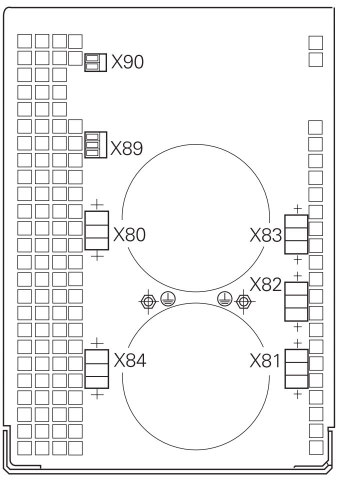


X31 Power supply for inverter

X32 Output for power supply (L1, L2, $+U_Z$, $-U_Z$)
X33 Power supply for supply unit (L1, L2)

X70 Main contactor

X71 Safety relay for spindle
X72 Safety relay for axes



X90 24-V output

X89 Braking resistor

X80 Motor connection for spindle (19 A)
X83 Motor connection for axis 3 (7.5 A)

X82 Motor connection for axis 2 (7.5 A)

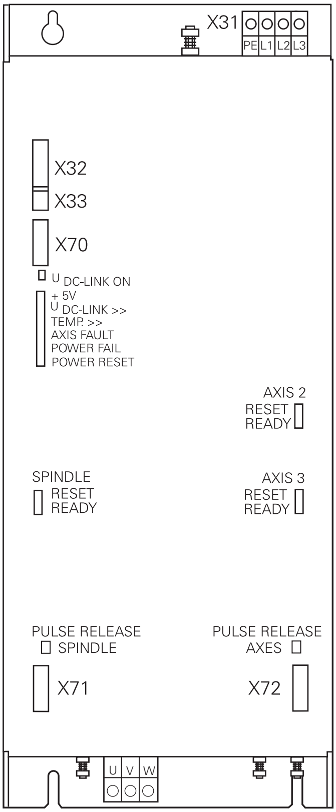
X84 Motor connection for axis 4 (14 A)
X81 Motor connection for axis 1 (7.5 A)

⏚ Equipment ground

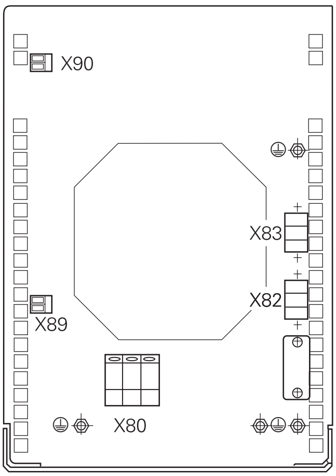
5.1.4 UE 230 Compact Inverter

Danger

Do not engage or disengage any connecting elements while the unit is under power!



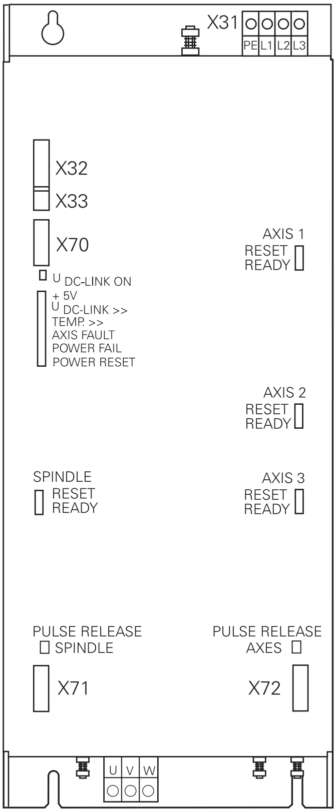
X31	Power supply for inverter
X32	Output for power supply (L1, L2, $+U_Z$, $-U_Z$)
X33	Power supply for supply unit (L1, L2)
X70	Main contactor
X71	Safety relay for spindle
X72	Safety relay for axes



X90	24-V output
X83	Motor connection for axis 3 (7.5 A)
X82	Motor connection for axis 2 (7.5 A)
X89	Braking resistor
X80	Motor connection for spindle (31 A)
⏚	Equipment ground

5.1.5 UE 240 Compact Inverter

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



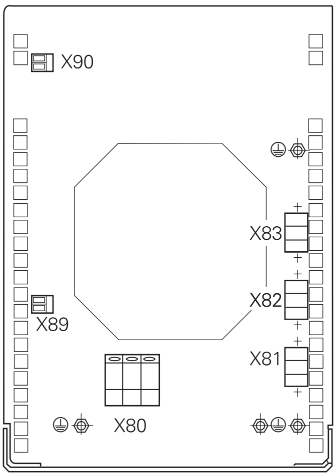
X31 Power supply for inverter

X32 Output for power supply (L1, L2, $+U_Z$, $-U_Z$)

X33 Power supply for supply unit (L1, L2)

X70 Main contactor

X71 Safety relay for spindle
X72 Safety relay for axes



X90 24-V output

X83 Motor connection for axis 3 (7.5 A)

X82 Motor connection for axis 2 (7.5 A)
X89 Braking resistor

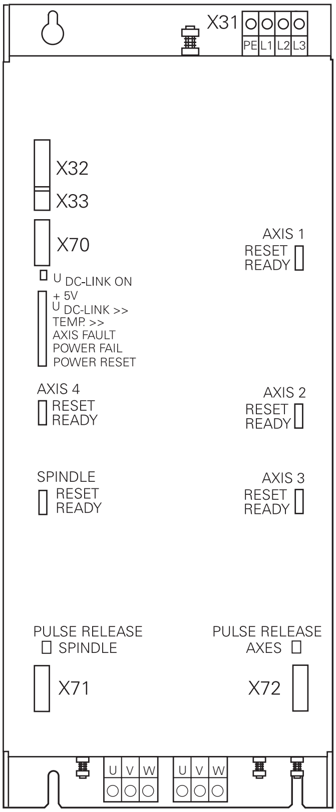
X81 Motor connection for axis 1 (7.5 A)
X80 Motor connection for spindle (31 A)

Equipment ground

5.1.6 UE 242 Compact Inverter

Danger

Do not engage or disengage any connecting elements while the unit is under power!



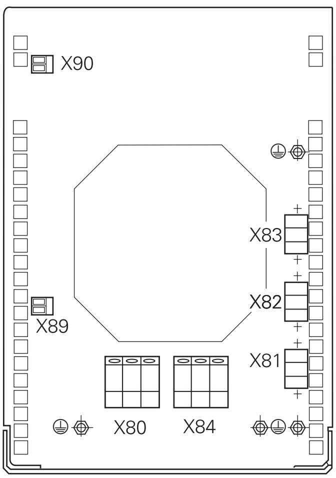
X31 Power supply for inverter

X32 Output for power supply (L1, L2, $+U_Z$, $-U_Z$)

X33 Power supply for supply unit (L1, L2)

X70 Main contactor

X71 Safety relay for spindle
X72 Safety relay for axes



X90 24-V output

X83 Motor connection for axis 3 (7.5 A)
X82 Motor connection for axis 2 (7.5 A)
X89 Braking resistor

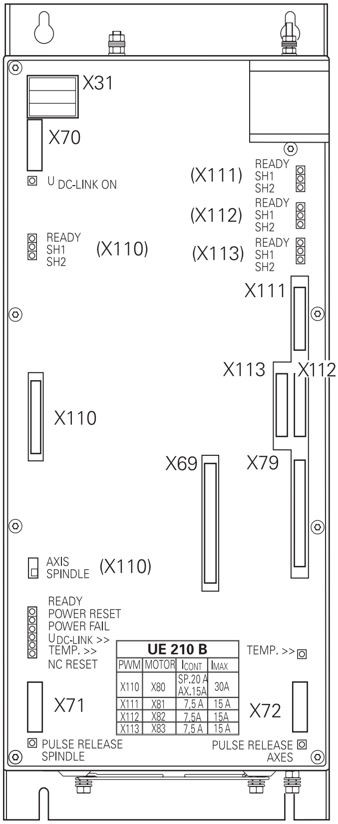
X81 Motor connection for axis 1 (7.5 A)
X80 Motor connection for spindle (31 A)
X84 Motor connection for axis 4 (23 A)

⏚ Equipment ground

5.1.7 UE 210B Compact Inverter

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X31 Power supply for inverter

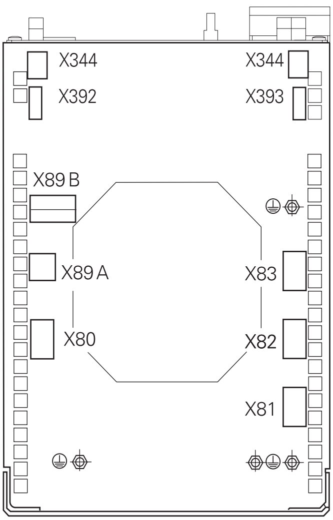
X70 Main contactor

X110 to
X113 PWM connection for axes/spindle

X69 Power supply for control
X79 Unit bus

Sliding switch:
AXIS: X110 is used as axis
SPINDLE: X110 is used as spindle

X71 Safety relay for spindle
X72 Safety relay for axes



X344 24-V supply for motor holding brake
X392 Motor holding brake (X110)
X393 Motor holding brake (X111 to X113)

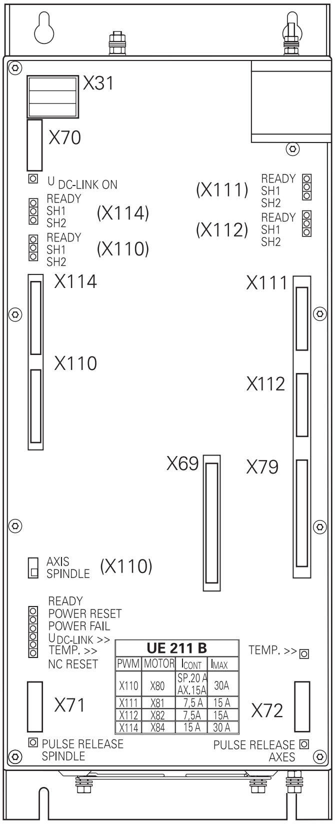
X89B Internal braking resistor
X89A PW 21x or PW 1x0(B) external braking resistor

X83 Motor connection for axis 3 (7.5 A)
X80 Motor connection for spindle (20 A)
X82 Motor connection for axis 2 (7.5 A)
X81 Motor connection for axis 1 (7.5 A)

⏚ Equipment ground

5.1.8 UE 211B Compact Inverter

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



X31 Power supply for inverter

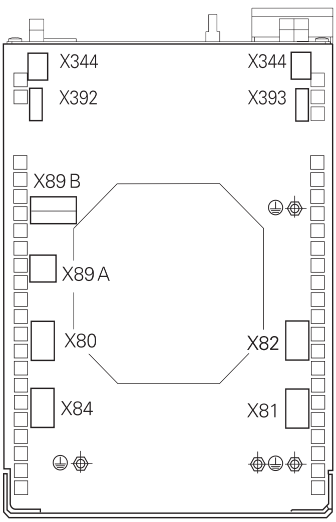
X70 Main contactor

X110 to
X114 PWM connection for axes/spindle

X69 Power supply for control
X79 Unit bus

Sliding switch:
AXIS: X110 is used as axis
SPINDLE: X110 is used as spindle

X71 Safety relay for spindle
X72 Safety relay for axes



X344 24-V supply for motor holding brake
X392 Motor holding brake (X110, X114)
X393 Motor holding brake (X111, X113)

X89B Internal braking resistor
X89A PW 21x or PW 1x0(B) external braking resistor

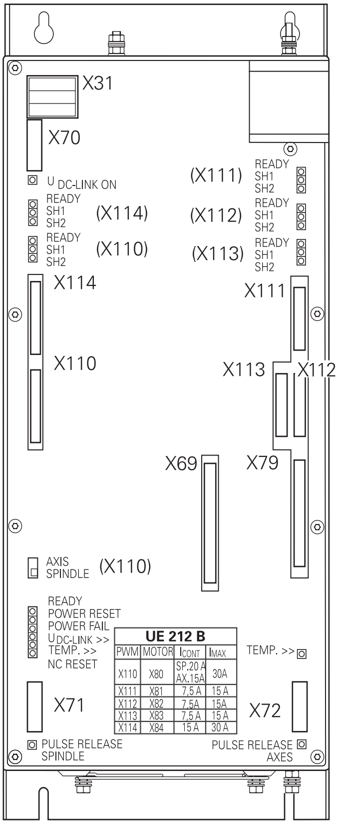
X80 Motor connection for spindle (20 A)
X82 Motor connection for axis 2 (7.5 A)
X84 Motor connection for axis 3 (15 A)
X81 Motor connection for axis 1 (7.5 A)

Equipment ground

5.1.9 UE 212B Compact Inverter

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X31 Power supply for inverter

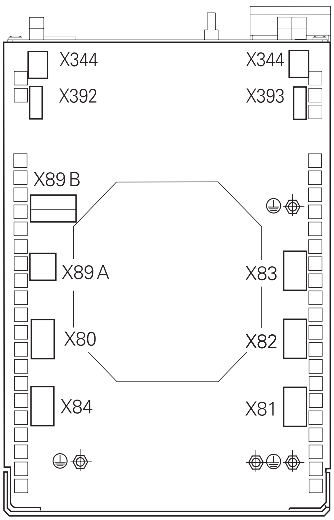
X70 Main contactor

X110 to
X114 PWM connection for axes/spindle

X69 Power supply for control
X79 Unit bus

Sliding switch:
AXIS: X110 is used as axis
SPINDLE: X110 is used as spindle

X71 Safety relay for spindle
X72 Safety relay for axes



X344 24-V supply for motor holding brake
X392 Motor holding brake (X110, X114)
X393 Motor holding brake (X111 to X113)

X89B Internal braking resistor
X89A PW 21x or PW 1x0(B) external braking resistor

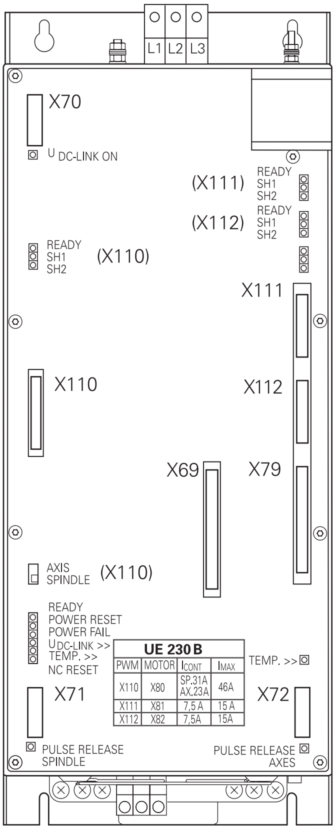
X83 Motor connection for axis 3 (7.5 A)
X80 Motor connection for spindle (20 A)
X82 Motor connection for axis 2 (7.5 A)
X84 Motor connection for axis 4 (15 A)
X81 Motor connection for axis 1 (7.5 A)

⏚ Equipment ground

5.1.10 UE 230B Compact Inverter

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X31 Power supply for inverter

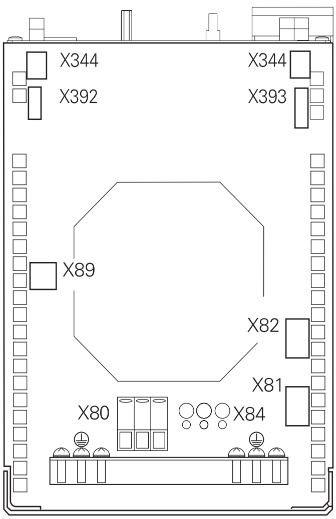
X70 Main contactor

X110 to
X112 PWM connection for axes/spindle

X69 Power supply for control
X79 Unit bus

Sliding switch:
AXIS: X110 is used as axis
SPINDLE: X110 is used as spindle

X71 Safety relay for spindle
X72 Safety relay for axes



X344 24-V supply for motor holding brake
X392 Motor holding brake (X110)
X393 Motor holding brake (X111, X112)

X89 Braking resistor

X82 Motor connection for axis 2 (7.5 A)

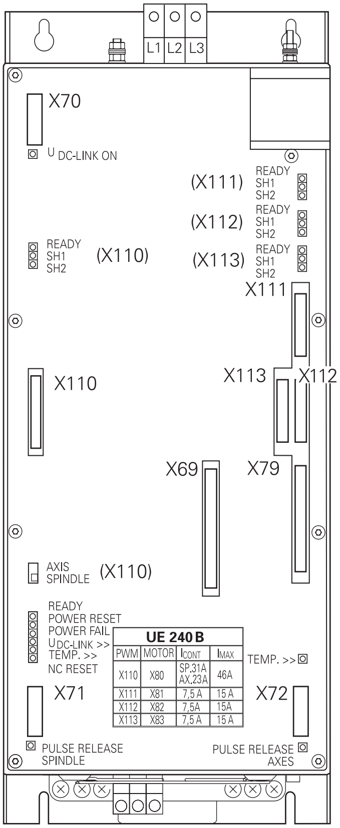
X81 Motor connection for axis 1 (7.5 A)
X80 Motor connection for spindle (31 A)

⏚ Equipment ground

5.1.11 UE 240B Compact Inverter

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X31 Power supply for inverter

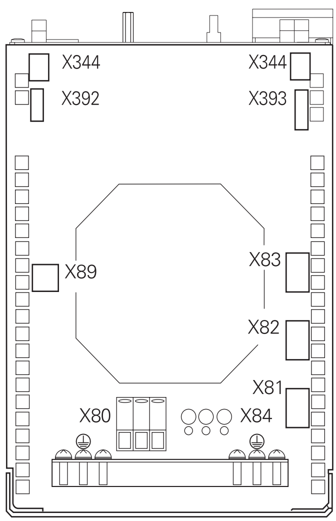
X70 Main contactor

X110 to
X113 PWM connection for axes/spindle

X69 Power supply for control
X79 Unit bus

Sliding switch:
AXIS: X110 is used as axis
SPINDLE: X110 is used as spindle

X71 Safety relay for spindle
X72 Safety relay for axes



X344 24-V supply for motor holding brake
X392 Motor holding brake (X110)
X393 Motor holding brake (X111 to X113)

X89 Braking resistor
X83 Motor connection for axis 3 (7.5 A)

X82 Motor connection for axis 2 (7.5 A)

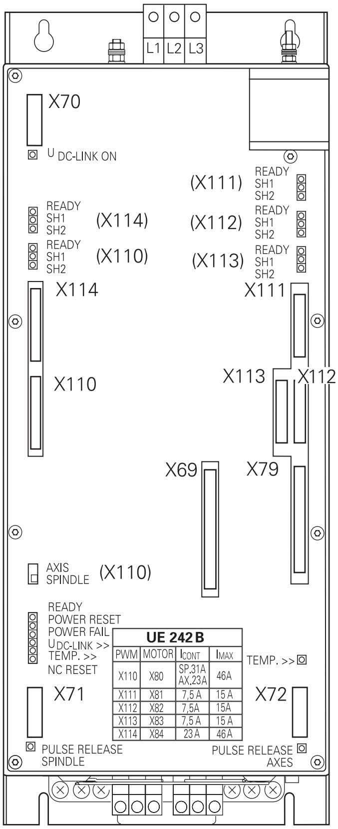
X81 Motor connection for axis 1 (7.5 A)
X80 Motor connection for spindle (31 A)

⏚ Equipment ground

5.1.12 UE 242B Compact Inverter

Danger

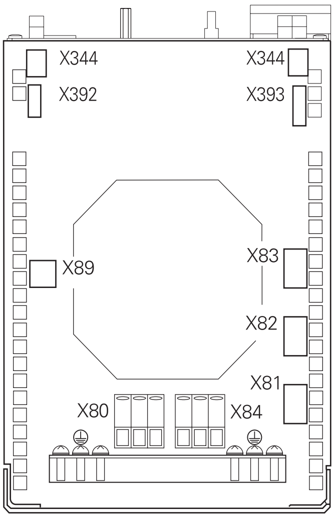
Do not engage or disengage any connecting elements while the unit is under power!



X31	Power supply for inverter
X70	Main contactor
X110 to X114	PWM connection for axes/spindle
X69	Power supply for control
X79	Unit bus

Sliding switch:
AXIS: X110 is used as axis
SPINDLE: X110 is used as spindle

X71	Safety relay for spindle
X72	Safety relay for axes

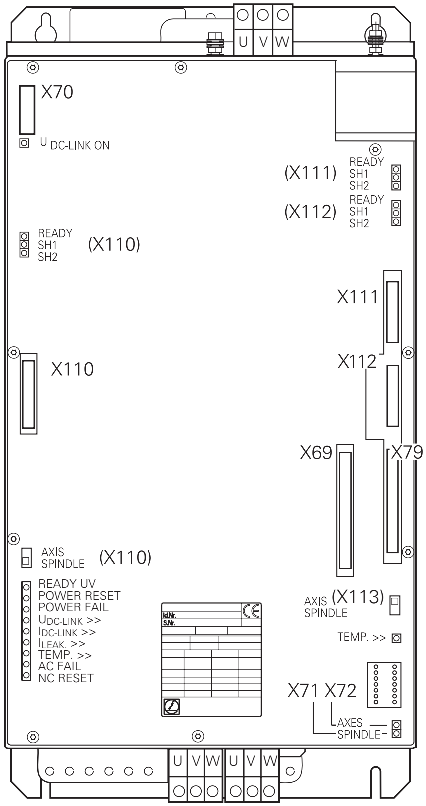


X344	24-V supply for motor holding brake
X392	Motor holding brake (X110, X114)
X393	Motor holding brake (X111 to X113)
X89	Braking resistor
X83	Motor connection for axis 3 (7.5 A)
X82	Motor connection for axis 2 (7.5 A)
X81	Motor connection for axis 1 (7.5 A)
X80	Motor connection for spindle (31 A)
X84	Motor connection for axis 4 (23 A)
⏚	Equipment ground

5.1.13 UR 230 Compact Inverter

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X31 Power supply for inverter

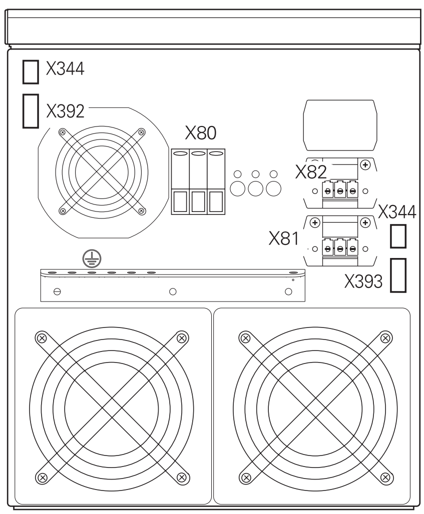
X70 Main contactor

X110 to
X112 PWM connection for axes/spindle

X69 Power supply for control
X79 Unit bus

Sliding switch:
AXIS: X110 or X113 is used as axis
SPINDLE: X110 or X113 is used as spindle

X71 Safety relay for spindle
X72 Safety relay for axes



X344 24-V supply for motor holding brake
X392 Motor holding brake (X110)

X80 Motor connection for spindle (35 A)
X82 Motor connection for axis 2 (7.5 A)
X81 Motor connection for axis 1 (7.5 A)

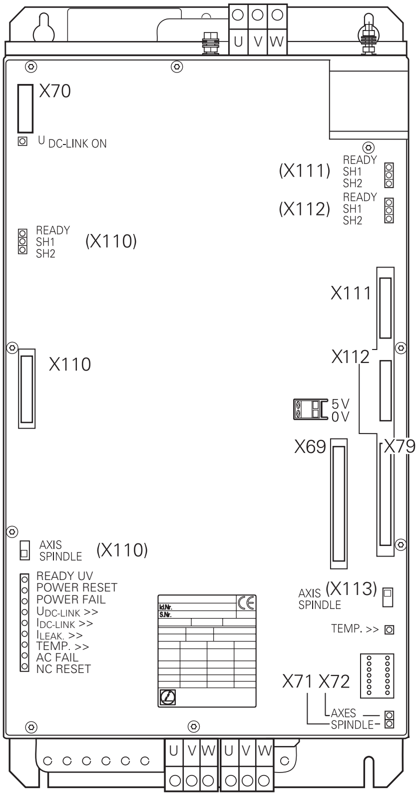
⏚ Equipment ground

X393 Motor holding brake (X111, X112)

5.1.14 UR 230D Compact Inverter

Danger

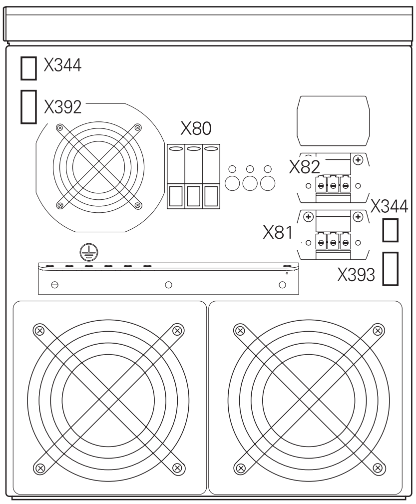
Do not engage or disengage any connecting elements while the unit is under power!



X31	Power supply for inverter
X70	Main contactor
X110 to X112	PWM connection for axes/spindle
X74	5-V power supply
X69	Power supply for control
X79	Unit bus

Sliding switch:
AXIS: X110 or X113 is used as axis
SPINDLE: X110 or X113 is used as spindle

X71	Safety relay for spindle
X72	Safety relay for axes

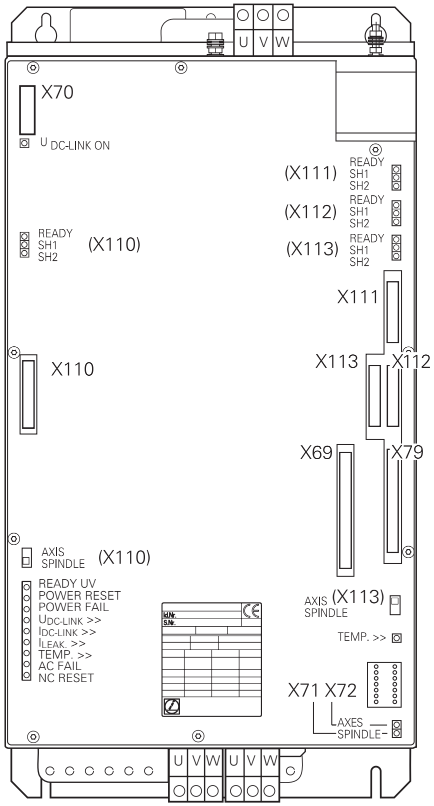


X344	24-V supply for motor holding brake
X392	Motor holding brake (X110)
X80	Motor connection for spindle (35 A)
X82	Motor connection for axis 2 (7.5 A)
X81	Motor connection for axis 1 (7.5 A)
⏚	Equipment ground
X393	Motor holding brake (X111, X112)

5.1.15 UR 240 Compact Inverter

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X31 Power supply for inverter

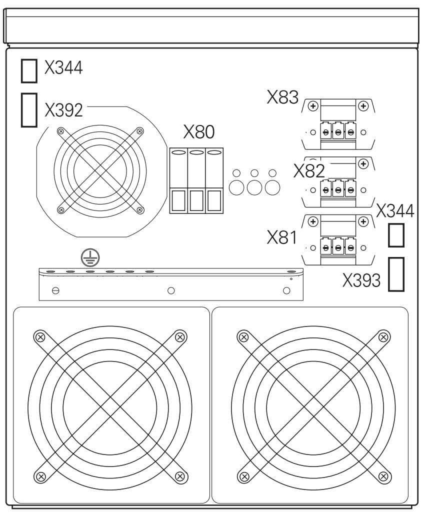
X70 Main contactor

X110 to
X113 PWM connection for axes/spindle

X69 Power supply for control
X79 Unit bus

Sliding switch:
AXIS: X110 or X113 is used as axis
SPINDLE: X110 or X113 is used as spindle

X71 Safety relay for spindle
X72 Safety relay for axes



X344 24-V supply for motor holding brake
X392 Motor holding brake (X110)
X83 Motor connection for axis 3 (7.5 A)
X80 Motor connection for spindle (35 A)
X82 Motor connection for axis 2 (7.5 A)
X81 Motor connection for axis 1 (7.5 A)

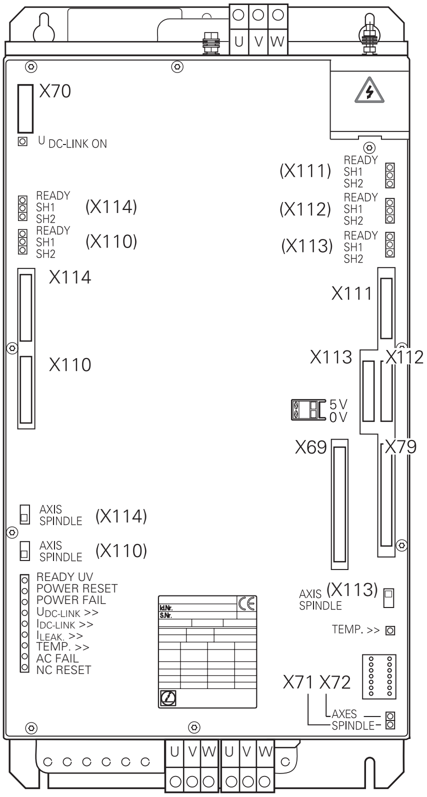
⏚ Equipment ground

X393 Motor holding brake (X111 to X113)

5.1.16 UR 240 D Compact Inverter

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X31 Power supply for inverter

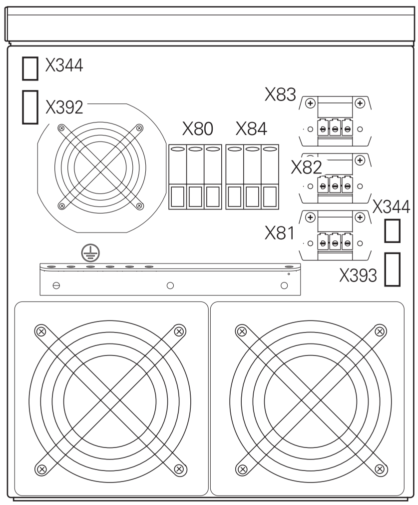
X70 Main contactor

X110 to
X113 PWM connection for axes/spindle

X69 Power supply for control
X79 Unit bus

Sliding switch:
AXIS: X110 or X113 is used as axis
SPINDLE: X110 or X113 is used as spindle

X71 Safety relay for spindle
X72 Safety relay for axes



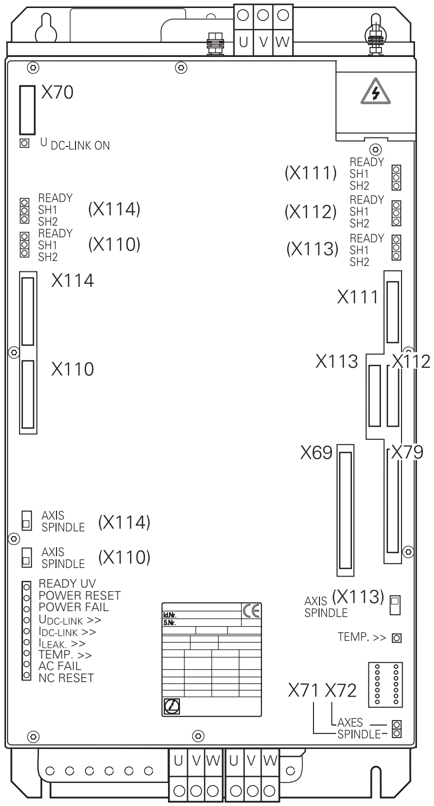
X344 24-V supply for motor holding brake
X392 Motor holding brake (X110)
X83 Motor connection for axis 3 (7.5 A)
X80 Motor connection for spindle (35 A)
X82 Motor connection for axis 2 (7.5 A)
X81 Motor connection for axis 1 (7.5 A)

⏚ Equipment ground

X393 Motor holding brake (X111 to X113)

5.1.17 UR 242 Compact Inverter

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



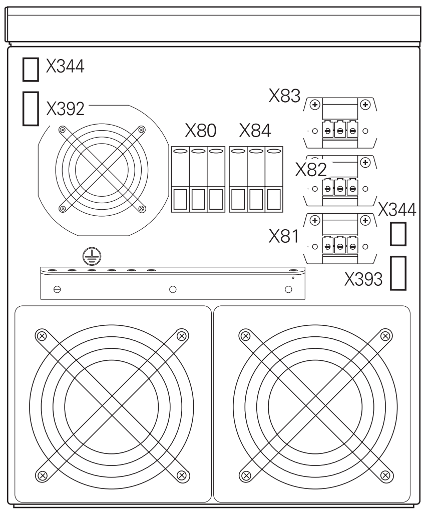
X31 Power supply for inverter

X70 Main contactor

X110 to
X114 PWM connection for axes/spindle

X69 Power supply for control
X79 Unit bus

Sliding switch:
AXIS: X110, X113 or X114 is used as axis
SPINDLE: X110, X113 or X114 is used as spindle
X71 Safety relay for spindle
X72 Safety relay for axes



X344 24-V supply for motor holding brake
X392 Motor holding brake (X110, X114)

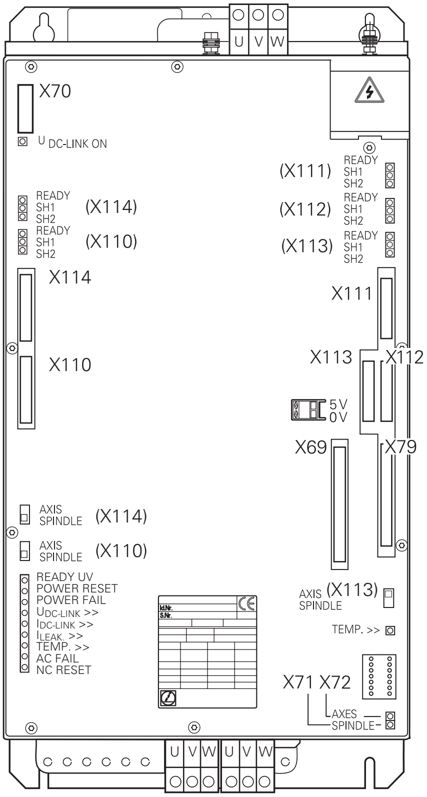
X83 Motor connection for axis 3 (7.5 A)
X80 Motor connection for spindle (35 A)
X84 Motor connection for axis 4 (25 A)
X82 Motor connection for axis 2 (7.5 A)
X81 Motor connection for axis 1 (7.5 A)

⏚ Equipment ground

X393 Motor holding brake (X111 to X113)

5.1.18 UR 242 D Compact Inverter

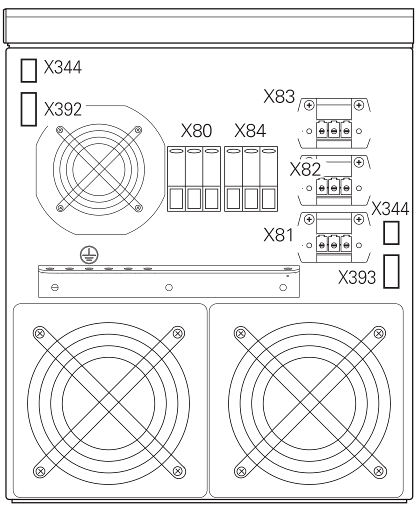
> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



X31	Power supply for inverter
X70	Main contactor
X110 to X114	PWM connection for axes/spindle
X69	Power supply for control
X79	Unit bus

Sliding switch:
AXIS: X110, X113 or X114 is used as axis
SPINDLE: X110, X113 or X114 is used as spindle

X71	Safety relay for spindle
X72	Safety relay for axes



X344	24-V supply for motor holding brake
X392	Motor holding brake (X110, X114)
X83	Motor connection for axis 3 (7.5 A)
X80	Motor connection for spindle (35 A)
X84	Motor connection for axis 4 (25 A)
X82	Motor connection for axis 2 (7.5 A)
X81	Motor connection for axis 1 (7.5 A)
⏚	Equipment ground
X393	Motor holding brake (X111 to X113)

5.1.19 Meaning of the LEDs

On the front of the compact inverters are several LEDs for functional control, with the following meaning:

UE 1xx

LED	Meaning	Signal direction	Signal
NC RESET	Reset signal from LE, CC to UE	LE, CC →UE	$\overline{\text{RES.LE}}$
PWR FAIL	U_Z too low, U_Z < 410 V (e.g. failure of a phase under load, power < 290 V)	UE →LE, CC	$\overline{\text{PF.PS}}$
PWR RESET	Reset signal from UE to LE, CC	UE →LE, CC	$\overline{\text{RES.PS}}$
READY	Inverter ready	UE →LE, CC	RDY
TEMP >>	Temperature of heat sink too high (> 100 °C)	UE →LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{DC\ LINK}$ >>	U_Z too high (> approx. 850 V); power modules are switched off	UE →LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{DC\ LINK\ ON}$	Main contactor on	–	–
X 71 SP.	Safety relay for spindle on	–	–
X 72 AXES	Safety relay for axes on	–	–
SH1 (RED) RDY (GREEN)	Safe stop 1; no enable from control (main contactor not active, DSP error, PLC error with Emergency Stop, hardware or software error of LE, CC) Axis/Spindle enabled	LE, CC →UE UE →LE, CC	$\overline{\text{SH1B}}$ RDY
SH2	Safe stop 2; no drive enable from control (e.g. by the PLC, active via external signal or SH1)	LE, CC →UE	$\overline{\text{SH2}}$

UE 2xx

LED	Meaning	Signal direction	Signal
AXIS FAULT	Short circuit between a phase of the motor output and U_Z (axes only)	UE →LE, CC	$\overline{\text{AXISFAULT}}$
AXIS/SPINDLE READY	Inverter ready	UE →LE, CC	$\overline{\text{RDY}}$
AXIS/SPINDLE RESET	Axes/spindle disabled by LE	LE, CC →UE	$\overline{\text{SH2}}$
POWER FAIL	U_Z too low, U_Z < 410 V (e.g. failure of a phase under load, power < 290 V)	UE →LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from UE to LE	UE →LE, CC	$\overline{\text{RES.PS}}$
PULSE RELEASE AXES	Safety relay for axes on	–	–
PULSE RELEASE SPINDLE	Safety relay for spindle on	–	–
TEMP >>	Temperature of heat sink too high (> 100 °C)	UE →LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{DC\ LINK}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UE →LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{DC\ LINK\ ON}$	Main contactor on	–	–

UE 2xx B

LED	Meaning	Signal direction	Signal
NC RESET	Reset signal from the LE to the UE	LE, CC →UE	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, U_Z < 410 V (e.g. failure of a phase under load, power < 290 V)	UE →LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from UE to LE	UE →LE, CC	$\overline{\text{RES.PS}}$
PULSE RELEASE AXES	Safety relay for axes on	–	–
PULSE RELEASE SPINDLE	Safety relay for spindle on	–	–
READY	Inverter ready	UE →LE, CC	RDY
TEMP >> (left)	Heat sink temperature too high for axis 4 and spindle (> 100 °C)	UE →LE, CC	$\overline{\text{ERR}}$
TEMP >> (right)	Heat sink temperature too high for axis 1 to axis 3 (> 100 °C)	UE →LE, CC	$\overline{\text{ERR}}$
$U_{\text{DC LINK}}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UE →LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{\text{DC LINK ON}}$	Main contactor on	–	–
X11x READY	Inverter ready	UE →LE, CC	RDY
X11x SH1	DSP error, PLC error with Emergency Stop, LE hardware or software error	LE, CC →UE	$\overline{\text{SH1B}}$
X11x SH2	No drive enable (e.g. by the PLC, active via external signal or SH1)	LE, CC →UE	$\overline{\text{SH2}}$

UR 2xx

LED	Meaning	Signal direction	Signal
AC FAIL	Phase missing	UR →LE, CC	$\overline{\text{PF.PS.AC}}$
AXES	Safety relay for axes on	–	–
$I_{\text{DC LINK}}$ >>	I_Z > 52 A, warning signal to control at 58 A	UR →LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UR →LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from the LE to the UR 2xx	LE, CC →UR	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, $U_Z < 410$ V (because the main contactor is off, for example)	UR →LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from UR to LE	UR →LE, CC	$\overline{\text{RES.PS}}$
READY UV	Inverter ready	UR →LE, CC	RDY
SPINDLE	Safety relay for spindle on	–	–
TEMP >> (left)	Heat sink temperature too high for axis 4 and spindle (> 100 °C)	UR →LE, CC	$\overline{\text{ERR}}$
TEMP >> (right)	Heat sink temperature too high for axis 1 to axis 3 (> 100 °C)	UR →LE, CC	$\overline{\text{ERR}}$
$U_{\text{DC LINK}}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UR →LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{\text{DC LINK ON}}$	Main contactor on	–	–
X11x READY	Inverter ready	UR →LE, CC	RDY
X11x SH1	DSP error, PLC error with Emergency Stop, LE hardware or software error	LE, CC →UR	$\overline{\text{SH1B}}$
X11x SH2	No drive enable (e.g. by the PLC, active via external signal or SH1)	LE, CC →UR	$\overline{\text{SH2}}$

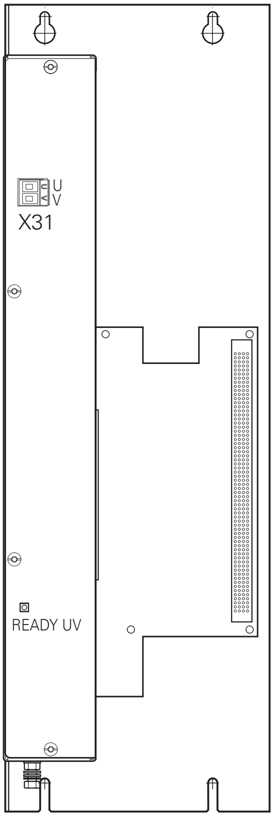
UR 2xx D

LED	Meaning	Signal direction	Signal
AC FAIL	Phase missing	UR → LE, CC	$\overline{\text{PF.PS.AC}}$
AXES	Safety relay for axes on	–	–
$I_{DC\ LINK}$ >>	I_Z > 52 A, warning signal to control at 58 A	UR → LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UR → LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from the LE to the UR 2xx	LE, CC → UR	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, U_Z < 410 V (because the main contactor is off, for example)	UR → LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from UR to LE	UR → LE, CC	$\overline{\text{RES.PS}}$
READY UV	Inverter ready	UR → LE, CC	RDY
SPINDLE	Safety relay for spindle on	–	–
TEMP >> (left)	Heat sink temperature too high for axis 4 and spindle (> 100 °C)	UR → LE, CC	$\overline{\text{ERR}}$
TEMP >> (right)	Heat sink temperature too high for axis 1 to axis 3 (> 100 °C)	UR → LE, CC	$\overline{\text{ERR}}$
$U_{DC\ LINK}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UR → LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{DC\ LINK\ ON}$	Main contactor on	–	–
X11x READY	Inverter ready	UR → LE, CC	RDY
X11x SH1	DSP error, PLC error with Emergency Stop, LE hardware or software error	LE, CC → UR	$\overline{\text{SH1B}}$
X11x SH2	No drive enable (e.g. by the PLC, active via external signal or SH1)	LE, CC → UR	$\overline{\text{SH2}}$

5.1.20 UV 106 B Power Supply Unit

Danger

Do not engage or disengage any connecting elements while the unit is under power!

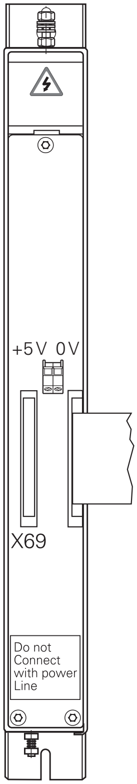


X31	U/V	400-V supply voltage
Green LED		Operational status indicator
⏚		Equipment ground (YL/GN)

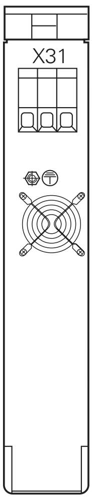
5.1.21 UV 105 Power Supply Unit

Danger

Do not engage or disengage any connecting elements while the unit is under power!



Conductor bar	Power supply via dc-link voltage Uz
X74	5-V power supply for control
Ribbon cable supply	Transmission of status signal and power to the control
X 69	Status signals from UV 1x0 or UE 2xxB
X31	400-V power supply

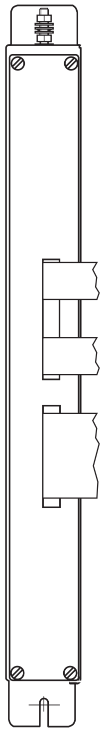


5.1.22 UV 102 Power Supply Unit

Only for LE 426 M when used with UE 2xx compact inverter.

Danger

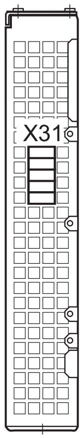
Do not engage or disengage any connecting elements while the unit is under power!



PWM, axis
(connection on the LE: X51 to X53)

PWM, axis/spindle
(connection on the LE: X54 to X56, or X61)

Power supply for the LE
(connection to X69 on the LE)



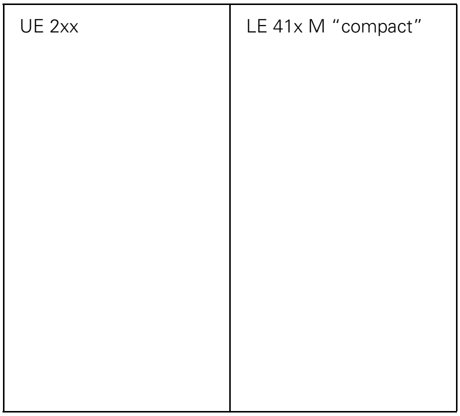
X31 Supply voltage for UV 102

5.2 Mounting and Connecting the Compact Inverter

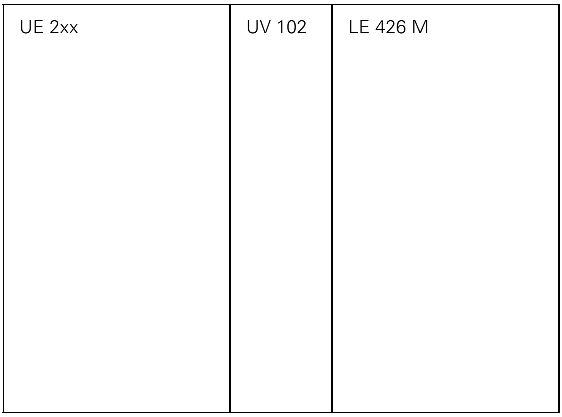
5.2.1 UE 2xx Compact Inverter

Arranging the modules

If an LE 41x M “compact” (with internal PWM interfaces) is to be operated with a UE 2xx compact inverter, the compact inverter is arranged next to the left of the LE.



If an LE 426 M is to be operated with a compact inverter, the UV 102 power supply module must be placed between the two modules.



Connecting the modules

LE 41x M “compact”: The compact inverter and LE are connected via ribbon cables, which are connected with plug-in PCBs at the LE end. Once this connection has been established, the protective cover (supplied as accessory with LE) must still be screwed onto the LE and the compact inverter.

LE 426 M: The front panel of the UV 102 must be removed. Then the compact inverter and the UV 102 are connected to each other via ribbon cables, which are connected with plug-in PCBs at the UV 102 end. The ribbon cables of the UV 102 are connected to the LE. Once these connections have been made, the front panel is replaced on the UV 102 housing.

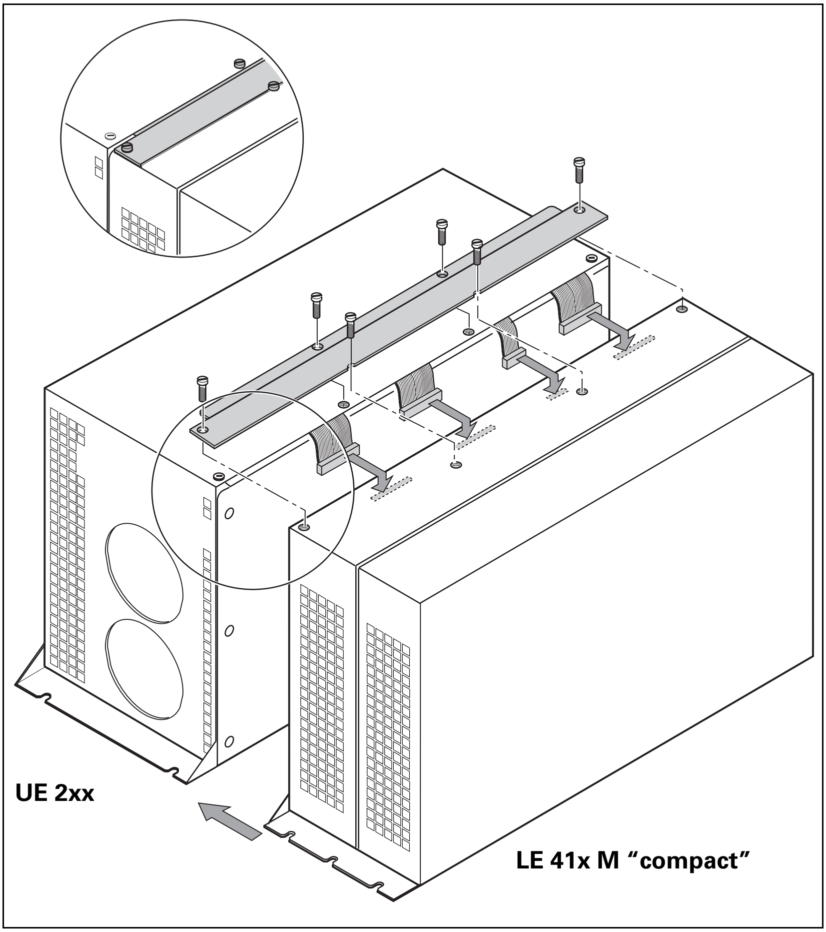
Covering the modules

LE 41x M "compact": No covers are required.

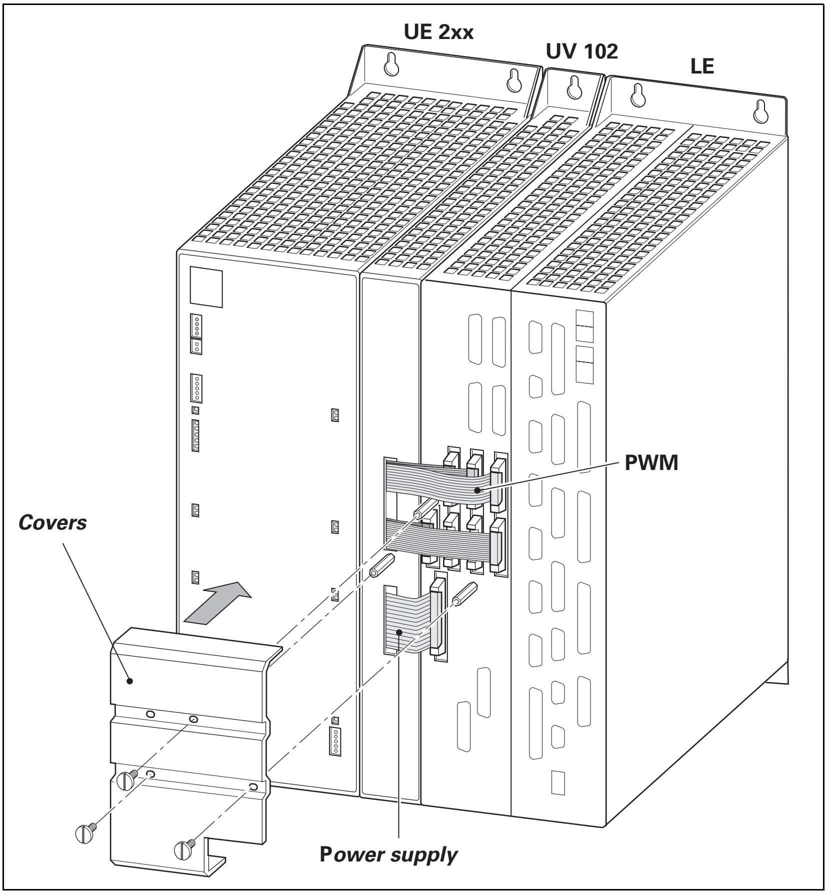
LE 426 M: The ribbon cables must be covered to protect them against interference.
The protective cover for the LE is supplied as an accessory with the LE, and that for the UV 102 as an accessory with the UV 102.

Mounting the HEIDENHAIN UE 2xx compact inverter

LE 41x M "compact":



LE 426 M:



> **Warning**
>
> All electrical screw connections must be tightened after installation is complete (tightening torque 3.5 Nm).

Conducted interference

To suppress occurrence of conducted interference, toroidal cores must be mounted in the motor leads (X80 to X84), in the voltage supply lead (X31) and in the lead to the braking resistor (only with UE 21x). See "Mounting the Toroidal Cores" on page 5 – 38.

5.2.2 UE 1xx, UE 2xxB, UR 2xx(D) Compact Inverters

Arranging the modules

The UE 1xx, UE 2xxB and UR 2xx compact inverters can only be operated with the LE 426 M/LE 430 M, the LE 41x M "modular" (with external PWM interfaces) or the MC 422/CC 42x. The compact inverter is arranged next to the control at its left.

If the UP 110 braking resistor module is used together with the UR 2xx(D) regenerative compact inverter, the braking resistor is arranged between the weakest power module and the control.

UE 1xx UE 2xxB UR 2xx(D)	Opt. UP 110	Opt. UV 105	LE 41x M "modular" LE 426 M/LE 430 M MC 422/CC 42x

An additional UM 111 power module **can** be connected to the UE 2xxB and UR 2xx compact inverters. It must be placed between the control or UP 110 and the compact inverter.

UE 2xxB UR 2xx(D)	Opt. With linear drive, ZKF 1xx to UR 2xx(D)	Opt. UM 111(D)	Opt. UP 110	Opt. UV 105	LE 41x M "modular" LE 426 M/LE 430 M MC 422/CC 42x

Connecting the modules

The UE 1xx, UE 2xxB or UR 2xx compact inverters supply power to the control via the 50-line ribbon cable (exception: See “Additional power supply” on page 5 – 34.).

The control transmits the PWM signals for the axes and spindle(s) to the UE 1xx, UE 2xx B or UR 2xx compact inverters via 20-line ribbon cables.

U_Z dc-link power is supplied to the additional UM 111(D) power module from the UE 2xxB or UR 2xx(D) compact inverter via a conductor bar, which is screwed to the power module and the compact inverter. A second power conductor establishes the ground connection between the UE 2xx B or UR 2xx(D) and the UM 111(D).
The power bars are supplied as accessories with the power modules.

A 40-line ribbon cable connects the UE 2xxB or UR 2xx(D) with the UM 111(D) power module, forming the unit bus.

Direct drives

Direct drives (linear motors, torque motors) used in conjunction with regenerative inverter systems require a ZKF 1xx dc-link filter, which is mounted to the left of the direct drives' power modules. The dc-link current is then led through this filter.

Covering the modules

With the UE 2xx B and UR 2xx(D), the ribbon cables must be covered to protect them against interference.

The covers for the control and the UE compact inverter are included with each as accessories.

The cover for an optional UM 111(D) power module must be ordered separately.

Additional power supply

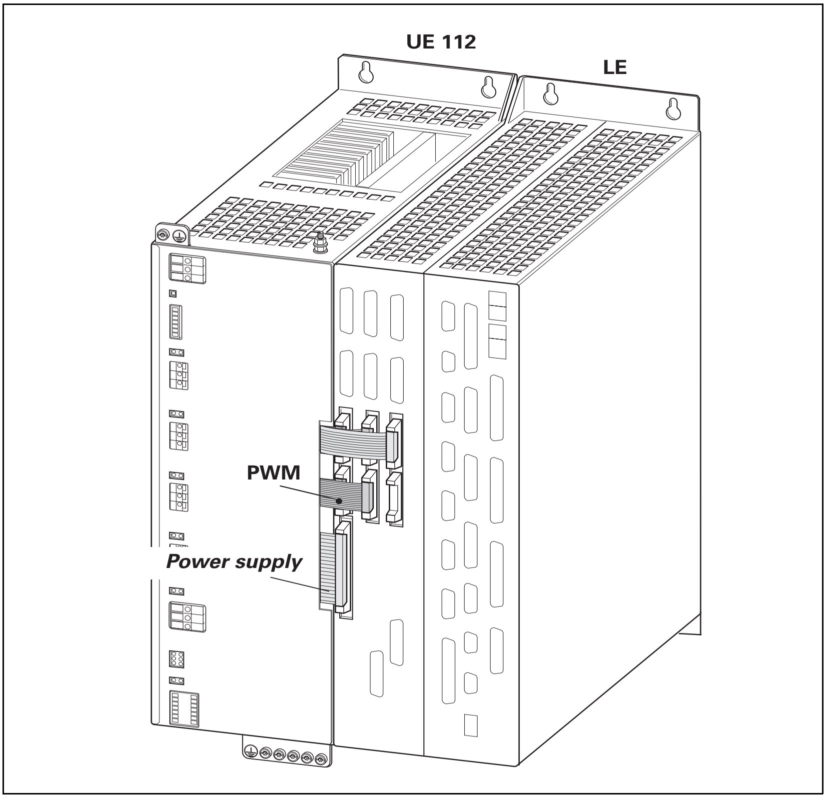
If several encoders with a high current consumption (e.g. encoders with EnDat interface) or the dual-processor MC 422 B are connected in conjunction with a compact inverter or a power supply unit, however, an additional power supply source might become necessary. The additional UV 105 power supply unit can be used for this purpose. It is mounted next to the control at its left.

The power supply unit is connected to the dc-link voltage via the conductor bar of the previous left module. The upper conductor bar also establishes the ground connection of the dc-link.

The 50-line ribbon cable of the compact inverter / power supply unit for transmitting the status signals is connected to X69 of the UV 105. The free ribbon cable of the UV 105 is connected to X69 of the control.

The 5-V power supply (X74) of the UV 105 is connected to the terminals on the control (X74) by using the litz wires included with the UV 105.

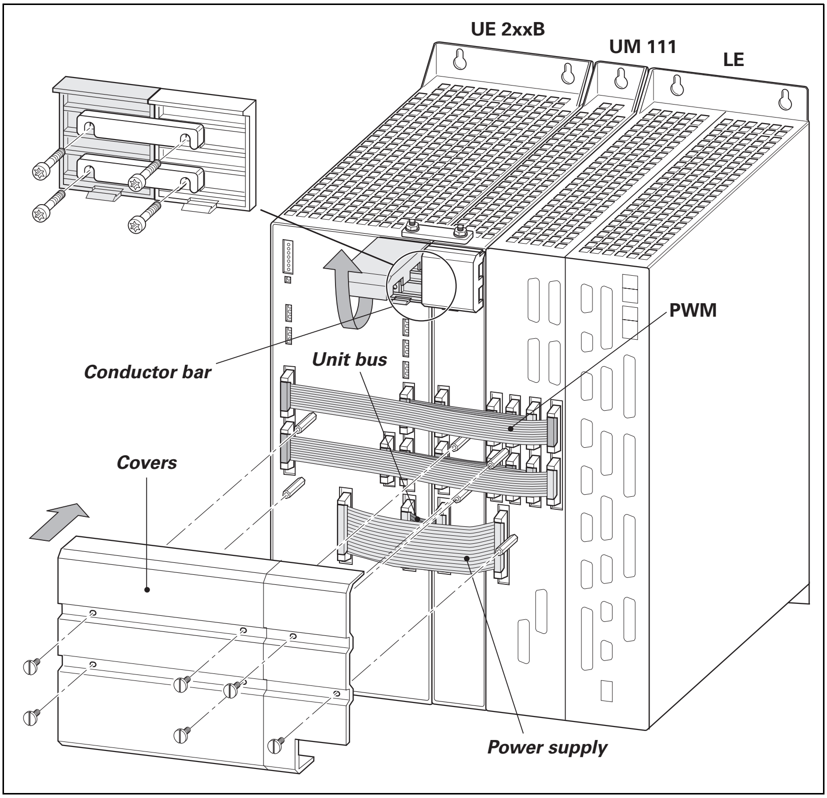
Mounting the HEIDENHAIN UE 1xx compact inverter



Warning

All electrical screw connections must be tightened after installation is complete (tightening torque 3.5 Nm).

Mounting the HEIDENHAIN UE 2xxB and UR 2xx(D) compact inverters



Warning

All electrical screw connections must be tightened after installation is complete (tightening torque 3.5 Nm).

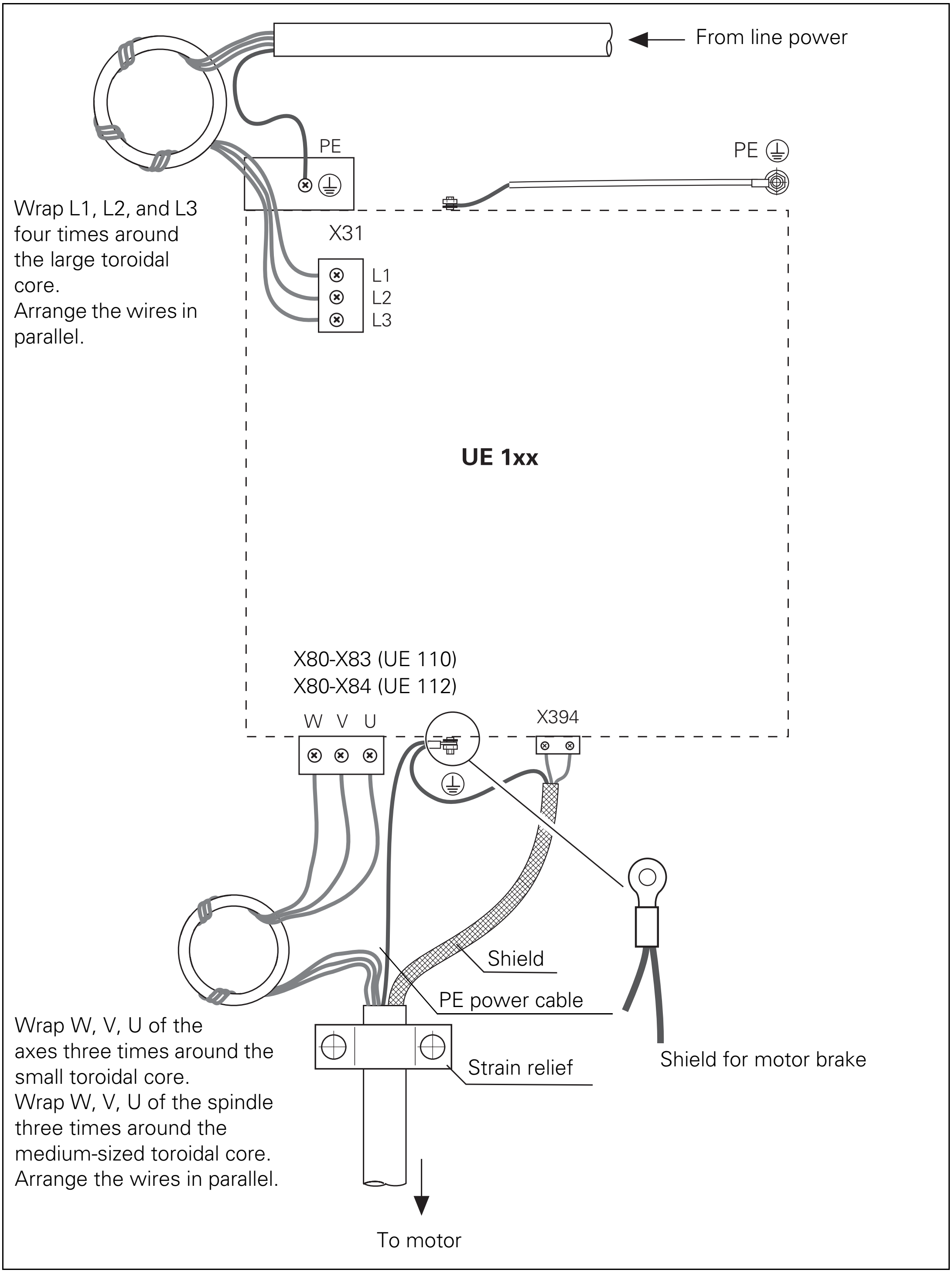
Conducted interference

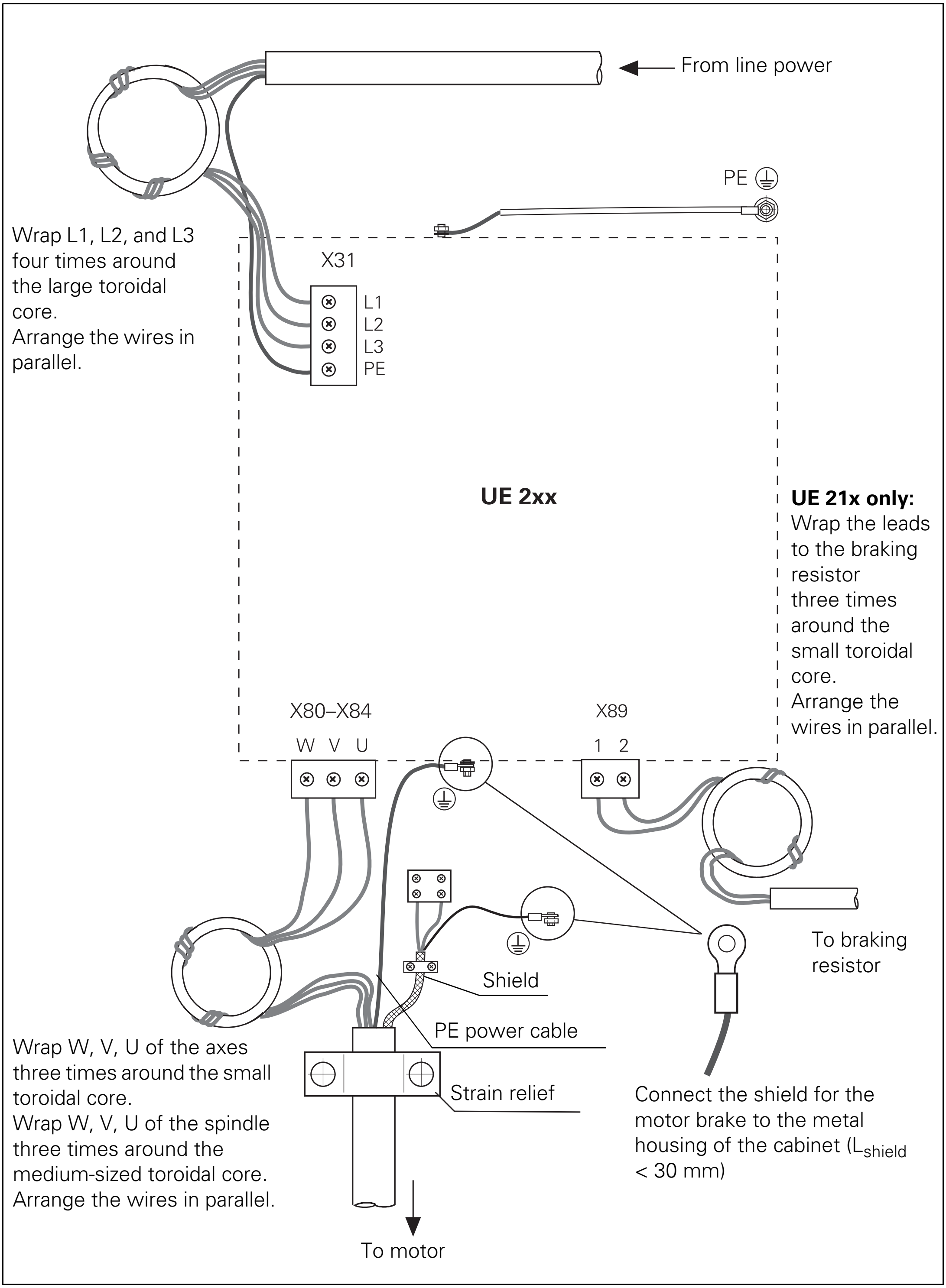
To suppress occurrence of conducted interference, toroidal cores must be mounted in the motor leads (X80 to X84), in the voltage supply lead (X31) and in the lead to the braking resistor (only with UE 21x). See “Mounting the Toroidal Cores” on page 5 – 38.

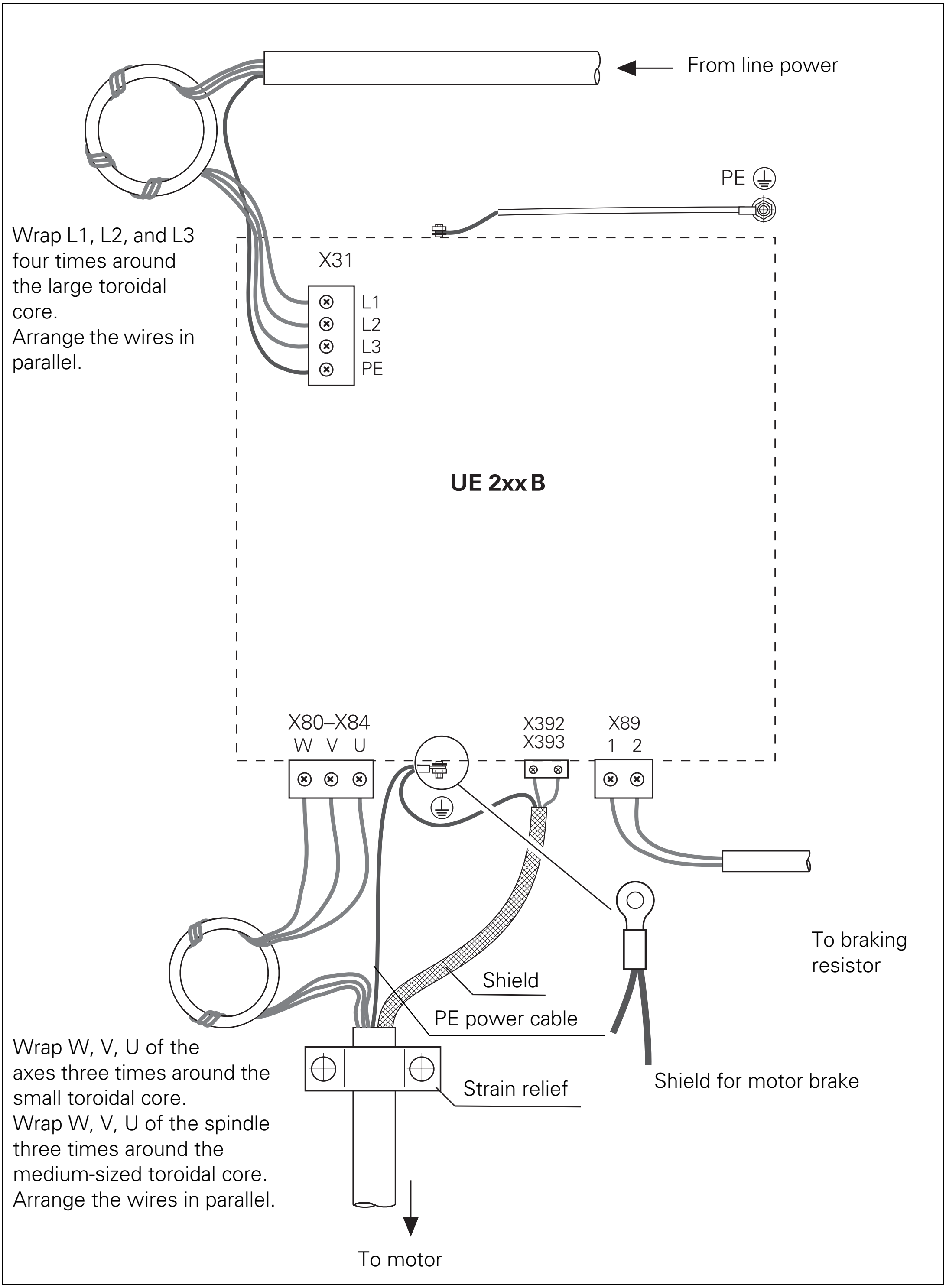
No toroidal cores are necessary for the UR 2xx and UR 2xxD.

5.2.3 Mounting the Toroidal Cores

To suppress occurrence of conducted interference, toroidal cores must be mounted in the motor leads (X80 to X84), in the voltage supply lead (X31) and in the lead to the braking resistor (only with UE 21x).




From line power
PE
Wrap L1, L2, and L3 four times around the large toroidal core.
Arrange the wires in parallel.
X31
L1
L2
L3
PE
UE 2xx
UE 21x only:
Wrap the leads to the braking resistor three times around the small toroidal core.
Arrange the wires in parallel.
X80–X84
W V U
X89
1 2
To braking resistor
Shield
PE power cable
Strain relief
Wrap W, V, U of the axes three times around the small toroidal core.
Wrap W, V, U of the spindle three times around the medium-sized toroidal core.
Arrange the wires in parallel.
Connect the shield for the motor brake to the metal housing of the cabinet (L_{shield} < 30 mm)
To motor


From line power
PE
Wrap L1, L2, and L3 four times around the large toroidal core.
Arrange the wires in parallel.
X31
L1
L2
L3
PE
UE 2xx B
X80–X84
W V U
X392
X393
X89
1 2
To braking resistor
Shield
PE power cable
Strain relief
Shield for motor brake
Wrap W, V, U of the axes three times around the small toroidal core.
Wrap W, V, U of the spindle three times around the medium-sized toroidal core.
Arrange the wires in parallel.
To motor

5.3 Connecting the UE 2xx Compact Inverter

Danger

Danger of electrical shock!
The compact inverters may be opened only by HEIDENHAIN service engineers.
Do not engage or disengage any terminals while they are under power.

5.3.1 Power Supplies

X3: Supply voltage for dc-link

With a power supply of 400 V, the inverter voltage U_Z is 565 V–.

Power supply for a defined setup speed:

$$U_{SP} = \left(\frac{U_{NM} \cdot n_S}{n_{NM} \cdot \sqrt{3}}\right) \cdot 2$$

U_{SP}: Power supply for setup speed
U_{NM}: Rated voltage of motor
n_S: Setup speed
n_{NM}: Rated speed of motor

For power connection, see page 4 – 31.

Connecting terminals	UE 210, UE 212	UE 230, UE 240, UE 242
L1	400 V~ ± 10% 50 Hz to 60 Hz	400 V~ ± 10% 50 Hz to 60 Hz
L2		
L3		
	Cable / single conductor (HT wire): Wire cross section: 6 mm^2 (AWG 10) Line fuse: 35 A (gR) Siemens Sitor type Grounding terminal: ≥ 10 mm^2 (AWG 6)	Cable / single conductor (HT wire): Wire cross section: 10 mm^2 (AWG 6) Line fuse: 50 A (gR) Siemens Sitor type Grounding terminal: ≥ 10 mm^2 (AWG 6)
Tightening torque for connecting terminals:	0.7 Nm (6.5 – 7 lbs/in)	2.0 – 2.3 Nm (18 – 20.5 lbs/in)

Note

If the power supply is other than 400 V, an autotransformer is required. It must comply at least with the connection specifications of the subsequent compact inverter.

X33: Supply voltage for the inverter supply unit

Connection:

Connecting terminals	Assignment
1	Jumper to X32/pin 1 (with setup operation L1 from line power 290 V~ to 440 V~, 50 Hz to 60 Hz)
2	Jumper to X32/pin 2 (with setup operation L2 from line power)

X32: Output for supply voltage of power unit

Connection:

Connecting terminals	Assignment
1	Jumper to X33/pin 1 (short-circuit protection with 4 A)
2	Jumper to X33/pin 2 (short-circuit protection with 4 A)
3	$+U_Z$ (short-circuit protection with 4 A)
4	$–U_Z$ (short-circuit protection with 4 A)

5.3.2 Motor Connections

X80: Spindle motor
X81: Axis motor 1
X82: Axis motor 2
X83: Axis motor 3
X84: Axis motor 4

Connection:

Connecting terminals	Assignment
U	Motor connection U
V	Motor connection V
W	Motor connection W

For information on synchronous motors, asynchronous motors and power cables, refer to the chapter “Motors for Axis and Spindle Drives on page 7 – 3.

5.3.3 Main Contactor and Safety Relay

X70: Main contactor X71: Safety relay for spindle
X72: Safety relay for axes

For information on the wiring and function, see the Basic Circuit Diagram for your control.

Connecting terminals X70 to X72	Assignment
1	+24 V output (max. 250 mA)
2	24 V input for U_Z ON, Axis ON, Spindle ON
3	Not assigned
4[a]	Normally closed contact 1
5[a]	Normally closed contact 2

a. Max. 125 V

Warning

A recovery diode is required in the proximity of inductive loads, e.g. relay or contactor coils.

5.3.4 PW 21x or PW 1x0(B) Braking Resistor for UE 2xx Compact Inverter

An external braking resistor must be connected to the UE 230 and UE 24x compact inverters, as these inverters are not equipped with internal braking resistors.
An external braking resistor can also be connected to the UE 210 and UE 212 compact inverters instead of the internal braking resistor. This becomes necessary if the internal braking resistor is no longer able to absorb all of the braking energy, because it is too much, or if the braking resistor needs to be mounted outside the electrical cabinet.

Either one PW x10(B) or two PW 120 switched in series can be connected to all UE 2xx compact inverters.

The braking resistor is switched on when the inverter voltage U_Z exceeds 700 V and is switched off again as soon as it falls below 670 V.

Note

If no braking resistor is connected, the inverter voltage U_Z can increase and at U_Z > 760 V all power stages will be switched off (LED for $U_{DC\text{-}LINK}$ >> lights up)!

Cross section

The following cross section is required for connecting the braking resistor:

Braking resistor	Cross section
1 x PW 21x	1.5 mm^2
1 x PW 110(B)	1.5 mm^2
2 x PW 120 in series	4 mm^2

X89: Braking resistor

Pin layout on the UE 21x:

Connecting terminal X89 UE 21x	Assignment	Internal braking resistor	PW 21x	PW 1x0(B); connecting terminal X1
1	+U_Z	Jumper	RB1	1
2	Internal braking resistor		Not assign	Do not assign
3	Switch to –U_Z	Do not assign	RB2	2

Pin layout on UE 230 and UE 24x:

Connecting terminal X89 UE 230 UE 24x	Assignment	PW 21x	PW 1x0(B); connecting terminal X1
1	+U_Z	RB1	1
2	Switch against –U_Z	RB2	2

Temperature switch

The temperature switch is a normally closed contact and is set to protect the braking resistor from being damaged. It can have a maximum load of 250 V, 5 A. The switch can be connected to a PLC input on the control and evaluated via the PLC.
Connection:

Connecting terminal on PW 21x	Assignment
T1	1
T2	2

Connecting terminal X3 on the PW 110B	Assignment
1	1
2	2

X2: Fan for the PW 1x0(B) external braking resistor

Connection:

Connecting terminal X2	Assignment
+	+24 V (PLC)
–	0 V

5.4 Connecting the UE 1xx Compact Inverter

Danger

Danger of electrical shock!
The compact inverters may be opened only by HEIDENHAIN service engineers.
Do not engage or disengage any terminals while they are under power.

5.4.1 Power Supplies

Note

IEC 61800-5-1 requires a non-detachable connection to the line power supply.

Note

If the power supply is other than 400 V, an autotransformer is required. It must comply at least with the connection specifications of the subsequent compact inverter.

X31: Power supply

With a power supply of 400 V, the inverter voltage U_Z is 565 V–, and with a power supply of 480 V it is 678 V–.

For power connection, see page 4 – 31.

Connecting terminals	UE 110, UE 112
Operation with 400V~	
L1	400 V~ ± 10% 50 Hz to 60 Hz
L2	
L3	
	Cable / single conductor (HT wire): 6 mm^2 (AWG 10) Single conductor H07 V2-K: 4 mm^2 (AWG 10) Line fuse: 25 A (gR) Siemens Sitor type Grounding terminal: ≥ 10 mm^2 (AWG 6)
	Tightening torque for connecting terminals: 0.7 Nm (6.5 - 7 lbs/in)
Operation with 480V~	
L1	480 V~ ± 10% 50 Hz to 60 Hz
L2	
L3	
	Cable / single conductor (HT wire): 6 mm^2 (AWG 10) Single conductor H07 V2-K: 4 mm^2 (AWG 10) Line fuse: 25 A (gR) Siemens Sitor type Grounding terminal: ≥ 10 mm^2 (AWG 6)
	Tightening torque for connecting terminals: 0.7 Nm (6.5 - 7 lbs/in)

5.4.2 Motor Connections

X80: Spindle motor
X81: Axis motor 1
X82: Axis motor 2
X83: Axis motor 3
(X84: Axis motor 4)

Connection:

Connecting terminals	Assignment
U	Motor connection U
V	Motor connection V
W	Motor connection W

For information on synchronous motors, asynchronous motors and power cables, refer to the chapter “Motors for Axis and Spindle Drives on page 7 – 3.

Motor connections	PWM input
X80	X110
X81	X111
X82	X112
X83	X113
X84 (UE 112)	X114 (UE 112)

5.4.3 Motor Holding Brakes

X344: 24-V supply for motor holding brake

Connection:

Connecting terminals X344	Assignment
1	+24 V
2	0 V

X394: Motor holding brake

Connection:

Connecting terminals X394	Assignment
1	Holding brake (X111)
2	0 V (X111)
3	Holding brake (X112)
4	0 V (X112)
5	Holding brake (X113)
6	0 V (X113)
7	Holding brake (X114)
8	0 V (X114)

Maximum current for X394

Maximum current I_{max} for controlling the holding brakes via X394:

Compact Inverters	I_{max} (X394)
UE 110	1.5 A
UE 112	1.5 A

5.4.4 Main Contactor and Safety Relay

X70: Main contactor
X71: Safety relay for spindle
X72: Safety relay for axes

For information on the wiring and function, see the Basic Circuit Diagram for your control.

Connecting terminals X70 to X72	Assignment
1	+24 V output (max. 250 mA)
2	0 V
3	+24 V input for U_Z ON, Axis ON, Spindle ON
4	Do not assign
5	Do not assign
6[a]	Normally closed contact (OE1, OE1A or OE1S)
7[a]	Normally closed contact (OE2, OE2A or OE2S)

a. Max. 125 V

Warning

A recovery diode is required in the proximity of inductive loads, e.g. relay or contactor coils.

5.4.5 PWM Connection to the Control

X110 to X114: PWM connection to control

Connection:

Ribbon connector, 20-pin	Assignment
1a	PWM U1
1b	0 V U1
2a	PWM U2
2b	0 V U2
3a	PWM U3
3b	0 V U3
4a	$\overline{\text{SH2}}$
4b	0 V ($\overline{\text{SH2}}$)
5a	$\overline{\text{SH1}}$
5b	0 V ($\overline{\text{SH1}}$)
6a	$+I_{Actl\ 1}$
6b	$-I_{Actl\ 1}$
7a	0 V (analog)
7b	$+I_{Actl\ 2}$
8a	$-I_{Actl\ 2}$
8b	0 V (analog)
9a	Do not assign
9b	$\overline{\text{BRK}}$
10a	$\overline{\text{ERR}}$
10b	RDY

Danger

The interface complies with the requirements of IEC 61800-5-1 for "low voltage electrical separation."

5.4.6 NC Supply Voltage and Control Signals

X69: NC supply voltage and control signals

Connection:

50-pin ribbon connector	Assignment
1a to 5b	+5 V
6a to 7b	+12 V
8a	+5 V (low-voltage separation)
8b	0 V (low-voltage separation)
9a	+15 V
9b	–15 V
10a	UZAN
10b	0 V
11a	IZAN
11b	0 V
12a	$\overline{\text{RES.PS}}$
12b	0 V
13a	$\overline{\text{PF.PS}}$
13b	GND
14a	$\overline{\text{ERR.UZ.GR}}$
14b	GND
15a	$\overline{\text{ERR.IZ.GR}}$
15b	GND
16a	$\overline{\text{ERR.TEMP}}$

50-pin ribbon connector	Assignment
16b	GND
17a	RDY.PS
17b	GND
18a	$\overline{\text{ERR.ILEAK}}$
18b	GND
19a	Do not assign
19b	GND
20a	Do not assign
20b	GND
21a	Do not assign (UE 2xxB: 0V)
21b	GND
22a	Do not assign (UE 2xxB: 0V)
22b	GND
23a	Reserved (SDA)
23b	GND
24a	Reserved (SCL)
24b	GND
25a	$\overline{\text{RES.LE}}$
25b	GND

Danger

The interface complies with the requirements of IEC 61800-5-1 for “low voltage electrical separation.”

5.5 Connecting the UE 2xxB and UR 2xx(D) Compact Inverters

Danger

Danger of electrical shock!
The compact inverters may be opened only by HEIDENHAIN service engineers.
Do not engage or disengage any terminals while they are under power.

5.5.1 Power Supplies

Danger

IEC 61800-5-1 requires a non-detachable connection to the line power supply.

Note

If the power supply is other than 400 V, an autotransformer is required. It must comply at least with the connection specifications of the subsequent compact inverter.

UE 2xxB
X31: Power supply

With a power supply of 400 V, the inverter voltage U_Z is 565 V–.

For power connection, see page 4 – 31.

Connecting terminals	UE 21xB	UE 230B, UE 24xB
L1	400 V~ ± 10% 50 Hz to 60 Hz	400 V~ ± 10% 50 Hz to 60 Hz
L2		
L3		
	Cable / single conductor (HT wire): 6 mm² (AWG 10) Single conductor H07 V2-K: 4 mm² (AWG 10) Line fuse: 35 A (gR) Siemens Sitor type Grounding terminal: ≥ 10 mm² (AWG 6)	Cable / single conductor (HT wire): 10 mm² (AWG 6) Single conductor H07 V2-K: 6 mm² (AWG 10) Line fuse: 50 A (gR) Siemens Sitor type Grounding terminal: ≥ 10 mm² (AWG 6)
Tightening torque for connecting terminals	0.7 Nm (6.5 – 7 lbs/in)	2.0 – 2.3 Nm (18 – 20.5 lbs/in)

UR 2xx(D)
X31: Power supply

The inverter voltage U_Z is 650 V–.

The UR 2xx regenerative compact inverters must be connected to the main power line via the KDR 120 commutating reactor and the line filter. This is necessary for keeping the main line free of disruptive higher harmonics.

For power connection, see page 4 – 30.

Power supply	UR 2xx(D)
L1	400 V~ ± 10% 50 Hz to 60 Hz
L2	
L3	
PE	
	Cable / single conductor (HT wire): 10 mm^2 (AWG 6) Single conductor H07 V2-K: 6 mm^2 (AWG 10) Line fuse: 35 A (gR) Siemens Sitor type Grounding terminal: ≥ 10 mm^2 (AWG 6)
Tightening torque for connecting terminals:	0.7 Nm (6.5 - 7 lbs/in)

Note

The cables between the UR 2xx compact inverter and commutating reactor as well as between the commutating reactor and line filter must be as short as possible (< 0.4 m)!

5.5.2 Motor Connections

X80: Spindle motor
X81: Axis motor 1
X82: Axis motor 2
X83: Axis motor 3
X84: Axis motor 4

Connection:

Connecting terminals	Assignment
U	Motor connection U
V	Motor connection V
W	Motor connection W

For information on synchronous motors, asynchronous motors and power cables, refer to the chapter "Motors for Axis and Spindle Drives on page 7 – 3.

Motor connections	PWM input
X80	X110
X81	X111
X82	X112
X83	X113
X84	X114

5.5.3 Connection of the Motor Holding Brakes

X344: 24-V supply for motor holding brake

Connection:

Connecting terminals X344	Assignment
1	+24 V
2	0 V

X392: Motor holding brake

Connection:

Connecting terminals X392	Assignment
1	Holding brake (X110)
2	0 V (X110)
3	Holding brake (X114)
4	0 V (X114)

X393: Motor holding brake

Connection:

Connecting terminals X393	Assignment
1	Holding brake (X111)
2	0 V (X111)
3	Holding brake (X112)
4	0 V (X112)
5	Holding brake (X113)
6	0 V

Maximum current for X392/X393

Maximum current I_{max} for controlling the holding brakes via X392:

Compact Inverters	I_{max} (X392)	I_{max} (X393)
UE 210B, UE 240B, UR 240	3.0 A	1.5 A
UE 211B	2.0 A	2.0 A
UE 212B, UE 242B, UR 242	2.0 A	1.5 A
UE 230B, UR 230	3.0 A	2.0 A

5.5.4 Main Contactor and Safety Relay

X70: Main contactor
X71: Safety relay for spindle
X72: Safety relay for axes

For information on the wiring and function, see the Basic Circuit Diagram for your control.

Connecting terminals X70 to X72	Assignment
1	+24 V output (max. 250 mA)
2	0 V
3	+24 V input for U_Z ON, Axis ON, Spindle ON
4	Do not assign
5	Do not assign
6[a]	Normally closed contact (OE1, OE1A or OE1S)
7[a]	Normally closed contact (OE2, OE2A or OE2S)

a. Max. 125 V

Warning

A recovery diode is required in the proximity of inductive loads, e.g. relay or contactor coils.

5.5.5 PWM Connection to the Control

X110 to X114: PWM connection to control

Connection:

Ribbon connector, 20-pin	Assignment
1a	PWM U1
1b	0 V U1
2a	PWM U2
2b	0 V U2
3a	PWM U3
3b	0 V U3
4a	$\overline{\text{SH2}}$
4b	0 V ($\overline{\text{SH2}}$)
5a	$\overline{\text{SH1}}$
5b	0 V ($\overline{\text{SH1}}$)
6a	$+I_{Actl\ 1}$
6b	$-I_{Actl\ 1}$
7a	0 V (analog)
7b	$+I_{Actl\ 2}$
8a	$-I_{Actl\ 2}$
8b	0 V (analog)
9a	Do not assign
9b	$\overline{\text{BRK}}$
10a	$\overline{\text{ERR}}$
10b	RDY

Danger

The interface complies with the requirements of IEC 61800-5-1 for “low voltage electrical separation.”

5.5.6 NC Supply Voltage and Control Signals

X69: NC supply voltage and control signals

Connection:

50-pin ribbon connector	Assignment
1a to 5b	+5 V
6a to 7b	+12 V
8a	+5 V (low-voltage separation)
8b	0 V (low-voltage separation)
9a	+15 V
9b	–15 V
10a	UZAN
10b	0 V
11a	IZAN
11b	0 V
12a	$\overline{\text{RES.PS}}$
12b	0 V
13a	$\overline{\text{PF.PS}}$
13b	GND
14a	$\overline{\text{ERR.UZ.GR}}$
14b	GND
15a	$\overline{\text{ERR.IZ.GR}}$
15b	GND
16a	$\overline{\text{ERR.TEMP}}$

50-pin ribbon connector	Assignment
16b	GND
17a	RDY.PS
17b	GND
18a	$\overline{\text{ERR.ILEAK}}$
18b	GND
19a	Do not assign
19b	GND
20a	Do not assign
20b	GND
21a	Do not assign (UE 2xxB: 0V)
21b	GND
22a	Do not assign (UE 2xxB: 0V)
22b	GND
23a	Reserved (SDA)
23b	GND
24a	Reserved (SCL)
24b	GND
25a	$\overline{\text{RES.LE}}$
25b	GND

Danger

The interface complies with the requirements of IEC 61800-5-1 for “low voltage electrical separation.”

5.5.7 Unit Bus

The unit bus connects the compact inverter with a UM 111 power module. If you are not using a UM 111, you do not need to connect the unit bus.

X79: Unit bus

Connection:

40-pin ribbon connector	Assignment	
1a to 3b	0 V [*1]	These voltages must not be linked with other voltages (only basic insulation)!
4a	+24 V [*1]	
4b	+24 V [*1]	
5a	+15 V [*1]	
5b	+24 V [*1]	
6a	+15 V [*1]	
6b	+15 V [*1]	
7a to 8b	Do not assign	
9a	Reserved (SDA)	
9b	Do not assign	
10a	Reserved (SCL)	
10b	$\overline{\text{ERR.TEMP}}$	
11a	$\overline{\text{PF.PS}}$	
11b	0 V	
12a	$\overline{\text{RES.PS}}$	
12b	0 V	
13a	$\overline{\text{PWR.OFF}}$	
13b	0 V	
14a	5 V FS (spindle enable)	
14b	0 V	
15a	5 V FA (axis enable)	
15b to 16b	0 V	
17a and 17b	–15 V	
18a and 18b	+15 V	
19a to 20b	+5 V	

Danger

The interface complies with the requirements of IEC 61800-5-1 for low voltage electrical separation (except for 1a to 6b).

5.5.8 PW 1x0(B) and PW 21x Braking Resistors for UE 2xxB Compact Inverter

An external braking resistor must be connected to the UE 230B and UE 24xB compact inverters, as these inverters are not equipped with internal braking resistors.
An external braking resistor can also be connected to the UE 21xB compact inverters instead of the internal braking resistor. This may be necessary if the internal resistor can no longer fully absorb the excessive braking energy, or if the braking resistor needs to be mounted outside the control cabinet.

Either one PW 1x0(B), one PW 21x, two PW 210 or two PW 110B switched in series can be connected to all UE 2xxB compact inverters.

The braking resistor is switched on when the inverter voltage U_Z exceeds 700 V and is switched off again as soon as it falls below 670 V.

Note

If no braking resistor is connected, the inverter voltage U_Z can increase and at U_Z > 760 V all power stages will be switched off (LED for $U_{DC-LINK}$ >> lights up)!

Cross section

The following cross section is required for connecting the braking resistor:

Braking resistor	Cross section
1 x PW 21x	1.5 mm^2
2 x PW 210 in parallel	4 mm^2
2 x PW 110B in parallel	4 mm^2
1 x PW 110(B)	1.5 mm^2
1 x PW 120	4 mm^2

X89: Braking resistor

Pin layout on UE 21xB for internal braking resistor:

Connecting terminal X89A UE 21xB	Assignment	Connecting terminal X89B UE 21xB	Assignment
1	Do not assign	1	Jumper
2	Do not assign	2	

Pin layout on UE 21xB for external braking resistor:

Connecting terminal X89B UE 21xB	Assignment	Connecting terminal X89A UE 21xB	Assignment	PW 21x	PW 1x0(B); connecting terminal X1
1	Do not assign	1	$+U_Z$	RB 1	1
2	Do not assign	2	Switch against $-U_Z$	RB 2	2

Warning

The internal and an external braking resistor must **not** be operated in parallel!

Pin layout on UE 230B and UE 24xB:

Connecting terminal X89 UE 230B UE 24xB	Assignment	PW 21x	PW 1x0(B), connecting terminal X1
1	$+U_Z$	RB 1	1
2	Switch against $-U_Z$	RB 2	2

Temperature switch

The temperature switch is a normally closed contact and is set to protect the braking resistor from being damaged. It can have a maximum load of 250 V, 5 A. The switch can be connected to a PLC input on the control and evaluated via the PLC.

Connection:

Connecting terminal on PW 21x	Assignment
T1	1
T2	2

Connecting terminal X3 on the PW 110B	Assignment
1	1
2	2

X2: Fan for the PW 1x0(B) external braking resistor

Connection:

Connecting terminal X2	Assignment
+	+24 V (PLC)
–	0 V

5.6 Connecting the UV 106 B Power Supply Unit

X31: Supply voltage for UV 106 B

Supply voltage: 400 V ± 10 %

Connection:

Connecting terminal	Assignment
U	Phase 1 / 400 V~ ±10% / 50 Hz to 60 Hz
V	Phase 2 / 400 V~ ±10% / 50 Hz to 60 Hz
⏚	Protective ground (YL/GN), ≥ 10 mm^2
	Connecting leads Wire cross section: 1.5 mm^2 (AWG 16)
Tightening torque: for the connecting terminals 0.7 Nm (6.5 - 7 lbs/in) **Grounding terminal:** ≥ 10 mm^2 (AWG 6) **Strain relief:** Ensure that the connecting cables are not subject to excessive strain	

Power connection

5.7 Connecting the UV 105 Power Supply Unit

X69, X169: NC supply voltage and control signals

Note

For the control to be able to evaluate the status signals of the power supply units, connector X69 of the controller unit must be connected by ribbon cable with X69 of the UV 105.
Since non-HEIDENHAIN inverters do not send any status signals, an adapter connector (Id. Nr. 349 211-01) must be connected to X69 on the UV 105. This connector is delivered with the UV 105.

Connection:

50-pin ribbon connector	Assignment	50-pin ribbon connector	Assignment
1a to 5b	+5 V	16b	GND
6a to 7b	+12 V	17a	RDY.PS
8a	+5 V (low-voltage separation)	17b	GND
8b	0 V (low-voltage separation)	18a	ERR.ILEAK
9a	+15 V	18b	GND
9b	–15 V	19a	PF.PS.AC (only UV 120, UV 140, UV 150, UR 2xx)
10a	UZAN	19b	GND
10b	0 V	20a	Do not assign
11a	IZAN	20b	GND
11b	0 V	21a	Do not assign
12a	RES.PS	21b	GND
12b	0 V	22a	Do not assign
13a	PF.PS.ZK	22b	GND
13b	GND	23a	Reserved (SDA)
14a	ERR.UZ.GR	23b	GND
14b	GND	24a	Reserved (SLC)
15a	ERR.IZ.GR	24b	GND
15b	GND	25a	RES.LE
16a	ERR.TMP	25b	GND

X74: 5-V connection of the UV 105

Connection:

Wire color of 5-V connection	5-V terminal on CC 42x
Black	0 V
Red	+5 V

X31: Supply voltage for UV 105

Supply voltage: 400 V ± 10 %

Connection:

Connecting terminal	Assignment
U	Phase 1 / 400 V~ ±10% / 50 Hz to 60 Hz
V	Phase 2 / 400 V~ ±10% / 50 Hz to 60 Hz
⏚	Protective ground (YL/GN), ≥ 10 mm^2
	Cable: Wire cross section: 1.5 mm^2 (AWG 16) Line fuse: 6.3 A (gR) Siemens Sitor type The screw terminal between X31 and the grounding terminal must be used for fixing the cable and for ensuring appropriate strain relief of the cable. **Grounding terminal:** ≥ 10 mm^2 (AWG 6)
	Tightening torque for connecting terminals: 0.7 Nm (6.5 - 7 lbs/in)

Note

- If you are using non-HEIDENHAIN inverter systems or regenerative HEIDENHAIN inverter systems, you must connect the supply voltage to the terminals U and V via an isolating transformer (300 VA, basic insulation as per IEC 61800-5-1 or protective insulation as per VDE 0550).

Warning

The isolating transformer must not be grounded on the secondary side

The isolating transformer decouples the line voltage from ground. Grounding the isolating transformer on the secondary side leads to an addition of the dc-link voltage and the supply voltage. This overloads the UV 105, thereby destroying it!

Please keep this in mind in your circuit diagrams.

U_Z: Supply of the UV 105 with U_Z

Since the power to the UV 105 is supplied through the dc-link, the voltage fed into the dc-link by the motors that are still running can be used during line voltage failures. The UV 105 uses this voltage to maintain the power supply to the control until the system has been shut down properly by the control.

Connecting terminals	Assignment
$-U_Z$	DC-link voltage –
$+U_Z$	DC-link voltage +

The UV 105 is powered with dc-link voltage U_Z through

- the conductor bars (for HEIDENHAIN inverter systems).
- a cable which is connected instead of the conductor bar (for non-HEIDENHAIN inverter systems).

5.8 Connecting the UV 102 Power Supply Unit

The UV 102 has a 50-line ribbon cable for the power supply to the LE 426 M and five 20-line ribbon cables for the PWM signals of the axes and the spindle from the LE.

X31: Supply voltage Connection:

Connecting terminals	**Assignment**
⏚	Equipment ground (YL/GN)
U1	Phase 1 / 400 V~ ±10% / 50 Hz to 60 Hz
U2	Phase 2 / 400 V~ ±10% / 50 Hz to 60 Hz
$-U_Z$	DC-link voltage –
$+U_Z$	DC-link voltage +
	Cable / single conductor (HT wire): Wire cross section: 1.5 mm^2 (AWG 16) Line fuse: 6.3 A (gR) Siemens Sitor type Grounding terminal: ≥ 10 mm^2 (AWG 6)
	Tightening torque for connecting terminals: 0.7 Nm (6.5 - 7 lbs/in)

Note

The voltage at the terminals U1 and U2 must be supplied via an isolating transformer (250 VA, functional insulation or basic insulation in accordance with IEC 61800-5-1, or protective insulation as per VDE 0550).

5.9 Connecting the UP 110 Braking Resistor Module

For regenerative inverter systems, the UP 110 braking resistor module must be used when axis motors without brakes are used. In the event of power failure, it dissipates the energy returned by the motors to the dc link. The UP 110 is switched on when the inverter voltage U_Z exceeds 740 V and is switched off again as soon as it falls below 720 V.

> **Danger**
>
> Danger of electrical shock!
> The UP 110 braking resistor module may be opened only by HEIDENHAIN service engineers.
> Do not engage or disengage any terminals while they are under power.

X79: Unit bus

Connection:

<table>
<tr><th>40-pin ribbon connector</th><th>Assignment</th><th></th></tr>
<tr><td>1a to 3b</td><td>0 V [*1]</td><td rowspan="7">These voltages must not be linked with other voltages (only basic insulation)!</td></tr>
<tr><td>4a</td><td>+24 V [*1]</td></tr>
<tr><td>4b</td><td>+24 V [*1]</td></tr>
<tr><td>5a</td><td>+15 V [*1]</td></tr>
<tr><td>5b</td><td>+24 V [*1]</td></tr>
<tr><td>6a</td><td>+15 V [*1]</td></tr>
<tr><td>6b</td><td>+15 V [*1]</td></tr>
<tr><td>7a to 8b</td><td>Do not assign</td><td></td></tr>
<tr><td>9a</td><td>Reserved (SDA)</td><td></td></tr>
<tr><td>9b</td><td>Do not assign</td><td></td></tr>
<tr><td>10a</td><td>Reserved (SCL)</td><td></td></tr>
<tr><td>10b</td><td>$\overline{\text{ERR.TEMP}}$</td><td></td></tr>
<tr><td>11a</td><td>$\overline{\text{PF.PS}}$</td><td></td></tr>
<tr><td>11b</td><td>0 V</td><td></td></tr>
<tr><td>12a</td><td>$\overline{\text{RES.PS}}$</td><td></td></tr>
<tr><td>12b</td><td>0 V</td><td></td></tr>
<tr><td>13a</td><td>$\overline{\text{PWR.OFF}}$</td><td></td></tr>
<tr><td>13b</td><td>0 V</td><td></td></tr>
<tr><td>14a</td><td>5 V FS (spindle enable)</td><td></td></tr>
<tr><td>14b</td><td>0 V</td><td></td></tr>
<tr><td>15a</td><td>5 V FA (axis enable)</td><td></td></tr>
<tr><td>15b to 16b</td><td>0 V</td><td></td></tr>
<tr><td>17a and 17b</td><td>–15 V</td><td></td></tr>
<tr><td>18a and 18b</td><td>+15 V</td><td></td></tr>
<tr><td>19a to 20b</td><td>+5 V</td><td></td></tr>
</table>

Danger

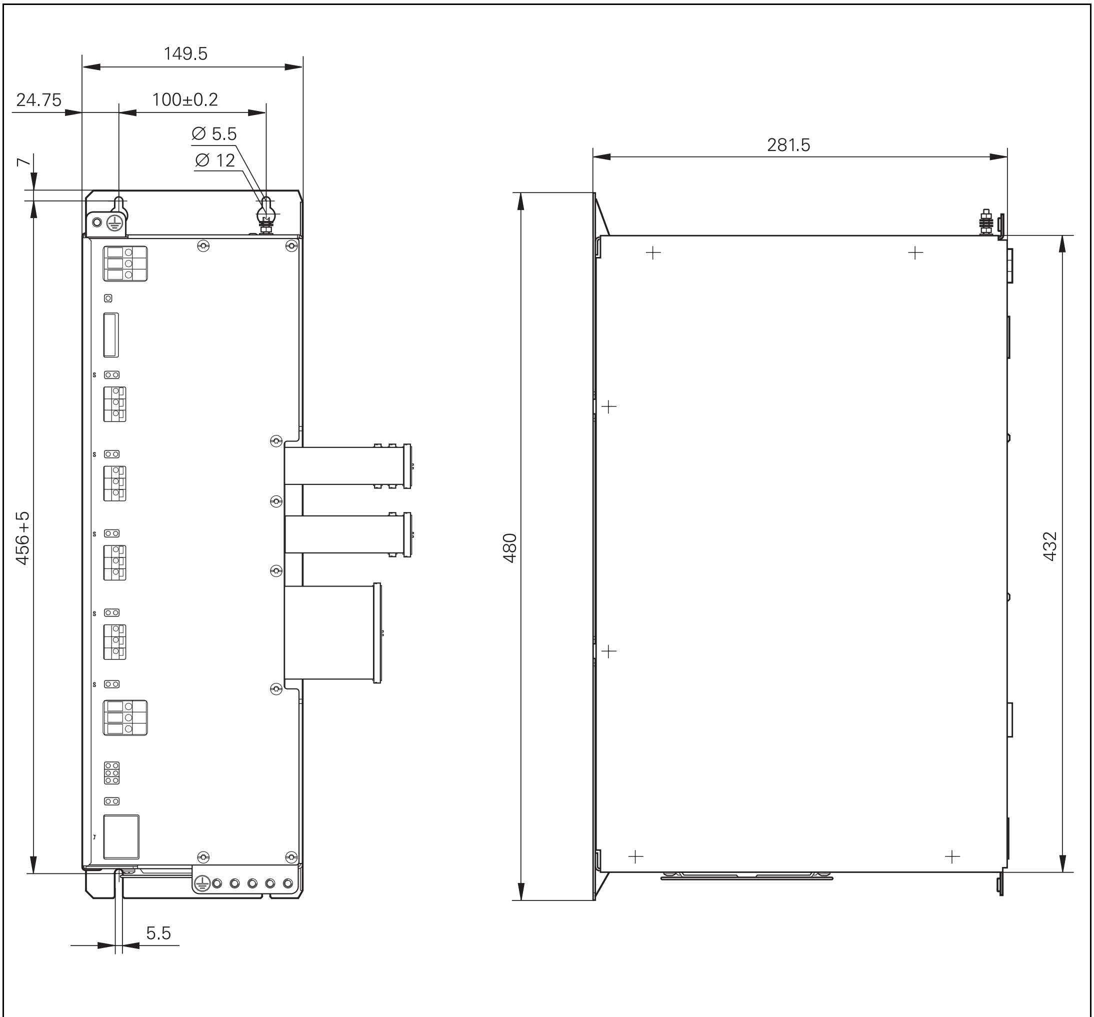
The interface complies with the requirements of IEC 61800-5-1 for low voltage electrical separation (except for 1a to 6b).

5.10 Dimensions

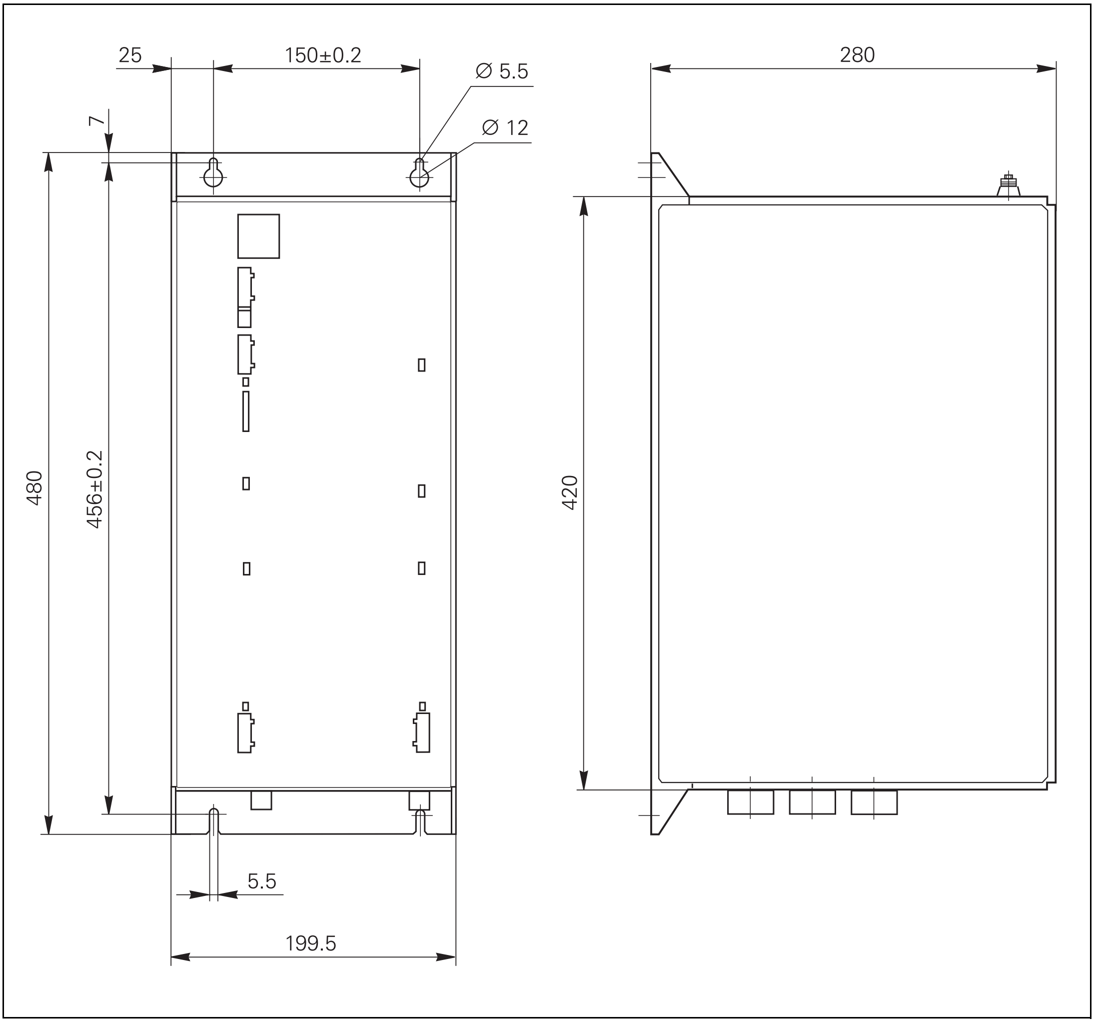
Note

All dimensions are in millimeters [mm].

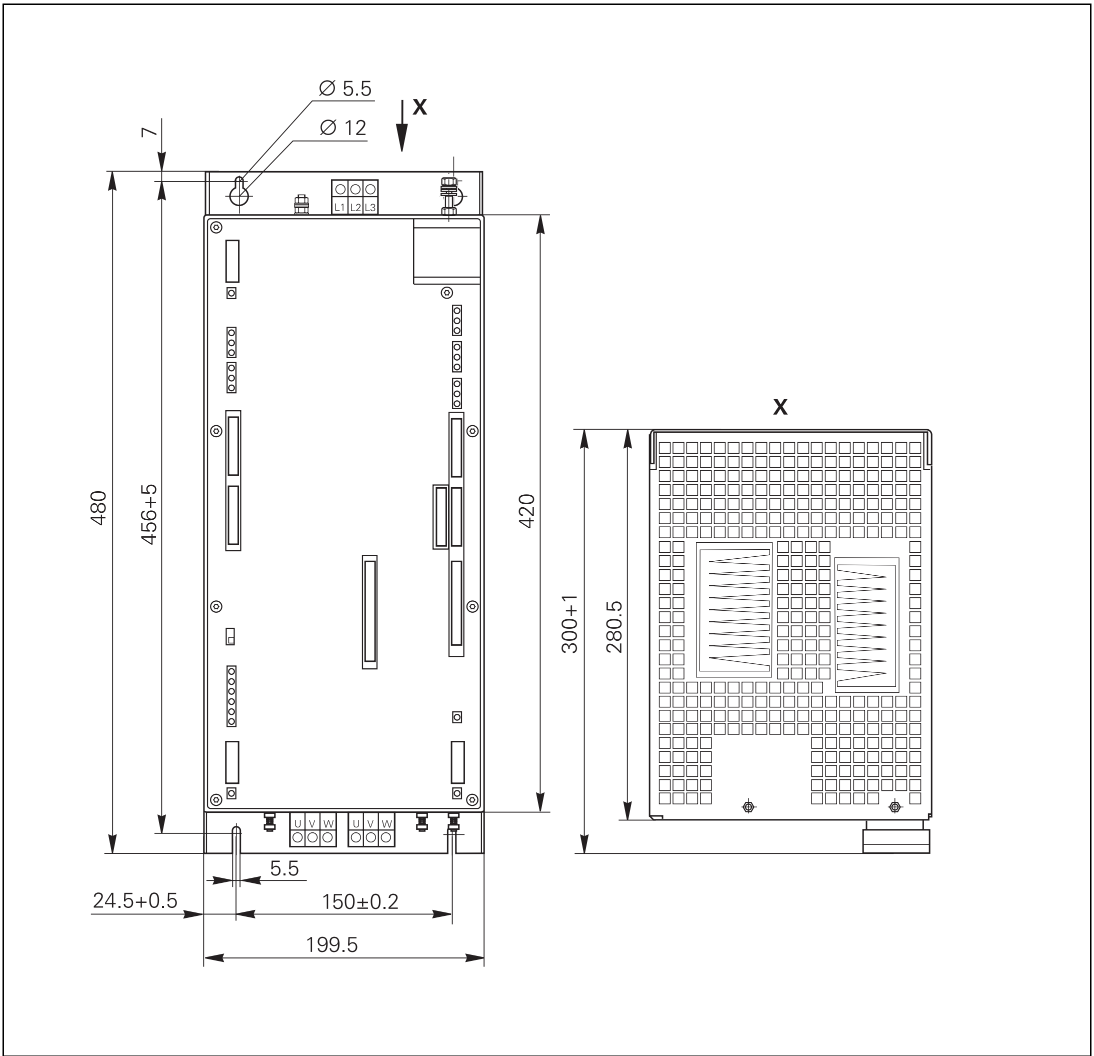
5.10.1 UE 1xx



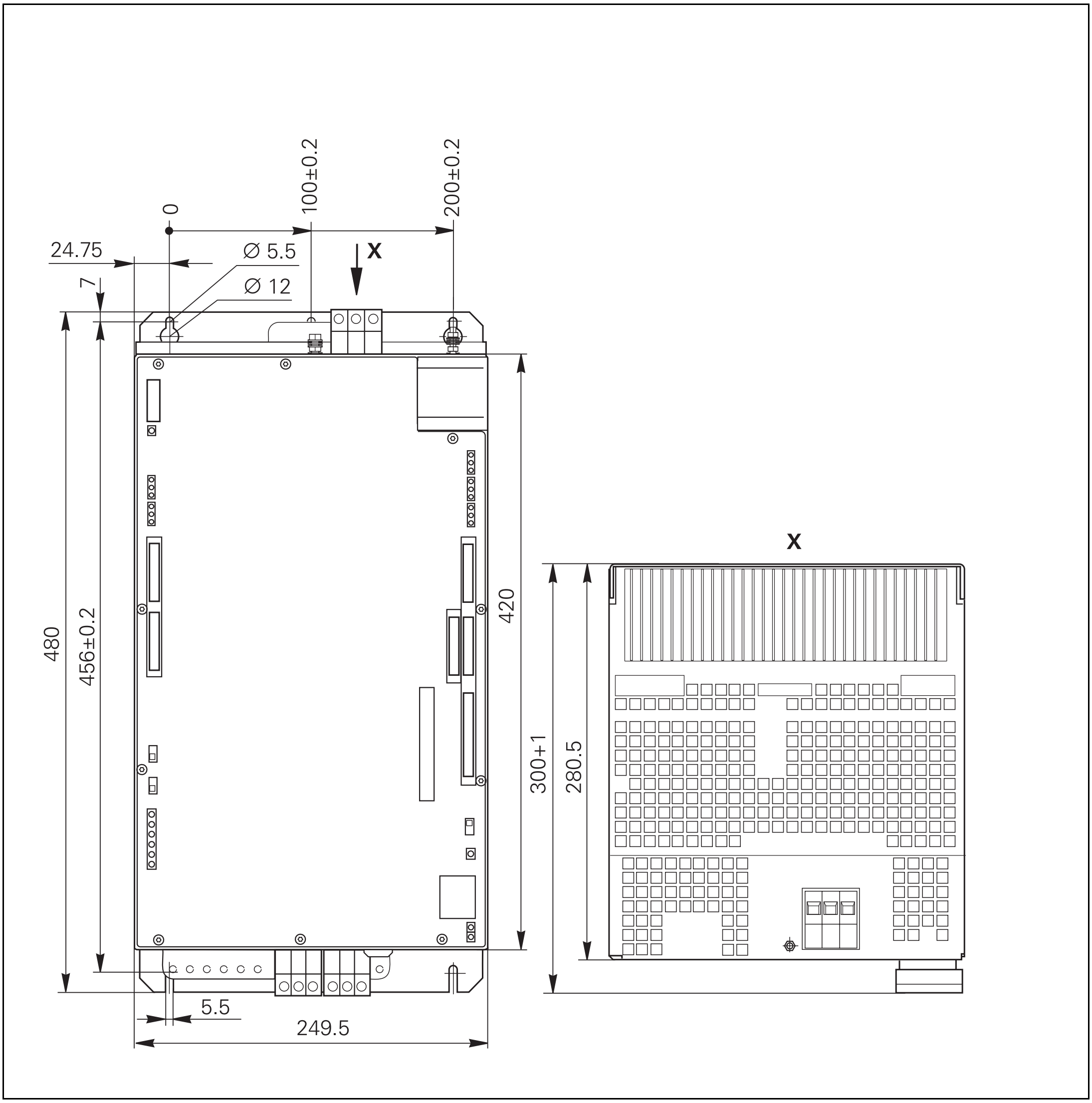
5.10.2 UE 2xx



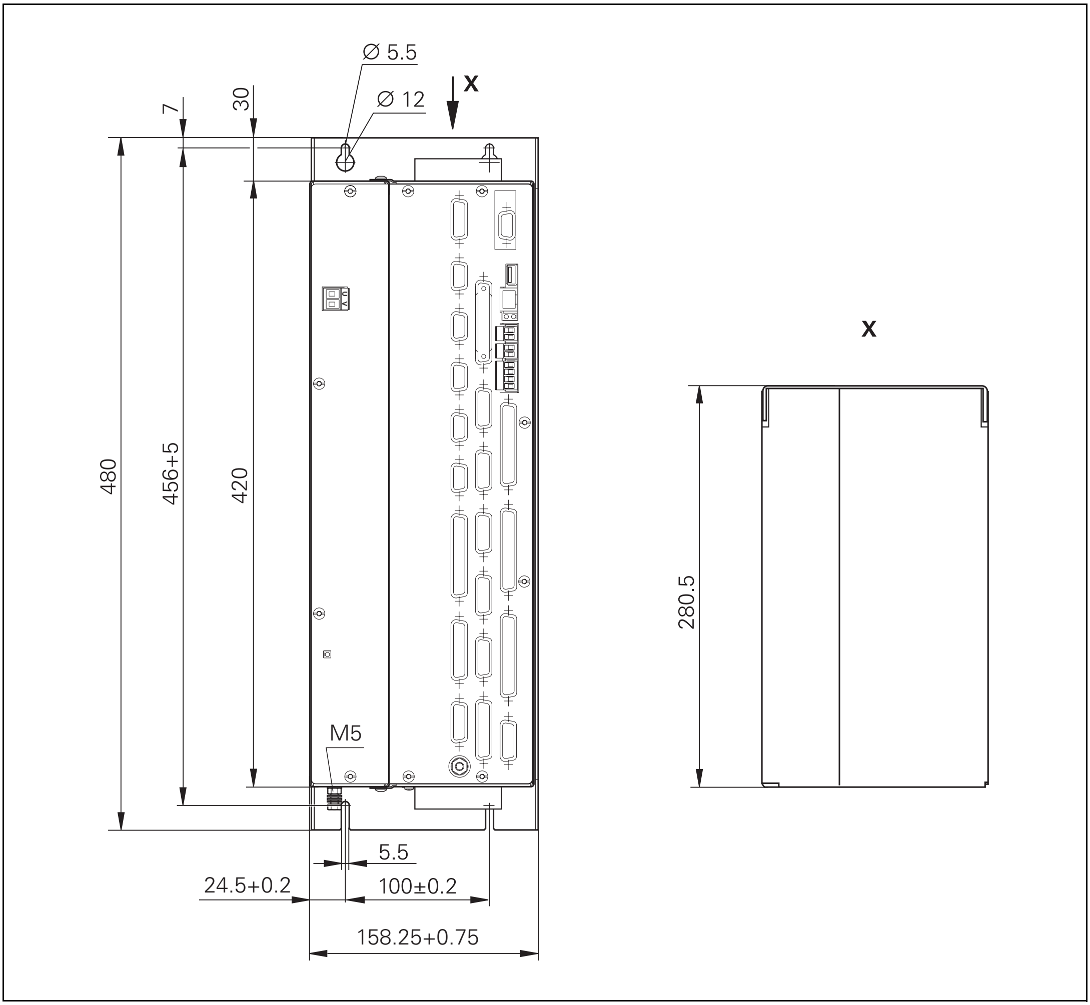
5.10.3 UE 2xx B


Ø 5.5
X
Ø 12
7
L1 L2 L3
480
456+5
420
X
300+1
280.5
U V W
U V W
5.5
24.5+0.5
150±0.2
199.5

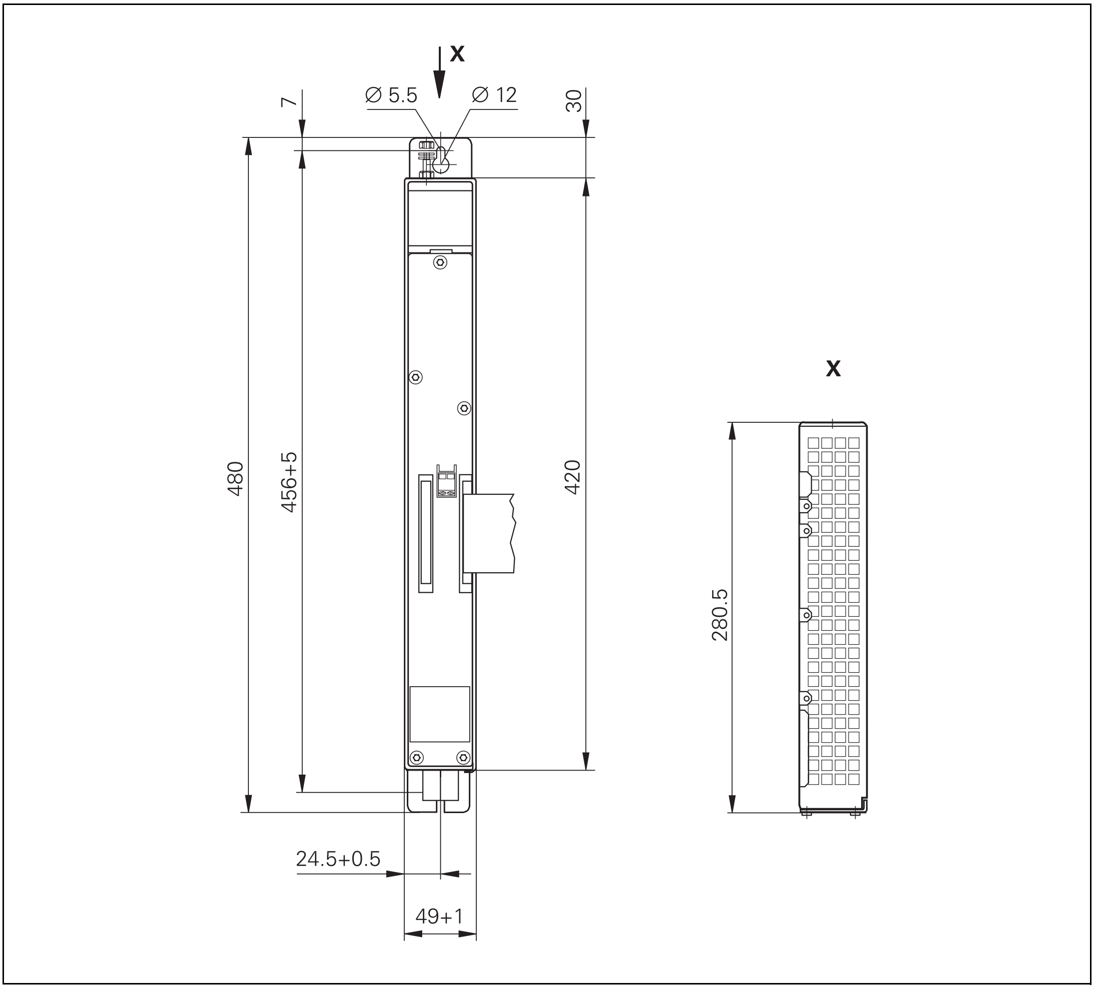
5.10.4 UR 2xx(D)



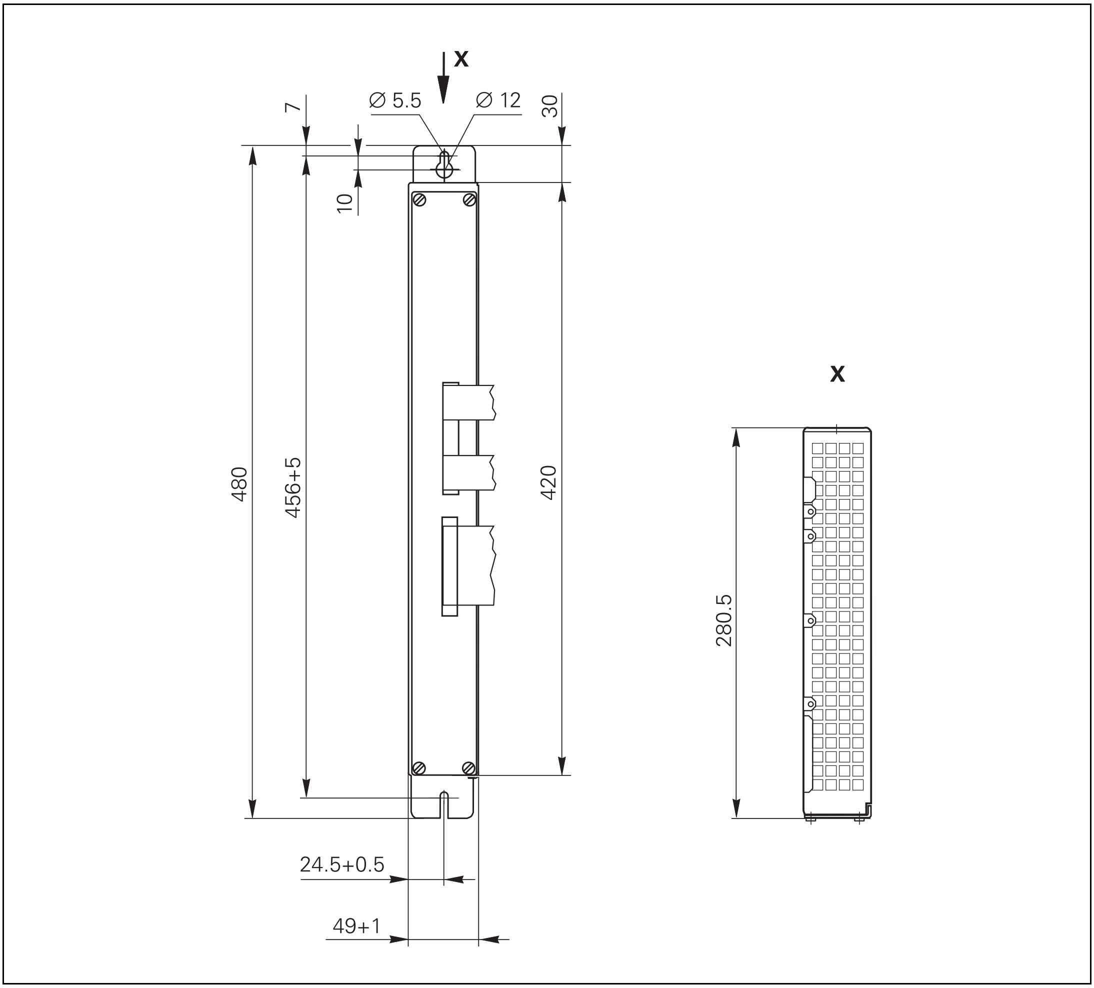
5.10.5 UV 106B



5.10.6 UV 105



5.10.7 UV 102

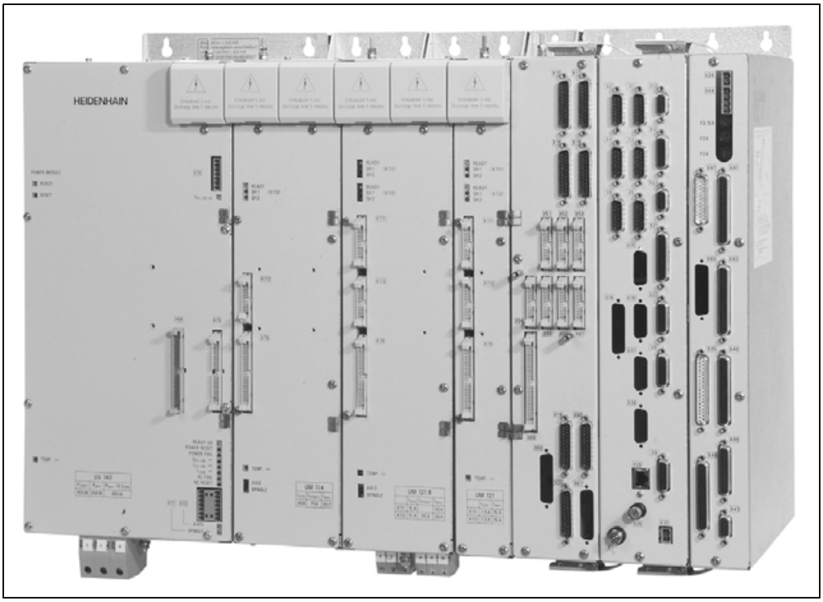


6 Modular Inverters

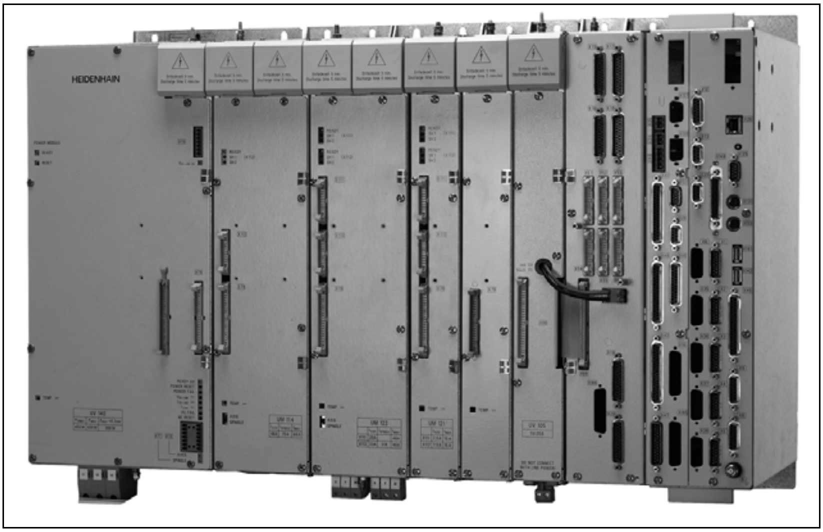
6 Modular Inverters

6.1 Connection Overview

LE 430 M with modular inverter



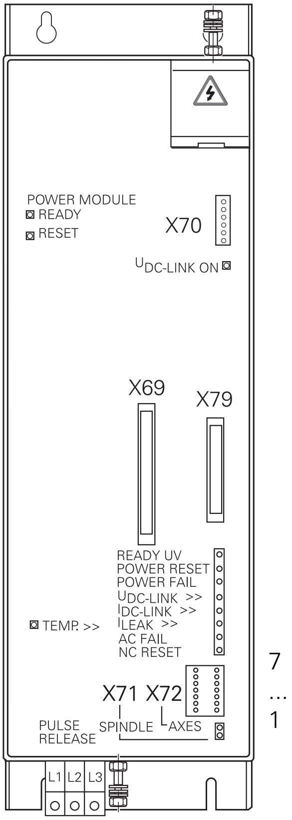
MC 422/CC 422 with modular inverter modules



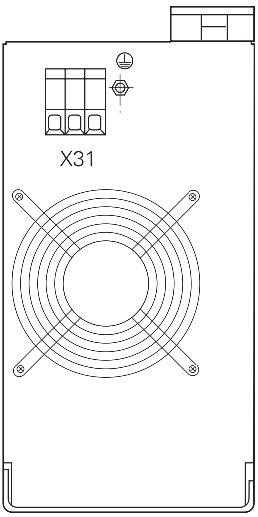
6.1.1 UV 120 Power Supply Unit

Danger

Do not engage or disengage any connecting elements while the unit is under power!



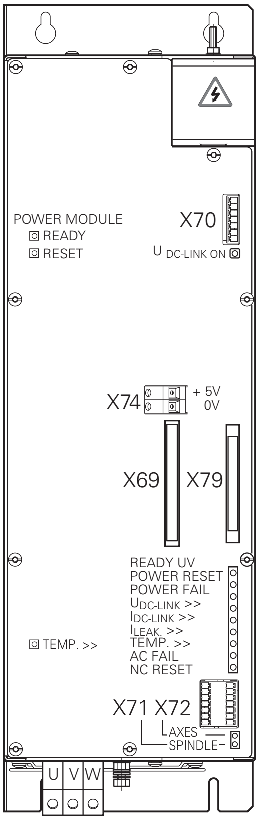
X70	Main contactor
X69	Power supply for the control (in double for lengths over 0.5 m)
X79	Unit bus
X71	Safety relay for spindle (pulse disable for the spindle)
X72	Safety relay for the axes (pulse disable for all axes)



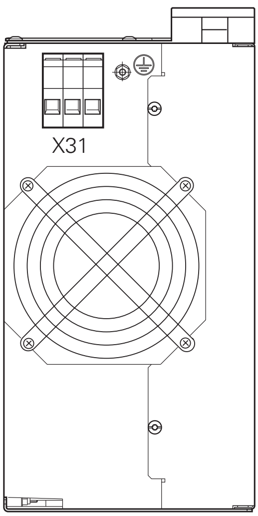
X31	Supply voltage for inverter (3 x 400 V ±10 %)
⏚	Equipment ground

6.1.2 UVR 120D Power Supply Unit

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



X70	Main contactor
X74	5-V power supply
X69	Power supply for the control (in double for lengths over 0.5 m)
X79	Unit bus
X71	Safety relay for spindle (pulse disable for the spindle)
X72	Safety relay for the axes (pulse disable for all axes)

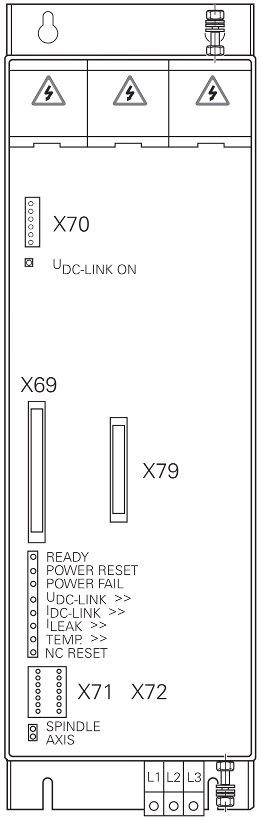


X31	Supply voltage for inverter (3 x 400 V ±10 %)
⏚	Equipment ground

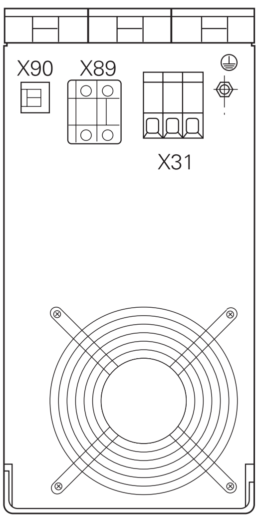
6.1.3 UV 130 Power Supply Unit

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X70	Main contactor
X69	Power supply for the control (in double for lengths over 0.5 m)
X79	Unit bus
X71	Safety relay for spindle (pulse disable for the spindle)
X72	Safety relay for the axes (pulse disable for all axes)

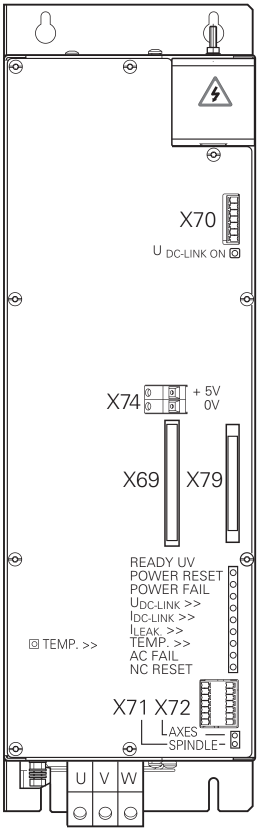


X31	Supply voltage for inverter (3 x 400 V ±10 %)
X89	Braking resistor
X90	24-V output
⏚	Equipment ground

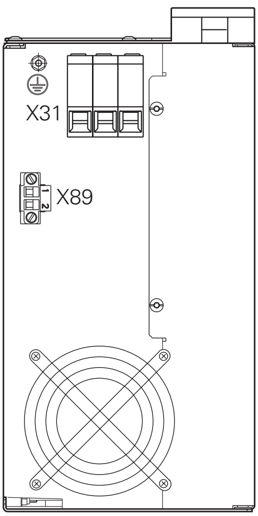
6.1.4 UV 130D Power Supply Unit

Danger

Do not engage or disengage any connecting elements while the unit is under power!



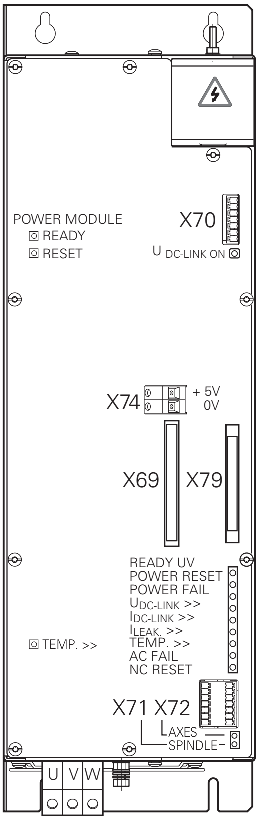
X70	Main contactor
X74	5-V power supply
X69	Power supply for the control (in double for lengths over 0.5 m)
X79	Unit bus
X71	Safety relay for spindle (pulse disable for the spindle)
X72	Safety relay for the axes (pulse disable for all axes)

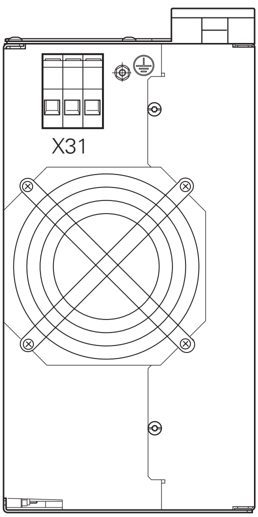


X31	Supply voltage for inverter (3 x 400 V ±10 %)
⏚	Equipment ground
X89	Braking resistor

6.1.5 UVR 130D Power Supply Unit

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



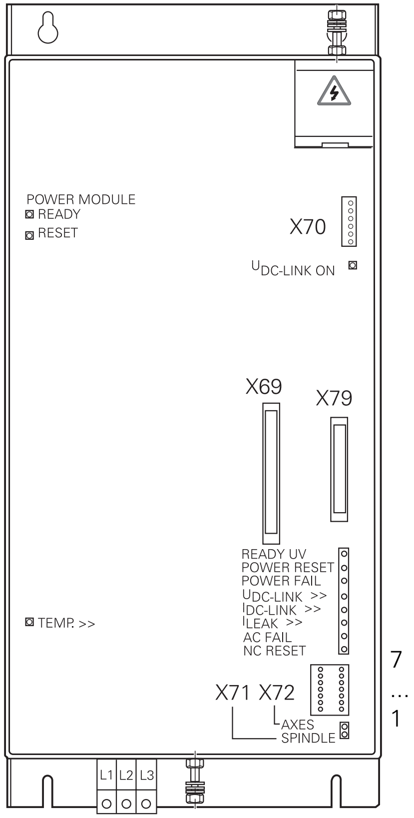


X70	Main contactor
X74	5-V power supply
X69	Power supply for the control (in double for lengths over 0.5 m)
X79	Unit bus
X71	Safety relay for spindle (pulse disable for the spindle)
X72	Safety relay for the axes (pulse disable for all axes)
X31	Supply voltage for inverter (3 x 400 V ±10 %)
⏚	Equipment ground

6.1.6 UV 140 Power Supply Unit

Danger

Do not engage or disengage any connecting elements while the unit is under power!



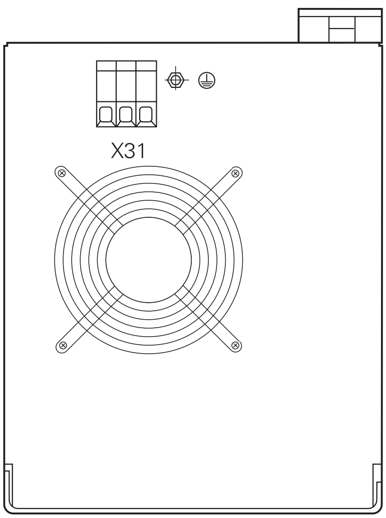
X70 Main contactor

X69 Power supply for the control
(in double for lengths over 0.5 m)

X79 Unit bus

X71 Safety relay for spindle (pulse disable for the spindle)

X72 Safety relay for the axes (pulse disable for all axes)



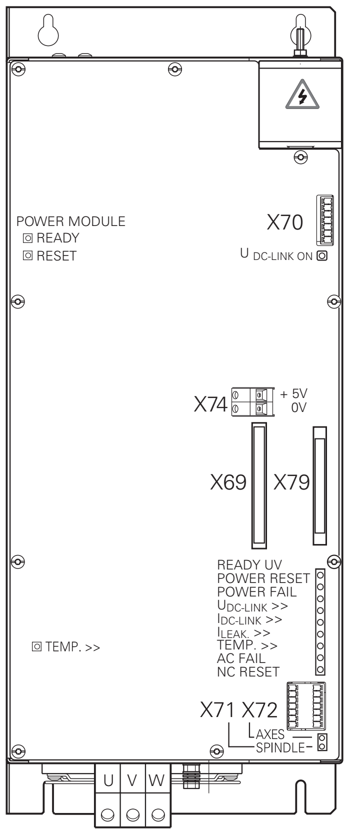
X31 Supply voltage for inverter (3 x 400 V ±10 %)

⏚ Equipment ground

6.1.7 UVR 140D Power Supply Unit

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X70 Main contactor

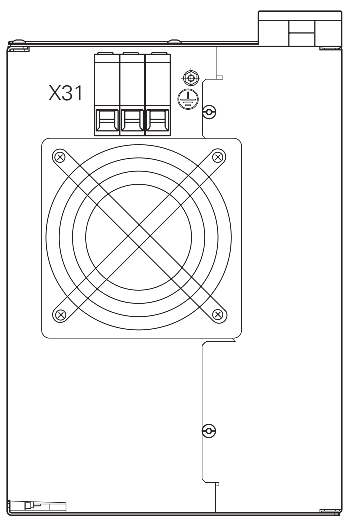
X74 5-V power supply

X69 Power supply for the control
(in double for lengths over 0.5 m)

X79 Unit bus

X71 Safety relay for spindle (pulse disable for the spindle)

X72 Safety relay for the axes (pulse disable for all axes)



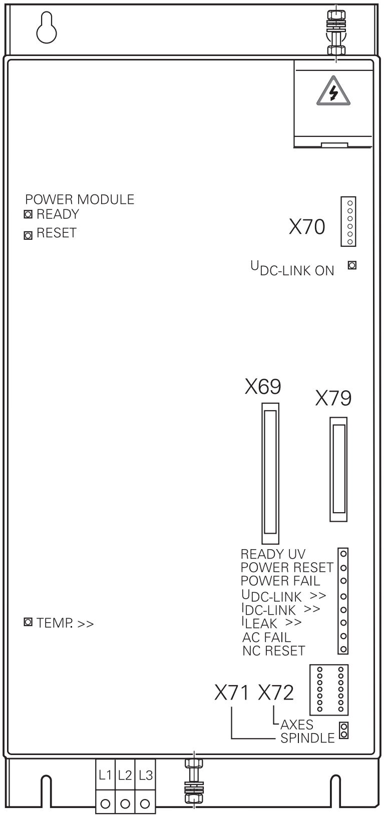
X31 Supply voltage for inverter (3 x 400 V ±10%)

⏚ Equipment ground

6.1.8 UV 150 Power Supply Unit

Danger

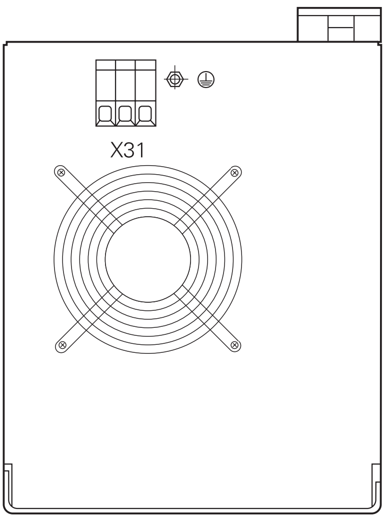
Do not engage or disengage any connecting elements while the unit is under power!



X70 Main contactor

X69 Power supply for the control
(in double for lengths over 0.5 m)
X79 Unit bus

X71 Safety relay for spindle (pulse disable for the spindle)
X72 Safety relay for the axes (pulse disable for all axes)



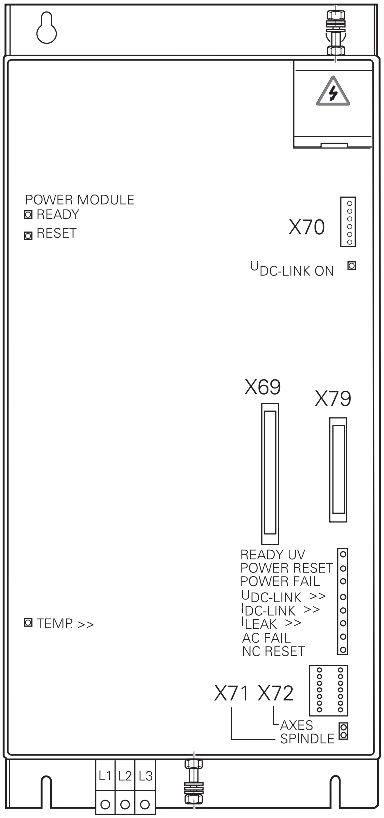
X31 Supply voltage for inverter (3 x 400 V ±10 %)

⏚ Equipment ground

6.1.9 UVR 150 Power Supply Unit

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X70 Main contactor

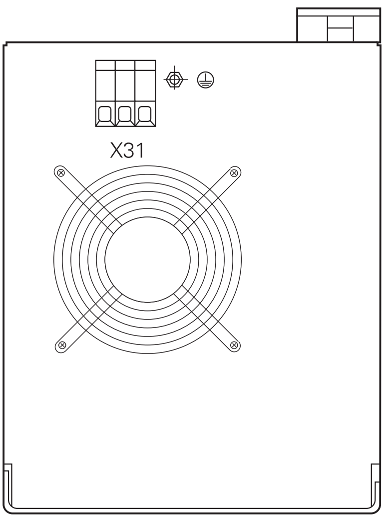
X74 +5-V and 0-V supply

X69 Power supply for the control (in double for lengths over 0.5 m)

X79 Unit bus

X71 Safety relay for spindle (pulse disable for the spindle)

X72 Safety relay for the axes (pulse disable for all axes)

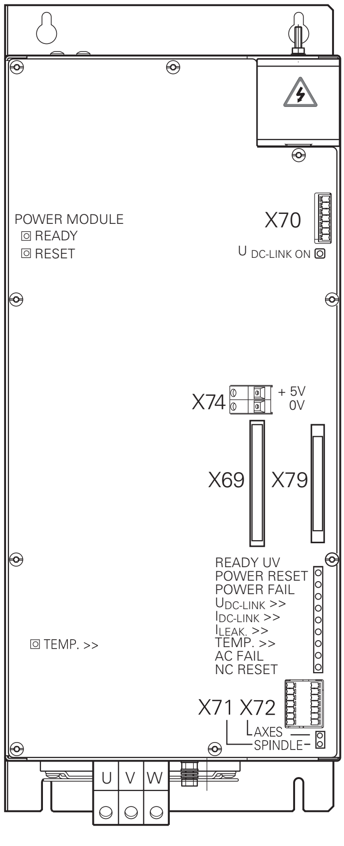


X31 Supply voltage for inverter (3 x 400 V ±10%)

⏚ Equipment ground

6.1.10 UVR 150D Power Supply Unit

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



X70 Main contactor

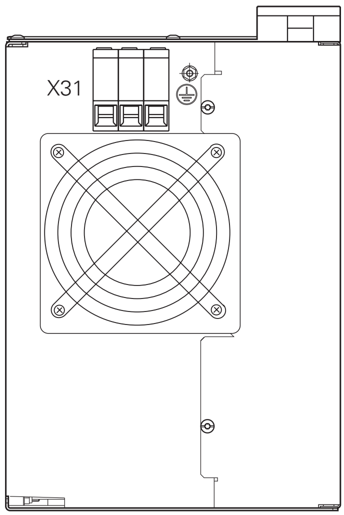
X74 +5-V and 0-V supply

X69 Power supply for the control
(in double for lengths over 0.5 m)

X79 Unit bus

X71 Safety relay for spindle (pulse disable for the spindle)

X72 Safety relay for the axes (pulse disable for all axes)

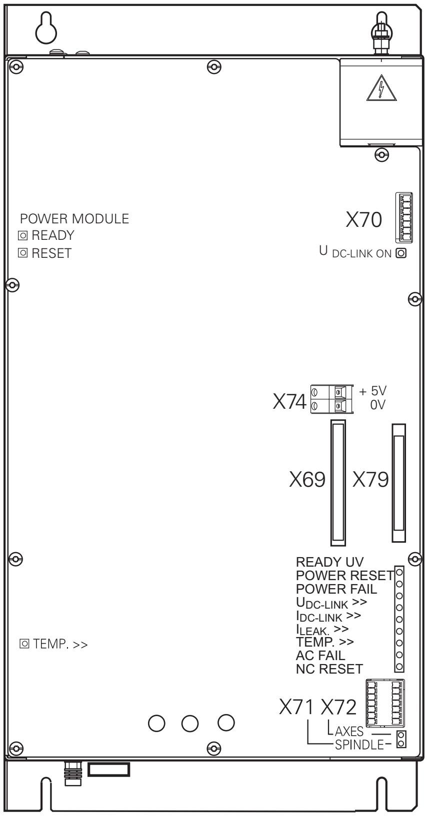


X31 Supply voltage for inverter (3 x 400 V ±10 %)

⏚ Equipment ground

6.1.11 UVR 160DW Power Supply Unit

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



X70 Main contactor

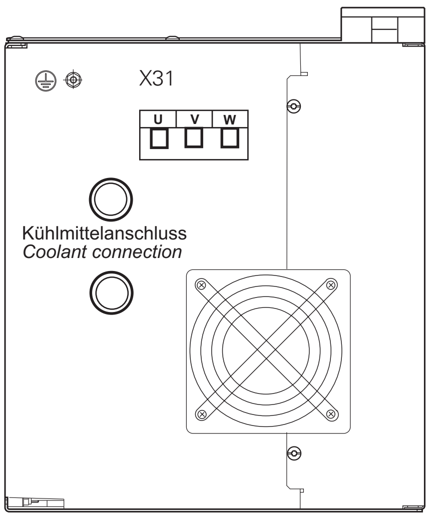
X74 +5-V and 0-V supply

X69 Power supply for the control
(in double for lengths over 0.5 m)

X79 Unit bus

X71 Safety relay for spindle (pulse disable for the spindle)

X72 Safety relay for the axes (pulse disable for all axes)



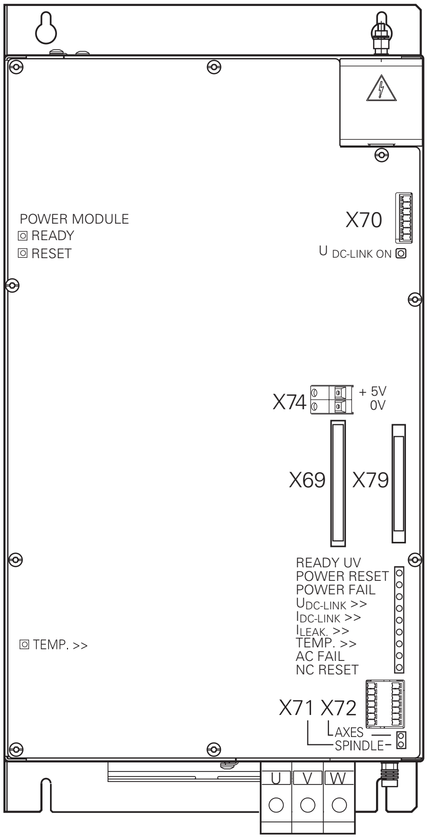
X31 Supply voltage for inverter (3 x 400 V ±10 %)

⏚ Equipment ground

6.1.12 UVR 160D Power Supply Unit

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X70 Main contactor

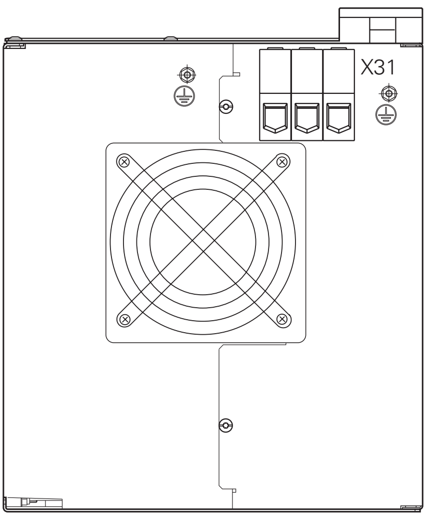
X74 +5-V and 0-V supply

X69 Power supply for the control (in double for lengths over 0.5 m)

X79 Unit bus

X71 Safety relay for spindle (pulse disable for the spindle)

X72 Safety relay for the axes (pulse disable for all axes)



X31 Supply voltage for inverter (3 x 400 V ±10 %)

⏚ Equipment ground

6.1.13 Meaning of the LEDs of the Power Supply Units

UV 120

LED	Meaning	Signal direction	Signal
AC FAIL	Phase missing	UV → LE, CC	$\overline{\text{PF.PS.AC}}$
AXES	Safety relay for axes on	–	–
$I_{\text{DC LINK}}$ >>	Warning signal to control at I_Z > 52 A[a]	UV → LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UV → LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from control to power supply unit	LE, CC → UV	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, U_Z < 410 V (e.g. line power < 290 V)	UV → LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from power supply unit to control	UV → LE, CC	$\overline{\text{RES.PS}}$
READY	End stage ready (only for service purposes)	–	–
READY UV	Power supply unit is ready	UV → LE, CC	RDY.PS
RESET	Reset for end stage (only for service purposes)	–	–
SPINDLE	Safety relay for spindle on	–	–
TEMP >>	Temperature of heat sink too high (> 95 °C)	UV → LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{\text{DC LINK}}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UV → LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{\text{DC LINK ON}}$	Main contactor on	–	–

a. A further increase of around 10% results in the drives being switched off.

UVR 120D

LED	Meaning	Signal direction	Signal
AC FAIL	Phase missing	UV →LE, CC	$\overline{\text{PF.PS.AC}}$
AXES	Safety relay for axes on	–	–
$I_{DC\ LINK}$ >>	Warning signal to control at I_Z > 52.5 A[a]	UV →LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UV →LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from control to power supply unit	LE, CC →UV	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, U_Z < 410 V (e.g. line power < 290 V)	UV →LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from power supply unit to control	UV →LE, CC	$\overline{\text{RES.PS}}$
READY	End stage ready (only for service purposes)	–	–
READY UV	Power supply unit is ready	UV →LE, CC	RDY.PS
RESET	Reset for end stage (only for service purposes)	–	–
SPINDLE	Safety relay for spindle on	–	–
TEMP >>	Temperature of heat sink too high (> 95 °C)	UV →LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{DC\ LINK}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UV →LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{DC\ LINK\ ON}$	Main contactor on	–	–

a. A further increase of around 10% results in the drives being switched off.

UV 130

LED	Meaning	Signal direction	Signal
AXES	Safety relay for axes on	–	–
$I_{DC\ LINK}$ >>	Warning signal to control at I_Z > 75 A[a]	UV $\rightarrow$LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UV $\rightarrow$LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from control to power supply unit	LE, CC $\rightarrow$UV	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, U_Z < 410 V (e.g. line power < 290 V)	UV $\rightarrow$LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from power supply unit to control	UV $\rightarrow$LE, CC	$\overline{\text{RES.PS}}$
READY	Power supply unit is ready	UV $\rightarrow$LE, CC	RDY.PS
SPINDLE	Safety relay for spindle on	–	–
TEMP >>	Temperature of heat sink too high (> 95 °C)	UV $\rightarrow$LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{DC\ LINK}$ >>	U_Z too high (> approx. 760 V); power modules are switched off	UV $\rightarrow$LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{DC\ LINK\ ON}$	Main contactor on	–	–

a. A further increase of around 10% results in the drives being switched off.

UV 130D

LED	Meaning	Signal direction	Signal
AC FAIL	Phase missing	UV $\rightarrow$ LE, CC	$\overline{\text{PF.PS.AC}}$
AXES	Safety relay for axes on	–	–
$I_{\text{DC LINK}}$ >>	Warning signal to control at $I_Z > 85.2$ A[a]	UV $\rightarrow$ LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UV $\rightarrow$ LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from control to power supply unit	LE, CC $\rightarrow$ UV	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, $U_Z < 410$ V (e.g. line power < 290 V)	UV $\rightarrow$ LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from power supply unit to control	UV $\rightarrow$ LE, CC	$\overline{\text{RES.PS}}$
READY UV	Power supply unit is ready	UV $\rightarrow$ LE, CC	RDY.PS
SPINDLE	Safety relay for spindle on	–	–
TEMP >>	Temperature of heat sink too high (> 95 °C)	UV $\rightarrow$ LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{\text{DC LINK}}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UV $\rightarrow$ LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{\text{DC LINK ON}}$	Main contactor on	–	–

a. A further increase of around 10% results in the drives being switched off.

UVR 130 D

LED	Meaning	Signal direction	Signal
AC FAIL	Phase missing	UV →LE, CC	$\overline{\text{PF.PS.AC}}$
AXES	Safety relay for axes on	–	–
$I_{\text{DC LINK}}$ >>	Warning signal to control at I_Z > 71 A[a]	UV →LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UV →LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from control to power supply unit	LE, CC →UV	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, U_Z < 410 V (e.g. line power < 290 V)	UV →LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from power supply unit to control	UV →LE, CC	$\overline{\text{RES.PS}}$
READY	End stage ready (only for service purposes)	–	–
READY UV	Power supply unit is ready	UV →LE, CC	RDY.PS
RESET	Reset for end stage (only for service purposes)	–	–
SPINDLE	Safety relay for spindle on	–	–
TEMP >>	Temperature of heat sink too high (> 95 °C)	UV →LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{\text{DC LINK}}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UV →LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{\text{DC LINK ON}}$	Main contactor on	–	–

a. A further increase of around 10% results in the drives being switched off.

UV 140

LED	Meaning	Signal direction	Signal
AC FAIL	Phase missing	UV → LE, CC	$\overline{\text{PF.PS.AC}}$
AXES	Safety relay for axes on	–	–
$I_{DC\ LINK}$ >>	Warning signal to control at I_Z > 103 A[a]	UV → LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UV → LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from control to power supply unit	LE, CC → UV	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, U_Z < 410 V (e.g. line power < 290 V)	UV → LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from power supply unit to control	UV → LE, CC	$\overline{\text{RES.PS}}$
READY	End stage ready (only for service purposes)	–	–
READY UV	Power supply unit is ready	UV → LE, CC	RDY.PS
RESET	Reset for end stage (only for service purposes)	–	–
SPINDLE	Safety relay for spindle on	–	–
TEMP >>	Temperature of heat sink too high (> 95 °C)	UV → LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{DC\ LINK}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UV → LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{DC\ LINK\ ON}$	Main contactor on	–	–

a. A further increase of around 10% results in the drives being switched off.

UVR 140 D

LED	Meaning	Signal direction	Signal
AC FAIL	Phase missing	UV → LE, CC	$\overline{\text{PF.PS.AC}}$
AXES	Safety relay for axes on	–	–
$I_{DC\ LINK}$ >>	Warning signal to control at I_Z > 105 A[a]	UV → LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UV → LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from control to power supply unit	LE, CC → UV	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, U_Z < 410 V (e.g. line power < 290 V)	UV → LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from power supply unit to control	UV → LE, CC	$\overline{\text{RES.PS}}$
READY	End stage ready (only for service purposes)	–	–
READY UV	Power supply unit is ready	UV → LE, CC	RDY.PS
RESET	Reset for end stage (only for service purposes)	–	–
SPINDLE	Safety relay for spindle on	–	–
TEMP >>	Temperature of heat sink too high (> 95 °C)	UV → LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{DC\ LINK}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UV → LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{DC\ LINK\ ON}$	Main contactor on	–	–

a. A further increase of around 10% results in the drives being switched off.

UV 150

LED	Meaning	Signal direction	Signal
AC FAIL	Phase missing	UV →LE, CC	$\overline{\text{PF.PS.AC}}$
AXES	Safety relay for axes on	–	–
$I_{DC\ LINK}$ >>	Warning signal to control at I_Z > 119.0 A[a]	UV →LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UV →LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from control to power supply unit	LE, CC →UV	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, U_Z < 410 V (e.g. line power < 290 V)	UV →LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from power supply unit to control	UV →LE, CC	$\overline{\text{RES.PS}}$
READY	End stage ready (only for service purposes)	–	–
READY UV	Power supply unit is ready	UV →LE, CC	RDY.PS
RESET	Reset for end stage (only for service purposes)	–	–
SPINDLE	Safety relay for spindle on	–	–
TEMP >>	Temperature of heat sink too high (> 95 °C)	UV →LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{DC\ LINK}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UV →LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{DC\ LINK\ ON}$	Main contactor on	–	–

a. A further increase of around 10% results in the drives being switched off.

UVR 150

LED	Meaning	Signal direction	Signal
AC FAIL	Phase missing	UV →LE, CC	$\overline{\text{PF.PS.AC}}$
AXES	Safety relay for axes on	–	–
$I_{DC\ LINK}$ >>	Warning signal to control at $I_Z > 103$ A[a]	UV →LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UV →LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from control to power supply unit	LE, CC →UV	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, $U_Z < 410$ V (e.g. line power < 290 V)	UV →LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from power supply unit to control	UV →LE, CC	$\overline{\text{RES.PS}}$
READY	End stage ready (only for service purposes)	–	–
READY UV	Power supply unit is ready	UV →LE, CC	RDY.PS
RESET	Reset for end stage (only for service purposes)	–	–
SPINDLE	Safety relay for spindle on	–	–
TEMP >>	Temperature of heat sink too high (> 95 °C)	UV →LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{DC\ LINK}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UV →LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{DC\ LINK\ ON}$	Main contactor on	–	–

a. A further increase of around 10% results in the drives being switched off.

UVR 150 D

LED	Meaning	Signal direction	Signal
AC FAIL	Phase missing	UV →LE, CC	$\overline{\text{PF.PS.AC}}$
AXES	Safety relay for axes on	–	–
$I_{DC\ LINK}$ >>	Warning signal to control at $I_Z > 126$ A[a]	UV →LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UV →LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from control to power supply unit	LE, CC →UV	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, $U_Z < 410$ V (e.g. line power < 290 V)	UV →LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from power supply unit to control	UV →LE, CC	$\overline{\text{RES.PS}}$
READY	End stage ready (only for service purposes)	–	–
READY UV	Power supply unit is ready	UV →LE, CC	RDY.PS
RESET	Reset for end stage (only for service purposes)	–	–
SPINDLE	Safety relay for spindle on	–	–
TEMP >>	Temperature of heat sink too high (> 95 °C)	UV →LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{DC\ LINK}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UV →LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{DC\ LINK\ ON}$	Main contactor on	–	–

a. A further increase of around 10% results in the drives being switched off.

UVR 160 D(W)

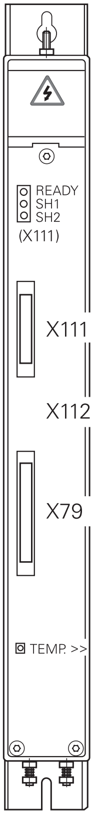
LED	Meaning	Signal direction	Signal
AC FAIL	Phase missing	UV → LE, CC	$\overline{\text{PF.PS.AC}}$
AXES	Safety relay for axes on	–	–
$I_{DC\ LINK}$ >>	Warning signal to control at $I_Z > 126$ A[a]	UV → LE, CC	$\overline{\text{ERR.IZ.GR}}$
I_{LEAK} >>	Error current, e.g. through ground fault; warning signal to control	UV → LE, CC	$\overline{\text{ERR.ILEAK}}$
NC RESET	Reset signal from control to power supply unit	LE, CC → UV	$\overline{\text{RES.LE}}$
POWER FAIL	U_Z too low, $U_Z < 410$ V (e.g. line power < 290 V)	UV → LE, CC	$\overline{\text{PF.PS}}$
POWER RESET	Reset signal from power supply unit to control	UV → LE, CC	$\overline{\text{RES.PS}}$
READY	End stage ready (only for service purposes)	–	–
READY UV	Power supply unit is ready	UV → LE, CC	RDY.PS
RESET	Reset for end stage (only for service purposes)	–	–
SPINDLE	Safety relay for spindle on	–	–
TEMP >>	Temperature of heat sink too high (> 95 °C)	UV → LE, CC	$\overline{\text{ERR.TEMP}}$
$U_{DC\ LINK}$ >>	U_Z too high (> approx. 800 V); power modules are switched off	UV → LE, CC	$\overline{\text{ERR.UZ.GR}}$
$U_{DC\ LINK\ ON}$	Main contactor on	–	–

a. A further increase of around 10% results in the drives being switched off.

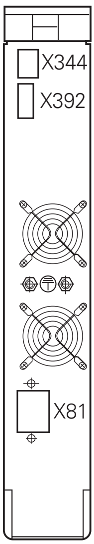
6.1.14 UM 111 Power Module

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X111	PWM, axis
X79	Unit bus

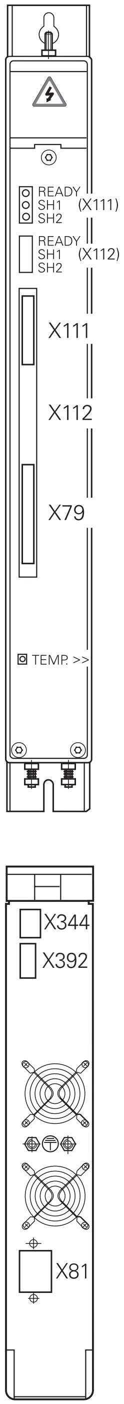


X344	24-V supply for motor holding brake (available as of version 325000-02)
X392	Motor holding brake (available as of version 325000-02)
	Equipment ground
X81	Motor connection for axis

6.1.15 UM 111D Power Module

Danger

Do not engage or disengage any connecting elements while the unit is under power!

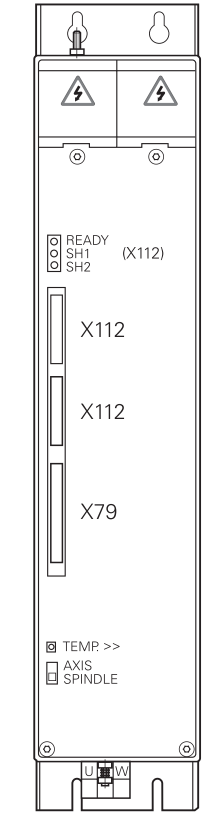


X111	PWM, axis
X79	Unit bus
X344	24-V supply for motor holding brake
X392	Motor holding brake
⏚	Equipment ground
X81	Motor connection for axis

6.1.16 UM 111B Power Module

Danger

Do not engage or disengage any connecting elements while the unit is under power!

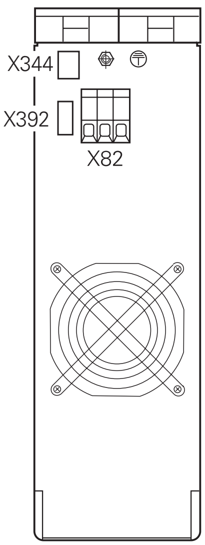


X112 PWM, axis / spindle

X112 PWM, axis/spindle
(The upper or lower X112 may be used;
Internally both of these inputs are switched in parallel.)

X79 Unit bus

Sliding switch:
AXIS: Axis module
Enabling through X72 of the power supply unit
SPINDLE: Spindle module
Enabling through X71 of the power supply unit



X344 24-V supply for motor holding brake
(available as of version 336 948-03)

X392 Motor holding brake
(available as of version 336 948-03)

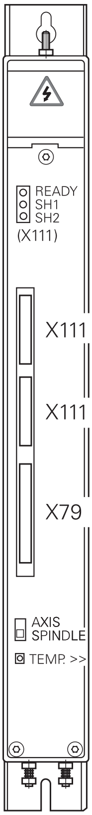
X82 Motor connection for axis / spindle

Equipment ground

6.1.17 UM 111BD Power Module

Danger

Do not engage or disengage any connecting elements while the unit is under power!

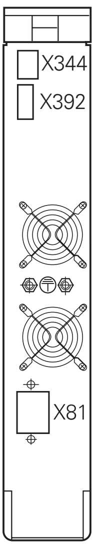


X111 PWM, axis / spindle

X111 PWM, axis/spindle
(The upper or lower X111 may be used;
Internally both of these inputs are switched in parallel.)

X79 Unit bus

Sliding switch:
AXIS: Axis module
Enabling through X72 of the power supply unit
SPINDLE: Spindle module
Enabling through X71 of the power supply unit



X344 24-V supply for motor holding brake
X392 Motor holding brake

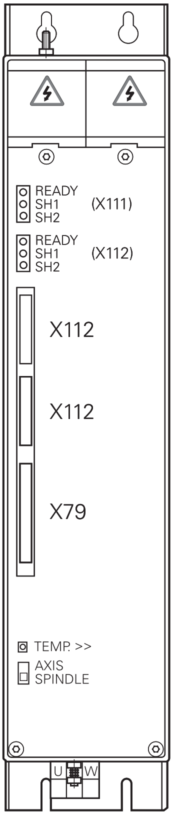
⏚ Equipment ground

X81 Motor connection for axis / spindle

6.1.18 UM 112 Power Module

Danger

Do not engage or disengage any connecting elements while the unit is under power!

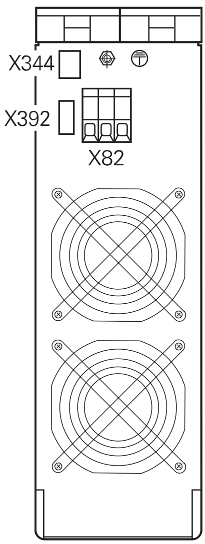


X112 PWM, axis / spindle

X112 PWM, axis/spindle
(The upper or lower X112 may be used;
Internally both of these inputs are switched in parallel.)

X79 Unit bus

Sliding switch:
AXIS: Axis module
Enabling through X72 of the power supply unit
SPINDLE: Spindle module
Enabling through X71 of the power supply unit



X344 24-V supply for motor holding brake
(available as of version 325 001-02)

X392 Motor holding brake
(available as of version 325 001-02)

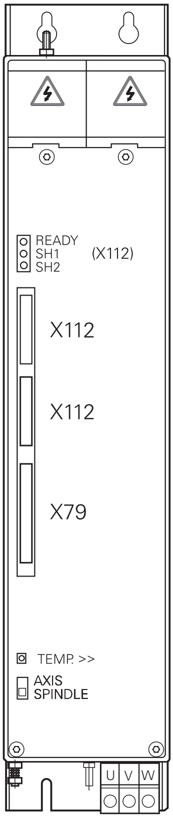
X82 Motor connection for axis / spindle

⏚ Equipment ground

6.1.19 UM 112D Power Module

Danger

Do not engage or disengage any connecting elements while the unit is under power!

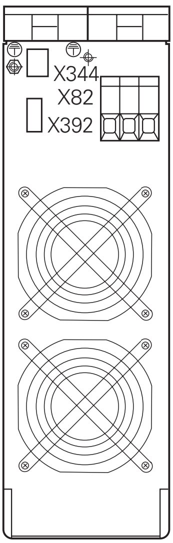


X112 PWM, axis / spindle

X112 PWM, axis/spindle
(The upper or lower X112 may be used;
Internally both of these inputs are switched in parallel.)

X79 Unit bus

Sliding switch:
AXIS: Axis module
Enabling through X72 of the power supply unit
SPINDLE: Spindle module
Enabling through X71 of the power supply unit



X344 24-V supply for motor holding brake
X392 Motor holding brake

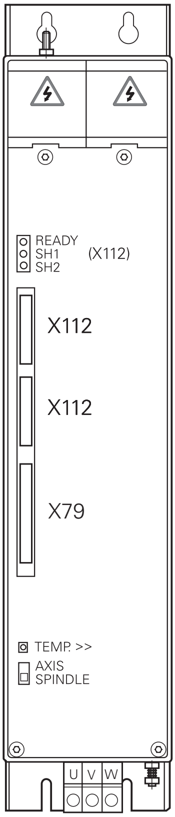
X81 Motor connection for axis / spindle

⏚ Equipment ground

6.1.20 UM 113 Power Module

Danger

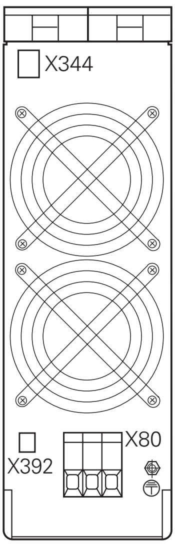
Do not engage or disengage any connecting elements while the unit is under power!



X112	PWM, axis/spindle
X112	PWM, axis/spindle (The upper or lower X112 may be used; Internally both of these inputs are switched in parallel.)
X79	Unit bus

Sliding switch:

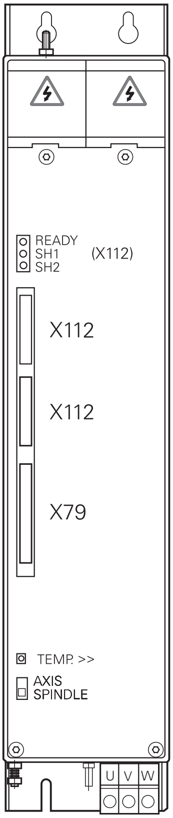
AXIS: Axis module
Enabling through X72 of the power supply unit
SPINDLE: Spindle module
Enabling through X71 of the power supply unit



X344	24-V supply for motor holding brake (available as of version 325002-02)
X392	Motor holding brake (available as of version 325002-02)
X80	Motor connection for axis / spindle
⏚	Equipment ground

6.1.21 UM 113 D Power Module

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!

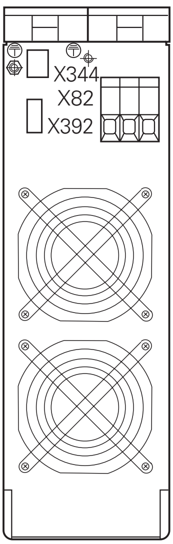


X112 PWM, axis/spindle

X112 PWM, axis/spindle
(The upper or lower X112 may be used;
Internally both of these inputs are switched in parallel.)

X79 Unit bus

Sliding switch:
AXIS: Axis module
Enabling through X72 of the power supply unit
SPINDLE: Spindle module
Enabling through X71 of the power supply unit



X344 24-V supply for motor holding brake

X392 Motor holding brake

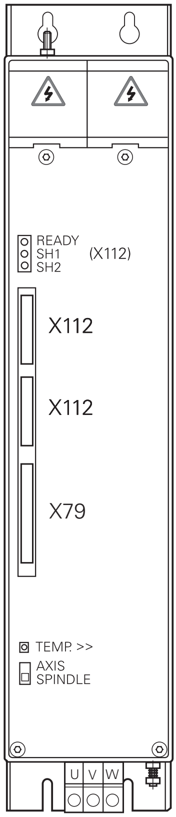
X81 Motor connection for axis / spindle

⏚ Equipment ground

6.1.22 UM 114 Power Module

Danger

Do not engage or disengage any connecting elements while the unit is under power!

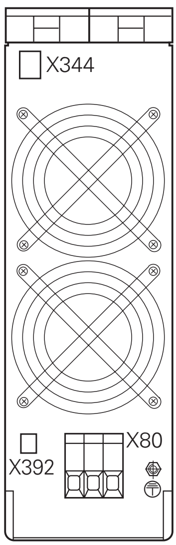


X112 PWM, axis/spindle

X112 PWM, axis/spindle
(The upper or lower X112 may be used;
Internally both of these inputs are switched in parallel.)

X79 Unit bus

Sliding switch:
AXIS: Axis module
Enabling through X72 of the power supply unit
SPINDLE: Spindle module
Enabling through X71 of the power supply unit



X344 24-V supply for motor holding brake
(available as of version 325005-02)

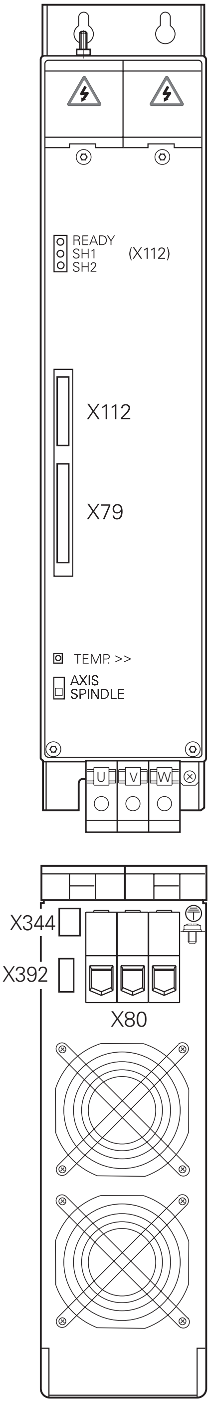
X392 Motor holding brake
(available as of version 325005-02)

X80 Motor connection for axis / spindle

⏚ Equipment ground

6.1.23 UM 114D Power Module

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



X112 PWM, axis / spindle

X79 Unit bus

Sliding switch:

AXIS: Axis module
Enabling through X72 of the power supply unit
SPINDLE: Spindle module
Enabling through X71 of the power supply unit

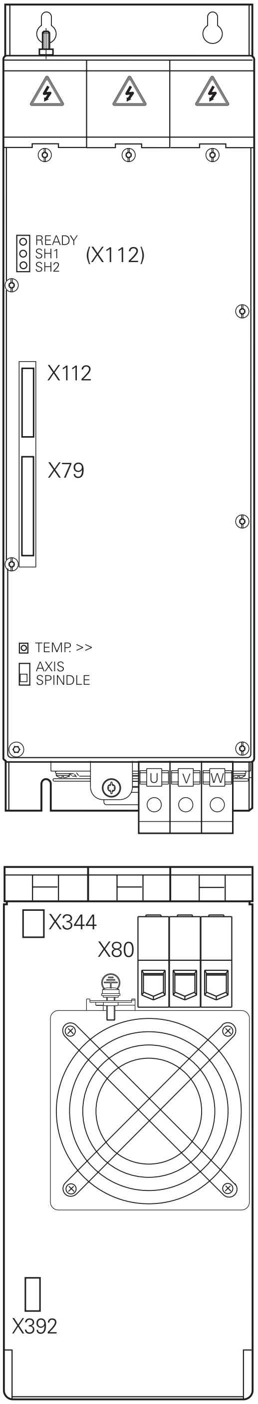
X344 24-V supply for motor holding brake

X80 Motor connection for axis / spindle

⏚ Equipment ground

6.1.24 UM 115 Power Modules

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



X112	PWM, axis / spindle
X79	Unit bus

Sliding switch:

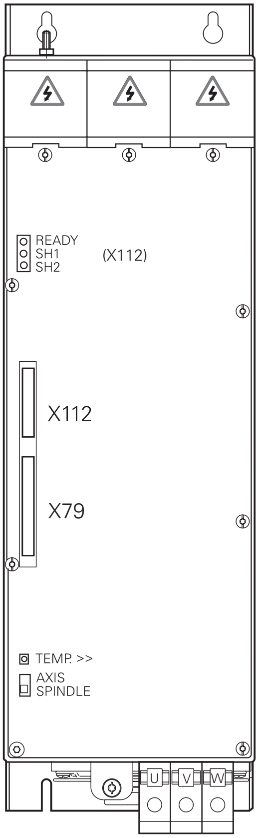
AXIS: Axis module
Enabling through X72 of the power supply unit
SPINDLE: Spindle module
Enabling through X71 of the power supply unit

X344	24-V supply for motor holding brake
X80	Motor connection for axis / spindle
⏚	Equipment ground
X392	Motor holding brake

6.1.25 UM 115D Power Modules

Danger

Do not engage or disengage any connecting elements while the unit is under power!

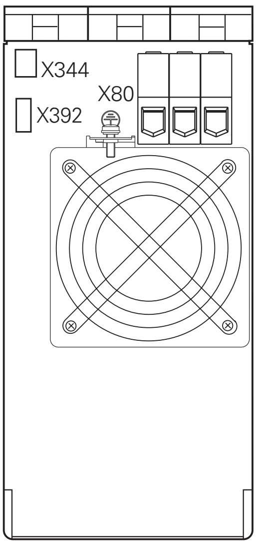


X112 PWM, axis / spindle

X79 Unit bus

Sliding switch:

AXIS: Axis module
Enabling through X72 of the power supply unit
SPINDLE: Spindle module
Enabling through X71 of the power supply unit



X344 24-V supply for motor holding brake

X392 Motor holding brake

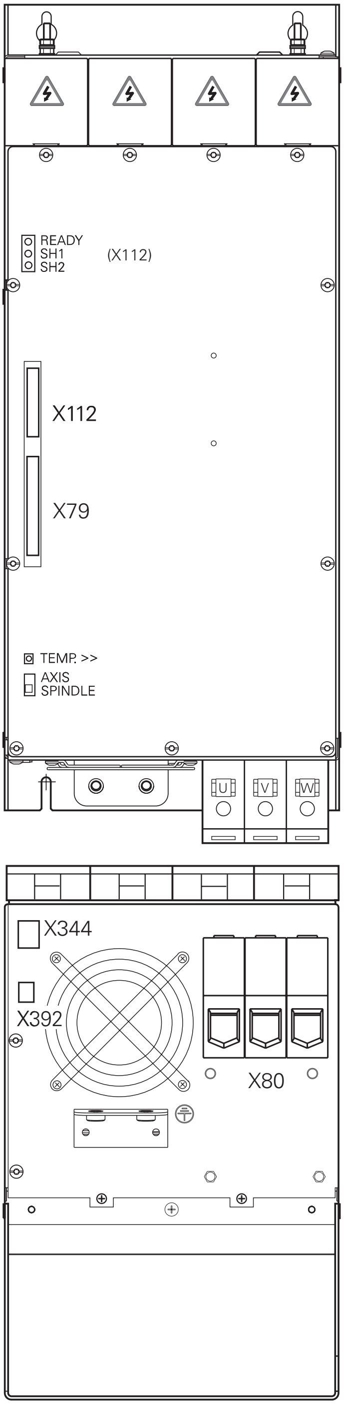
X80 Motor connection for axis / spindle

⏚ Equipment ground

6.1.26 UM 116DW Power Modules

Danger

Do not engage or disengage any connecting elements while the unit is under power!



X112	PWM, axis / spindle
X79	Unit bus

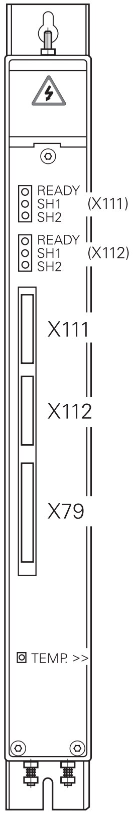
Sliding switch:
AXIS: Axis module
Enabling through X72 of the power supply unit
SPINDLE: Spindle module
Enabling through X71 of the power supply unit

X344	24-V supply for motor holding brake
X392	Motor holding brake
X80	Motor connection for axis / spindle
⏚	Equipment ground

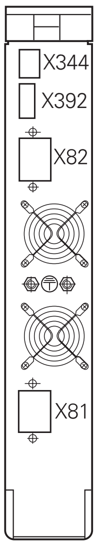
6.1.27 UM 121 Power Module

Danger

Do not engage or disengage any connecting elements while the unit is under power!



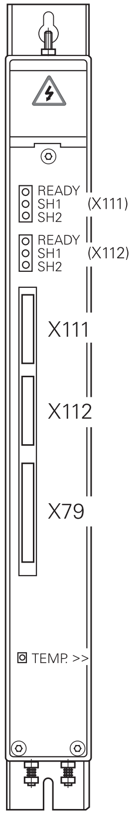
X111	PWM, axis 1
X112	PWM, axis 2
X79	Unit bus



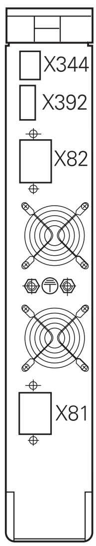
X344	24-V supply for motor holding brake (available as of version 325003-02)
X392	Motor holding brake (available as of version 325003-02)
X82	Motor connection for axis 2 (X112)
⏚	Equipment ground
X81	Motor connection for axis 1 (X111)

6.1.28 UM 121D Power Module

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



X111	PWM, axis 1
X112	PWM, axis 2
X79	Unit bus

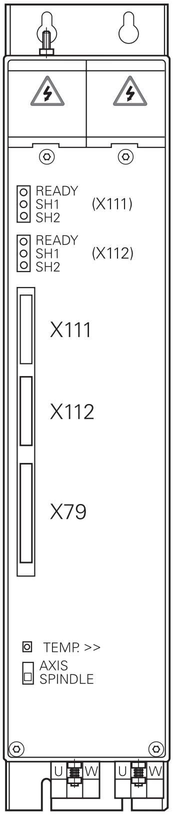


X344	24-V supply for motor holding brake
X392	Motor holding brake
X82	Motor connection for axis 2 (X112);
⏚	Equipment ground
X81	Motor connection for axis 1 (X111)

6.1.29 UM 121B Power Module

Danger

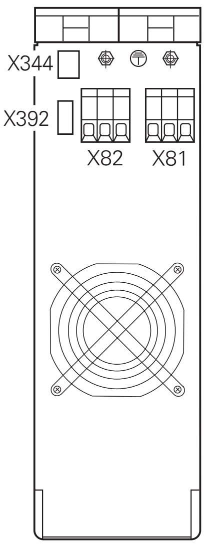
Do not engage or disengage any connecting elements while the unit is under power!



X111	PWM, axis 1
X112	PWM, axis 2 / spindle
X79	Unit bus

Sliding switch:

AXIS: X112 = axis
Enabling through X72 of the power supply unit
SPINDLE: X112 = spindle
Enabling through X71 of the power supply unit

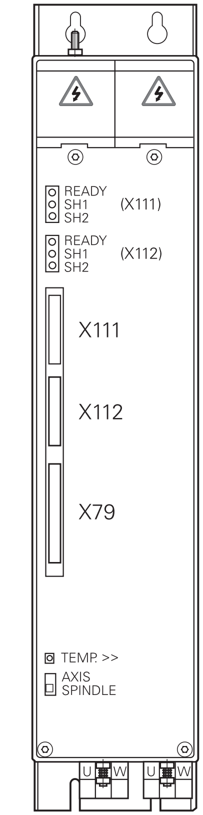


X344	24-V supply for motor holding brake (available as of version 336948-03)
X392	Motor holding brake (available as of version 336948-03)
X82	Motor connection for axis 2 / spindle (X112)
X81	Motor connection for axis 1 (X111);
⏚	Equipment ground

6.1.30 UM 121BD Power Module

Danger

Do not engage or disengage any connecting elements while the unit is under power!



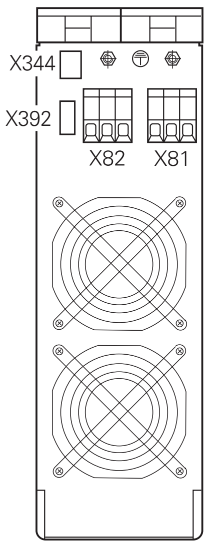
X111 PWM, axis 1

X112 PWM, axis 2 / spindle

X79 Unit bus

Sliding switch:

AXIS: X112 = axis
Enabling through X72 of the power supply unit
SPINDLE: X112 = spindle
Enabling through X71 of the power supply unit



X344 24-V supply for motor holding brake

X392 Motor holding brake

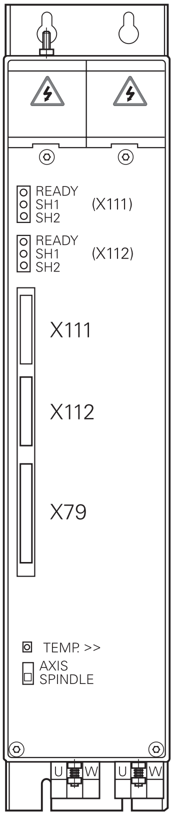
X82 Motor connection for axis 2 / spindle (X112)
X81 Motor connection for axis 1 (X111);

⏚ Equipment ground

6.1.31 UM 122 Power Module

Danger

Do not engage or disengage any connecting elements while the unit is under power!



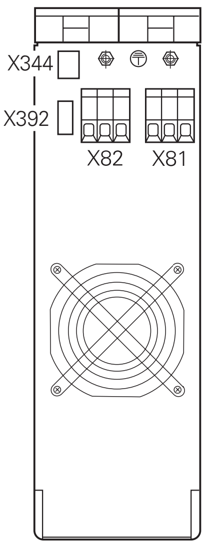
X111 PWM, axis 1

X112 PWM, axis 2 / spindle

X79 Unit bus

Sliding switch:

UM 122: AXIS: X112 = axis
Enabling through X72 of the power supply unit
SPINDLE: X112 = spindle
Enabling through X71 of the power supply unit



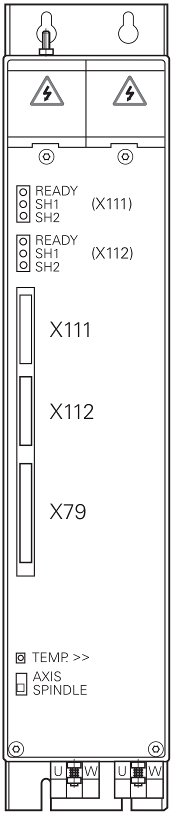
X344 24-V supply for motor holding brake (available as of version 325004-02)
X392 Motor holding brake (available as of version 325004-02)

X82 Motor connection for axis 2 / spindle (X112)
X81 Motor connection for axis 1 (X111)

⏚ Equipment ground

6.1.32 UM 122D Power Module

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



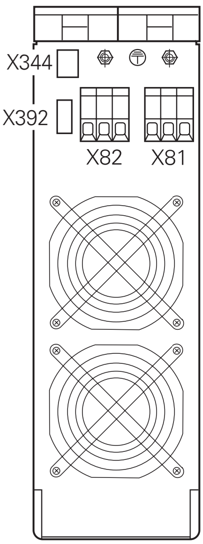
X111 PWM, axis 1

X112 PWM, axis 2 / spindle

X79 Unit bus

Sliding switch:

UM 122: AXIS: X112 = axis
Enabling through X72 of the power supply unit
SPINDLE: X112 = spindle
Enabling through X71 of the power supply unit



X344 24-V supply for motor holding brake
X392 Motor holding brake

X82 Motor connection for axis 2 / spindle (X112)
X81 Motor connection for axis 1 (X111);

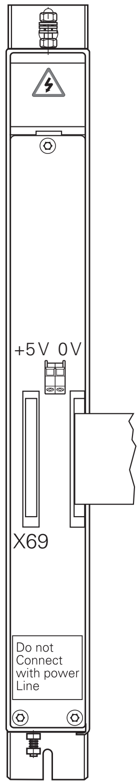
⏚ Equipment ground

6.1.33 Meaning of the LEDs on the UM 1xx

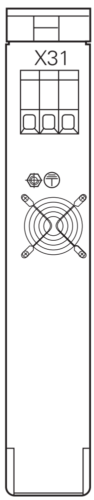
LED	Meaning	Signal direction	Signal
READY	Power module is ready	UM →LE, CC	RDY
SH 1	DSP error, PLC error with Emergency Stop, control hardware or software error	LE, CC →UM	$\overline{\text{SH1}}$
SH 2	No drive enable (e.g. by the PLC, active via external signal or SH1)	LE, CC →UM	$\overline{\text{SH2}}$
TEMP >>	Warning signal for IGBT temperature too high	UM →LE, CC	$\overline{\text{ERR}}$

6.1.34 UV 105 Power Supply Unit

> **Danger**
>
> Do not engage or disengage any connecting elements while the unit is under power!



Conductor bar	Power supply via dc-link voltage Uz
X74	5-V power supply for control
Ribbon cable	Transmission of status signal and power supply for the control
X 69	Status signals from UV 1x0 or UE 2xxB



X31	400-V power supply
⏚	Equipment ground

6.2 Mounting and Connection of the Modular Inverter System

Arranging the modules

The power modules are arranged between the power supply unit and the control. The power module for the spindle is placed next to the power supply unit, and the power modules for the axes are then placed in order of decreasing rated current.
If the UP 110 braking resistor module is used together with the regenerative power supply units, the braking resistor is arranged between the weakest power module and the control.
The power module for a second spindle (not on all controls possible) is placed between the power module for the first spindle and the strongest power module for the axes.

For more examples of arranging the modules and connection overviews, Page 4–30.

UV(R) 1x0(D)	UM 1xx(B)(D) for the first spindle	UM 1xx(B)(D) for the second spindle (not on all controls)	Opt. ZKF 1xx	UM 1xx(B)(D)	Opt. UP 110	LE 41x M “modular” LE 426 M LE 430 M MC 422/ CC 42x

Connecting the modules

The dc-link power U_Z is supplied to the power modules by the power supply unit via conductor bars (screwed onto each module, and if required, the UP 110).
A further conductor bar establishes the ground connection between the individual modules.
Three conductor bars are included as accessories with the power modules (two for the dc-link, one for the ground).

A 50-line ribbon cable connects the control with the UV(R) 1x0 and supplies the power to the control.

A 40-line ribbon cable connects the power supply unit with the power modules, and if required with the UP 110, forming the unit bus.

The 20-line ribbon cables connect the control and the power modules, and supply the PWM signals to the axes and the spindle(s).

Direct drives

Direct drives (linear motors, torque motors) used in conjunction with regenerative inverter systems require a ZKF 1xx dc-link filter, which is mounted to the left of the direct drives' power modules. The dc-link current is then led through this filter.

Covering the modules

The ribbon cables must be covered to protect them against interference. (See Chapter 2 - 60.)

Additional power supply

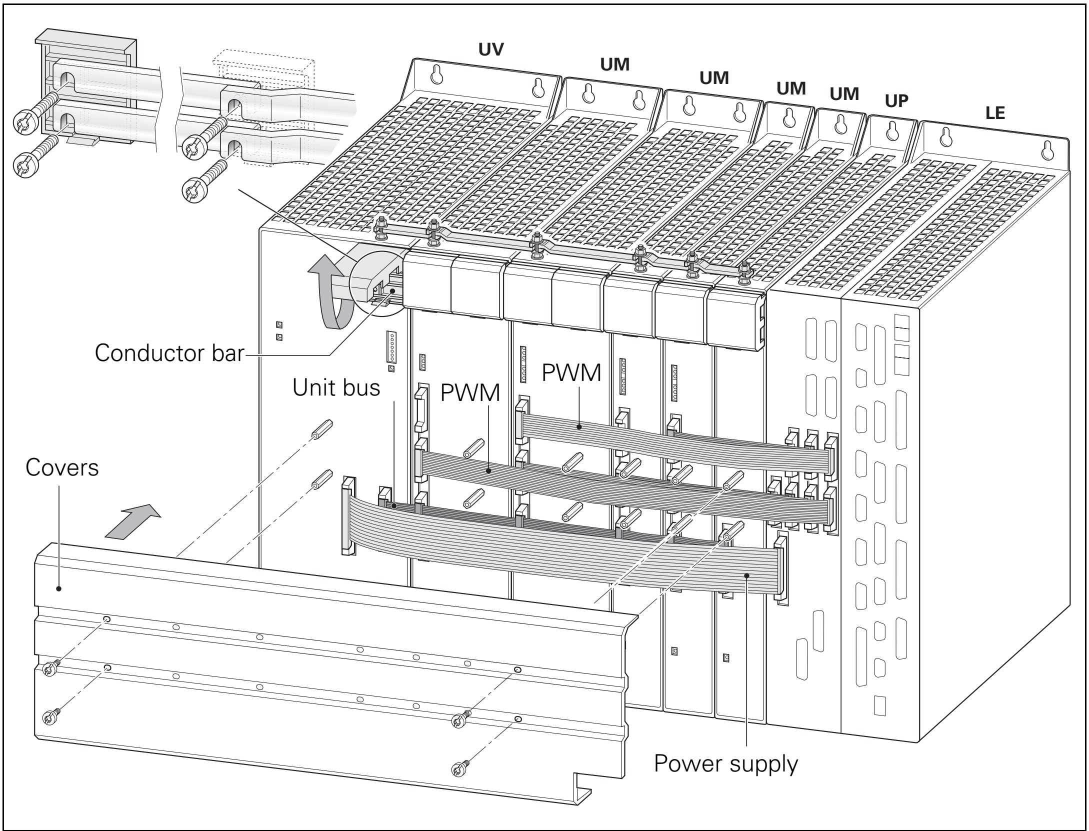
If several encoders with a high current consumption (e.g. encoders with EnDat interface) or the dual-processor MC 422B are connected in conjunction with a compact inverter or a power supply unit, however, an additional power supply source might become necessary. The additional UV 105 power supply unit can be used for this purpose. It is mounted next to the control at its left.

The power supply unit is connected to the dc-link voltage via the conductor bar of the previous left module. The upper conductor bar also establishes the ground connection of the dc-link.

The 50-line ribbon cable of the compact inverter / power supply unit for transmitting the status signals is connected to X69 of the UV 105. The free ribbon cable of the UV 105 is connected to X69 of the control.

The 5-V power supply (X74) of the UV 105 is connected to the terminals on the control (X74) by using the litz wires included with the UV 105.

Mounting the modular HEIDENHAIN inverter system

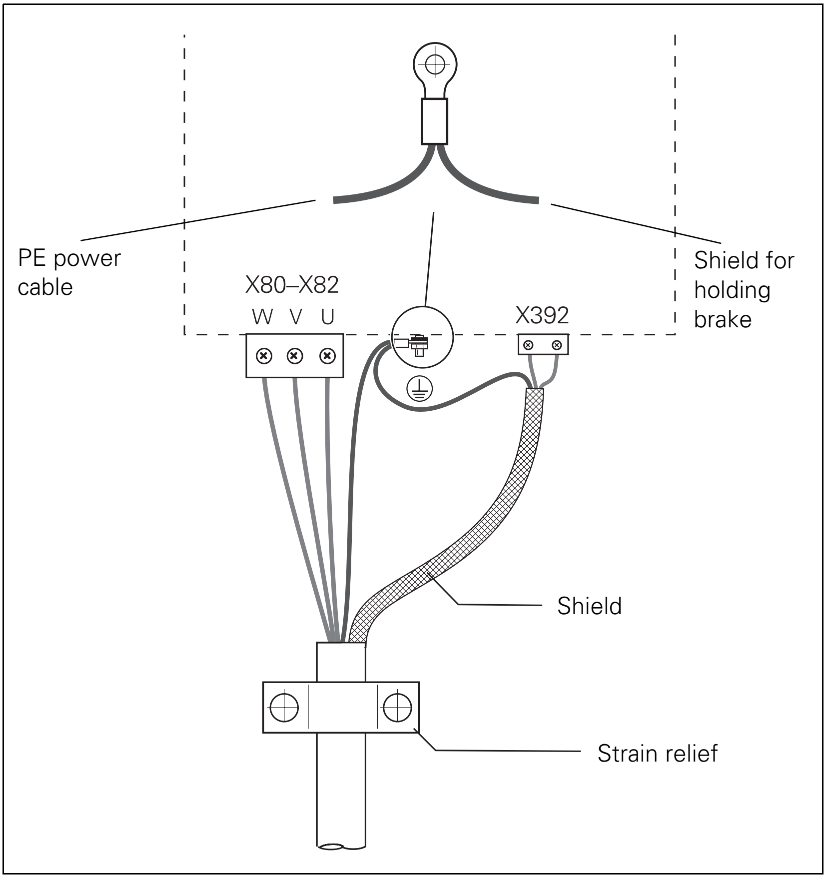


Warning

All electrical screw connections must be tightened after installation is complete (tightening torque 3.5 Nm).

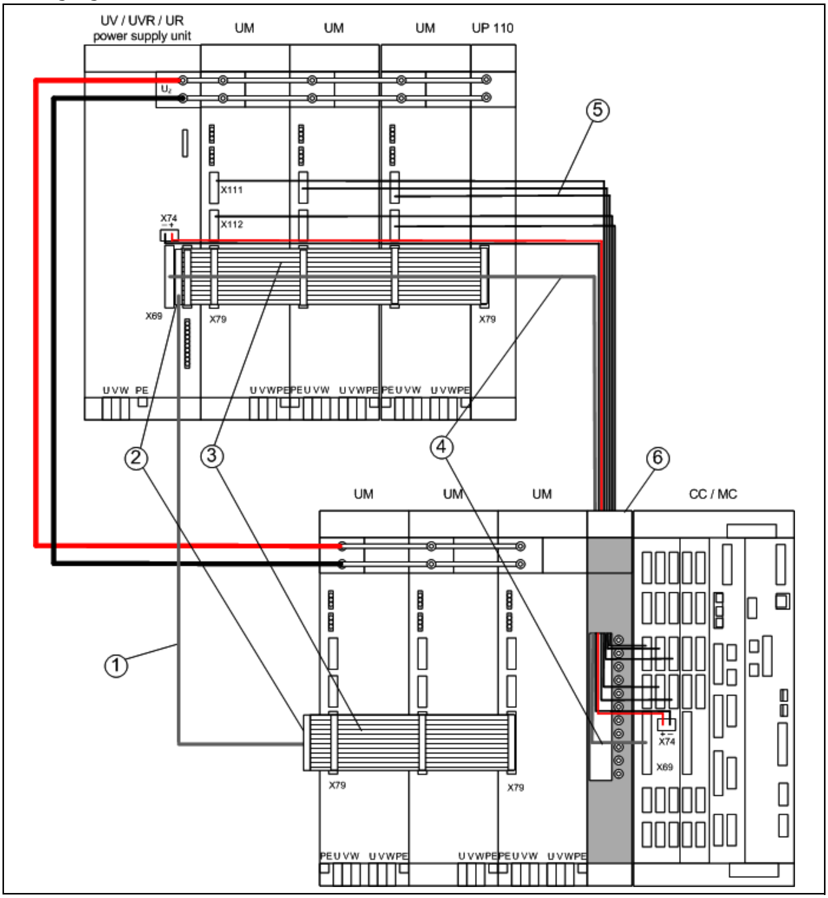
Connecting the motors

The shield of the lines for the holding brake is to be kept as close as possible (< 30 cm) to ground. The best solution is to fasten the shield with a metal clamp directly onto the sheet-metal housing of the electrical cabinet.



6.3 Double-Row Configuration

Double-row configuration can be used when there is not enough space for arranging the modules in one row.



- 1: Unit bus cable (round)
- 2: Extreme left connector of flat unit bus cable. This connector is used to connect the two rows with each other via the round unit bus cable.
- 3: Unit bus cable (flat)
- 4: Supply bus cable (round)
- 5: PWM cable
- 6: Installation kit

Warning

- Due to the heat generated by the inverter components, the separation between the two rows should be at least 250 mm.
- See also the information on Page 4–37 and the following pages.

For more information on double-row configuration, see Page 2–99.

6.4 Connecting the UV 130(D) Power Supply Unit

Danger

Danger of electrical shock!
The power supply unit may be opened only by HEIDENHAIN service engineers.
Do not engage or disengage any terminals while they are under power.

6.4.1 Power Supply

X31: Supply voltage for U_Z

With a power supply of 400 V, the inverter voltage U_Z is 565 V–.
Connection:

Connecting terminals	Assignment
L1	400 V~ ± 10%
L2	50 Hz to 60 Hz
L3	
	Cable / single conductor (HT wire): Wire cross section: 16 mm^2 (AWG 5) Line fuse: 63 A (gR) Siemens Sitor type Grounding terminal: ≥ 10 mm^2 (AWG 6)
Tightening torque for connecting terminals:	4 – 4.5 Nm (35 – 40 lbs/in)

Note

IEC 61800-5-1 requires a non-detachable connection to the line power supply.

Note

If the power supply is other than 400 V, an autotransformer is required. It must comply at least with the connection specifications of the subsequent power supply unit.

6.4.2 Main Contactor and Safety Relay

X70: Main contactor

Connection:

Connection Terminal X70	Assignment
1	+24 V output (max. 250 mA)
2	0 V
3	+24 V input for U_Z ON
4	Do not assign
5	Do not assign
6[a]	Normally closed contact (OE1)
7[a]	Normally closed contact (OE2)

a. Max. 125 V

Warning

A recovery diode is required in the proximity of inductive loads, e.g. relay or contactor coils.

X71: Safety relay for spindle
X72: Safety relay for axes

Connection:

Connecting terminals X71 and X72	Assignment
1	+24 V output (max. 250 mA)
2	0 V
3	+24 V input for Axis ON, Spindle ON
4	Do not assign
5	Do not assign
6[a]	Normally closed contact (OE1A or OE1S)
7[a]	Normally closed contact (OE2A or OE2S)

a. Max. 125 V

Warning

A recovery diode is required in the proximity of inductive loads, e.g. relay or contactor coils.

6.4.3 X90: 24-V Output (Only UV 130)

Connection:

Connecting terminal X90	Assignment
+	+24 V (max. 250 mA)
–	0 V

6.4.4 NC Supply Voltage and Control Signals

X69: NC supply voltage and control signals

For lengths of 600 mm and longer, the 50-line ribbon cable for the NC power supply and control signals is led doubled to the control in order to increase the wire cross section.

50-pin ribbon connector	Assignment
1a to 5b	+5 V
6a to 7b	+12 V
8a	+5 V (low-voltage separation)
8b	0 V (low-voltage separation)
9a	+15 V
9b	–15 V
10a	UZAN
10b	0 V
11a	IZAN
11b	0 V
12a	$\overline{\text{RES.PS}}$
12b	0 V
13a	$\overline{\text{PF.PS}}$
13b	GND
14a	$\overline{\text{ERR.UZ.GR}}$
14b	GND
15a	$\overline{\text{ERR.IZ.GR}}$
15b	GND
16a	$\overline{\text{ERR.TEMP}}$ (UV, ZKF, UP)

50-pin ribbon connector	Assignment
16b	GND
17a	RDY.PS
17b	GND
18a	$\overline{\text{ERR.ILEAK}}$
18b	GND
19a	Do not assign
19b	GND
20a	Do not assign
20b	GND
21a	0 V
21b	GND
22a	0 V
22b	GND
23a	Reserved (SDA)
23b	GND
24a	Reserved (SCL)
24b	GND
25a	$\overline{\text{RES.LE}}$
25b	GND

Danger

The interface complies with the requirements of IEC 61800-5-1 for "low voltage electrical separation."

6.4.5 5-V Power Supply (Only UV130D)

X74 Connection:

Connecting terminal X74	Assignment
+	+5 V (load capacity 20 A)
–	0 V

6.4.6 Unit Bus

X79: Unit bus Connection:

<table>
<tr><th>40-pin ribbon connector</th><th>Assignment</th><th></th></tr>
<tr><td>1a to 3b</td><td>0 V [*1]</td><td rowspan="7">These voltages must not be linked with other voltages (only basic insulation)!</td></tr>
<tr><td>4a</td><td>+24 V [*1]</td></tr>
<tr><td>4b</td><td>+24 V [*1]</td></tr>
<tr><td>5a</td><td>+15 V [*1]</td></tr>
<tr><td>5b</td><td>+24 V [*1]</td></tr>
<tr><td>6a</td><td>+15 V [*1]</td></tr>
<tr><td>6b</td><td>+15 V [*1]</td></tr>
<tr><td>7a to 8b</td><td>Do not assign</td><td></td></tr>
<tr><td>9a</td><td>Reserved (SDA)</td><td></td></tr>
<tr><td>9b</td><td>Do not assign</td><td></td></tr>
<tr><td>10a</td><td>Reserved (SCL)</td><td></td></tr>
<tr><td>10b</td><td>$\overline{\text{ERR.TEMP}}$</td><td></td></tr>
<tr><td>11a</td><td>$\overline{\text{PF.PS}}$</td><td></td></tr>
<tr><td>11b</td><td>0 V</td><td></td></tr>
<tr><td>12a</td><td>$\overline{\text{RES.PS}}$</td><td></td></tr>
<tr><td>12b</td><td>0 V</td><td></td></tr>
<tr><td>13a</td><td>$\overline{\text{PWR.OFF}}$</td><td></td></tr>
<tr><td>13b</td><td>0 V</td><td></td></tr>
<tr><td>14a</td><td>5 V FS (spindle enable)</td><td></td></tr>
<tr><td>14b</td><td>0 V</td><td></td></tr>
<tr><td>15a</td><td>5 V FA (axis enable)</td><td></td></tr>
<tr><td>15b to 16b</td><td>0 V</td><td></td></tr>
<tr><td>17a and 17b</td><td>–15 V</td><td></td></tr>
<tr><td>18a and 18b</td><td>+15 V</td><td></td></tr>
<tr><td>19a to 20b</td><td>+5 V</td><td></td></tr>
</table>

Danger

The interface complies with the requirements of IEC 61800-5-1 for low voltage electrical separation (except for 1a to 6b).

6.4.7 Connecting the Braking Resistor to the UV 130(D) Power Supply Unit

One PW 21x, one PW 1x0(B) or two PW 110B braking resistors in parallel **must** be connected with the UV 130(D) power supply unit.

The braking resistor is switched on when the inverter voltage U_Z exceeds 700 V and is switched off again as soon as it falls below 670 V.

Note

If no braking resistor is connected, the inverter voltage U_Z can increase and at U_Z > 800 V all power stages will be switched off (LED for $U_{DC\text{-}LINK}$ >> lights up)!

Cross section

The following cross section is required for connecting the braking resistor:

Braking resistor	Cross section
PW 21x	1.5 mm^2
2 x PW 210 in parallel	4 mm^2
2 x PW 110B in parallel	4 mm^2
PW 110(B)	1.5 mm^2
PW 120	4 mm^2

X89: Braking resistor

Pin layout on the PW 21x:

Connecting terminal X89	Assignment	PW 21x braking resistor
1	$+U_Z$	RB1
2	Switch against $–U_Z$	RB2

Pin layout on the PW 1x0(B):

Connecting terminal X89	Assignment	PW 1x0(B) braking resistor; connecting terminal X1
1	$+U_Z$	1
2	Switch against $–U_Z$	2

Temperature switch

The temperature switch is a normally closed contact and is set to protect the braking resistor from being damaged. It can have a maximum load of 250 V, 5 A. The switch can be connected to a PLC input on the control and evaluated via the PLC.

Connection:

Connecting terminal on PW 21x	Assignment
T1	1
T2	2

Connecting terminal X3 on the PW 110B	Assignment
1	1
2	2

X2: Fan for the PW 1x0(B) external braking resistor

Connection:

Connecting terminal X2	Assignment
+	+24 V (PLC)
–	0 V

6.5 Connecting the UV(R) 1x0(D) Power Supply Units

Danger

Danger of electrical shock!
The power supply units may be opened only by HEIDENHAIN service engineers.
Do not engage or disengage any terminals while they are under power.

6.5.1 Power Supply

Note

IEC 61800-5-1 requires a non-detachable connection to the line power supply.

Note

If the power supply is other than 400 V, an autotransformer is required. It must comply at least with the connection specifications of the subsequent power supply unit.

X31: Power supply

The dc-link voltage U_Z is 650 V–.

The regenerative power supply units must be connected to the main power line via a commutating reactor and a line filter. This is necessary for keeping the main line free of disruptive higher harmonics.

For power connection Page 4–30.

Power supply	
L1	400 V~ ± 10% 50 Hz to 60 Hz
L2	
L3	
PE	

Power supply	
	UV 120, UVR 120D: Cable / single conductor (PVC): 10 mm^2 (AWG 8) Single conductor H07 V2-K: 6 mm^2 (AWG 10) Line fuse: 35 A (gR) Siemens Sitor type Grounding terminal: ≥ 10 mm^2 (AWG 6) Tightening torque for connecting terminals: 2.0 – 2.3 Nm (18 – 20.5 lbs/in) **UVR 130D:** Cable / single conductor (PVC): 16 mm^2 (AWG 6) Single conductor H07 V2-K: 10 mm^2 (AWG 8) Line fuse: 50 A (gR) Siemens Sitor type Grounding terminal: ≥ 10 mm^2 (AWG 6) Tightening torque for connecting terminals: 2.0 – 2.3 Nm (18 – 20.5 lbs/in) **UV 140, UVR 140D:** Cable / single conductor (PVC): 35 mm^2 (AWG 2) Single conductor H07 V2-K: 25 mm^2 (AWG 4) Line fuse: 80 A (gR) Siemens Sitor type Grounding terminal: ≥ 16 mm^2 (AWG 4) Tightening torque for connecting terminals: 4.0 – 4.5 Nm (35 – 40 lbs/in) **UVR 150, UVR 150D:** Cable / single conductor (PVC): 35 mm^2 (AWG 2) Single conductor H07 V2-K: 25 mm^2 (AWG 4) Line fuse: 80 A (gR) Siemens Sitor type Grounding terminal: ≥ 16 mm^2 (AWG 4) Tightening torque for connecting terminals: 4.0 – 4.5 Nm (35 – 40 lbs/in) **UVR 160D(W):** Cable / single conductor (PVC): 50 mm^2 (AWG 1) Single conductor H07 V2-K: 35 mm^2 (AWG 2) Line fuse: 125 A (gR) Siemens Sitor type Grounding terminal: ≥ 25 mm^2 (AWG 4) Tightening torque for connecting terminals: 4.0 – 4.5 Nm (35 – 40 lbs/in)

Note

The cables between the power supply unit and commutating reactor as well as between the commutating reactor and line filter must be as short as possible (< 0.4 m)!

6.5.2 Main Contactor and Safety Relay

X70: Main contactor

Connection:

Connection Terminal X70	**Assignment**
1	+24 V output (max. 250 mA)
2	0 V
3	+24 V input for U_Z ON
4	Do not assign
5	Do not assign
6[a]	Normally closed contact (OE1)
7[a]	Normally closed contact (OE2)

a. Max. 125 V

Warning

A recovery diode is required in the proximity of inductive loads, e.g. relay or contactor coils.

X71: Safety relay for spindle
X72: Safety relay for axes

Connection:

Connecting terminals X71 and X72	**Assignment**
1	+24 V output (max. 250 mA)
2	0 V
3	+24 V input for Axis ON, Spindle ON
4	Do not assign
5	Do not assign
6[a]	Normally closed contact (OE1A or OE1S)
7[a]	Normally closed contact (OE2A or OE2S)

a. Max. 125 V

Warning

A recovery diode is required in the proximity of inductive loads, e.g. relay or contactor coils.

6.5.3 NC Supply Voltage and Control Signals

X69: NC supply voltage and control signals

For lengths of 600 mm and longer, the 50-line ribbon cable for the NC power supply and control signals is led doubled to the control in order to increase the wire cross section.

50-pin ribbon connector	Assignment
1a to 5b	+5 V
6a to 7b	+12 V
8a	+5 V (low-voltage separation)
8b	0 V (low-voltage separation)
9a	+15 V
9b	–15 V
10a	UZAN
10b	0 V
11a	IZAN
11b	0 V
12a	$\overline{\text{RES.PS}}$
12b	0 V
13a	$\overline{\text{PF.PS.ZK}}$
13b	GND
14a	$\overline{\text{ERR.UZ.GR}}$
14b	GND
15a	$\overline{\text{ERR.IZ.GR}}$
15b	GND
16a	$\overline{\text{ERR.TEMP}}$ (UV, ZKF, UP)

50-pin ribbon connector	Assignment
16b	GND
17a	RDY.PS
17b	GND
18a	$\overline{\text{ERR.ILEAK}}$
18b	GND
19a	$\overline{\text{PF.PS.AC}}$
19b	GND
20a	Do not assign
20b	GND
21a	Do not assign
21b	GND
22a	Do not assign
22b	GND
23a	Reserved (SDA)
23b	GND
24a	Reserved (SCL)
24b	GND
25a	$\overline{\text{RES.LE}}$
25b	GND

Danger

The interface complies with the requirements of IEC 61800-5-1 for "low voltage electrical separation."

6.5.4 5-V Power Supply (Only UV(R) 1x0D)

X74

Connection:

Connecting terminal X74	Assignment
+	+5 V (load capacity 29 A)
–	0 V

6.5.5 Unit Bus

X79: Unit bus

Connection:

40-pin ribbon connector	Assignment	
1a to 3b	0 V [*1]	These voltages must not be linked with other voltages (only basic insulation)!
4a	+24 V [*1]	
4b	+24 V [*1]	
5a	+15 V [*1]	
5b	+24 V [*1]	
6a	+15 V [*1]	
6b	+15 V [*1]	
7a to 8b	Do not assign	
9a	Reserved (SDA)	
9b	Do not assign	
10a	Reserved (SCL)	
10b	$\overline{\text{ERR.TEMP}}$	
11a	$\overline{\text{PF.PS}}$	
11b	0 V	
12a	$\overline{\text{RES.PS}}$	
12b	0 V	
13a	$\overline{\text{PWR.OFF}}$	
13b	0 V	
14a	5 V FS (spindle enable)	
14b	0 V	
15a	5 V FA (axis enable)	
15b to 16b	0 V	
17a and 17b	–15 V	
18a and 18b	+15 V	
19a to 20b	+5 V	

Danger

The interface complies with the requirements of IEC 61800-5-1 for low voltage electrical separation (except for 1a to 6b).

6.6 Connecting the UP 110 Braking Resistor Module

The UP 110 braking resistor module must be used when axis motors without brakes are used. In the event of power failure, it dissipates the energy returned by the axis motors to the dc link. The UP 110 is switched on when the inverter voltage U_Z exceeds 740 V and is switched off again as soon as it falls below 720 V.

Danger

Danger of electrical shock!
The UP 110 braking resistor module may be opened only by HEIDENHAIN service engineers.
Do not engage or disengage any terminals while they are under power.

X79: Unit bus

Connection:

<table>
<tr><th>40-pin ribbon connector</th><th>Assignment</th><th></th></tr>
<tr><td>1a to 3b</td><td>0 V [*1]</td><td rowspan="7">These voltages must not be linked with other voltages (only basic insulation)!</td></tr>
<tr><td>4a</td><td>+24 V [*1]</td></tr>
<tr><td>4b</td><td>+24 V [*1]</td></tr>
<tr><td>5a</td><td>+15 V [*1]</td></tr>
<tr><td>5b</td><td>+24 V [*1]</td></tr>
<tr><td>6a</td><td>+15 V [*1]</td></tr>
<tr><td>6b</td><td>+15 V [*1]</td></tr>
<tr><td>7a to 8b</td><td>Do not assign</td><td></td></tr>
<tr><td>9a</td><td>Reserved (SDA)</td><td></td></tr>
<tr><td>9b</td><td>Do not assign</td><td></td></tr>
<tr><td>10a</td><td>Reserved (SCL)</td><td></td></tr>
<tr><td>10b</td><td>$\overline{\text{ERR.TEMP}}$</td><td></td></tr>
<tr><td>11a</td><td>$\overline{\text{PF.PS}}$</td><td></td></tr>
<tr><td>11b</td><td>0 V</td><td></td></tr>
<tr><td>12a</td><td>$\overline{\text{RES.PS}}$</td><td></td></tr>
<tr><td>12b</td><td>0 V</td><td></td></tr>
<tr><td>13a</td><td>$\overline{\text{PWR.OFF}}$</td><td></td></tr>
<tr><td>13b</td><td>0 V</td><td></td></tr>
<tr><td>14a</td><td>5 V FS (spindle enable)</td><td></td></tr>
<tr><td>14b</td><td>0 V</td><td></td></tr>
<tr><td>15a</td><td>5 V FA (axis enable)</td><td></td></tr>
<tr><td>15b to 16b</td><td>0 V</td><td></td></tr>
<tr><td>17a and 17b</td><td>–15 V</td><td></td></tr>
<tr><td>18a and 18b</td><td>+15 V</td><td></td></tr>
<tr><td>19a to 20b</td><td>+5 V</td><td></td></tr>
</table>

Danger

The interface complies with the requirements of IEC 61800-5-1 for low voltage electrical separation (except for 1a to 6b).

6.7 Connecting the UM 1xx(B)(D) Power Modules

Danger

Danger of electrical shock!
The UM 1xx power modules may be opened only by HEIDENHAIN service personnel.
Do not engage or disengage any terminals while they are under power.

6.7.1 PWM Connection to the Control

X111, X112: PWM connection to the control

Connection:

Ribbon connector, 20-pin	Assignment
1a	PWM U1
1b	0 V U1
2a	PWM U2
2b	0 V U2
3a	PWM U3
3b	0 V U3
4a	$\overline{\text{SH2}}$
4b	0 V ($\overline{\text{SH2}}$)
5a	$\overline{\text{SH1}}$
5b	0 V ($\overline{\text{SH1}}$)
6a	+Iactl 1
6b	–Iactl 1
7a	0 V (analog)
7b	+Iactl 2
8a	–Iactl 2
8b	0 V (analog)
9a	Do not assign
9b	$\overline{\text{BRK}}$
10a	$\overline{\text{ERR}}$
10b	RDY

Danger

The interface complies with the requirements of IEC 61800-5-1 for “low voltage electrical separation.”

6.7.2 Unit Bus

X79: Unit bus

Connection:

40-pin ribbon connector	Assignment	
1a to 3b	0 V ^{*1}	These voltages must not be linked with other voltages (only basic insulation)!
4a	+24 V ^{*1}	
4b	+24 V ^{*1}	
5a	+15 V ^{*1}	
5b	+24 V ^{*1}	
6a	+15 V ^{*1}	
6b	+15 V ^{*1}	
7a to 8b	Do not assign	
9a	Reserved (SDA)	
9b	Do not assign	
10a	Reserved (SCL)	
10b	$\overline{\text{ERR.TEMP}}$	
11a	$\overline{\text{PF.PS}}$	
11b	0 V	
12a	$\overline{\text{RES.PS}}$	
12b	0 V	
13a	$\overline{\text{PWR.OFF}}$	
13b	0 V	
14a	5 V FS (spindle enable)	
14b	0 V	
15a	5 V FA (axis enable)	
15b to 16b	0 V	
17a and 17b	–15 V	
18a and 18b	+15 V	
19a to 20b	+5 V	

Danger

The interface complies with the requirements of IEC 61800-5-1 for low voltage electrical separation (except for 1a to 6b).

6.7.3 Motor Connections

X81: Axis/spindle motor
X82: Axis/spindle motor

Connection:

Terminals X81, X82	Assignment
U	Motor connection U
V	Motor connection V
W	Motor connection W

For information on synchronous motors, asynchronous motors and power cables, refer to the chapter "Motors for Axis and Spindle Drives on page 7 – 3.

6.7.4 Motor Holding Brakes

X344: 24-V supply for motor holding brake

Connection:

Connecting terminals X344	Assignment
1	+24 V
2	0 V

X392: Motor holding brake

2-pin connection:

Connecting terminals X392	Assignment
1	Holding brake
2	0 V

4-pin connection:

Connecting terminals X392	Assignment
1	Holding brake (X112)
2	0 V (X112)
3	Holding brake (X111)
4	0 V (X111)

Maximum current I_{max} for controlling the holding brakes via X392:

Power module	I_{max}
UM 11x(B)(D)	3.0 A
UM 12x(B)(D)	2.0 A

6.8 Connecting the UV 105 Power Supply Unit

X69, X169: NC supply voltage and control signals

Note

For the control to be able to evaluate the status signals of the power supply units, connector X69 of the controller unit must be connected by ribbon cable with X69 of the UV 105.
Since non-HEIDENHAIN inverters do not send any status signals, an adapter connector (Id. Nr. 349 211-01) must be connected to X69 on the UV 105. This connector is delivered with the UV 105.

Note

There is no need for the UV 105 power supply unit when the UV 1x0D is used. If the UV 1x0 or UE 2xxB is used, the power supplied by the power pack does not suffice. In this case an UV 105 must be used.

Warning

See also the information on Page 4–37 and the following pages about the connection of the UV 105.

Connection:

50-pin ribbon connector	Assignment	50-pin ribbon connector	Assignment
1a to 5b	+5 V	16b	GND
6a to 7b	+12 V	17a	RDY.PS
8a	+5 V (low-voltage separation)	17b	GND
8b	0 V (low-voltage separation)	18a	ERR.ILEAK
9a	+15 V	18b	GND
9b	–15 V	19a	PF.PS.AC (only UV(R) 120(D), UVR 130D, UV 130D, UV(R) 140(D), UV(R) 150(D), UVR 160D(W), UR 2xx)
10a	UZAN	19b	GND
10b	0 V	20a	Do not assign
11a	IZAN	20b	GND
11b	0 V	21a	Do not assign
12a	RES.PS	21b	GND
12b	0 V	22a	Do not assign

50-pin ribbon connector	Assignment	50-pin ribbon connector	Assignment
13a	PF.PS.ZK	22b	GND
13b	GND	23a	Reserved (SDA)
14a	ERR.UZ.GR	23b	GND
14b	GND	24a	Reserved (SLC)
15a	ERR.IZ.GR	24b	GND
15b	GND	25a	RES.LE
16a	ERR.TMP (UV, ZKF, UP)	25b	GND

X74: 5-V power supply

Connection:

Wire color of 5-V connection	5-V terminal on CC 42x
Black	0 V
Red	+5 V

X31: Power supply

Supply voltage: 400 V ± 10 %

Connection:

Connecting terminal	Assignment
U	Phase 1 / 400 V~ ±10% / 50 Hz to 60 Hz
V	Phase 2 / 400 V~ ±10% / 50 Hz to 60 Hz
⏚	Equipment ground (YL/GY), ≥ 10 mm^2 (AWG 6)
	Cable: Wire cross section: 1.5 mm^2 (AWG 16) Line fuse: 6.3 A (gR) Siemens Sitor type The screw terminal between X31 and the grounding terminal must be used for fixing the cable and for ensuring appropriate strain relief of the cable. **Grounding terminal:** ≥ 10 mm^2 (AWG 6)
	Tightening torque for connecting terminals: 0.7 Nm (6.5 - 7 lbs/in)

Note

- If you are using non-HEIDENHAIN inverter systems or regenerative HEIDENHAIN inverter systems, you must connect the supply voltage to the terminals U and V via an isolating transformer (300 VA, basic insulation as per IEC 61800-5-1 or protective insulation as per VDE 0550).
- There is no need for an isolating transformer if non-regenerative HEIDENHAIN inverter systems are used.

Warning

When using an isolating transformer, do not ground this isolating transformer on the secondary side!

The isolating transformer decouples the line voltage from ground. Grounding the isolating transformer on the secondary side leads to an addition of the dc-link voltage and the supply voltage. This overloads the UV 105, thereby destroying it!

Please keep this in mind in your circuit diagrams.

U_Z: DC-link voltage

Since the power to the UV 105 is supplied through the dc-link, the voltage fed into the dc-link by the motors that are still running can be used during line voltage failures. The UV 105 uses this voltage to maintain the power supply to the control until the system has been shut down properly by the control.

Connecting terminals	Assignment
$-U_Z$	DC-link voltage –
$+U_Z$	DC-link voltage +

The UV 105 is powered with dc-link voltage U_Z through

- the conductor bars (for HEIDENHAIN inverter systems).
- a cable which is connected instead of the conductor bar (for non-HEIDENHAIN inverter systems).

6.9 Connecting the ZKF 1xx

Direct drives (linear motors, torque motors) used with regenerative inverter systems can result in voltage peaks, which might destroy the drive. If you are using direct drives in conjunction with the regenerative UVR 1xx(D) and UR 2xx(D) inverters, you must use the ZKF dc-link filter.

X79: Unit bus (only ZKF 130)

Connection:

40-pin ribbon connector	Assignment	
1a to 3b	0 V ^{*1}	
4a	+24 V ^{*1}	
4b	+24 V ^{*1}	These voltages must not be linked with other voltages (only basic insulation)!
5a	+15 V ^{*1}	
5b	+24 V ^{*1}	
6a	+15 V ^{*1}	
6b	+15 V ^{*1}	
7a to 8b	Do not assign	
9a	Reserved (SDA)	
9b	Do not assign	
10a	Reserved (SCL)	
10b	$\overline{\text{ERR.TEMP}}$	
11a	$\overline{\text{PF.PS}}$	
11b	0 V	
12a	$\overline{\text{RES.PS}}$	
12b	0 V	
13a	$\overline{\text{PWR.OFF}}$	
13b	0 V	
14a	5 V FS (spindle enable)	
14b	0 V	
15a	5 V FA (axis enable)	
15b to 16b	0 V	
17a and 17b	–15 V	
18a and 18b	+15 V	
19a to 20b	+5 V	

Danger

The interface complies with the requirements of IEC 61800-5-1 for low voltage electrical separation (except for 1a to 6b).

U_Z: DC-link voltage

The inverters for the direct drives are mounted to the right of the ZKF in order to separate the dc-link of the direct drives from the dc-link of the conventional drives through the filter.

Connecting terminals	Assignment
$-U_Z$in	DC-link voltage –, from power supply unit
$+U_Z$in	DC-link voltage +, from power supply unit
$-U_Z$out	DC-link voltage –, to direct drives
$+U_Z$out	DC-link voltage +, to direct drives

The dc-link is mounted by using

- the conductor bars (for HEIDENHAIN inverter systems).

Warning

A dc-link filter is not permitted for non-HEIDENHAIN inverters!

6.10 Connecting the Adapter Module

General information

In modular regenerative inverter systems an additional power supply unit may become necessary if you are using inverters or motors with a high power demand. The adapter module makes it possible to connect this power supply unit to the present inverter system. This enables you to use one power supply unit for a high-performance spindle for example, and the other power supply unit for the axes.

The two power supply units are connected to the control via the supply bus (X69a/X69b – X69) and are then monitored by the system monitoring functions.

This results in two **separate** supply systems whose power modules operate independently of each other, but are monitored by the control.

The two supply buses are linked in the adapter module. The reset signal, analog signals and the power supply are used by the module connected to X69a. The ready signals of the power supply units are AND-gated. All other digital signals are OR-gated. X75 is an interface for service purposes. This connector must not be wired.

Important notes for the connection

For the connection overview, see Page 4–36.

Warning

Please keep the following in mind for connecting the inverter system and for integrating the status and control signals in its diagnosis or monitoring functions:

- The two power supply units form two separate dc-links and must therefore not be connected using the dc-link conductor bars. The power of each dc-link must be rated separately. Motors whose power exceeds that of an individual power supply module can **not** be operated with two power supply units either.
- Each of the power supply units must have a separate power connection. This means that upstream filters and other devices for noise suppression, such as a line filter, commutating reactor and three-phase capacitor, must be provided separately for each of the power supply lines.
- If the machine requires the use of braking resistors (e.g. UP 110), a separate module must be used for each dc-link.
- Since this basically results in two separate inverter systems result, each of the systems requires its own unit bus (X79).
- Error messages from the power supply units are received by the adapter module and transmitted to the control. However, the control cannot determine which of the supply buses is responsible for the error messages.

- The ready signals from the power supply units are collected in the adapter module and transmitted to the control. If a ready signal is missing, the control cannot determine which of the inverter systems has failed to send the ready signal.
- **Supply bus X69a/b:**
  The dc-links to be monitored must be evaluated. The present system architecture allows monitoring of only one dc-link's voltage and current. The dc-link with the greater load or the more critical components should be monitored and, the respective power supply module must be connected to X69a. The other power supply module must be connected to X69b in the same way.
- **Diagnosability:**
  The information given above also applies to diagnosability. The control is only able to diagnose power supply units, such as the UVR 140D, if the supply bus (X69) of the UVR 140D is connected to X69a of the adapter module. The power supply unit connected to X69b cannot be addressed by the system diagnosis function.
- **5-V power supply X74:**
  The 5-V power supply must be routed from the power supply unit that has been connected to X69a to the control.

X69a: From the first power supply unit (diagnosable)

For lengths of 600 mm and longer, the 50-line ribbon cable for the NC power supply and control signals is led doubled to the control in order to increase the wire cross section.

50-pin ribbon connector	Assignment
1a to 5b	+5 V
6a to 7b	+12 V
8a	+5 V (low-voltage separation)
8b	0 V (low-voltage separation)
9a	+15 V
9b	–15 V
10a	UZAN_U1
10b	0 V
11a	IZAN_U1
11b	0 V
12a	RES.PS_U1
12b	0 V
13a	PF.PS_U1
13b	GND
14a	ERR.UZ.GR_U1
14b	GND
15a	ERR.IZ.GR_U1
15b	GND
16a	ERR.TEMP_U1 (UV, ZKF, UP)

50-pin ribbon connector	Assignment
16b	GND
17a	RDY.PS_U1
17b	GND
18a	ERR.ILEAK_U1
18b	GND
19a	Not connected
19b	GND
20a	Not connected
20b	GND
21a	Not connected
21b	GND
22a	Not connected
22b	GND
23a	SDA
23b	GND
24a	SLC
24b	GND
25a	RES.LE
25b	GND

Danger

The interface complies with the requirements of IEC 61800-5-1 for "low voltage electrical separation."

X69b: From the second power supply unit (no diagnosis)

For lengths of 600 mm and longer, the 50-line ribbon cable for the NC power supply and control signals is led doubled to the control in order to increase the wire cross section.

50-pin ribbon connector	Assignment	50-pin ribbon connector	Assignment
1a to 5b	+5 V	16b	GND
6a to 7b	Not connected	17a	RDY.PS_U2
8a	Not connected	17b	GND
8b	Not connected	18a	$\overline{\text{ERR.ILEAK\_U2}}$
9a	Not connected	18b	GND
9b	Not connected	19a	Not connected
10a	UZAN_U2	19b	GND
10b	Not connected	20a	Not connected
11a	IZAN_U2	20b	GND
11b	Not connected	21a	Not connected
12a	Not connected	21b	GND
12b	0 V	22a	Not connected
13a	$\overline{\text{PF.PS\_U2}}$	22b	GND
13b	GND	23a	Not connected
14a	$\overline{\text{ERR.UZ.GR\_U2}}$	23b	GND
14b	GND	24a	Not connected
15a	$\overline{\text{ERR.IZ.GR\_U2}}$	24b	GND
15b	GND	25a	$\overline{\text{RES.LE}}$
16a	$\overline{\text{ERR.TEMP\_U2}}$ (UV, ZKF, UP)	25b	GND

Danger

The interface complies with the requirements of IEC 61800-5-1 for "low voltage electrical separation."

X69: Ribbon cable to the control

For lengths of 600 mm and longer, the 50-line ribbon cable for the NC power supply and control signals is led doubled to the control in order to increase the wire cross section.

50-pin ribbon connector	Assignment
1a to 5b	+5 V
6a to 7b	+12 V
8a	+5 V (low-voltage separation)
8b	0 V (low-voltage separation)
9a	+15 V
9b	–15 V
10a	UZAN
10b	0 V
11a	IZAN
11b	0 V
12a	$\overline{\text{RES.PS}}$
12b	0 V
13a	$\overline{\text{PF.PS}}$
13b	GND
14a	$\overline{\text{ERR.UZ.GR}}$
14b	GND
15a	$\overline{\text{ERR.IZ.GR}}$
15b	GND
16a	$\overline{\text{ERR.TEMP}}$ (UV, ZKF, UP)

50-pin ribbon connector	Assignment
16b	GND
17a	RDY.PS
17b	GND
18a	$\overline{\text{ERR.ILEAK}}$
18b	GND
19a	Do not assign
19b	GND
20a	Do not assign
20b	GND
21a	0 V
21b	GND
22a	0 V
22b	GND
23a	Reserved (SDA)
23b	GND
24a	Reserved (SCL)
24b	GND
25a	$\overline{\text{RES.LE}}$
25b	GND

Danger

The interface complies with the requirements of IEC 61800-5-1 for “low voltage electrical separation.”

X75: Service connector

Warning

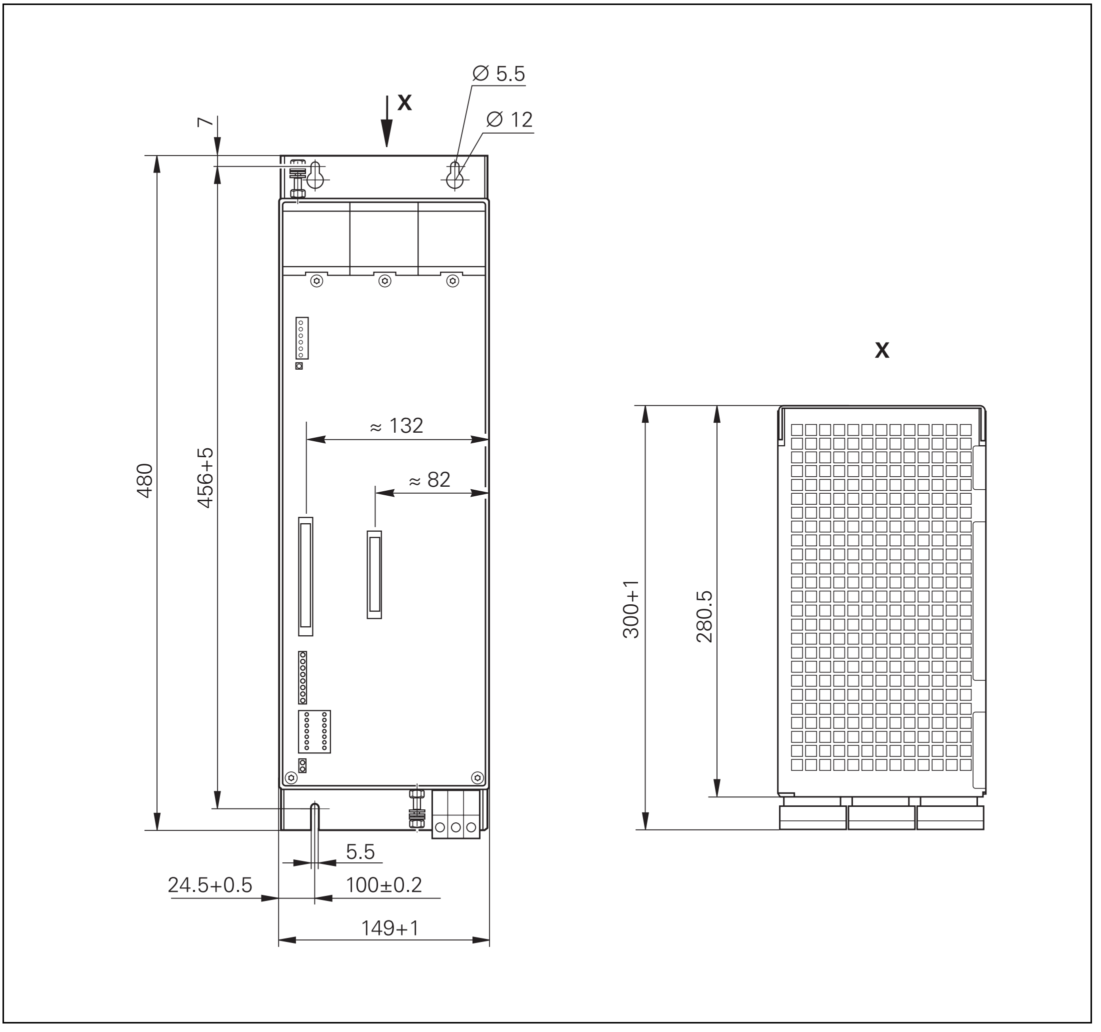
X75 must not be assigned. It is only for service purposes.

6.11 Dimensions

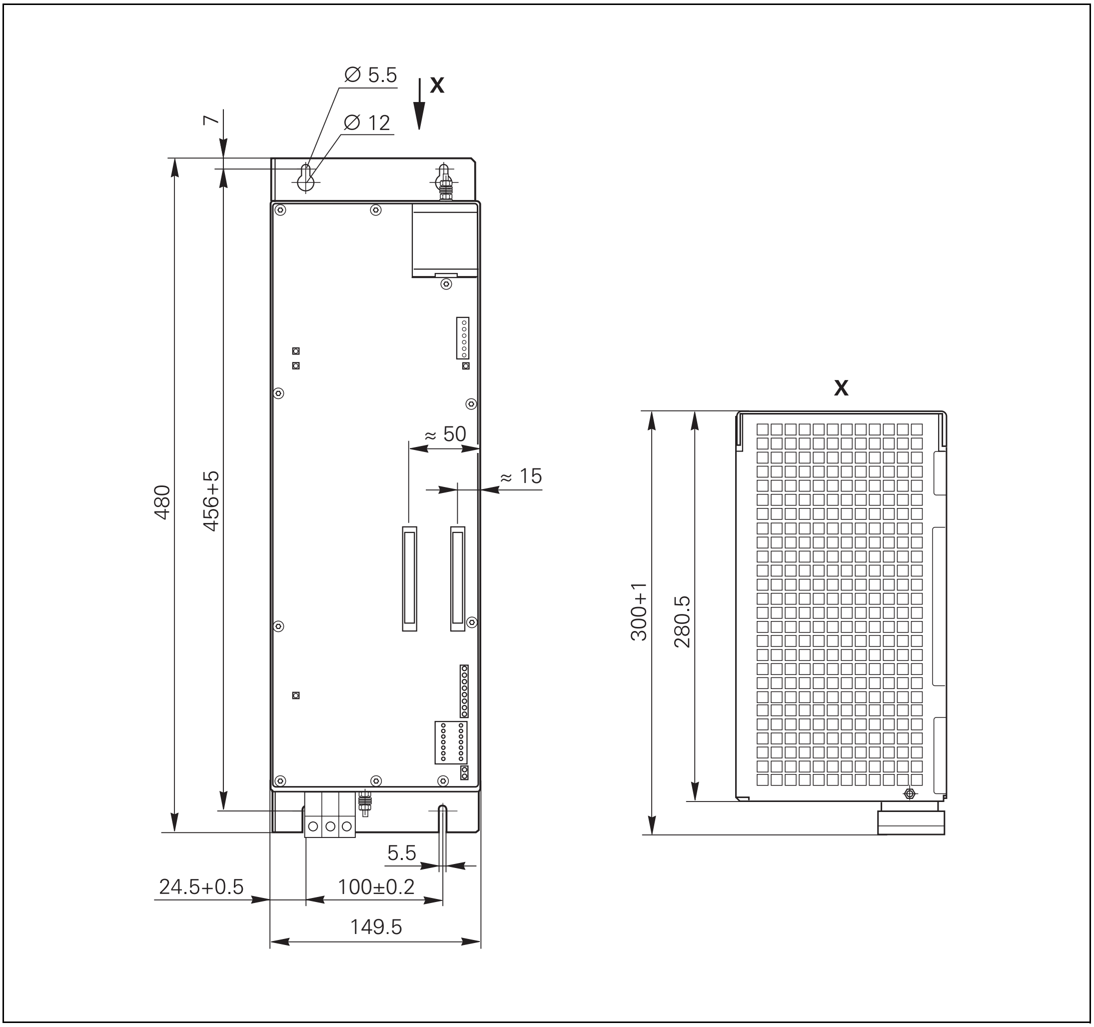
Note

All dimensions are in millimeters [mm].

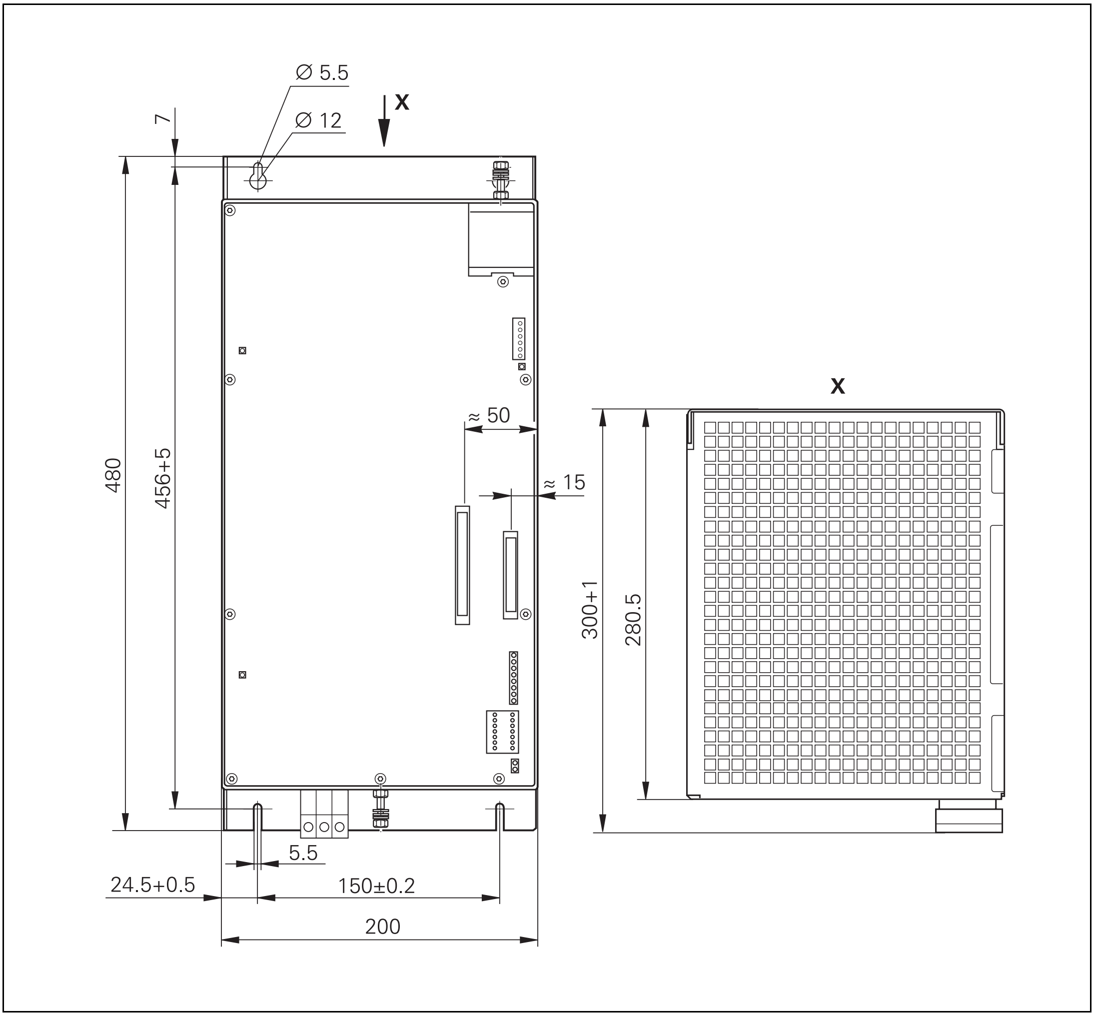
6.11.1 UV 130(D)



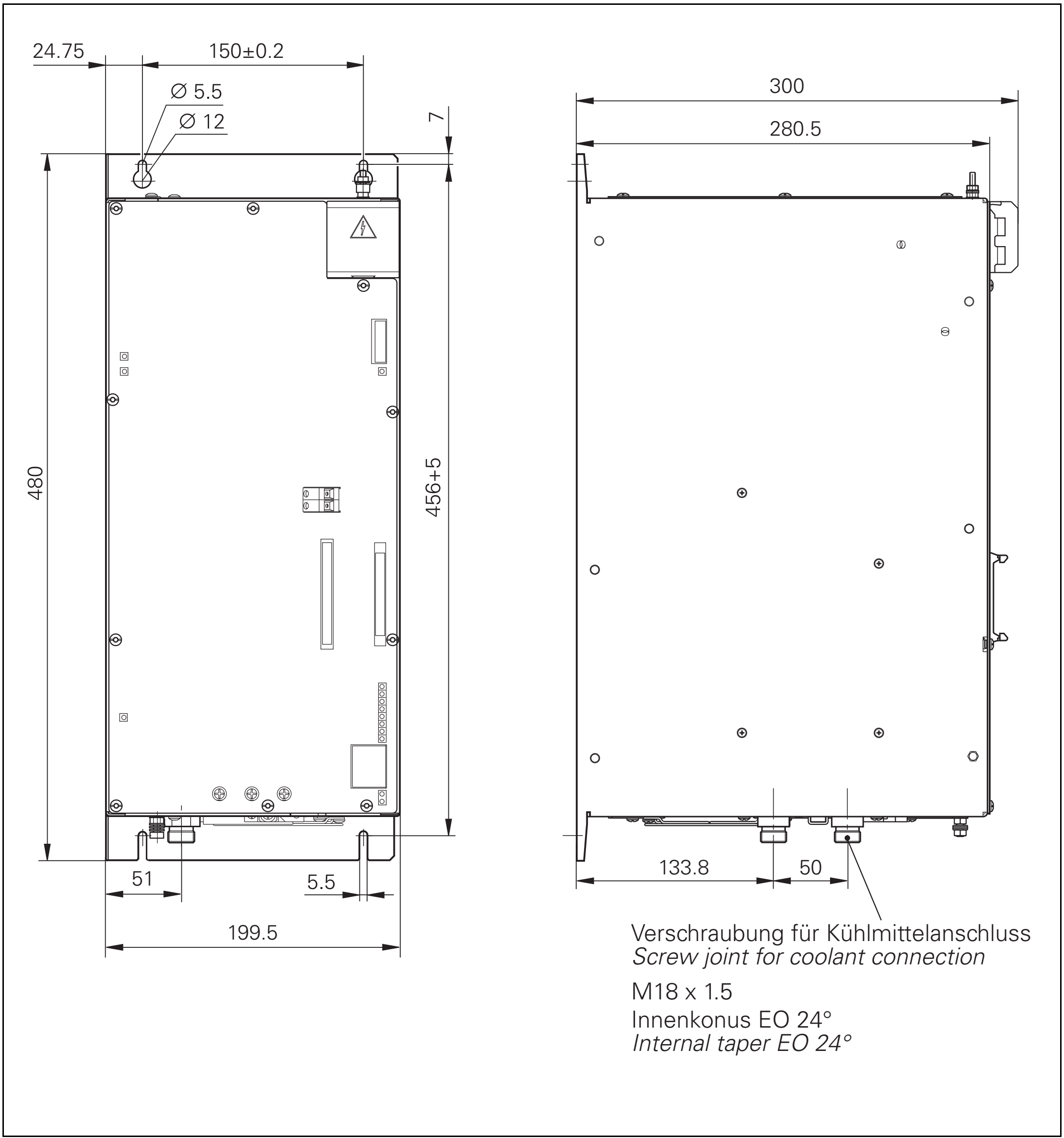
6.11.2 UV 120, UVR 120D, UVR 130D



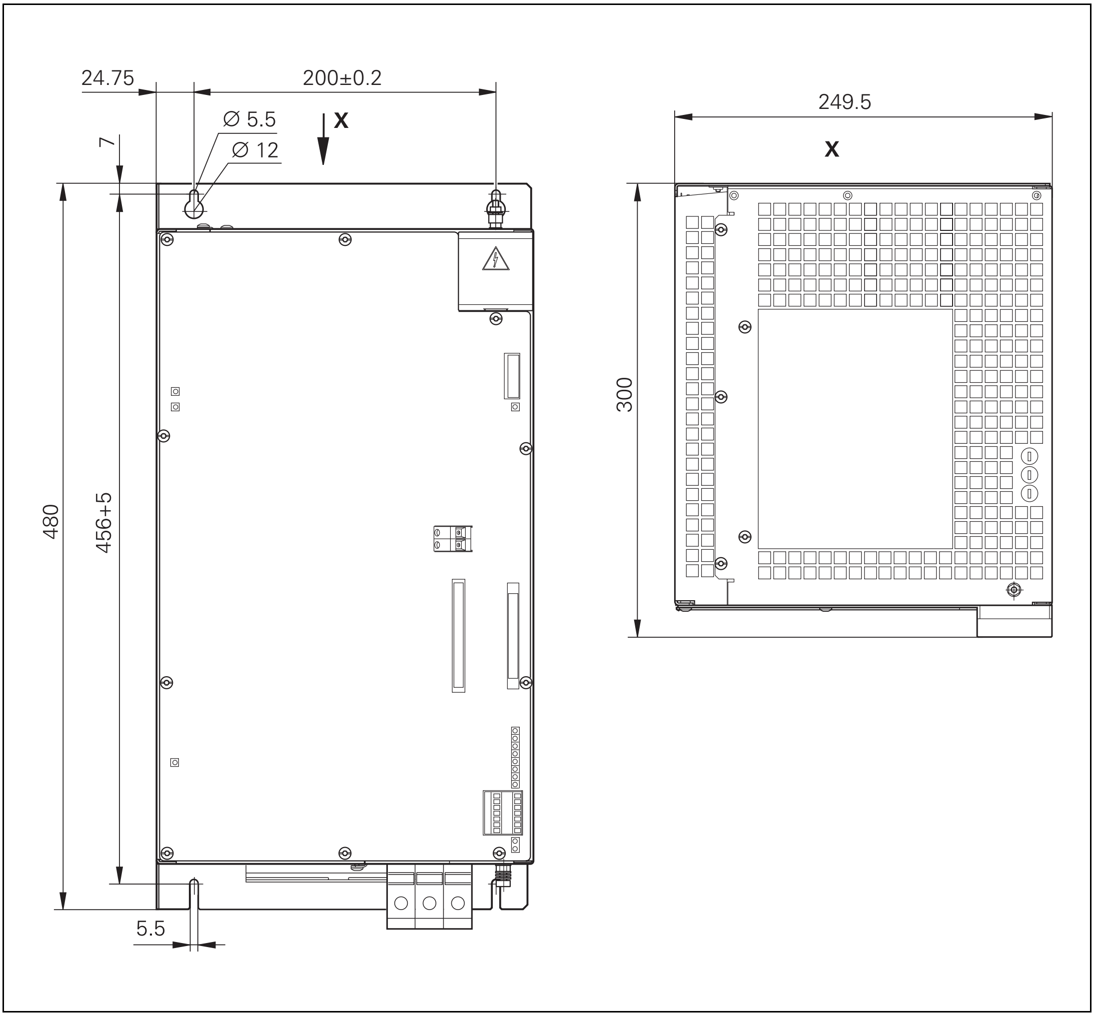
6.11.3 UV 140, UVR 140D, UV 150, UVR 150(D)



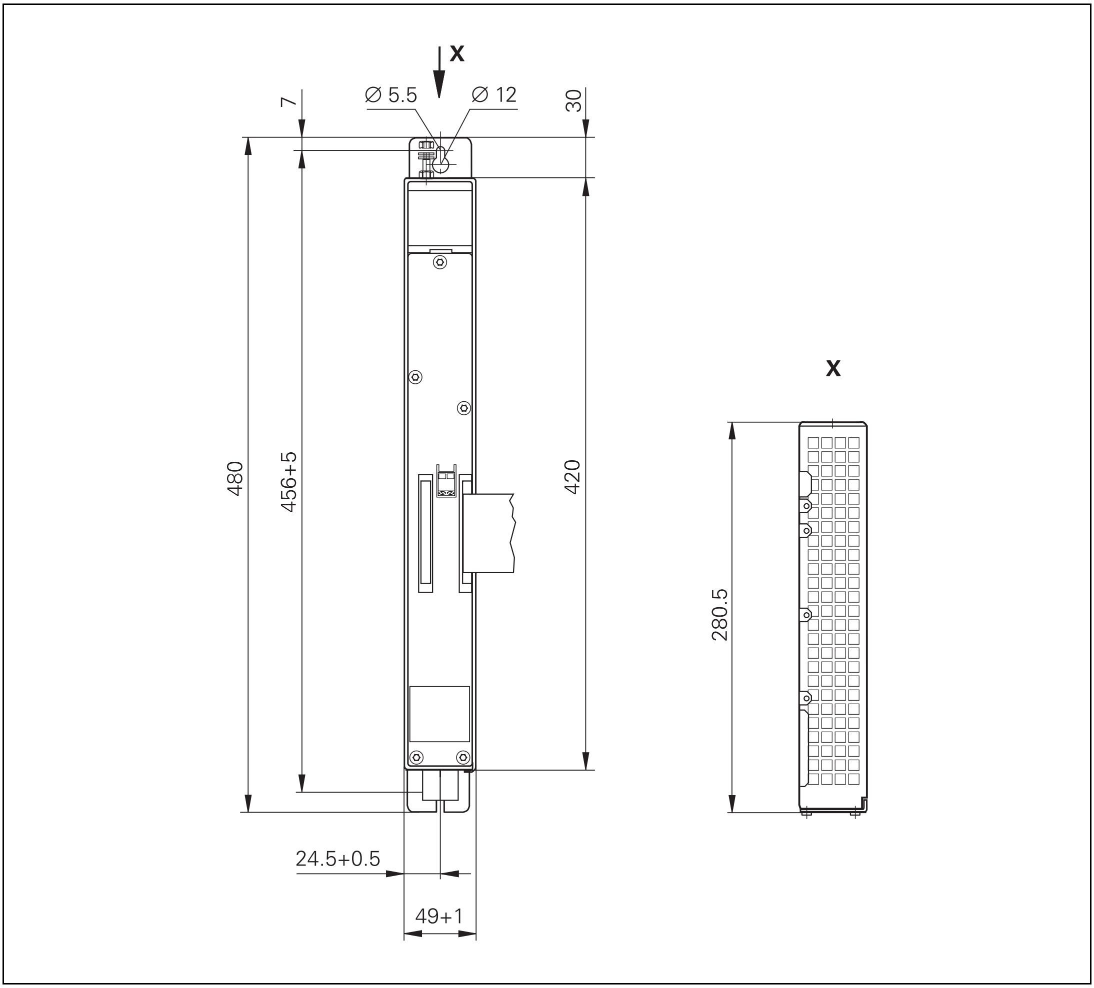
6.11.4 UVR 160 DW



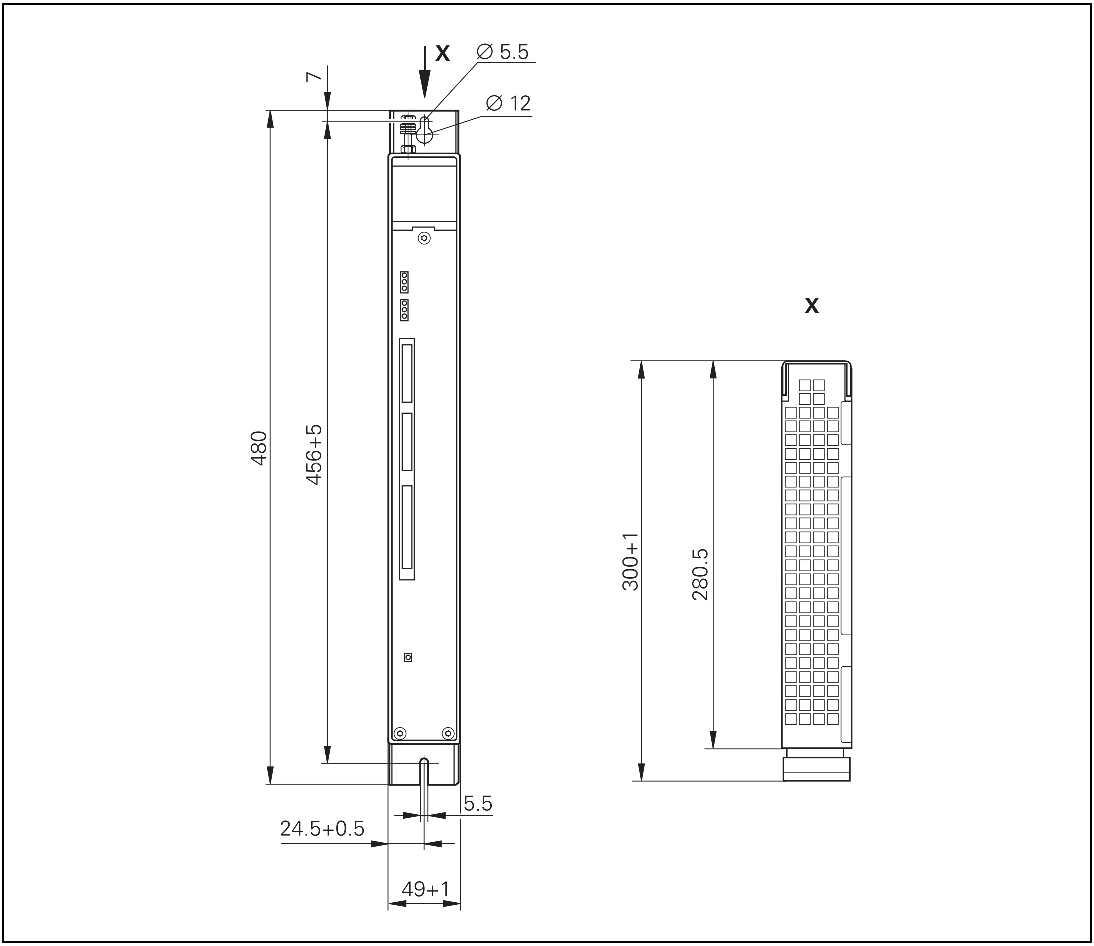
6.11.5 UVR 160D



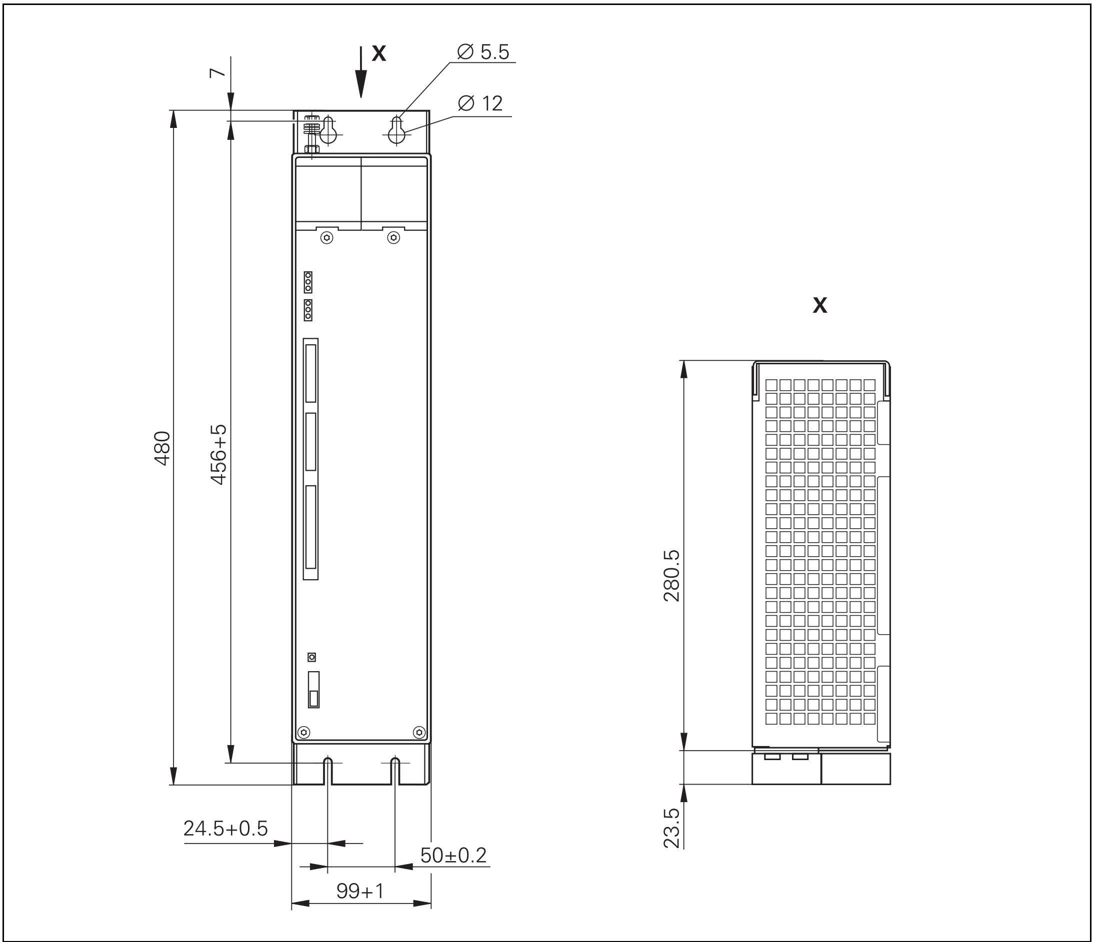
6.11.6 UV 105



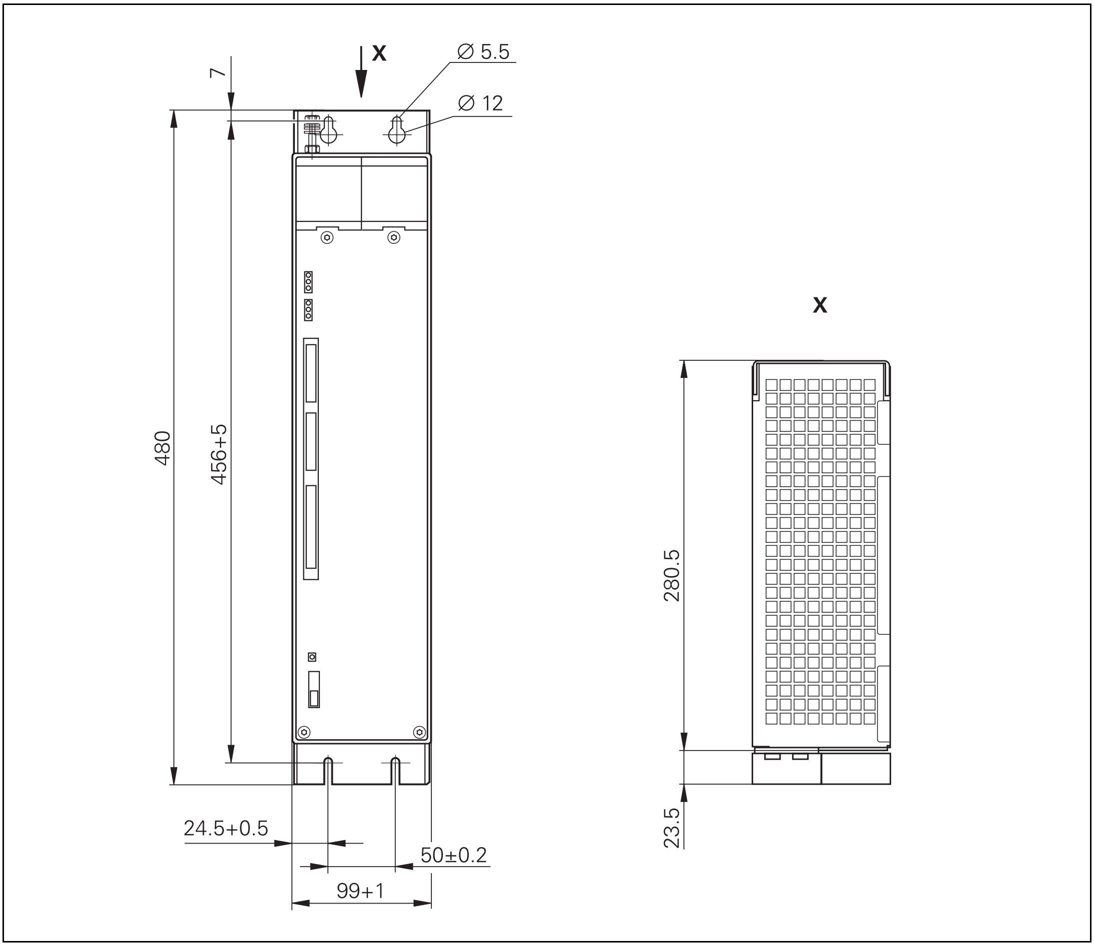
6.11.7 UM 111, UM 111D, UM 111BD, UM 121, UM 121D



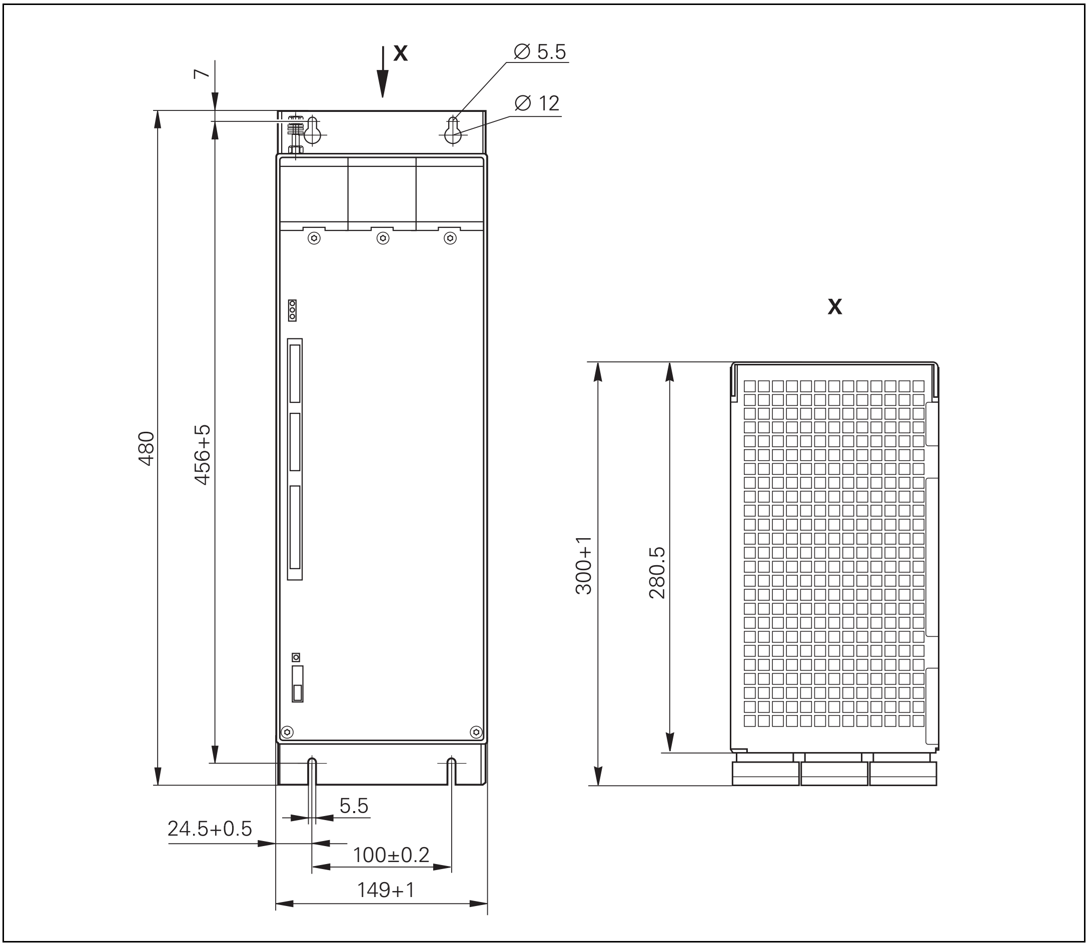
6.11.8 UM 111B, UM 112(D), UM 121B(D), UM 122(D)



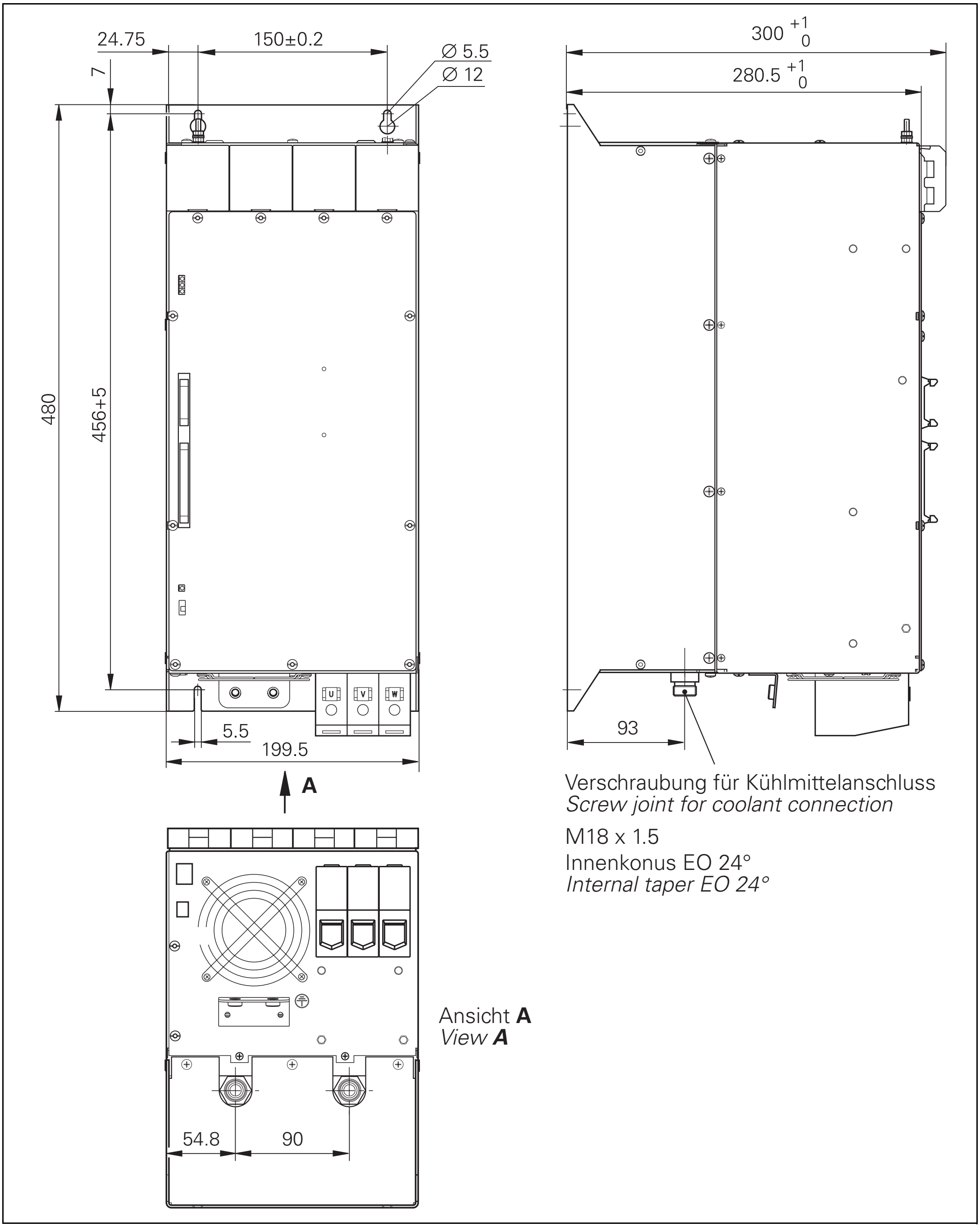
6.11.9 UM 113(D), UM 114(D)



6.11.10 UM 115(D)



6.11.11 UM 116DW



7 Motors for Axis and Spindle Drives

7 Motors for Axis and Spindle Drives

7.1 General Information

7.1.1 Safety and Commissioning Regulations

Please note the following regulations for safety and commissioning. Damage caused by careless treatment or use of goods will not be covered in the warranty.

Danger

During operation several of the motor parts may be either live or moving.

Never perform any kind of work on the motor (e.g. open of terminal box, make or break connections) while it is under power.

Repairs or other kind of service to the motor may only be carried out by trained personnel.

Connect the motor as shown in the accompanying circuit diagram and establish a stable and safe electrical connection. Ensure in particular that the motor is properly grounded!

The motors are not intended for direct connection to three-phase line power. They must be operated via an electronic power converter. Connecting the motor directly to line power may destroy the motor!

Warning

Temperatures of up to 145 °C may occur on the motor surfaces.

When connecting the fan, ensure that the direction of rotation is correct. The arrow symbol on the fan housing indicates the correct direction.

Warning

The standstill brake that can be installed as an option is designed only for a limited number of emergency stops.

After mounting the motor you must verify the trouble-free functioning of the brake.

On motors with plug-in connection and built-in brake, you must install the varistor required for wiring the brake when commissioning the motor. See "Connecting the Holding Brake" on page 7–33.

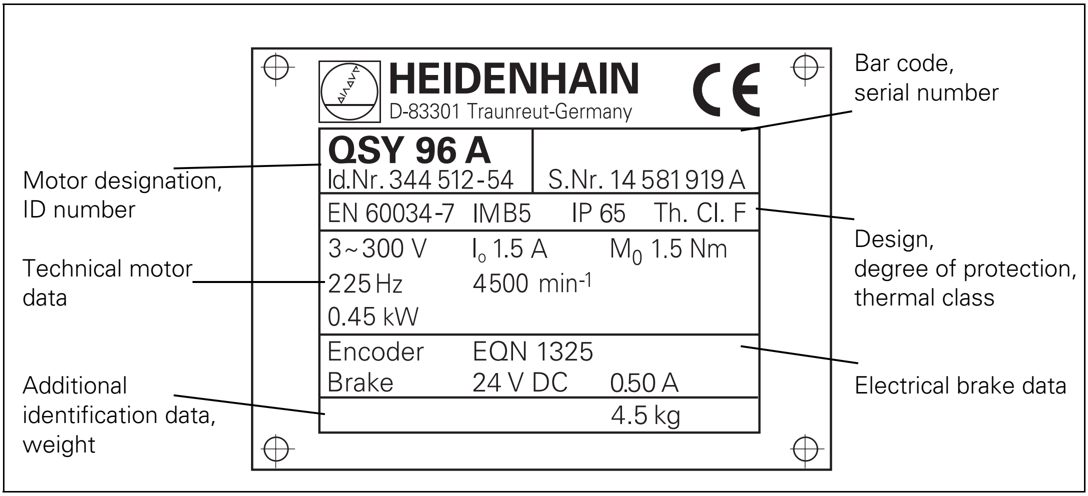
Danger

Before the commissioning of motors equipped with a feather key at the shaft end, the feather key must be secured against ejection.

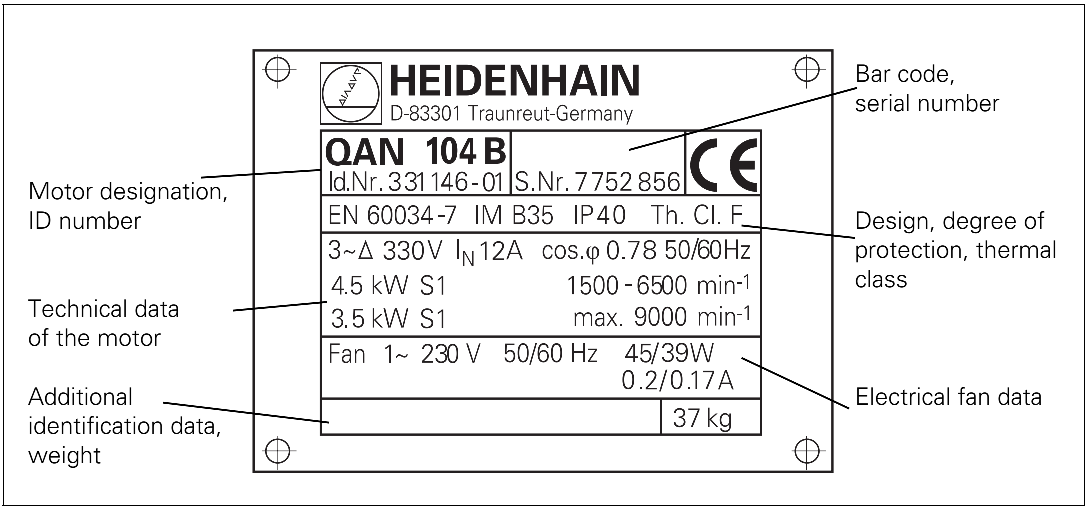
You will find further information on the safe and trouble-free functioning of your motor in the operating instructions that accompany each unit.

7.1.2 Data on the Name Plate

QSY synchronous motors



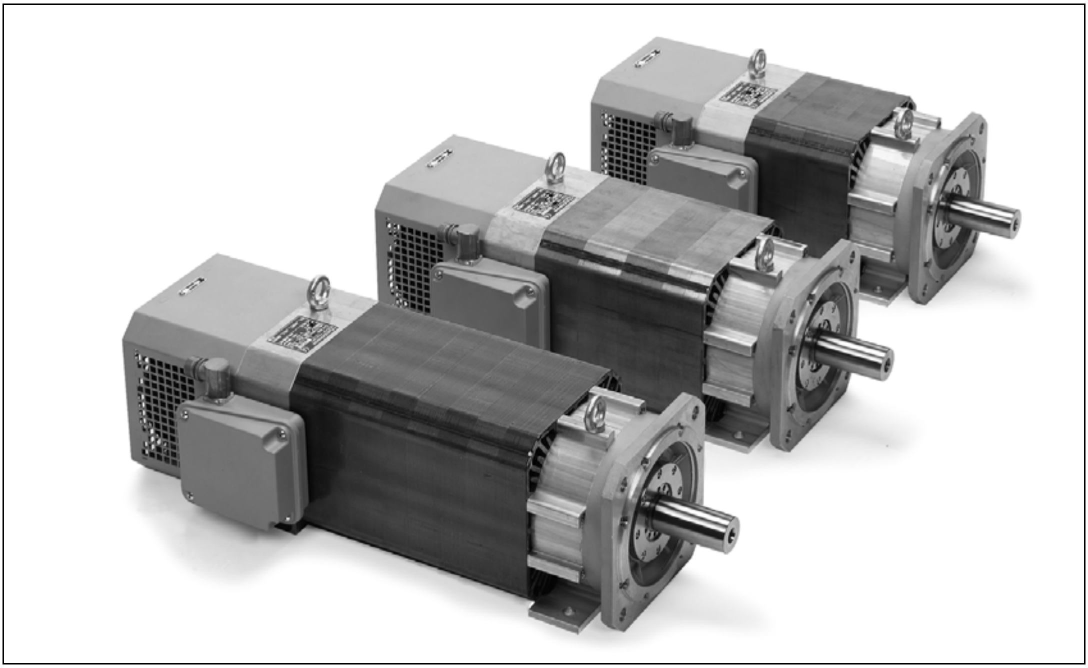
QAN asynchronous motors

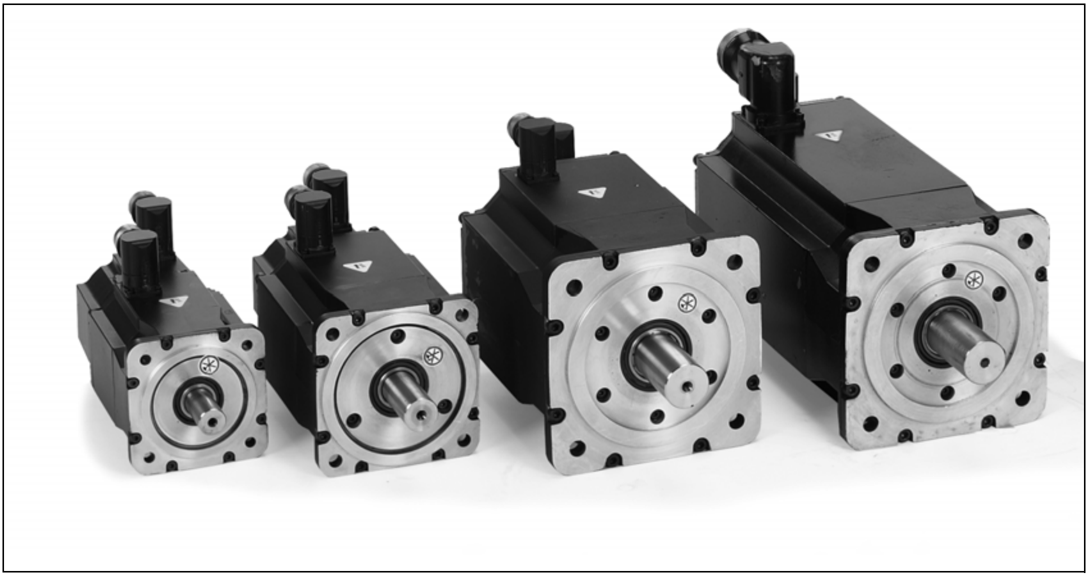


Note

The motors of the QAN 30 series and of the QAN 4S are wired for delta connection. This data is included on the name plate.
The control's motor table includes the data for the wye equivalent circuit.

7.2 Overview of Asynchronous and Synchronous Motors





7.2.1 Asynchronous Motors, QAN Series

Designation	Rated power	Rated speed	ID	Type of power cable[a]
QAN 104B – (page 7 – 146)	4.5 kW	1500 rpm	331 146-11	**1**
QAN 104C – (page 7 – 146)	7.5 kW	1500 rpm	331 147-11	**1**
QAN 104D – (page 7 – 146)	10.0 kW	1500 rpm	331 148-11	**2**
QAN 134B – (page 7 – 164)	12.0 kW	1500 rpm	331 149-11	**2**
QAN 134C – (page 7 – 164)	18.0 kW	1500 rpm	331 150-11	**7**
QAN 134D – (page 7 – 164)	22.0 kW	1250 rpm	331 151-11	**7**
QAN 164B – (page 7 – 170)	31.5 kW	1350 rpm	331 152-11	**8**
QAN 200L – (page 7 – 151) with standard bearing with spindle bearing	7.5 kW	1500 rpm	 374 329-01 374 329-11	**4**
QAN 200M – (page 7 – 151) with standard bearing with spindle bearing	5.5 kW	1500 rpm	 374 328-01 374 328-11	**4**
QAN 200U – (page 7 – 151) with standard bearing with spindle bearing	10.0 kW	1500 rpm	 374 330-01 374 330-11	**4**
QAN 260L – (page 7 – 155) with standard bearing with spindle bearing	20.0 kW	1500 rpm	 510 020-01 510 020-13	**9**
QAN 260M – (page 7 – 155) with standard bearing with spindle bearing	15.5 kW	1500 rpm	 510 019-01 510 019-13	**9**
QAN 260U – (page 7 – 155) with standard bearing with spindle bearing	24.0 kW	1500 rpm	 510 021-01 510 021-13	**9**
QAN 260W – (page 7 – 155) with standard bearing with spindle bearing	12.0 kW	750 rpm	 510 022-01 510 022-13	**5**
QAN 320M – (page 7 – 160) with standard bearing with spindle bearing	32.0 kW	1500 rpm	 513 302-01 513 302-13	**10**
QAN 320L – (page 7 – 160) with standard bearing with spindle bearing	40.0 kW	1500 rpm	 577 484-01 577 484-13	**10**[1]
QAN 320W – (page 7 – 160) with standard bearing with spindle bearing	18.0 kW	750 rpm	 517 952-01 517 952-13	**9**
QAN 3L – (page 7 – 147)	7.5 kW	1500 rpm	316 007-31	**4**
QAN 3M – (page 7 – 147)	5.5 kW	1500 rpm	316 006-31	**3**
QAN 3U – (page 7 – 147)	10.0 kW	1500 rpm	316 008-31	**5**
QAN 4S – (page 7 – 168)	15.0 kW	1800 rpm	317 449-31	**6**

a. The specification for the QAN power cables can be found in the table in the section "Power cables for HEIDENHAIN asynchronous motors" on page 14.

7.2.2 Synchronous Motors, QSY Series

Designation	Stall torque (100 K)	Rated speed (rpm)	ID with brake	ID without brake	Type of power cable[a]
QSY 041B – (page 7 – 46)	3.0 Nm	3000	331 140-04	331 140-03	**14**
QSY 071B – (page 7 – 58)	9.0 Nm	3000	331 141-04	331 141-03	**14**
QSY 090B – (page 7 – 104)	13.0 Nm	**2000**	331 142-14	331 142-13	**14**
QSY 090B – (page 7 – 106)	13.0 Nm	**3000**	331 142-04	331 142-03	**14**
QSY 093B – (page 7 – 108)	20.0 Nm	3000	331 143-04	331 143-03	**15**
QSY 1A – (page 7 – 48)	3.5 Nm	3000	317 122-44	317 122-43	**11**
QSY 1C – (page 7 – 50)	6.5 Nm	3000	317 123-44	317 123-43	**11**
QSY 1E – (page 7 – 52)	9.3 Nm	3000	317 124-44	317 124-43	**11**
QSY 96A – (page 7 – 54) with ERN 1387 with EQN 1325	1.5 Nm	4500	 344 512-04 344 512-54	 344 512-03 344 512-53	**11**
QSY 96G – (page 7 – 56) with ERN 1387 with EQN 1325	5.2 Nm	4500	 339 875-04 339 875-54	 339 875-03 339 875-53	**11**
QSY 116C – (page 7 – 60) with ERN 1387 with EQN 1325	5.2 Nm	3000	 339 876-04 339 876-54	 339 876-03 339 876-53	**11**
QSY 116E – (page 7 – 62) with ERN 1387 with EQN 1325	7.2 Nm	3000	 339 877-04 339 877-54	 339 877-03 339 877-53	**11**
QSY 116J – (page 7 – 64) with ERN 1387 with EQN 1325	10.0 Nm	3000	 339 878-04 339 878-54	 339 878-03 339 878-53	**11**
QSY 116J EcoDyn – (page 7 – 66) with ERN 1387 with EQN 1325	10.0 Nm	3000	 339 878-14 339 878-64	 339 878-13 339 878-63	**11**
QSY 130C EcoDyn – (page 7 – 68) with ERN 1387 with ECN 1313	6.0 Nm	3000	 389 053-14 389 053-84	 389 053-13 389 053-83	**11**
QSY 130E EcoDyn – (page 7 – 70) with ERN 1387 with ECN 1313	9.0 Nm	3000	 388 422-14 388 422-84	 388 422-13 388 422-83	**11**

Designation	Stall torque (100 K)	Rated speed (rpm)	ID		Type of power cable[a]
			with brake	without brake	
QSY 2C – (page 7 – 72)	10.8 Nm	3000	317 125-44	317 125-43	**11**
QSY 2E – (page 7 – 74)	15.3 Nm	**2000**	317 126-44	317 126-43	**11**
QSY 2E – (page 7 – 76)	15.3 Nm	**3000**	317 126-54	317 126-53	**11**
QSY 2G – (page 7 – 78)	20.0 Nm	2000	317 127-44	317 127-43	**11**
QSY 155B – (page 7 – 80) with ERN 1387 with EQN 1325	13 Nm	3000	 339 880-04 339 880-54	 339 880-03 339 880-53	**12**
QSY 155C – (page 7 – 82) with ERN 1387 with EQN 1325	17.7 Nm	3000	 365 308-04 365 308-54	 365 308-03 365 308-53	**12**
QSY 155D – (page 7 – 84) with ERN 1387 with EQN 1325	21.6 Nm	3000	 339 881-04 339 881-54	 339 881-03 339 881-53	**13**
QSY 155F – (page 7 – 86) with ERN 1387 with EQN 1325	26.1 Nm	3000	 339 882-04 339 882-54	 339 882-03 339 882-54	**13**
QSY 155B EcoDyn – (page 7 – 88) with ERN 1387 with EQN 1325	13.0 Nm	3000	 339 880-14 339 880-64	 339 880-13 339 880-63	**11**
QSY 155C EcoDyn – (page 7 – 90) with ERN 1387 with EQN 1325	17.7 Nm	3000	 365 308-14 365 308-64	 365 308-13 365 308-63	**11**
QSY 155D EcoDyn – (page 7 – 92) with ERN 1387 with EQN 1325	21.6 Nm	3000	 339 881-14 339 881-64	 339 881-13 339 881-63	**11**
QSY 155F EcoDyn – (page 7 – 94) with ERN 1387 with EQN 1325	26.1 Nm	3000	 339 882-14 339 882-64	 339 882-13 339 882-63	**13**
QSY 190C EcoDyn – (page 7 – 96) with ERN 1387 with ECN 1313	28.0 Nm	3000	 392 023-14 392 023-84	 392 023-13 392 023-83	**13**
QSY 190D EcoDyn – (page 7 – 98) with ERN 1387 with ECN 1313	38.0 Nm	3000	 392 024-14 392 024-84	 392 024-13 392 024-83	**13**
QSY 190F EcoDyn – (page 7 – 100) with ERN 1387 with ECN 1313	47.6 Nm	3000	 388 244-14 388 244-84	 388 244-13 388 244-83	**13**
QSY 190K EcoDyn – (page 7 – 102) with ERN 1387 with ECN 1313	62.5 Nm	3000	 392 025-14 392 025-84	 392 025-13 392 025-83	**18**

Designation	Stall torque (100 K)	Rated speed (rpm)	ID		Type of power cable[a]
			with brake	without brake	
QSY 112B – (page 7 – 110)	32.0 Nm	3000	331 144-04	331 144-03	**16**
QSY 112C – (page 7 – 112)	44.0 Nm	3000	331 145-04	331 145-03	**17**
QSY 112D – (page 7 – 114)	72.0 Nm	2000	344 736-14	344 736-13	**17**

a. The specification for the QSY power cables can be found in the table in the section "Power cables for HEIDENHAIN synchronous motors" on page 15.

7.2.3 Motors with Hollow Shaft, QAN xxxUH Series

Designation	Rated power	Rated speed	ID	Type of power cable[a]
QAN 200UH - (page 7 – 191)	10 kW	1500 rpm	536 257-18	**4**
QAN 260UH - (page 7 – 191)	22 kW	1500 rpm	536 259-13	**9**

a. The specification for the QAN power cables can be found in the table in the section "Power cables for HEIDENHAIN asynchronous motors" on page 14.

7.2.4 Cables and Connectors

Danger

Ensure appropriate strain relief of the connecting lines!

Never perform any work on the unit when it is under power!

Make sure the motor is properly grounded!

Make sure the toroidal cores are mounted correctly (when using the HEIDENHAIN UE 1xx, UE 2xx and UE 2xx B compact inverters)!

Note

For cable lengths longer than 15 m between motor and inverter, it may be necessary to take additional noise suppression measures.

Warning

Make sure the toroidal cores are mounted correctly (when using the HEIDENHAIN UE1xx, UE 2xx und UE 2xx B compact inverters)!

For cable lengths longer than 15 m between motor and inverter, it may be necessary to take additional noise suppression measures.

Power cables for HEIDENHAIN asynchronous motors

The following cables are available from HEIDENHAIN for connecting the asynchronous motors:

Note

All cables have a UL certification and are suited for use at ambient temperatures of up to 40 °C.
The conductor material consists of copper (Cu).

Type of power cable[a]	Cable	Type of cable	Diameter	Max. bending radius[b]	Type of installation
1	352 956-xx (complete)[c]	4 x 4 mm^2	13.7 mm	≥ 75 mm	B2
2	352 957-xx (complete)[c]	4 x 6 mm^2	15.1 mm	≥ 85 mm	B2
3	348 949-03 (in meters)	4 x 2.5 mm^2	12.1 mm	≥ 65 mm	B2
4	348 949-04 (in meters)	4 x 4 mm^2	14.1 mm	≥ 75 mm	B2
5	348 949-05 (in meters)	4 x 6 mm^2	15.6 mm	≥ 85 mm	B2
6	348 949-06 (in meters)	4 x 10 mm^2	20.9 mm	≥ 105 mm	B2
7	352 958-xx (complete)[c]	4 x 16 mm^2	26.5 mm	≥ 135 mm	B2
8	352 959-xx (complete)[c]	4 x 25 mm^2	30.5 mm	≥ 150 mm	B2
9	348 949-07 (in meters)	4 x 16 mm^2	27.3 mm	≥ 135 mm	B2
10	348 949-09 (in meters)	4 x 35 mm^2	35.5 mm	≥ 175 mm	B2
10[1]	348 949-09 (in meters)	4 x 35 mm^2	35.5 mm	≥ 175 mm	C and E

a. The assignment of the cables to the motors is shown in the table “Asynchronous Motors, QAN Series” on page 8.
b. For frequent flexing.
c. The following cable lengths are available:
5 m: xx = 05
7 m: xx = 07
10 m: xx = 10
12 m: xx = 12
15 m: xx = 15

Power cables for HEIDENHAIN synchronous motors

The following cables are available from HEIDENHAIN for connecting the synchronous motors:

Note

All cables have a UL certification and are suited for use at ambient temperatures of up to 40 °C.
The conductor material consists of copper (Cu).

Type of power cable[a]	Cable with connector at one end	Cable without connector	Type of cable	Diamete r	Max. bending radius[b]
11	352 960-xx[c]	348 948-01 (325 165-02)	4 x 1.5 mm^2 + 2 x 1 mm^2	12.5 mm	≥ 65 mm
12	352 962-xx[c]	348 948-01 (333 090-02)	4 x 1.5 mm^2 + 2 x 1 mm^2	12.5 mm	≥ 65 mm
13	352 963-xx[c]	348 948-03 (333 090-02)	4 x 4 mm^2 + 2 x 1 mm^2	14.8 mm	≥ 75 mm
14	352 961-xx[c]	348 948-01 (325 165-04)	4 x 1.5 mm^2 + 2 x 1 mm^2	12.5 mm	≥ 65 mm
15	352 950-xx[c]	–	4 x 2.5 mm^2 + 2 x 1 mm^2	13.3 mm	≥ 65 mm
16	352 952-xx[c]	348 948-04	4 x 6 mm^2 + 2 x 1 mm^2	16.4 mm	≥ 85 mm
17	352 953-xx[c]	348 948-05	4 x 10 mm^2 + 2 x 1 mm^2	21.0 mm	≥ 105 mm
18	393 570-xx[c]	348 948-04 (333 090-03)	4 x 6 mm^2 + 2 x 1 mm^2	16.4 mm	≥ 85 mm

a.The assignment of the cables to the motors can be found in the table "Synchronous Motors, QSY Series" on page 9 or "**SIEMENS Synchronous Motors, 1FK7xxx Series – (page 7 – 226)**.".
b. For frequent flexing.
c. The following cable lengths are available:
5 m: xx = 05
7 m: xx = 07
10 m: xx = 10
12 m: xx = 12
15 m: xx = 15

Encoder cable for asynchronous motors

	Cable complete with connectors	Extension	Voltage controller 5 V	Type of cable	Diameter	Max. bending radius[a]
With ERN 1387						
Up to 30 m	289 440-xx	Extension 336 847-xx	–	PUR[b] 4 x 2 x 0.14 mm^2 + 4 x 0.5 mm^2 + 4 x 0.14 mm^2	8 mm	≥ 100 mm
Up to 60 m	289 440-xx	Extension 336 847-xx	370 226-01	PUR[b] 4 x 2 x 0.14 mm^2 + 4 x 0.5 mm^2 + 4 x 0.14 mm^2	8 mm	≥ 100 mm

a. For frequent flexing.
b. PUR = polyurethane

Encoder cables for synchronous motors

	Cable complete with connectors	Extension	Voltage controller 5 V	Type of cable	Diameter	Max. bending radius[a]
With ERN 1387						
Up to 30 m	289 440-xx	336 847-xx	–	PUR[b] 4 x 2 x 0.14 mm^2 + 4 x 0.5 mm^2 + 4 x 0.14 mm^2	8 mm	≥ 100 mm
Up to 60 m	289 440-xx	336 847-xx	370 226-01	PUR[c] 4 x 2 x 0.14 mm^2 + 4 x 0.5 mm^2 + 4 x 0.14 mm^2	8 mm	≥ 100 mm
With ECN 1313 or EQN 1325						
Up to 15 m	336 376-xx	–	–	PUR[d] 4 x 2 x 0.14 mm^2 + 4 x 0.5 mm^2 + 4 x 0.14 mm^2	8 mm	≥ 100 mm
Up to 60 m	336 376-xx	340 302-xx	370 224-01	PUR[e] 4 x 2 x 0.14 mm^2 + 4 x 0.5 mm^2 + 4 x 0.14 mm^2	8 mm	≥ 100 mm

a. For frequent flexing.
b. PUR = polyurethane
c. PUR = polyurethane
d. PUR = polyurethane
e. PUR = polyurethane

Fan cable for asynchronous motors

	Cable	Type of cable	Diameter	Max. bending radius[a]
QAN	348 949-01 (in meters)	PUR[b] 4 x 0.75 mm^2	10.1 mm	≥ 50 mm

a. For frequent flexing.
b. PUR = polyurethane

7.3 Different DC-Link Voltages

The dc-link voltages supplied by HEIDENHAIN inverter systems vary depending on the type of inverter system.

- Non-regenerative compact inverters: 565 V
- Regenerative compact inverters: 650 V
- Nonregenerative modular inverters: 565 V
- Regenerative modular inverters: 650 V

QSY synchronous motors

The characteristic curves for the HEIDENHAIN synchronous motors were determined at a dc-link voltage of 565 V or 650 V.

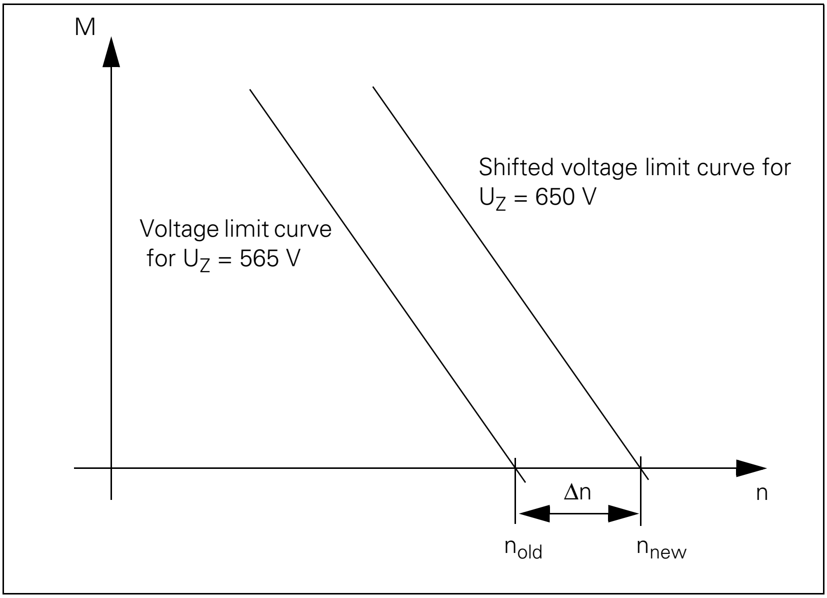
Operating the synchronous motor at a different dc-link voltage requires a parallel shift of the voltage limit curve.
The shift is calculated as follows:

$$\Delta n = n_{old} \cdot \frac{U_{Znew}}{U_{Zold}} - n_{old}$$

Example: $U_{Zold} = 565$ V, $U_{Znew} = 650$ V, $n_{old} = 3300$ rpm, $\Delta n = ?$, $n_{new} = ?$

$$\Delta n = 3300\ min^{-1} \cdot \frac{650\ V}{565\ V} - 3300\ min^{-1} = 497\ min^{-1}$$

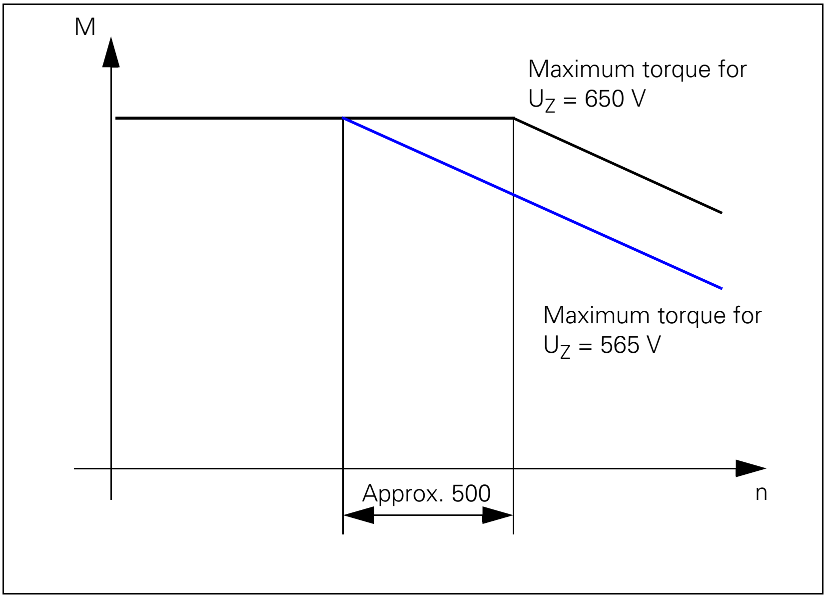
$$n_{new} = n_{old} + \Delta n = 3300 \text{ rpm} + 497 \text{ rpm} = 3797 \text{ rpm}$$



QSY EcoDyn synchronous motors

The characteristic curves of the HEIDENHAIN EcoDyn synchronous motors were determined at a dc-link voltage of 650 V.

If the EcoDyn synchronous motor is operated at a dc-link voltage of 565 V, a parallel shift of the downward sloping portion of the maximum-torque characteristic curve by approx. 500 rpm to the left is required.



QAN asynchronous motors

The characteristic curves for the HEIDENHAIN asynchronous motors were determined at a dc-link voltage of 565 V or 650 V. If a motor is operated at a different dc-link voltage, the characteristic curve must be adjusted.

If the power characteristic lies above the breakdown-torque speed, it must be multiplied by a factor k.

$$P_{new} = P_{old} \cdot k$$

With

$$k = \frac{(U_{Znew})^2}{(U_{Zold})^2}$$

The torque characteristic above the breakdown-torque speed must be newly calculated as follows:

$$M_{new} = \frac{P_{new} \cdot 60}{2 \cdot \pi \cdot n}$$

Example:

QAN 134B: P_{old} = 12.0 kW at n = 7000 rpm (see diagram) and 565 V

P_{new} at n = 7000 rpm and 650 V
M_{new} at n = 7000 rpm and 650 V

$$k = \frac{(650\ V)^2}{(565\ V)^2} = 1{,}32$$

$$P_{new} = 12\ kW \cdot 1.32 = 15.84\ kW$$

$$M_{new} = \frac{15840\ W \cdot 60}{2 \cdot \pi \cdot 7000\ min^{-1}} = 21{,}60\ Nm$$

7.4 Power Connection of the HEIDENHAIN Motors

7.4.1 Synchronous Motors

Note

The shielded line for the holding brake included in the power cable must have intermediate terminals and the shield should be kept as close as possible to ground.

Series QSY 96, QSY 10, QSY 20, QSY 116, QSY 130, QSY 155 and QSY 190

The power connection of the HEIDENHAIN synchronous motors QSY 96, QSY 10, QSY 20, QSY 116 and QSY 155 is made via a 6-pin flange socket.

Flange socket (male) 6-pin	Assignment	Connector (female) 6-pin	Power cable	Inverter Terminal 3-pin
1	U	1	Black 1	U
2	V	2	Black 2	V
⏚	PE		GN/YL	
4	+24 V (brake)	4	Black 6	Intermediate terminals
5	0 V (brake)	5	Black 5	Intermediate terminals
6	W	6	Black 3	W

QSY 041B, QSY 071B and QSY 090B

The power connection of the HEIDENHAIN synchronous motors QSY 041B, QSY 071B and QSY 090B is made via a 9-pin flange socket.

Flange socket (male) 9-pin	Assignment	Connector (female) 9-pin	Power cable	Inverter Terminal 3-pin
A	U	A	Black 1	U
B	V	B	Black 2	V
C	W	C	Black 3	W
D	PE	⏚	GN/YL	
F	+24 V (brake)	F	Black 6	Intermediate terminals
G	0 V (brake)	G	Black 5	Intermediate terminals
E, H, L	Do not assign	E, H, L	Do not assign	Do not assign

QSY 093B and QSY 112 motors

The power connection of the HEIDENHAIN synchronous motors QSY 093 B and QSY 112 is made via an 11-pin flange socket.

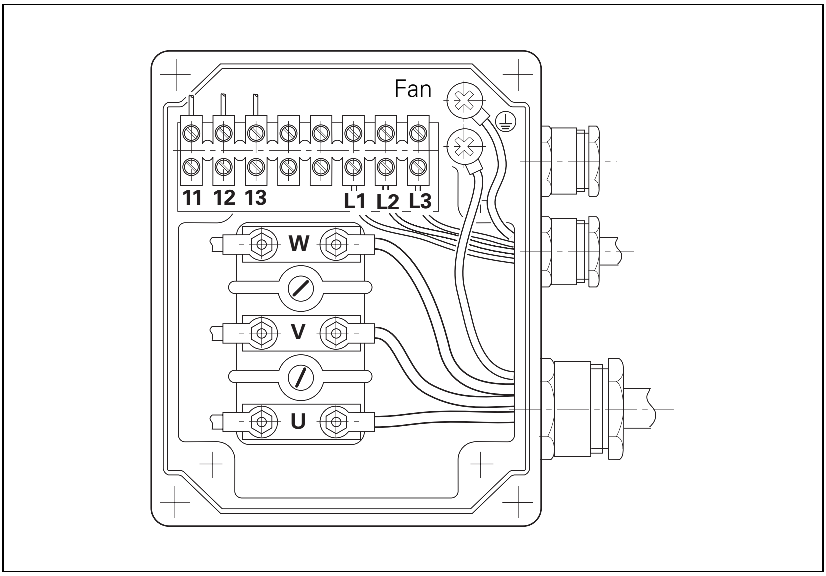
Flange socket (male) 11-pin	Assignment	Connector (female) 11-pin	Power cable	Inverter Terminal 3-pin
A	U	A	Black 1	U
B	V	B	Black 2	V
C	W	C	Black 3	W
D	PE	⏚	GN/YL	
F	+24 V (brake)	F	Black 6	Intermediate terminals
G	0 V (brake)		Black 5	Intermediate terminals
E, H, J, K	Do not assign	E, H, J, K	Do not assign	Do not assign
L	Internal shield	L	Internal shield	Intermediate terminals

7.4.2 Asynchronous Motors

QAN 30 and QAN 4S series

The power connection of the HEIDENHAIN asynchronous motors QAN 30 and QAN 4S is made via a terminal box. The connections for the fan are also to be found in the terminal box. See "Connecting the Fan" on page 7–35.

Terminal box:



Terminal strip for motors	Power cable	Inverter Connecting terminal 3-pin
U	Black 1	U
V	Black 2	V
W	Black 3	W
⏚	GN/YL	

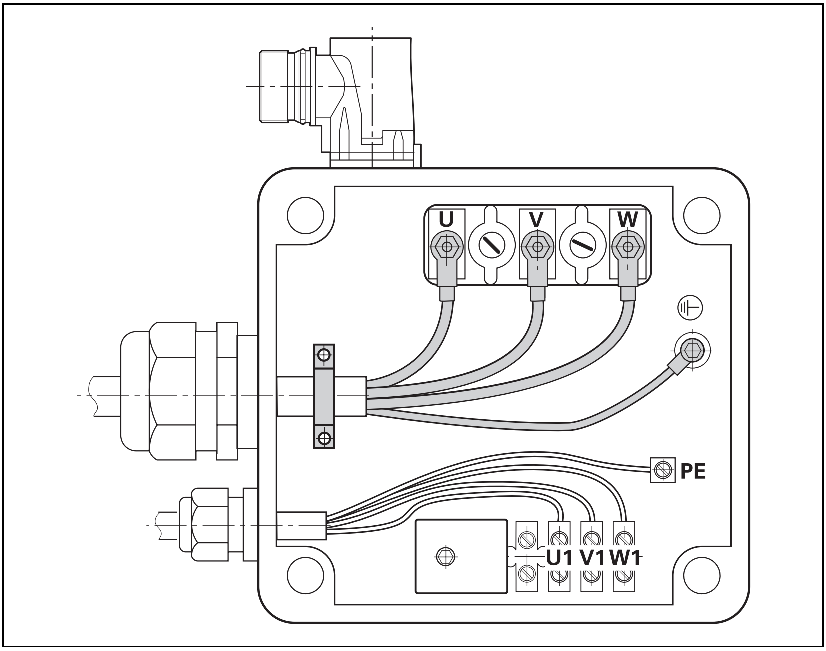
Warning

Do not use connections 11, 12 and 13.
They only serve the purpose of leading the temperature sensors lines through the motor.

QAN 200, QAN 260 series

The power connection of the HEIDENHAIN asynchronous motors QAN 200 and QAN 260 is made via a terminal box. The connections for the fan are also to be found in the terminal box. See "Connecting the Fan" on page 7–35.

Terminal box:



Terminal strip for motors	Power cable	Inverter Connecting terminal 3-pin
U	Black 1	U
V	Black 2	V
W	Black 3	W
⏚	GN/YL	

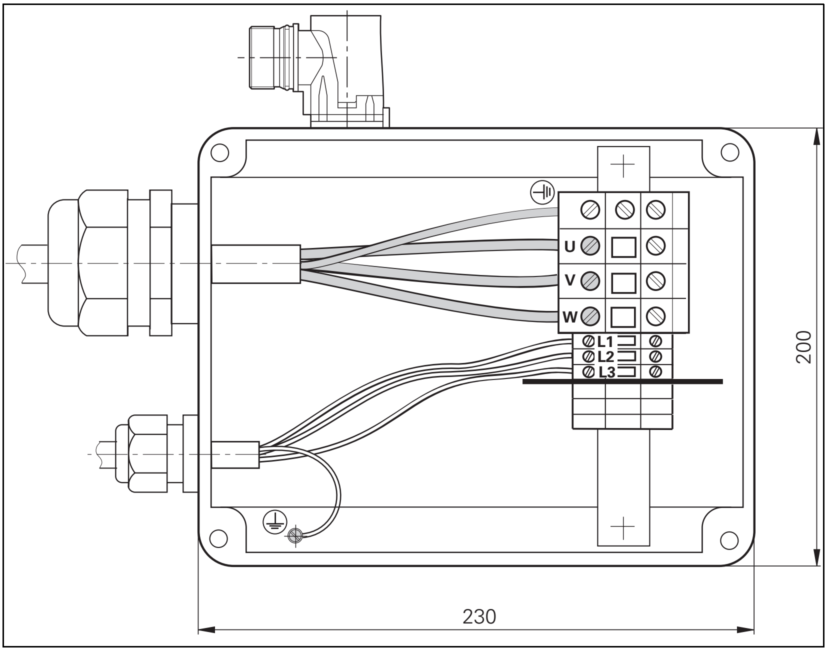
Warning

Do not use any connections other than U, V, W, U1, V1 and W1. They only serve the purpose of leading the temperature sensor lines through the motor.

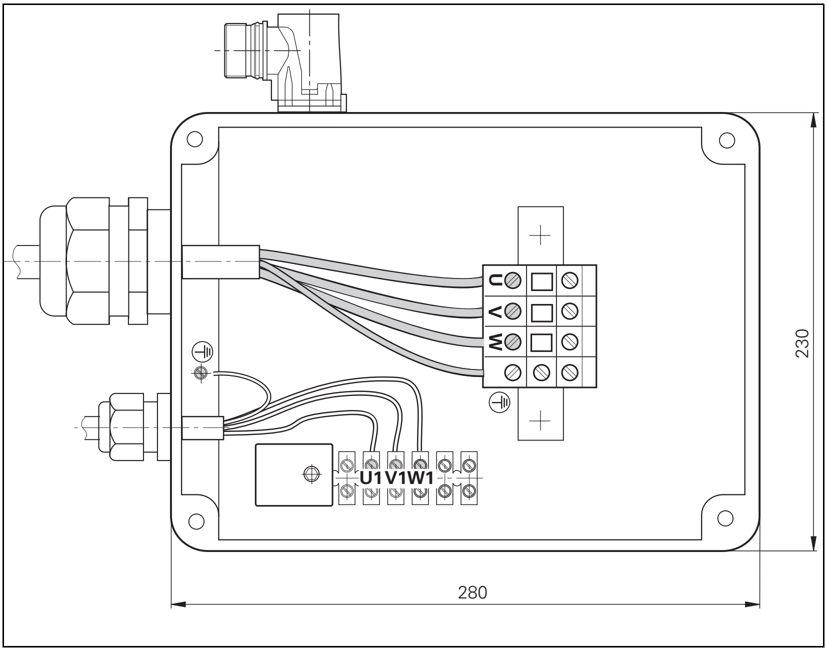
QAN 320 series

The power connection of the HEIDENHAIN asynchronous motors QAN 320 is made via a terminal box. The connections for the fan are also to be found in the terminal box. See "Connecting the Fan" on page 7–35.

Terminal box for QAN 320M, QAN 320W, QAN 320L as of August 2006:



Terminal box for QAN 320M, QAN 320 W until August 2006:



Terminal strip for motors	Power cable	Inverter Connecting terminal 3-pin
U	Black 1	U
V	Black 2	V
W	Black 3	W
⏚	GN/YL	

Warning

Do not use any connections other than U, V, W, U1/L1, V1/L2 and W1/L3. They only serve the purpose of leading the temperature sensor lines through the motor.

QAN 104, QAN 134 and QAN 164B series

The power connection of the HEIDENHAIN asynchronous motors QAN 104, QAN 134 and QAN 164B is made via an 11-pin flange socket.

Flange socket (male) 11-pin	Assignment	Connector (female) 11-pin	Power cable	Inverters Terminal 3-pin
A	U	A	Black 1	U
B	V	B	Black 2	V
C	W	C	Black 3	W
D	PE	D	GN/YL	⏚
E to L	Do not assign			

7.5 Connecting the Speed Encoders

All HEIDENHAIN motors are equipped with HEIDENHAIN speed encoders. The speed encoder signals and the signals from the temperature sensors are transmitted via a 17-pin flange socket.

1-V_{PP} speed encoder

Pin layout:

Motor flange socket (male) 17-pin	Assignment	Cable for speed encoder (ID 289 440-xx) Connector (female) 17-pin	Color	D-sub connector (male) 25-pin
1	A+	1	GN/BK	3
2	A–	2	YL/BK	4
3	R+	3	Red	17
4	D–	4	PK	22
5	C+	5	GN	19
6	C–	6	BN	20
7	0 V	7	WH/GN	2
8	Temperature +	8	YL	13
9	Temperature–	9	VI	25
10	5 V	10	BN/GN	1
11	B+	11	BL/BK	6
12	B–	12	RD/BK	7
13	R–	13	BK	18
14	D+	14	GY	21
15	0-V sensor	15	WH	16
16	5-V sensor	16	BL	14
17	Internal shield	17	Internal shield	8
Housing	External shield	Housing	External shield	Housing
			Free	5, 9, 10, 11, 12, 15, 23, 24

Danger

The interface complies with the requirements of IEC 61800-5-1 for "low voltage electrical separation."

An adapter connector (ID: 544 703-01) is available for connecting spindle motors to the speed encoder input of the CC 42x. The adapter connector separates the pins 19, 20, 21 and 22 so that spindle motors, which need these pins (pins for the commutation signals of the speed encoder input) for additional signals, can be used without a modification of the encoder cables. Some manufacturers provide signals of additional temperature sensors, for example, which can however result in unjustified error messages or poor controllability of the spindle.

Speed encoder with EnDat interface

Pin layout:

Motor flange socket (male) 17-pin	Assignment	Cable for speed encoder (ID 336 376-xx)		
		Connector (female) 17-pin	Color	D-sub connector (male) 25-pin
1	A+	1	GN/BK	3
2	A–	2	YL/BK	4
3	Data	3	Red	15
4		4		
5	Clock	5	GN	10
6		6		
7	0 V (U_N)	7	WH/GN	2
8	Temperature +	8	YL	13
9	Temperature–	9	VI	25
10	+5 V (U_P)	10	BN/GN	1
11	B+	11	BL/BK	6
12	B–	12	RD/BK	7
13	$\overline{\text{Data}}$	13	BK	23
14	$\overline{\text{Clock}}$	14	BN	12
15	0 V (sensor line)	15	WH	16
16	+5 V (sensor line)	16	BL	14
17	Internal shield	17	Internal shield	8
Housing	External shield	Housing	External shield	Housing
			Free	5, 9, 11, 17, 18, 19, 20, 21, 22, 24

Danger

The interface complies with the requirements of IEC 61800-5-1 for "low voltage electrical separation."

7.6 Connecting the Holding Brake

The HEIDENHAIN synchronous motors can be supplied with a holding brake (optional).
The brake is a permanent-magnet single-disk brake, operated by direct current. It serves to hold the motor shaft at standstill.
The electrical connection of the brake is made via the power connection. See "Power Connection of the HEIDENHAIN Motors" on page 7–24.

Note

The brake is a holding brake and not a service brake.

When connecting the brake, particular attention should be paid to electrical noise immunity!

The brake is engaged when it is not under power. The rated voltage for releasing the brake is 24 V (± 10 %).

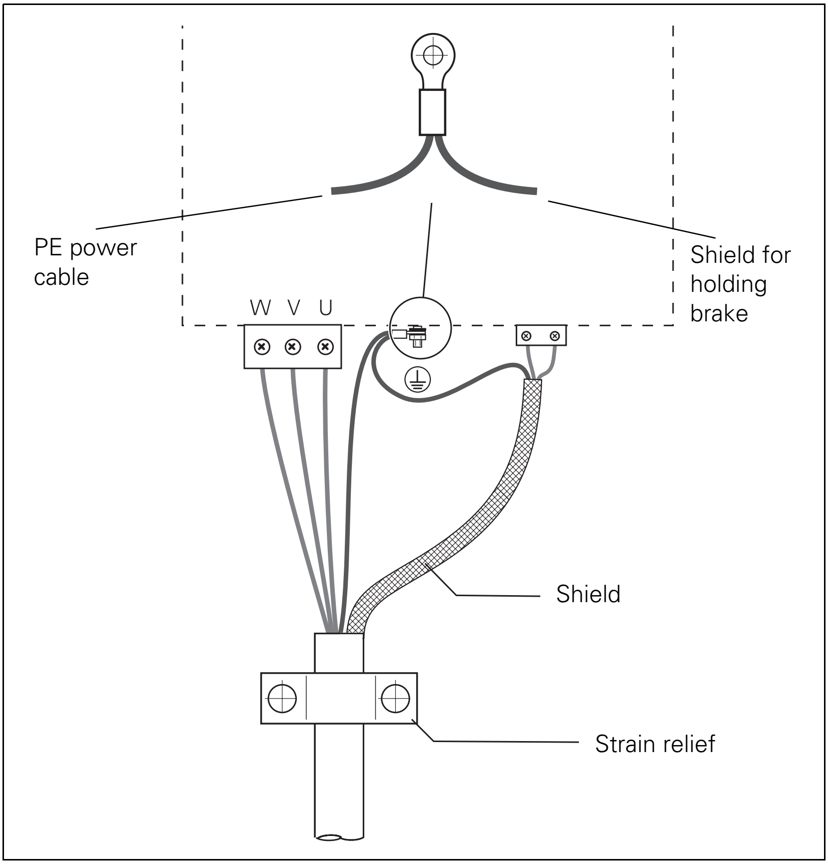
Warning

The holding brakes are permanent-magnet brakes! Observe the correct polarity of the dc voltage. Otherwise the brake will not be released.

The shield of the lines for the holding brake is to be kept as close as possible (< 30 mm) to ground. The best solution is to fasten the shield with a metal clamp directly onto the sheet-metal housing of the electrical cabinet.

Note

After mounting the motor you must verify the trouble-free functioning of the brake.

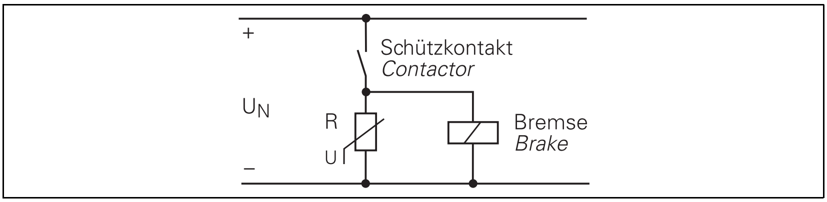


Due to the inductance of the holding brakes, a voltage peak that may exceed 1000 V occurs when the exciting current is switched off.

A protective circuit is not necessary if the holding brakes are controlled via the inverters, since the internal electronic switches limit the voltage.

To avoid the voltage peak that occurs when controlling the holding brakes by relay, use a protective circuit with an R varistor (recommended model: Q69-X3022).

The following circuitry is suggested for the protective circuit of the brake:



7.7 Connecting the Fan

The HEIDENHAIN asynchronous motors are fitted with axial fans (standard).

☞ **Note**

When connecting the fan, you must pay attention that the turning direction is correct: check the direction arrow on the fan housing.

You will find the electrical connecting values for the fan under the technical data of the HEIDENHAIN asynchronous motors (see chapter on HEIDENHAIN asynchronous motors, QAN series).

The fan can be supplied via a line with a cross section of 0.75 mm^2.

Series QAN 30, QAN 200, QAN 260, QAN 320 and QAN 4S

With the HEIDENHAIN asynchronous motors QAN 30, QAN 200, QAN 260, QAN 320 as well as with the QAN 4S, the fan is connected via the terminal box of the power connection. See “Power Connection of the HEIDENHAIN Motors” on page 7–24.

Terminal strip for fan	Assignment	Fan cable (ID 348 949-01)
U1 / L1	U	Black 1
V1 / L2	V	Black 2
W1 / L3	W	Black 3
⏚	PE	GN/YL

QAN 104 and QSY 112D series

With the HEIDENHAIN asynchronous motors of the series QAN 104 and the HEIDENHAIN synchronous motor QSY 112D, the fan is connected via a connector according to EN 175301-803 type A on the upper side of the motor. The connector is included in the items supplied with the motor. The fan may only be operated with 230 V!

Connctr. (female) 4-pin	Assignment	Fan cable (ID 309 683-02)
1	L1	Black 1
2	N	Black 2
3	Do not assign	
⏚	PE	GN/YL

QAN 134 series und QAN 164B

With the HEIDENHAIN asynchronous motors of the QAN 134 series and with QAN 164B, the fan is connected via a STAK3 Hirschmann connector on the B side of the motor. The connector is supplied with the motor.

Connctr. (female) 4-pin	Assignment	Fan cable (ID 348 949-01)
1	U	Black 1
2	V	Black 2
3	W	Black 3
⏚	PE	GN/YL

7.8 Mechanical Data

7.8.1 Mounting Flange and Design

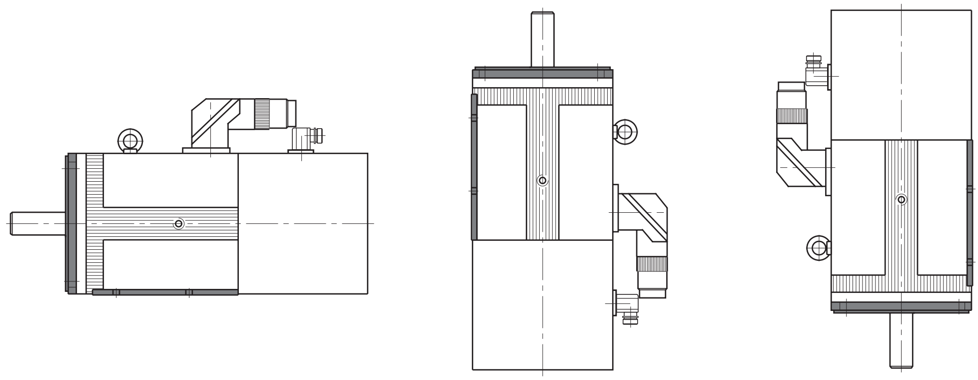
All HEIDENHAIN motors except the QSY 041B, QSY 071B and the QAN 104 series are equipped with a mounting flange according to DIN 42948 and IEC 72.

By mounting the motor via an attachment flange part of the power loss is dissipated via this flange. If the motor is mounted so that it is thermally insulated, which means that it cannot dissipate any heat through the flange, it is necessary to reduce the motor torque by approx. 5 to 15% to avoid overheating of the motor.

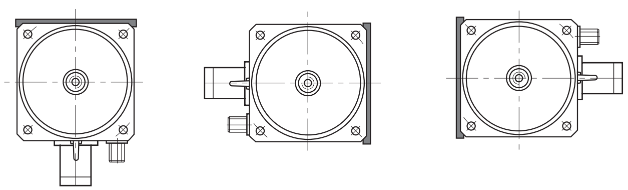
All indicated motor operating data refer to a maximum ambient temperature of +40 °C.
If you are using a motor with natural cooling, you must therefore ensure adequate heat dissipation. If the space in which the motor is mounted is too narrow (e.g. from a narrow frame or shaft), the dissipation of heat may be obstructed, which can lead to excessive heating of the motor.

The HEIDENHAIN synchronous motors are available in IM B5 design according to IEC 60 034-7; the asynchronous motors are available in IM B35 design according to IEC 60 034-7.

Design B35

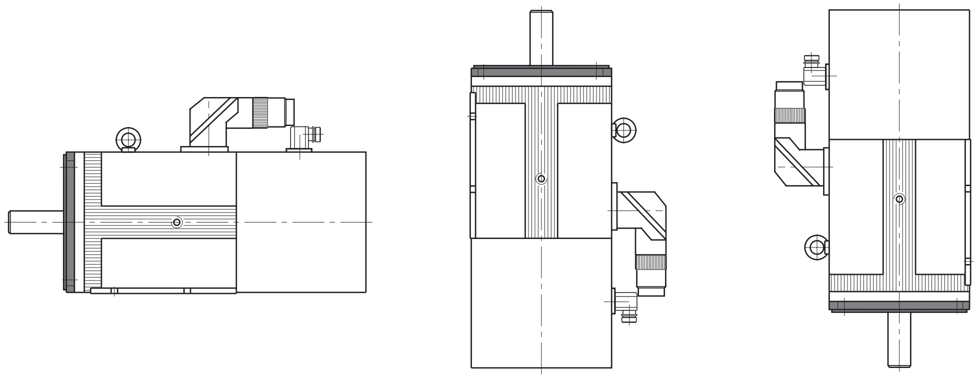


IM B35 IM V36 IM V15



IM B8 IM B7 IM B6

Design B5



7.8.2 Mounting the Motor

We recommend using the following screws according to ISO 4017 or ISO 4762 to mount the motors:

Motor	To secure the flange	To secure the block
QSY 041B	M10	–
QSY 10 series	ISO 4017 – M8 x 30 ISO 4762 – M8 x 25	–
QSY 96 series	M6	–
QSY 116 series	M8	–
QSY 071B	M10	–
QSY 20 series	ISO 4017 – M10 x 35 ISO 4762 – M10 x 35	–
QSY 130	M8	–
QSY 155 series	M10	–
QSY 190 series	ISO 4017 – M12 x 40	–
QSY 090B	M10	–
QSY 093B	M10	–
QSY 112 series	M12	–
QAN 104 series	M12	–
QAN 30 series, QAN 200 series, QAN 4S	ISO 4017 – M12 x 30	ISO 4017 – M10 x 30
QAN 260 series	ISO 4017 – M16 x 40	ISO 4017 – M10 x 35
QAN 320 series	ISO 4017 – M18 x 60	ISO 4017 – M14 x 40
QAN 134 series	M16	M10
QAN 164B	M16	M12

7.8.3 Shaft End

HEIDENHAIN motors have cylindrical shaft ends according to ISO-R775 and IEC 72.
Exceptions: QSY 041B and QSY 071B (see dimension drawings).

Vibration severity grade

The shaft of the motor has vibration severity grade S according to IEC60034. The motors QAN 200, QAN 260, QAN 320 comply with grade SR. These motors can be high-precision balanced externally.

Center holes

HEIDENHAIN motors have one center hole in the drive shaft.

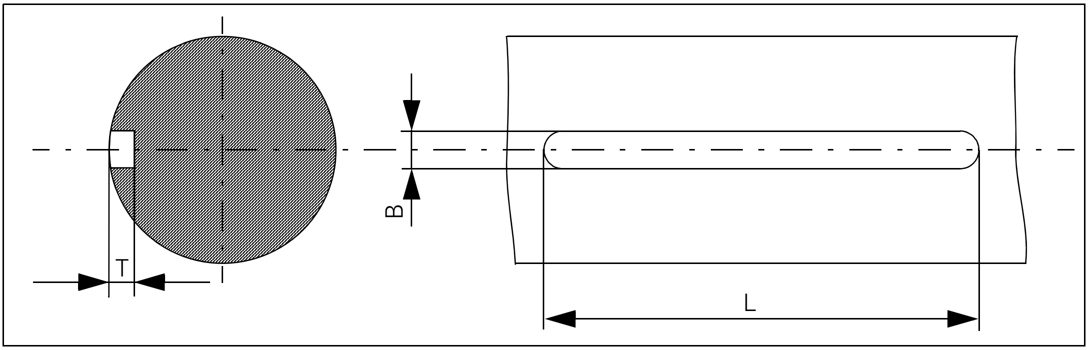
Motor	Center hole
QSY 041B	ISO 866 BS 5 M5 x 12.5
QSY 10 series	ISO 866 BS 5
QSY 071B	ISO 866 BS 5 M6 x 16
QSY 20 series	ISO 866 BS 5
QSY 96 series	ISO 866 BS 5 M6 x 15
QSY 116 series	ISO 866 BS 5 M8 x 20
QSY 130 series	ISO 866 BS 5 M8 x 20
QSY 155 series	ISO 866 BS 5 M12 x 30
QSY 190 series	ISO 866 BS 5 M12 x 30
QSY 090B	ISO 866 BS 5 M8 x 19
QSY 112 series, QSY 093B	ISO 866 BS 5 M10 x 22
QAN 104 series	DIN 332 - DR M8 x 19
QAN 30 series	DIN 332 - DR M12 x 28
QAN 200 series	DIN 332 - DR M12
QAN 260 series	DIN 332 - DR M12
QAN 320 series	DIN 332 – DR M20
QAN 134 series, QAN 4S	DIN 332 - DR M16 x 36
QAN 164B	DIN 332 - DS M20 x 42

Feather key

HEIDENHAIN synchronous motors are supplied without feather key as standard, and HEIDENHAIN asynchronous motors with feather key. The motors with feather key are full-key balanced.

Motors can be supplied with or without feather key upon request.

Motor	**Feather key**	**Slot dimensions**		
		L	**B**	**T**
QAN 104 series	DIN 6885-1 – A 10 x 8 x 45	45	10	5
QAN 30 series, QAN 200 series	DIN 6885-1 – E 10 x 8 x 70	70	10	5
QAN 260 series	DIN 6885-1 – AS 12 x 8 x 90	90	12	5
QAN 320 series	DIN 6885-1 – A 16 x 8 x 90	90	16	6
QAN 134 series	DIN 6885-1 – A 12 x 8 x 80	80	12	5
QAN 4S	DIN 6885-1 – A 12 x 8 x 100	100	12	5
QAN 164B	DIN 6885-1 – A 16 x 10 x 80	0	16	6



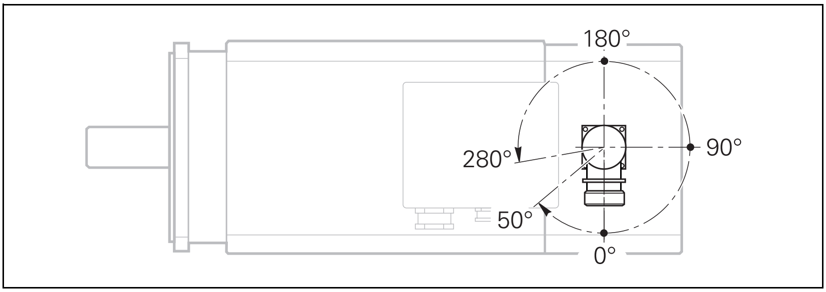
7.8.4 Rotatable Flange Sockets

The flange sockets in some HEIDENHAIN motors are rotatable within certain limits.

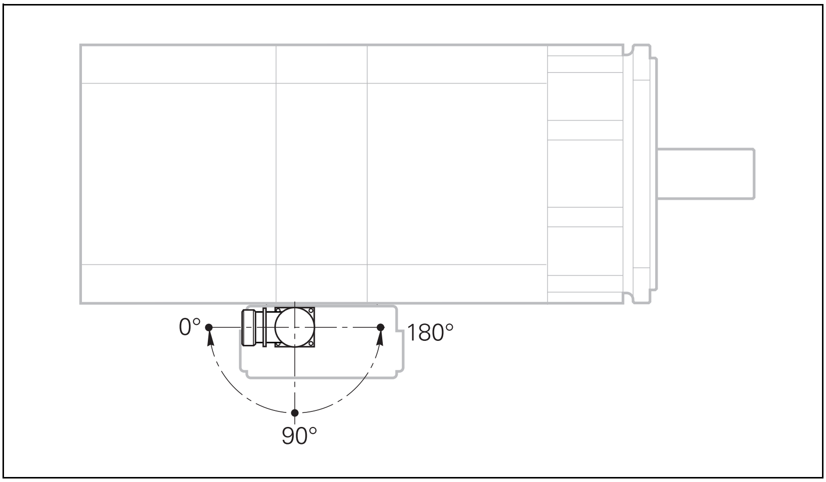
Asynchronous motors

QAN 4S

QAN 30 series

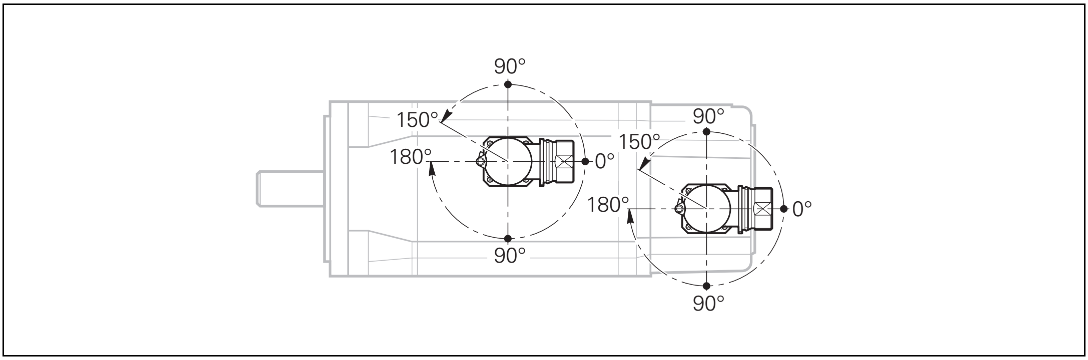


QAN 200 series
QAN 260 series
QAN 320 series

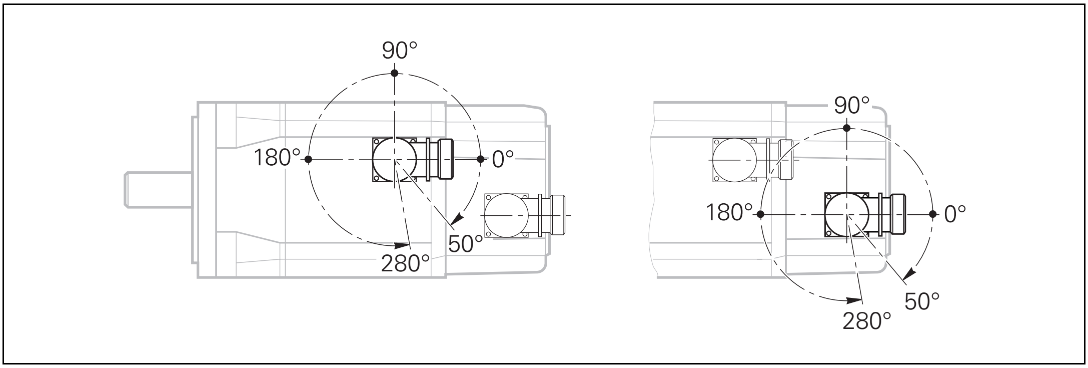


Synchronous motors

QSY 96 series
QSY 116 series
(starting mid-2002)



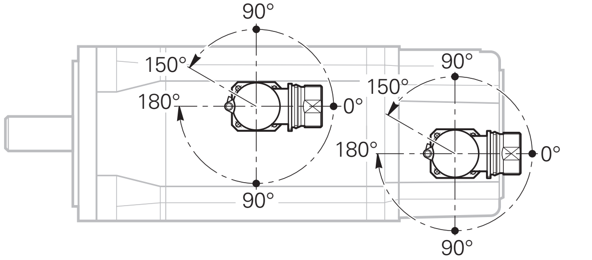
QSY 96 series
QSY 116 series
(until mid-2002)



QSY 130 series
QSY 155 series
QSY 190 series
(starting mid-2002)

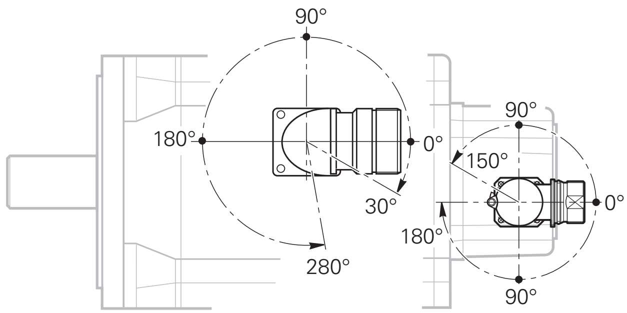
QSY 130C EcoDyn
QSY 130E EcoDyn

QSY 155B EcoDyn
QSY 155C EcoDyn
QSY 155D EcoDyn
QSY 155F EcoDyn

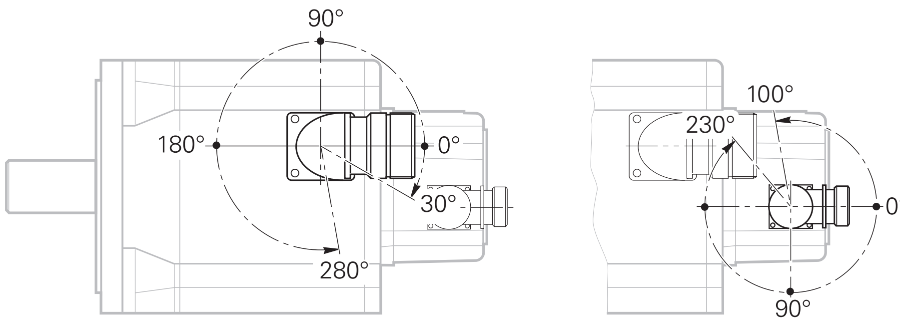


QSY 155B
QSY 155C
QSY 155D
QSY 155F

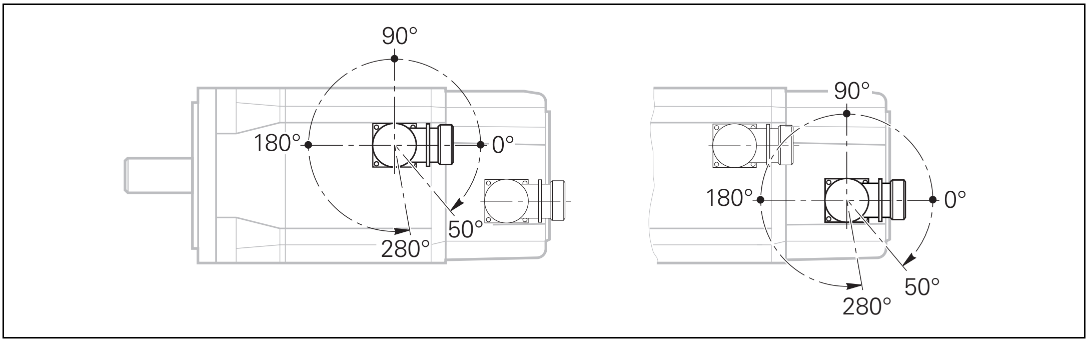
QSY 190C EcoDyn
QSY 190D EcoDyn
QSY 190F EcoDyn
QSY 190K EcoDyn



QSY 155 series
(until mid-2002)



QSY 10 series
QSY 20 series



7.9 HEIDENHAIN Synchronous Motors, QSY Series

The HEIDENHAIN synchronous motors have the following features:

- Sine commutation
- Incremental HEIDENHAIN ERN 1387 rotary encoder
  ECN 1313 absolute singleturn rotary encoder or EQN 1325 absolute multiturn rotary encoder for speed measurement for the QSY 96, QSY 116, QSY 130,QSY 155 and QSY 190 series (QSY 093B: RON 487)
- IM B5 design (mounting via flange) according to IEC 60 034-7
- Protection class IP 63 according to IEC 60 529 (shaft hole IP 64)
- Cylindrical shaft end according to ISO-R775 and IEC 72 (QSY 041B and QSY 071B see dimension drawing) with central bore hole according to ISO 866 with thread
- QSY 096, QSY 116, QSY 130, QSY 155 and QSY 190 series: Flange dimensions according to DIN 42 948 and IEC 72
- Maintenance-free bearing
- Natural cooling
- KTY 84-130 resistor probe for temperature monitoring in the stator winding
- Thermal class F
- Option: integrated holding brake (without much play <= 1°)

The following NC software versions are required for operation of the EcoDyn synchronous motors:

- iTNC 530: 340 420-06 and later
- MANUALplus 4110: 354 809-11 and later
- CNC PILOT 4290: 340 460-14, 362 796-10 and later

Note

In the performance diagrams, the characteristic curves from the data sheet are shown in an interrupted, lightface line.

In addition, each performance diagram shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Motors with absolute rotary encoders

If you are using synchronous motors with absolute rotary encoders (EQN 1325 or ECN 1313), remember to reduce the rated torque by approx. 10 %. The reason is the reduced maximum temperature of the rotary encoder. The stall torque and the maximum torque are not reduced.

7.9.1 Specifications – Synchronous Motors, QSY Series

QSY 041B

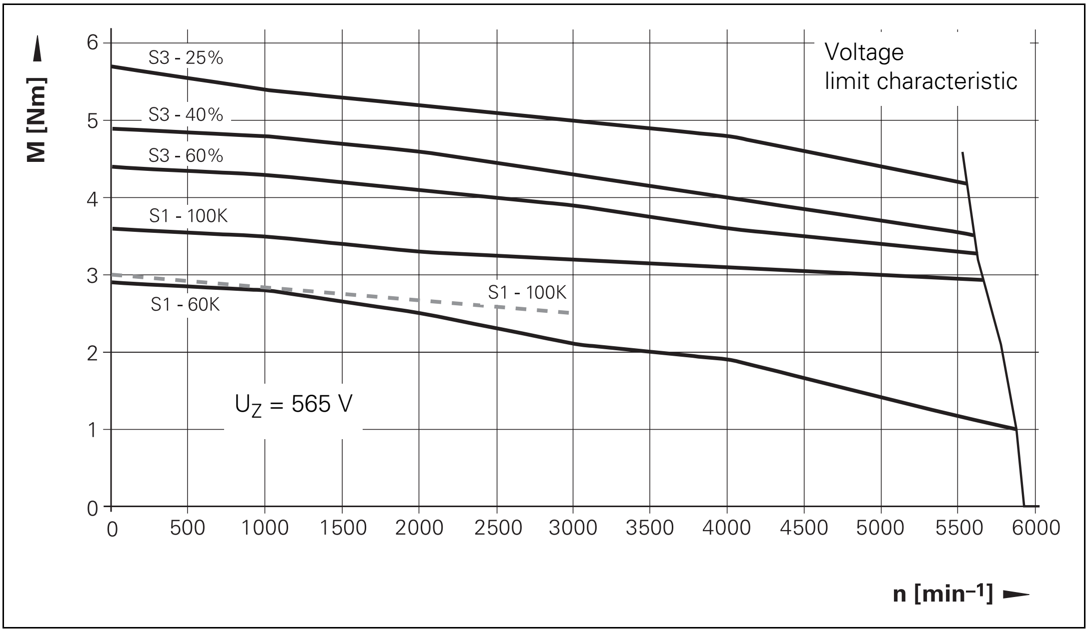
	QSY 041B with brake	**QSY 041B without brake**
Rated voltage U_N	244 V	
Rated power output P_N	0.8 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	2.5 Nm	
Rated current (100 K) I_N	2.8 A	
Stall torque (100 K) M_0	3.0 Nm	
Stall current (100 K) I_0	3.3 A	
Maximum current (for ≤200 ms) I_{max}	13.5 A	
Maximum torque (for ≤200 ms) M_{max}	11.3 Nm	
Pole pairs PP	3	
Weight m	4.7 kg	4.4 kg
Rotor inertia J	1.86 $kgcm^2$	1.7 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.4 A	–
Holding torque for brake M_{Br}	2.2 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 041B



QSY 1A

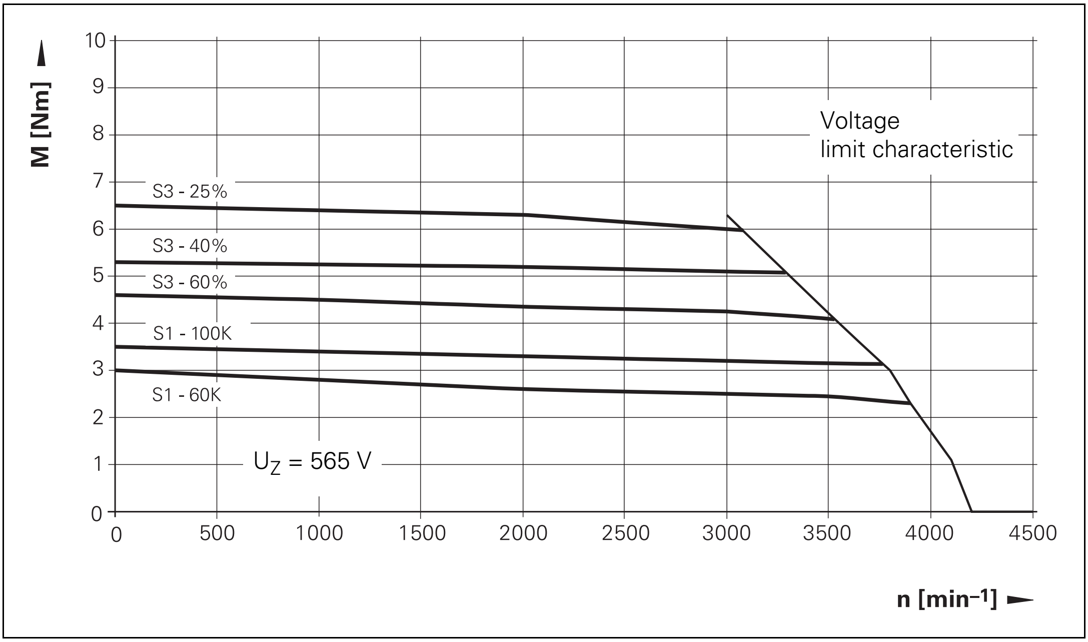
	QSY 1A with brake	QSY 1A without brake
Rated voltage U_N	316 V	
Rated power output P_N	1.0 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	3.2 Nm	
Rated current (100 K) I_N	2.1 A	
Stall torque (100 K) M_0	3.5 Nm	
Stall current (100 K) I_0	2.3 A	
Maximum current (for ≤200 ms) I_{max}	8.6 A	
Maximum torque (for ≤200 ms) M_{max}	11.0 Nm	
Pole pairs PP	3	
Weight m	8.2 kg	7.4 kg
Rotor inertia J	4.6 $kgcm^2$	4.3 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.5 A	–
Holding torque for brake M_{Br}	5.0 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 1A



QSY 1C

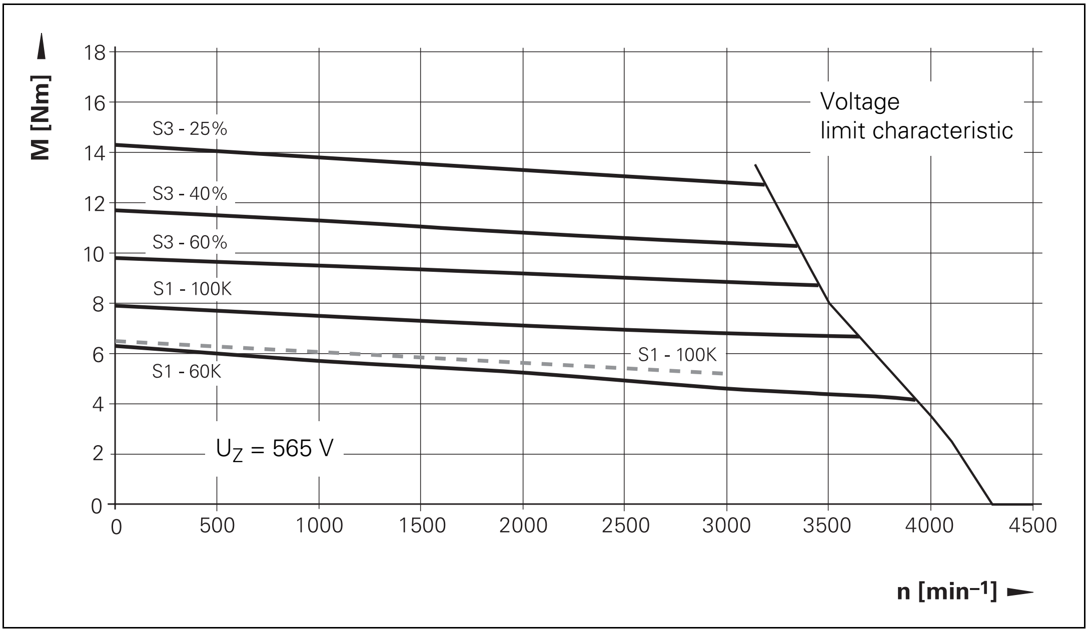
	QSY 1C with brake	QSY 1C without brake
Rated voltage U_N	299 V	
Rated power output P_N	1.6 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	5.2 Nm	
Rated current (100 K) I_N	3.4 A	
Stall torque (100 K) M_0	6.5 Nm	
Stall current (100 K) I_0	4.2 A	
Maximum current (for ≤200 ms) I_{max}	17.0 A	
Maximum torque (for ≤200 ms) M_{max}	22.0 Nm	
Pole pairs PP	3	
Weight m	10.7 kg	9.8 kg
Rotor inertia J	7.4 kgcm^2	7.0 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.5 A	–
Holding torque for brake M_{Br}	10.0 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 1C



QSY 1E

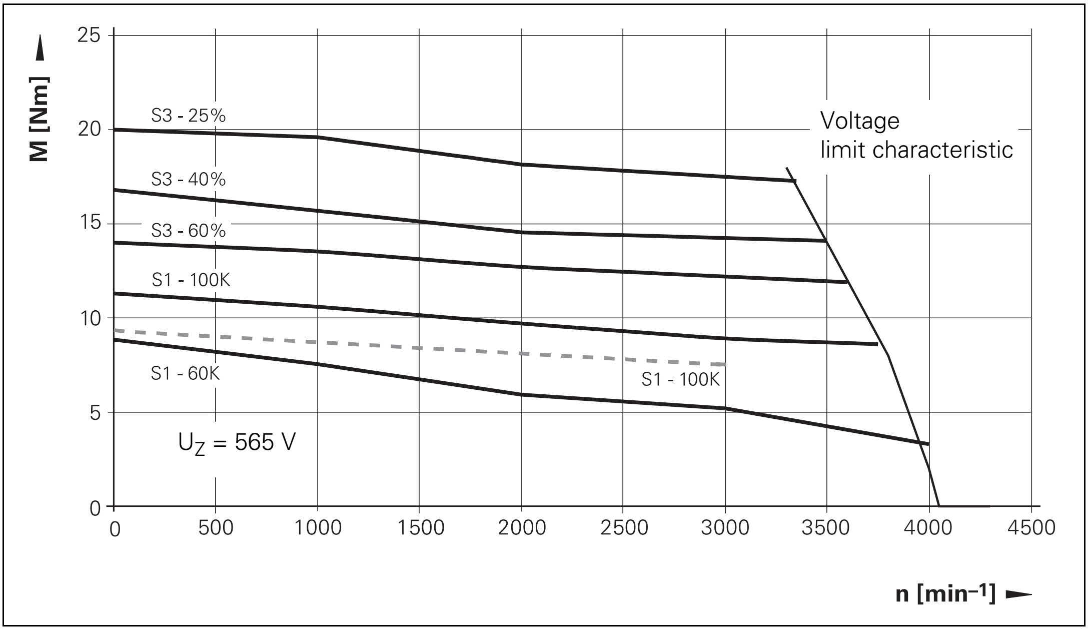
	QSY 1E with brake	QSY 1E without brake
Rated voltage U_N	295 V	
Rated power output P_N	2.4 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	7.6 Nm	
Rated current (100 K) I_N	4.9 A	
Stall torque (100 K) M_0	9.3 Nm	
Stall current (100 K) I_0	6.1 A	
Maximum current (for ≤200 ms) I_{max}	25.4 A	
Maximum torque (for ≤200 ms) M_{max}	33.0 Nm	
Pole pairs PP	3	
Weight m	13.1 kg	12.2 kg
Rotor inertia J	10.4 $kgcm^2$	10.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.5 A	–
Holding torque for brake M_{Br}	10.0 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 1E



QSY 96A

	QSY 96A with brake	**QSY 96A without brake**
Rated voltage U_N	303 V (300 V)[a]	
Rated power output P_N	0.50 kW (0.45 kW)[a]	
Rated speed n_N	4500 rpm	
Rated torque (100 K) M_N	1.05 Nm (0.95 Nm)[a]	
Rated current (100 K) I_N	1.1 A (1.0 A)[a]	
Stall torque (100 K) M_0	1.5 Nm	
Stall current (100 K) I_0	1.5 A	
Maximum current (for ≤200 ms) I_{max}	6.3 A	
Maximum torque (for ≤200 ms) M_{max}	5.5 Nm	
Maximum speed	6000 rpm	
Pole pairs PP	3	
Winding resistance (in one phase)	10.5 Ω	
Winding inductance (in one phase)	15 mH	
Weight m	4.5 kg	3.6 kg
Rotor inertia J	2.1 kgcm^2	1.8 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.5 A	–
Holding torque for brake M_{Br}	5.0 Nm	–

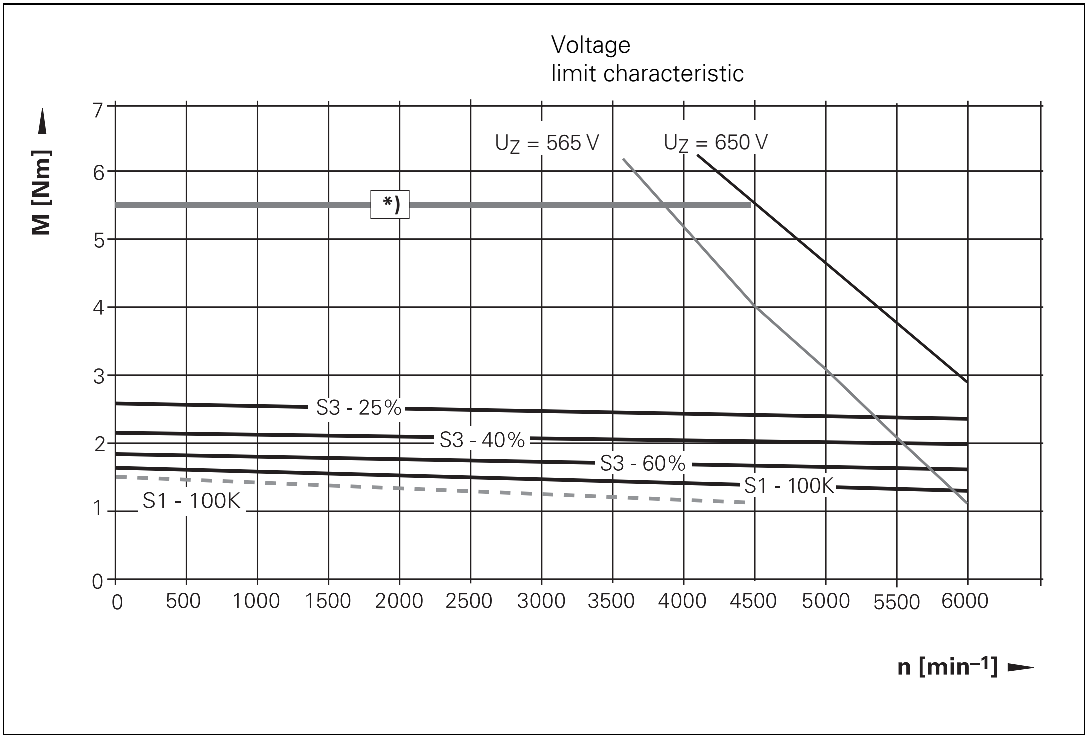
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 96A



*) M_{max} = 5.5 Nm when I_{max} = 6.3 A

QSY 96G

	QSY 96G with brake	**QSY 96G without brake**
Rated voltage U_N	288 V (287 V)[a]	
Rated power output P_N	1.4 kW (1.3 kW)[a]	
Rated speed n_N	4500 rpm	
Rated torque (100 K) M_N	3.0 Nm (2.7 Nm at 4500 rpm)[a] (4.1 Nm at 3000 rpm)	
Rated current (100 K) I_N	3.3 A (3.0 A)[a]	
Stall torque (100 K) M_0	5.2 Nm	
Stall current (100 K) I_0	5.2 A	
Maximum current (for ≤200 ms) I_{max}	25.4 A	
Maximum torque (for ≤200 ms) M_{max}	22.0 Nm	
Maximum speed	6000 rpm	
Pole pairs PP	3	
Winding resistance (in one phase)	1.20 Ω	
Winding inductance (in one phase)	3.20 mH	
Weight m	8.1 kg	7.2 kg
Rotor inertia J	6.6 kgcm^2	6.3 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.5 A	–
Holding torque for brake M_{Br}	5.0 Nm	–

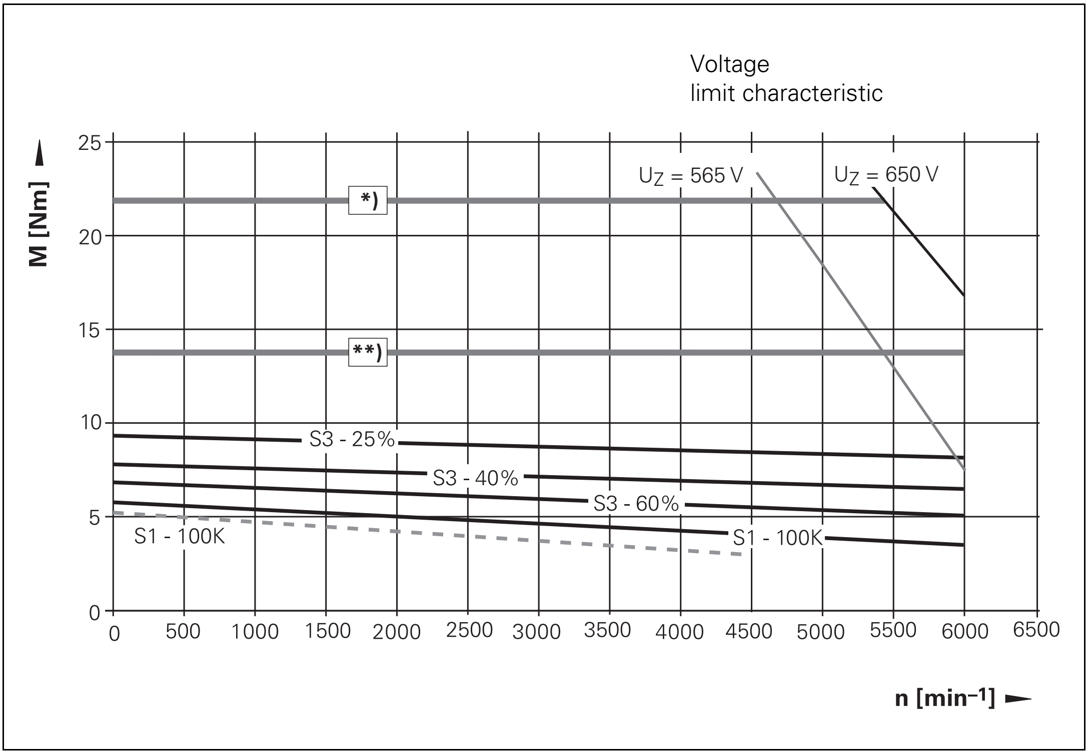
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 96G



*) M_{max} = 22 Nm when I_{max} = 25.4 A

**) M_{max} = 14 Nm when I_{max} = 15 A

QSY 071B

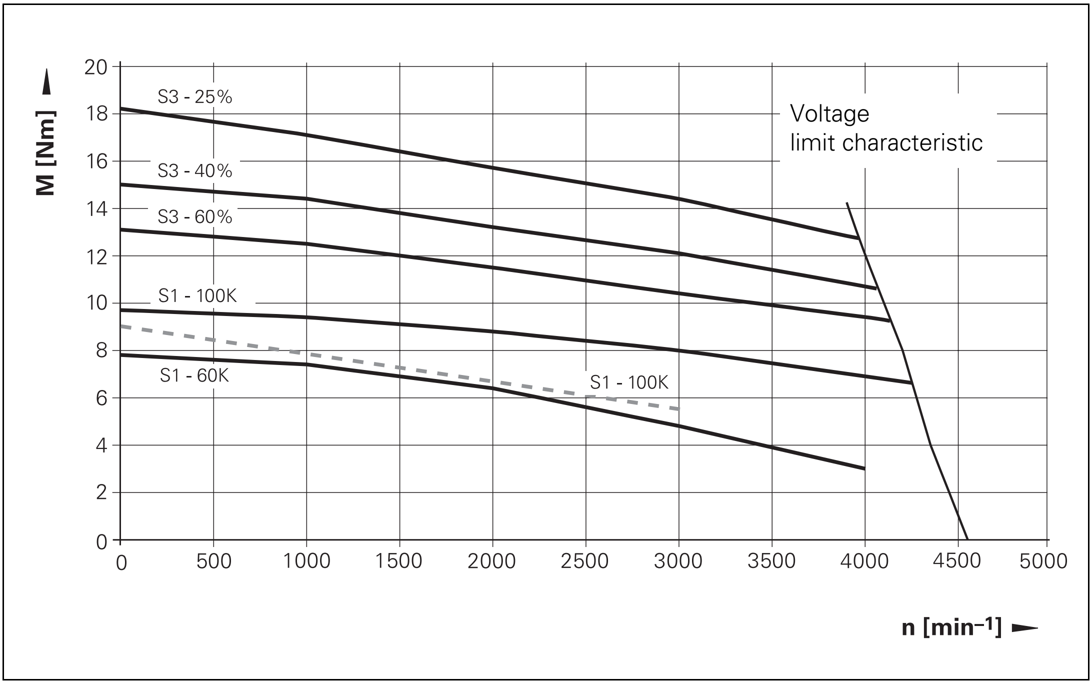
	QSY 071B with brake	QSY 071B without brake
Rated voltage U_N	323 V	
Rated power output P_N	1.7 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	5.5 Nm	
Rated current (100 K) I_N	4.4 A	
Stall torque (100 K) M_0	9.0 Nm	
Stall current (100 K) I_0	7.2 A	
Maximum current (for ≤200 ms) I_{max}	29.0 A	
Maximum torque (for ≤200 ms) M_{max}	32.0 Nm	
Pole pairs PP	4	
Weight m	9.17 kg	8.80 kg
Rotor inertia J	9.08 $kgcm^2$	8.70 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.6 A	–
Holding torque for brake M_{Br}	6.5 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 071B



QSY 116C

	QSY 116C with brake	**QSY 116C without brake**
Rated voltage U_N	306 V (303 V)[a]	
Rated power output P_N	1.45 kW (1.30 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	4.6 Nm (4.1 Nm)[a]	
Rated current (100 K) I_N	3.3 A (3.0 A)[a]	
Stall torque (100 K) M_0	5.2 Nm	
Stall current (100 K) I_0	3.4 A	
Maximum current (for ≤200 ms) I_{max}	12.7 A	
Maximum torque (for ≤200 ms) M_{max}	16.0 Nm	
Maximum speed	5400 rpm	
Pole pairs PP	3	
Winding resistance (in one phase)	3.80 Ω	
Winding inductance (in one phase)	13.50 mH	
Weight m	7.8 kg	6.9 kg
Rotor inertia J	7.9 kgcm^2	7.5 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.6 A	–
Holding torque for brake M_{Br}	13.5 Nm	–

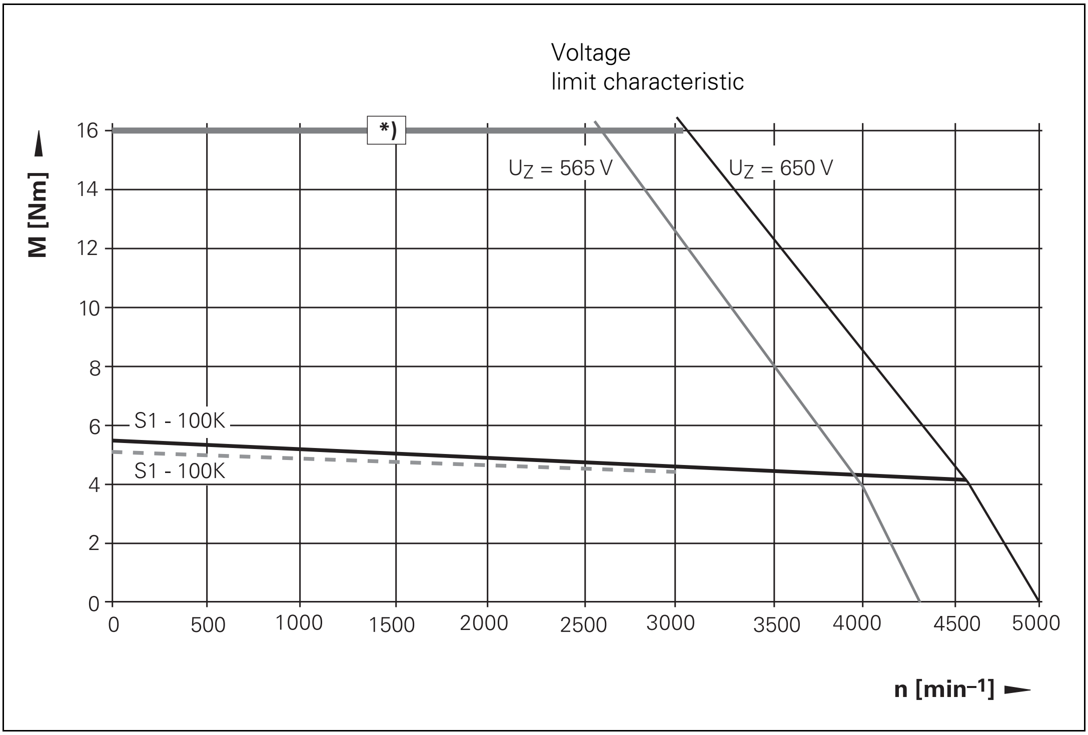
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 116C



*) M_{max} = 16 Nm when I_{max} = 12.7 A

QSY 116E

	QSY 116E with brake	QSY 116E without brake
Rated voltage U_N	296 V (294 V)[a]	
Rated power output P_N	1.85 kW (1.67 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	5.9 Nm (5.3 Nm)[a]	
Rated current (100 K) I_N	4.1 A (3.7 A)[a]	
Stall torque (100 K) M_0	7.2 Nm	
Stall current (100 K) I_0	4.8 A	
Maximum current (for ≤200 ms) I_{max}	19.0 A	
Maximum torque (for ≤200 ms) M_{max}	25.0 Nm	
Maximum speed	5400 rpm	
Pole pairs PP	3	
Winding resistance (in one phase)	2.05 Ω	
Winding inductance (in one phase)	8.50 mH	
Weight m	9.5 kg	8.6 kg
Rotor inertia J	10.3 $kgcm^2$	9.9 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	
Rated current for brake I_{Br}	0.6 A	–
Holding torque for brake M_{Br}	13.5 Nm	–

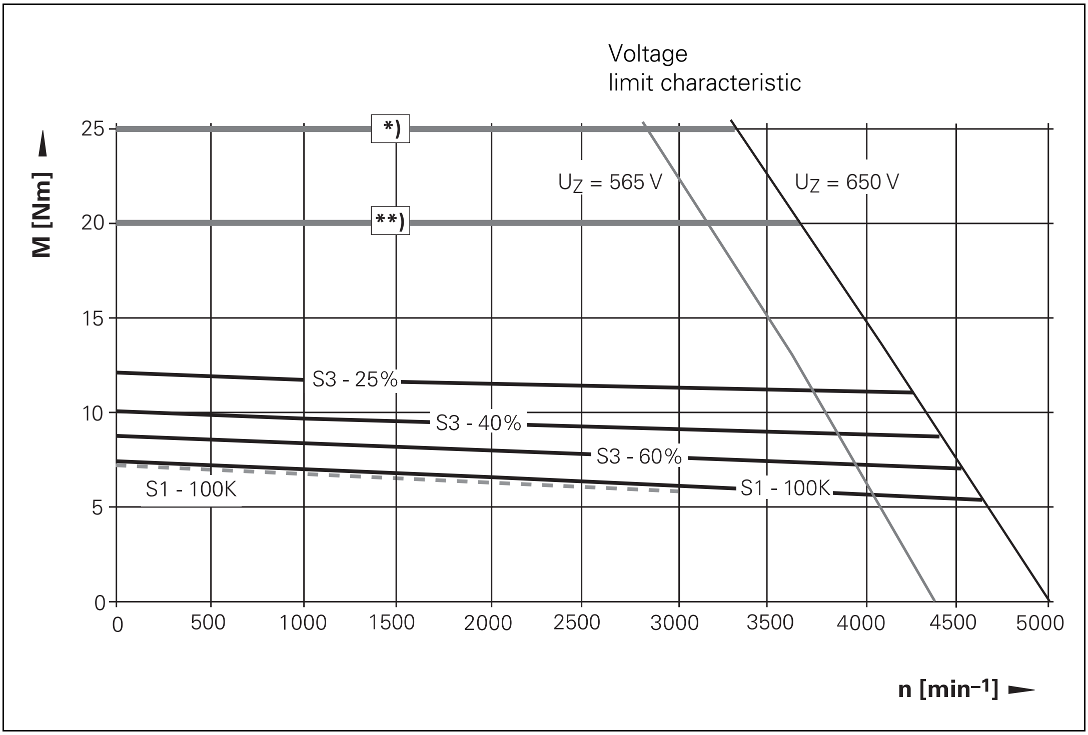
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 116E



*) M_{max} = 25 Nm when I_{max} = 19 A

**) M_{max} = 21 Nm when I_{max} = 15 A

QSY 116J

	QSY 116J with brake	QSY 116J without brake
Rated voltage U_N	287 V (286 V)[a]	
Rated power output P_N	2.42 kW (2.18 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	7.7 Nm (6.9 Nm)[a]	
Rated current (100 K) I_N	5.35 A (4.80 A)[a]	
Stall torque (100 K) M_0	10.0 Nm	
Stall current (100 K) I_0	6.8 A	
Maximum current (for ≤200 ms) I_{max}	32.6 A	
Maximum torque (for ≤200 ms) M_{max}	41.0 Nm	
Maximum speed	5400 rpm	
Pole pairs PP	3	
Winding resistance (in one phase)	0.85 Ω	
Winding inductance (in one phase)	4.75 mH	
Weight m	12.9 kg	12.0 kg
Rotor inertia J	15.4 $kgcm^2$	15.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.6 A	–
Holding torque for brake M_{Br}	13.5 Nm	–

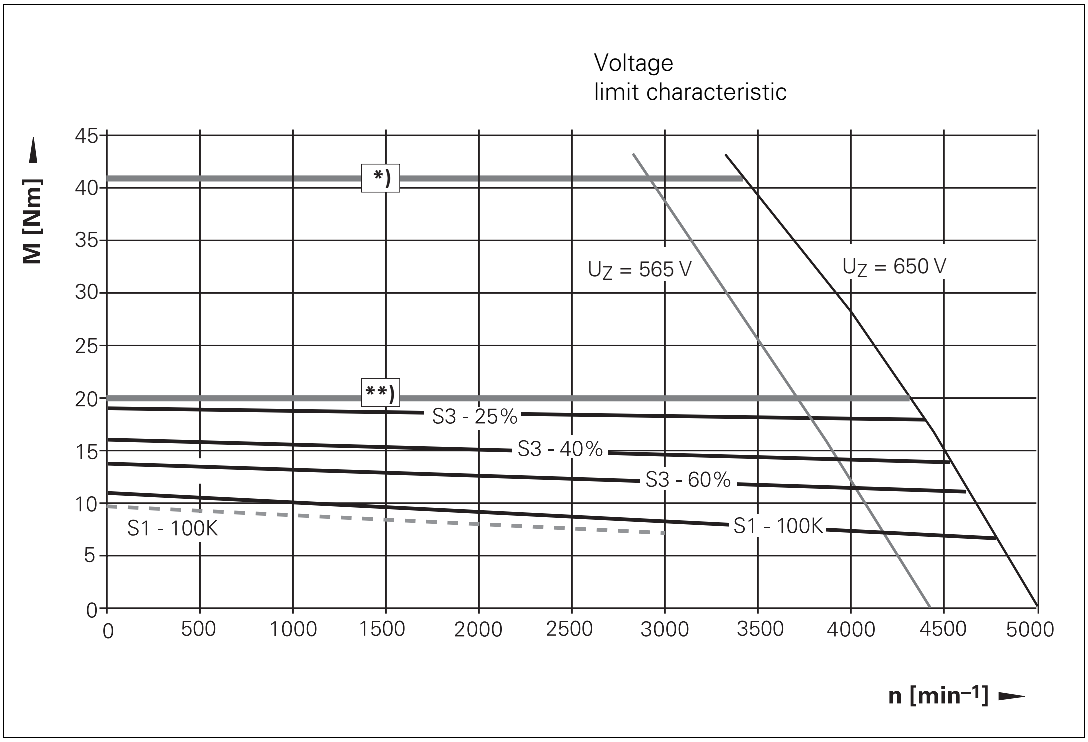
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 116J



*) M_{max} = 41 Nm when I_{max} = 32.6 A

**) M_{max} = 21 Nm when I_{max} = 15 A

QSY 116J EcoDyn

	QSY 116J EcoDyn with brake	QSY 116J EcoDyn without brake
Rated voltage U_N	401 V (399 V)[a]	
Rated power output P_N	2.64 kW (2.38 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	8.4 Nm (7.6 Nm)[a]	
Rated current (100 K) I_N	4.3 A (3.9 A)[a]	
Stall torque (100 K) M_0	10.0 Nm	
Stall current (100 K) I_0	5.0 A	
Maximum current (for ≤200 ms) I_{max}	23.0 A	
Maximum torque (for ≤200 ms) M_{max}	41.0 Nm	
Maximum speed	4200 rpm	
Pole pairs PP	3	
Winding resistance (in one phase)	1.93 Ω	
Winding inductance (in one phase)	8.6 mH	
Weight m	12.9 kg	12.0 kg
Rotor inertia J	15.4 $kgcm^2$	15.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.6 A	–
Holding torque for brake M_{Br}	13.5 Nm	–

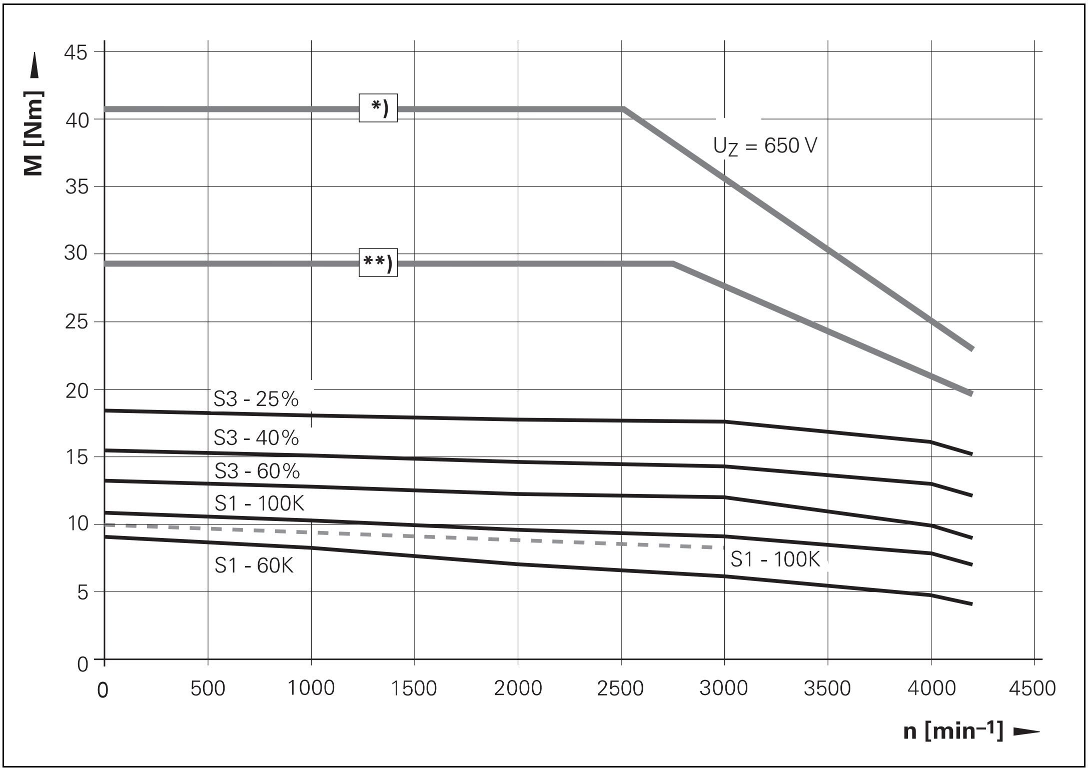
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 116J EcoDyn



*) M_{max} = 41 Nm when I_{max} = 23 A

**) M_{max} = 29 Nm when I_{max} = 15 A

QSY 130C EcoDyn

	QSY 130C EcoDyn with holding brake	**QSY 130C EcoDyn without holding brake**
Rated voltage U_N	408 V (404 V)[a]	
Rated power output P_N	1.6 kW (1.5 kW)[a]	
Rated speed n_N	3000 rpm (in EcoDyn mode)	
Rated torque (100 K) M_N	5.2 Nm (4.7 Nm)[a]	
Rated current (100 K) I_N	2.7 A (2.4 A)[a]	
Stall torque (100 K) M_0	6.0 Nm	
Stall current (100 K) I_0	3.0 A	
Maximum current (for ≤200 ms) I_{max}	8.6 A	
Maximum torque (for ≤200 ms) M_{max}	16 Nm	
Maximum speed	4200 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	3.85 Ω	
Winding inductance (in one phase)	13.5 mH	
Weight m	8.8 kg	7.9 kg
Rotor inertia J	16.4 $kgcm^2$	16.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.6 A	–
Holding torque for brake M_{Br}	13.5 Nm	–

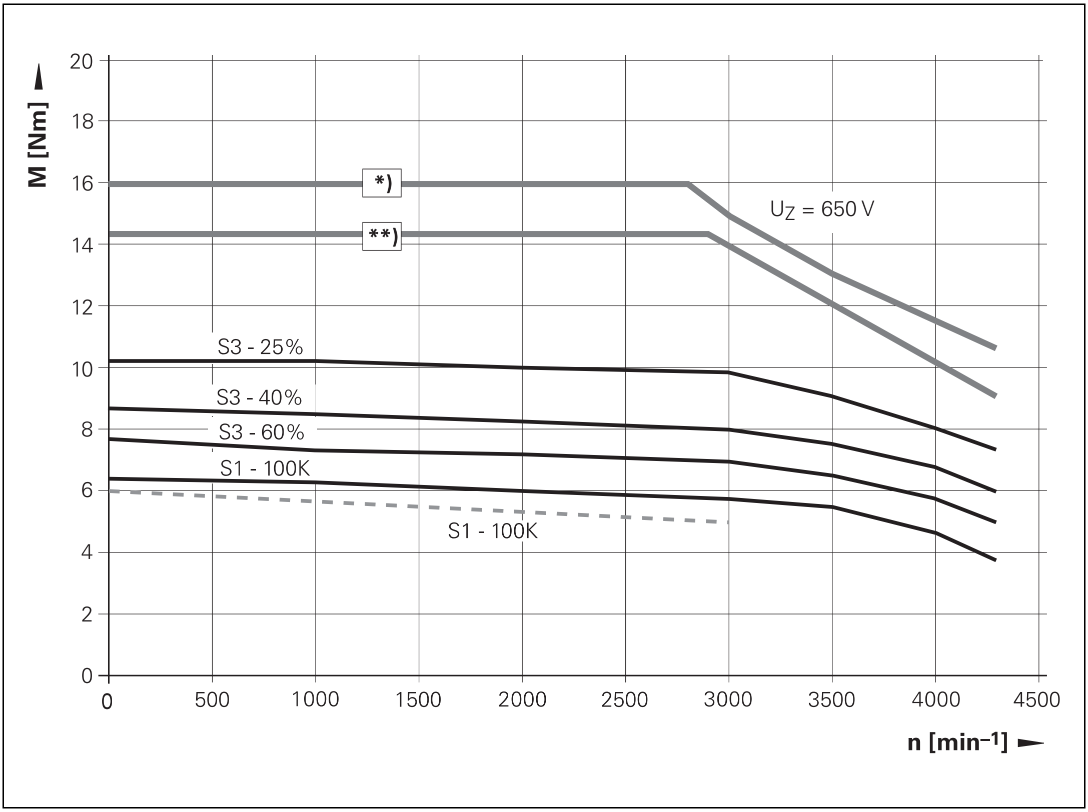
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 130C EcoDyn



*) M_{max} = 16 Nm when I_{max} = 8.6 A

**) M_{max} = 14.5 Nm when I_{max} = 7.5 A

QSY 130E EcoDyn

	QSY 130E EcoDyn with holding brake	**QSY 130E EcoDyn without holding brake**
Rated voltage U_N	401 V (399 V)[a]	
Rated power output P_N	2.3 kW (2.1 kW)[a]	
Rated speed n_N	3000 rpm (in EcoDyn mode)	
Rated torque (100 K) M_N	7.4 Nm (6.7 Nm)[a]	
Rated current (100 K) I_N	3.8 A (3.4 A)[a]	
Stall torque (100 K) M_0	9.0 Nm	
Stall current (100 K) I_0	4.5 A	
Maximum current (for ≤200 ms) I_{max}	12.7 A	
Maximum torque (for ≤200 ms) M_{max}	23 Nm	
Maximum speed	4200 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	2.0 Ω	
Winding inductance (in one phase)	8.5 mH	
Weight m	10.6 kg	9.7 kg
Rotor inertia J	21.4 kgcm^2	21.0 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.6 A	–
Holding torque for brake M_{Br}	13.5 Nm	–

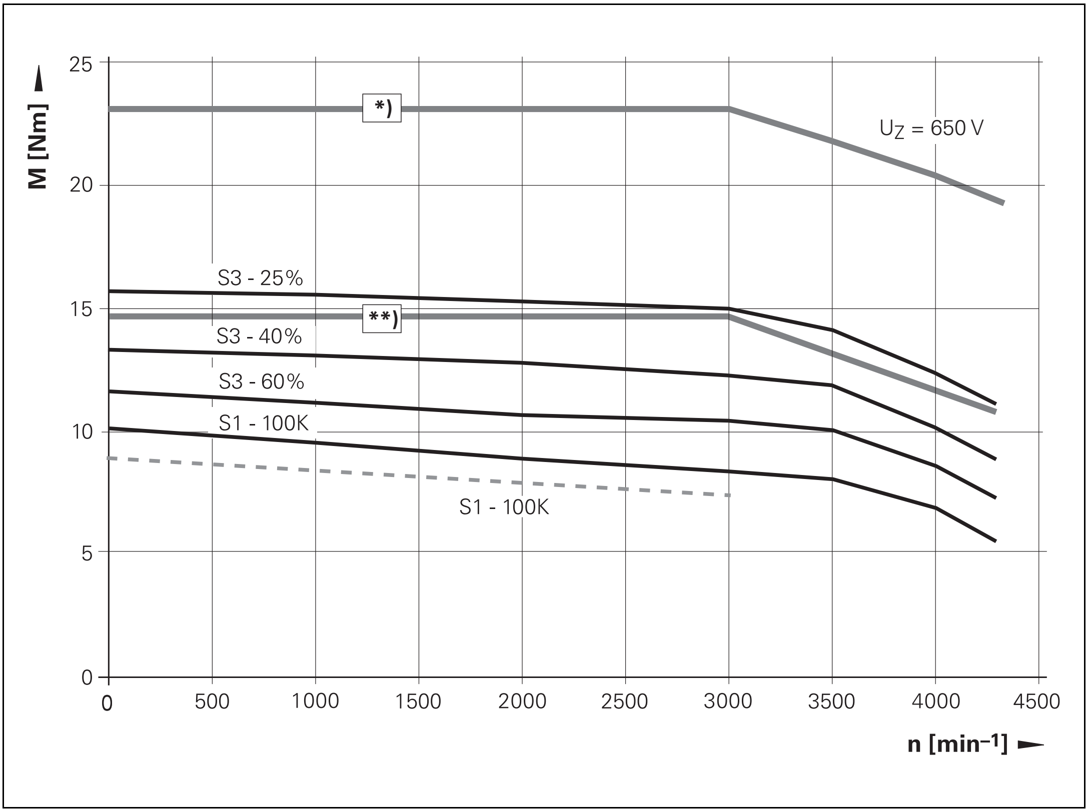
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 130E EcoDyn



*) M_{max} = 23 Nm when I_{max} = 12.7 A

**) M_{max} = 14.5 Nm when I_{max} = 7.5 A

QSY 2C

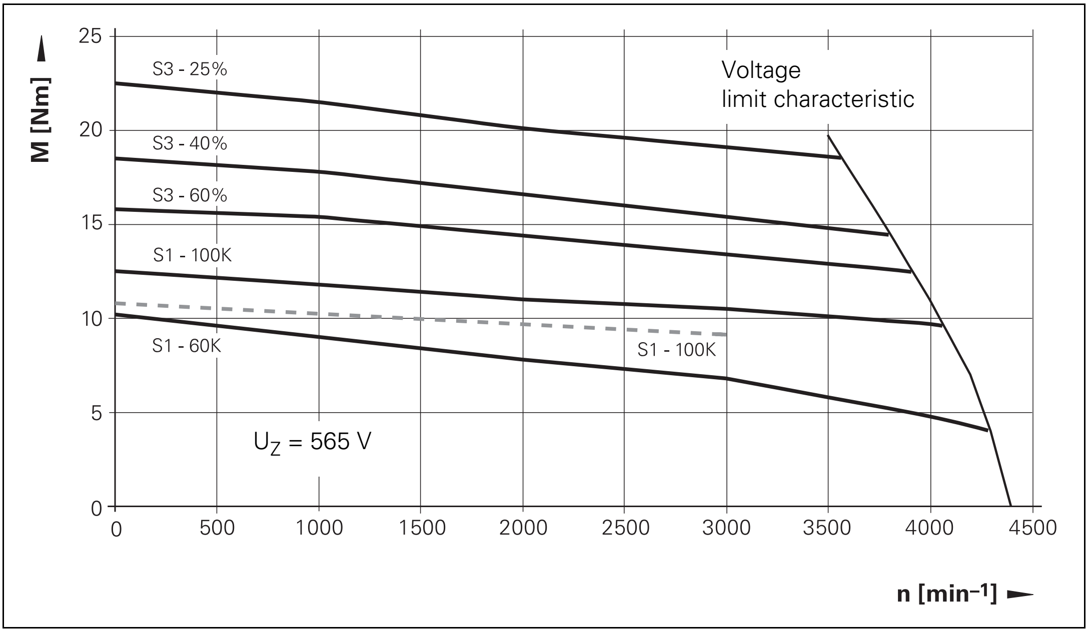
	QSY 2C with brake	**QSY 2C without brake**
Rated voltage U_N	299 V	
Rated power output P_N	2.7 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	8.6 Nm	
Rated current (100 K) I_N	5.9 A	
Stall torque (100 K) M_0	10.8 Nm	
Stall current (100 K) I_0	7.0 A	
Maximum current (for ≤200 ms) I_{max}	24.7 A	
Maximum torque (for ≤200 ms) M_{max}	30.0 Nm	
Pole pairs PP	3	
Weight m	17.4 kg	15.0 kg
Rotor inertia J	16.0 $kgcm^2$	14.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.0 A	–
Holding torque for brake M_{Br}	18.0 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 2C



QSY 2E

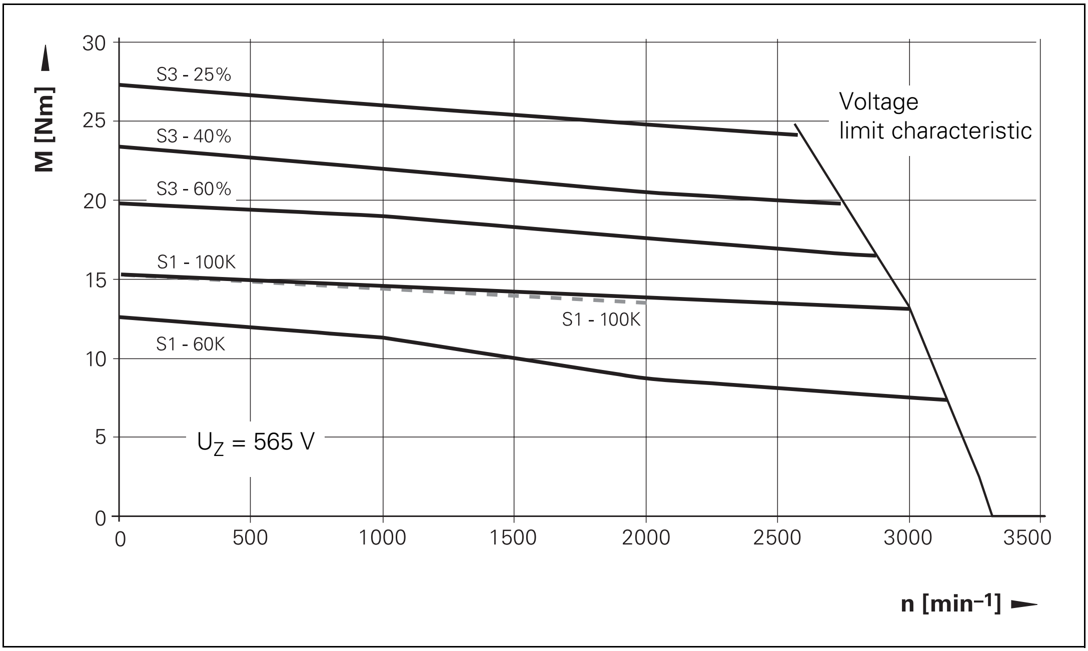
	QSY 2E (n_N = 2000 rpm) with brake	QSY 2E (n_N = 2000 rpm) without brake
Rated voltage U_N	275 V	
Rated power output P_N	2.8 kW	
Rated speed n_N	2000 rpm	
Rated torque (100 K) M_N	13.5 Nm	
Rated current (100 K) I_N	6.5 A	
Stall torque (100 K) M_0	15.3 Nm	
Stall current (100 K) I_0	7.3 A	
Maximum current (for ≤200 ms) I_{max}	28.3 A	
Maximum torque (for ≤200 ms) M_{max}	45.0 Nm	
Pole pairs PP	3	
Weight m	21.4 kg	19.0 kg
Rotor inertia J	24.0 kgcm^2	22.0 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.0 A	–
Holding torque for brake M_{Br}	18.0 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 2E (n_N = 2000 rpm)



QSY 2E

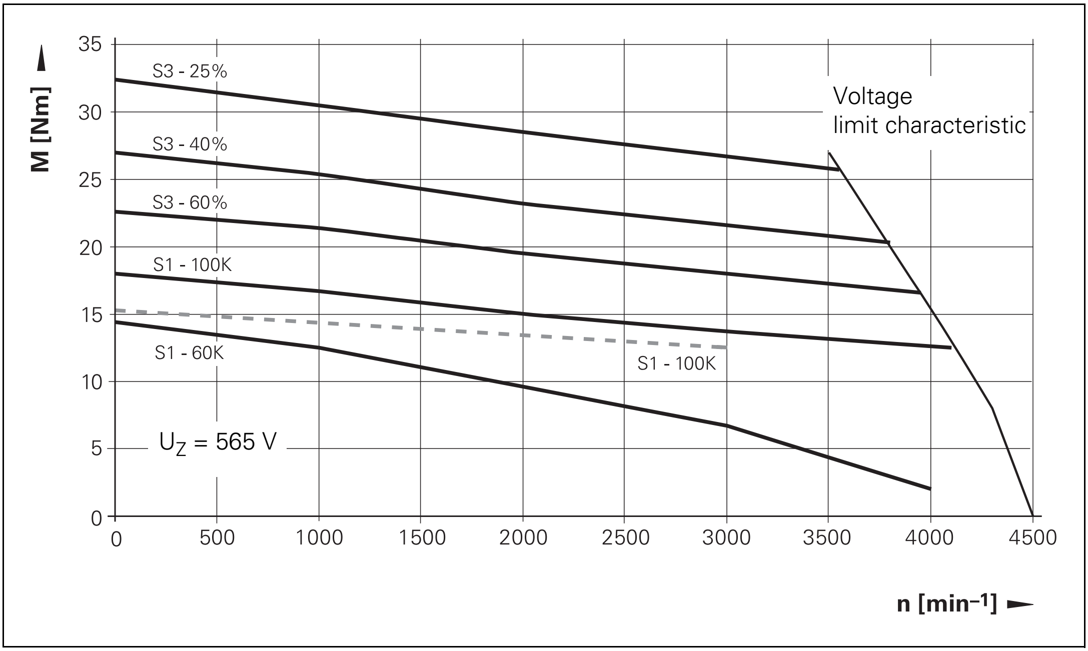
	QSY 2E (n_N = 3000 rpm) with brake	QSY 2E-3000 (n_N = 3000 rpm) without brake
Rated voltage U_N	295 V	
Rated power output P_N	4.0 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	12.7 Nm	
Rated current (100 K) I_N	8.3 A	
Stall torque (100 K) M_0	15.3 Nm	
Stall current (100 K) I_0	10.0 A	
Maximum current (for ≤200 ms) I_{max}	37.5 A	
Maximum torque (for ≤200 ms) M_{max}	45.0 Nm	
Pole pairs PP	3	
Weight m	21.4 kg	19.0 kg
Rotor inertia J	24.0 $kgcm^2$	22.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.0 A	–
Holding torque for brake M_{Br}	18.0 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 2E (n_N = 3000 rpm)



QSY 2G

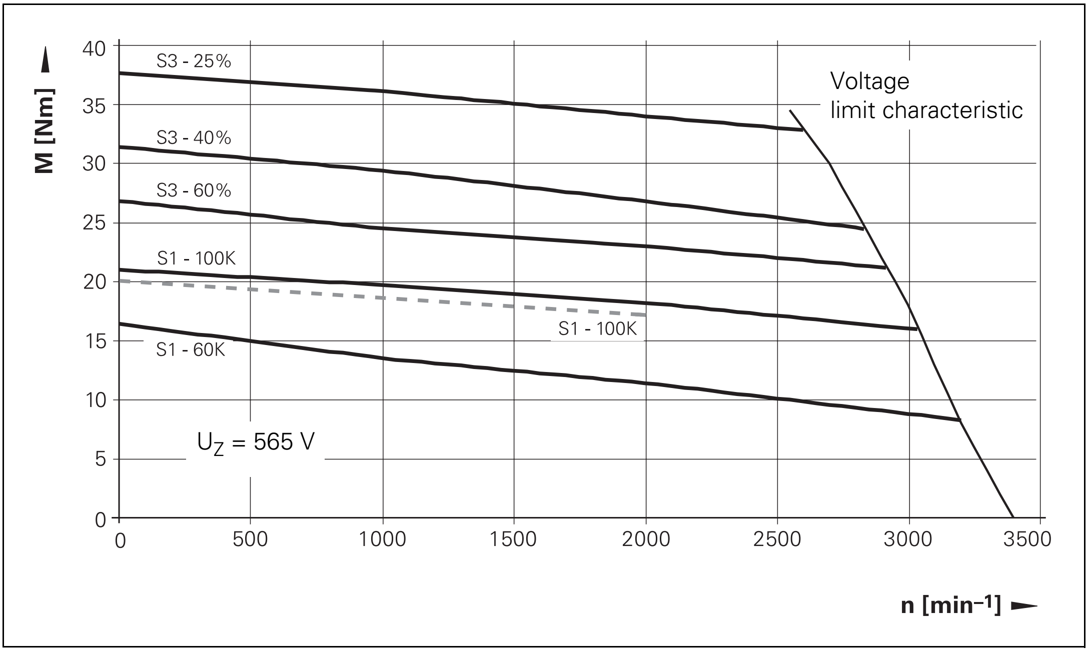
	QSY 2G with brake	**QSY 2G without brake**
Rated voltage U_N	272 V	
Rated power output P_N	3.6 kW	
Rated speed n_N	2000 rpm	
Rated torque (100 K) M_N	17.2 Nm	
Rated current (100 K) I_N	8.2 A	
Stall torque (100 K) M_0	20.0 Nm	
Stall current (100 K) I_0	9.5 A	
Maximum current (for ≤200 ms) I_{max}	35.4 A	
Maximum torque (for ≤200 ms) M_{max}	60.0 Nm	
Pole pairs PP	3	
Weight m	24.4 kg	22.0 kg
Rotor inertia J	29.0 kgcm^2	27.0 kgcm^2
Rated voltage for brake U_{Br}	24 V–	
Rated current for brake I_{Br}	1.0 A	–
Holding torque for brake M_{Br}	40.0 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 2G



QSY 155B

	QSY 155B with holding brake	QSY 155B without holding brake
Rated voltage U_N	295 V (292 V)[a]	
Rated power output P_N	2.9 kW (2.6 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	9.2 Nm (8.3 Nm)[a]	
Rated current (100 K) I_N	6.9 A (6.2 A)[a]	
Stall torque (100 K) M_0	13 Nm	
Stall current (100 K) I_0	9.1 A	
Maximum current (for ≤200 ms) I_{max}	29.7 A	
Maximum torque (for ≤200 ms) M_{max}	39 Nm	
Maximum speed	5000 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	0.67 Ω	
Winding inductance (in one phase)	5.40 mH	
Weight m	17.4 kg	15.0 kg
Rotor inertia J	35.0 $kgcm^2$	33.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.1 A	–
Holding torque for brake M_{Br}	40 Nm	–

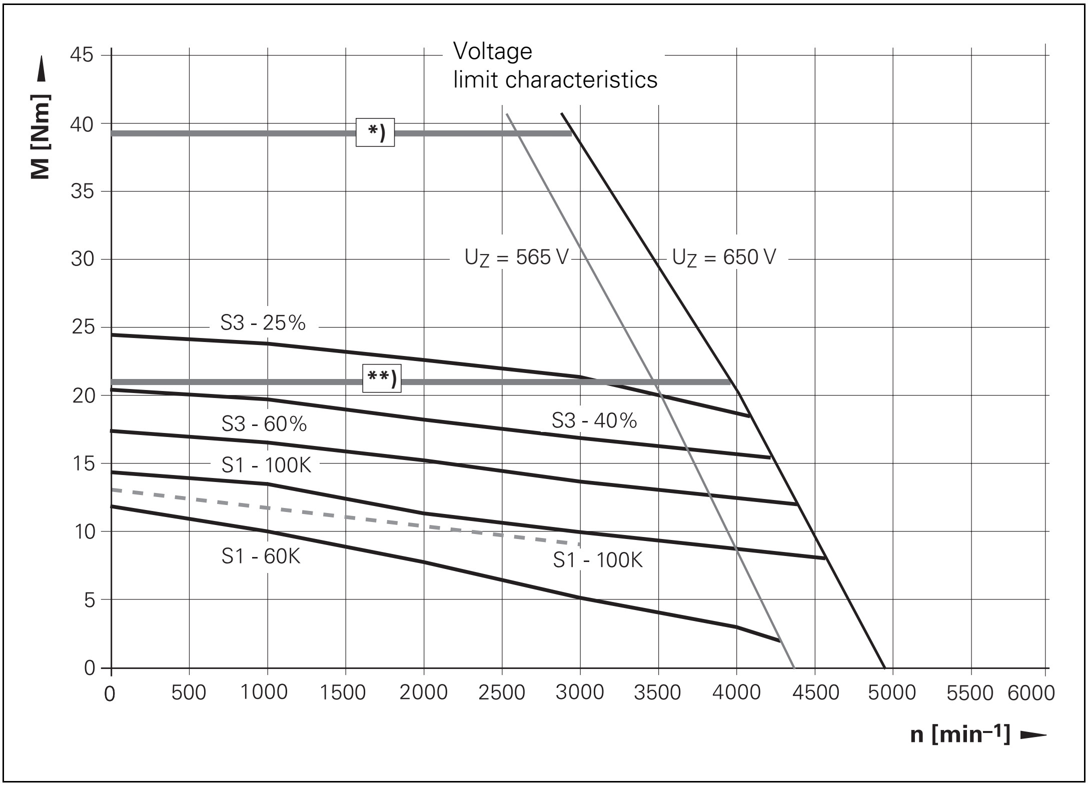
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 155B



*) M_{max} = 39 Nm when I_{max} = 29.7 A

**) M_{max} = 21 Nm when I_{max} = 15 A

QSY 155C

	QSY 155C with brake	QSY 155C without brake
Rated voltage U_N	291 V (289 V)[a]	
Rated power output P_N	3.9 kW (3.5 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	12.5 Nm (11.3 Nm)[a]	
Rated current (100 K) I_N	8.7 A (7.8 A)[a]	
Stall torque (100 K) M_0	17.7 Nm	
Stall current (100 K) I_0	11.8 A	
Maximum current (for ≤200 ms) I_{max}	38.9 A	
Maximum torque (for ≤200 ms) M_{max}	52.0 Nm	
Maximum speed	5000 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	0.45 Ω	
Winding inductance (in one phase)	3.72 mH	
Weight m	19.9 kg	17.5 kg
Rotor inertia J	45.0 $kgcm^2$	43.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.1 A	–
Holding torque for brake M_{Br}	40 Nm	–

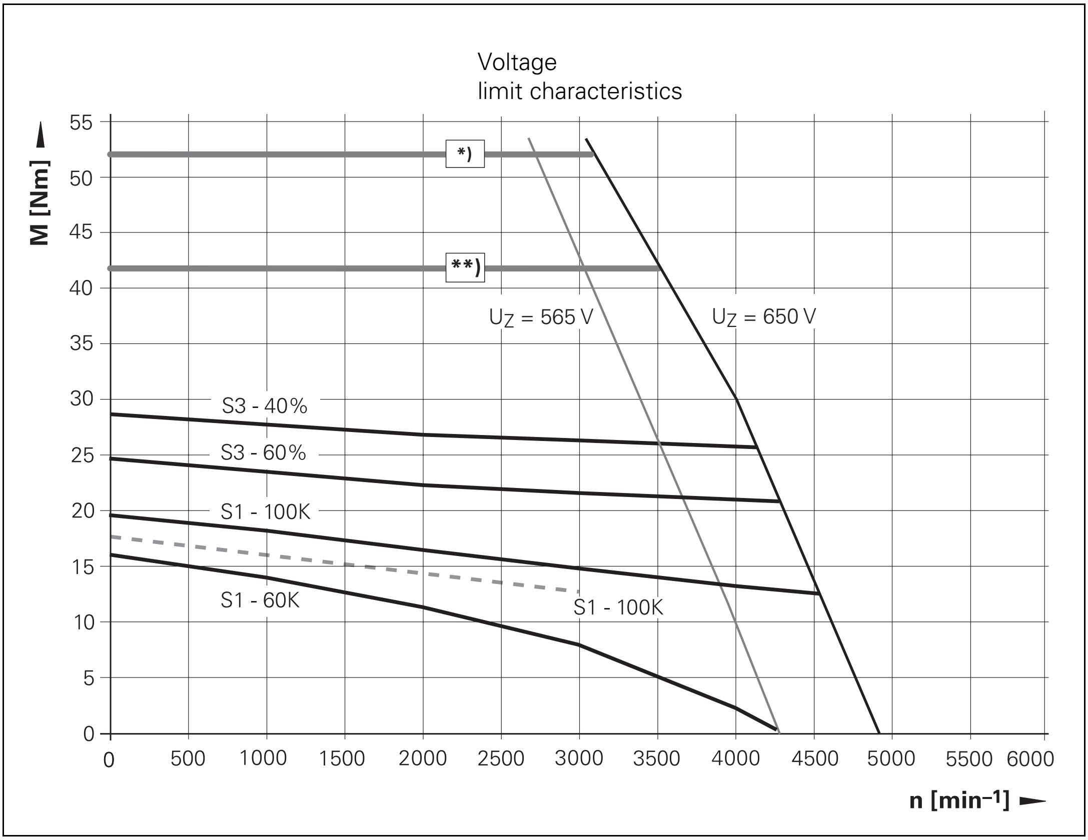
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 155C



*) M_{max} = 52 Nm when I_{max} = 38.9 A

**) M_{max} = 42 Nm when I_{max} = 30 A

QSY 155D

	QSY 155D with brake	**QSY 155D without brake**
Rated voltage U_N	291 V (288 V)[a]	
Rated power output P_N	4.6 kW (4.1 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	14.8 Nm (13.3 Nm)[a]	
Rated current (100 K) I_N	10.6 A (9.5 A)[a]	
Stall torque (100 K) M_0	21.6 Nm	
Stall current (100 K) I_0	14.6 A	
Maximum current (for ≤200 ms) I_{max}	49.5 A	
Maximum torque (for ≤200 ms) M_{max}	64 Nm	
Maximum speed	5000 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	0.32 Ω	
Winding inductance (in one phase)	3.10 mH	
Weight m	22.4 kg	20.0 kg
Rotor inertia J	56.0 $kgcm^2$	54.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.1 A	–
Holding torque for brake M_{Br}	40 Nm	–

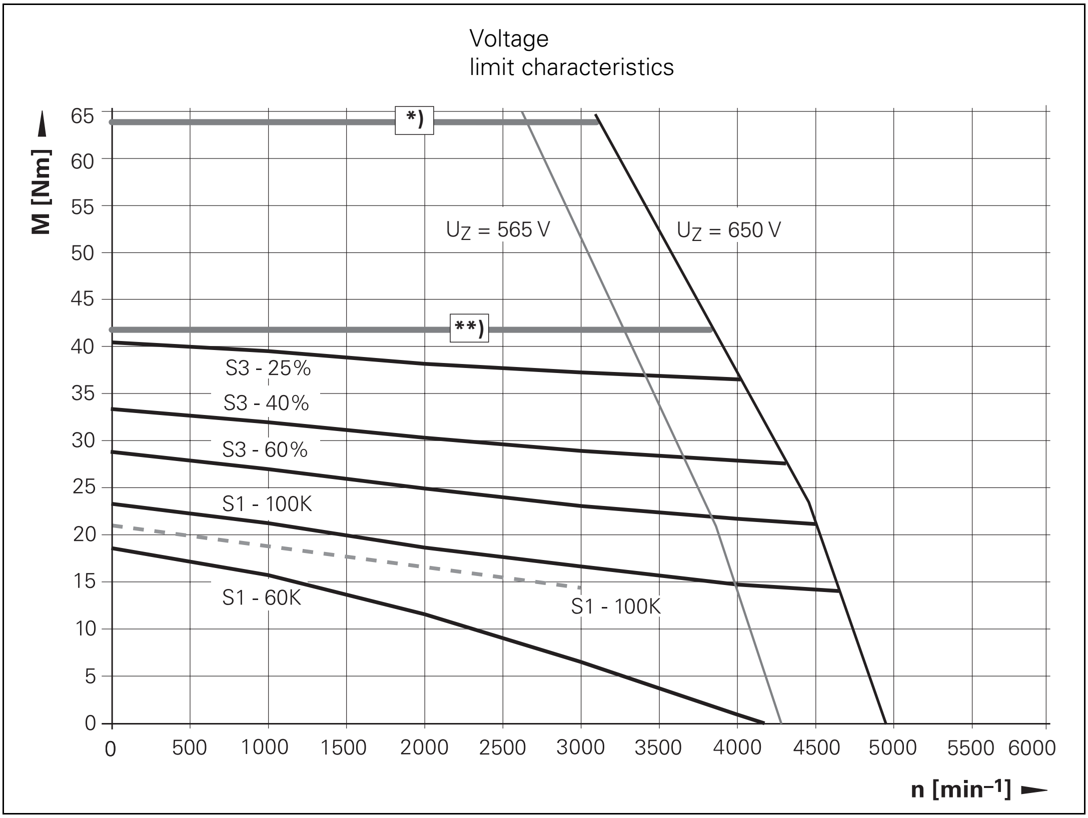
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 155D



*) M_{max} = 64 Nm when I_{max} = 49.5 A

**) M_{max} = 42 Nm when I_{max} = 30 A

QSY 155F

	QSY 155F with brake	**QSY 155F without brake**
Rated voltage U_N	287 V (285 V)[a]	
Rated power output P_N	5.2 kW (4.7 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	16.7 Nm (15.0 Nm)[a]	
Rated current (100 K) I_N	12.0 A (10.8 A)[a]	
Stall torque (100 K) M_0	26.1 Nm	
Stall current (100 K) I_0	18.0 A	
Maximum current (for ≤200 ms) I_{max}	68.6 A	
Maximum torque (for ≤200 ms) M_{max}	90 Nm	
Maximum speed	5000 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	0.23 Ω	
Winding inductance (in one phase)	2.25 mH	
Weight m	27.4 kg	25.0 kg
Rotor inertia J	77.0 kgcm^2	75.0 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.1 A	–
Holding torque for brake M_{Br}	40 Nm	–

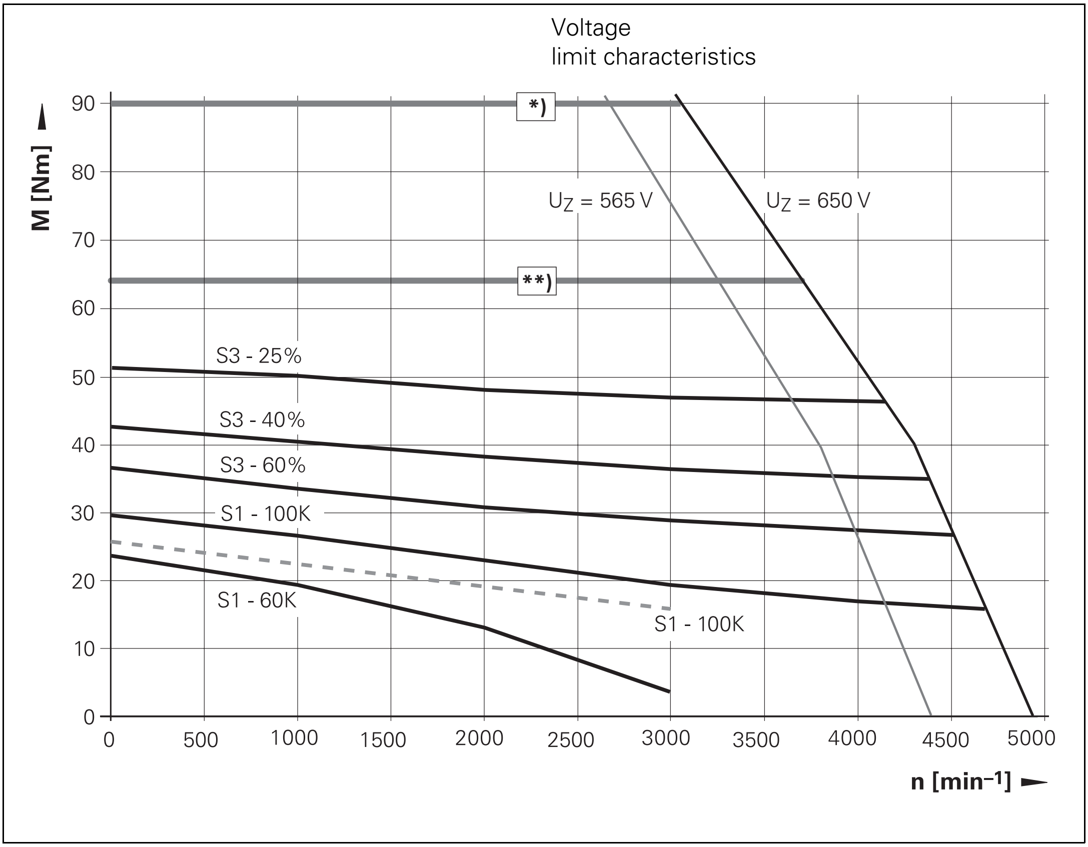
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

☞ **Note**

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 155F



*) M_{max} = 90 Nm when I_{max} = 68.6 A

**) M_{max} = 64 Nm when I_{max} = 46 A

QSY 155B EcoDyn

	QSY 155B EcoDyn with brake	**QSY 155B EcoDyn without brake**
Rated voltage U_N	412 V (408 V)[a]	
Rated power output P_N	3.5 kW (3.1 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	11.0 Nm (9.9 Nm)[a]	
Rated current (100 K) I_N	5.6 A (5.0 A)[a]	
Stall torque (100 K) M_0	13.0 Nm	
Stall current (100 K) I_0	6.5 A	
Maximum current (for ≤200 ms) I_{max}	21.2 A	
Maximum torque (for ≤200 ms) M_{max}	39 Nm	
Maximum speed	4200 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	1.3 Ω	
Winding inductance (in one phase)	9.8 mH	
Weight m	17.4 kg	15.0 kg
Rotor inertia J	35.0 kgcm^2	33.0 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.1 A	–
Holding torque for brake M_{Br}	40 Nm	–

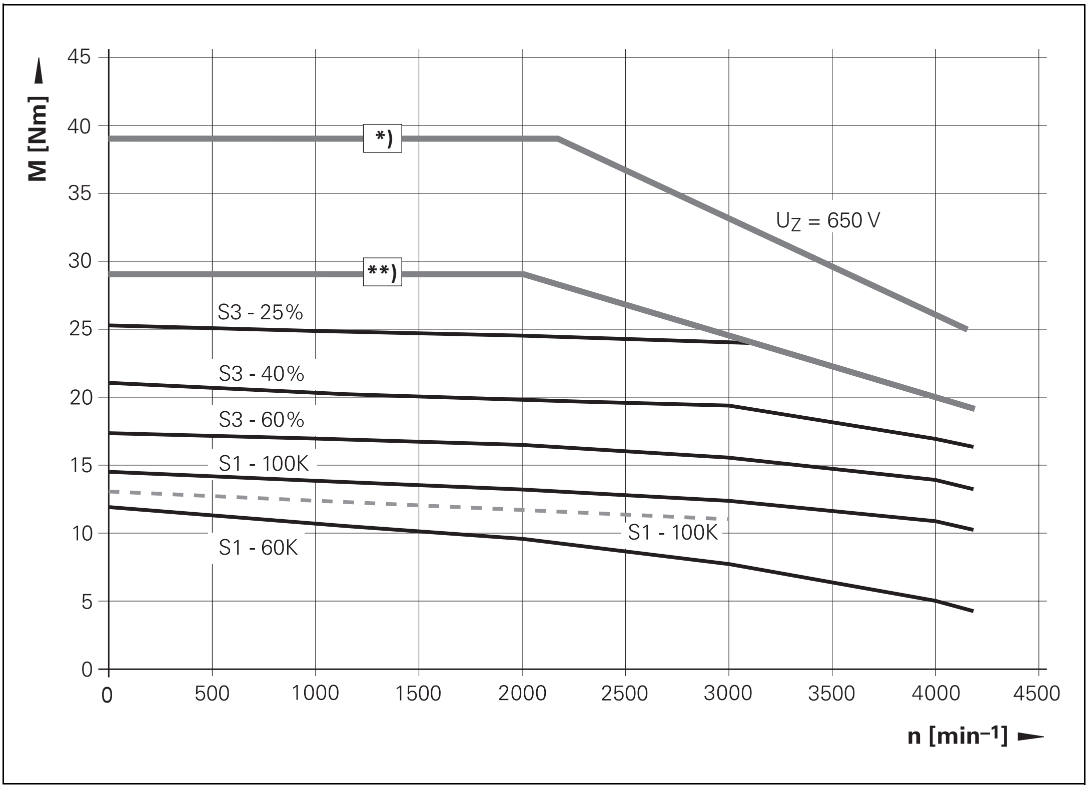
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 155B EcoDyn



*) M_{max} = 39 Nm when I_{max} = 21.2 A

**) M_{max} = 29 Nm when I_{max} = 15 A

QSY 155C EcoDyn

	QSY 155C EcoDyn with brake	**QSY 155C EcoDyn without brake**
Rated voltage U_N	416 V (411 V)[a]	
Rated power output P_N	5.0 kW (4.5 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	16.0 Nm (14.4 Nm)[a]	
Rated current (100 K) I_N	8.2 A (7.4 A)[a]	
Stall torque (100 K) M_0	17.7 Nm	
Stall current (100 K) I_0	8.5 A	
Maximum current (for ≤200 ms) I_{max}	27.6 A	
Maximum torque (for ≤200 ms) M_{max}	52.0 Nm	
Maximum speed	4200 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	0.86 Ω	
Winding inductance (in one phase)	7.4 mH	
Weight m	19.9 kg	17.5 kg
Rotor inertia J	45.0 $kgcm^2$	43.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.1 A	–
Holding torque for brake M_{Br}	40 Nm	–

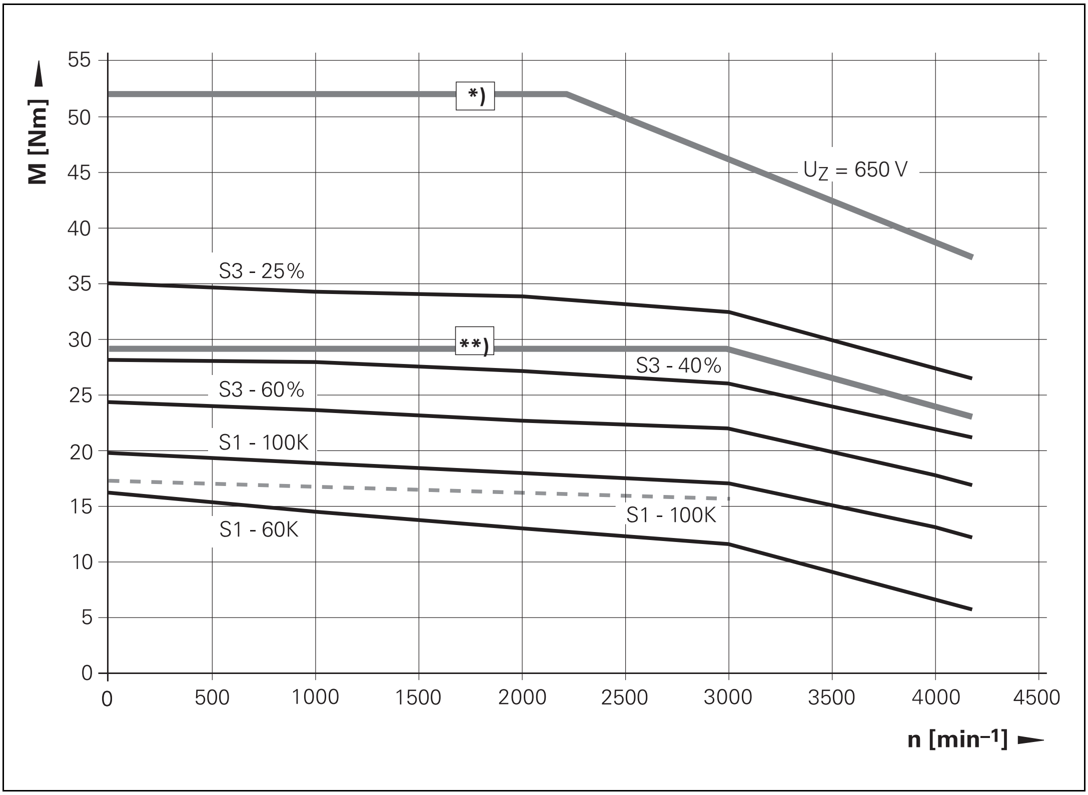
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 155C EcoDyn



*) M_{max} = 52 Nm when I_{max} = 27.6 A

**) M_{max} = 29 Nm when I_{max} = 15 A

QSY 155D EcoDyn

	QSY 155D EcoDyn with brake	QSY 155D EcoDyn without brake
Rated voltage U_N	408 V (404 V)[a]	
Rated power output P_N	5.7 kW (5.1 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	18.1 Nm (16.3 Nm)[a]	
Rated current (100 K) I_N	9.1 A (8.2 A)[a]	
Stall torque (100 K) M_0	21.6 Nm	
Stall current (100 K) I_0	10.6 A	
Maximum current (for ≤200 ms) I_{max}	35.0 A	
Maximum torque (for ≤200 ms) M_{max}	64 Nm	
Maximum speed	4200 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	0.61 Ω	
Winding inductance (in one phase)	5.8 mH	
Weight m	22.4 kg	20.0 kg
Rotor inertia J	56.0 $kgcm^2$	54.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.1 A	–
Holding torque for brake M_{Br}	40 Nm	–

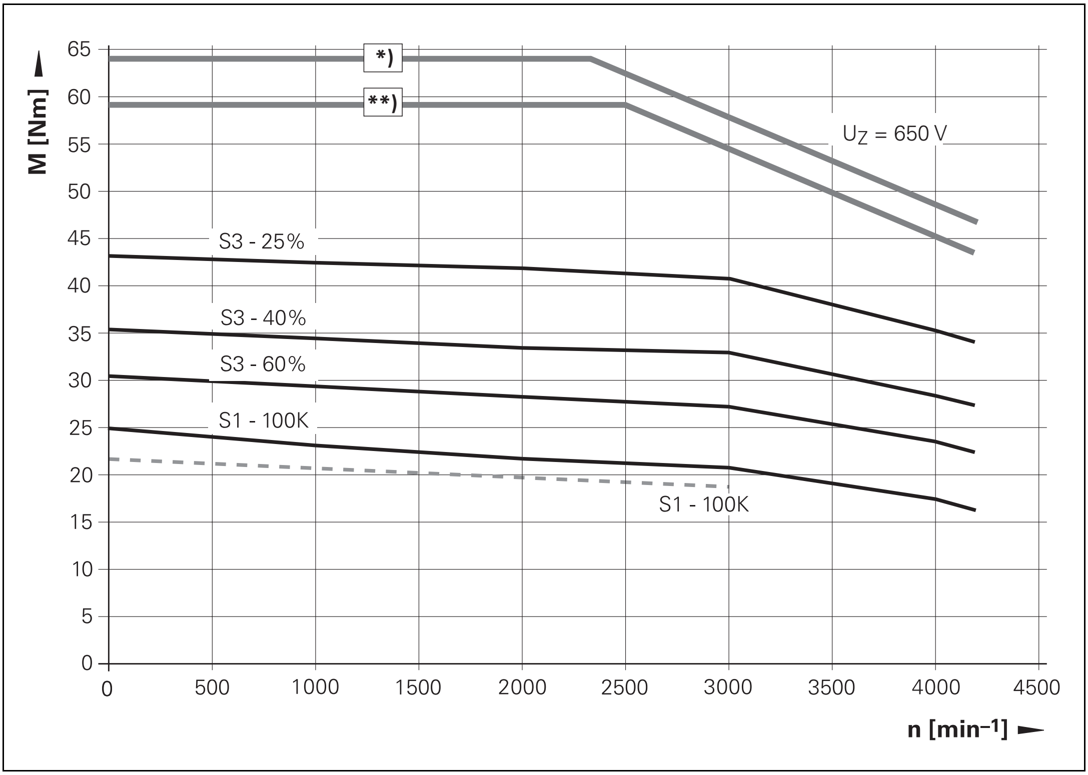
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 155D EcoDyn



*) M_{max} = 64 Nm when I_{max} = 35 A

**) M_{max} = 59 Nm when I_{max} = 30 A

QSY 155F EcoDyn

	QSY 155F EcoDyn with brake	QSY 155F EcoDyn without brake
Rated voltage U_N	396 V (394 V)[a]	
Rated power output P_N	6.0 kW (5.4 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	19.2 Nm (17.3 Nm)[a]	
Rated current (100 K) I_N	9.8 A (8.8 A)[a]	
Stall torque (100 K) M_0	26.1 Nm	
Stall current (100 K) I_0	12.8 A	
Maximum current (for ≤200 ms) I_{max}	49.5 A	
Maximum torque (for ≤200 ms) M_{max}	90 Nm	
Maximum speed	4200 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	0.38 Ω	
Winding inductance (in one phase)	3.7 mH	
Weight m	27.4 kg	25.0 kg
Rotor inertia J	77.0 kgcm^2	75.0 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.1 A	–
Holding torque for brake M_{Br}	40 Nm	–

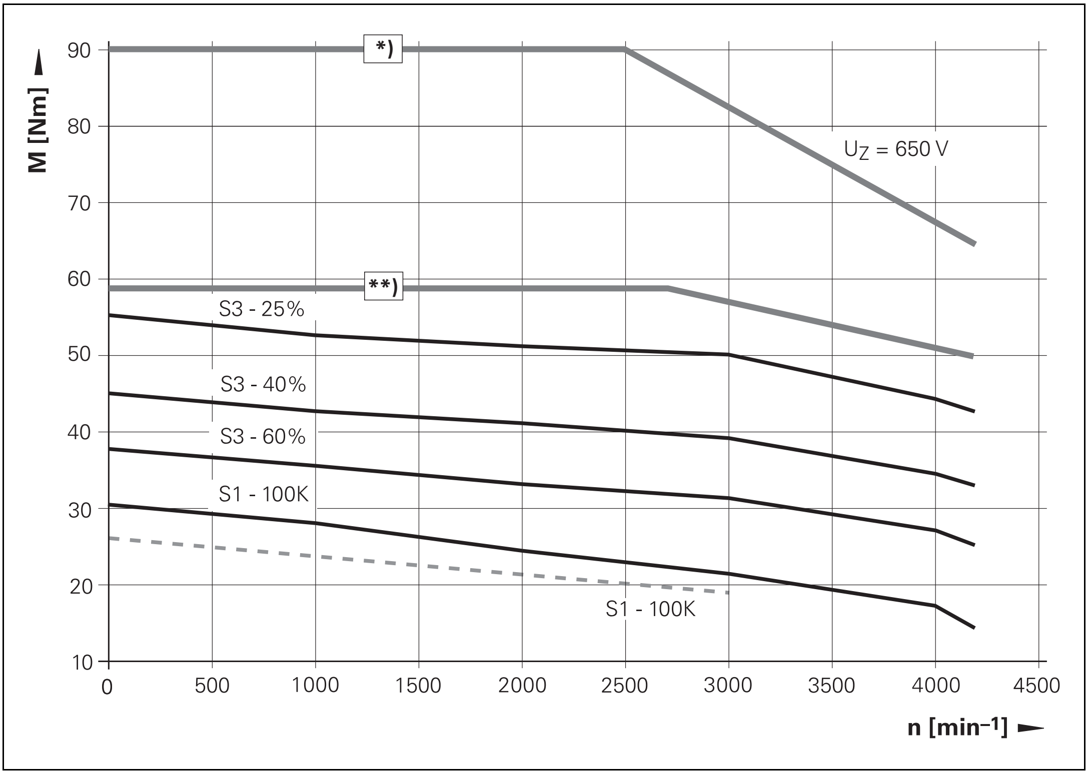
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 155F EcoDyn



*) M_{max} = 90 Nm when I_{max} = 49.5 A

**) M_{max} = 59 Nm when I_{max} = 30 A

QSY 190C EcoDyn

	QSY 190C EcoDyn with brake	**QSY 190C EcoDyn without brake**
Rated voltage U_N	423 V (416 V)[a]	
Rated power output P_N	7.2 kW (6.5 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	23.0 Nm (20.7 Nm)[a]	
Rated current (100 K) I_N	11.8 A (10.6 A)[a]	
Stall torque (100 K) M_0	28.0 Nm	
Stall current (100 K) I_0	14.0 A	
Maximum current (for ≤200 ms) I_{max}	40.0 A	
Maximum torque (for ≤200 ms) M_{max}	78 Nm	
Maximum speed	3900 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	0.525 Ω	
Winding inductance (in one phase)	6.2 mH	
Weight m	37.6 kg	29.3 kg
Rotor inertia J	115 $kgcm^2$	106 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.7 A	–
Holding torque for brake M_{Br}	70 Nm	–

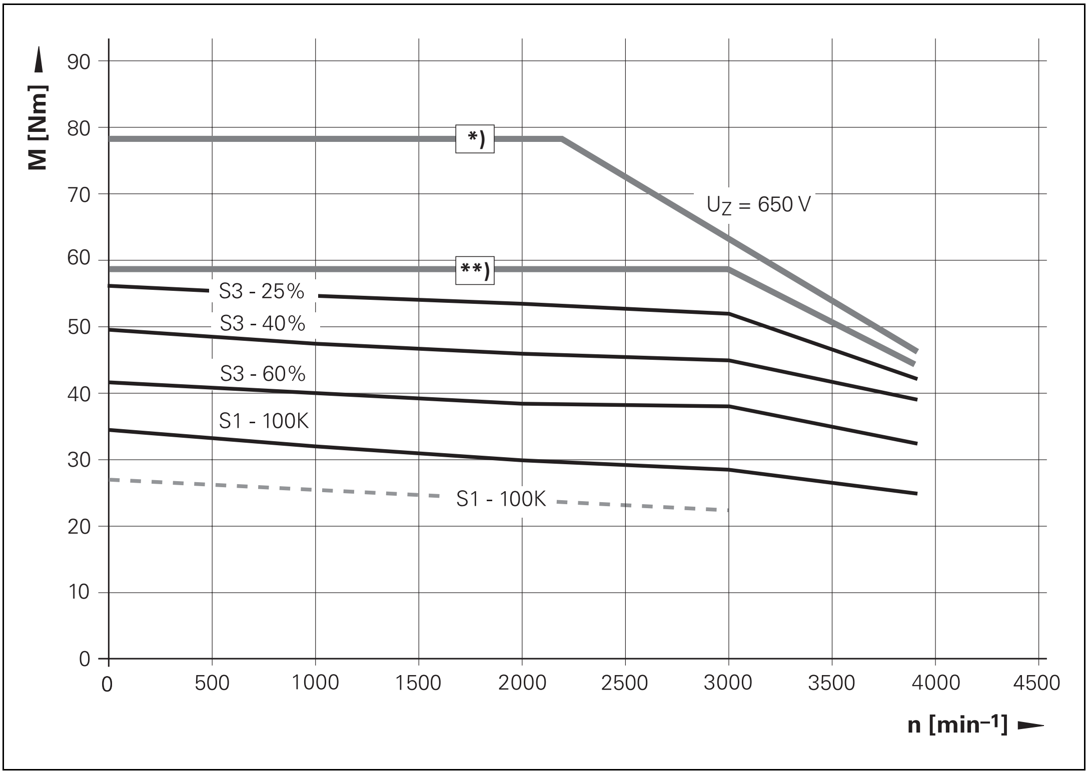
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 190C EcoDyn



*) M_{max} = 78 Nm when I_{max} = 40 A

**) M_{max} = 59 Nm when I_{max} = 30 A

QSY 190D EcoDyn

	QSY 190D EcoDyn with brake	**QSY 190D EcoDyn without brake**
Rated voltage U_N	418 V (412 V)[a]	
Rated power output P_N	9.6 kW (8.6 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	30.6 Nm (27.5 Nm)[a]	
Rated current (100 K) I_N	14.6 A (13.1 A)[a]	
Stall torque (100 K) M_0	38.0 Nm	
Stall current (100 K) I_0	18.1 A	
Maximum current (for ≤200 ms) I_{max}	54.4 A	
Maximum torque (for ≤200 ms) M_{max}	104 Nm	
Maximum speed	3900 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	0.317 Ω	
Winding inductance (in one phase)	4.8 mH	
Weight m	41.8 kg	33.5 kg
Rotor inertia J	139 kgcm^2	130 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.7 A	–
Holding torque for brake M_{Br}	70 Nm	–

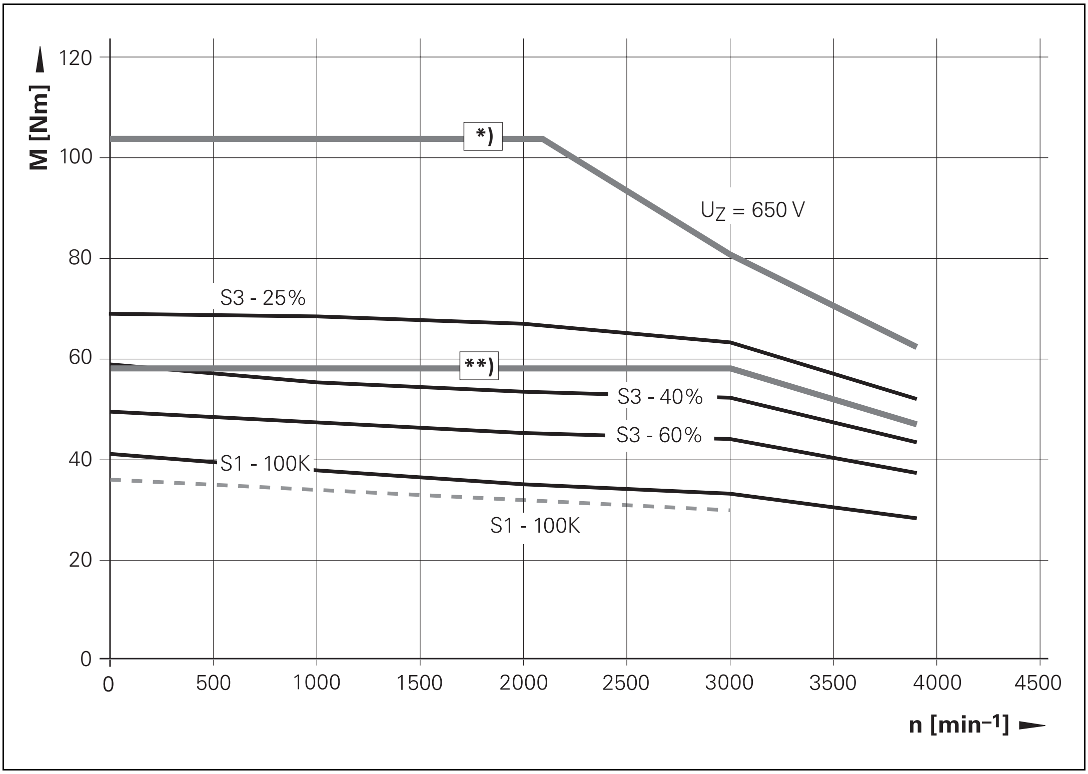
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 190D EcoDyn



*) M_{max} = 104 Nm when I_{max} = 54.4 A

**) M_{max} = 59 Nm when I_{max} = 30 A

QSY 190F EcoDyn

	QSY 190F EcoDyn with brake	QSY 190F EcoDyn without brake
Rated voltage U_N	405 V (401 V)[a]	
Rated power output P_N	9.9 kW (8.9 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	31.5 Nm (28.4 Nm)[a]	
Rated current (100 K) I_N	15.0 A (13.5 A)[a]	
Stall torque (100 K) M_0	47.6 Nm	
Stall current (100 K) I_0	22.7 A	
Maximum current (for ≤200 ms) I_{max}	75.0 A	
Maximum torque (for ≤200 ms) M_{max}	135 Nm	
Maximum speed	3900 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	0.228 Ω	
Winding inductance (in one phase)	3.6 mH	
Weight m	50.8 kg	42.5 kg
Rotor inertia J	199 $kgcm^2$	190 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.7 A	–
Holding torque for brake M_{Br}	70 Nm	–

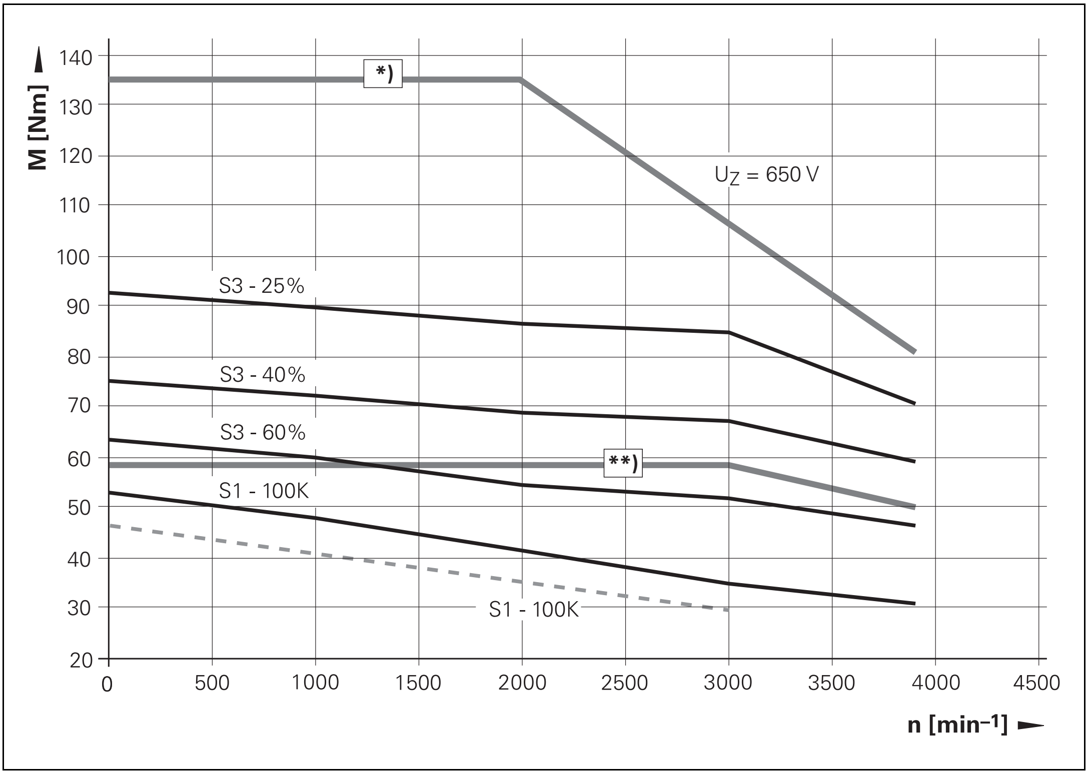
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 190F EcoDyn



*) M_{max} = 135 Nm when I_{max} = 75 A

**) M_{max} = 59 Nm when I_{max} = 30 A

QSY 190K EcoDyn

	QSY 190K EcoDyn with brake	QSY 190K EcoDyn without brake
Rated voltage U_N	397 V (395 V)[a]	
Rated power output P_N	12.2 kW (11.0 kW)[a]	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	39.0 Nm (35.1 Nm)[a]	
Rated current (100 K) I_N	20.2 A (18.2 A)[a]	
Stall torque (100 K) M_0	62.5 Nm	
Stall current (100 K) I_0	29.8 A	
Maximum current (for ≤200 ms) I_{max}	113.0 A	
Maximum torque (for ≤200 ms) M_{max}	210 Nm	
Maximum speed	3900 rpm	
Pole pairs PP	4	
Winding resistance (in one phase)	0.12 Ω	
Winding inductance (in one phase)	2.1 mH	
Weight m	69.3 kg	61 kg
Rotor inertia J	299 $kgcm^2$	290 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.7 A	–
Holding torque for brake M_{Br}	70 Nm	–

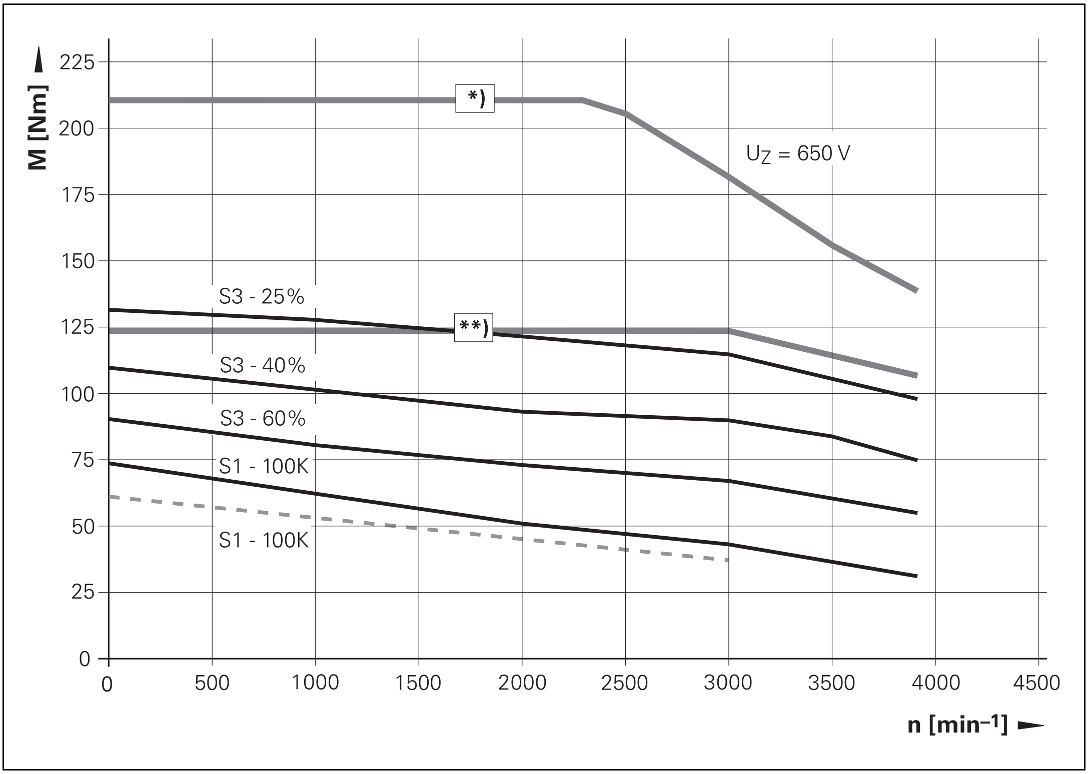
a. For motors with ECN 1313 / EQN 1325, the rated torque is reduced by 10% due to the lower permissible temperature.

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curve determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 190K EcoDyn



*) M_{max} = 210 Nm when I_{max} = 113 A

**) M_{max} = 123 Nm when I_{max} = 64 A

QSY 090B

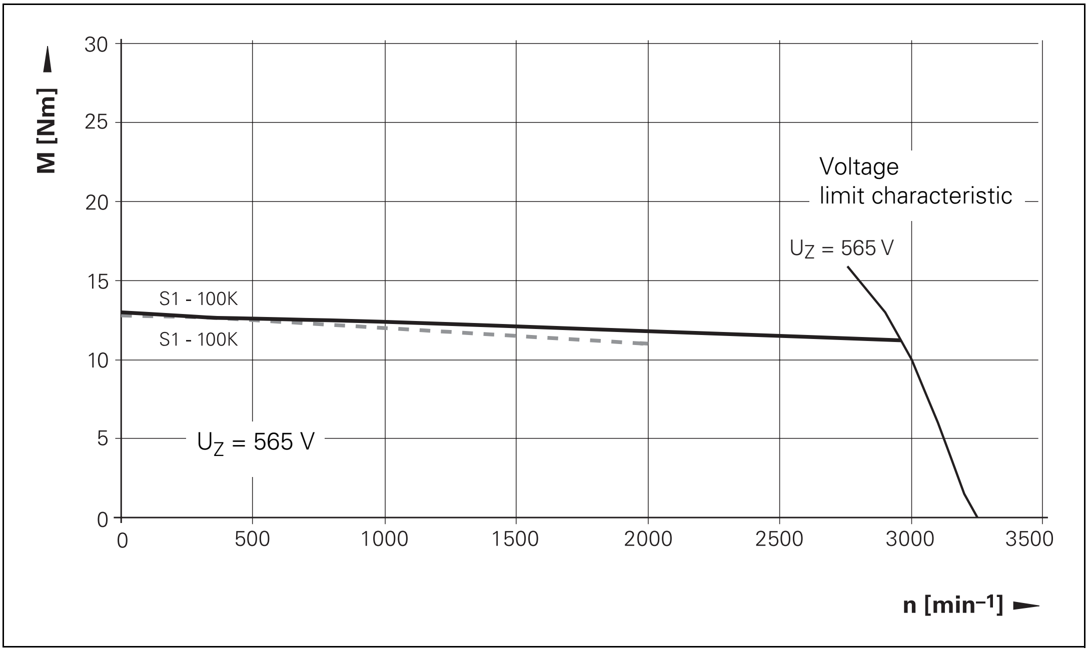
	QSY 090B (n_N = 2000 rpm) with brake	QSY 090B (n_N = 2000 rpm) without brake
Rated voltage U_N	305 V	
Rated power output P_N	2.3 kW	
Rated speed n_N	2000 rpm	
Rated torque (100 K) M_N	11.0 Nm	
Rated current (100 K) I_N	6.0 A	
Stall torque (100 K) M_0	13.0 Nm	
Stall current (100 K) I_0	7.2 A	
Maximum current (for ≤200 ms) I_{max}	30.0 A	
Maximum torque (for ≤200 ms) M_{max}	43.5 Nm	
Pole pairs PP	4	
Weight m	14.6 kg	14.0 kg
Rotor inertia J	43.6 $kgcm^2$	43.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.7 A	–
Holding torque for brake M_{Br}	11.0 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 090B (n_N = 2000 rpm)



QSY 090B

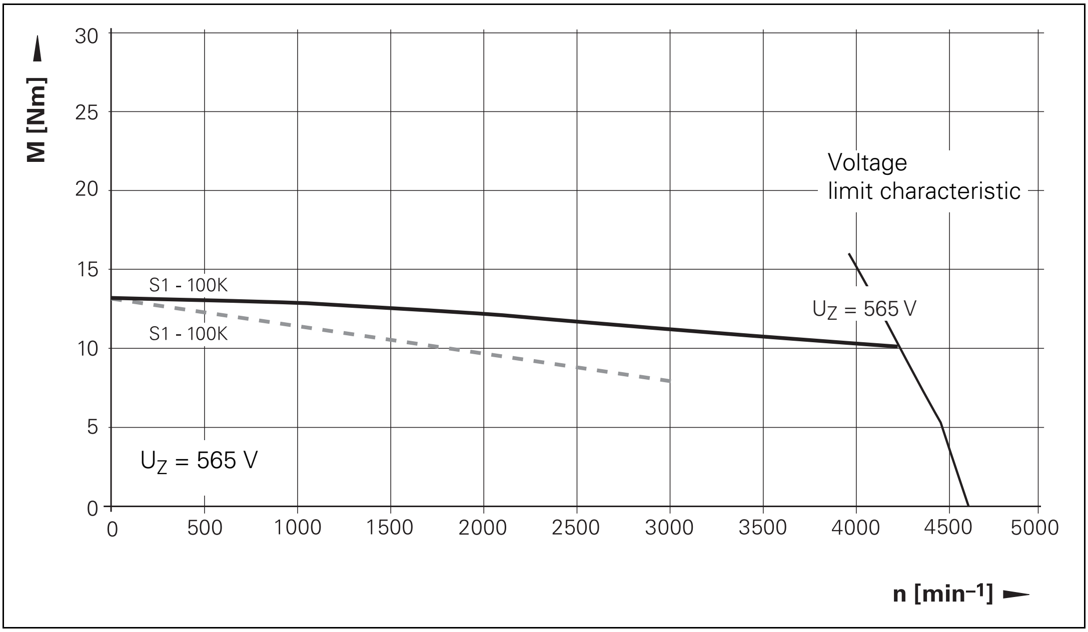
	QSY 090B (n_N = 3000 rpm) with brake	QSY 090B (n_N = 3000 rpm) without brake
Rated voltage U_N	330 V	
Rated power output P_N	2.7 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	8.5 Nm	
Rated current (100 K) I_N	6.6 A	
Stall torque (100 K) M_0	13.0 Nm	
Stall current (100 K) I_0	10.1 A	
Maximum current (for ≤200 ms) I_{max}	42.0 A	
Maximum torque (for ≤200 ms) M_{max}	43.5 Nm	
Pole pairs PP	4	
Weight m	14.6 kg	14.0 kg
Rotor inertia J	43.6 $kgcm^2$	43.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.7 A	–
Holding torque for brake M_{Br}	11.0 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 090B (n_N = 3000 rpm)



QSY 093B

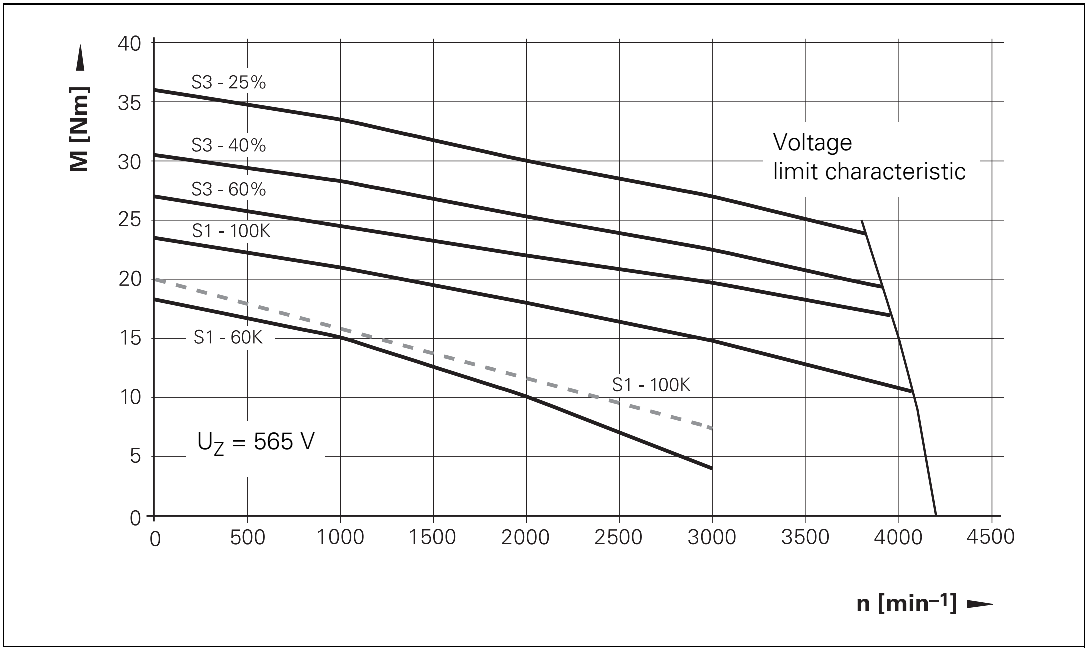
	QSY 093B with brake	QSY 093B without brake
Rated voltage U_N	356 V	
Rated power output P_N	2.3 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	7.2 Nm	
Rated current (100 K) I_N	4.7 A	
Stall torque (100 K) M_0	20.0 Nm	
Stall current (100 K) I_0	13.0 A	
Maximum current (for ≤200 ms) I_{max}	51.0 A	
Maximum torque (for ≤200 ms) M_{max}	66.0 Nm	
Pole pairs PP	4	
Weight m	19.1 kg	18.0 kg
Rotor inertia J	29.1 kgcm^2	25.5 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.7 A	–
Holding torque for brake M_{Br}	22.0 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristics for QSY 093B



QSY 112B

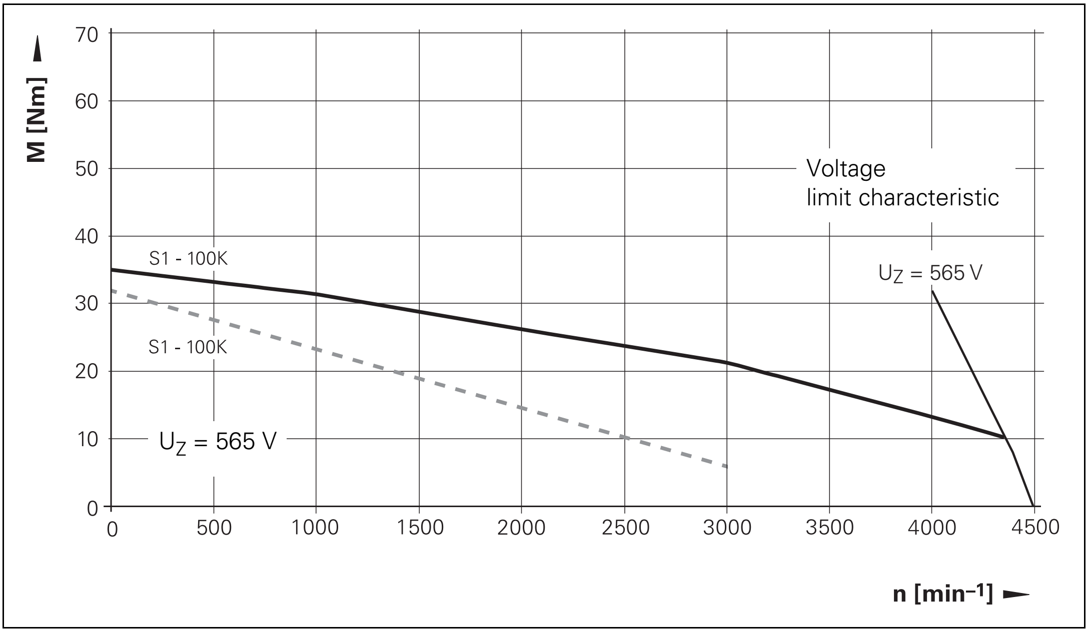
	QSY 112B with brake	**QSY 112B without brake**
Rated voltage U_N	278 V	
Rated power output P_N	1.9 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	6.0 Nm	
Rated current (100 K) I_N	5.4 A	
Stall torque (100 K) M_0	32.0 Nm	
Stall current (100 K) I_0	28.8 A	
Maximum current (for ≤200 ms) I_{max}	113.5 A	
Maximum torque (for ≤200 ms) M_{max}	102.0 Nm	
Pole pairs PP	4	
Weight m	35.4 kg	34.0 kg
Rotor inertia J	196 $kgcm^2$	192 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.7 A	–
Holding torque for brake M_{Br}	20.0 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 112B



QSY 112C

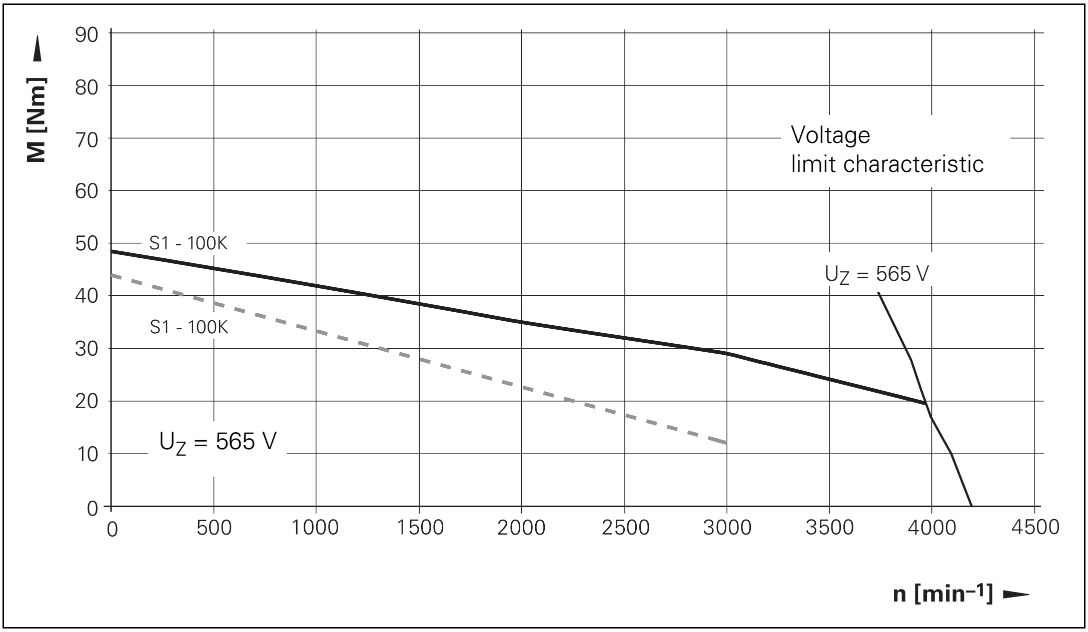
	QSY 112C with brake	QSY 112C without brake
Rated voltage U_N	336 V	
Rated power output P_N	3.8 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	12.0 Nm	
Rated current (100 K) I_N	8.5 A	
Stall torque (100 K) M_0	44.0 Nm	
Stall current (100 K) I_0	31.3 A	
Maximum current (for ≤200 ms) I_{max}	121.5 A	
Maximum torque (for ≤200 ms) M_{max}	148.0 Nm	
Pole pairs PP	4	
Weight m	45.0 kg	41.0 kg
Rotor inertia J	303 $kgcm^2$	273 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.3 A	–
Holding torque for brake M_{Br}	70.0 Nm	–

Note

In the performance diagram, the characteristic curve from the data sheet is shown in an interrupted, lightface line.

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for QSY 112C



QSY 112D

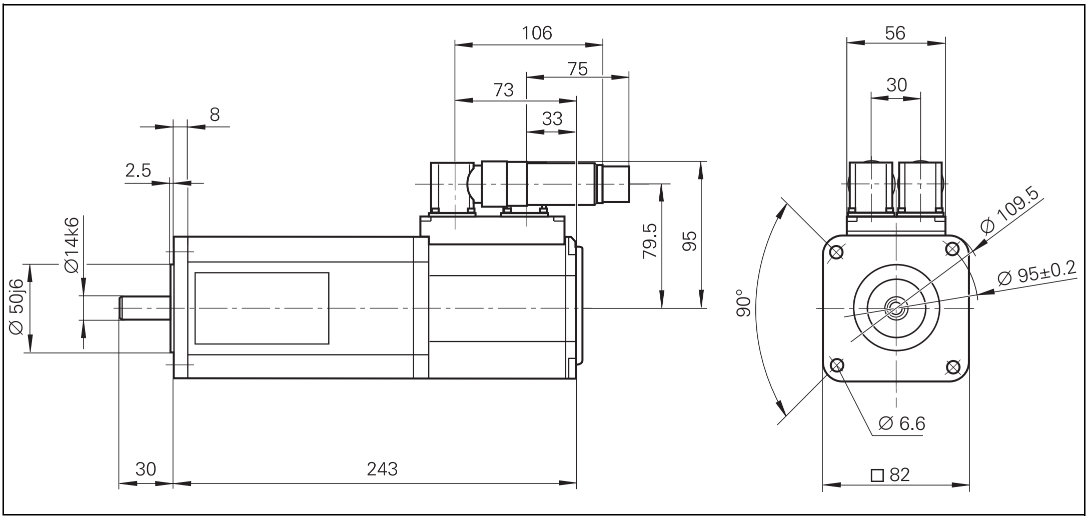
	QSY 112D with fan with brake	**QSY 112D with fan without brake**
Rated voltage U_N	328 V	
Rated power output P_N	12.0 kW	
Rated speed n_N	2000 rpm	
Rated torque (100 K) M_N	57.1 Nm	
Rated current (100 K) I_N	23.4 A	
Stall torque (100 K) M_0	72.0 Nm	
Stall current (100 K) I_0	33.3 A	
Maximum current (for ≤200 ms) I_{max}	100.0 A	
Maximum torque (for ≤200 ms) M_{max}	185.0 Nm	
Pole pairs PP	4	
Weight m	55.0 kg	51.0 kg
Rotor inertia J	390 $kgcm^2$	360 $kgcm^2$
Rated voltage for fan U_L	230 V	
Rated current for fan I_L	0.3 A	
Frequency f_L	50 Hz/60 Hz	
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.3 A	–
Holding torque for brake M_{Br}	70.0 Nm	–

7.9.2 Dimensions – Synchronous Motors, QSY Series

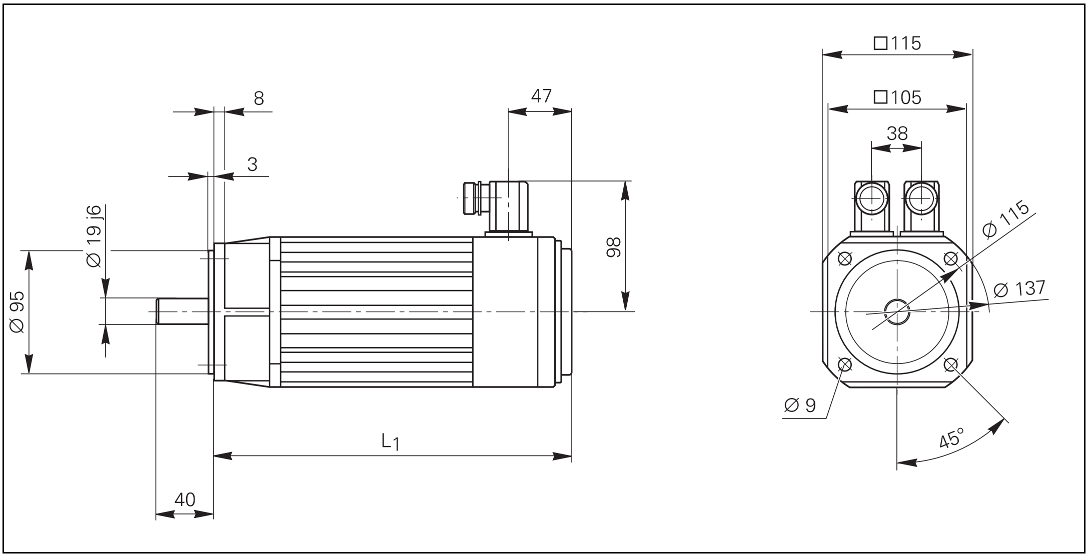
Note

All dimensions are in millimeters [mm].

QSY 041B

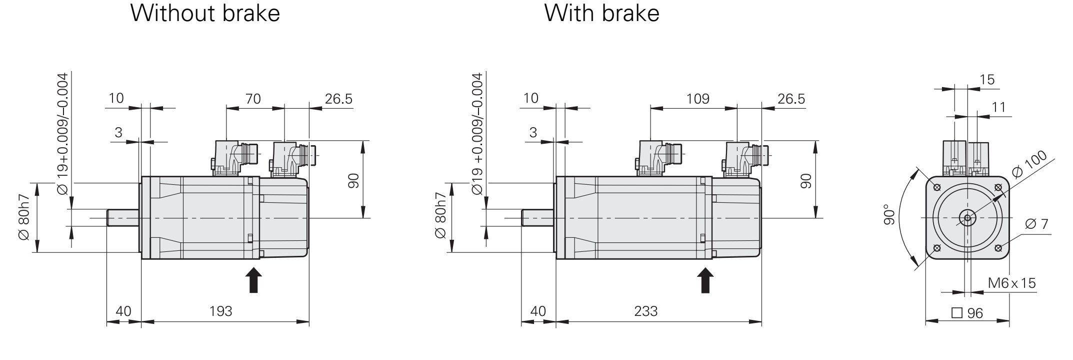


QSY 10 series

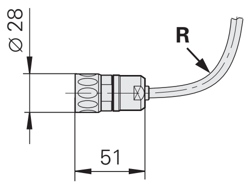
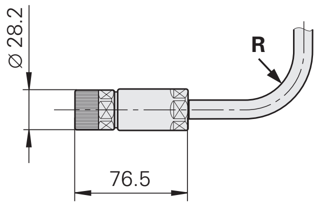


Motor	L_1
QSY 1A	235 mm
QSY 1C	275 mm
QSY 1E	315 mm

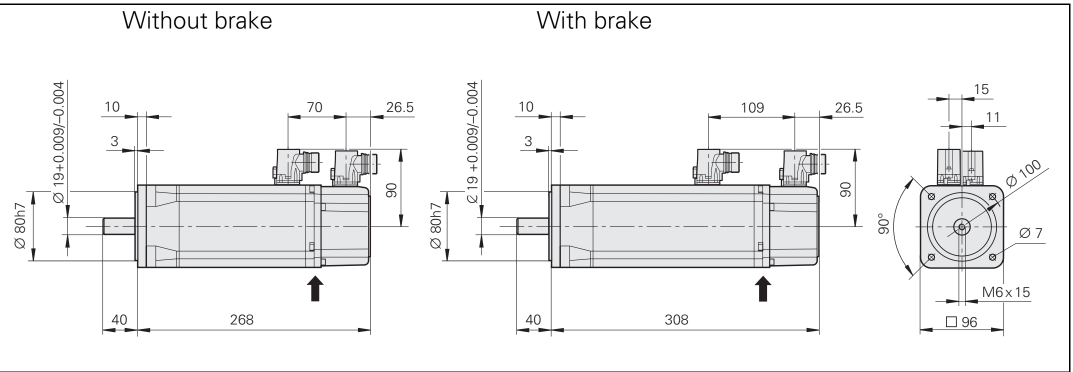
QSY 96A



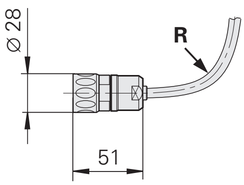
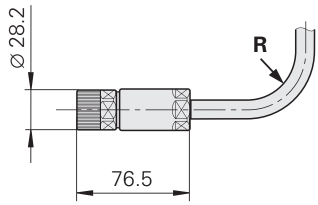
⬆ Fixed bearing

Connector for speed encoder	Connector for power connection
	

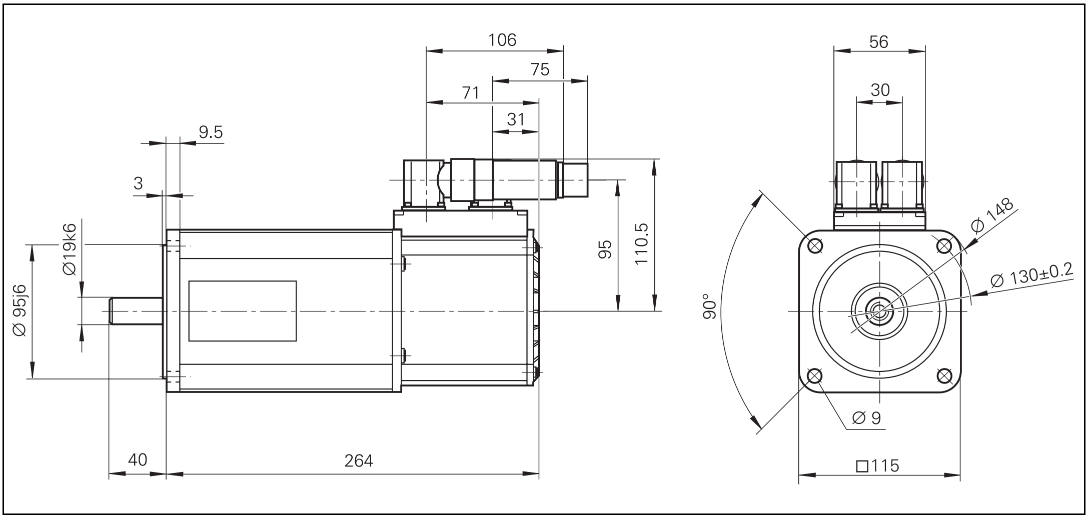
QSY 96G



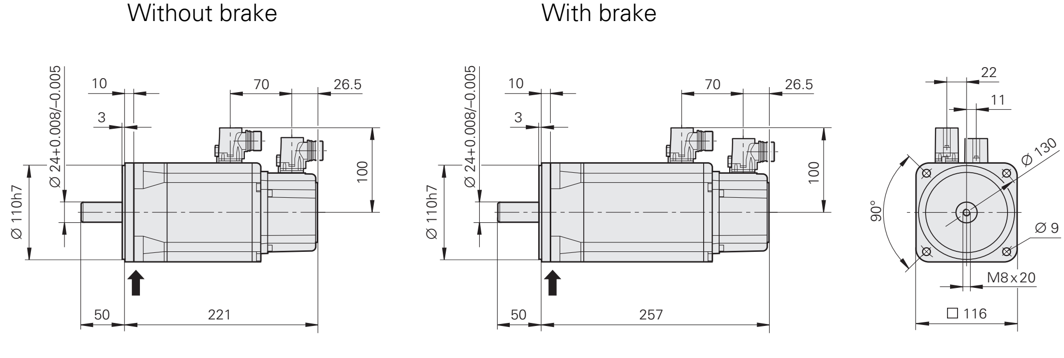
⬆ Fixed bearing

Connector for speed encoder	Connector for power connection
	

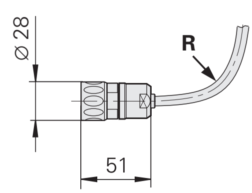
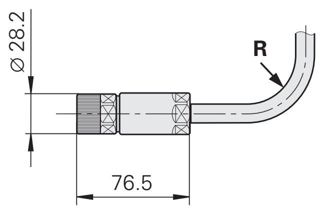
QSY 071B


106
75
71
31
9.5
3
Ø19k6
Ø 95j6
95
110.5
40
264
56
30
Ø 148
Ø 130±0.2
90°
Ø 9
□115

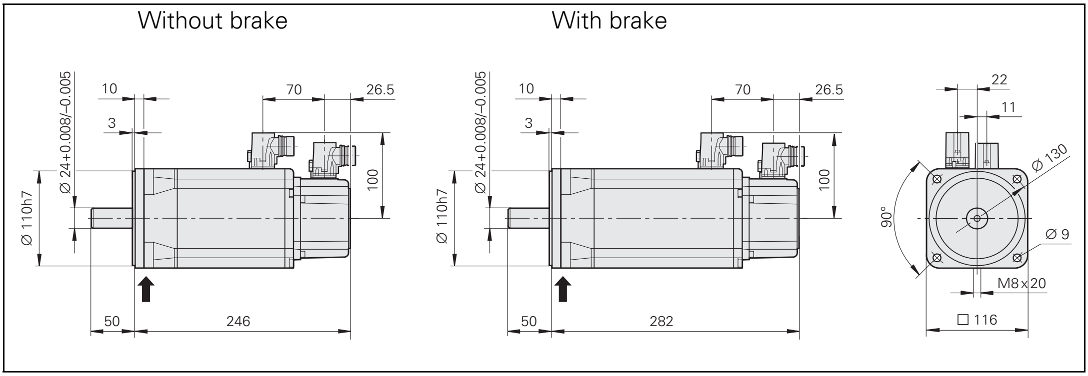
QSY 116C



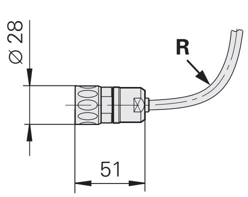
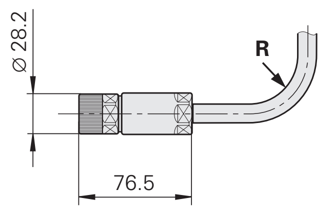
 Fixed bearing

Connector for speed encoder	Connector for power connection
	

QSY 116E



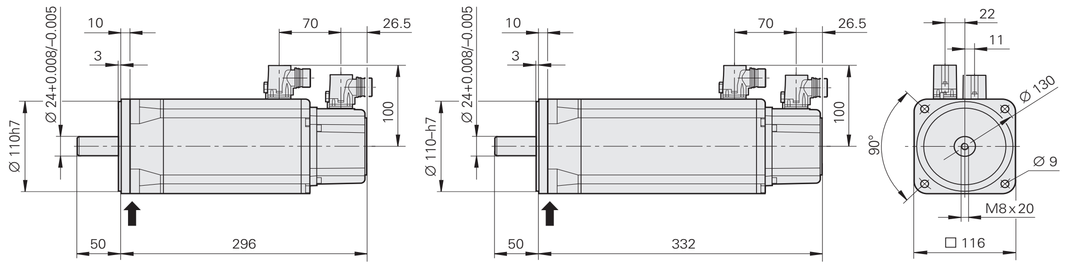
⬆ Fixed bearing

Connector for speed encoder	Connector for power connection
	

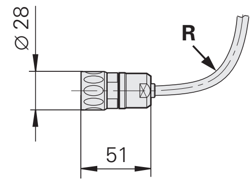
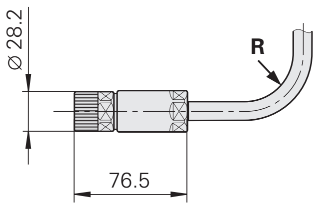
QSY 116J,
QSY 116J EcoDyn

Without brake

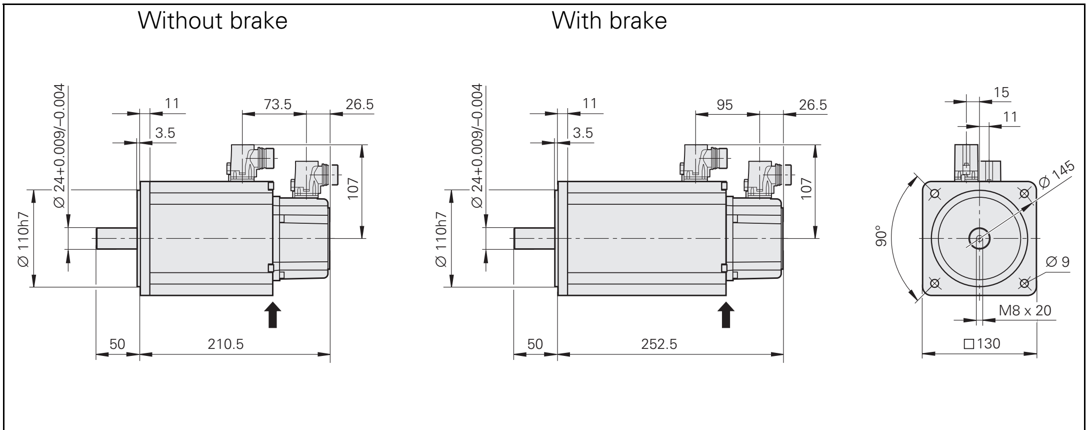
With brake



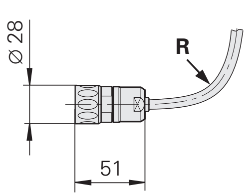
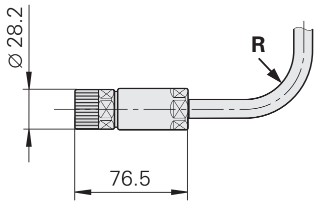
Fixed bearing

Connector for speed encoder	Connector for power connection
	

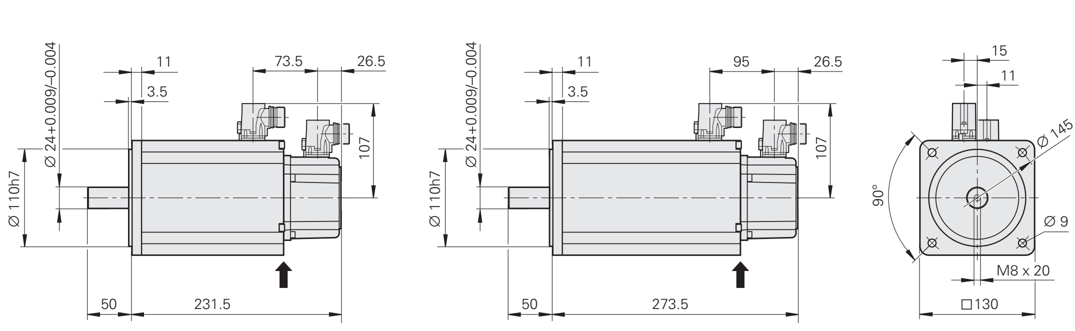
QSY 130C EcoDyn



Fixed bearing

Connector for speed encoder	Connector for power connection
	

QSY 130E EcoDyn



⬆ Fixed bearing

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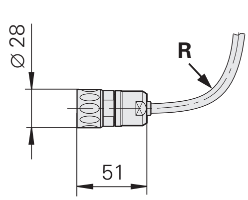
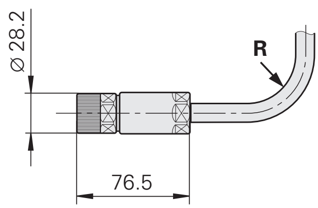
<tr><td>
</td><td>
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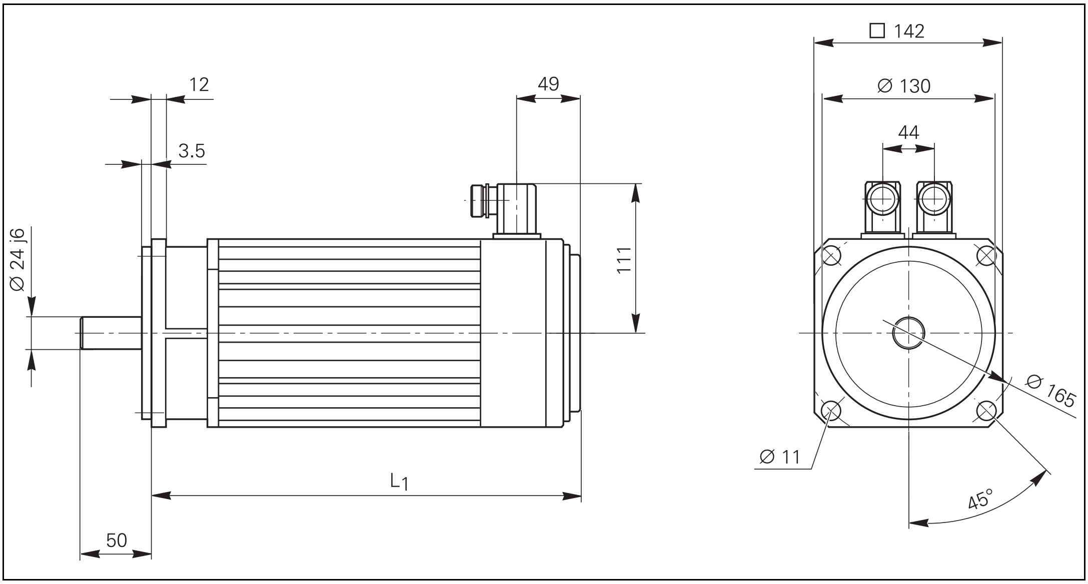
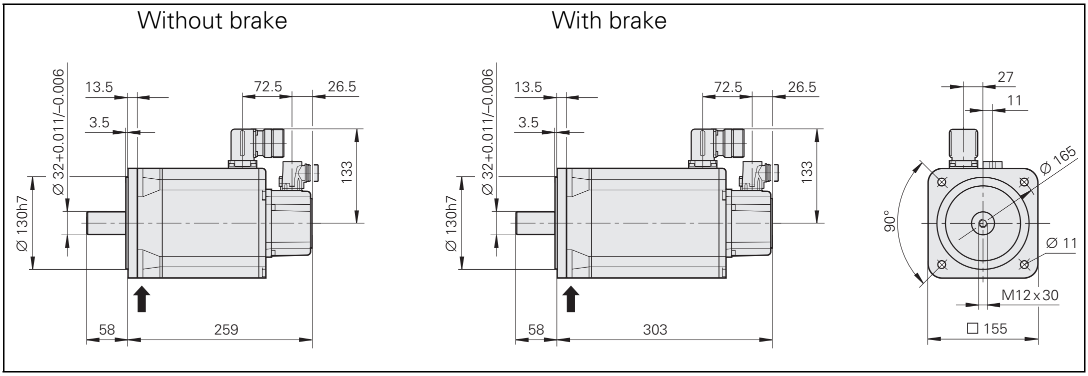
QSY 20 series

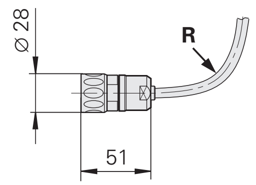
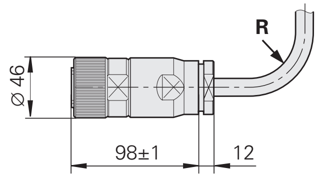


Motor	L_1
QSY 2C	312 mm
QSY 2E	352 mm
QSY 2G	392 mm

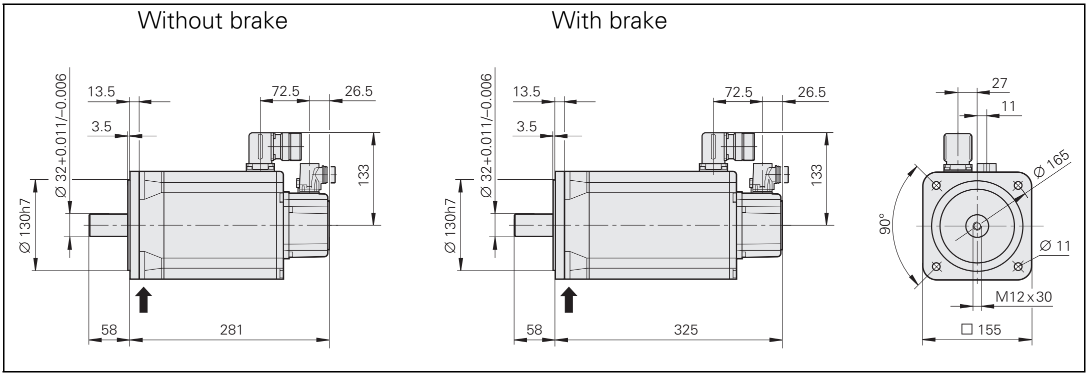
QSY 155B



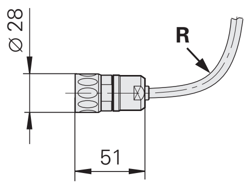
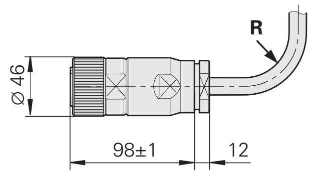
Fixed bearing

Connector for speed encoder	Connector for power connection
	

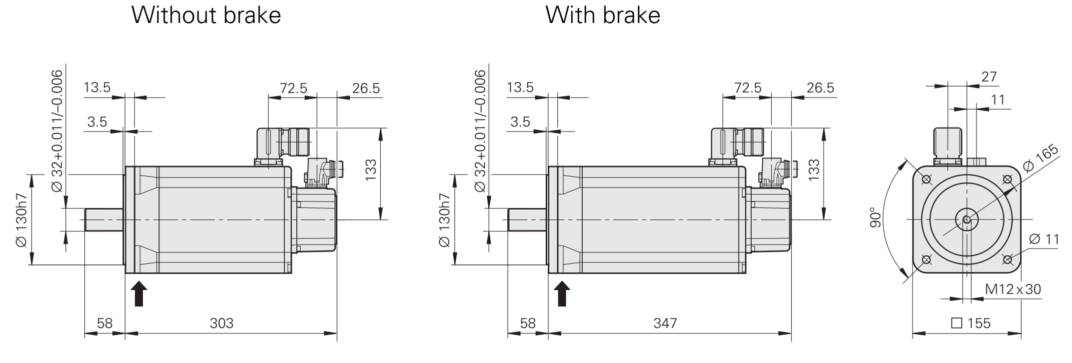
QSY 155C



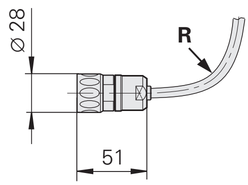
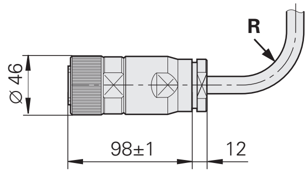
⬆ Fixed bearing

Connector for speed encoder	Connector for power connection
	

QSY 155D



⬆ Fixed bearing

Connector for speed encoder	Connector for power connection
	

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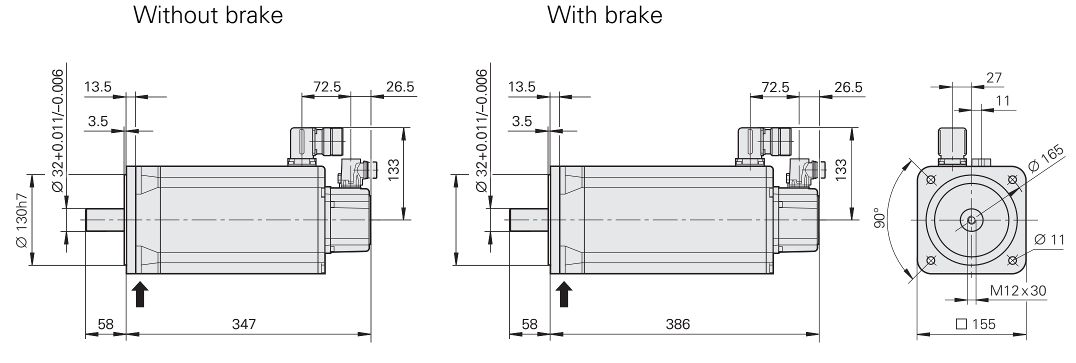
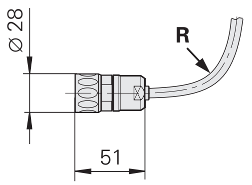
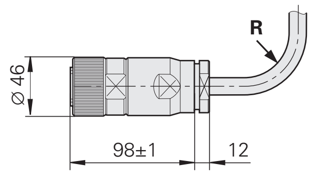
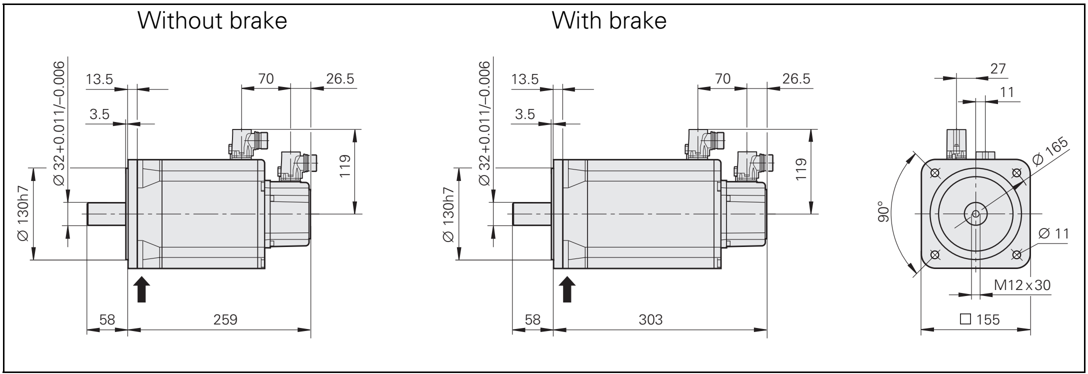


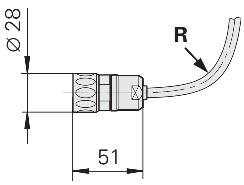
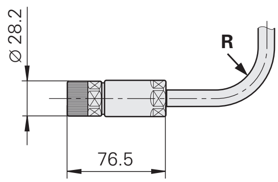
⬆ Fixed bearing

Connector for speed encoder	Connector for power connection
	

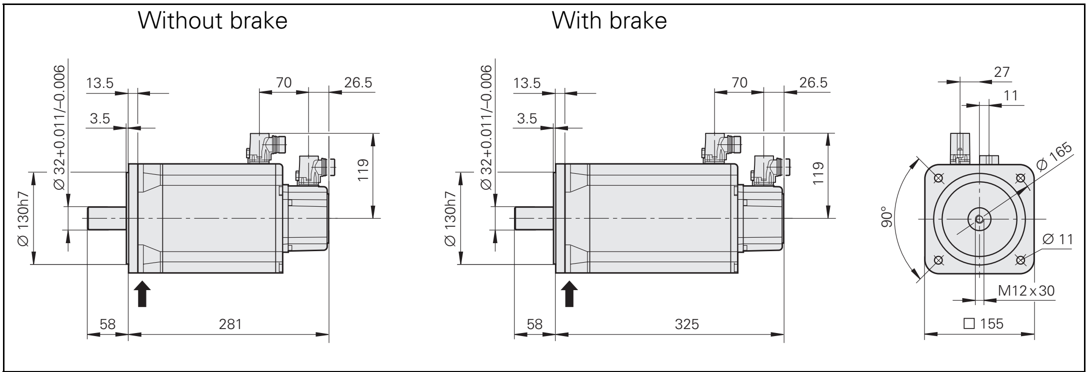
QSY 155B EcoDyn



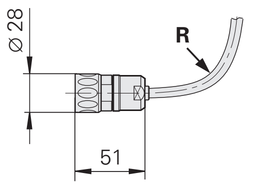
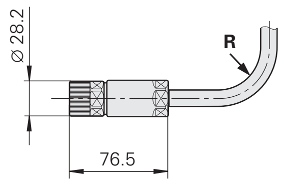
Fixed bearing

Connector for speed encoder	Connector for power connection
	

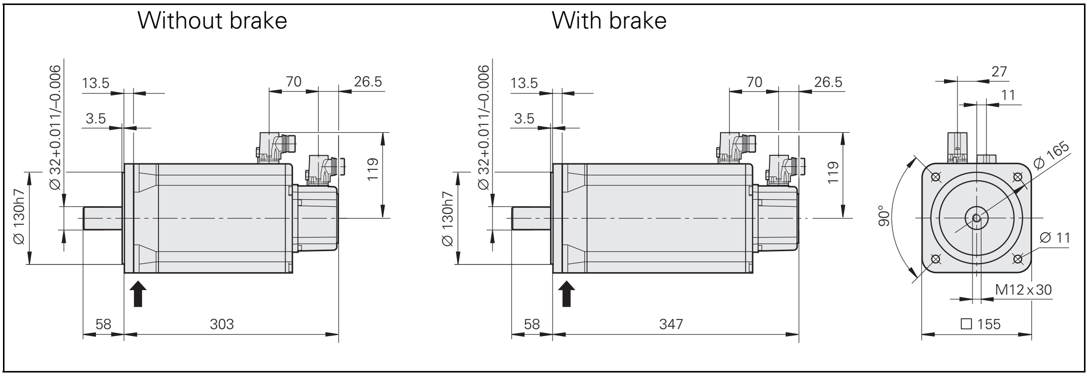
QSY 155C EcoDyn



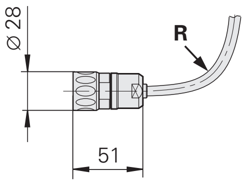
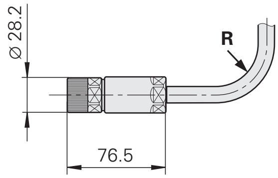
Fixed bearing

Connector for speed encoder	Connector for power connection
	

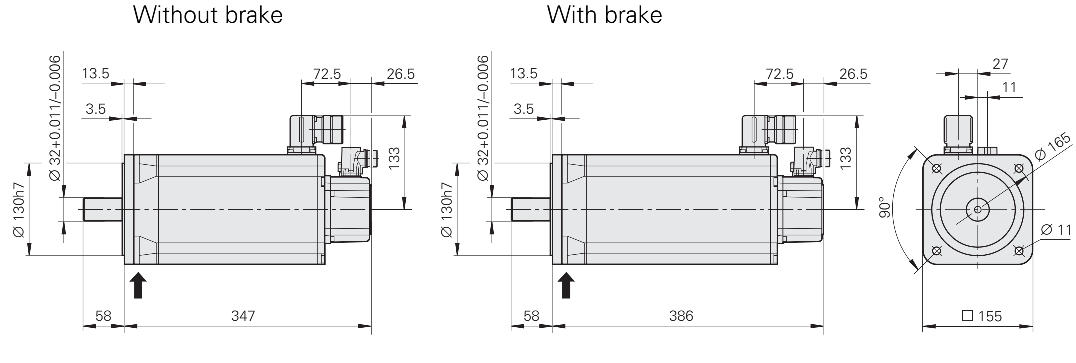
QSY 155D EcoDyn



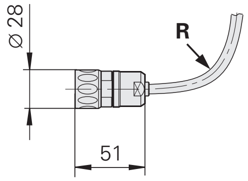
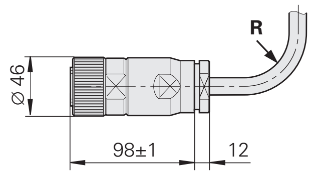
Fixed bearing

Connector for speed encoder	Connector for power connection
	

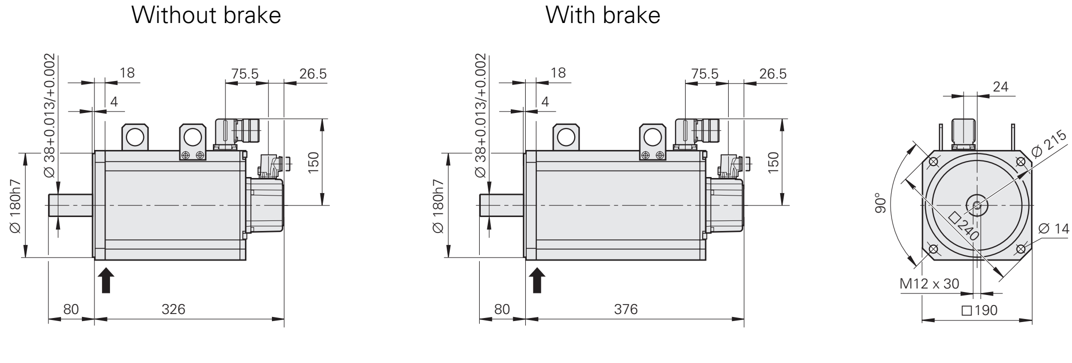
QSY 155F EcoDyn



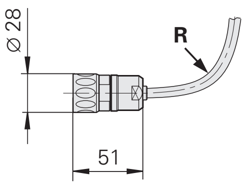
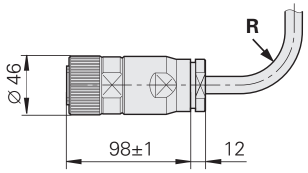
Fixed bearing

Connector for speed encoder	Connector for power connection
	

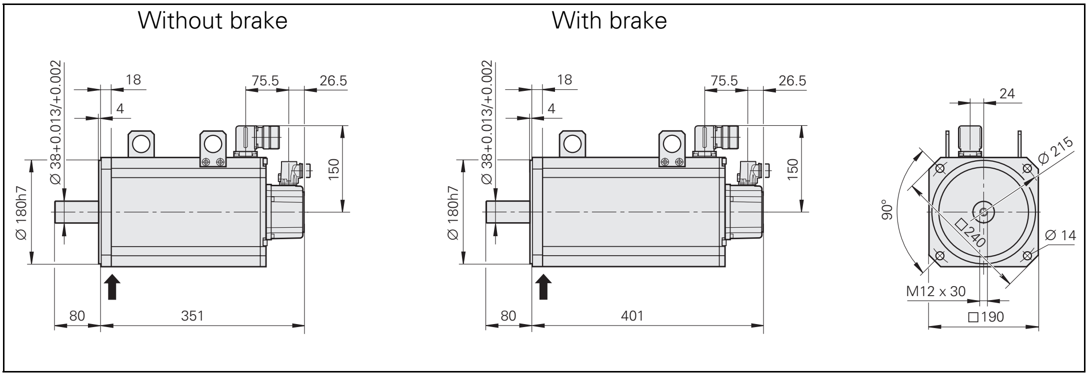
QSY 190C EcoDyn



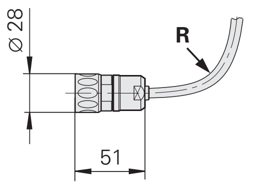
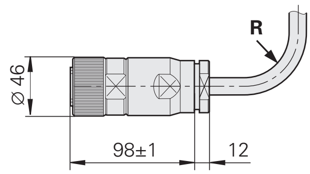
⬆ Fixed bearing

Connector for speed encoder	Connector for power connection
	

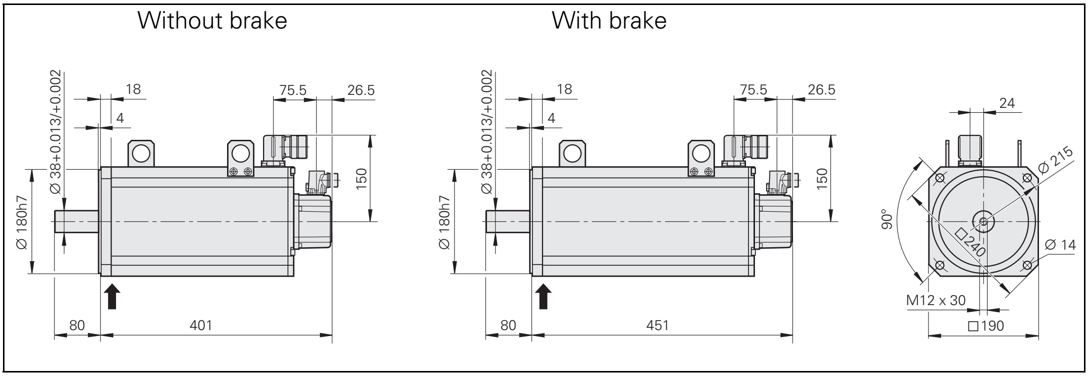
QSY 190D EcoDyn



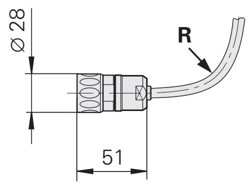
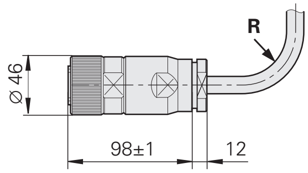
⬆ Fixed bearing

Connector for speed encoder	Connector for power connection
	

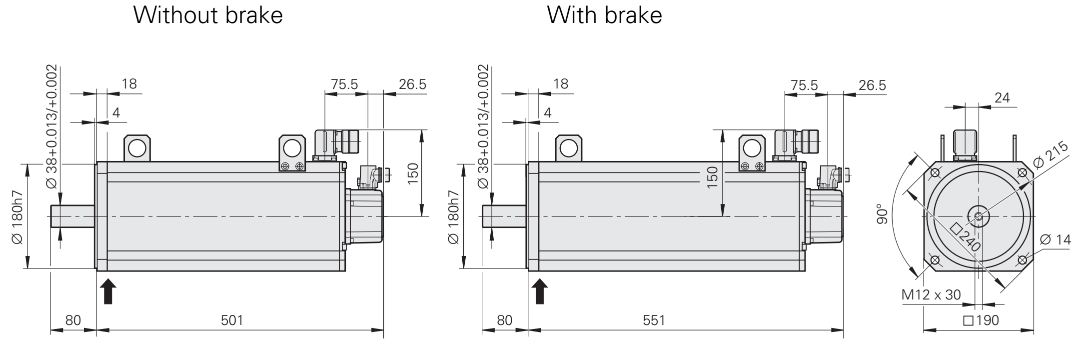
QSY 190F EcoDyn



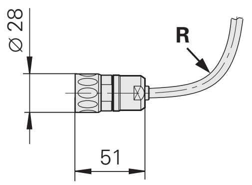
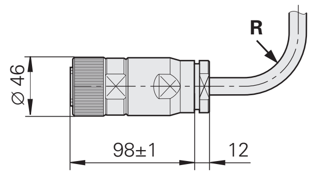
⬆ Fixed bearing

Connector for speed encoder	Connector for power connection
	

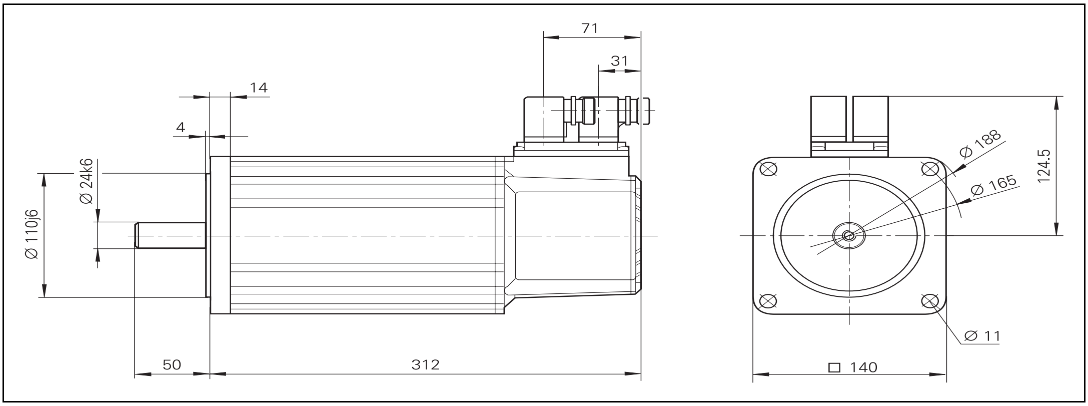
QSY 190K EcoDyn



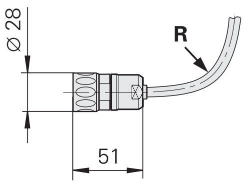
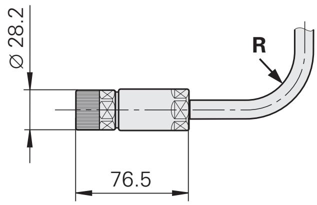
⬆ Fixed bearing

Connector for speed encoder	Connector for power connection
	

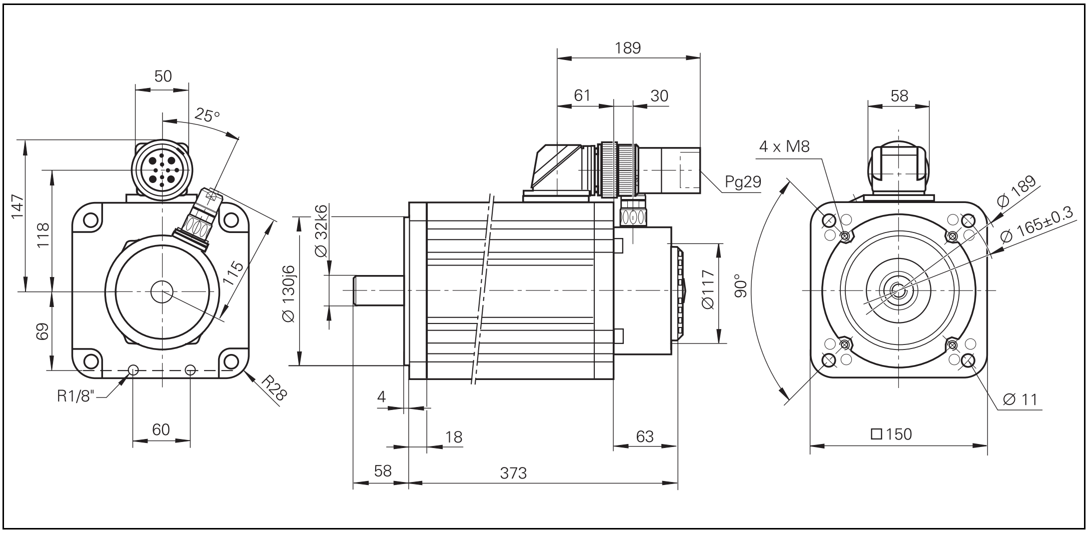
QSY 090B



⬆ Fixed bearing

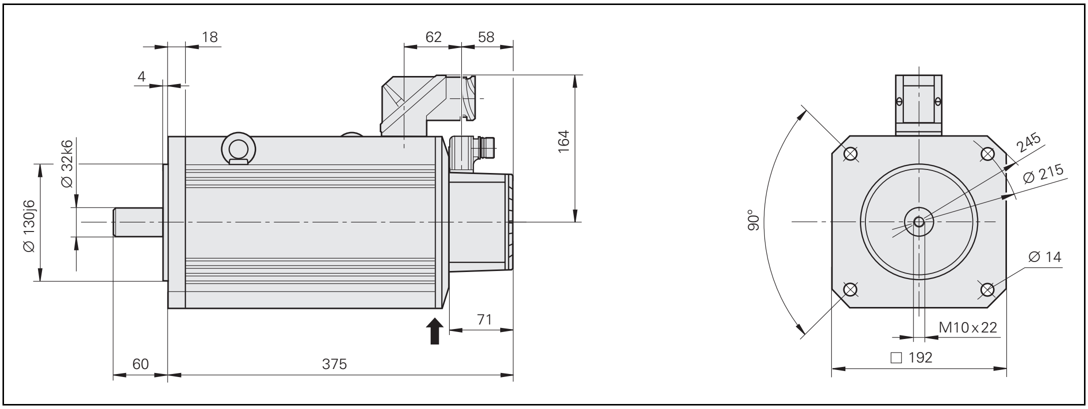
Connector for speed encoder	Connector for power connection
	

QSY 093B

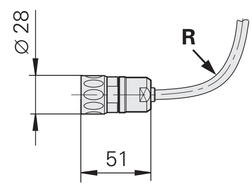
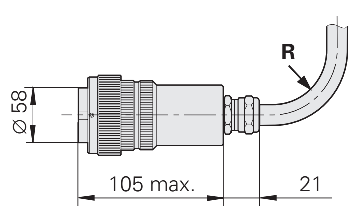


50
25°
147
118
69
115
R1/8"
60
R28
189
61
30
Pg29
Ø 32k6
Ø 130j6
Ø117
4
18
63
58
373
58
4 x M8
Ø 189
Ø 165±0.3
90°
Ø 11
□150

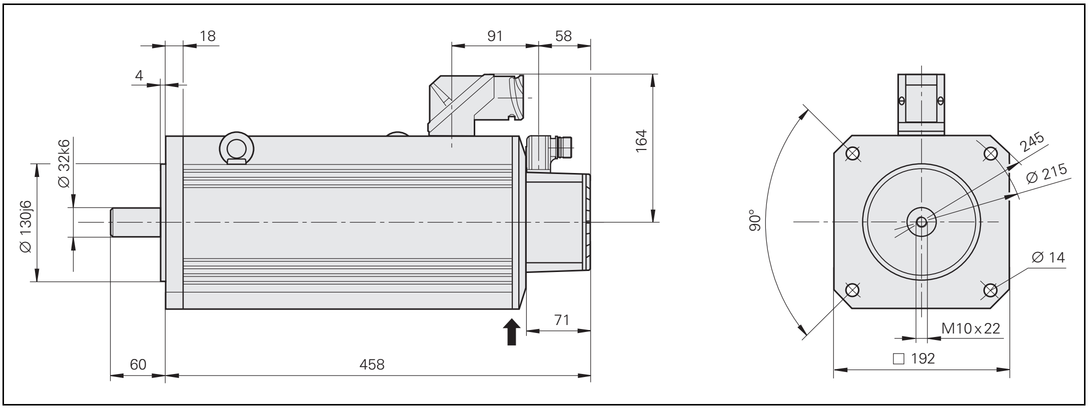
QSY 112B



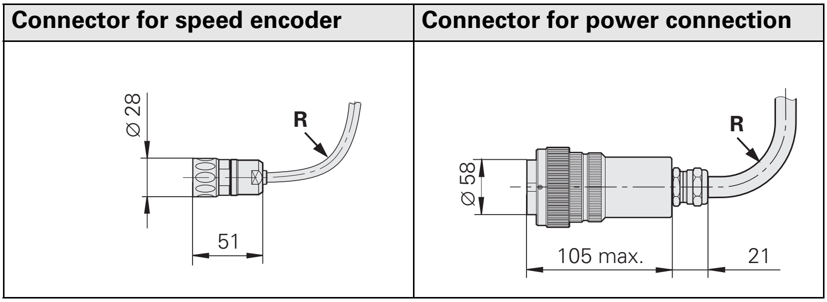
Fixed bearing

Connector for speed encoder	Connector for power connection
	

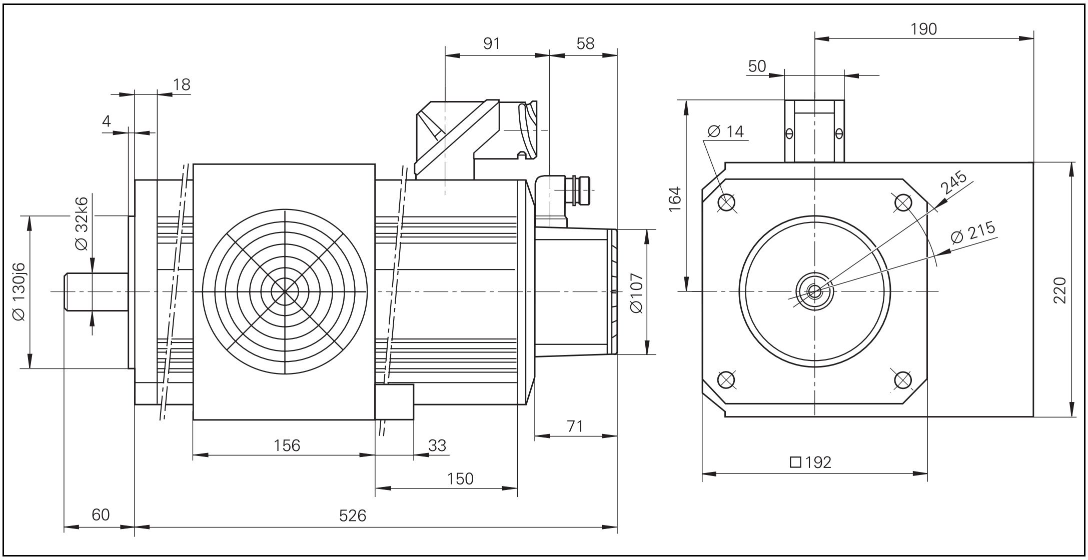
QSY 112C



⬆ Fixed bearing



QSY 112D



91
58
190
50
18
4
Ø 14
164
245
Ø 215
Ø 32k6
Ø 130j6
Ø107
220
71
156
33
150
□192
60
526

7.10 HEIDENHAIN Asynchronous Motors, QAN Series

The HEIDENHAIN asynchronous motors have the following features:

- HEIDENHAIN ERN 1381 motor encoder for speed measurement (QAN 104, QAN 134, QAN 164B with RON 481)
- HEIDENHAIN motor encoder with 1024 lines (ERN 1381) (2048 lines with RON 481)
- Separate cooling via integrated fan
- Design IM B35 (mounting via flange / mounting block) according to IEC 60 034-7, design IM B5 (mounting via flange) on request
- Degree of protection IP 54 according to IEC 60 529 (QAN 104, QAN 134, QAN 164B: IP 40)
- Cylindrical shaft end according to DIN 748 with feather key and threaded central bore hole according to DIN 332-DR (QAN 134 and QAN 164B: DIN 332-DS), without feather key on request
- Flange dimensions according to DIN 42 948 and IEC 72 (not QAN 104)
- Maintenance-free bearing
- KTY 84-130 resistor probe for temperature monitoring in the stator winding
- Thermal class F
- Vibration severity grade S (QAN 200, QAN 260, QAN 320: grade SR, external high-precision balancing possible)
- Full-key balanced

7.10.1 Specifications – Asynchronous Motors, QAN Series

QAN 104 Series

	QAN 104B	QAN 104C	QAN 104D
Fan	+	+	+
Holding brake	–	–	–
Rated voltage U_N	330 V	321 V	303 V
Rated power output P_N	4.5 kW	7.5 kW	10 kW
Rated speed n_N	1500 rpm		
Rated torque M_N	29 Nm	48 Nm	64 Nm
Rated current I_N	12 A	19.9 A	28.4 A
Efficiency η	0.85		
Maximum speed n_{max}	9000 rpm		
Pole pairs PP	2		
Weight m	37 kg	49 kg	60 kg
Rotor inertia J	140 $kgcm^2$	210 $kgcm^2$	280 $kgcm^2$
Rated voltage for fan U_L	230 V		
Rated current for fan I_L	0.3 A		
Frequency f_L	50 Hz/60 Hz		

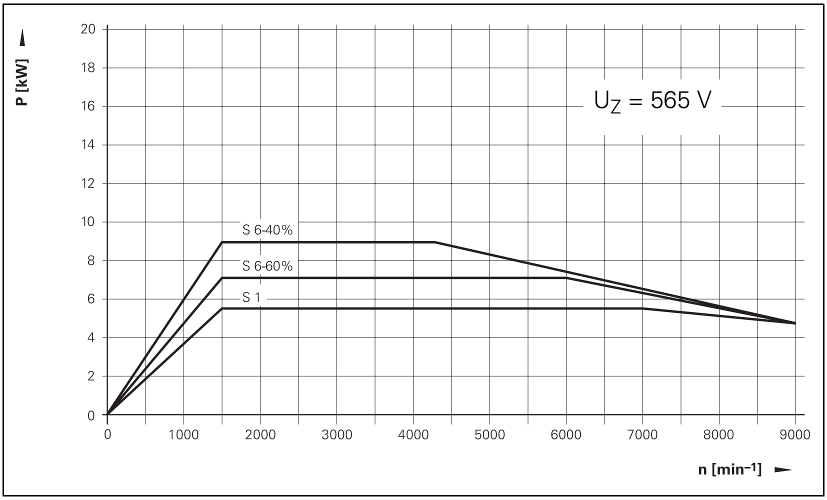
QAN 30 series

	QAN 3M	QAN 3L	QAN 3U
Fan	+	+	+
Holding brake	–	–	–
Rated voltage U_N	330 V		
Rated power output P_N	5.5 kW	7.5 kW	10 kW
Rated speed n_N	1500 rpm		
Rated torque M_N	35 Nm	48 Nm	63.5 Nm
Rated current I_N	15.5 A	21 A	26 A
Efficiency η	0.83		0.82
Maximum speed n_{max}	9000 rpm		
Pole pairs PP	2		
Weight m	53 kg	64 kg	73 kg
Rotor inertia J	184 $kgcm^2$	242 $kgcm^2$	291 $kgcm^2$
Rated voltage for fan U_L	3 x 400 V		
Rated current for fan I_L	0.14 A		0.17 A
Frequency f_L	50 Hz/60 Hz		

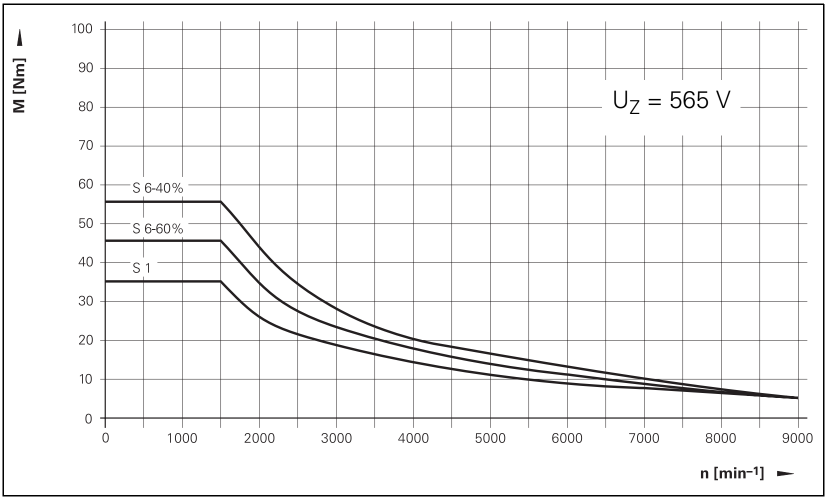
Power and torque characteristics for QAN 3M

Operating mode	S1	S6-60%	S6-40%
Speed n	1500 rpm 7000 rpm 9000 rpm	1500 rpm 6000 rpm 9000 rpm	500 rpm 4300 rpm 9000 rpm
Power P	5.5 kW 5.5 kW 4.7 kW	7.2 kW 7.2 kW 4.7 kW	8.8 kW 8.8 kW 4.7 kW
Torque M	35 Nm 7.5 nm 5 Nm	45.8 Nm 11.5 Nm 5 Nm	56 Nm 19.5 Nm 5 Nm
Current I (for 1500 rpm)	15.5 A	18.5 A	22 A

Power characteristic curve



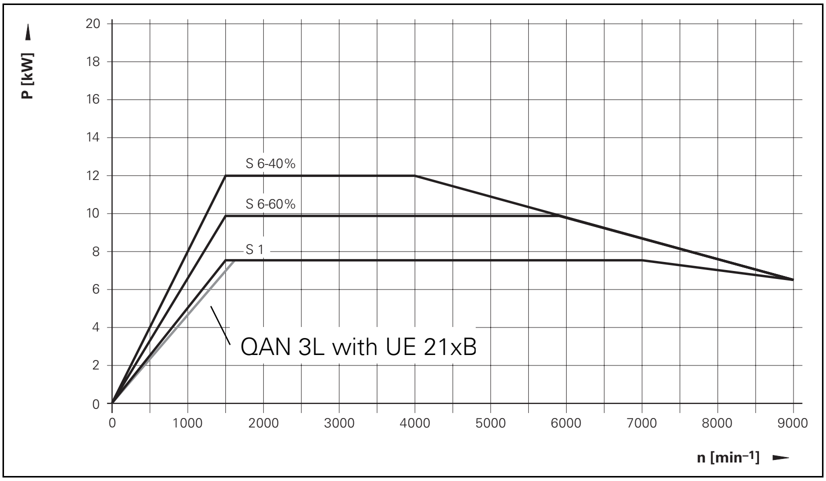
Torque characteristic curve



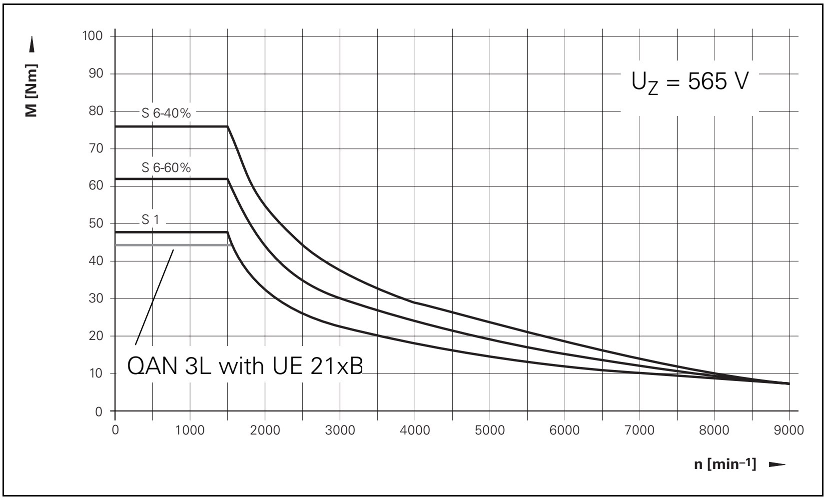
Power and torque characteristic for QAN 3L

Operating mode	S1	S6-60%	S6-40%
Speed n	1500 rpm 7000 rpm 9000 rpm	1500 rpm 5800 rpm 9000 rpm	1500 rpm 4300 rpm 9000 rpm
Power P	7.5 kW 7.5 kW 6.5 kW	9.8 kW 9.8 kW 6.5 kW	12 kW 12 kW 6.5 kW
Torque M	48 Nm 10.2 Nm 6.9 Nm	62.4 Nm 16.1 Nm 6.9 Nm	76.4 Nm 28.6 Nm 6.9 Nm
Current I (for 1500 rpm)	21 A	24.5 A	30 A

Power characteristic curve



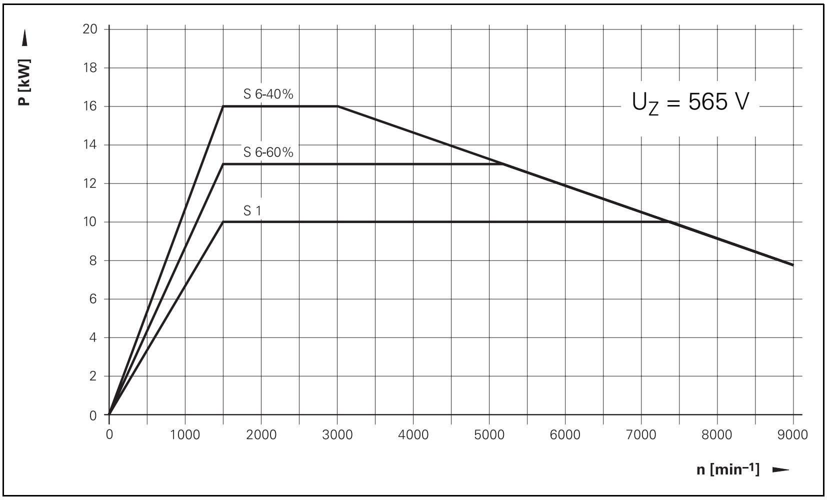
Torque characteristic curve



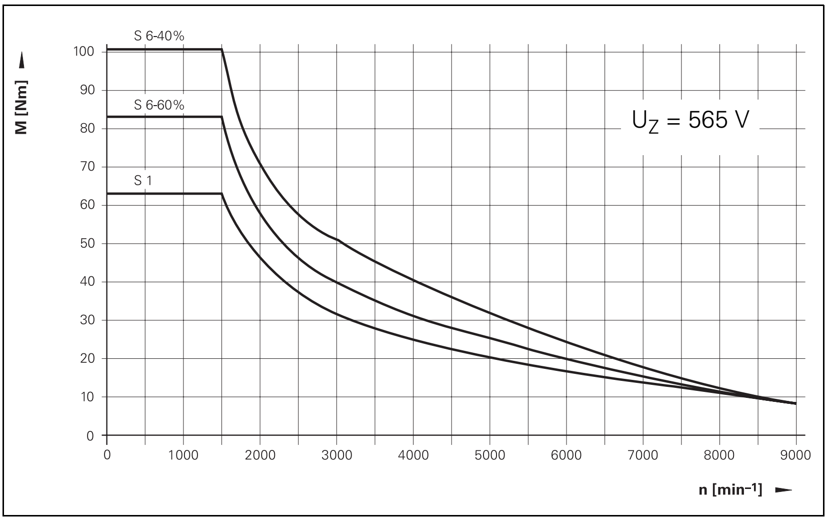
Power and torque characteristic for QAN 3U

Operating mode	S1	S6-60%	S6-40%
Speed n	1500 rpm 7400 rpm 9000 rpm	1500 rpm 5200 rpm 9000 rpm	1500 rpm 3000 rpm 9000 rpm
Power P	10 kW 10 kW 7.8 kW	13 kW 13 kW 7.8 kW	16 kW 16 kW 7.8 kW
Torque M	63.5 Nm 13.6 Nm 8.3 Nm	82.8 Nm 22.6 Nm 8.3 Nm	101.9 Nm 50.9 Nm 8.3 Nm
Current I (for 1500 rpm)	26 A	32 A	38 A

Power characteristic curve



Torque characteristic curve



QAN 200 series

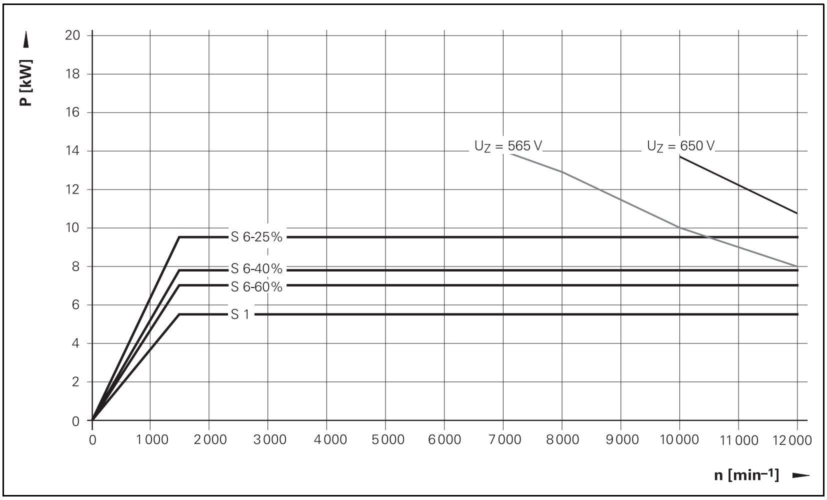
	QAN 200M	QAN 200L	QAN 200U
Fan	+	+	+
Holding brake	–	–	–
Rated voltage U_N	250 V	305 V	330 V
Rated power output P_N	5.5 kW	7.5 kW	10 kW
Rated speed n_N	1500 rpm		
Rated torque M_N (105 K)	35.0 Nm	47.8 Nm	63.7 Nm
Rated current I_N (105 K)	18.0 A	20.1 A	25 A
Efficiency η	0.85		
Maximum continuous speed $n_{max\ cont}$ with standard bearing with spindle bearing	 7500 rpm 10000 rpm		
Maximum speed[a] n_{max} with standard bearing with spindle bearing	 9000 rpm 12000 rpm		
Maximum current I_{max}	33 A	36 A	44 A
Pole pairs PP	2		
Weight m	51 kg	68 kg	83 kg
Rotor inertia J	245 $kgcm^2$	353 $kgcm^2$	405 $kgcm^2$
Fan			
Rated voltage for fan U_L	3 x 400 V		
Rated current for fan I_L	0.31 A		
Frequency f_L	50 Hz/60 Hz		

a. For cycle duration of 10 min.:
3 min. n_{max}; 6 min 2/3 x n_{max}; standstill of 1 min.

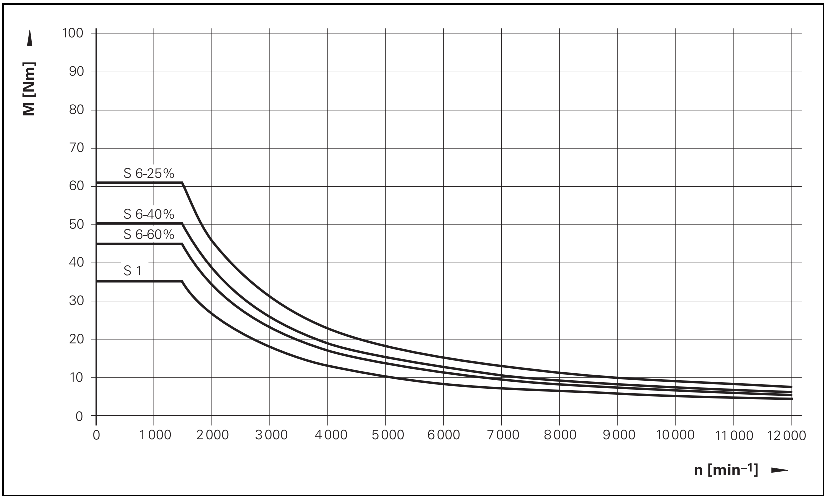
Power and torque characteristics for QAN 200M

Operating mode	S1	S6-60%	S6-40%	S6-25%
Speed n	1500 rpm 6000 rpm 12000 rpm	1500 rpm 6000 rpm 12000 rpm	1500 rpm 6000 rpm 12000 rpm	1500 rpm 6000 rpm 12000 rpm
Power P	5.5 kW 5.5 kW 5.5 kW	7.0 kW 7.0 kW 7.0 kW	7.9 kW 7.9 kW 7.9 kW	9.5 kW 9.5 kW 9.5 kW
Torque M	35.1 Nm 8.8 Nm 4.4 Nm	44.7 Nm 11.2 Nm 5.6 Nm	50.4 Nm 12.6 Nm 6.3 Nm	60.7 Nm 15.2 Nm 7.6 Nm
Current I (for 1500 rpm)	18.0 A	22.0 A	24.0 A	28.0 A

Power characteristic curve



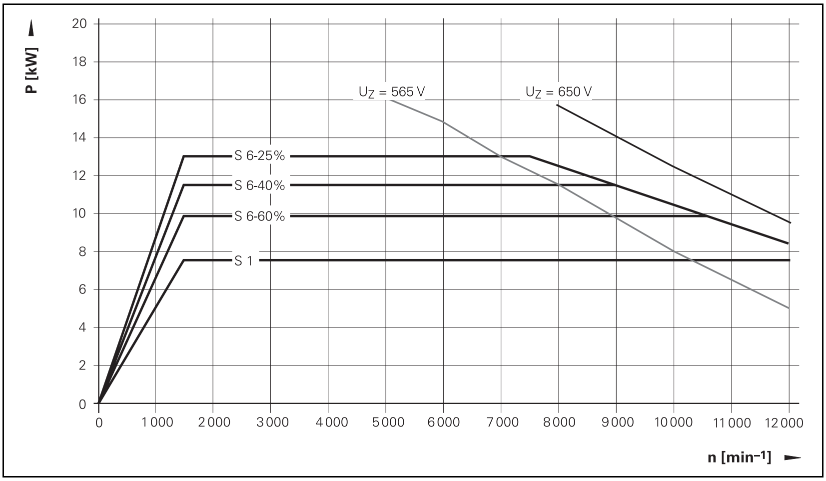
Torque characteristic curve



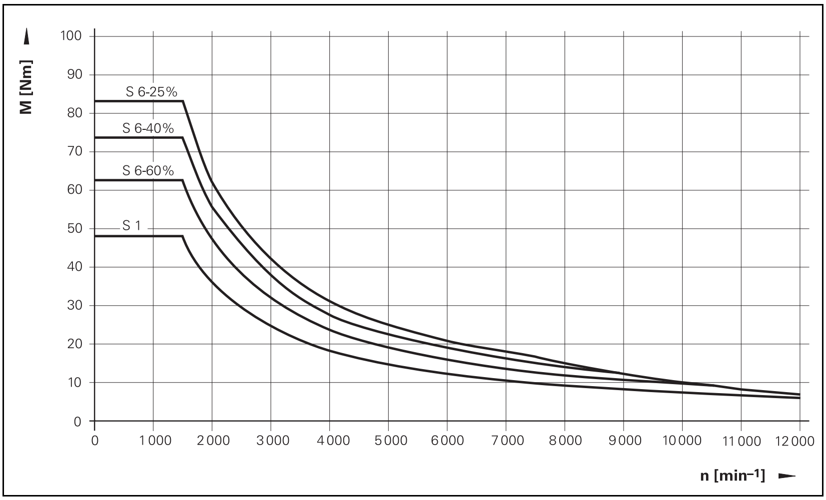
Power and torque characteristics for QAN 200L

Operating mode	**S1**	**S6-60%**	**S6-40%**	**S6-25%**
Speed n	1500 rpm 6000 rpm 12000 rpm	1500 rpm 10700 rpm 12000 rpm	1500 rpm 9000 rpm 12000 rpm	1500 rpm 7500 rpm 12000 rpm
Power P	7.5 kW 7.5 kW 7.5 kW	9.8 kW 9.8 kW 8.5 kW	11.5 kW 11.5 kW 8.5 kW	13.0 kW 13.0 kW 8.5 kW
Torque M	47.9 Nm 12.0 Nm 6.0 Nm	62.6 Nm 23.4 Nm 6.8 Nm	73.4 Nm 27.5 Nm 6.8 Nm	83.0 Nm 16.6 Nm 6.8 Nm
Current I (for 1500 rpm)	20.1 A	24.0 A	27.0 A	31.0 A

Power characteristic curve



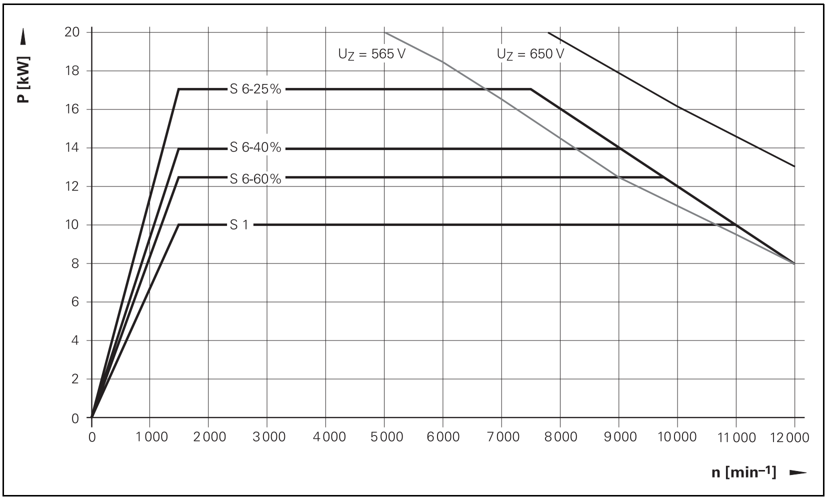
Torque characteristic curve



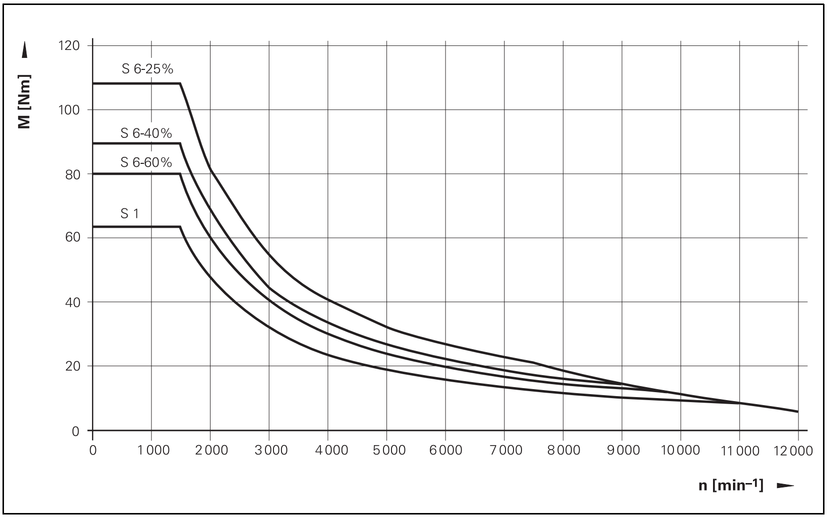
Power and torque characteristics for QAN 200U

Operating mode	S1	S6-60%	S6-40%	S6-25%
Speed n	1500 rpm 11000 rpm 12000 rpm	1500 rpm 9800 rpm 12000 rpm	1500 rpm 9000 rpm 12000 rpm	1500 rpm 7500 rpm 12000 rpm
Power P	10 kW 10 kW 8.0 kW	12.5 kW 12.5 kW 8.0 kW	14.0 kW 14.0 kW 8.0 kW	17.0 kW 17.0 kW 8.0 kW
Torque M	63.9 Nm 8.7 Nm 6.4 Nm	79.8 Nm 12.2 Nm 6.4 Nm	89.4 Nm 19.1 Nm 6.4 Nm	108.6 Nm 21.7 Nm 6.4 Nm
Current I (for 1500 rpm)	25 A	29 A	32 A	37 A

Power characteristic curve



Torque characteristic curve



QAN 260 series

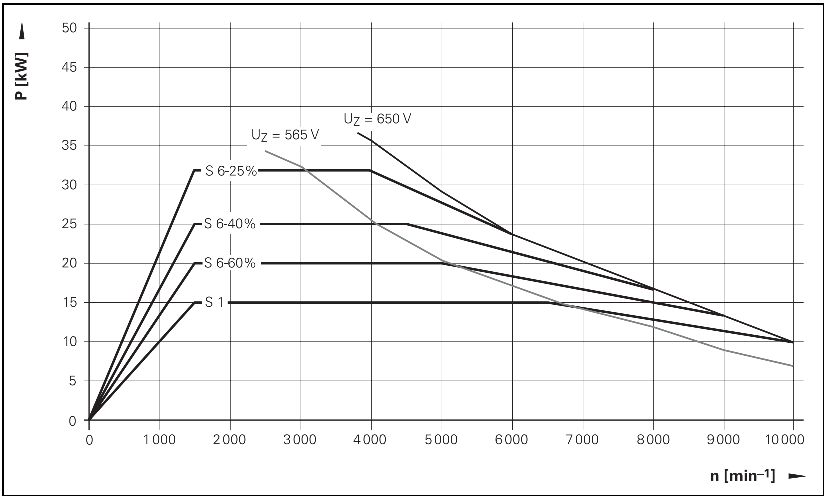
	QAN 260M	QAN 260L	QAN 260U	QAN 260W
Fan	+	+	+	+
Holding brake	–	–	–	–
Rated voltage U_N	348 V	331 V	318 V	335 V
Rated power output P_N	15 kW	20 kW	24 kW	12 kW
Rated speed n_N	1500 rpm			750 rpm
Rated torque M_N (105 K)	95.5 Nm	127.3 Nm	152.8 Nm	152.8 Nm
Rated current I_N (105 K)	35.0 A	46.0 A	58.0 A	29.0 A
Efficiency η	0.85			
Maximum continuous speed $n_{max\ cont}$ with standard bearing with spindle bearing	 7000 rpm 8500 rpm			
Maximum speed[a] n_{max} with standard bearing with spindle bearing	 8000 rpm 10000 rpm			
Maximum current I_{max}	70 A	96 A	116 A	62 A
Pole pairs PP	2			
Weight m	112 kg	135 kg	158 kg	158 kg
Rotor inertia J	700 $kgcm^2$	920 $kgcm^2$	1100 $kgcm^2$	1100 $kgcm^2$
Fan				
Rated voltage for fan U_L	3 x 400 V			
Rated current for fan I_L	0.25 A			
Frequency f_L	50 Hz/60 Hz			

a. For cycle duration of 10 min.:
3 min. n_{max}; 6 min 2/3 x n_{max}; standstill of 1 min.

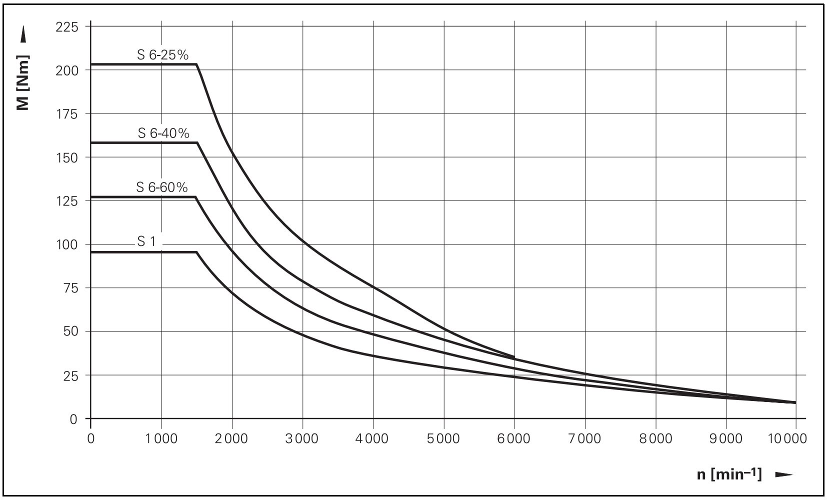
Power and torque characteristics for QAN 260M

Operating mode	S1	S6-60%	S6-40%	S6-25%
Speed n	1500 rpm 6500 rpm 10000 rpm	1500 rpm 5000 rpm 9000 rpm	1500 rpm 4500 rpm 8000 rpm	1500 rpm 4000 rpm 6000 rpm
Power P	15.0 kW 15.0 kW 10.0 kW	20.0 kW 20.0 kW 13.5 kW	25.0 kW 25.0 kW 16.8 kW	32.0 kW 32.0 kW 23.7 kW
Torque M	95.5 Nm 22.0 Nm 9.5 Nm	127.3 Nm 38.2 Nm 14.3 Nm	159.2 Nm 53.1 Nm 20.1 Nm	203.7 Nm 76.4 Nm 37.7 Nm
Current I (for 1500 rpm)	35.0 A	43.3 A	52.3 A	65.0 A

Power characteristic curve



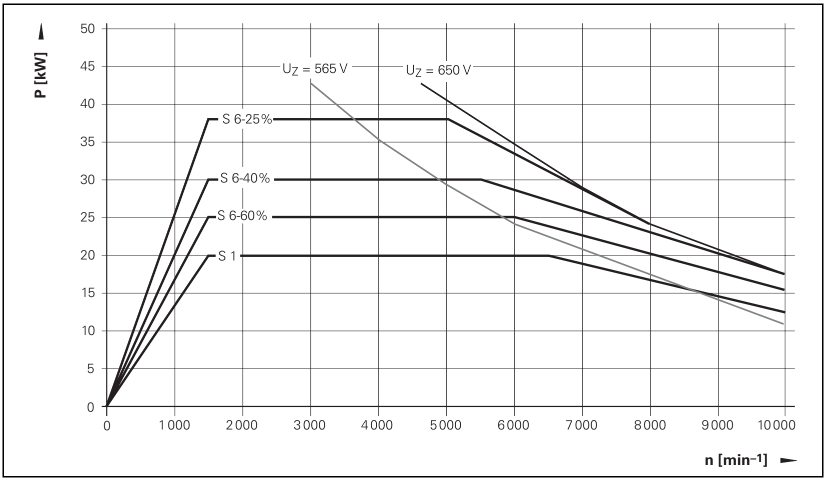
Torque characteristic curve



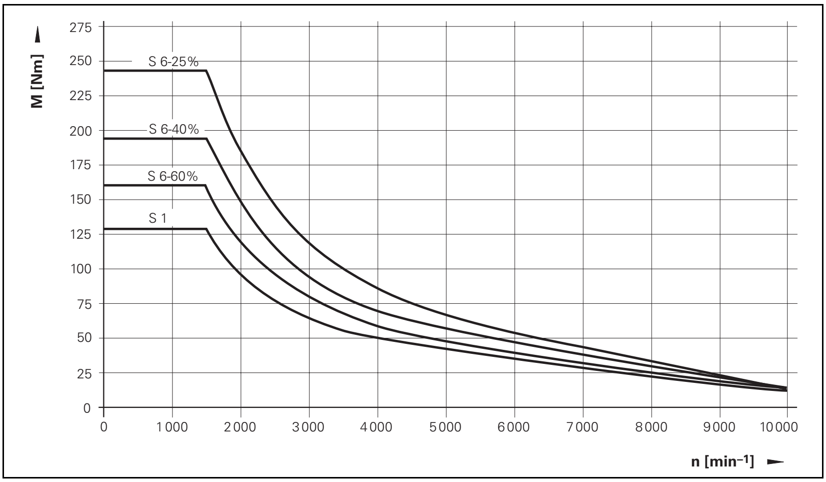
Power and torque characteristics for QAN 260L

Operating mode	S1	S6-60%	S6-40%	S6-25%
Speed n	1500 rpm 6500 rpm 10000 rpm	1500 rpm 6000 rpm 10000 rpm	1500 rpm 5500 rpm 10000 rpm	1500 rpm 5000 rpm 8000 rpm
Power P	20.0 kW 20.0 kW 13.0 kW	25.0 kW 25.0 kW 16.0 kW	30.0 kW 30.0 kW 17.5 kW	37.0 kW 37.0 kW 24.0 kW
Torque M	127.3 Nm 29.4 Nm 12.4 Nm	159.2 Nm 39.4 Nm 15.3 Nm	191.0 Nm 52.1 Nm 16.7 Nm	235.5 Nm 70.7 Nm 28.6 Nm
Current I (for 1500 rpm)	46.0 A	56.0 A	65.0 A	79.0 A

Power characteristic curve



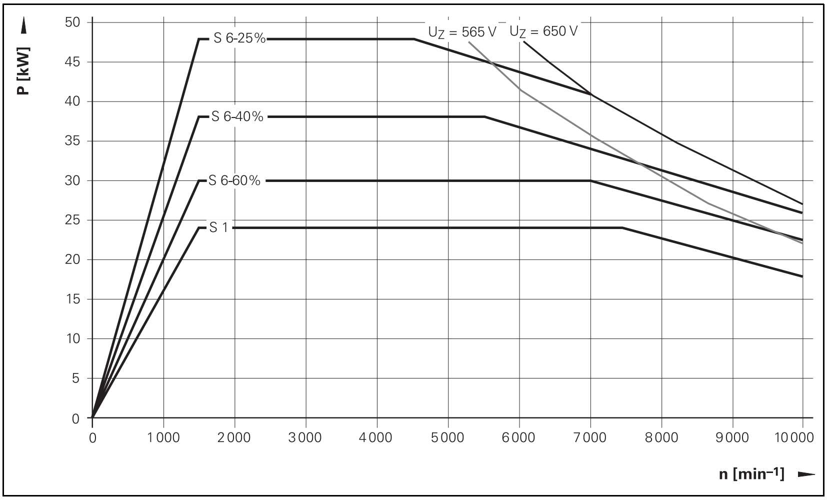
Torque characteristic curve



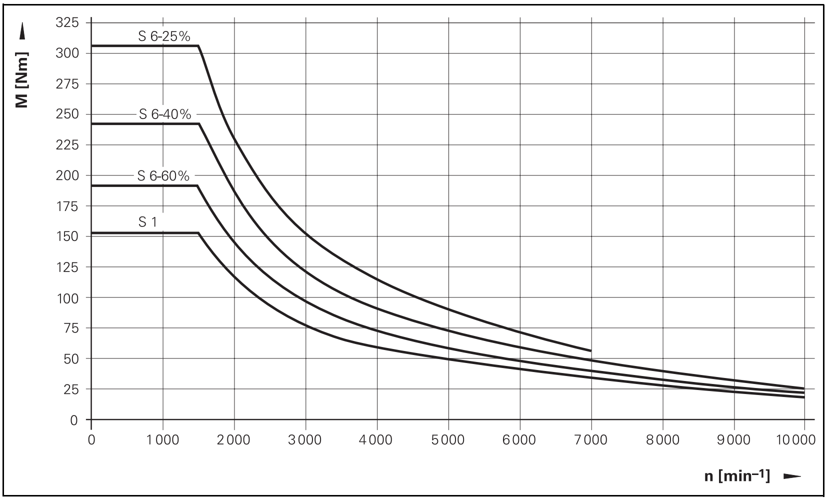
Power and torque characteristics for QAN 260U

Operating mode	S1	S6-60%	S6-40%	S6-25%
Speed n	1500 rpm 7400 rpm 10000 rpm	1500 rpm 7000 rpm 10000 rpm	1500 rpm 5500 rpm 10000 rpm	1500 rpm 4500 rpm 7000 rpm
Power P	24.0 kW 24.0 kW 18.0 kW	30.0 kW 30.0 kW 22.5 kW	38.0 kW 38.0 kW 26.0 kW	48.0 kW 48.0 kW 41.0 kW
Torque M	152.8 Nm 31.0 Nm 17.2 Nm	191.0 Nm 40.9 Nm 21.5 Nm	241.9 Nm 66.0 Nm 24.8 Nm	305.6 Nm 101.9 Nm 55.9 Nm
Current I (for 1500 rpm)	58.0 A	67.2 A	81.8 A	100.6 A

Power characteristic curve



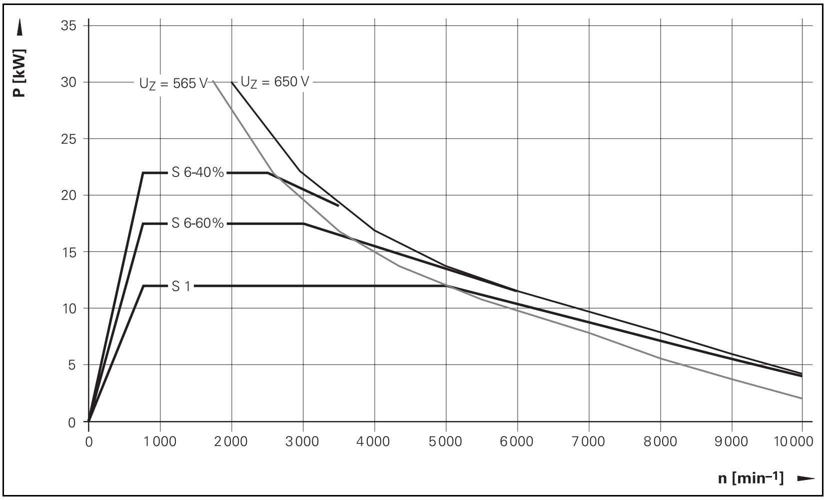
Torque characteristic curve



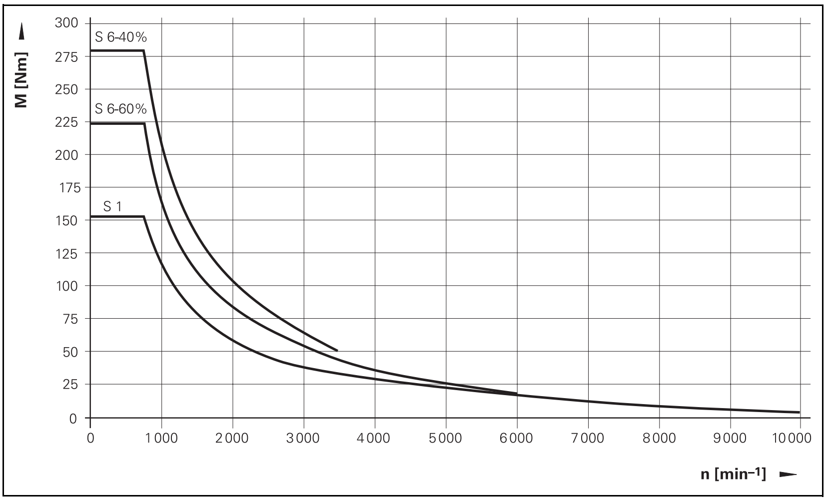
Power and torque characteristics for QAN 260W

Operating mode	S1	S6-60%	S6-40%
Speed n	750 rpm 5000 rpm 10000 rpm	750 rpm 3000 rpm 6000 rpm	750 rpm 2500 rpm 3500 rpm
Power P	12.0 kW 12.0 kW 4.0 kW	17.5 kW 17.5 kW 11.3 kW	22.0 kW 22.0 kW 19.0 kW
Torque M	152.8 Nm 22.9 Nm 3.8 Nm	222.8 Nm 55.7 Nm 18.0 Nm	280.1 Nm 84.0 Nm 51.8 Nm
Current I (for 750 rpm)	29.0 A	38.1 A	46.4 A

Power characteristic curve



Torque characteristic curve



QAN 320 series

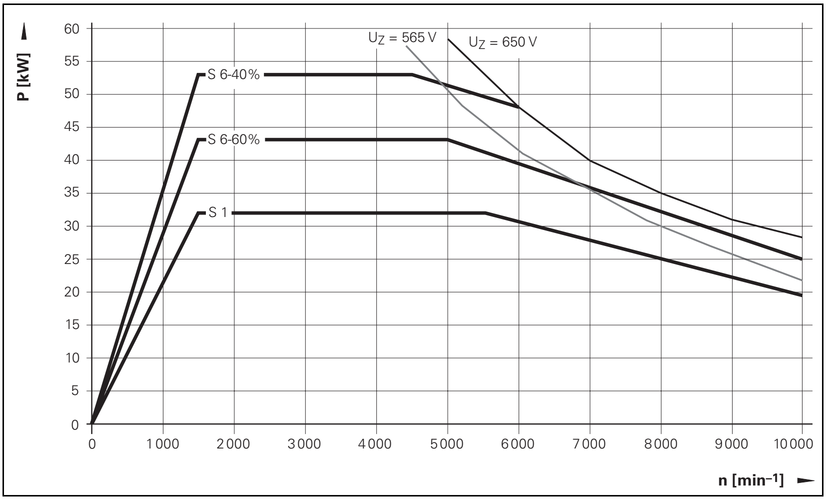
	QAN 320M	QAN 320L	QAN 320W
Fan	+	+	+
Holding brake	–	–	–
Rated voltage U_N	317 V	315 V	320 V
Rated power output P_N	32 kW	40 kW	18 kW
Rated speed n_N	1500 rpm	1500 rpm	750 rpm
Rated torque M_N (105 K)	203.7 Nm	254.6 Nm	229.2 Nm
Rated current I_N (105 K)	77.5 A	99.0 A	43.0 A
Efficiency η	0.85	0.91	0.85
Maximum continuous speed $n_{max\ cont}$ with standard bearing with spindle bearing	 7000 rpm 8500 rpm		
Maximum speed[a] n_{max} with standard bearing with spindle bearing	 8000 rpm 10000 rpm		
Maximum current I_{max}	155 A	186 A	86 A
Pole pairs PP	2		
Weight m	240 kg	280 kg	240 kg
Rotor inertia J	1870 $kgcm^2$	2300 $kgcm^2$	1870 $kgcm^2$
Fan			
Rated voltage for fan U_L	3 x 400 V		
Rated current for fan I_L	0.6 A		
Frequency f_L	50 Hz/60 Hz		

a. For cycle duration of 10 min.:
3 min. n_{max}; 6 min 2/3 x n_{max}; standstill of 1 min.

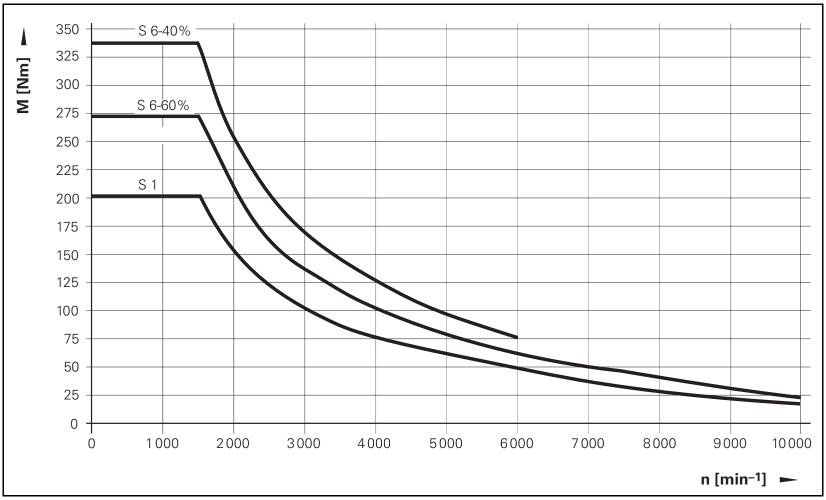
Power and torque characteristics for QAN 320M

Operating mode	S1	S6-60%	S6-40%
Speed n	1500 rpm 5500 rpm 10000 rpm	1500 rpm 5500 rpm 10000 rpm	1500 rpm 5500 rpm 6000 rpm
Power P	32.0 kW 32.0 kW 19.5 kW	43.0 kW 43.0 kW 25.0 kW	53.0 kW 53.0 kW 48.0 kW
Torque M	203.7 Nm 55.0 Nm 18.6 Nm	273.7 Nm 71.5 Nm 23.9 Nm	337.4 Nm 86.2 Nm 76.4 Nm
Current I (for 1500 rpm)	77.5 A	98.0 A	118.0 A

Power characteristic curve



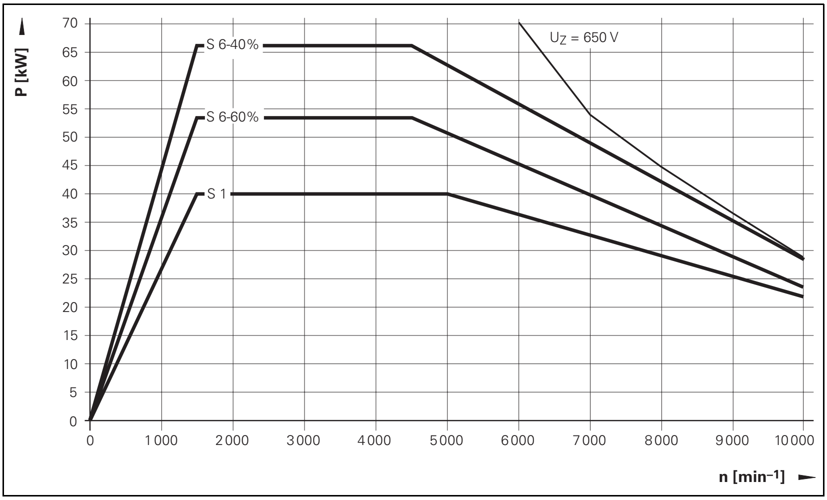
Torque characteristic curve



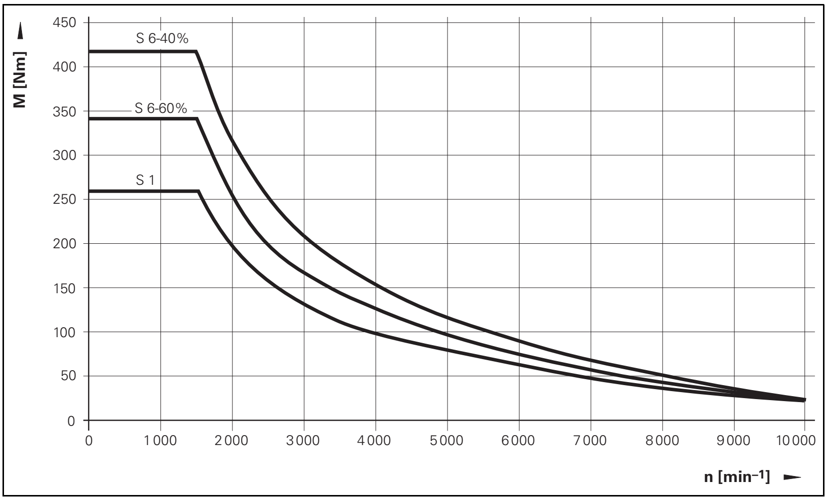
Power and torque characteristics for QAN 320L

Operating mode	S1	S6-60%	S6-40%
Speed n	1500 rpm 5000 rpm 10000 rpm	1500 rpm 4500 rpm 10000 rpm	1500 rpm 4500 rpm 10000 rpm
Power P	40.0 kW 40.0 kW 21.0 kW	53.0 kW 53.0 kW 24.0 kW	66.0 kW 66.0 kW 28.0 kW
Torque M	254.6 Nm 77.9 Nm 21.0 Nm	337.4 Nm 112.5 Nm 22.9 Nm	420.2 Nm 140.1 Nm 26.7 Nm
Current I (for 750 rpm)	99.0 A	123.0 A	148.0 A

Power characteristic curve



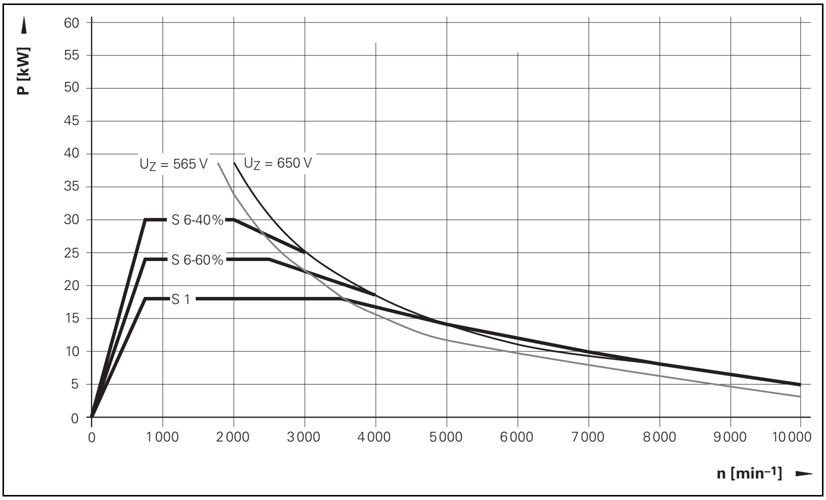
Torque characteristic curve



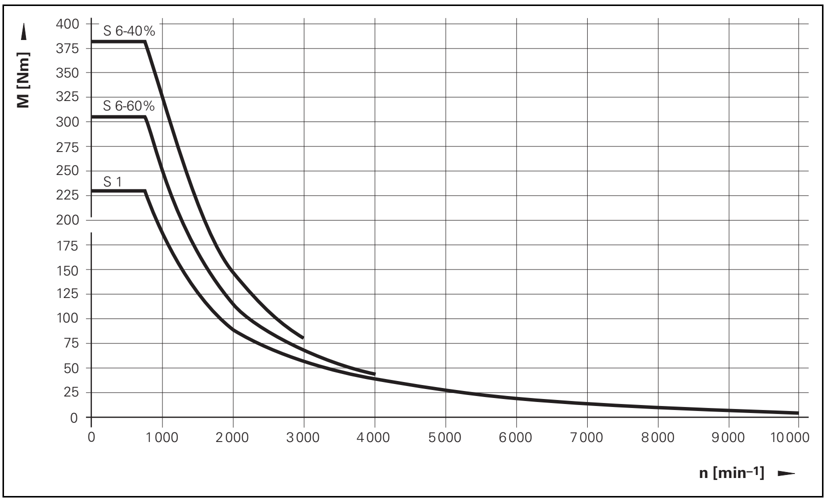
Power and torque characteristics for QAN 320W

Operating mode	S1	S6-60%	S6-40%
Speed n	750 rpm 3500 rpm 10000 rpm	750 rpm 2000 rpm 4000 rpm	750 rpm 2000 rpm 3000 rpm
Power P	18.0 kW 18.0 kW 5.0 kW	24.0 kW 24.0 kW 18.5 kW	30.0 kW 30.0 kW 25.0 kW
Torque M	229.2 Nm 49.1 Nm 4.8 Nm	305.6 Nm 114.6 Nm 44.2 Nm	382.0 Nm 143.2 Nm 79.6 Nm
Current I (for 750 rpm)	43.0 A	54.0 A	71.0 A

Power characteristic curve



Torque characteristic curve



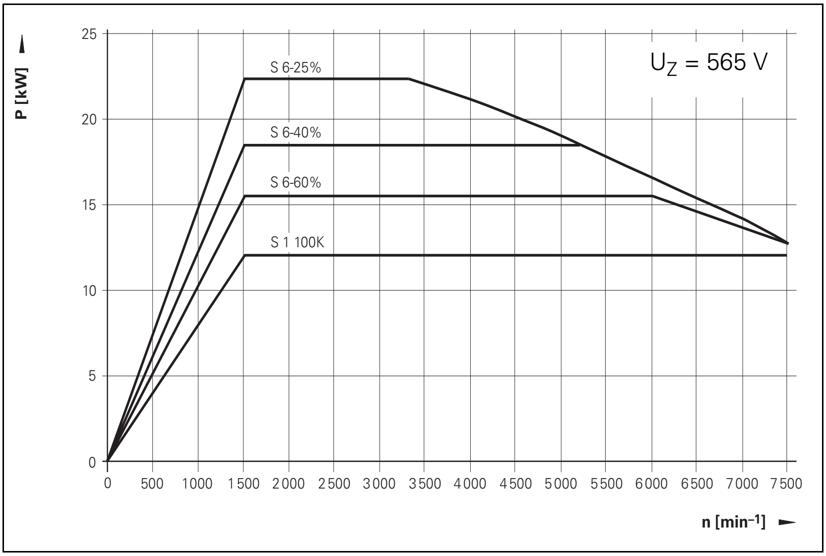
QAN 134 series

	QAN 134B	QAN 134C	QAN 134D
Fan	+	+	+
Holding brake	–	–	–
Rated voltage U_N	328 V	321 V	387 V
Rated power output P_N	12 kW	18 kW	22 kW
Rated speed n_N	1500 rpm		1250 rpm
Rated torque M_N	76 Nm	115 Nm	166 Nm
Rated current I_N	27.8 A	42 A	51.6 A
Efficiency η	0.85		
Maximum speed n_{max}	7500 rpm		
Pole pairs PP	2		
Weight m	90 kg	115 kg	135 kg
Rotor inertia J	540 $kgcm^2$	60 $kgcm^2$	1180 $kgcm^2$
Rated voltage for fan U_L	3 x 400 V		
Rated current for fan I_L	0.2 A		
Frequency f_L	50 Hz/60 Hz		

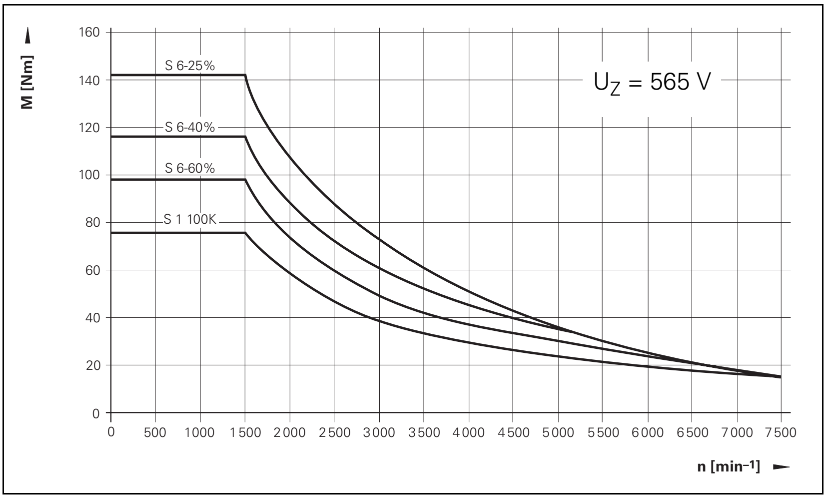
Power and torque characteristic for QAN 134B

Operating mode	S1	S6-60%	S6-40%
Speed n	1500 rpm 6000 rpm 7500 rpm	1500 rpm 5200 rpm 7500 rpm	1500 rpm 3300 rpm 7500 rpm
Power P	12 kW 12 kW 12 kW	15 kW 15 kW 13 kW	18 kW 18 kW 13 kW
Torque M	76 Nm 21 Nm 18 Nm	98 Nm 28 Nm 24 Nm	117 Nm 34 Nm 36 Nm
Current I (for 1500 rpm)	27.8 A	34.0 A	40.0 A

Power characteristic curve



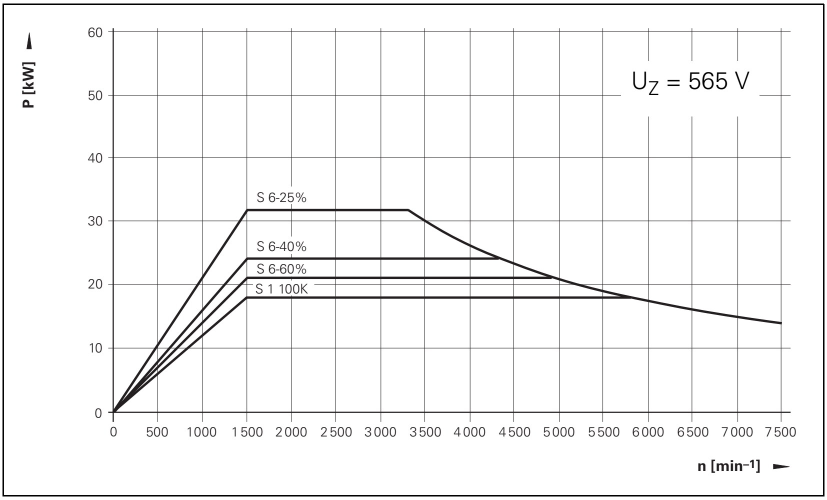
Torque characteristic curve



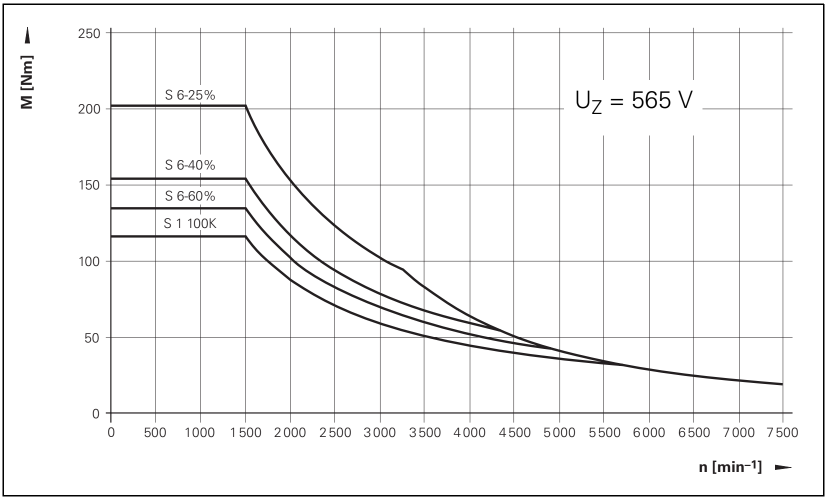
Power and torque characteristic for QAN 134C

Operating mode	S1	S6-60%	S6-40%
Speed n	1500 rpm 5800 rpm 7500 rpm	1500 rpm 4900 rpm 7500 rpm	1500 rpm 4300 rpm 7500 rpm
Power P	18 kW 18 kW 13 kW	21 kW 21 kW 13 kW	24 kW 24 kW 13 kW
Torque M	115 Nm 30 Nm 18 Nm	134 Nm 41 Nm 18 Nm	154 Nm 53 Nm 18 Nm
Current I (for 1500 rpm)	42.0 A	43.0 A	55.0 A

Power characteristic curve



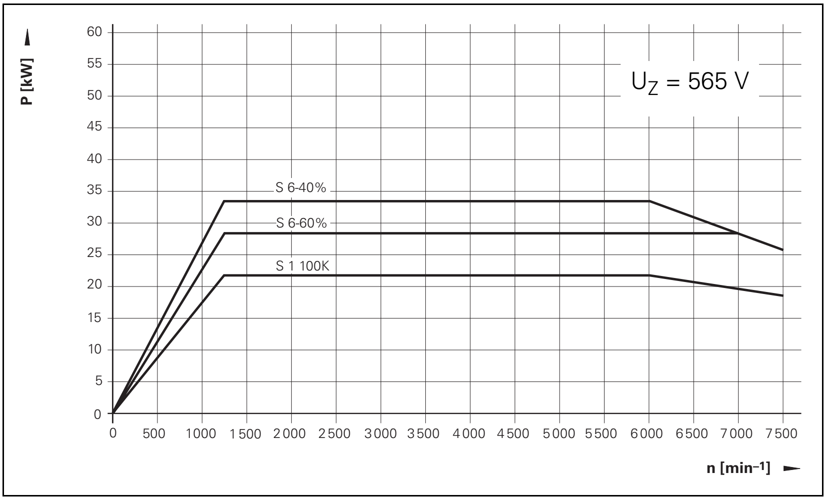
Torque characteristic curve



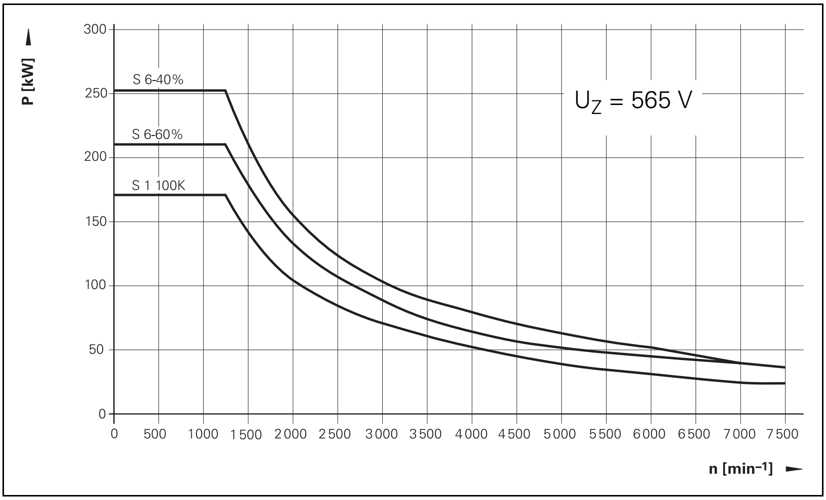
Power and torque characteristic for QAN 134D

Operating mode	S1	S6-60%	S6-40%
Speed n	1250 rpm 6000 rpm 7500 rpm	1250 rpm 7000 rpm 7500 rpm	1250 rpm 6000 rpm 7500 rpm
Power P	22 kW 22 kW 16 kW	28 kW 28 kW 26 kW	33 kW 33 kW 26 kW
Torque M	166 Nm 35 Nm 23 Nm	213 Nm 38 Nm 33 Nm	252 Nm 45 Nm 38 Nm
Current I (for 1250 rpm)	51.6 A	63.0 A	73.0 A

Power characteristic curve



Torque characteristic curve



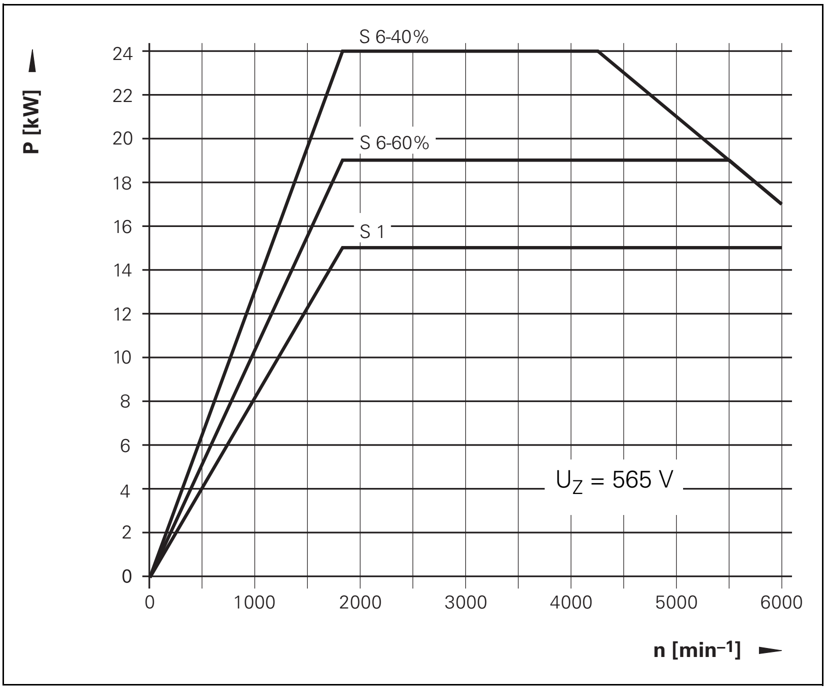
QAN 4S

	QAN 4S
Fan	+
Holding brake	–
Rated voltage U_N	380 V
Rated power output P_N	15 kW
Rated speed n_N	1800 rpm
Rated torque M_N	80 Nm
Rated current I_N	31 A
Efficiency η	0.85
Maximum speed n_{max}	6000 rpm
Pole pairs PP	2
Weight m	5 kg
Rotor inertia J	827 $kgcm^2$
Rated voltage for fan U_L	3 x 400 V
Rated current for fan I_L	0.19 A/ 0.22 A
Frequency f_L	50 Hz/60 Hz

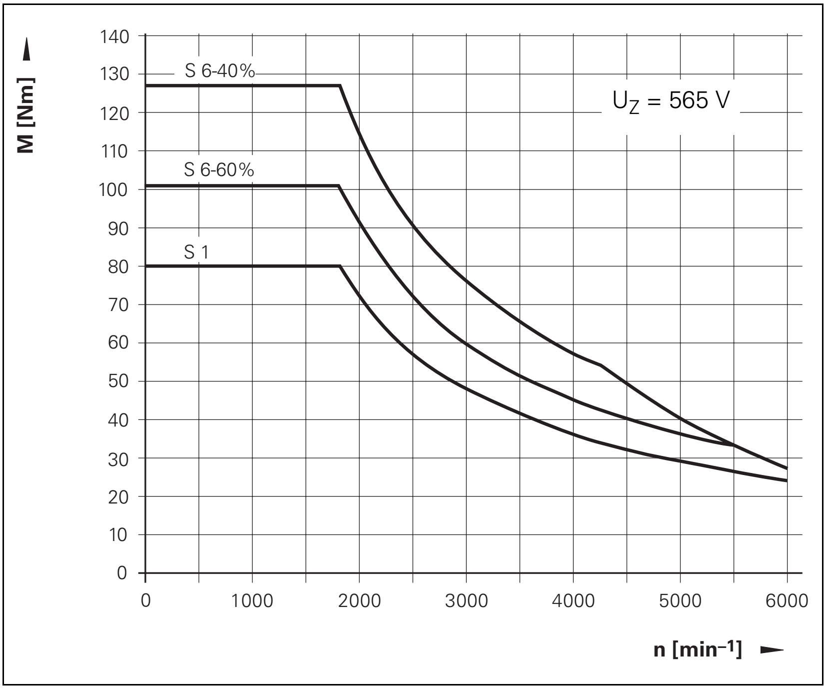
Power and torque characteristic for QAN 4S

Operating mode	S1	S6-60%	S6-40%
Speed n	1800 rpm 6000 rpm	1800 rpm 5500 rpm 6000 rpm	1800 rpm 4250 rpm 6000 rpm
Power P	15 kW 15 kW	19 kW 19 kW 17 kW	24 kW 24 kW 17 kW
Torque M	80 Nm 24 Nm	101 Nm 33 Nm 27 Nm	127 Nm 54 Nm 27 Nm
Current I (for 1800 rpm)	31 A	38 A	47 A

Power characteristic curve



Torque characteristic curve



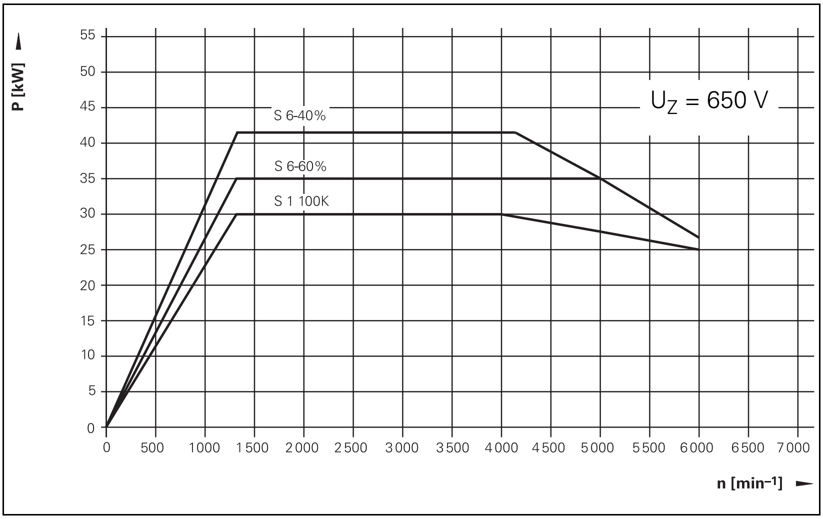
QAN 164B

	QAN 164B
Fan	+
Holding brake	–
Rated voltage U_N	423 V
Rated power output P_N	31.5 kW
Rated speed n_N	1350 rpm
Rated torque M_N	223 Nm
Rated current I_N	56.6 A
Efficiency η	0.85
Maximum speed n_{max}	6000 rpm
Pole pairs PP	2
Weight m	205 kg
Rotor inertia J	1740 $kgcm^2$
Rated voltage for fan U_L	3 x 400 V
Rated current for fan I_L	0.2 A
Frequency f_L	50 Hz/60 Hz

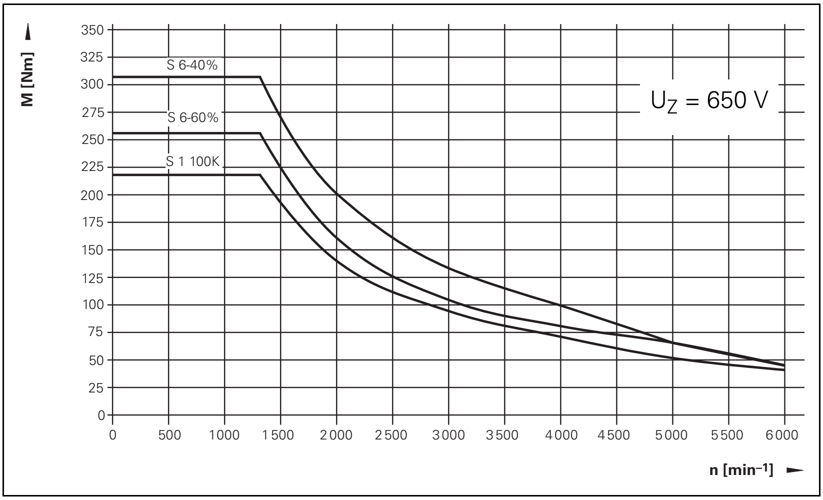
Power and torque characteristic for QAN 164B

Operating mode	S1	S6-60%	S6-40%
Speed n	1300 rpm 4000 rpm 6000 rpm	1300 rpm 5000 rpm 6000 rpm	1300 rpm 4200 rpm 6000 rpm
Power P	30 kW 30 kW 25 kW	35 kW 35 kW 27 kW	42 kW 42 kW 27 kW
Torque M	221.0 Nm 71.6 Nm 39.8 Nm	257.00 Nm 66.84 Nm 43.00 Nm	308.5 Nm 95.5 Nm 43.0 Nm
Current I (for 1300 rpm)	57.0 A	62.5 A	77.0 A

Power characteristic curve



Torque characteristic curve

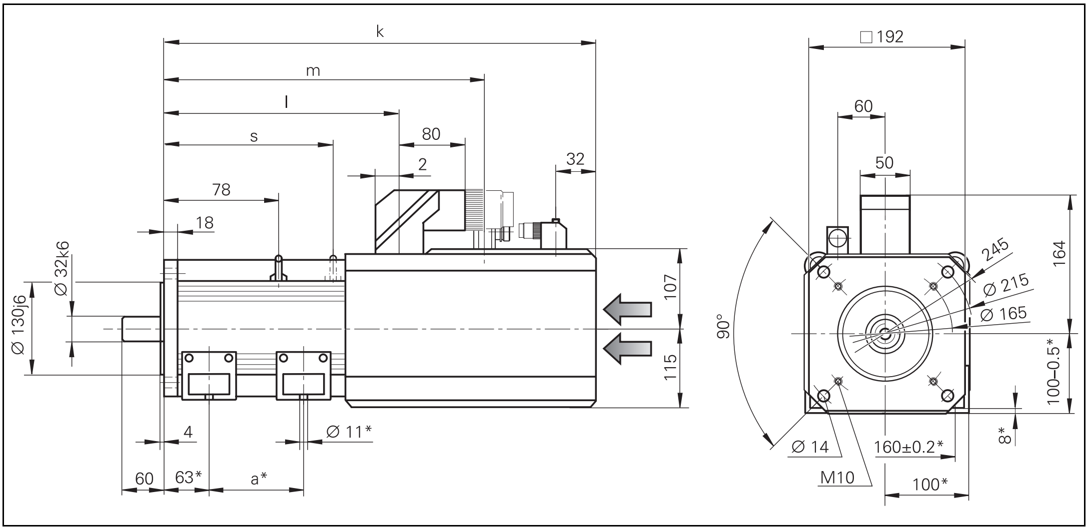


7.10.2 Dimensions – Asynchronous Motors, QAN Series

Note

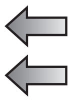
All dimensions are in millimeters [mm].

QAN 104 series



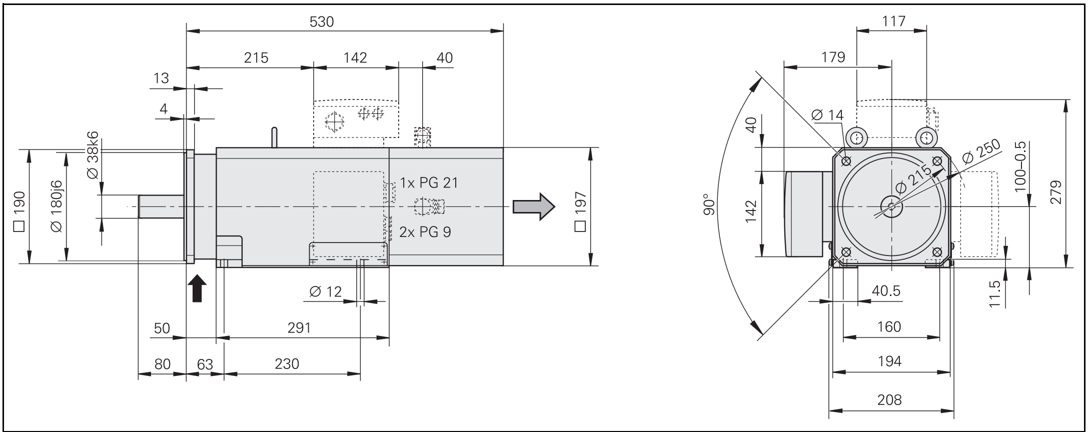
*) Mounting block (design IM B35) on request

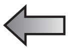
Motor	k	l	m	a	s
QAN 104B	507 mm	247 mm	339 mm	80 mm	166 mm
QAN 104C	582 mm	322 mm	414 mm	140 mm	241 mm
QAN 104D	657 mm	397 mm	489 mm	215 mm	316 mm



Air current of the fan

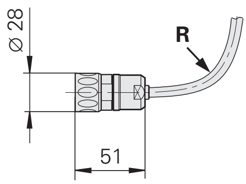
QAN 3M



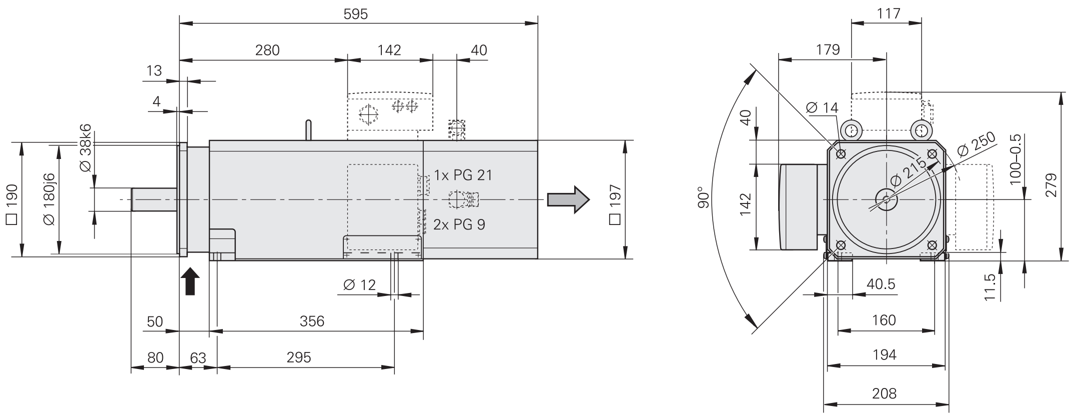


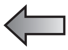
Air current of the fan

Fixed bearing

Connector for speed encoder


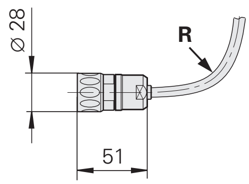
QAN 3L



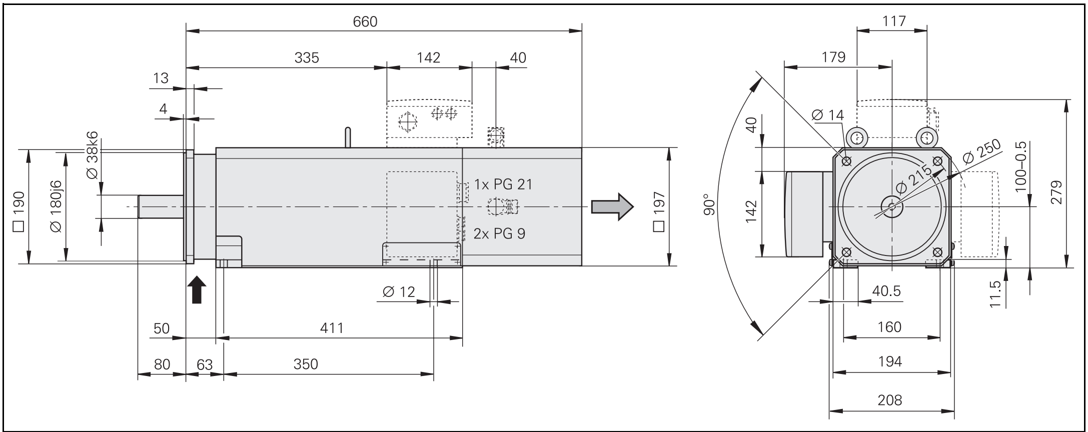


Air current of the fan

Fixed bearing

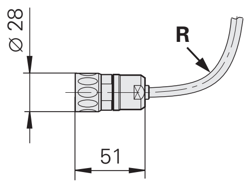
Connector for speed encoder


QAN 3U

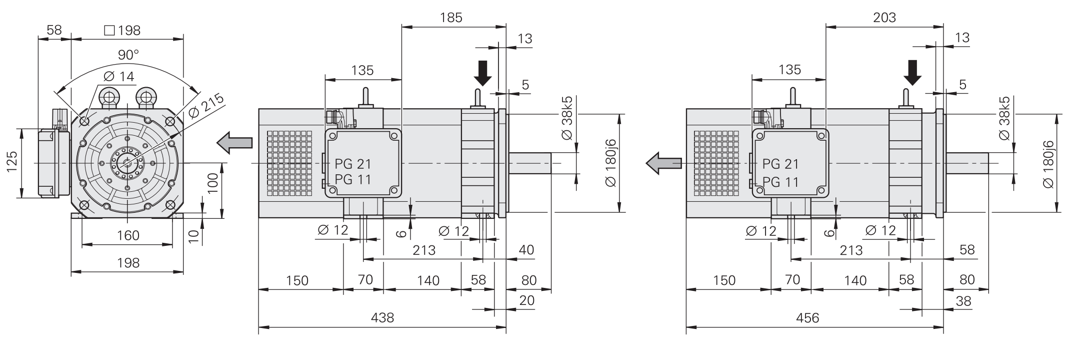


Air current of the fan

Fixed bearing

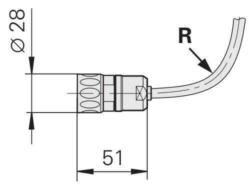
Connector for speed encoder


QAN 200M

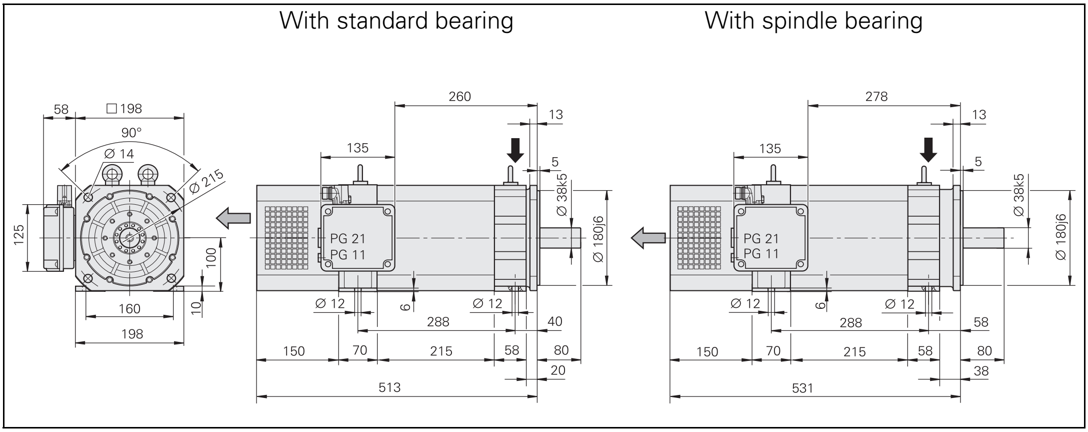


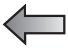
Air current of the fan

Fixed bearing

Connector for speed encoder


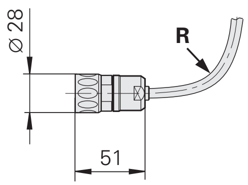
QAN 200L





Air current of the fan

Fixed bearing

Connector for speed encoder


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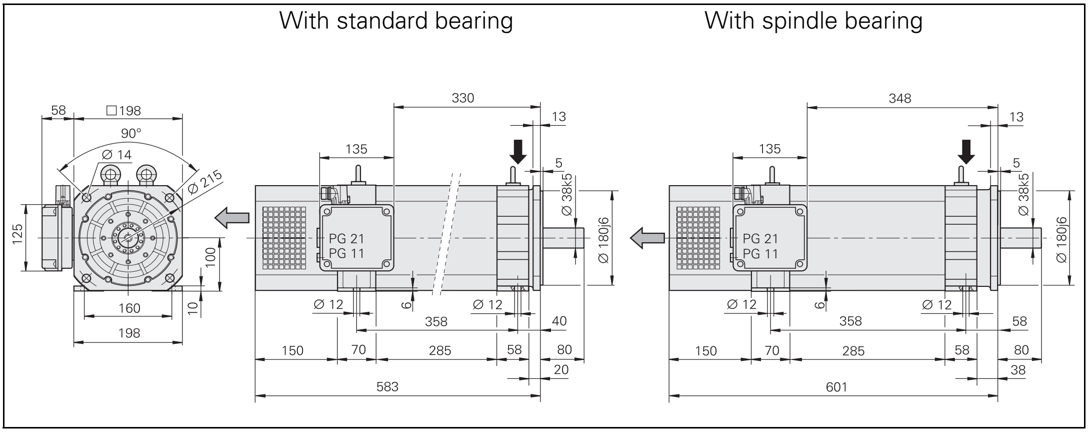
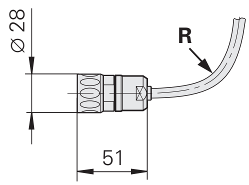
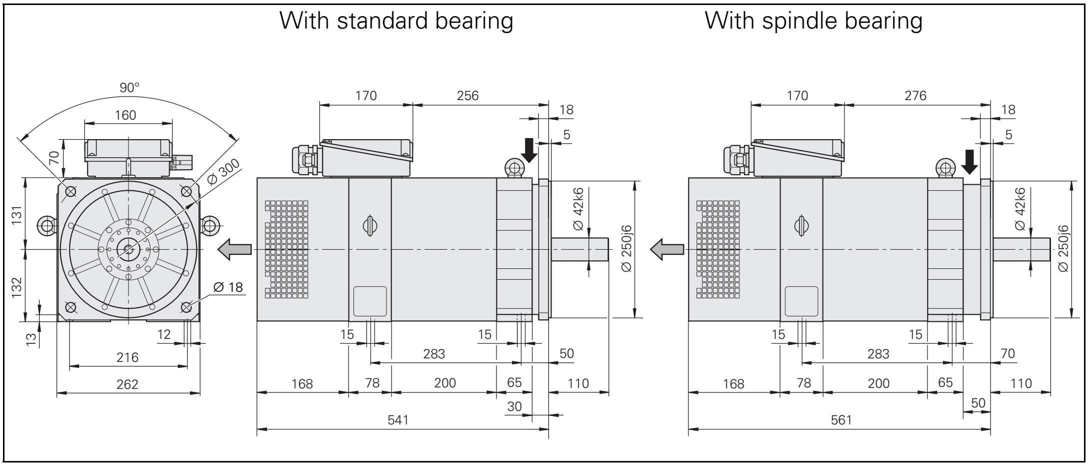


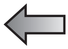
Air current of the fan

Fixed bearing

Connector for speed encoder


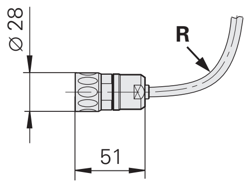
QAN 260M



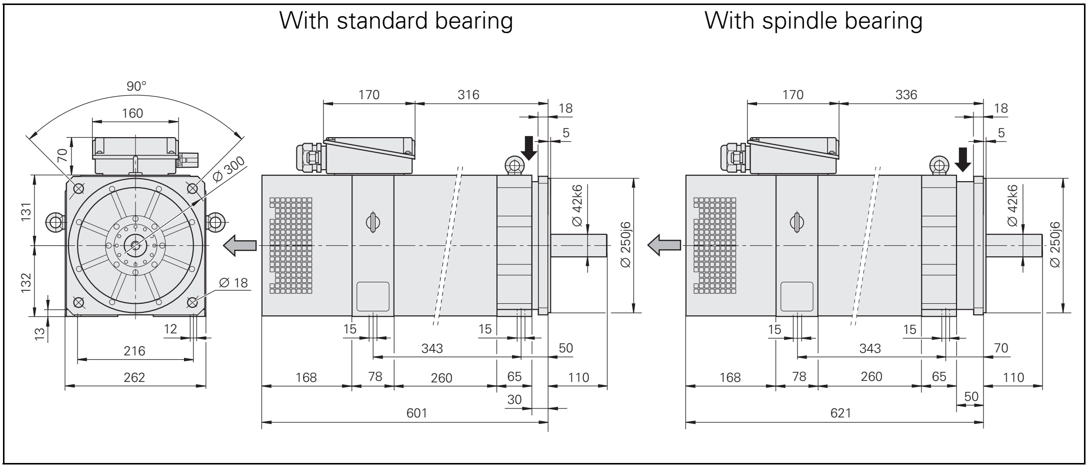


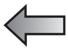
Air current of the fan

Fixed bearing

Connector for speed encoder


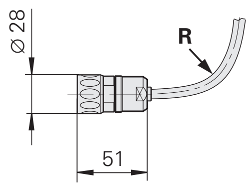
QAN 260 L



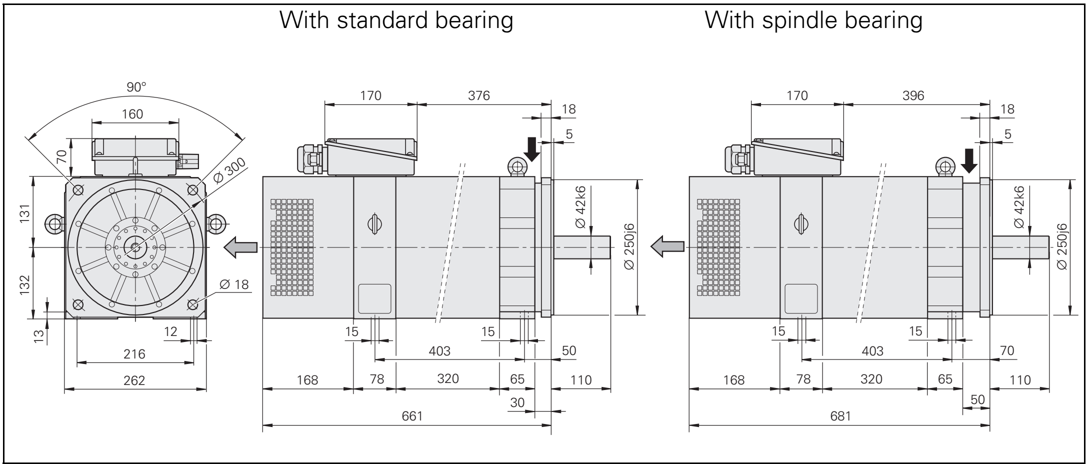


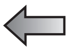
Air current of the fan

Fixed bearing

Connector for speed encoder


QAN 260 U
QAN 260 W

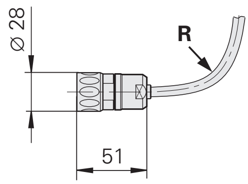




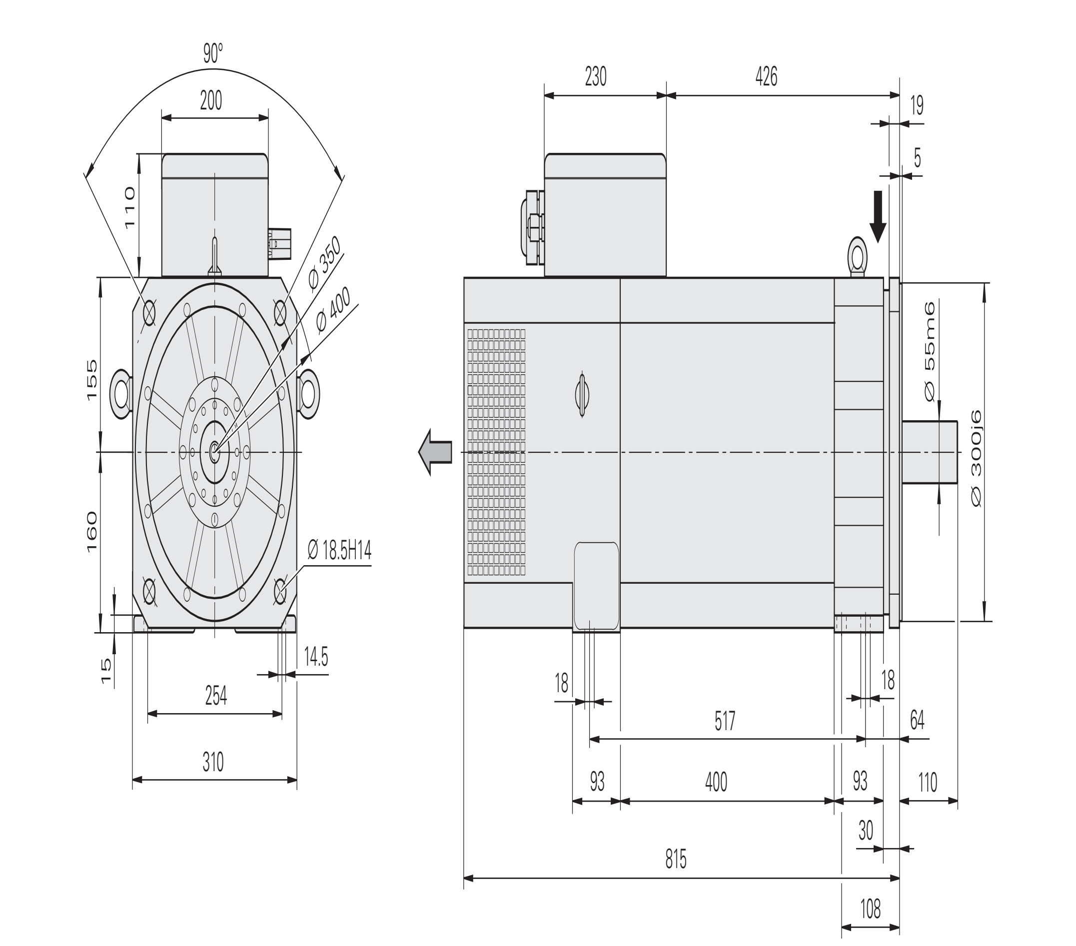
Air current of the fan

Fixed bearing

Connector for speed encoder

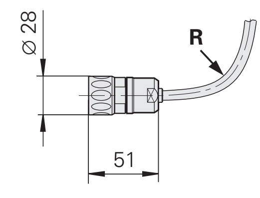


QAN 320M
QAN 320W
QAN 320L

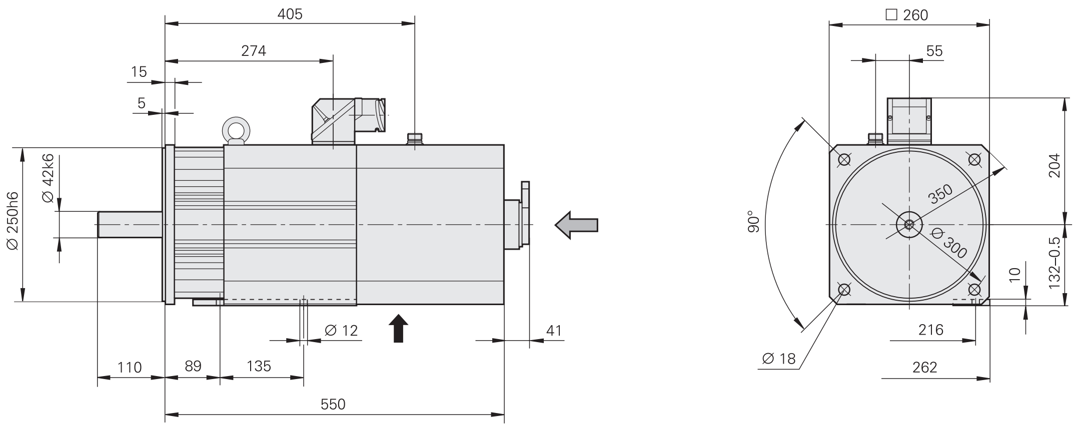


Air current of the fan

Fixed bearing

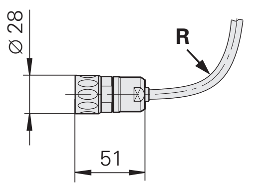
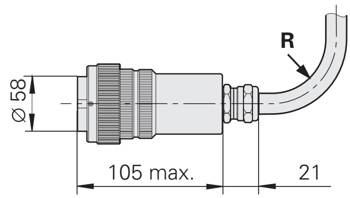
Connector for speed encoder


QAN 134B

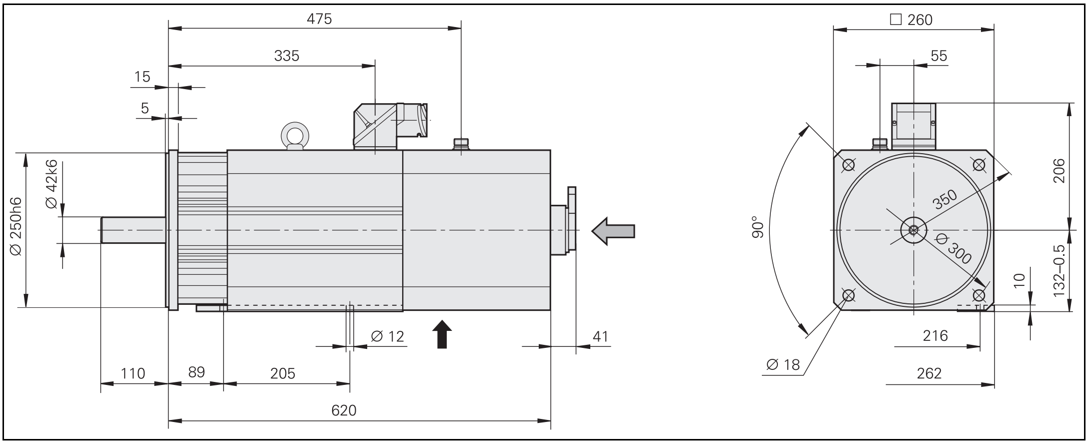


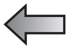
Air current of the fan

Fixed bearing

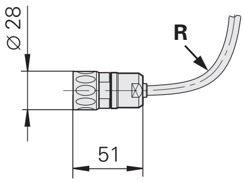
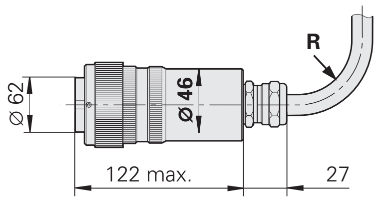
Connector for speed encoder	Connector for power connection
	

QAN 134C

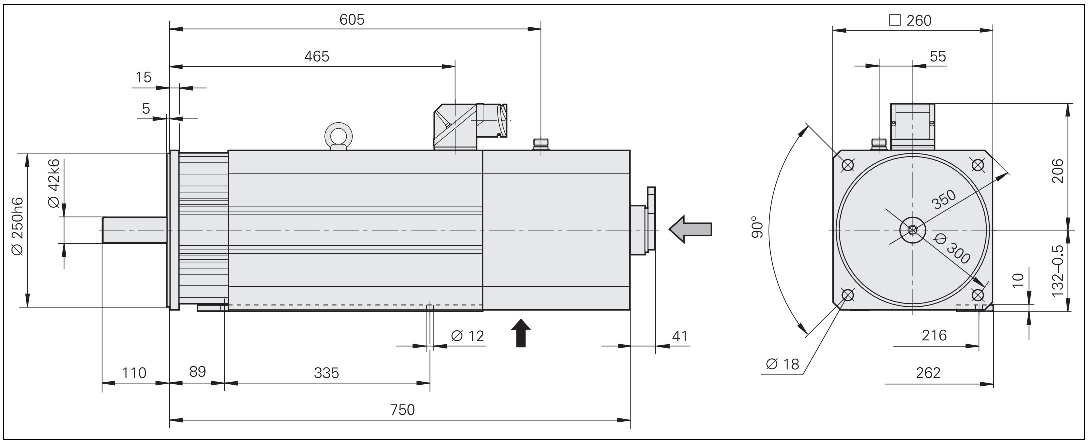


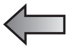
 Air current of the fan

 Fixed bearing

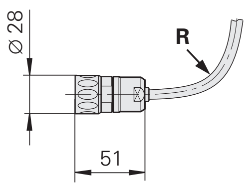
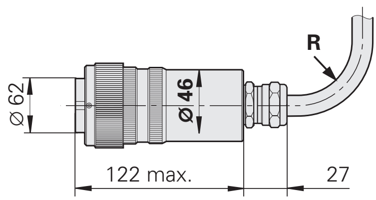
Connector for speed encoder	Connector for power connection
	

QAN 134D

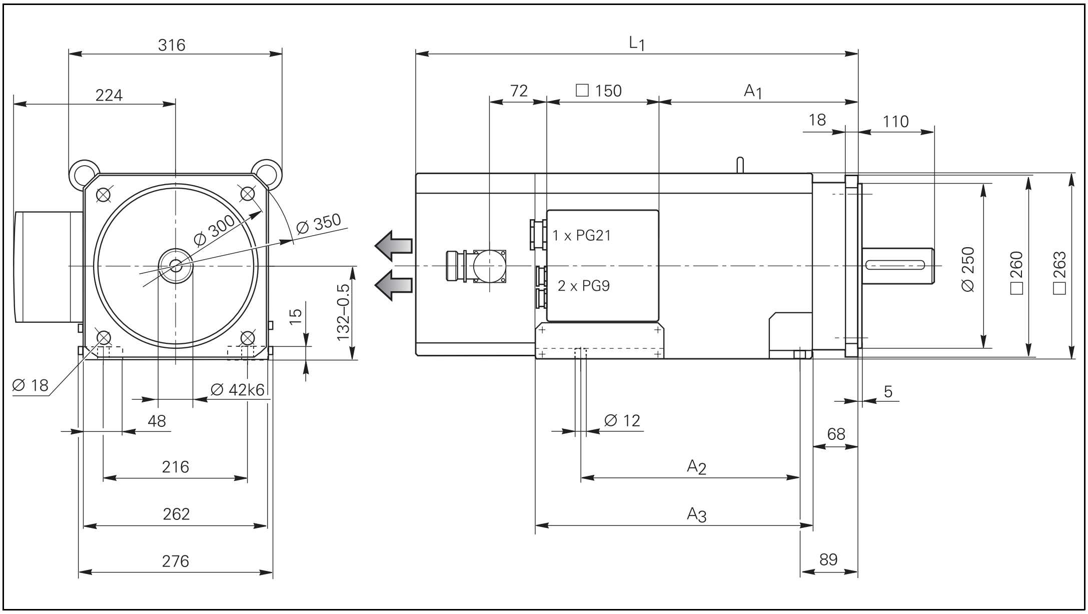



Air current of the fan

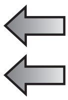

Fixed bearing

Connector for speed encoder	Connector for power connection
	

QAN 4S

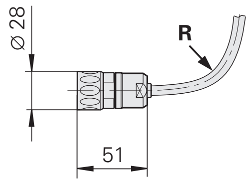


Motor	L_1	A_1	A_2	A_3
QAN 4S	610 mm	245 mm	265 mm	338 mm

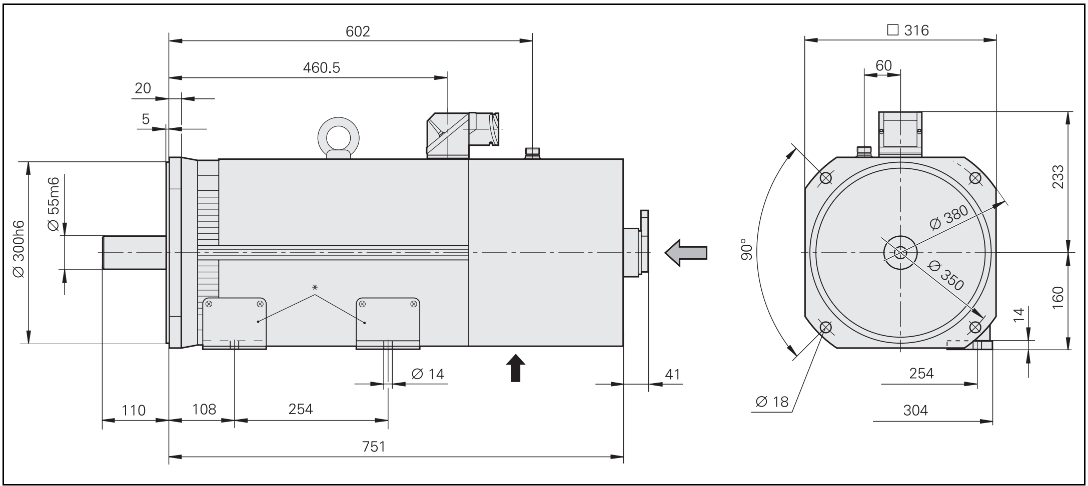


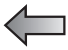
Air current of the fan

Connector for speed encoder



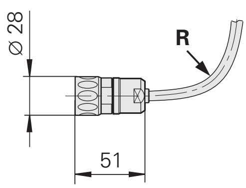
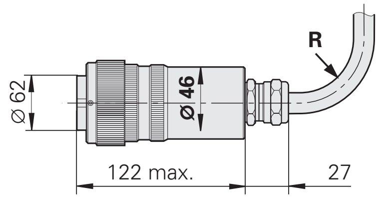
QAN 164B





Air current of the fan

Fixed bearing

Connector for speed encoder	Connector for power connection
	

7.11 HEIDENHAIN Motors with Hollow Shaft, QAN xxxUH Series

The HEIDENHAIN asynchronous motors have the following features:

- HEIDENHAIN ERN 1381 motor encoder for speed measurement (QAN 104, QAN 134, QAN 164B with RON 481)
- HEIDENHAIN motor encoder with 1024 lines (ERN 1381) (2048 lines with RON 481)
- Separate cooling via integrated fan
- Design IM B35 (mounting via flange / mounting block) according to IEC 60 034-7, design IM B5 (mounting via flange) on request
- Degree of protection IP 54 according to IEC 60 529 (QAN 104, QAN 134, QAN 164B: IP 40)
- Cylindrical shaft end according to DIN 748 with feather key and threaded central bore hole according to DIN 332-DR (QAN 134 and QAN 164B: DIN 332-DS), without feather key on request
- Flange dimensions according to DIN 42 948 and IEC 72 (not QAN 104)
- Maintenance-free bearing
- KTY 84-130 resistor probe for temperature monitoring in the stator winding
- Thermal class F
- Vibration severity grade S (QAN 200, QAN 260, QAN 320: grade SR, external high-precision balancing possible)
- Full-key balanced

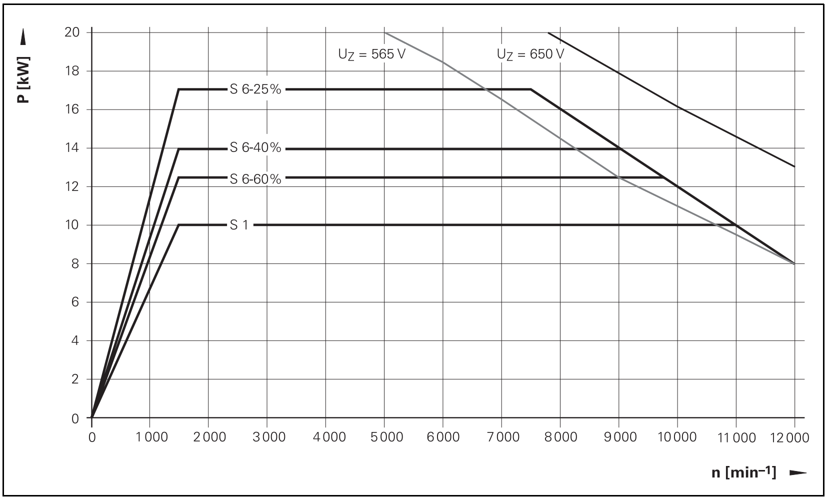
QAN 2xxUH

	QAN 200UH	QAN 260UH
Fan	+	+
Holding brake	–	–
Rated voltage U_N	330 V	318 V
Rated power output P_N	10 kW	22 kW
Rated speed n_N	1500 rpm	1500 rpm
Rated torque M_N (105 K)	63.7 Nm	140 Nm
Rated current I_N (105 K)	25.0 A	54.0 A
Efficiency η	0.85	0.9
Maximum speed n_{max} with spindle bearing	12000 rpm	10000 rpm
Maximum current I_{max}	33 A	116 A
Pole pairs PP	2	2
Weight m	83 kg	166 kg
Rotor inertia J	0.0405 kgm^2	0.11 kgm^2
Fan		
Rated voltage for fan U_L	3 x 400 V	3 x 400 V
Rated current for fan I_L	0.2 A	0.35 A
Frequency f_L	50 Hz/60 Hz	50 Hz/60 Hz

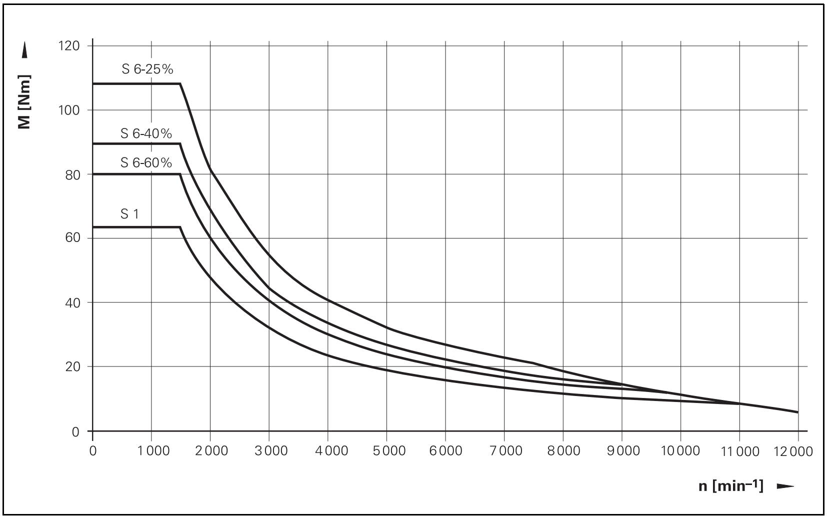
Power and torque characteristics for QAN 200UH

Operating mode	S1	S6-60%	S6-40%	S6-25%
Speed n	1500 rpm 11000 rpm 12000 rpm	1500 rpm 9800 rpm 12000 rpm	1500 rpm 9000 rpm 12000 rpm	1500 rpm 7500 rpm 12000 rpm
Power P	10 kW 10 kW 8.0 kW	12.5 kW 12.5 kW 8.0 kW	14.0 kW 14.0 kW 8.0 kW	17.0 kW 17.0 kW 8.0 kW
Torque M	63.9 Nm 8.7 Nm 6.4 Nm	79.8 Nm 12.2 Nm 6.4 Nm	89.4 Nm 19.1 Nm 6.4 Nm	108.6 Nm 21.7 Nm 6.4 Nm
Current I (for 1500 rpm)	25 A	29 A	32 A	37 A

Power characteristic curve



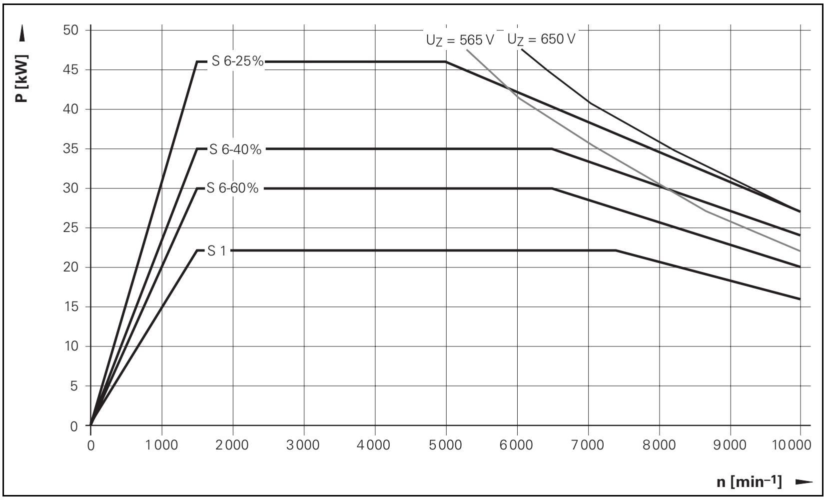
Torque characteristic curve



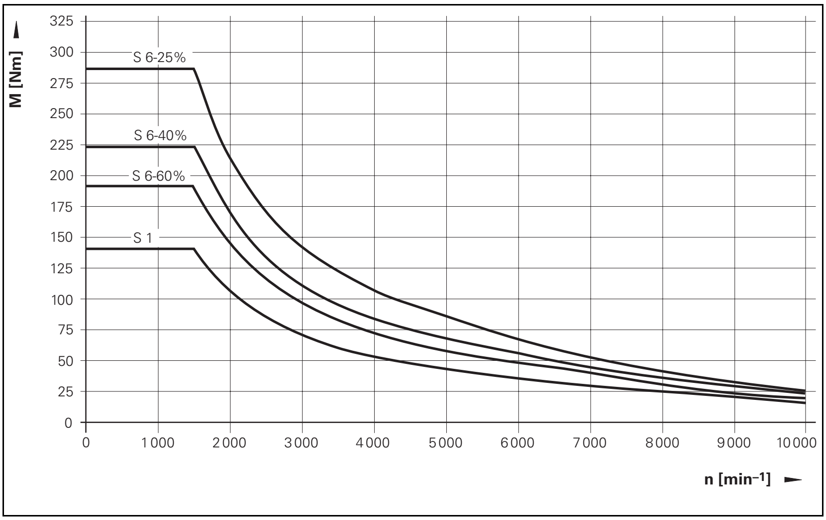
Power and torque characteristics for QAN 260UH

Operating mode	S1	S6-60%	S6-40%	S6-25%
Speed n	1500 rpm 7400 rpm 10000 rpm	1500 rpm 6500 rpm 10000 rpm	1500 rpm 6500 rpm 10000 rpm	1500 rpm 5000 rpm 10000 rpm
Power P	22 kW 22 kW 16 kW	30 kW 30 kW 20 kW	35 kW 35 kW 24 kW	46 kW 46 kW 27 kW
Torque M	140.1 Nm 32.5 Nm 15.3 Nm	191.0 Nm 44.1 Nm 19.1 Nm	222.8 Nm 49.4 Nm 22.9 Nm	286.5 Nm 85.9 Nm 25.8 Nm
Current I (for 1500 rpm)	54 A	68 A	77 A	97.5 A

Power characteristic curve



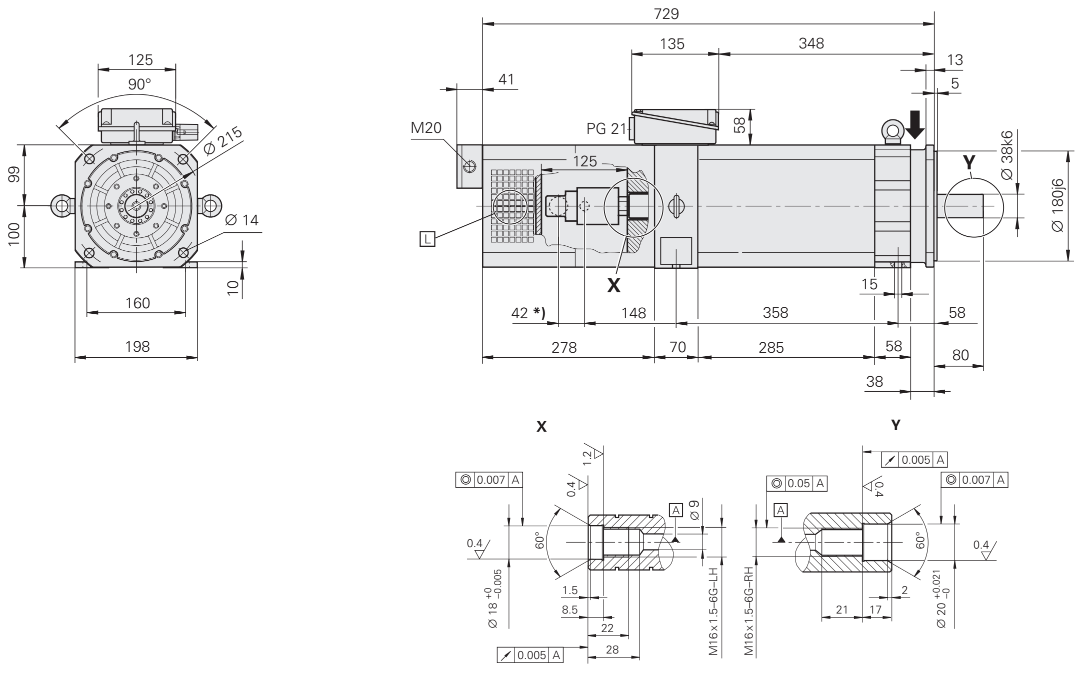
Torque characteristic curve



7.11.1 Dimensions –Motors with Hollow Shaft, QAN 2xxUH Series

> **Note**
>
> All dimensions are in millimeters [mm].

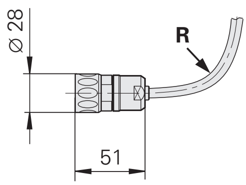
QAN 200UH



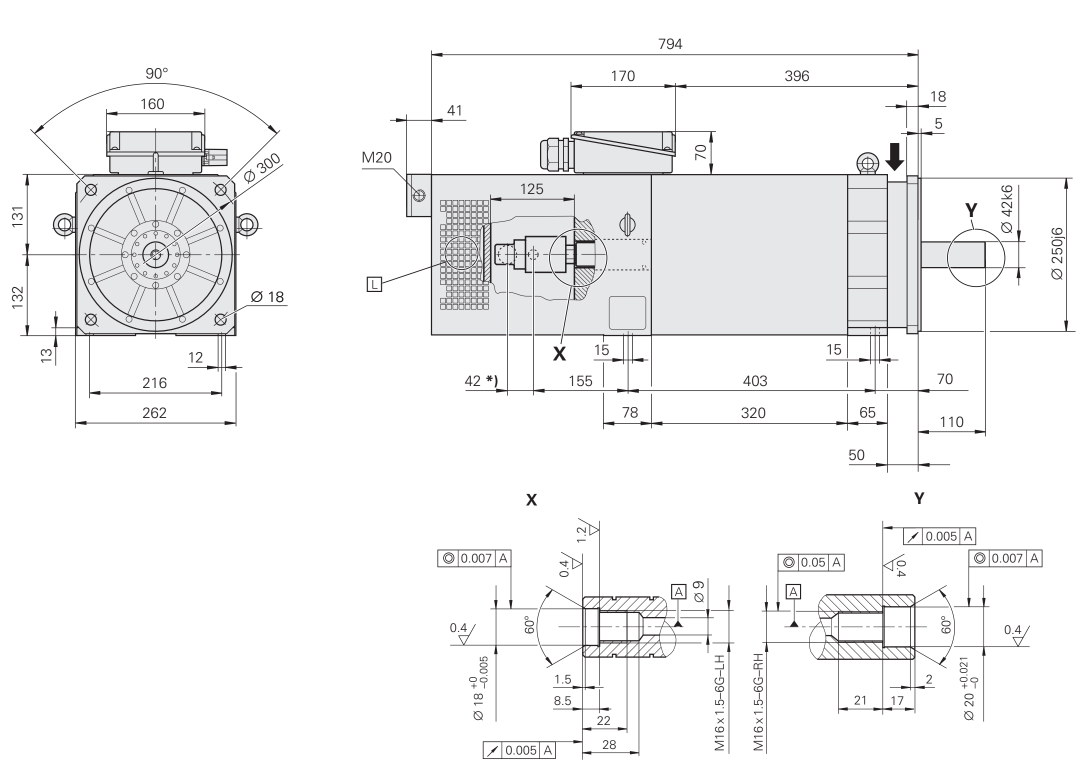
L = Air outlet on both sides

*) = Coolant connection on right side (e.g. Deublin 1109-020-188)

Connector for speed encoder

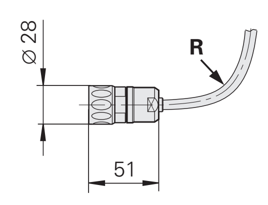


QAN 260UH



L = Air outlet on both sides

*) = Coolant connection on right side (e.g. Deublin 1109-020-188)

Connector for speed encoder


7.12 Permissible Forces on the Motor Shaft

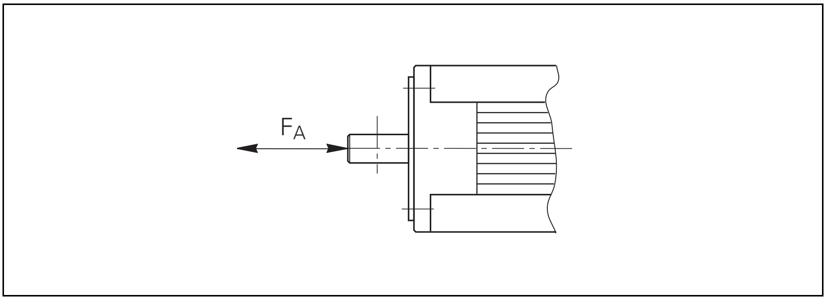
7.12.1 General Information

All diagram values given for permissible axial and radial forces on the motor shafts apply for the nominal bearing life, depending on the specific motor.

In the diagram the nominal bearing life values are specified for the maximum permissible forces.

Axial forces

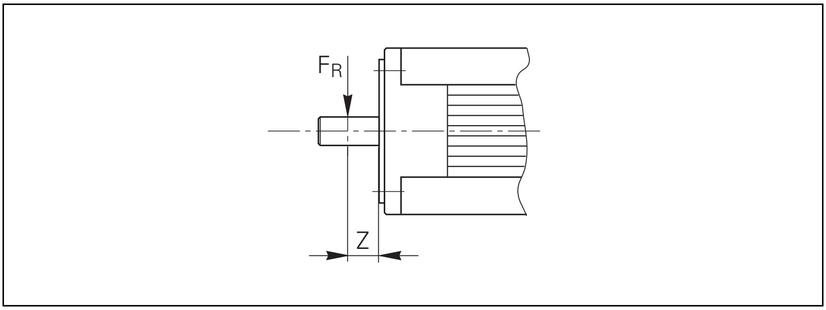
Point of the axial force



As shown in the diagrams, the maximum permissible axial force may also depend on the motor speed.

Radial forces

Point of the radial force

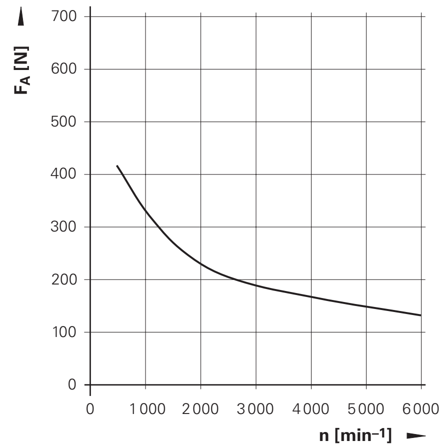


The maximum permissible radial force may also depend on the motor speed and the point of the radial force on the motor shaft. The point of the force is defined by the distance *z* and is shown as an axis in the load diagrams.

7.12.2 QSY 10

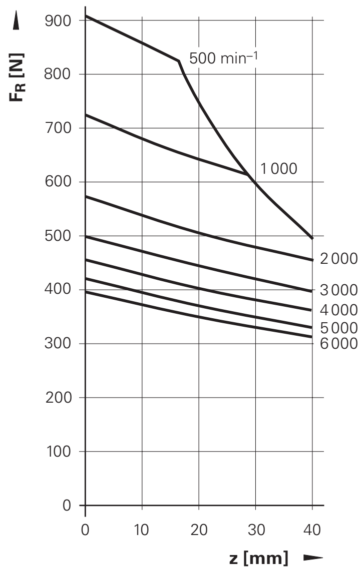
Axial forces

The following diagram shows the maximum permissible axial forces F_{Amax} for a nominal bearing service life of 30 000 h.



Radial forces

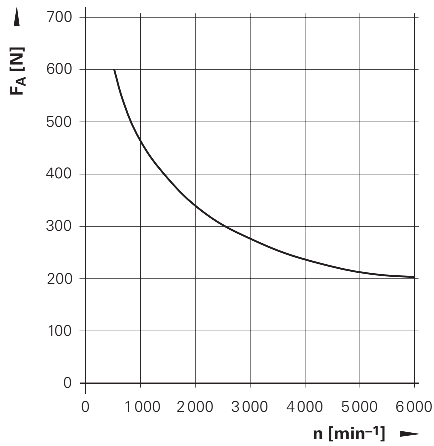
The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 30 000 h, depending on the point of the radial force and the average speed.



7.12.3 QSY 20

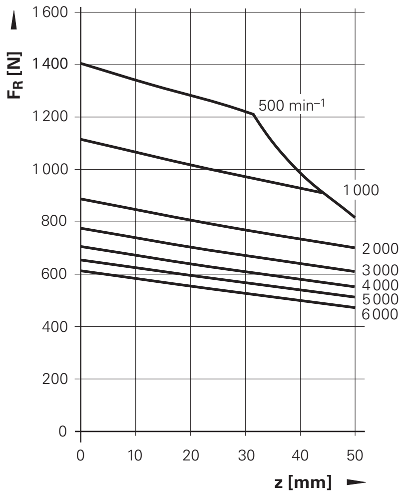
Axial forces

The following diagram shows the maximum permissible axial forces F_{Amax} for a nominal bearing service life of 30 000 h.



Radial forces

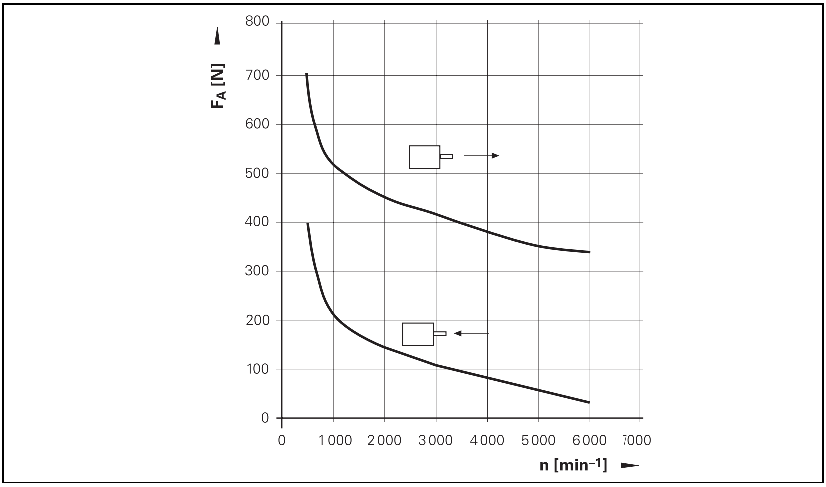
The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 30 000 h, depending on the point of the radial force and the average speed.



7.12.4 QSY 96

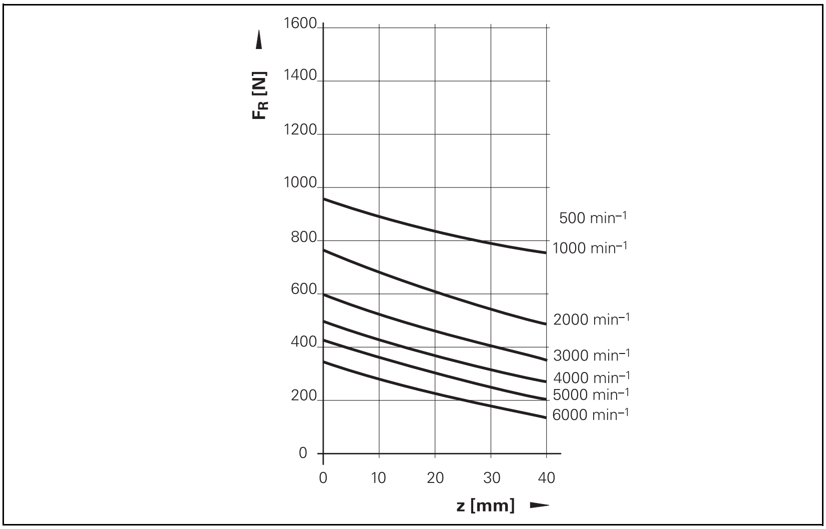
Axial forces

The following diagram shows the maximum permissible axial forces F_{Amax} for a nominal bearing service life of 30 000 h.



Radial forces

The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 30 000 h, depending on the point of the radial force and the average speed.



7.12.5 QSY 116

Combined load on QSY 116

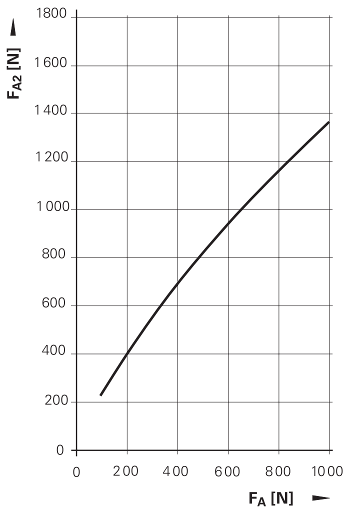
It is necessary to determine the combined load resulting from axial and radial forces for the HEIDENHAIN synchronous motors QSY 116.

- Use the diagram showing the radial forces to determine the permissible radial force F_R depending on the distance *z* and the average speed.
- Use the diagram for axial forces to determine the equivalent axial force F_{A2} depending on the applied axial force F_A, where the applied axial force F_A must not exceed 1000 N.
- Calculate the combined load F_{com} from the permissible radial force F_R and the equivalent axial force F_{A2}:

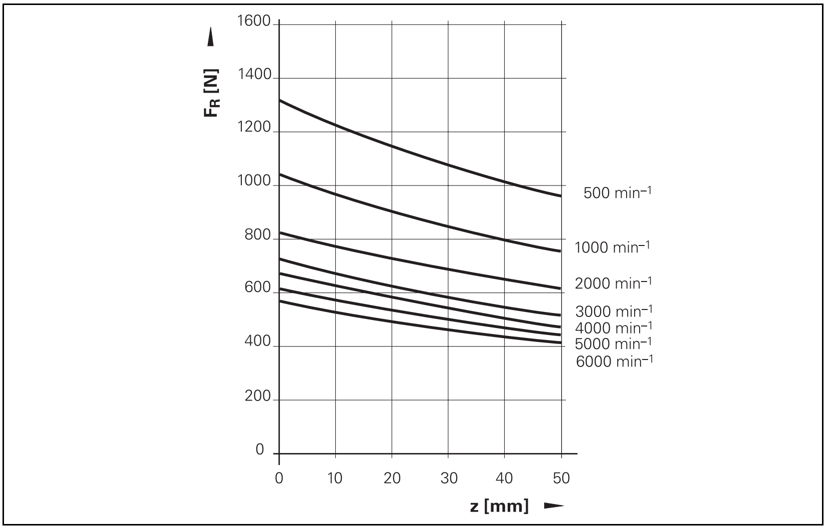
$$F_{com} = (0{,}56 \cdot F_R) + F_{A2}$$

- The following conditions must be fulfilled in order to achieve a bearing service life of 30 000 h:
  - The applied axial force F_A must not exceed 1000 N.
  - The applied radial force F_{Ra} must not exceed the permissible radial force F_R from the diagram for radial forces.
  - The combined load F_{com} must not exceed the permissible radial force F_R from the diagram for radial forces.

Axial forces



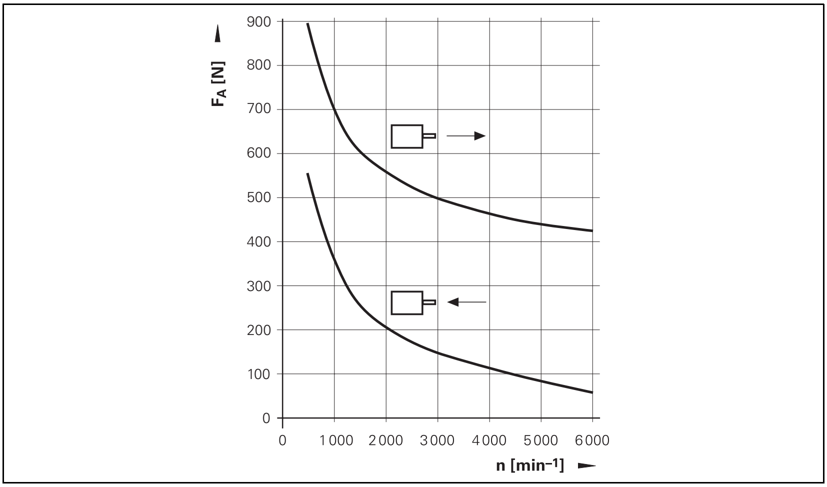
Radial forces



7.12.6 QSY 130

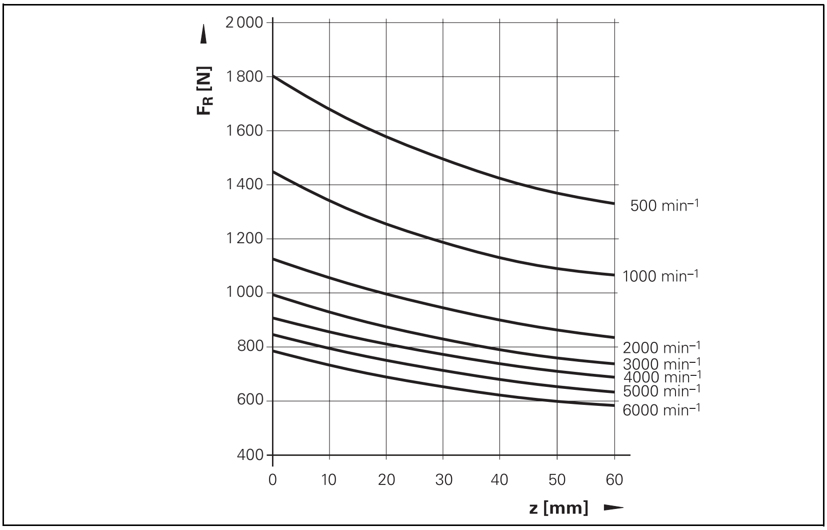
Axial forces

The following diagram shows the maximum permissible axial forces F_{Amax} for a nominal bearing service life of 30 000 h.



Radial forces

The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 30 000 h, depending on the point of the radial force and the average speed.



7.12.7 QSY 155

Combined load on QSY 155

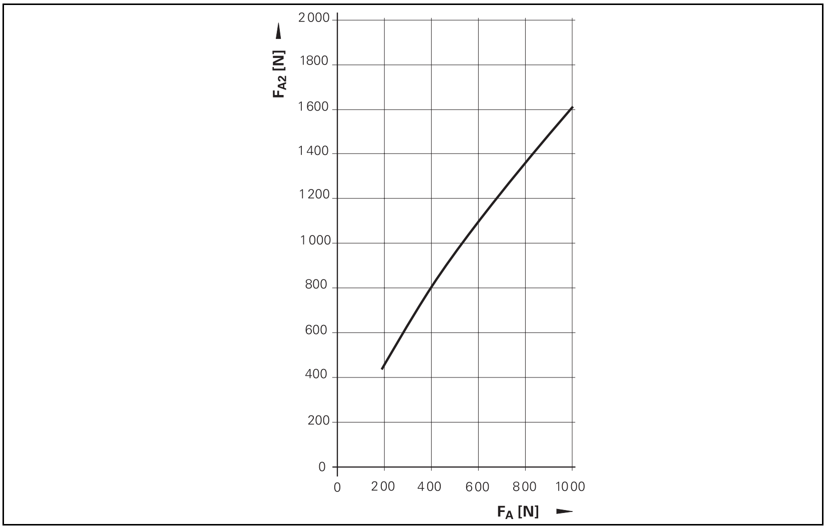
It is necessary to determine the combined load resulting from axial and radial forces for the HEIDENHAIN synchronous motors QSY 155.

- Use the diagram showing the radial forces to determine the permissible radial force F_R depending on the distance *z* and the average speed.
- Use the diagram for axial forces to determine the equivalent axial force F_{A2} depending on the applied axial force F_A, where the applied axial force F_A must not exceed 1000 N.
- Calculate the combined load F_{com} from the permissible radial force F_R and the equivalent axial force F_{A2}:

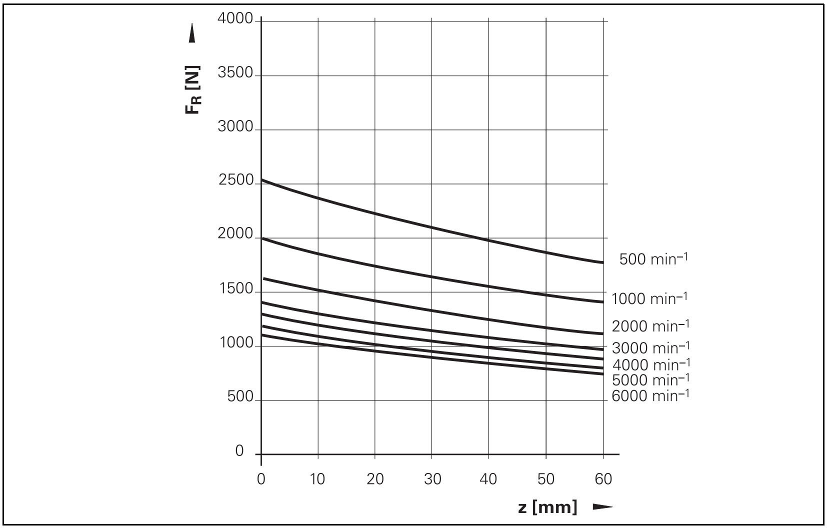
$$F_{com} = (0{,}56 \cdot F_R) + F_{A2}$$

- The following conditions must be fulfilled in order to achieve a bearing service life of 30 000 h:
  - The applied axial force F_A must not exceed 1000 N.
  - The applied radial force F_{Ra} must not exceed the permissible radial force F_R from the diagram for radial forces.
  - The combined load F_{com} must not exceed the permissible radial force F_R from the diagram for radial forces.

Axial forces



Radial forces



7.12.8 QSY 190

Combined load on QSY 190

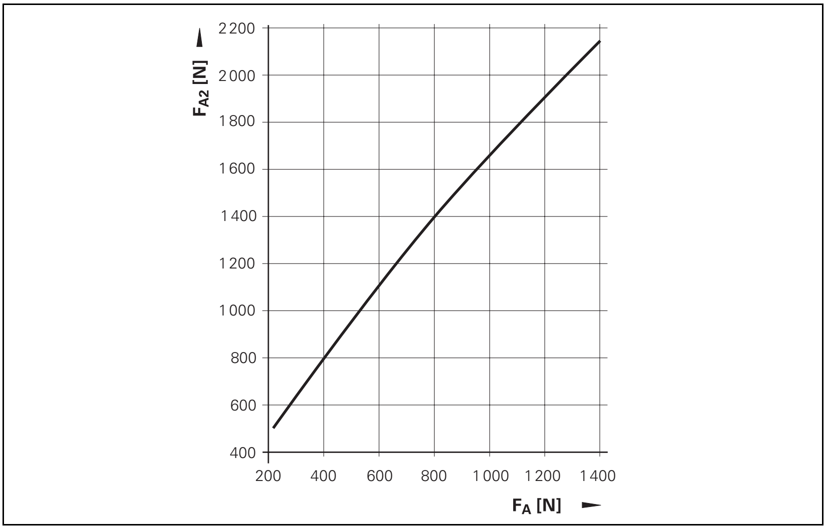
It is necessary to determine the combined load resulting from axial and radial forces for the HEIDENHAIN synchronous motors QSY 190.

- Use the diagram showing the radial forces to determine the permissible radial force F_R depending on the distance *z* and the average speed.
- Use the diagram for axial forces to determine the equivalent axial force F_{A2} depending on the applied axial force F_A, where the applied axial force F_A must not exceed 1500 N.
- Calculate the combined load F_{com} from the permissible radial force F_R and the equivalent axial force F_{A2}:

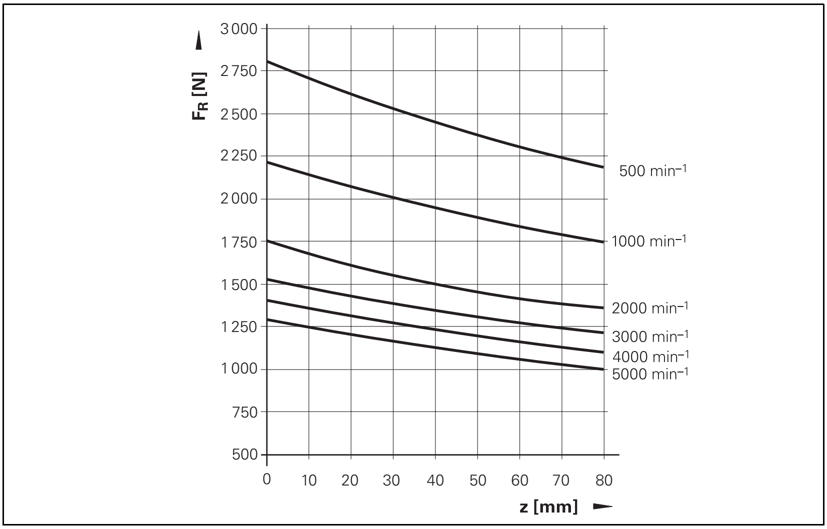
$$F_{com} = (0{,}56 \cdot F_R) + F_{A2}$$

- The following conditions must be fulfilled in order to achieve a bearing service life of 30 000 h:
  - The applied axial force F_A must not exceed 1500 N.
  - The applied radial force F_{Ra} must not exceed the permissible radial force F_R from the diagram for radial forces.
  - The combined load F_{com} must not exceed the permissible radial force F_R from the diagram for radial forces.

Axial forces



Radial forces



7.12.9 QSY 041B

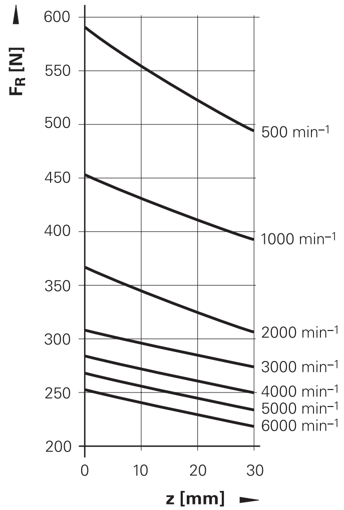
The values given for the maximum permissible axial and radial forces are valid for a bearing life of 30 000 h.

Axial forces

$F_{Amax} = 0.45 \cdot F_{Rmax}$

Radial forces

The maximum permissible radial forces F_{Rmax} given in the following diagram depend on the point of the radial force and the average speed.

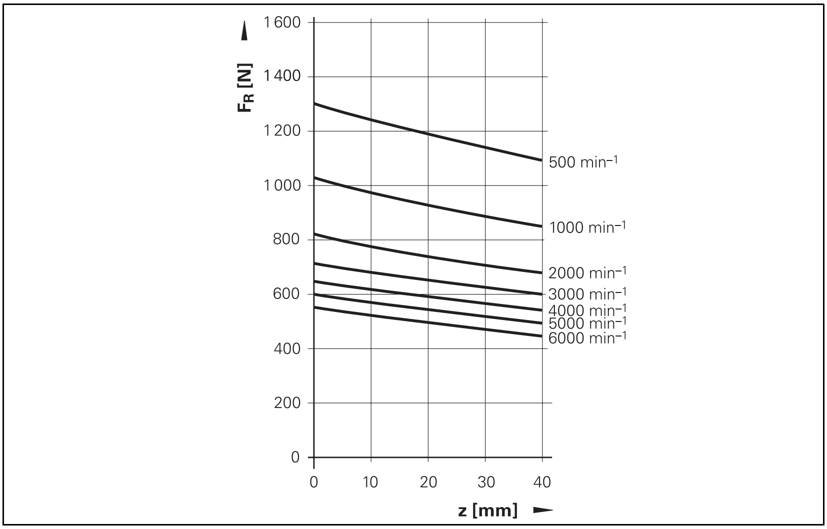


7.12.10 QSY 071B

The values given for the maximum permissible axial and radial forces are valid for a bearing life of 30 000 h.

Axial forces $F_{Amax} = 0.55 \cdot F_{Rmax}$

Radial forces The maximum permissible radial forces F_{Rmax} given in the following diagram depend on the point of the radial force and the average speed.



7.12.11 QSY 090B

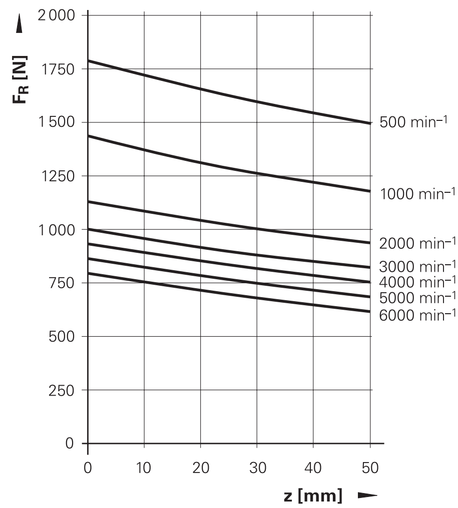
The values given for the maximum permissible axial and radial forces are valid for a bearing life of 30 000 h.

Axial forces

$F_{Amax} = 0.34 \cdot F_{Rmax}$

Radial forces

The maximum permissible radial forces F_{Rmax} given in the following diagram depend on the point of the radial force and the average speed.



7.12.12 QSY 093B

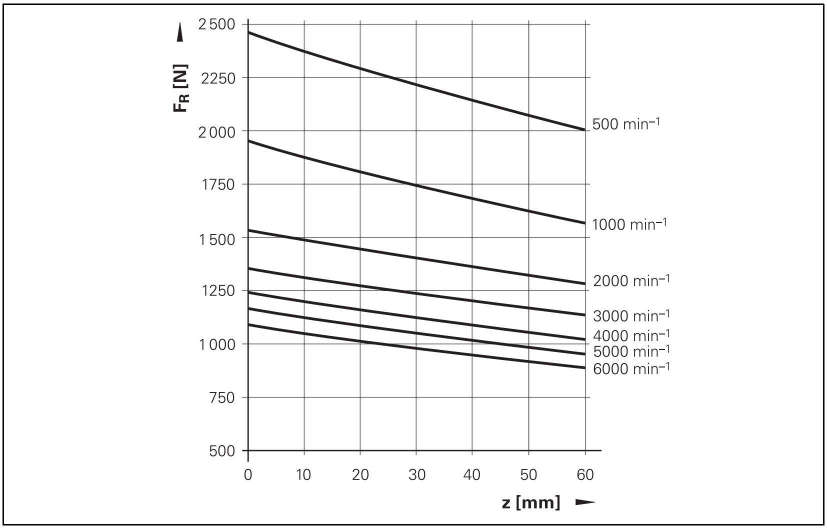
The values given for the maximum permissible axial and radial forces are valid for a bearing life of 30 000 h.

Axial forces

$F_{Amax} = 0.24 \cdot F_{Rmax}$

Radial forces

The maximum permissible radial forces F_{Rmax} given in the following diagram depend on the point of the radial force and the average speed.



7.12.13 QSY 112B

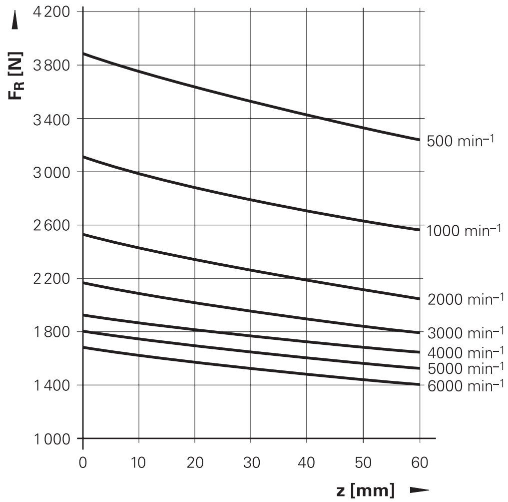
The values given for the maximum permissible axial and radial forces are valid for a bearing life of 30 000 h.

Axial forces

$F_{Amax} = 0.36 \cdot F_{Rmax}$

Radial forces

The maximum permissible radial forces F_{Rmax} given in the following diagram depend on the point of the radial force and the average speed.



7.12.14 QSY 112C

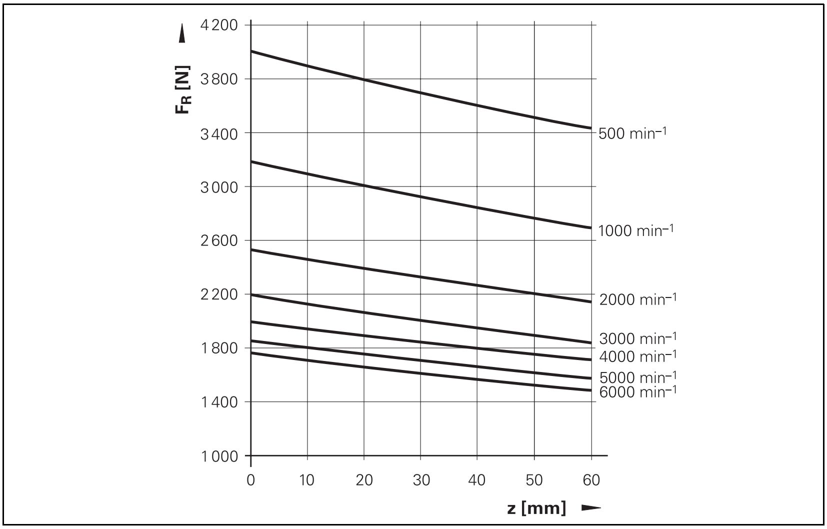
The values given for the maximum permissible axial and radial forces are valid for a bearing life of 30 000 h.

Axial forces

$F_{Amax} = 0.35 \cdot F_{Rmax}$

Radial forces

The maximum permissible radial forces F_{Rmax} given in the following diagram depend on the point of the radial force and the average speed.



7.12.15 QSY 112D

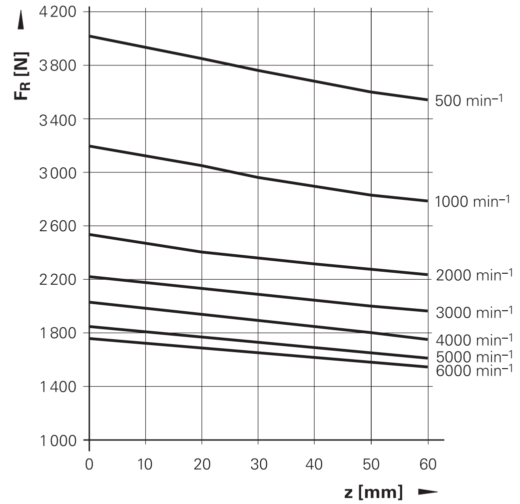
The values given for the maximum permissible axial and radial forces are valid for a bearing life of 30 000 h.

Axial forces

$F_{Amax} = 0.35 \cdot F_{Rmax}$

Radial forces

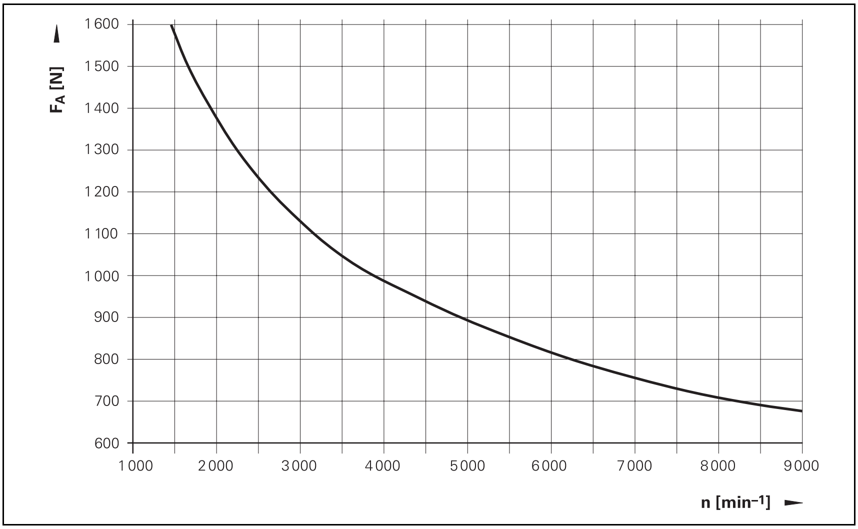
The maximum permissible radial forces F_{Rmax} given in the following diagram depend on the point of the radial force and the average speed.



7.12.16 QAN 30

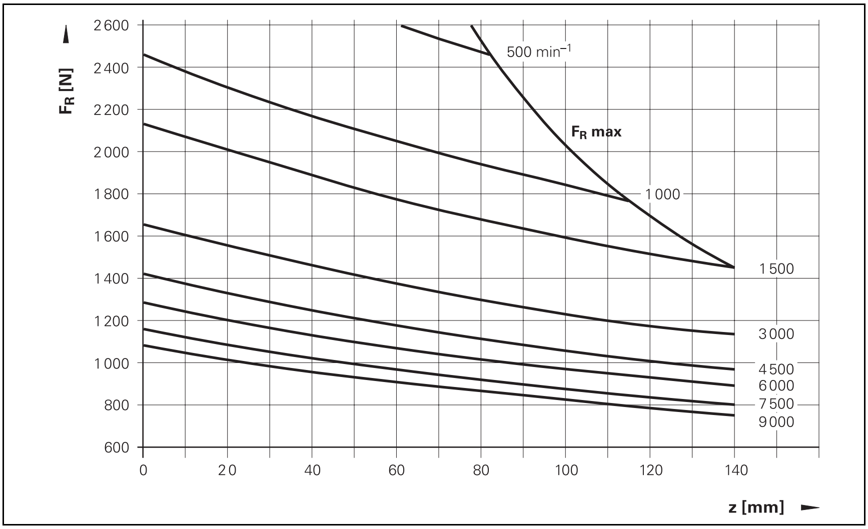
Axial forces

The maximum permissible axial forces F_{Amax} given in the following diagram apply for a nominal bearing service life of 20 000 h, provided that the motor is installed horizontally.
The permissible axial force for HEIDENHAIN asynchronous motors with vertical mounting is available upon request.



Radial forces

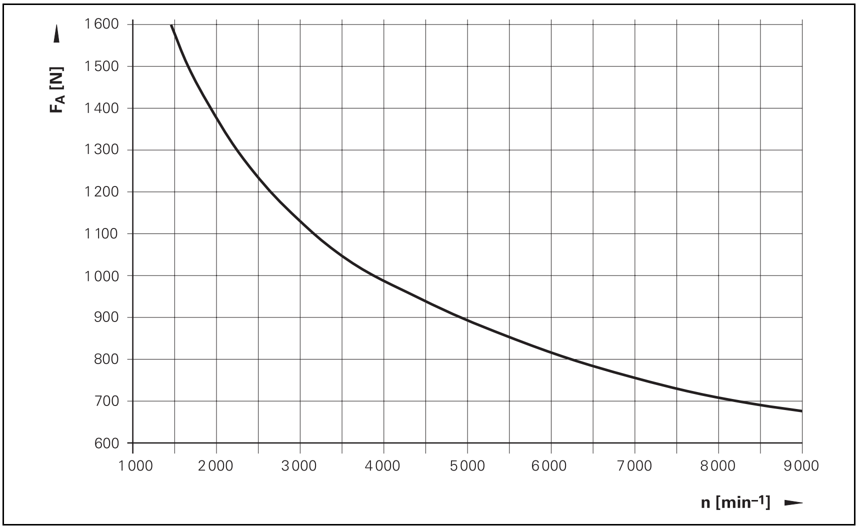
The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 20 000 h, depending on the point of the radial force and the average speed.



7.12.17 QAN 4S

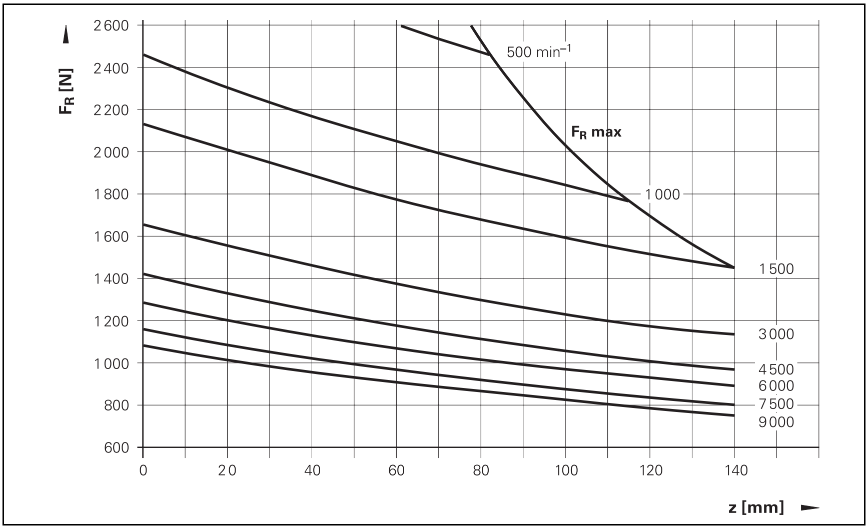
Axial forces

The maximum permissible axial forces F_{Amax} given in the following diagram apply for a nominal bearing service life of 20 000 h, provided that the motor is installed horizontally.
The permissible axial force for HEIDENHAIN asynchronous motors with vertical mounting is available upon request.



Radial forces

The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 20 000 h, depending on the point of the radial force and the average speed.

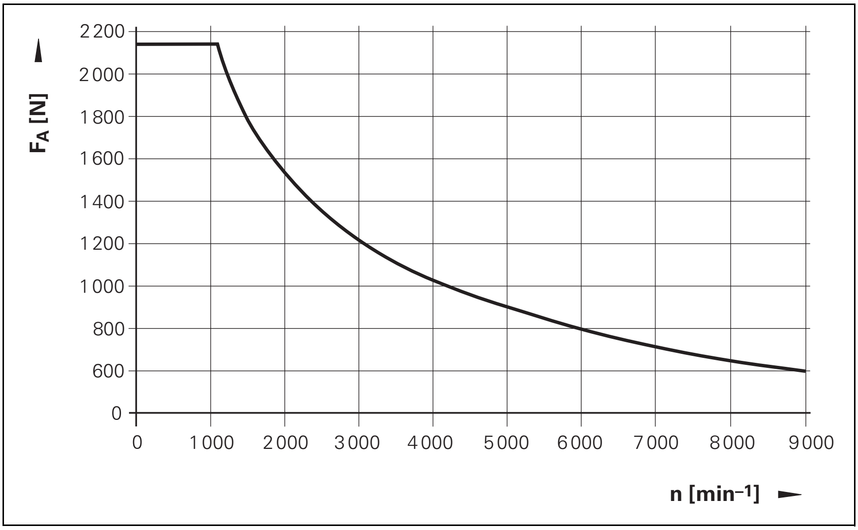


7.12.18 QAN 200(UH)

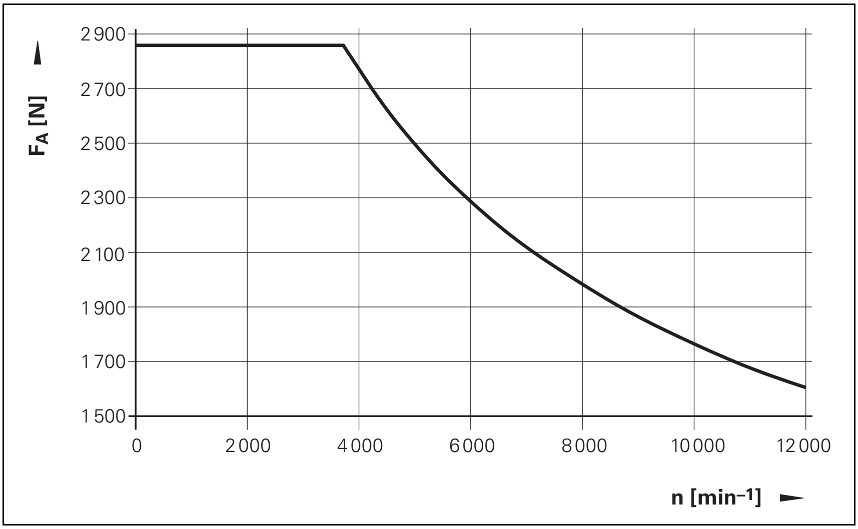
The following diagram shows the maximum permissible axial forces F_{Amax} for a nominal bearing service life of 10.000 h.
This also applies to the grease service life.

Axial forces

QAN 200 series with standard bearing



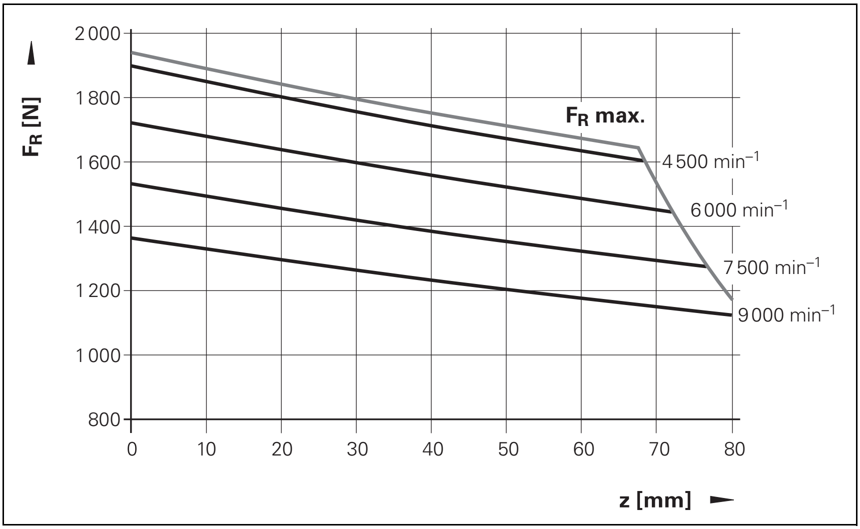
QAN 200 series with spindle bearing, QAN 200UH



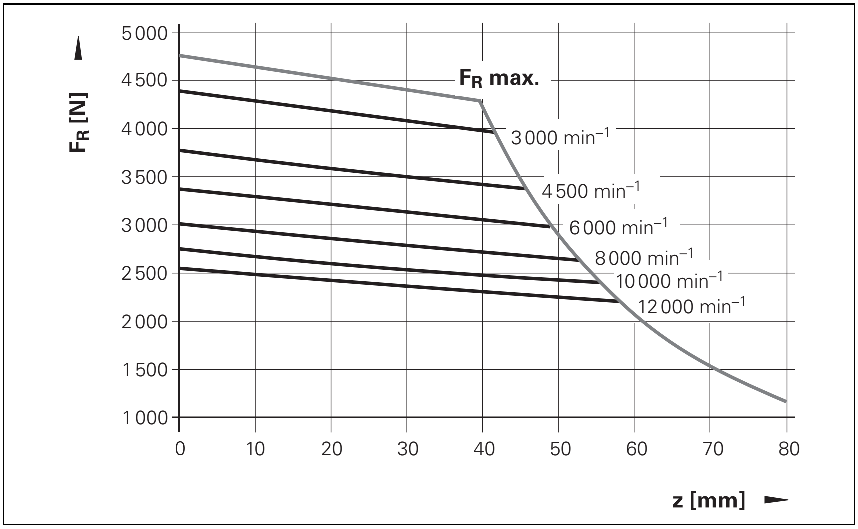
Radial forces

The maximum permissible radial forces F_{Rmax} shown in the following diagrams are valid for a bearing service life of 10.000 h, depending on the point of the radial force and the average speed.

QAN 200 series with standard bearing



QAN 200 series with spindle bearing, QAN 200UH

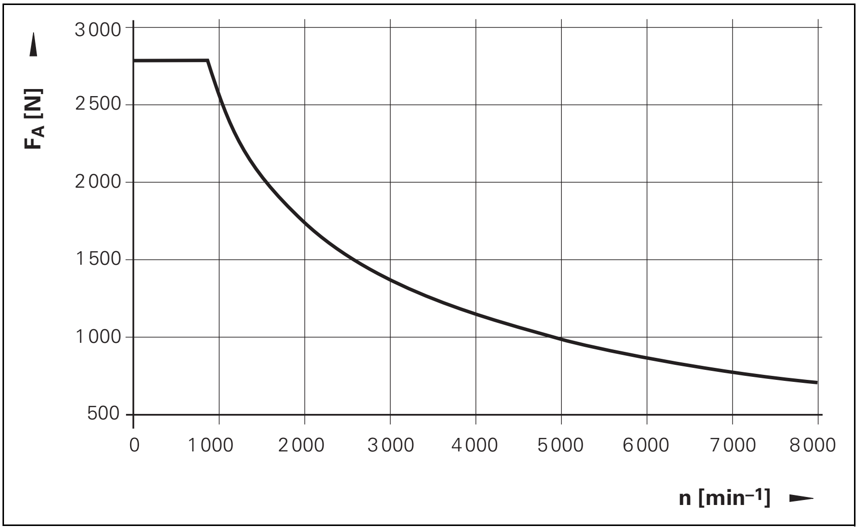


7.12.19 QAN 260(UH)

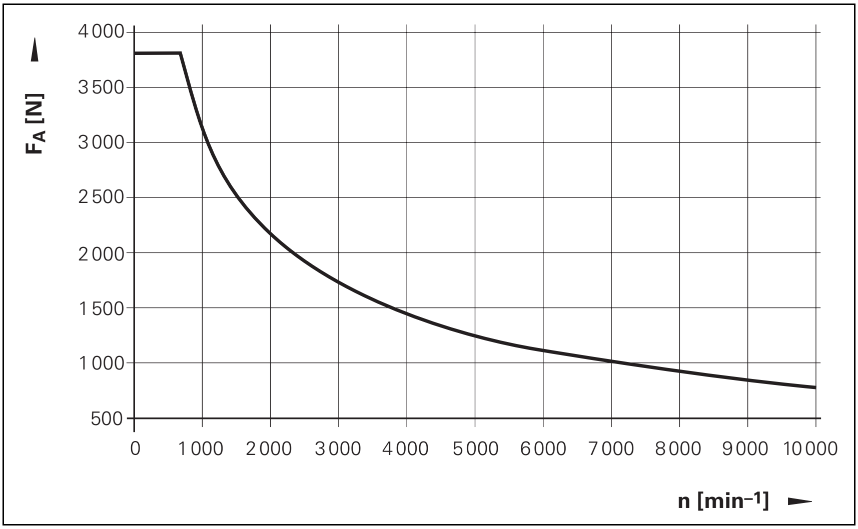
The following diagrams show the maximum permissible axial forces F_{Amax} for a nominal bearing service life of 10.000 h.
This also applies to the grease service life.

Axial forces

QAN 260 series with standard bearing



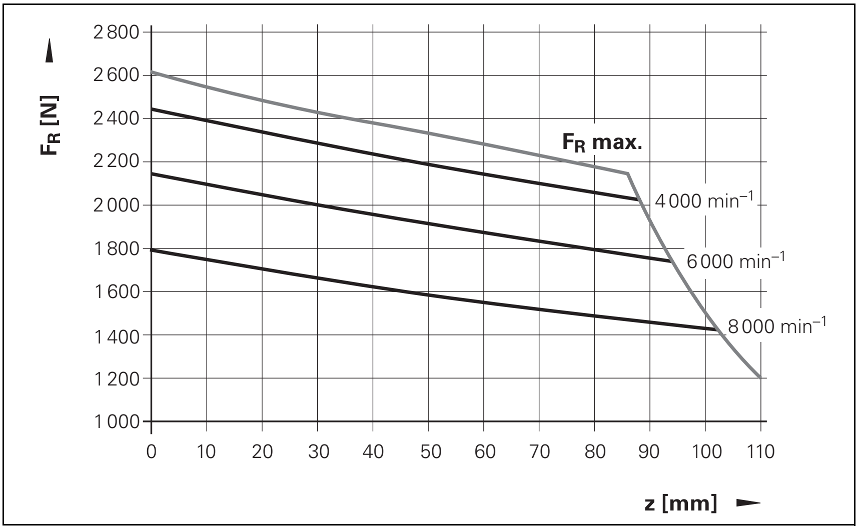
QAN 260 series with spindle bearing, QAN 260UH



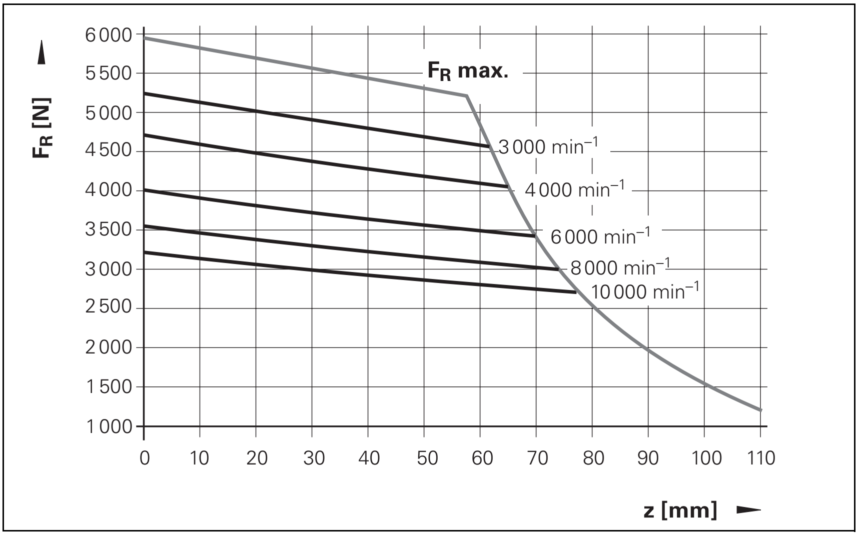
Radial forces

The maximum permissible radial forces F_{Rmax} shown in the following diagrams are valid for a bearing service life of 10.000 h, depending on the point of the radial force and the average speed.

QAN 260 series with standard bearing



QAN 260 series with spindle bearing, QAN 260UH

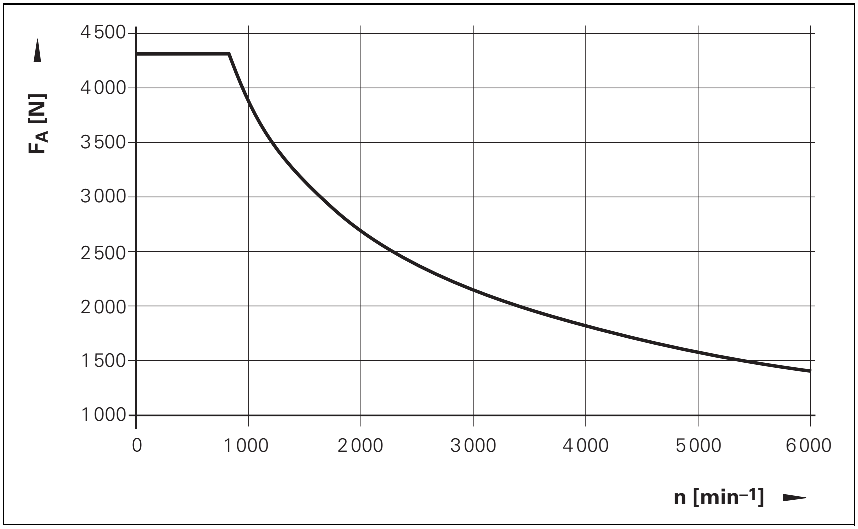


7.12.20 QAN 320

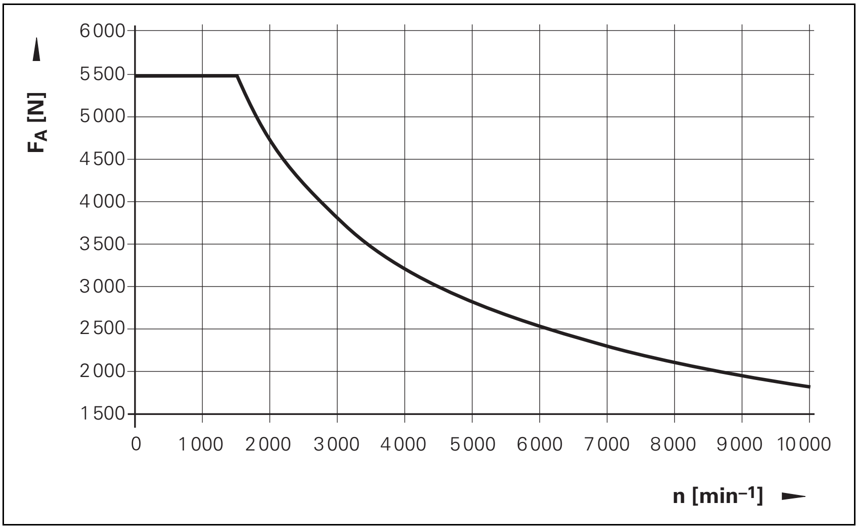
The following diagrams show the maximum permissible axial forces F_{Amax} for a nominal bearing service life of 10.000 h.
This also applies to the grease service life.

Axial forces

QAN 320 series with standard bearing



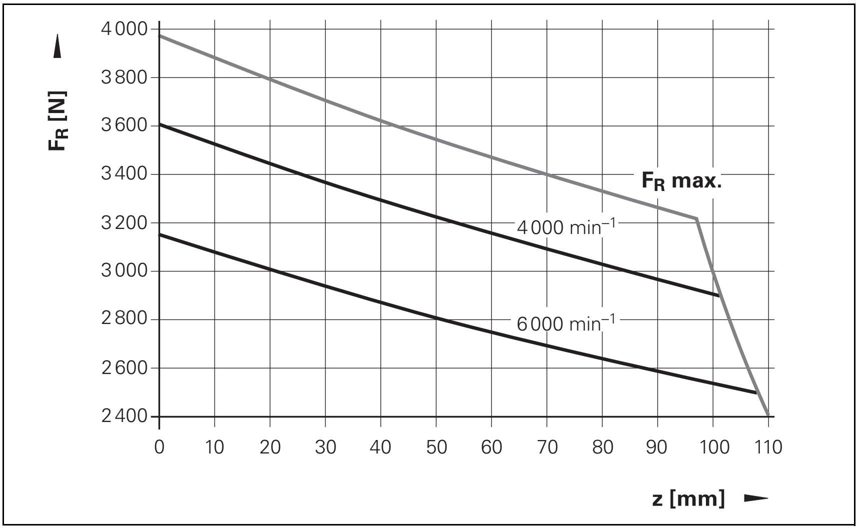
QAN 320 series with spindle bearing



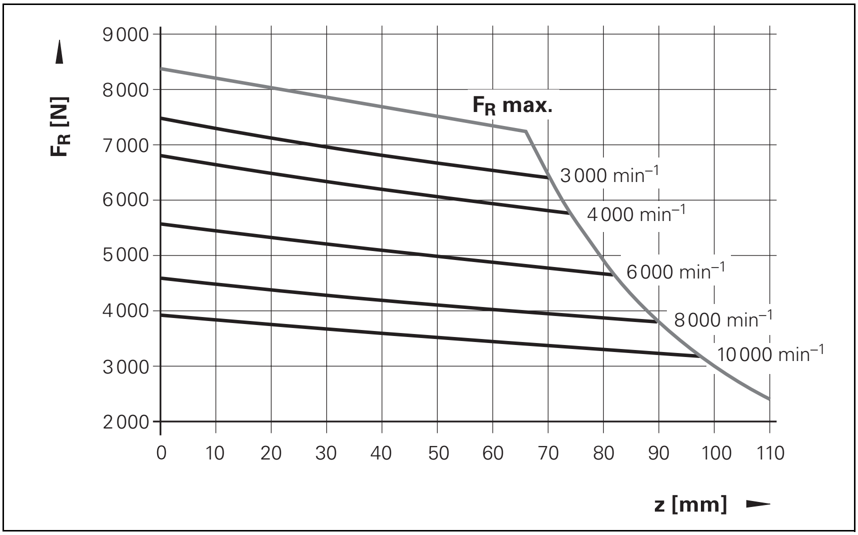
Radial forces

The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 10 000 h, depending on the point of the radial force and the average speed.

QAN 320 series with standard bearing



QAN 320 series with spindle bearing



7.12.21 QAN 104

The values given for the maximum permissible axial and radial forces are valid for a bearing life of 20.000 h.

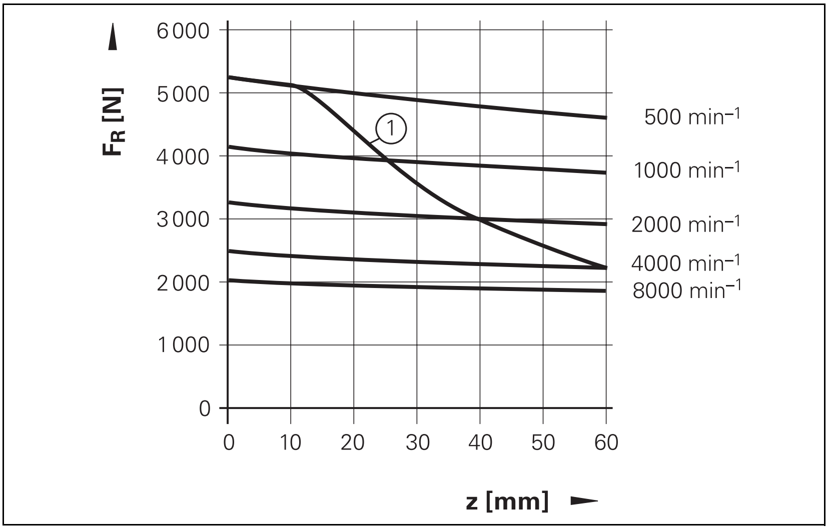
Axial forces

Maximum permissible axial force: F_A = 30 N

Radial forces

The maximum permissible radial forces F_{Rmax} given in the following diagram depend on the point of the radial force and the average speed.

1 = load limit for drive shaft with feather key



7.12.22 QAN 134

The values given for the maximum permissible axial and radial forces are valid for a bearing life of 20.000 h.

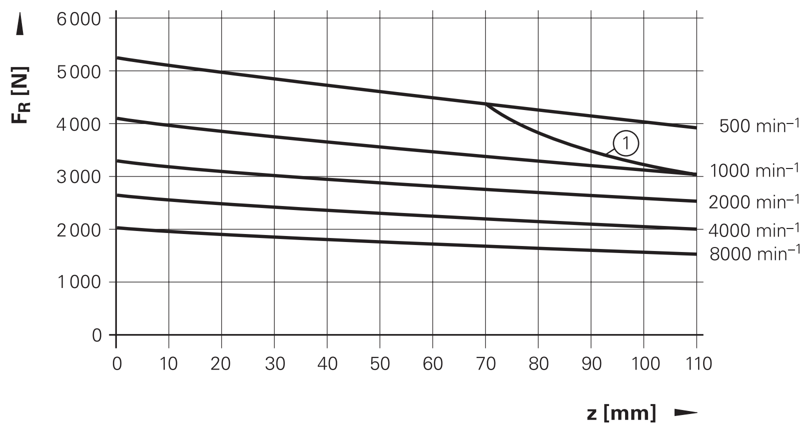
Axial forces

Maximum permissible axial force: F_A = 50 N

Radial forces

The maximum permissible radial forces F_{Rmax} given in the following diagram depend on the point of the radial force and the average speed.

1 = load limit for drive shaft with feather key



7.12.23 QAN 164B

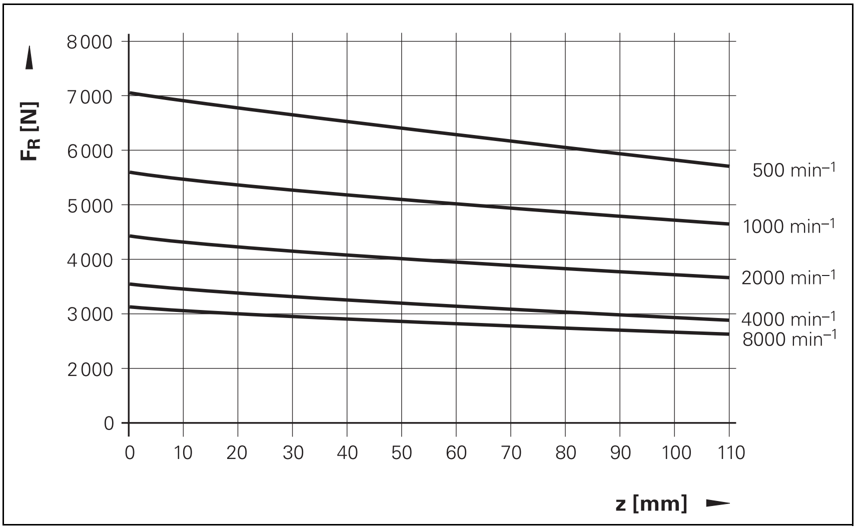
The values given for the maximum permissible axial and radial forces are valid for a bearing life of 20.000 h.

Axial forces

Maximum permissible axial force: F_A = 50 N

Radial forces

The following diagrams show the maximum permissible radial forces F_{Rmax}, depending on the point of the radial force and the average speed.



7.13 SIEMENS Synchronous Motors, 1FK7xxx Series

A temperature-sensitive resistor for monitoring the motor temperature is installed in the stator winding.

Type	KTY 84 (thermistor)
Cold resistance (20 °C)	Approx. 580 ohms
Hot resistance (100 °C)	Approx. 1000 ohms
Response temperature	Early warning at 120 °C Switch-off at 155 °C ± 5 °C
Connection	Via encoder line

The change in the resistance of the KTY 84 is proportional to the change in the winding temperature.

The controller unit is responsible for the measurement and evaluation of the temperature signal, and also considers the changes in the temperature of the motor resistors.
If an error occurs, it is reported to the controller. An increase in motor temperature triggers a message indicating that the motor temperature is too high, which can be evaluated externally. If this message is ignored, the controller switches the drive motors off when the temperature limit of the motor or the cut-out temperature is exceeded and generates a corresponding error message.

The temperature sensor is designed in such a way that it complies with the EN/DIN requirement for "electrical separation."

Warning

If the user wants to perform an additional high-voltage test, the line terminals of the temperature sensors must be short-circuited before performing the test.

Warning

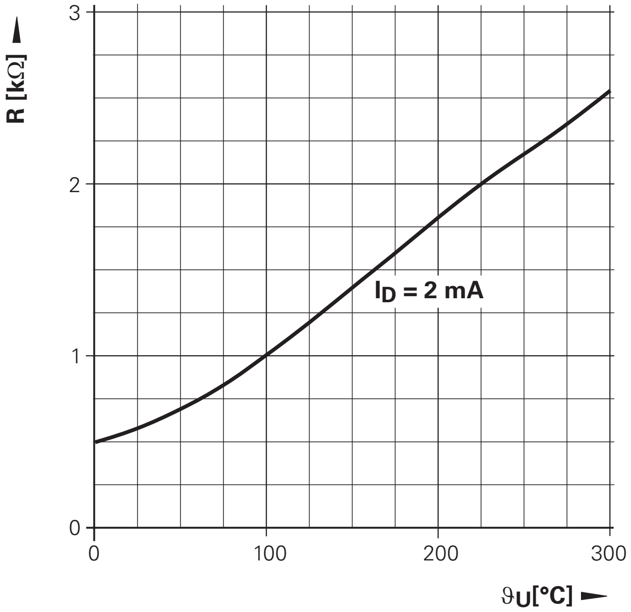
If the test voltage is only applied to one connecting terminal of the temperature sensor, the sensor will be destroyed. The polarity must be carefully observed.

Danger

The temperature sensor installed does not provide adequate protection from thermally critical loads, such as an excessive load on the stationary motor. Additional protection, such as a thermal overcurrent relay, must therefore be provided.
If overloads of 4 * M_0[a] are present for more than 4 seconds, you should also provide additional motor protection.

a. Stall torque of the motor in [Nm]

Resistance curve of the KTY 84 as a function of the temperature



7.13.1 1FK7042-5AF71

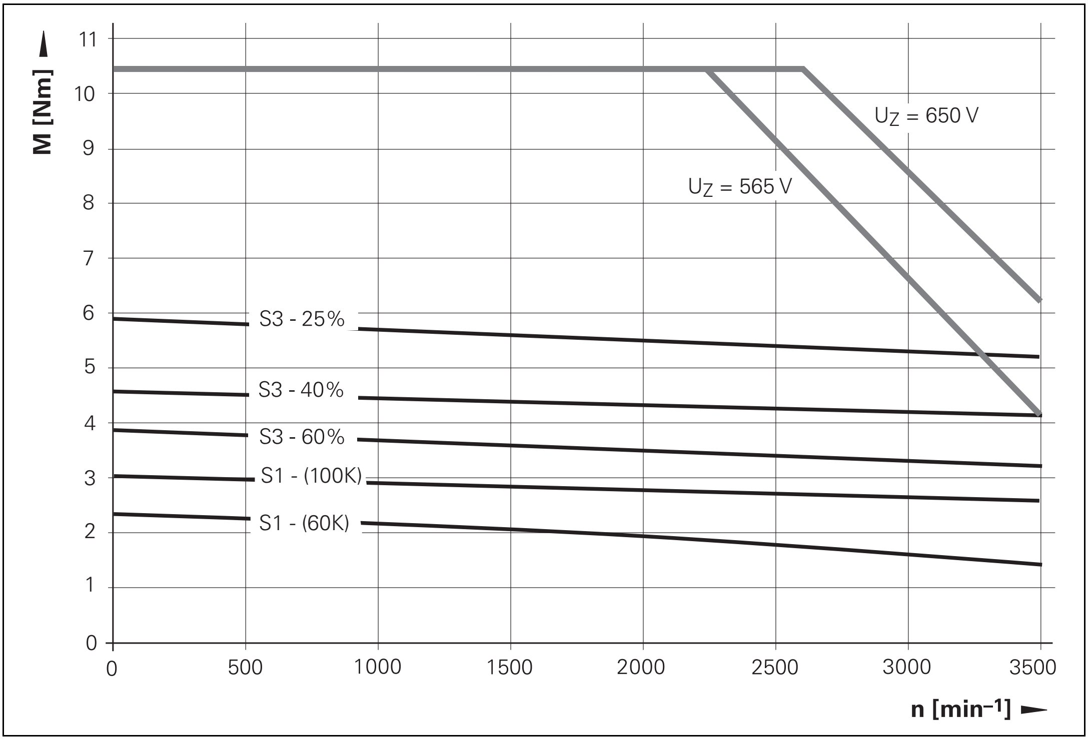
	1FK7042-5AF71-1AH3 with brake	**1FK7042-5AF71-1AG3 without brake**
Rated voltage U_N	297 V	
Rated power output P_N	0.82 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	2.6 Nm	
Rated current (100 K) I_N	1.95 A	
Stall torque (100 K) M_0	3.0 Nm	
Stall current (100 K) I_0	2.2 A	
Maximum current (for ≤200 ms) I_{max}	7.35 A	
Maximum torque (for ≤200 ms) M_{max}	10.5 Nm	
Maximum speed n_{max}	5150 rpm	
Type of power cable[a]	11	
Pole pairs PP	4	
Weight m	5.4 kg	4.9 kg
Rotor inertia J	3.73 $kgcm^2$	3.01 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.6 A	–
Holding torque for brake M_{Br}	4.0 Nm	–
ID	539 964-04	539 964-03

a. The specification for the power cables can be found in the table in the section “Power cables for HEIDENHAIN synchronous motors” on page 15.

Note

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for 1FK7042-5AF71

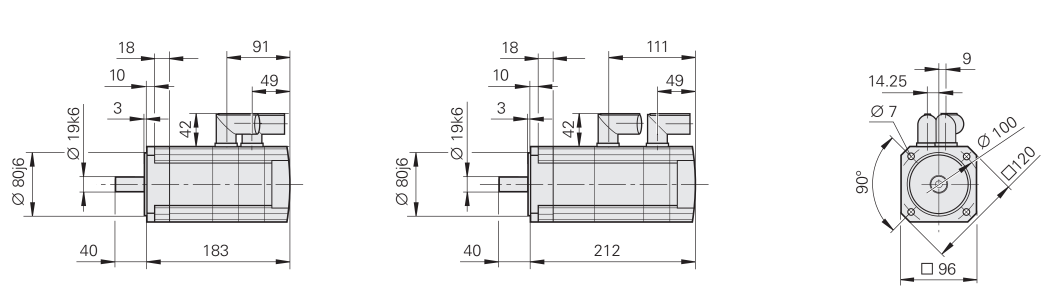


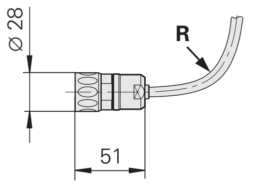
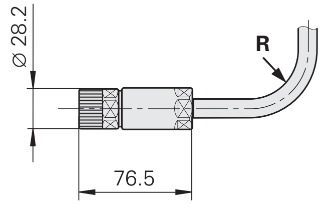
[a] MASTERDRIVES MC, U_{ZK}=540V (DC), U_{mot}=340V_{eff}

[b] SIMODRIVE 611 (UE), U_{ZK}=540V (DC) and MASTERDRIVES MC (AFE), U_{ZK}=600V (DC), U_{mot}=380V_{eff}

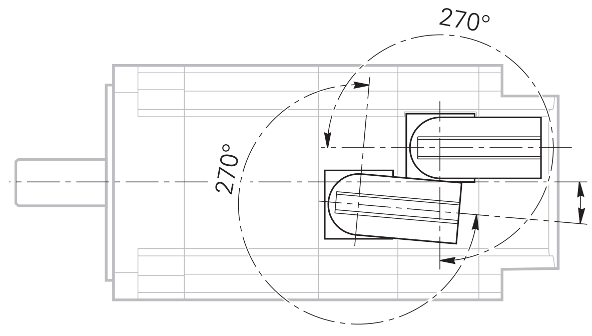
[c] SIMODRIVE 611 (ER), U_{ZK}=600V (DC), U_{mot}=425V_{eff}

Dimensions of 1FK7042-5AF71



Connector for speed encoder	Connector for power connection
	

Rotatable connections



Axial and radial forces with 1FK7042-5AF71

Axial forces

When using, for example, helical gear wheels as driving elements, an axial force acts on the motor bearing in addition to the radial force. When axial forces occur, the spring loading of the bearing might be overcome so that the rotor moves within the available axial play of the bearing (up to 0.2 mm).

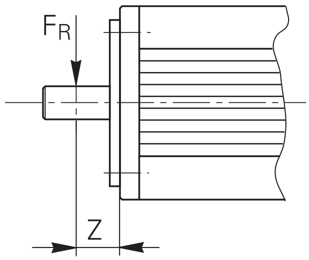
An estimation of the permissible axial force can be calculated using the following formula: $F_A = 0.35 * F_Q$

Warning

Axial forces acting on motors with integrated holding brake are not allowed!

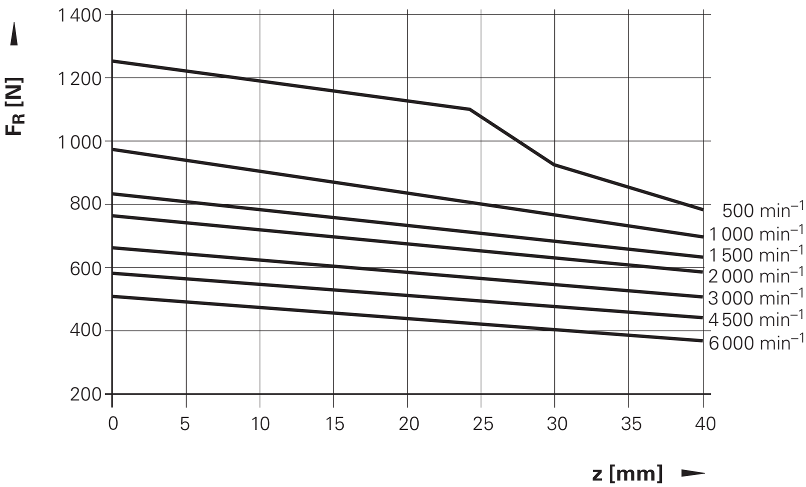
Radial forces

Point of the radial force:



The maximum permissible radial force may also depend on the motor speed and the point of the radial force on the motor shaft. The point of the force is defined by the distance Z and is shown as an axis in the load diagrams.

The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 20 000 h, depending on the point of the radial force and the average speed.



7.13.2 1FK7060-5AF71

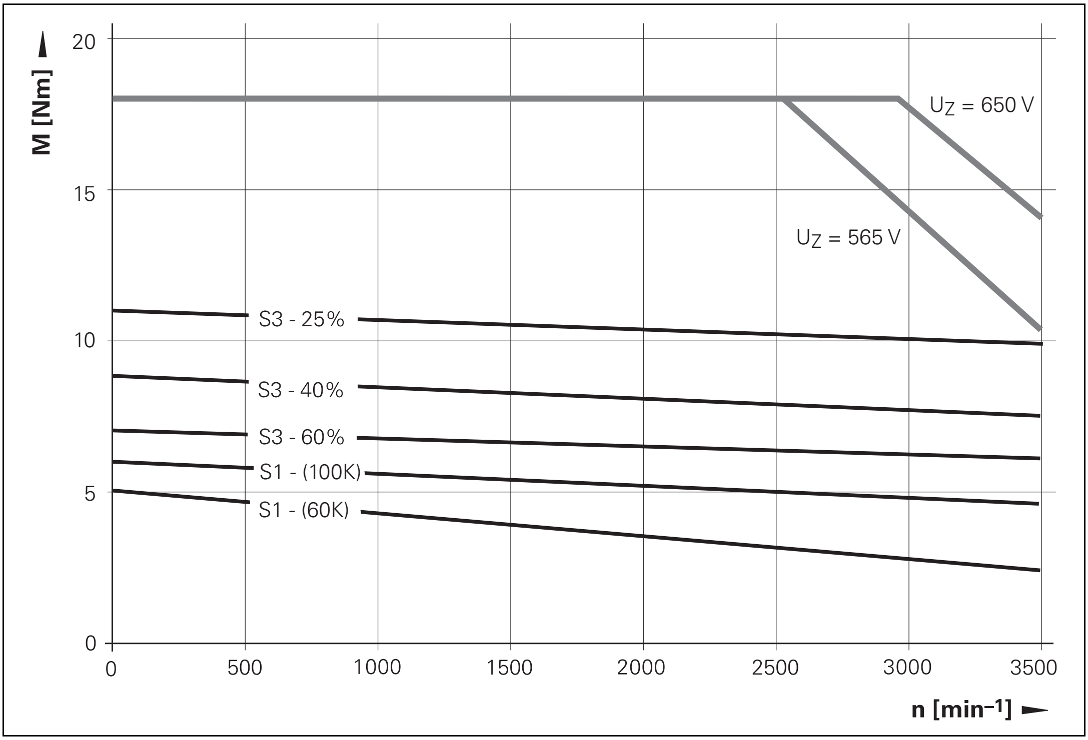
	1FK7060-5AF71-1AH3 with brake	**1FK7060-5AF71-1AG3 without brake**
Rated voltage U_N	274 V	
Rated power output P_N	1.48 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	4.7 Nm	
Rated current (100 K) I_N	3.7 A	
Stall torque (100 K) M_0	6.0 Nm	
Stall current (100 K) I_0	4.5 A	
Maximum current (for ≤200 ms) I_{max}	15.0 A	
Maximum torque (for ≤200 ms) M_{max}	18.0 Nm	
Maximum speed n_{max}	7200 rpm	
Type of power cable[a]	11	
Pole pairs PP	4	
Weight m	8.0 kg	7.0 kg
Rotor inertia J	10.2 kgcm^2	7.95 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.8 A	–
Holding torque for brake M_{Br}	12.0 Nm	–
ID	539 965-04	539 965-03

a. The specification for the power cables can be found in the table in the section "Power cables for HEIDENHAIN synchronous motors" on page 15.

Note

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for 1FK7060-5AF71

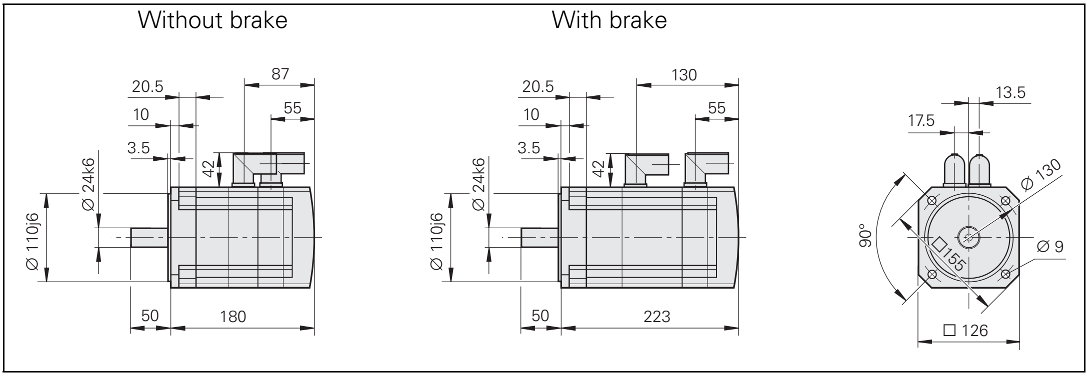


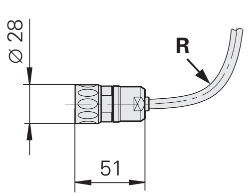
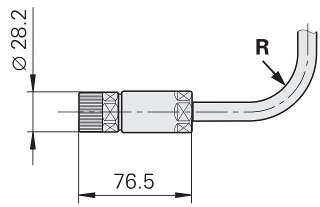
[a] MASTERDRIVES MC, U_{ZK}=540V (DC), U_{mot}=340V_{eff}

[b] SIMODRIVE 611 (UE), U_{ZK}=540V (DC) and MASTERDRIVES MC (AFE), U_{ZK}=600V (DC), U_{mot}=380V_{eff}

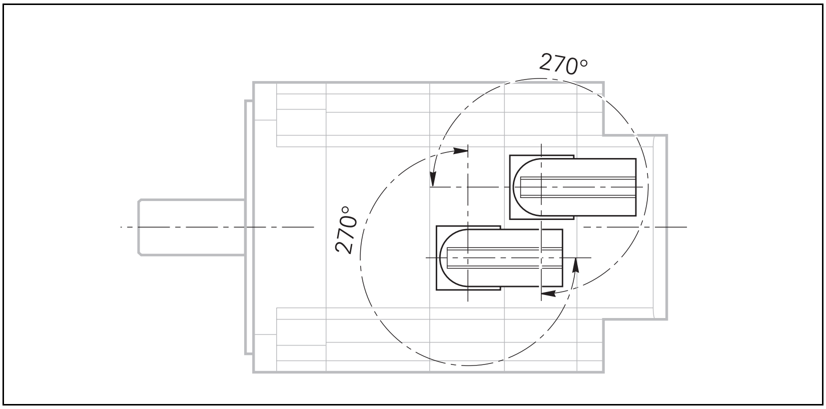
[c] SIMODRIVE 611 (ER), U_{ZK}=600V (DC), U_{mot}=425V_{eff}

Dimensions of 1FK7060-5AF71



Connector for speed encoder	Connector for power connection
	

Rotatable connections



Axial and radial forces 1FK7060-5AF71

Axial forces

When using, for example, helical gear wheels as driving elements, an axial force acts on the motor bearing in addition to the radial force. When axial forces occur, the spring loading of the bearing might be overcome so that the rotor moves within the available axial play of the bearing (up to 0.2 mm).

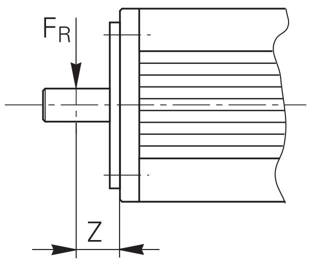
An estimation of the permissible axial force can be calculated using the following formula: $F_A = 0.35 * F_Q$

Warning

Axial forces acting on motors with integrated holding brake are not allowed!

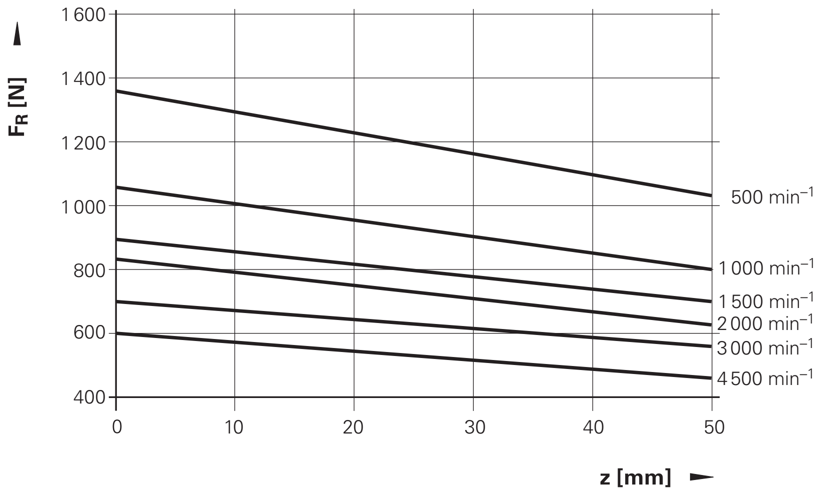
Radial forces

Point of the radial force:



The maximum permissible radial force may also depend on the motor speed and the point of the radial force on the motor shaft. The point of the force is defined by the distance Z and is shown as an axis in the load diagrams.

The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 20 000 h, depending on the point of the radial force and the average speed.



7.13.3 1FK7063-5AF71

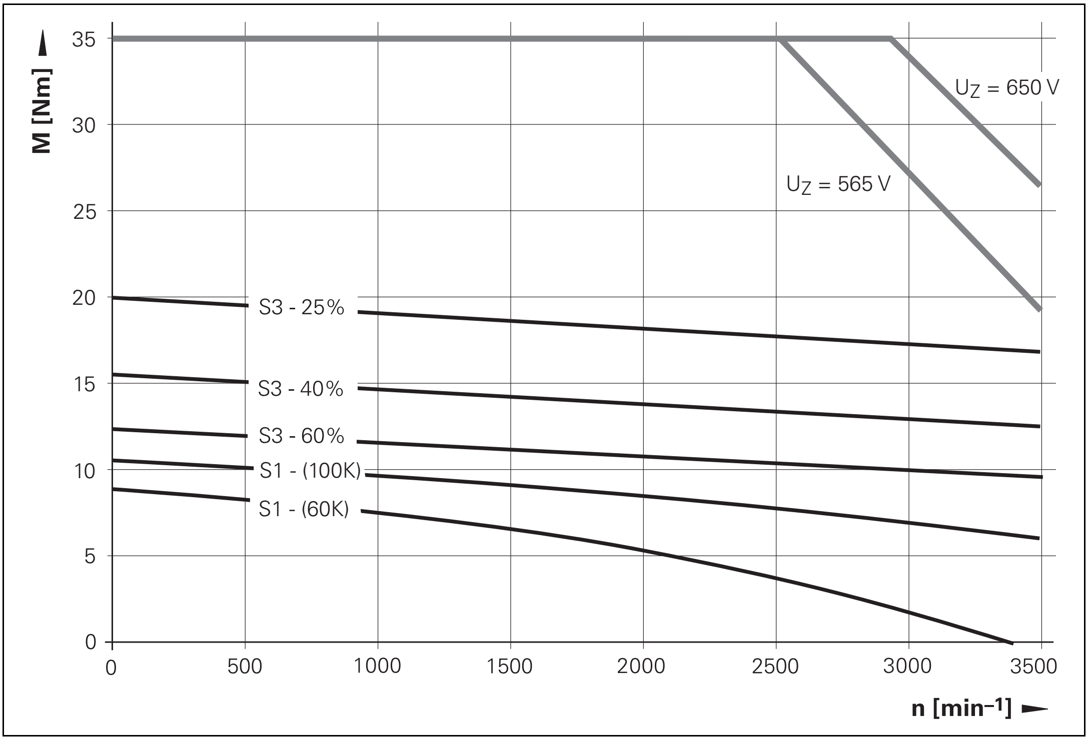
	1FK7063-5AF71-1AH3 with brake	1FK7063-5AF71-1AG3 without brake
Rated voltage U_N	275 V	
Rated power output P_N	2.3 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	7.3 Nm	
Rated current (100 K) I_N	5.6 A	
Stall torque (100 K) M_0	11.0 Nm	
Stall current (100 K) I_0	8.0 A	
Maximum current (for ≤200 ms) I_{max}	28.0 A	
Maximum torque (for ≤200 ms) M_{max}	35.0 Nm	
Maximum speed n_{max}	6600 rpm	
Type of power cable[a]	11	
Pole pairs PP	4	
Weight m	12.0 kg	11.5 kg
Rotor inertia J	17.3 $kgcm^2$	15.1 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.8 A	–
Holding torque for brake M_{Br}	12.0 Nm	–
ID	539 966-04	539 966-03

a. The specification for the power cables can be found in the table in the section "Power cables for HEIDENHAIN synchronous motors" on page 15.

Note

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for 1FK7063-5AF71

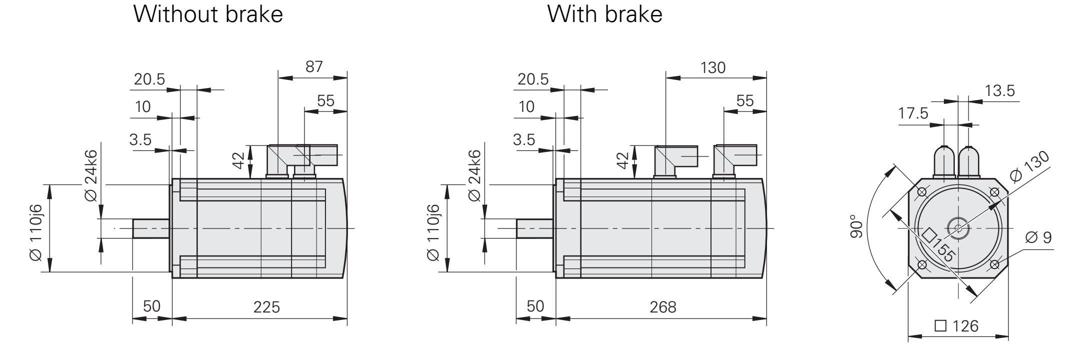


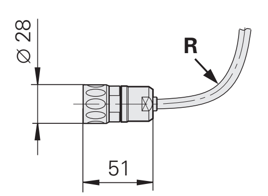
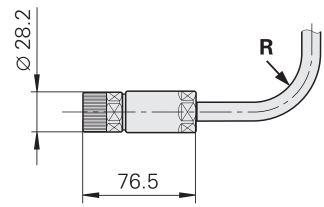
[a] MASTERDRIVES MC, U_{ZK}=540V (DC), U_{mot}=340V_{eff}

[b] SIMODRIVE 611 (UE), U_{ZK}=540V (DC) and MASTERDRIVES MC (AFE), U_{ZK}=600V (DC), U_{mot}=380V_{eff}

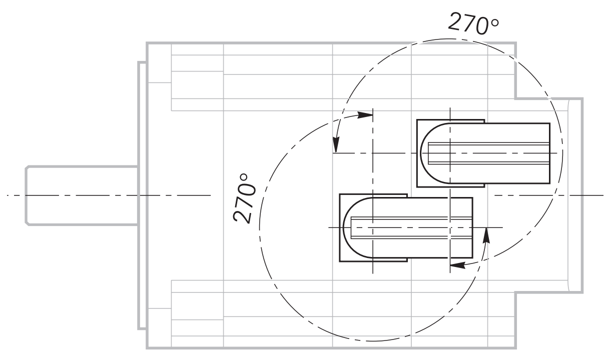
[c] SIMODRIVE 611 (ER), U_{ZK}=600V (DC), U_{mot}=425V_{eff}

Dimensions of 1FK7063-5AF71



Connector for speed encoder	Connector for power connection
	

Rotatable connections



Axial and radial forces 1FK7063-5AF71

Axial forces

When using, for example, helical gear wheels as driving elements, an axial force acts on the motor bearing in addition to the radial force. When axial forces occur, the spring loading of the bearing might be overcome so that the rotor moves within the available axial play of the bearing (up to 0.2 mm).

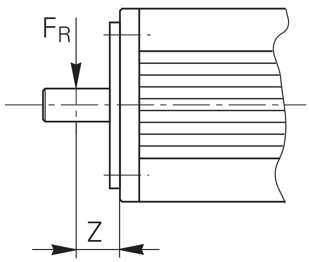
An estimation of the permissible axial force can be calculated using the following formula: $F_A = 0.35 * F_Q$

Warning

Axial forces acting on motors with integrated holding brake are not allowed!

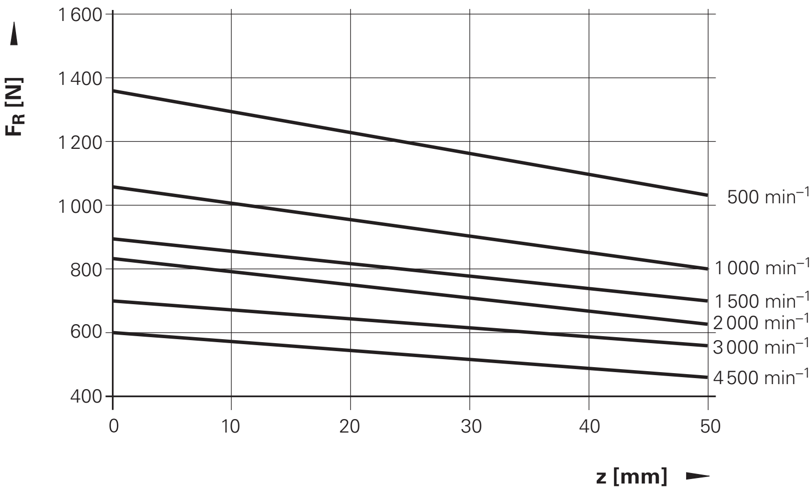
Radial forces

Point of the radial force:



The maximum permissible radial force may also depend on the motor speed and the point of the radial force on the motor shaft. The point of the force is defined by the distance Z and is shown as an axis in the load diagrams.

The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 20 000 h, depending on the point of the radial force and the average speed.



7.13.4 1FK7080-5AF71

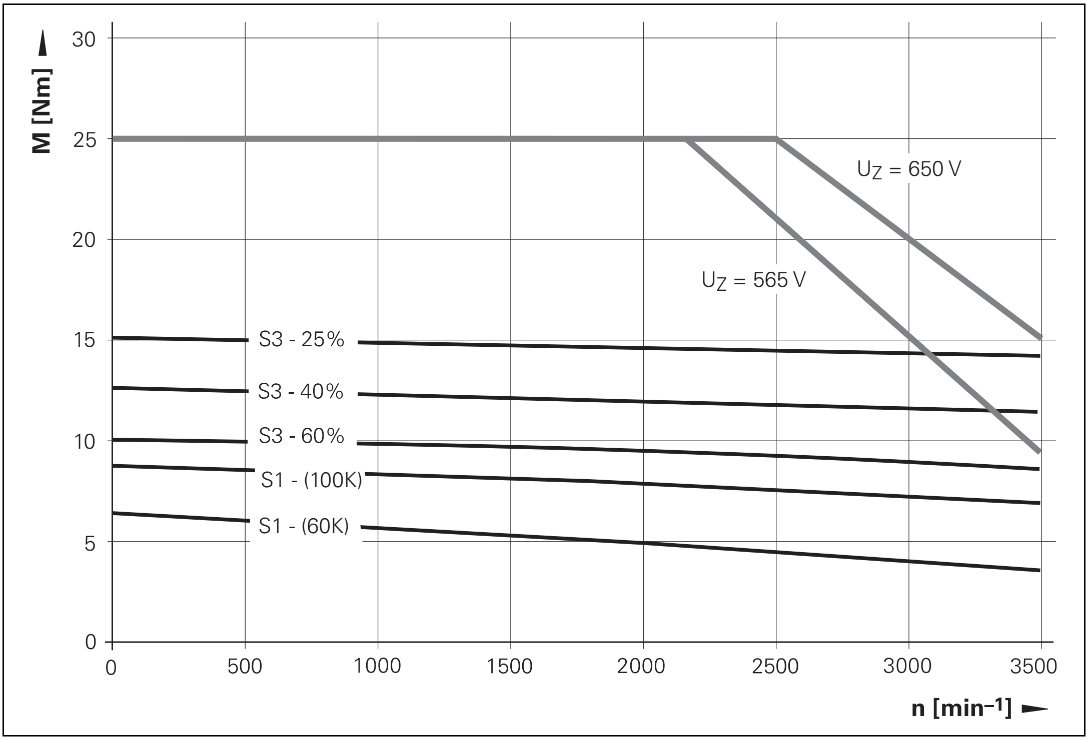
	1FK7080-5AF71-1AH3 with brake	1FK7080-5AF71-1AG3 without brake
Rated voltage U_N	327 V	
Rated power output P_N	2.14 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	6.8 Nm	
Rated current (100 K) I_N	4.4 A	
Stall torque (100 K) M_0	8.0 Nm	
Stall current (100 K) I_0	4.8 A	
Maximum current (for ≤200 ms) I_{max}	18.0 A	
Maximum torque (for ≤200 ms) M_{max}	25.0 Nm	
Maximum speed n_{max}	5600 rpm	
Type of power cable[a]	11	
Pole pairs PP	4	
Weight m	12.5 kg	10.0 kg
Rotor inertia J	18.1 kgcm^2	15.0 kgcm^2
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.2 A	–
Holding torque for brake M_{Br}	22.0 Nm	–
ID	539 967-04	539 967-03

a. The specification for the power cables can be found in the table in the section “Power cables for HEIDENHAIN synchronous motors” on page 15.

Note

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for 1FK7080-5AF71

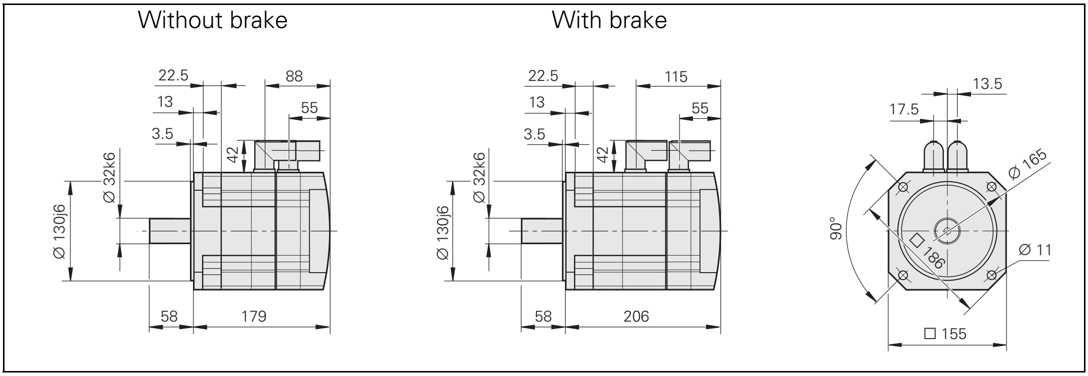


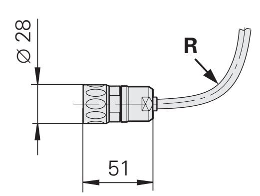
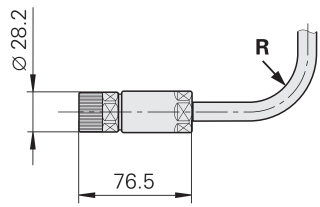
[a] MASTERDRIVES MC, U_{ZK}=540V (DC), U_{mot}=340V_{eff}

[b] SIMODRIVE 611 (UE), U_{ZK}=540V (DC) and MASTERDRIVES MC (AFE), U_{ZK}=600V (DC), U_{mot}=380V_{eff}

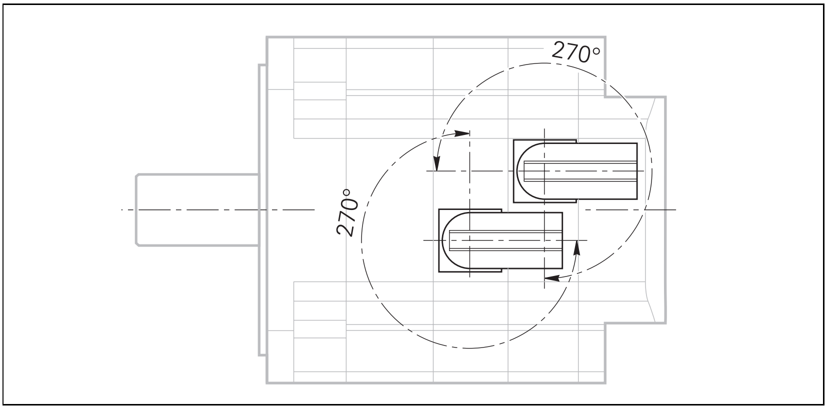
[c] SIMODRIVE 611 (ER), U_{ZK}=600V (DC), U_{mot}=425V_{eff}

Dimensions of 1FK7080-5AF71



Connector for speed encoder	Connector for power connection
	

Rotatable connections



Axial and radial forces 1FK7080-5AF71

Axial forces

When using, for example, helical gear wheels as driving elements, an axial force acts on the motor bearing in addition to the radial force. When axial forces occur, the spring loading of the bearing might be overcome so that the rotor moves within the available axial play of the bearing (up to 0.2 mm).

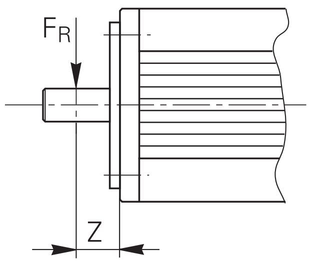
An estimation of the permissible axial force can be calculated using the following formula: $F_A = 0.35 * F_Q$

Warning

Axial forces acting on motors with integrated holding brake are not allowed!

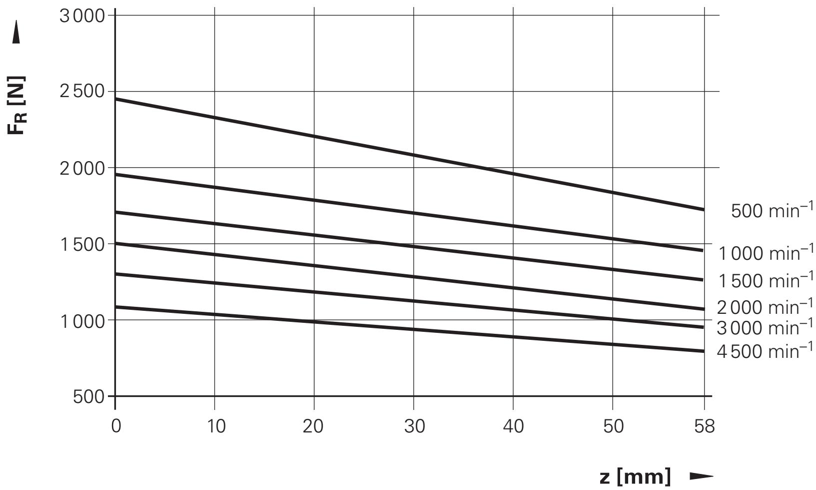
Radial forces

Point of the radial force:



The maximum permissible radial force may also depend on the motor speed and the point of the radial force on the motor shaft. The point of the force is defined by the distance Z and is shown as an axis in the load diagrams.

The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 20 000 h, depending on the point of the radial force and the average speed.



7.13.5 1FK7083-5AF71

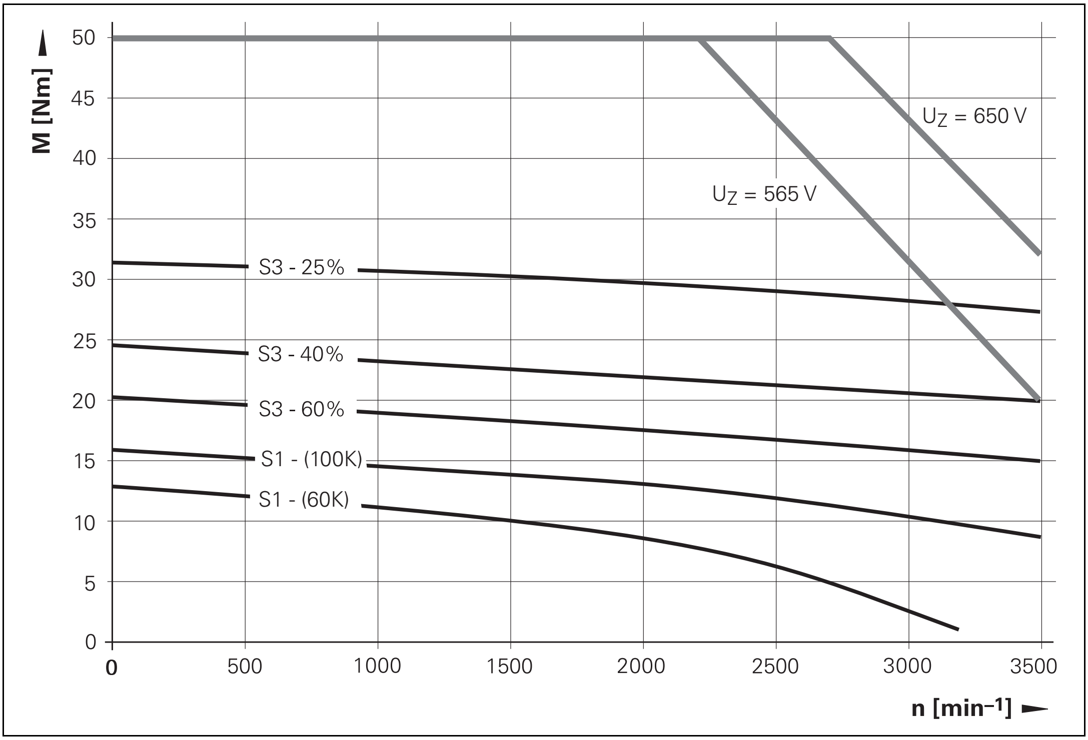
	1FK7083-5AF71-1AH3 with brake	**1FK7083-5AF71-1AG3 without brake**
Rated voltage U_N	303 V	
Rated power output P_N	3.3 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	10.5 Nm	
Rated current (100 K) I_N	7.4 A	
Stall torque (100 K) M_0	16.0 Nm	
Stall current (100 K) I_0	10.4 A	
Maximum current (for ≤200 ms) I_{max}	37.0 A	
Maximum torque (for ≤200 ms) M_{max}	50.0 Nm	
Maximum speed n_{max}	5600 rpm	
Type of power cable[a]	11	
Pole pairs PP	4	
Weight m	16.5 kg	14.0 kg
Rotor inertia J	35.9 $kgcm^2$	27.3 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.2 A	–
Holding torque for brake M_{Br}	22.0 Nm	–
ID	539 968-04	539 968-03

a. The specification for the power cables can be found in the table in the section “Power cables for HEIDENHAIN synchronous motors” on page 15.

Note

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for 1FK7083-5AF71

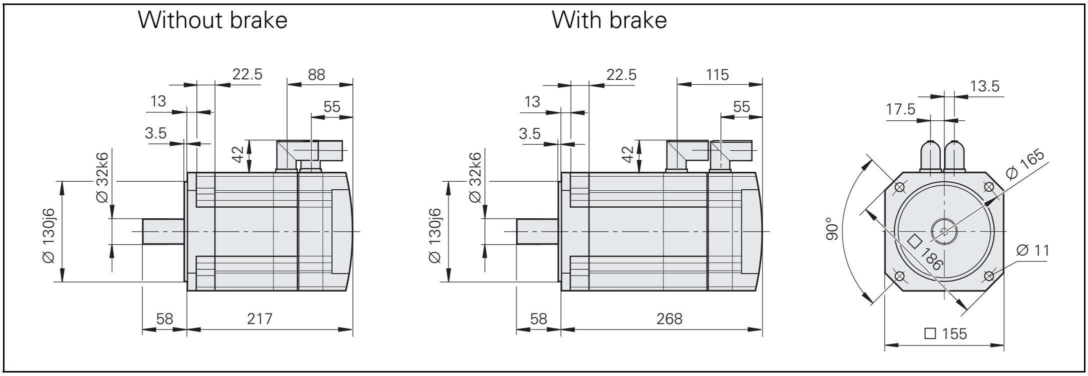


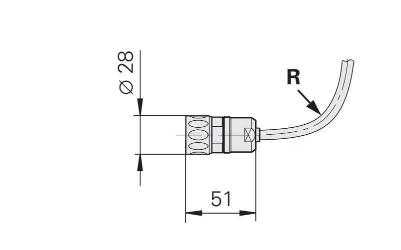
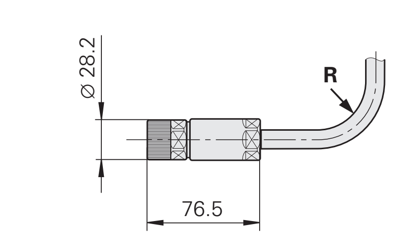
[a] MASTERDRIVES MC, U_{ZK}=540V (DC), U_{mot}=340 V_{eff}

[b] SIMODRIVE 611 (UE), U_{ZK}=540 V (DC) and MASTERDRIVES MC (AFE), U_{ZK}=600 V (DC), U_{mot}=380 V_{eff}

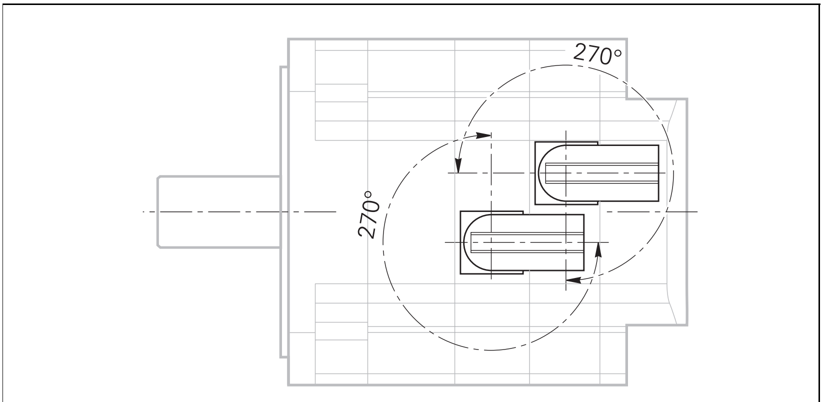
[c] SIMODRIVE 611 (ER), U_{ZK}=600V (DC), U_{mot}=425 V_{eff}

Dimensions of
1FK7083-5AF71



Connector for speed encoder	Connector for power connection
	

Rotatable connections



Axial and radial forces 1FK7083-5AF71

Axial forces

When using, for example, helical gear wheels as driving elements, an axial force acts on the motor bearing in addition to the radial force. When axial forces occur, the spring loading of the bearing might be overcome so that the rotor moves within the available axial play of the bearing (up to 0.2 mm).

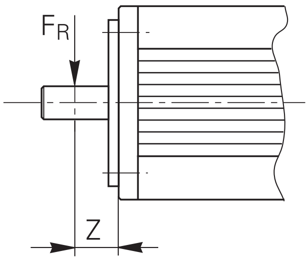
An estimation of the permissible axial force can be calculated using the following formula: $F_A = 0.35 * F_Q$

Warning

Axial forces acting on motors with integrated holding brake are not allowed!

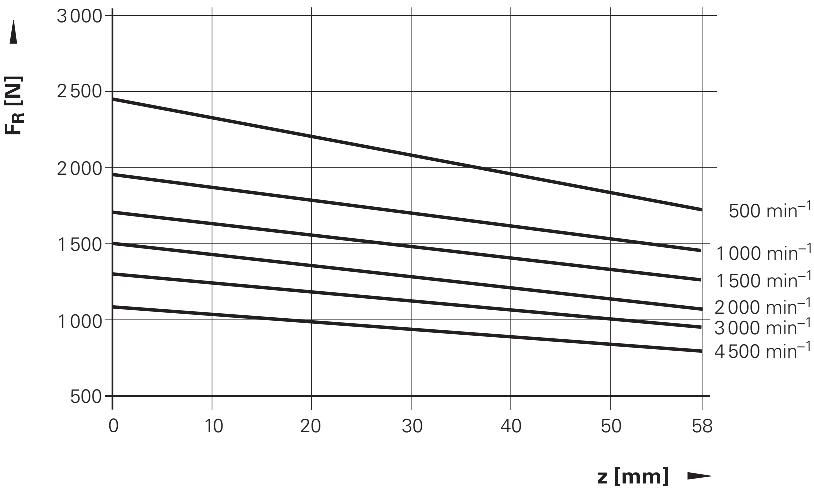
Radial forces

Point of the radial force:



The maximum permissible radial force may also depend on the motor speed and the point of the radial force on the motor shaft. The point of the force is defined by the distance Z and is shown as an axis in the load diagrams.

The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 20 000 h, depending on the point of the radial force and the average speed.



7.13.6 1FK7100-5AF71

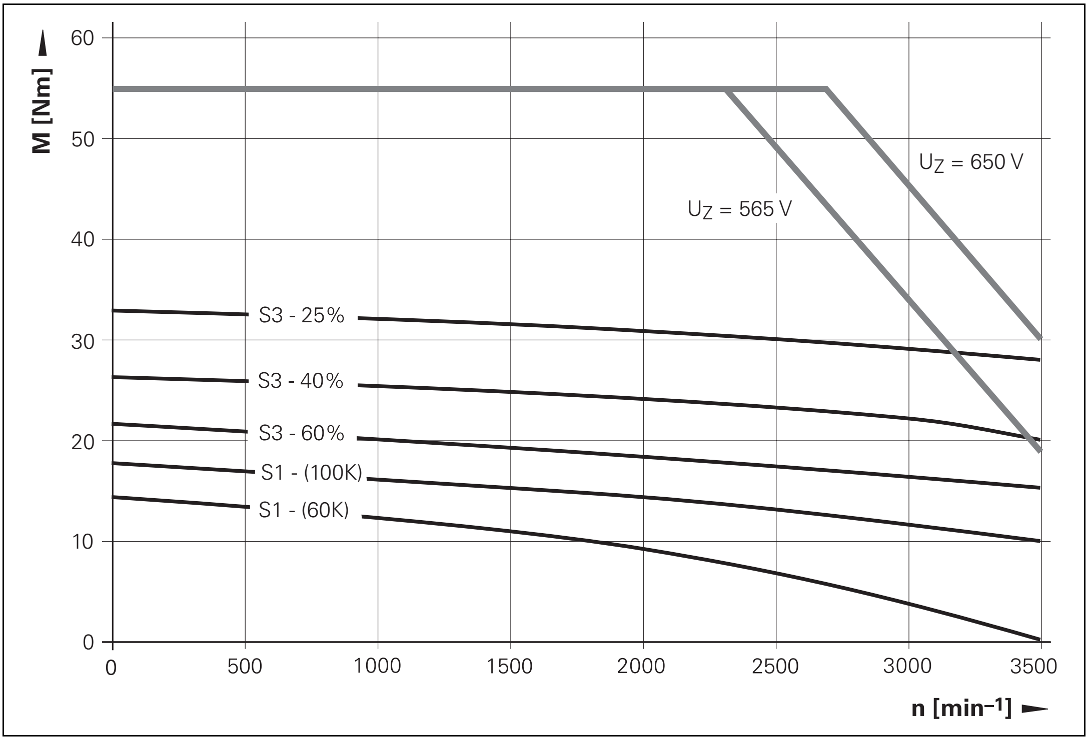
	1FK7100-5AF71-1AH3 with brake	**1FK7100-5AF71-1AG3 without brake**
Rated voltage U_N	318 V	
Rated power output P_N	3.77 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	12.0 Nm	
Rated current (100 K) I_N	8.0 A	
Stall torque (100 K) M_0	18.0 Nm	
Stall current (100 K) I_0	11.2 A	
Maximum current (for ≤200 ms) I_{max}	37.0 A	
Maximum torque (for ≤200 ms) M_{max}	55.0 Nm	
Maximum speed n_{max}	4300 rpm	
Type of power cable[a]	11	
Pole pairs PP	4	
Weight m	21.5 kg	19.0 kg
Rotor inertia J	63.9 $kgcm^2$	55.3 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	0.9 A	–
Holding torque for brake M_{Br}	22.0 Nm	–
ID	539 969-04	539 969-03

a. The specification for the power cables can be found in the table in the section “Power cables for HEIDENHAIN synchronous motors” on page 15.

Note

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for 1FK7100-5AF71

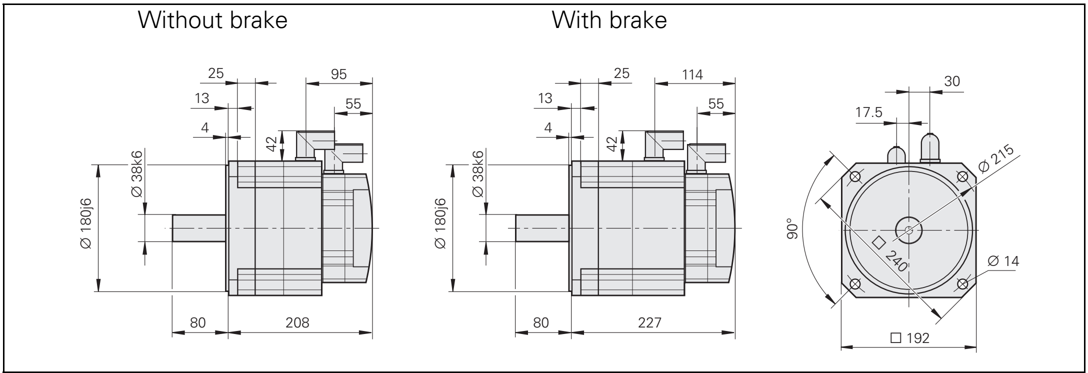


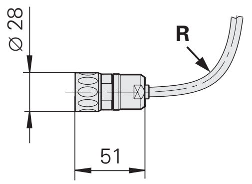
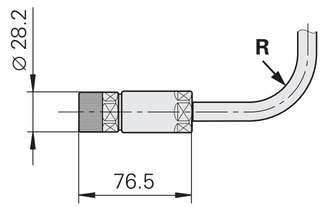
[a] MASTERDRIVES MC, U_{ZK}=540 V (DC), U_{mot}=340 V_{eff}

[b] SIMODRIVE 611 (UE), U_{ZK}=540 V (DC) and MASTERDRIVES MC (AFE), U_{ZK}=600 V (DC), U_{mot}=380V_{eff}

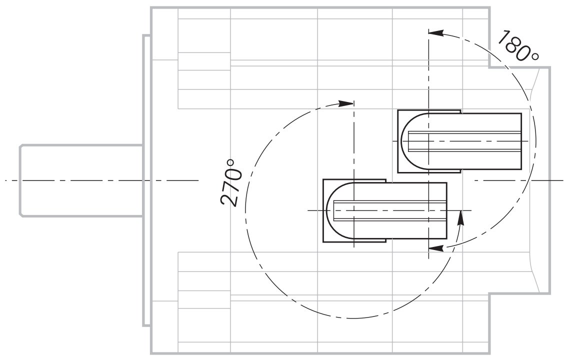
[c] SIMODRIVE 611 (ER), U_{ZK}=600 V (DC), U_{mot}=425 V_{eff}

**Dimensions of
1FK7100-5AF71**



Connector for speed encoder	Connector for power connection
	

Rotatable connections



Axial and radial forces 1FK7100-5AF71

Axial forces

When using, for example, helical gear wheels as driving elements, an axial force acts on the motor bearing in addition to the radial force. When axial forces occur, the spring loading of the bearing might be overcome so that the rotor moves within the available axial play of the bearing (up to 0.2 mm).

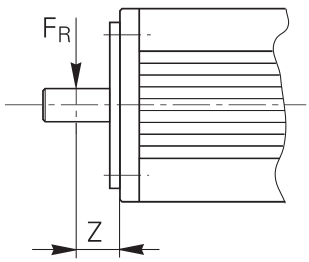
An estimation of the permissible axial force can be calculated using the following formula: $F_A = 0.35 * F_Q$

Warning

Axial forces acting on motors with integrated holding brake are not allowed!

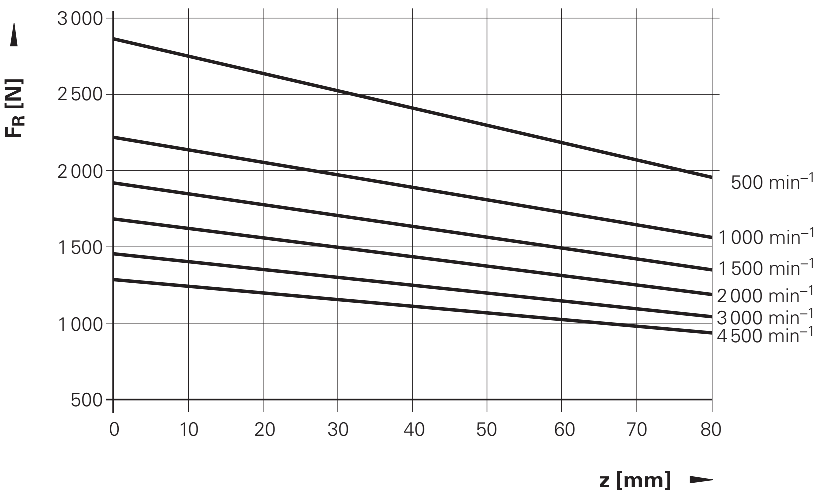
Radial forces

Point of the radial force:



The maximum permissible radial force may also depend on the motor speed and the point of the radial force on the motor shaft. The point of the force is defined by the distance Z and is shown as an axis in the load diagrams.

The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 20 000 h, depending on the point of the radial force and the average speed.



7.13.7 1FK7101-5AF71

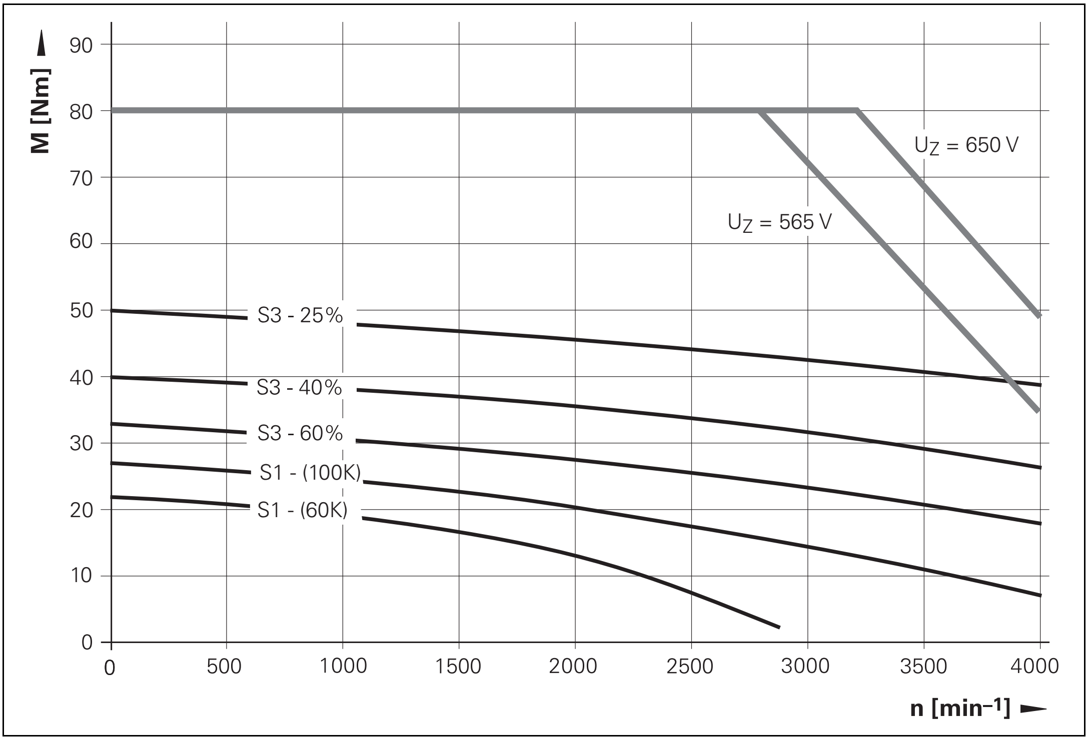
	1FK7101-5AF71-1AH3 **with brake**	1FK7101-5AF71-1AG3 **without brake**
Rated voltage U_N	277 V	
Rated power output P_N	4.87 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	15.5 Nm	
Rated current (100 K) I_N	11.8 A	
Stall torque (100 K) M_0	27.0 Nm	
Stall current (100 K) I_0	19.0 A	
Maximum current (for ≤200 ms) I_{max}	63.0 A	
Maximum torque (for ≤200 ms) M_{max}	80.0 Nm	
Maximum speed n_{max}	4300 rpm	
Type of power cable[a]	13	
Pole pairs PP	4	
Weight m	24.0 kg	21.0 kg
Rotor inertia J	92.3 $kgcm^2$	79.9 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.0 A	–
Holding torque for brake M_{Br}	41.0 Nm	–
ID	539 970-04	539 970-03

a. The specification for the power cables can be found in the table in the section “Power cables for HEIDENHAIN synchronous motors” on page 15.

Note

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for 1FK7101-5AF71

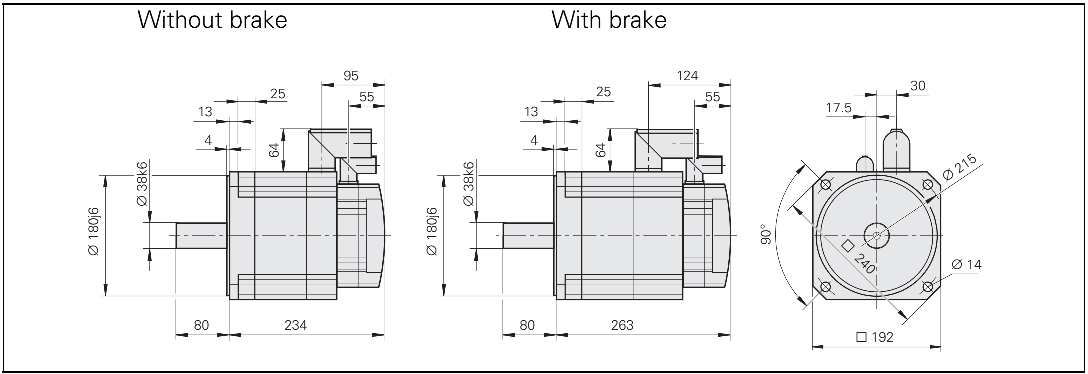


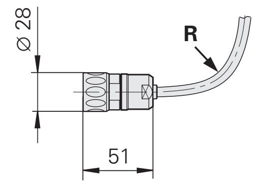
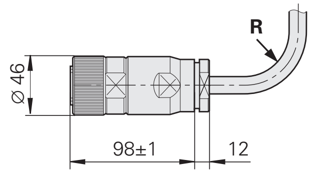
[a] MASTERDRIVES MC, U_{ZK}=540 V (DC), U_{mot}=340 V_{eff}

[b] SIMODRIVE 611 (UE), U_{ZK}=540 V (DC) and MASTERDRIVES MC (AFE), U_{ZK}=600 V (DC), U_{mot}=380 V_{eff}

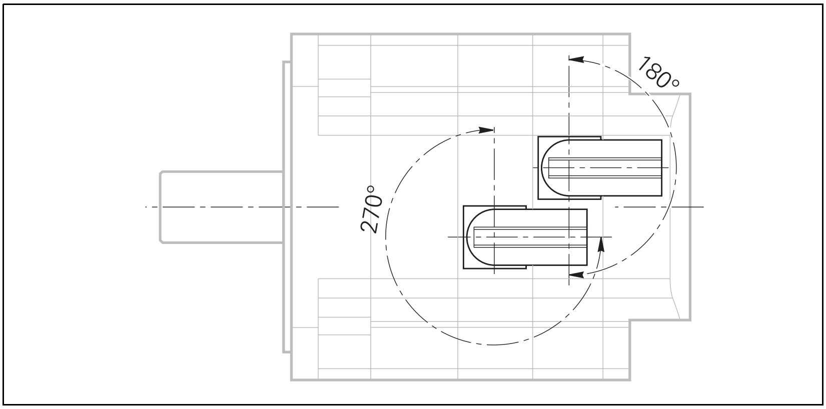
[c] SIMODRIVE 611 (ER), U_{ZK}=600 V (DC), U_{mot}=425 V_{eff}

Dimensions of 1FK7101-5AF71



Connector for speed encoder	Connector for power connection
	

Rotatable connections



Axial and radial forces 1FK7101-5AF71

Axial forces

When using, for example, helical gear wheels as driving elements, an axial force acts on the motor bearing in addition to the radial force. When axial forces occur, the spring loading of the bearing might be overcome so that the rotor moves within the available axial play of the bearing (up to 0.2 mm).

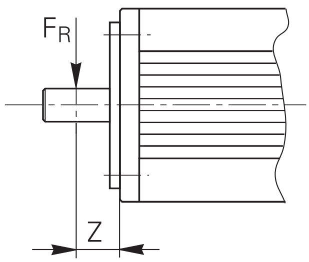
An estimation of the permissible axial force can be calculated using the following formula: $F_A = 0.35 * F_Q$

Warning

Axial forces acting on motors with integrated holding brake are not allowed!

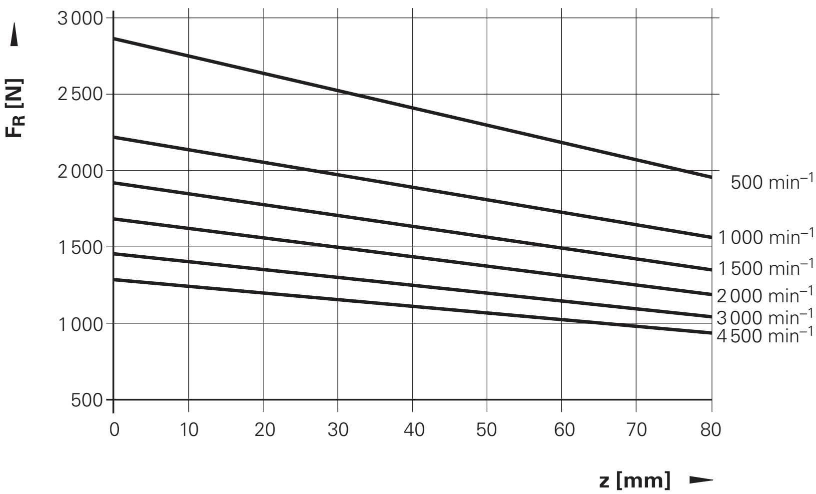
Radial forces

Point of the radial force:



The maximum permissible radial force may also depend on the motor speed and the point of the radial force on the motor shaft. The point of the force is defined by the distance Z and is shown as an axis in the load diagrams.

The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 20 000 h, depending on the point of the radial force and the average speed.



7.13.8 1FK7103-5AF71

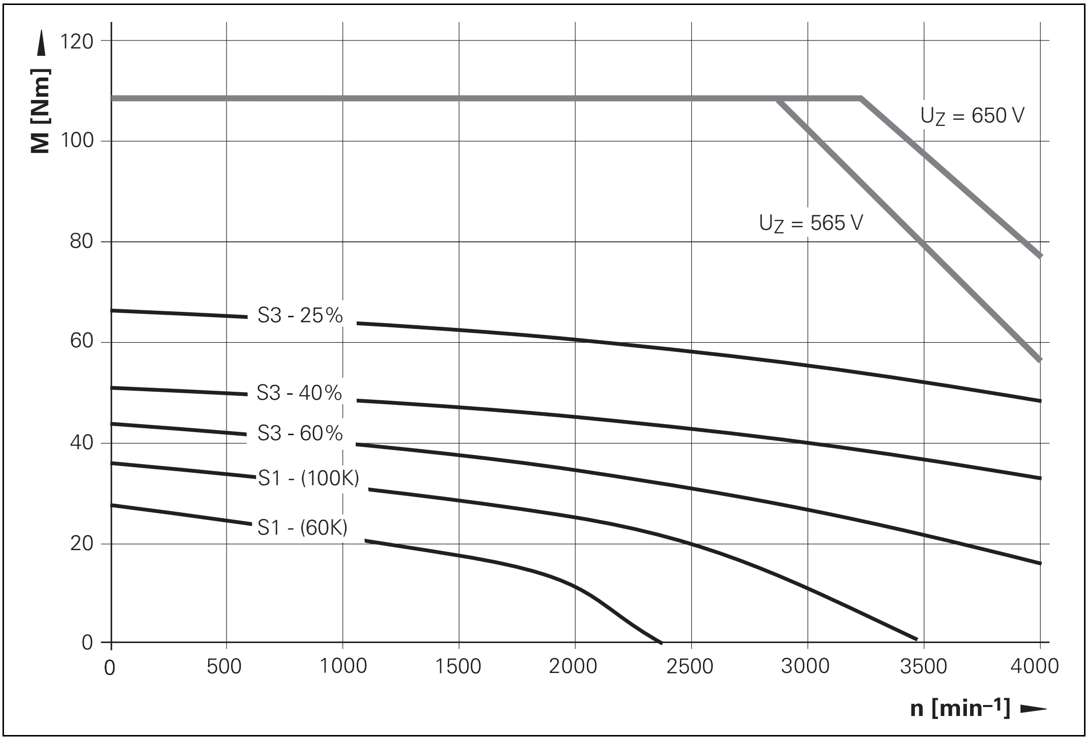
	1FK7103-5AF71-1AH3 with brake	**1FK7103-5AF71-1AG3 without brake**
Rated voltage U_N	262 V	
Rated power output P_N	4.4 kW	
Rated speed n_N	3000 rpm	
Rated torque (100 K) M_N	14.0 Nm	
Rated current (100 K) I_N	12.0 A	
Stall torque (100 K) M_0	36.0 Nm	
Stall current (100 K) I_0	27.5 A	
Maximum current (for ≤200 ms) I_{max}	84.0 A	
Maximum torque (for ≤200 ms) M_{max}	108.0 Nm	
Maximum speed n_{max}	4300 rpm	
Type of power cable[a]	16	
Pole pairs PP	4	
Weight m	32.0 kg	29.0 kg
Rotor inertia J	118.0 $kgcm^2$	105.0 $kgcm^2$
Rated voltage for brake U_{Br}	24 V–	–
Rated current for brake I_{Br}	1.0 A	–
Holding torque for brake M_{Br}	41.0 Nm	–
ID	539 971-04	539 971-03

a. The specification for the power cables can be found in the table in the section “Power cables for HEIDENHAIN synchronous motors” on page 15.

Note

In addition, it shows the characteristic curves determined on a test stand for **one** motor mounted without thermal insulation.

Speed-torque characteristic for 1FK7103-5AF71

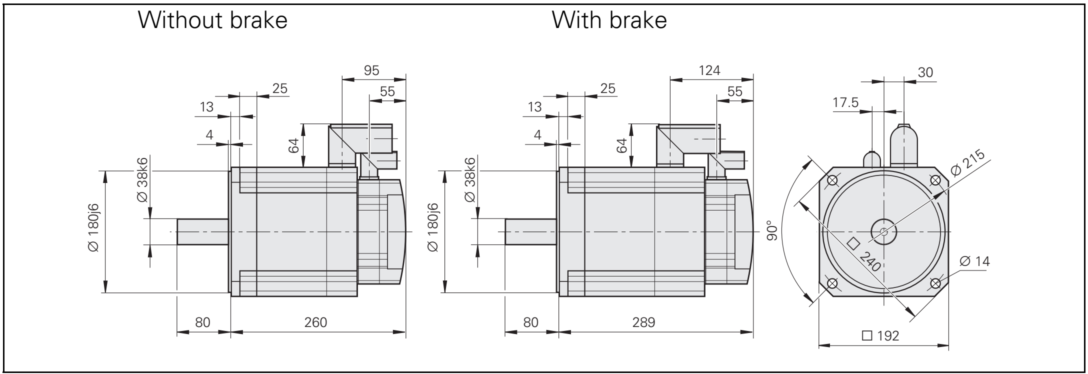


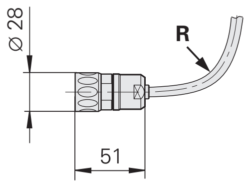
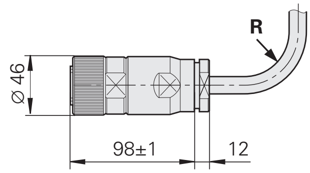
[a] MASTERDRIVES MC, U_{ZK}=540V (DC), U_{mot}=340 V_{eff}

[b] SIMODRIVE 611 (UE), U_{ZK}=540 V (DC) and MASTERDRIVES MC (AFE), U_{ZK}=600 V (DC), U_{mot}=380 V_{eff}

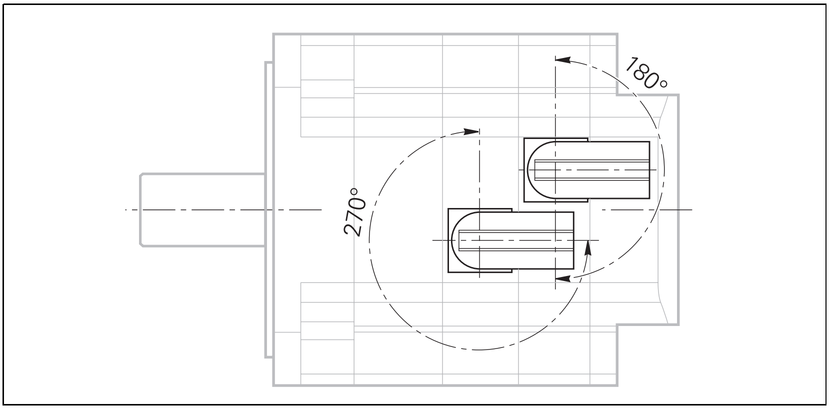
[c] SIMODRIVE 611 (ER), U_{ZK}=600 V (DC), U_{mot}=425V_{eff}

Dimensions of
1FK7103-5AF71



Connector for speed encoder	Connector for power connection
	

Rotatable connections



Axial and radial forces 1FK7103-5AF71

Axial forces

When using, for example, helical gear wheels as driving elements, an axial force acts on the motor bearing in addition to the radial force. When axial forces occur, the spring loading of the bearing might be overcome so that the rotor moves within the available axial play of the bearing (up to 0.2 mm).

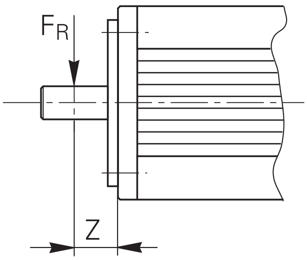
An estimation of the permissible axial force can be calculated using the following formula: $F_A = 0.35 * F_Q$

Warning

Axial forces acting on motors with integrated holding brake are not allowed!

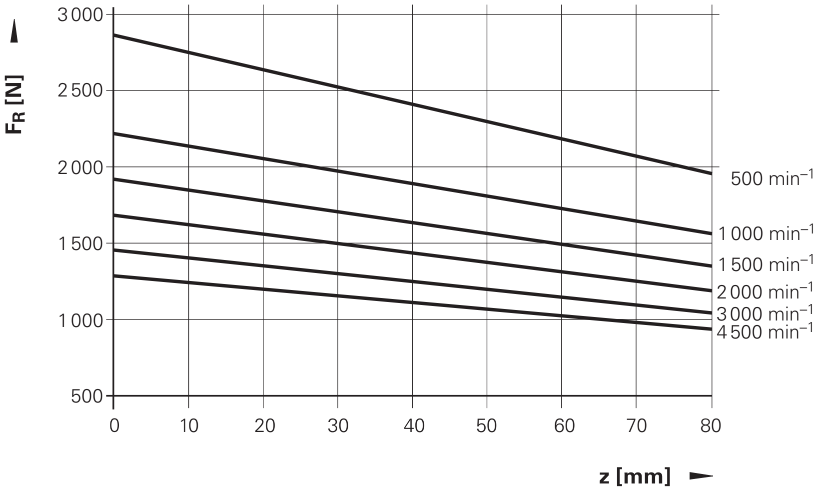
Radial forces

Point of the radial force:



The maximum permissible radial force may also depend on the motor speed and the point of the radial force on the motor shaft. The point of the force is defined by the distance Z and is shown as an axis in the load diagrams.

The maximum permissible radial forces F_{Rmax} shown in the following diagram are valid for a bearing service life of 20 000 h, depending on the point of the radial force and the average speed.



7.14 SIEMENS Hollow Shaft Motors, 1PM61xx-2DF81-1AR1-Z Series

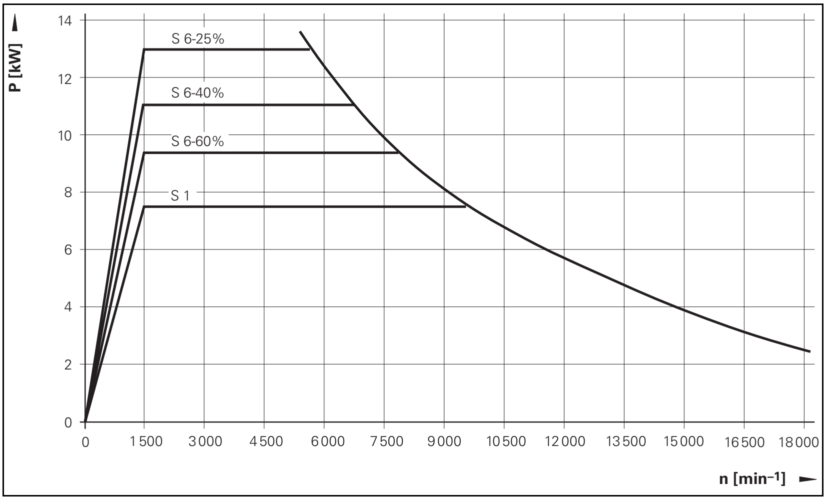
1PM61xx-2DF81-1AR1-Z

	1PM6105-2DF81-1AR1-Z	1PM6133-2DF81-1AR1-Z
Fan	+	+
Rated voltage U_N	300 V	300 V
Rated power output P_N	7.5 kW	11 kW
Rated speed n_N	1500 rpm	1500 rpm
Rated torque M_N (105 K)	48 Nm	70 Nm
Rated current I_N (105 K)	23.0 A	41.0 A
Maximum speed n_{max} with spindle bearing	18000 rpm	15000 rpm
Maximum current I_{max}	52 A	86 A
Pole pairs PP	2	2
Weight m	70 kg	94 kg
Power cable[a]	4	9
Rotor inertia J	0.024 kgm^2	0.046 kgm^2
ID number	557 622-13	557 623-13
Fan		
Rated voltage for fan U_L	3 x 400 V	3 x 400 V
Rated current for fan I_L	0.13 A	0.26 A
Frequency f_L	50 Hz/60 Hz	50 Hz/60 Hz

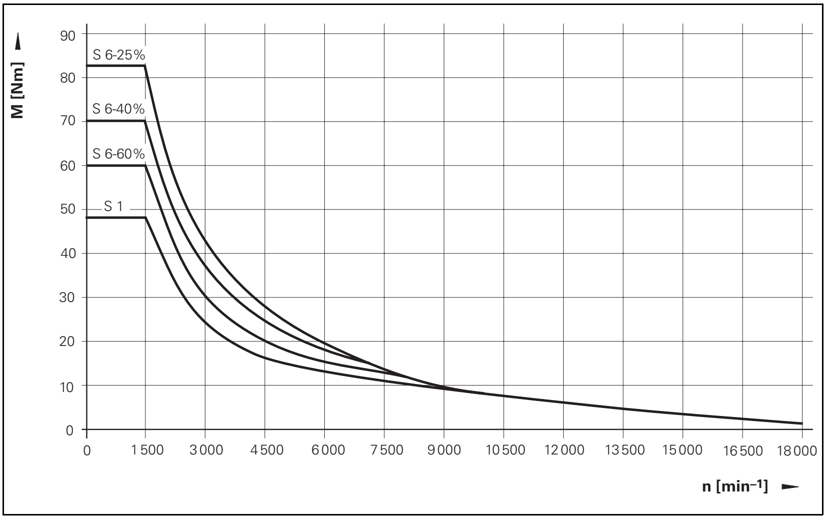
a. The specification for the power cables can be found in the table in the section "Power cables for HEIDENHAIN asynchronous motors" on page 14.

1PM6105-2DF81-1AR1-Z characteristics of power and torque

Power characteristic curve

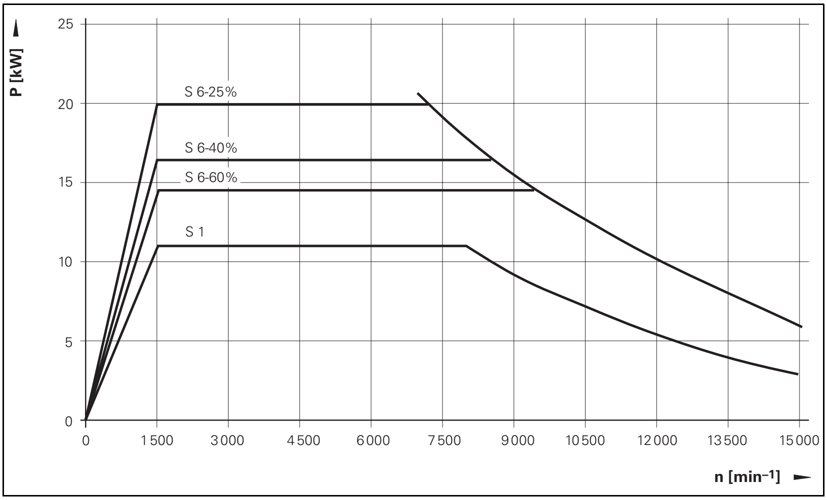


Torque characteristic curve

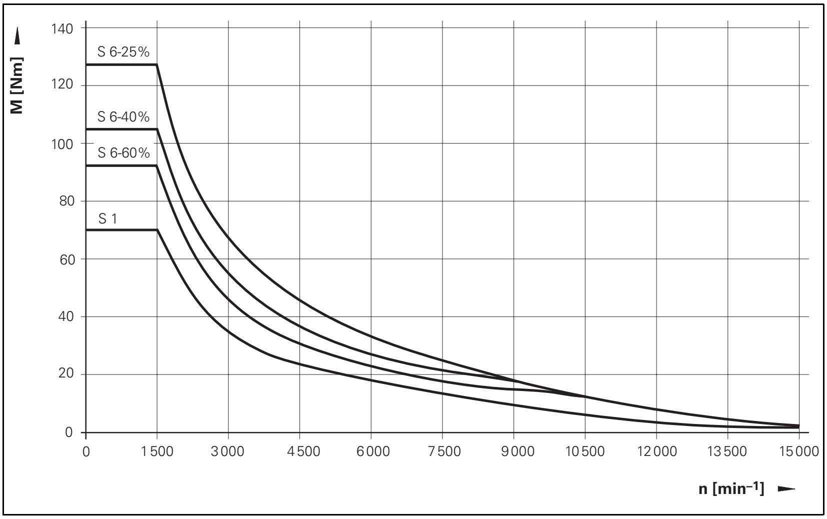


1PM6133-2DF81-1AR1-Z characteristics of power and torque

Power characteristic curve



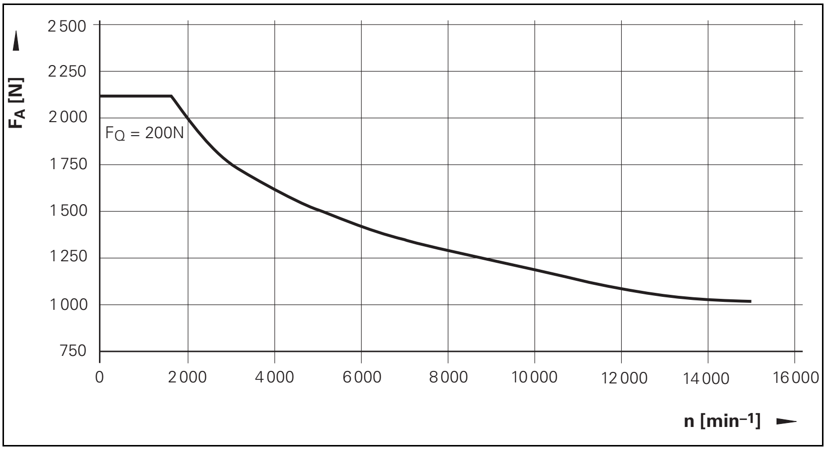
Torque characteristic curve



7.14.1 Axial and Radial Forces – Hollow Shaft Motors, 1PM6105 and 1PM6133 Series

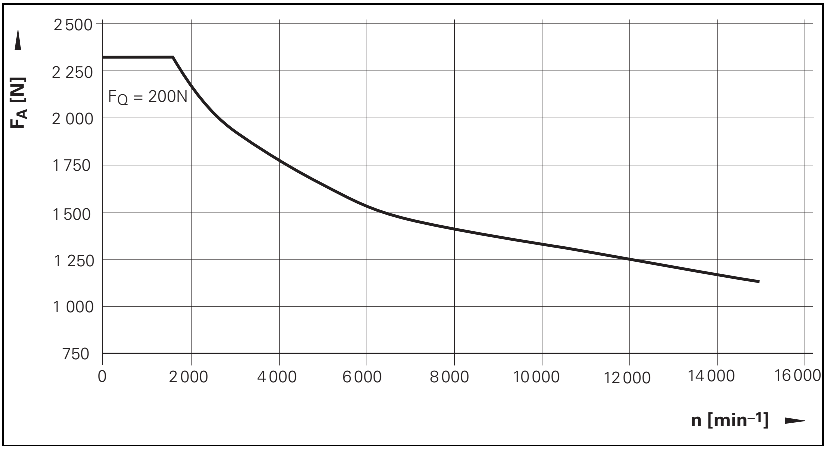
Maximum permissible axial forces for 1PM6105

Maximum permissible axial force FA with a maximum permissible radial force FQ = 200 N and a nominal bearing life of 10000 h.



Maximum permissible axial forces for 1PM6133

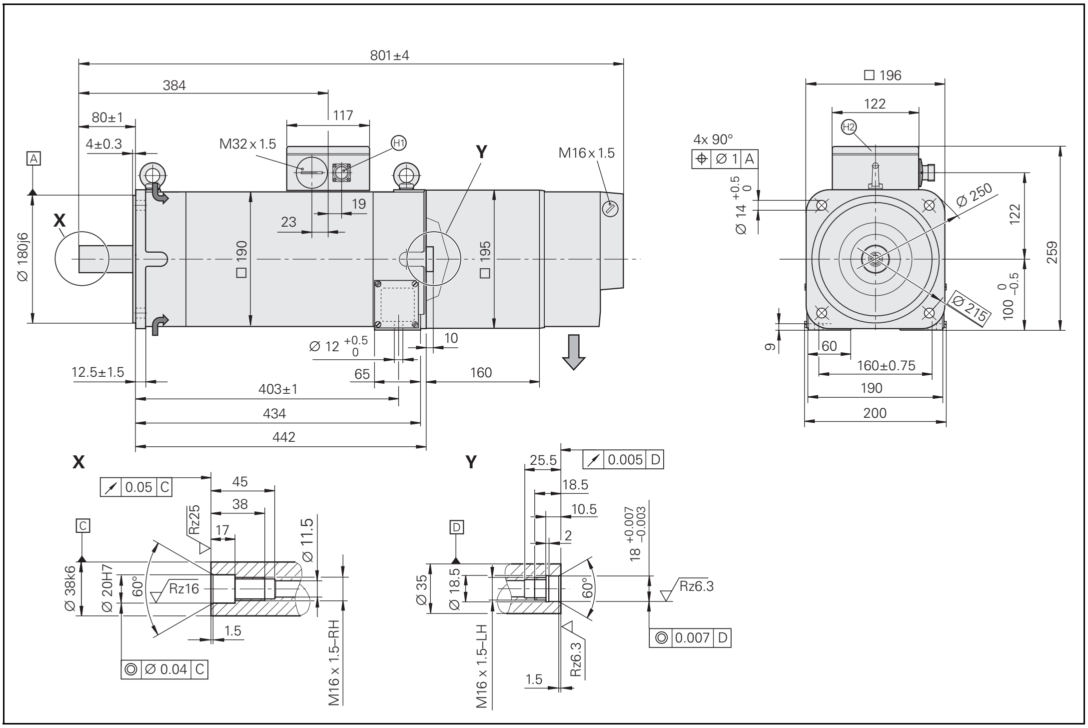
Maximum permissible axial force FA with a maximum permissible radial force FQ = 200 N and a nominal bearing life of 10000 h.



7.14.2 Dimensions – Hollow Shaft Motors, 1PM61xx-2DF81-1AR1-Z Series

> **Note**
>
> All dimensions are in millimeters [mm].

1PM6105-2DF81-1AR1-Z

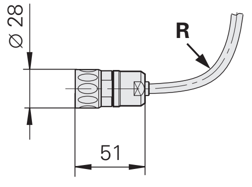


H1 = Signal connection

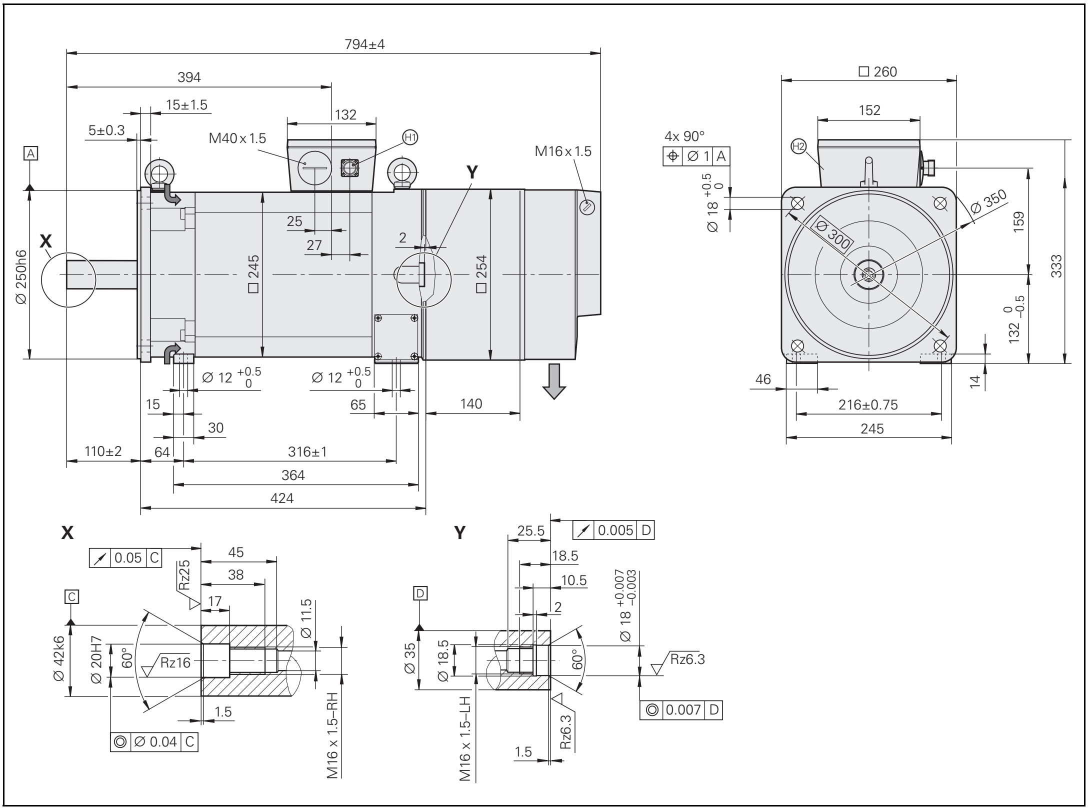
H2 = Terminal box, rotatable 4 x 90°

= Air inlet

Connector for speed encoder



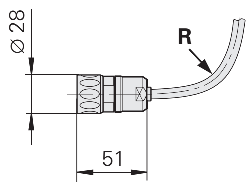
1PM6133-
2DF81-1AR1-Z



H1 = Signal connection

H2 = Terminal box, rotatable 4 x 90°

 = Air inlet

Connector for speed encoder


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