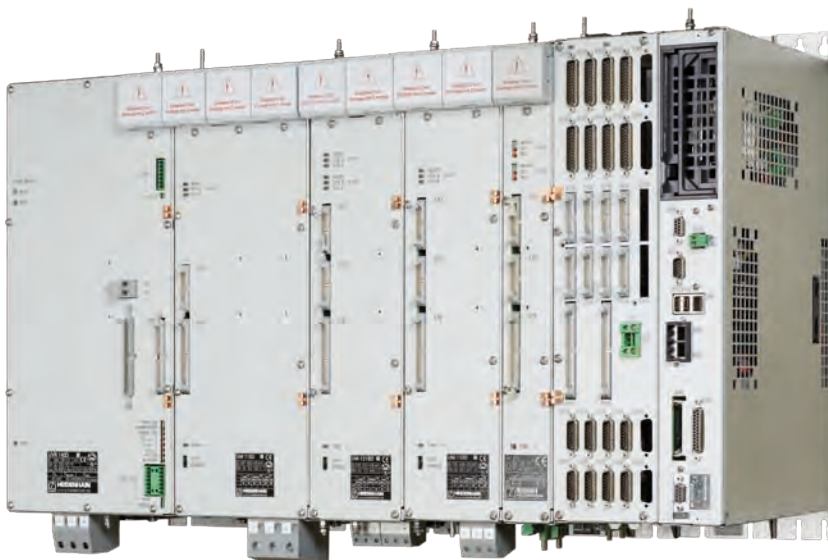




HEIDENHAIN



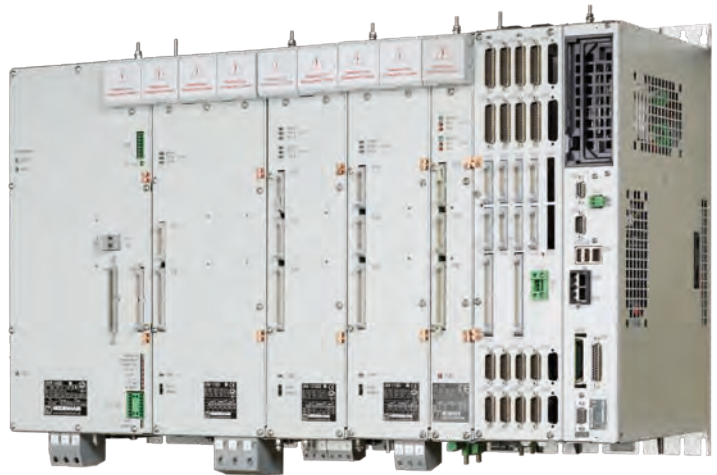
Inverter Systems for HEIDENHAIN Controls

**Information for the
Machine Tool Builder**

September 2013

HEIDENHAIN inverter systems

The inverter systems from HEIDENHAIN are suitable for HEIDENHAIN controls with digital speed control. They are designed for operating the synchronous and asynchronous motors from HEIDENHAIN.



MC 6241, CC 6108
With modular inverter

System tests

Controls, inverters, motors and encoders from HEIDENHAIN are usually integrated as components in larger systems. In these cases, comprehensive tests of the complete system are required, irrespective of the specifications of the individual devices.

Expendable parts

In particular the following parts in inverters from HEIDENHAIN are subject to wear:

- Fans

Standards

Standards (ISO, EN, etc.) apply only where explicitly stated in the catalog.

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This catalog supersedes all previous editions, which thereby become invalid.

Subject to change without notice

HEIDENHAIN inverter systems

HEIDENHAIN inverter systems are designed for use with QSY synchronous motors and QAN asynchronous motors from HEIDENHAIN. The inverter systems are available with power ratings of 10 kW to 125 kW. They can be supplied as compact inverters or in modular versions as regenerative or nonregenerative systems.

Regenerative inverters

With **regenerative inverters**, the braking energy of the motors is fed back into the power supply. Regenerative systems need additional components, such as **line filters** and **commutating reactors** (see *Accessories for Inverter Systems*).

Nonregenerative inverters

With **nonregenerative inverters**, the braking energy of the motors is converted to heat. This requires a **braking resistor** (see *Accessories for Inverter Systems*).

Supply voltage

The inverter systems are designed for connection to a TN public power grid with a voltage of 3AC 400 V; 50 to 60 Hz ($\pm 10\%$). Other public grids or other line voltages must be adapted over a transformer.

DC-link voltage

Both inverter systems use a rectifier bridge circuit to convert the line power DC-link voltage and other auxiliary voltages for the electronics of the power modules, the controller unit, and the main computer. The rectified and—for regenerative systems—controlled DC-link voltage is conducted through IGBTs to the motors under frequency and voltage control. Control is by PWM signals.

The DC-link voltage is DC 565 V for nonregenerative systems and DC 650 V for regenerative systems.

Safety functions

In the event of an emergency stop, HEIDENHAIN inverter systems make it possible to shut down the motors centrally over special inputs for deleting the pulse release for PWM control of the IGBTs. The controller unit controls the emergency-stop braking until standstill.

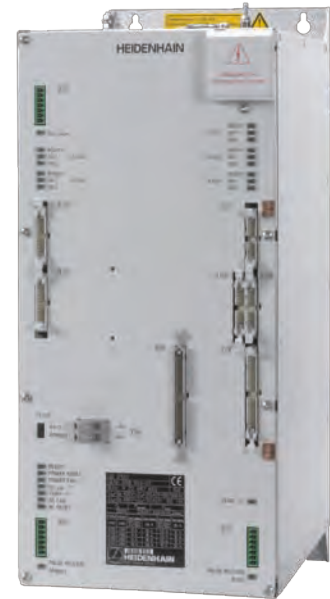
If required, however, drive groups can be formed in order to switch them off separately (e.g. axes for the tool magazine). On controls without functional safety, the axes are then switched off through an **axis-release module**.

Functional safety (FS)

HEIDENHAIN offers control systems with functional safety (FS). Controls with HSCI, the uniformly digital control design from HEIDENHAIN, are the foundation for this.

Control systems with functional safety have two redundant safety channels that operate completely independently of each other. They capture, process and output all safety-relevant signals in two channels. Only those inverters and supply modules that have been certified for functional safety may be used in FS control systems. Please take this into account when configuring your machine and in case servicing is required.

Inverter components for functional safety are identified as such in this brochure.



UE 212D



UR 242D

Compact inverters

In a single enclosure, **UE** and **UR** compact inverters house the rectifiers for generating the DC-link voltage and the IGBT full bridges for up to five drives. Compact inverters with internal braking resistor are available for power ratings up to 15 kW. As an alternative, the internal braking resistor can be replaced by an external resistor to reduce heat generation in the electrical cabinet (not with UE 11x). Higher power ratings require regenerative systems.

For special cases, an additional power module can be connected to a compact inverter (not with UE 11x). Please note that the total power consumption of the connected motors must not exceed the power rating of the compact inverter!

The CC controller unit is connected to the compact inverter over a ribbon cable and uses PWM signals to control the IGBTs.



UVR 140D

Modular inverters

Modular inverter systems consist of the following modules:

- One **UV** or **UVR power supply unit** including the necessary additional components
- Several **UM power modules** for axes and spindle
- **Ribbon cables and covers**

In modular systems, the power supply unit produces the rectified DC-link voltage. The IGBT full bridges are housed in the separate **UM** power modules. The DC-link power bar conducts the DC-link voltage to the power modules.

The CC controller unit is connected to the power modules over a ribbon cable and uses PWM signals to control the IGBTs. The power supply unit is arranged the farthest to the left. The power modules are arranged to the right in order of decreasing power rating.



UM 115D

Motor currents The power modules and compact inverters are available in gradations to make it possible to match them to the required motor currents and torques. In addition, the PWM frequency can be adjusted to the motor current. Please remember that very high spindle speeds require a higher PWM frequency (see *Spindle*).

Additional power supply for CC/MC Compact inverters and power supply units have a DC 5 V output (connector X74) in addition to the supply bus (connector X69). It additionally supplies the CC and thus also the connected encoders with power.

Power supply voltage for connected modules The current consumption for the electronics of the modular inverters depends largely on their power output. If several high-capacity modules are used, in rare cases the maximum permissible current from the power supply unit might be exceeded. Therefore, be sure to check the current consumption for the 15 V DC and 24 V DC supplies individually. The intrinsic needs of the supply unit must also be taken into account. The data specified in the specifications 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:

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

If the total current consumption exceeds the maximum value, an MS 111 must be used with the provision of external +24 V.

The UV power supply units supply the current for the electronics of the modules. The following limit values apply:

- DC 15 V: 3.5 A
- 24 V DC PLC: 4 A

Special case: UVR 170D(W), UV 130D

Like the PSL 13x, the UVR 170D(W) and UV 130D supply the 24 V NC and 24 V PLC voltages to the control system through the connector X90 on the bottom of the unit.

The power supplied of the integrated power supply unit suffices for a standard HSCI configuration of the control system, which means that there is no need for the PSL 13x. Please keep in mind during project planning, that the UVR 170D(W), UV 130D do not supply exactly the same power as the PSL 13x. The power requirement of the connected inverters and controller units must also be taken into account. Please contact HEIDENHAIN for detailed information on project planning.

Ribbon cables and covers The individual control components are connected through ribbon cables for PWM signals, power bus and unit bus. The ribbon cables must be covered to protect against interference. Ribbon cables and covers must be ordered in the required lengths.

The ribbon cables and covers for compact inverters are included in delivery.

Overview

	Model	Rated power output	Rated current ¹⁾		Page
			Axes	Spindle/Axis ²⁾	
Compact inverters					
Regenerative	UR 230D	22 kW	2 x 7.5 A	1 x 35/25 A	8
	UR 240D	22 kW	3 x 7.5 A	1 x 35/25 A	
	UR 242D	22 kW	3 x 7.5 A	2 x 35/25 A	
Nonregenerative	UE 110	10 kW	3 x 6 A	1 x 24/- A	10
	UE 112	10 kW	3 x 6 A + 1 x 9 A	1 x 24/- A	
	UE 210D	15 kW	3 x 7.5 A	1 x 20/15 A	11
	UE 211D	15 kW	2 x 7.5 A + 1 x 15 A	1 x 20/15 A	
	UE 212D	15 kW	3 x 7.5 A + 1 x 15 A	1 x 20/15 A	12
	UE 230D	22 kW	2 x 7.5 A	1 x 31/23 A	
	UE 240D	22 kW	3 x 7.5 A	1 x 31/23 A	13
	UE 241D	22 kW	2 x 7.5 A + 1 x 23 A	1 x 31/23 A	
	UE 242D	22 kW	3 x 7.5 A + 1 x 23 A	1 x 31/23 A	
Nonregenerative, integrated controller unit	UEC 111	14 kW	2 x 6 A + 1 x 9 A	1 x 24/- A	15
	UEC 112	14 kW	3 x 6 A + 1 x 9 A	1 x 24/- A	
	UEC 113	14 kW	4 x 6 A + 1 x 9 A	1 x 24/- A	
	UMC 111	14 kW	4 x 9 A	-	
Modular inverters					
Power module For one axis	UM 111D	-	1 x 7.5 A	-	17
	UM 111BD	-	-	1 x 20/15 A	
	UM 112D	-	-	1 x 34/25 A	
	UM 113D	-	-	1 x 56/40 A	
	UM 114D	-	-	1 x 90/60 A	
	UM 115D	-	-	1 x 125/96 A	
	UM 116D	-	-	1 x 210/150 A	
	UM 116DW	-	-	1 x 210/150 A	
UM 117DW	-	-	1 x 320/225 A		
For two axes	UM 121D	-	2 x 7.5 A	-	19
	UM 121BD	-	1 x 15 A	1 x 20/15 A	
	UM 122D	-	1 x 25 A	1 x 34/25 A	
Power supply unit Regenerative	UVR 120D	22 kW	-	-	20
	UVR 130D	30 kW	-	-	
	UVR 140D	45 kW	-	-	
	UVR 150D	55 kW	-	-	
	UVR 160D	80 kW	-	-	
	UVR 160DW	80 kW	-	-	
	UVR 170D	125 kW	-	-	
	UVR 170DW	125 kW	-	-	
Nonregenerative	UV 130D	30 kW	-	-	21

Italics: As required

¹⁾ At PWM frequency of 5 kHz, except for UE 1xx/UEC 1xx, where PWM frequency: 3.33 kHz

²⁾ Depending on whether the Axis or Spindle mode of operation is selected

Compact inverters

Regenerative

Regenerative compact inverters		2 axes + spindle or 3 axes		3 axes + spindle or 4 axes	
		UR 230D		UR 240D	
		2 axes	Spindle/axis	3 axes	Spindle/axis
Rated current I_N <i>S6-40 %</i> ¹⁾ Max. current I_{max} ²⁾ at PWM frequency	3333 Hz	9.0 A – 18.0 A	42.0 A/30.0 A 60.0 A/- 60.0 A/60.0 A	9.0 A – 18.0 A	42.0 A/30.0 A 60.0 A/- 60.0 A/60.0 A
	4000 Hz	8.3 A – 16.5 A	38.5 A/27.5 A 55.0 A/- 55.0 A/55.0 A	8.3 A – 16.5 A	38.5 A/27.5 A 55.0 A/- 55.0 A/55.0 A
	5000 Hz	7.5 A – 15.0 A	35.0 A/25.0 A 50.0 A/- 50.0 A/50.0 A	7.5 A – 15.0 A	35.0 A/25.0 A 50.0 A/- 50.0 A/50.0 A
	6666 Hz	6.3 A – 12.6 A	29.4 A/21.0 A 42.0 A/- 42.0 A/42.0 A	6.3 A – 12.6 A	29.4 A/21.0 A 42.0 A/- 42.0 A/42.0 A
	8000 Hz	5.5 A – 11.0 A	25.6 A/18.3 A 36.5 A/- 36.5 A/36.5 A	5.5 A – 11.0 A	25.6 A/18.3 A 36.5 A/- 36.5 A/36.5 A
	10000 Hz	4.6 A – 9.2 A	21.4 A/15.3 A 30.5 A/- 30.5 A/30.5 A	4.6 A – 9.2 A	21.4 A/15.3 A 30.5 A/- 30.5 A/30.5 A
Supply voltage	3 x 400 V AC ($\pm 10\%$); 50 Hz to 60 Hz			3 x 400 V AC ($\pm 10\%$); 50 Hz to 60 Hz	
Rated power of DC link	22 kW			22 kW	
Peak power ³⁾ of DC link	30 kW / 40 kW			30 kW / 40 kW	
Power loss ⁴⁾ at I_N	Approx. 680 W			Approx. 750 W	
DC-link voltage	650 V DC			650 V DC	
Module width	250 mm			250 mm	
Weight	Approx. 22.5 kg			Approx. 22.5 kg	
Functional safety	✓			✓	
ID	741356-01			741357-01	

Additional components for regenerative compact inverters (see *Accessories for Inverters*)

Commutating reactor	KDR 120	KDR 120
Line filter	EPCOS 35A	EPCOS 35A
Braking resistor	UP 110	UP 110
DC-link filter ⁵⁾	ZKF 110 or ZKF 120	ZKF 110 or ZKF 120
Surge voltage arrester	VALMS 230/FM	VALMS 230/FM
Voltage protection module ⁶⁾	SM 110	SM 110

¹⁾ Spindle: 40 % cyclic duration factor for duty cycle time of 10 minutes (S6-40 %)

²⁾ 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 duration of 60 s with 70% rated current preload

4 axes + spindle or 5 axes

UR 242D

3 axes	1 axis/spindle	Spindle/axis
9.0 A – 18.0 A	30.0 A/42.0 A 60.0 A/– 60.0 A/60.0 A	42.0 A/30.0 A 60.0 A/– 60.0 A/60.0 A
8.3 A – 16.5 A	27.5 A/38.5 A 55.0 A/– 55.0 A/55.0 A	38.5 A/27.5 A 55.0 A/– 55.0 A/55.0 A
7.5 A – 15.0 A	25.0 A/35.0 A 50.0 A/– 50.0 A/50.0 A	35.0 A/25.0 A 50.0 A/– 50.0 A/50.0 A
6.3 A – 12.6 A	21.0 A/29.5 A 42.0 A/– 42.0 A/42.0 A	29.4 A/21.0 A 42.0 A/– 42.0 A/42.0 A
5.5 A – 11.0 A	18.3 A/25.6 A 36.5 A/– 36.5 A/36.5 A	25.6 A/18.3 A 36.5 A/– 36.5 A/36.5 A
4.6 A – 9.2 A	15.3 A/21.4 A 30.5 A/– 30.5 A/30.5 A	21.4 A/15.3 A 30.5 A/– 30.5 A/30.5 A

3 x 400 V AC (± 10 %); 50 Hz to 60 Hz

22 kW

30 kW / 40 kW

Approx. 930 W

650 V DC

250 mm

Approx. 22.5 kg

✓

741359-01

KDR 120

EPCOS 35A

UP 110

ZKF 110 or ZKF 120

VALMS 230/FM

SM 110

³⁾ 1st value: 40% cyclic duration factor for 10 minutes duty cycle time (S6-40%)
2nd value: 0.2 s cyclic duration factor for 5 seconds duty cycle time

⁴⁾ Power loss during idle running: approx. 10% of the power loss at rated current

⁵⁾ Only for direct drives if an additional UM 1xxD is used
⁶⁾ Only for synchronous or torque motors with field weakening

Compact inverters

Nonregenerative

Nonregenerative compact inverters (continued on next double-page spread)		3 axes + spindle		4 axes + spindle		
		UE 110		UE 112		
		3 axes	Spindle	3 axes	1 axis	Spindle
Rated current I_N $I_{S6-40\%}$ ¹⁾ Max. current I_{max} ²⁾ at PWM frequency	3333 Hz	6.0 A – 12.0 A	24.0 A 36.0 A 36.0 A	6.0 A – 12.0 A	9.0 A – 18.0 A	24.0 A 36.0 A 36.0 A
	4000 Hz	5.5 A – 11.0 A	22.0 A 33.0 A 33.0 A	5.5 A – 11.0 A	8.3 A – 16.5 A	22.0 A 33.0 A 33.0 A
	5000 Hz	5.0 A – 10.0 A	20.0 A 30.0 A 30.0 A	5.0 A – 10.0 A	7.5 A – 15.0 A	20.0 A 30.0 A 30.0 A
	6666 Hz	4.2 A – 8.4 A	16.8 A 25.2 A 25.2 A	4.2 A – 8.4 A	6.3 A – 12.6 A	16.8 A 25.2 A 25.2 A
	8000 Hz	3.65 A – 7.3 A	14.6 A 21.9 A 21.9 A	3.65 A – 7.3 A	5.5 A – 11.0 A	14.6 A 21.9 A 21.9 A
	10000 Hz	3.0 A – 6.0 A	12.2 A 18.3 A 18.3 A	3.0 A – 6.0 A	4.6 A – 9.2 A	12.2 A 18.3 A 18.3 A
	Supply voltage	3 x 400 V AC to 480 V ($\pm 10\%$); 50 Hz to 60 Hz		3 x 400 V AC ($\pm 10\%$); 50 to 60 Hz		
Rated power of DC link	10 kW		10 kW			
Peak power ³⁾ of DC link	15 kW / 20 kW		15 kW / 20 kW			
Power loss ⁴⁾ at I_N	Approx. 450 W		Approx. 450 W			
DC-link voltage	565 V DC		565 V DC			
Integral braking resistance ⁵⁾	1 kW / 27 kW		1 kW / 27 kW			
Module width	175 mm		175 mm			
Weight	Approx. 20 kg		Approx. 20 kg			
Functional safety	–		–			
ID	375713-xx		375715-xx			

Additional components for nonregenerative compact inverters (see *Accessories for Inverters*)

Braking resistor	–	–
Surge voltage arrester	VAL-MS 230/FM	VAL-MS 230/FM
Voltage protection module ⁶⁾	SM 110	SM 110

¹⁾ Spindle: 40 % cyclic duration factor for duty cycle time of 10 minutes (S6-40 %)

²⁾ 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 duration of 60 s with 70% rated current preload

³⁾ 1st value: 40% cyclic duration factor for 10 minutes duty cycle time (S6-40%)

2nd value: 0.2 s cyclic duration factor for 5 seconds duty cycle time

3 axes + spindle						4 axes + spindle or 5 axes		
UE 210D			UE 211D			UE 212D		
3 axes	Spindle/axis		2 axes	1 axis	Spindle/axis	3 axes	1 axis	Spindle/axis
9.0 A – 18.0 A	24.0 A/18.0 A 36.0 A/– 36.0 A/36.0 A		9.0 A – 18.0 A	18.0 A – 36.0 A	24.0 A/18.0 A 36.0 A/– 36.0 A/36.0 A	9.0 A 18.0 A 18.0 A	18.0 A – 36.0 A	24.0 A/18.0 A 36.0 A/– 36.0 A/36.0 A
8.3 A – 16.5 A	22.0 A/16.5 A 33.0 A/– 33.0 A/33.0 A		8.3 A – 16.5 A	16.5 A – 33.0 A	22.0 A/16.5 A 33.0 A/– 33.0 A/33.0 A	8.3 A 16.5 A 16.5 A	16.5 A – 33.0 A	22.0 A/16.5 A 33.0 A/– 33.0 A/33.0 A
7.5 A – 15.0 A	20.0 A/15.0 A 30.0 A/– 30.0 A/30.0 A		7.5 A – 15.0 A	15.0 A – 30.0 A	20.0 A/15.0 A 30.0 A/– 30.0 A/30.0 A	7.5 A 15.0 A 15.0 A	15.0 A – 30.0 A	20.0 A/15.0 A 30.0 A/– 30.0 A/30.0 A
6.3 A – 12.6 A	16.8 A/12.6 A 25.2 A/– 25.2 A/25.2 A		6.3 A – 12.6 A	12.6 A – 25.2 A	16.8 A/12.6 A 25.2 A/– 25.2 A/25.2 A	6.3 A 12.6 A 12.6 A	12.6 A – 25.2 A	16.8 A/12.6 A 25.2 A/– 25.2 A/25.2 A
5.5 A – 11.0 A	14.6 A/11.0 A 22.0 A/– 22.0 A/22.0 A		5.5 A – 11.0 A	11.0 A – 22.0 A	14.6 A/11.0 A 22.0 A/– 22.0 A/22.0 A	5.5 A 11.0 A 11.0 A	11.0 A – 22.0 A	14.6 A/11.0 A 22.0 A/– 22.0 A/22.0 A
4.6 A – 9.2 A	12.2 A/9.1 A 18.2 A/– 18.2 A/18.2 A		4.6 A – 9.2 A	9.1 A – 18.2 A	12.2 A/9.1 A 18.2 A/– 18.2 A/18.2 A	4.6 A 9.2 A 9.2 A	9.1 A – 18.2 A	12.2 A/9.1 A 18.2 A/– 18.2 A/18.2 A
3 x 400 V AC (± 10 %); 50 Hz ⁷⁾			3 x 400 V AC (± 10 %); 50 Hz ⁷⁾			3 x 400 V AC (± 10 %); 50 Hz ⁷⁾		
15 kW			15 kW			15 kW		
23 kW / 40 kW			23 kW / 40 kW			23 kW / 40 kW		
Approx. 475 W			Approx. 525 W			Approx. 595 W		
565 V DC			565 V DC			565 V DC		
1 kW / 27 kW			1 kW / 27 kW			1 kW / 27 kW		
200 mm			200 mm			200 mm		
Approx. 20 kg			Approx. 20 kg			Approx. 20 kg		
✓			✓			✓		
733421-01			733423-01			733424-01		

PW 210	PW 210	PW 210
VAL-MS 230/FM	VAL-MS 230/FM	VAL-MS 230/FM
SM 110	SM 110	SM 110

⁴⁾ Power loss during idle running: approx. 10% of the power loss at rated current

⁵⁾ 1st value: Continuous duty

2nd value: 1.5% cyclic duration factor for duration of 120 s

⁶⁾ Only for synchronous or torque motors with field weakening

⁷⁾ For UL certification: 3AC 480 V (+6%/-10%); 60 Hz

Compact inverters

Nonregenerative

Nonregenerative compact inverters	2 axes + spindle or 3 axes		3 axes + spindle or 4 axes		
	UE 230D		UE 240D		
	2 axes	Spindle/axis	3 axes	Spindle/axis	
Rated current I_N <i>I_{S6-40} %¹⁾</i> Max. current I_{max} ²⁾ at PWM frequency	3333 Hz	9.0 A – 18.0 A	37.2 A/27.6 A 55.2 A/– 55.2 A/55.2 A	9.0 A – 18.0 A	37.2 A/27.6 A 55.2 A/– 55.2 A/55.2 A
	4000 Hz	8.3 A – 16.5 A	34.1 A/25.3 A 50.6 A/– 50.6 A/50.6 A	8.3 A – 16.5 A	34.1 A/25.3 A 50.6 A/– 50.6 A/50.6 A
	5000 Hz	7.5 A – 15.0 A	31.0 A/23.0 A 46.0 A/– 46.0 A/46.0 A	7.5 A – 15.0 A	31.0 A/23.0 A 46.0 A/– 46.0 A/46.0 A
	6666 Hz	6.3 A – 12.6 A	26.0 A/19.3 A 38.6 A/– 38.6 A/38.6 A	6.3 A – 12.6 A	26.0 A/19.3 A 38.6 A/– 38.6 A/38.6 A
	8000 Hz	5.5 A – 11.0 A	22.6 A/16.8 A 33.6 A/– 33.6 A/33.6 A	5.5 A – 11.0 A	22.6 A/16.8 A 33.6 A/– 33.6 A/33.6 A
	10000 Hz	4.6 A – 9.2 A	18.9 A/14.0 A 28.0 A/– 28.0 A/28.0 A	4.6 A – 9.2 A	18.9 A/14.0 A 28.0 A/– 28.0 A/28.0 A
	Supply voltage ³⁾	3 x 400 V AC (± 10 %); 50 Hz		3 x 400 V AC (± 10 %); 50 Hz	
Rated power of DC link	22 kW		22 kW		
Peak power ⁴⁾ of DC link	30 kW / 45 kW		30 kW / 45 kW		
Power loss ⁵⁾ at I_N	Approx. 520 W		Approx. 590 W		
DC-link voltage	565 V DC		565 V DC		
Integral braking resistance ⁶⁾	–		–		
Module width	200 mm		200 mm		
Weight	Approx. 23 kg		Approx. 23 kg		
Functional safety	✓		✓		
ID	733425-xx		733426-xx		

Additional components for nonregenerative compact inverters (see *Accessories for Inverters*)

Braking resistor	PW 210	PW 210
Surge voltage arrester	VAL-MS 230/FM	VAL-MS 230/FM
Voltage protection module ⁷⁾	SM 110	SM 110

¹⁾ Spindle: 40 % cyclic duration factor for duty cycle time of 10 minutes (S6-40 %)

²⁾ 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 duration of 60 s with 70% rated current preload

³⁾ For UL certification: 3AC 480 V (+6%/-10%); 60 Hz

⁴⁾ 1st value: 40% cyclic duration factor for duty cycle time of 10 minutes (S6-40%)

2nd value: 0.2 s cyclic duration factor for duty cycle time of 5 s

3 axes + spindle or 4 axes			4 axes + spindle or 5 axes		
UE 241D			UE 242D		
2 axes	1 axis	Spindle/axis	3 axes	1 axis	Spindle/axis
9.0 A – 18.0 A	28.2 A – 55.2 A	37.2 A/27.6 A 55.2 A/– 55.2 A/55.2 A	9.0 A – 18.0 A	27.6 A – 55.2 A	37.2 A/27.6 A 55.2 A/– 55.2 A/55.2 A
8.3 A – 16.5 A	26.0 A – 50.6 A	34.1 A/25.3 A 50.6 A/– 50.6 A/50.6 A	8.3 A – 16.5 A	25.3 A – 50.6 A	34.1 A/25.3 A 50.6 A/– 50.6 A/50.6 A
7.5 A – 15.0 A	23.0 A – 46.0 A	31.0 A/23.0 A 46.0 A/– 46.0 A/46.0 A	7.5 A – 15.0 A	23.0 A – 46.0 A	31.0 A/23.0 A 46.0 A/– 46.0 A/46.0 A
6.3 A – 12.6 A	19.3 A – 38.6 A	26.0 A/19.3 A 38.6 A/– 38.6 A/38.6 A	6.3 A – 12.6 A	19.3 A – 38.6 A	26.0 A/19.3 A 38.6 A/– 38.6 A/38.6 A
5.5 A – 11.0 A	16.7 A – 33.6 A	22.6 A/16.8 A 33.6 A/– 33.6 A/33.6 A	5.5 A – 11.0 A	16.8 A – 33.6 A	22.6 A/16.8 A 33.6 A/– 33.6 A/33.6 A
4.6 A – 9.2 A	14.1 A – 28.0 A	18.9 A/14.0 A 28.0 A/– 28.0 A/28.0 A	4.6 A – 9.2 A	14.0 A – 28.0 A	18.9 A/14.0 A 28.0 A/– 28.0 A/28.0 A
3 x 400 V AC (± 10 %); 50 Hz			3 x 400 V AC (± 10 %); 50 Hz		
22 kW			22 kW		
30 kW / 45 kW			30 kW / 45 kW		
Approx. 770 W			Approx. 770 W		
565 V DC			565 V DC		
–			–		
200 mm			200 mm		
Approx. 23 kg			Approx. 23 kg		
✓			✓		
733427-xx			733428-xx		

PW 210	PW 210
VAL-MS 230/FM	VAL-MS 230/FM
SM 110	SM 110

⁵⁾ Power loss during idle running: approx. 10% of the power loss at rated current

⁶⁾ Only for direct drives if an additional UM 1xxD is used

⁷⁾ Only for synchronous or torque motors with field weakening

Compact inverters

Nonregenerative, integrated controller unit

UEC 11x	The UEC 11x compact inverters not only include the inverter, but also a controller with PLC inputs and outputs and an integrated braking resistor. They offer a complete solution for machines with a limited number of axes and low power demands.
Controllers	<ul style="list-style-type: none"> • Position controller, speed controller, current controller • HSCI interface • Interfaces to the speed and position encoders
Inverter	<ul style="list-style-type: none"> • Power electronics • Connections for axis motors and spindle motor • Braking resistor • Connections for motor holding brakes
System PL	<ul style="list-style-type: none"> • Interfaces for one workpiece touch probe and one tool touch probe • Integrated PLC (expandable with PL 61xx) <ul style="list-style-type: none"> <i>UEC 11x:</i> 38 free inputs, 23 free outputs (7 of which can be switched off) <i>UEC 11xFS:</i> 38 free inputs, 28 free outputs (7 of which can be switched off), 8 free FS inputs, 8 free FS outputs • Configuration with IOconfig PC software
DC-link connections	The UEC 111 and UEC 112 have not DC-link connection. On the UEC 111FS, UEC 112FS and UEC 113 (FS), an additional DC-link connection is located on the front panel for connection of a PSL 130.



UEC 111



UEC 113

UMC 111	The UMC 111 is a compact inverter with integrated controller unit and PLC inputs/outputs. It is especially suitable for controlling the auxiliary axes: the UMC automatically enables the control loops required for the auxiliary axes. No additional options are required.
Controllers	<ul style="list-style-type: none"> • Position controller, speed controller, current controller • HSCI interface • Interfaces to the speed encoders
Inverter	<ul style="list-style-type: none"> • Power electronics • Connections for axis motors • Connections for motor holding brakes
System PL	<ul style="list-style-type: none"> • Interfaces for one workpiece touch probe and one tool touch probe • Integrated PLC (expandable with PL 61xx) <ul style="list-style-type: none"> <i>UMC 111:</i> 38 free inputs, 23 free outputs (7 of which can be switched off) <i>UMC 111FS:</i> 38 free inputs, 28 free outputs (7 of which can be switched off), 8 free FS inputs, 8 free FS outputs • Configuration with IOconfig PC software
DC-link connections	The UMC is supplied from an external DC link.



UMC 111

	UEC 111/UEC 112/UEC 113			UMC 111	
Controllers	4/5/6 digital control loops			4 digital control loops	
Speed inputs	4/5/6 x 1 V _{PP} or EnDat 2.2			4 x 1 V _{PP} or EnDat 2.2	
Position inputs	4/5/6 x 1 V _{PP} or EnDat 2.2			–	
Inverter	2/3/4 axes	1 axis	Spindle	4 axes	
Rated current I_N/ Max. current I_{max}¹⁾ at PWM frequency	3333 Hz	6.0/12.0 A	9.0/18.0 A	24.0/36.0 A	9.0/18.0 A
	4000 Hz	5.5/11.0 A	8.3/16.5 A	22.0/33.0 A	8.3/16.5 A
	5000 Hz	5.0/10.0 A	7.5/15.0 A	20.0/30.0 A	7.5/15.0 A
	6666 Hz	4.2/8.4 A	6.3/12.6 A	16.8/25.2 A	6.3/12.6 A
	8000 Hz	3.6/7.3 A	5.5/11.0 A	14.6/21.9 A	5.5/11.0 A
	10000 Hz	3.0/6.0 A	4.6/9.2 A	12.2/18.3 A	4.6/9.2 A
Supply voltage	3AC 400 V (± 10 %); 50 Hz ³⁾			–	
Rated power of DC link	14 kW			–	
Peak power ²⁾ of DC link	18 kW / 25 kW			–	
Power loss at I _N	Approx. 450 W			Approx. 400 W	
DC-link voltage	565 V DC			565 V DC	
Current consumption 24-V-PLC	–			24 V DC / 2 A	
Integral braking resistance	2.1 kW / 27 kW			–	
Power pack for HSCl components	24 V DC / 3.5 A			–	
Module width	150 mm			150 mm	
Weight	Approx. 20 kg			Approx. 11 kg	
Functional safety	–	✓		–	✓
ID	UEC 111/UMC 111 UEC 112 UEC 113	625777-xx 625779-xx 828471-xx	1075825-xx 1075826-xx 1038694-xx	736435-xx	664231-xx
Additional components					
Braking resistor	–			PW 210	
Surge voltage arrester	VAL-MS 230/FM			VAL-MS 230/FM	
Voltage-protection module	SM 110			–	

¹⁾ 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

²⁾ 1st value: 40 % cyclic duration factor for duty cycle time of 10 minutes (S6-40 %)

2nd value: 4 s cyclic duration factor for duty cycle time of 20 s

³⁾ For UL certification: 3AC 480 V (+6%/-10%); 60 Hz

Modular inverters

Power modules

Power modules

The power modules in the system are to be arranged so that the "heavy" modules are mounted at left and the "light" modules are to the right of these.

The total power of all connected motors must not exceed the rating of the power supply unit.

The UM 1xxD modules feature electronic ID labels. This permits advanced **diagnostic functions** (see *Diagnostic Functions*).

Water cooling

The **UM 116DW** or **UM 117DW** water-cooled inverter components are recommended for operating powerful axis and spindle motors. Despite their great power, they are compact and only emit a small amount of heat in the electrical cabinet. The water-cooled inverter components are to be connected separately via a distributor to a closed coolant loop. The initial temperature of the coolant/water should be between 20 °C and 40 °C. Successfully tested pressure hoses from HEIDENHAIN are available. Pay attention to further information in the "Inverter Systems and Motors" Technical Manual.

Fan cooling

Since the **UM 116D** runs with such high power, a separate fan unit is necessary as an accessory (see page 23). Please take this additional space requirement in the electrical cabinet into consideration (see *Overall Dimensions*).

Power modules (continued on next double-page spread)		1-axis modules									
		UM 111D		UM 111BD		UM 112D		UM 113D		UM 114D	
		Axis	Axis	Spindle	Axis	Spindle	Axis	Spindle	Axis	Spindle	
Rated current I_N <i>I_{S6-40%}</i> ¹⁾ Max. current I_{max} ²⁾ at PWM frequency	3333 Hz	9.0 A – 18.0 A	17.5 A – 35.0 A	24.5 A <i>35.0 A</i> 35.0 A	29.5 A – 59.0 A	40.0 A <i>59.0 A</i> 59.0 A	47.0 A – 94.0 A	67.0 A <i>88.0 A</i> 94.0 A	70.0 A – 140.0 A	108.0 A <i>125.0 A</i> 140.0 A	
	4000 Hz	8.3 A – 16.5 A	16.5 A – 33.0 A	22.5 A <i>33.0 A</i> 33.0 A	27.5 A – 55.0 A	37.0 A <i>55.0 A</i> 59.0 A	44.0 A – 88.0 A	62.0 A <i>82.0 A</i> 88.0 A	66.0 A – 132.0 A	99.0 A <i>116.0 A</i> 132.0 A	
	5000 Hz	7.5 A – 15.0 A	15.0 A – 30.0 A	20.0 A 30.0 A 30.0 A	25.0 A – 50.0 A	34.0 A 50.0 A 50.0 A	40.0 A – 80.0 A	50.0 A 75.0 A 80.0 A	60.0 A – 120.0 A	90.0 A 105.0 A 120.0 A	
	6666 Hz	6.3 A – 12.6 A	12.5 A – 25.0 A	17.0 A <i>25.0 A</i> 25.0 A	21.0 A – 42.0 A	28.5 A <i>42.0 A</i> 42.0 A	33.5 A – 67.0 A	47.0 A <i>63.0 A</i> 67.0 A	55.0 A – 110.0 A	76.0 A <i>88.0 A</i> 110.0 A	
	8000 Hz	5.5 A – 11.0 A	11.0 A – 22.0 A	14.5 A <i>22.0 A</i> 22.0 A	18.5 A – 37.0 A	25.0 A <i>37.0 A</i> 37.0 A	29.5 A – 59.0 A	41.0 A <i>55.0 A</i> 59.0 A	44.0 A – 88.0 A	66.0 A <i>77.0 A</i> 88.0 A	
	10000 Hz	4.6 A – 9.2 A	9.0 A – 18.0 A	12.0 A <i>18.0 A</i> 18.0 A	15.5 A – 31.0 A	21.0 A <i>31.0 A</i> 31.0 A	24.5 A – 49.0 A	34.0 A <i>46.0 A</i> 49.0 A	37.0 A – 73.0 A	55.0 A <i>64.0 A</i> 73.0 A	
Current consumption ³⁾		120 mA/70 mA	150 mA/225 mA	140 mA/180 mA	170 mA/360 mA	250 mA/500 mA					
Power loss ⁴⁾ at I _N		Approx. 70 W	Approx. 120 W	Approx. 160 W	Approx. 180 W	Approx. 270 W	Approx. 280 W	Approx. 430 W	Approx. 420 W	Approx. 650 W	
Cooling		Air	Air	Air	Air	Air					
Module width		50 mm	50 mm	100 mm	100 mm	100 mm					
Weight (approx.)		5.5 kg	5.5 kg	9.0 kg	9.0 kg	12.0 kg					
Functional safety		✓	✓	✓	✓	✓					
ID		667945-xx	671968-xx	731984-xx	730435-xx	671288-xx					

¹⁾ Spindle: 40% cyclic duration factor for duty cycle time of 10 minutes (S6-40%)

²⁾ 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 duration of 60 s with 70% rated current preload

³⁾ For 15 V DC / 24 V DC (see limit values on page 6)

⁴⁾ Power loss during idle running: approx. 10% of the power loss at rated current

Modular inverters

Power modules

Power modules		1-axis modules							
		UM 115D		UM 116D		UM 116DW		UM 117DW	
		Axis	Spindle	Axis	Spindle	Axis	Spindle	Axis	Spindle
Rated current I_N <i>$I_{S6-40\%}$</i> ¹⁾ Max. current I_{max} ²⁾ at PWM frequency	3333 Hz	115.0 A – 230.0 A	150.0 A <i>180.0 A</i> 230.0 A	175.0 A – 350.0 A	250.0 A <i>275.0 A</i> 350.0 A	175.0 A – 350.0 A	250.0 A <i>275.0 A</i> 350.0 A	250.0 A – 500.0 A	350.0 A <i>400.0 A</i> 500.0 A
	4000 Hz	106.0 A – 211.0 A	138.0 A <i>165.0 A</i> 211.0 A	165.0 A – 330.0 A	231.0 A <i>253.0 A</i> 330.0 A	165.0 A – 330.0 A	231.0 A <i>253.0 A</i> 330.0 A	236.0 A – 472.0 A	336.0 A <i>378.0 A</i> 472.0 A
	5000 Hz	96.0 A – 192.0 A	125.0 A <i>150.0 A</i> 192.0 A	150.0 A – 300.0 A	210.0 A <i>230.0 A</i> 300.0 A	150.0 A – 300.0 A	210.0 A <i>230.0 A</i> 300.0 A	225.0 A – 450.0 A	320.0 A <i>360.0 A</i> 450.0 A
	6666 Hz	80.0 A – 161.0 A	105.0 A <i>126.0 A</i> 161.0 A	126.0 A – 252.0 A	176.0 A <i>193.0 A</i> 252.0 A	126.0 A – 252.0 A	176.0 A <i>193.0 A</i> 252.0 A	189.0 A – 378.0 A	269.0 A <i>302.0 A</i> 378.0 A
	8000 Hz	70.0 A – 141.0 A	92.0 A <i>110.0 A</i> 141.0 A	110.0 A – 221.0 A	154.0 A <i>169.0 A</i> 221.0 A	110.0 A – 221.0 A	154.0 A <i>169.0 A</i> 221.0 A	164.0 A – 328.0 A	234.0 A <i>263.0 A</i> 328.0 A
	10000 Hz	59.0 A – 117.0 A	76.0 A <i>91.0 A</i> 117.0 A	91.0 A – 183.0 A	128.0 A <i>140.0 A</i> 183.0 A	91.0 A – 183.0 A	128.0 A <i>140.0 A</i> 183.0 A	137.0 A – 275.0 A	195.0 A <i>220.0 A</i> 275.0 A
	Current consumption ³⁾	360 mA/460 mA		400 mA/220 mA		400 mA/220 mA		450 mA/250 mA	
Power loss ⁴⁾ at I_N	Approx. 610 W	Approx. 870 W	Approx. 1115 W	Approx. 1560 W	Approx. 1115 W ⁶⁾	Approx. 1560 W ⁶⁾	Approx. 1400 W ⁶⁾	Approx. 2200 W ⁶⁾	
Cooling	Air		Fan unit		Water		Water		
Module width	150 mm		200 mm		200 mm		200 mm		
Weight (approx.)	19.0 kg		24.0 kg		24.0 kg		24.5 kg		
Functional safety	✓		✓		✓		✓		
ID	671566-xx		667954-xx		667946-xx		689572-xx		

Additional components for power supply unit (see *Accessories for Inverters*)

Cooling	–	Fan unit	Hose (set)	Hose (set)
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¹⁾ Spindle: 40% cyclic duration factor for duty cycle time of 10 minutes (S6-40%)

²⁾ Axes: 0.2 s cyclic duration factor for duty cycle time of 10 s with 70% rated current preload; only 0.15 s for UM 117DW
 Spindle: 10 s cyclic duration factor for duration of 60 s with 70% rated current preload

³⁾ For 15 V DC / 24 V DC (see limit values on page 6)

2-axis modules

	UM 121D	UM 121BD⁵⁾		UM 122D⁵⁾	
	Axis	Axis	Spindle	Axis	Spindle
	9.0 A – 18.0 A	17.5 A – 35.0 A	24.5 A <i>35.0 A</i> 35.0 A	29.5 A – 59.0 A	40.0 A <i>59.0 A</i> 59.0 A
	8.3 A – 16.5 A	16.5 A – 33.0 A	22.5 A <i>33.0 A</i> 33.0 A	27.5 A – 55.0 A	37.0 A <i>55.0 A</i> 59.0 A
	7.5 A – 15.0 A	15.0 A – 30.0 A	20.0 A 30.0 A 30.0 A	25.0 A – 50.0 A	34.0 A 50.0 A 50.0 A
	6.3 A – 12.6 A	12.5 A – 25.0 A	17.0 A <i>25.0 A</i> 25.0 A	21.0 A – 42.0 A	28.5 A <i>42.0 A</i> 42.0 A
	5.5 A – 11.0 A	11.0 A – 22.0 A	14.5 A <i>22.0 A</i> 22.0 A	18.5 A – 37.0 A	25.0 A <i>37.0 A</i> 37.0 A
	4.6 A – 9.2 A	9.0 A – 18.0 A	12.0 A <i>18.0 A</i> 18.0 A	15.5 A – 31.0 A	21.0 A <i>31.0 A</i> 31.0 A
	200 mA/140 mA	220 mA/110 mA		240 mA/360 mA	
	Approx. 140 W	<i>2x axis: 240 W</i> <i>1x axis / 1x spindle: 280 W</i>		<i>2x axis: 360 W</i> <i>1x axis / 1x spindle: 450 W</i>	
	Air	Air		Air	
	50 mm	100 mm		100 mm	
	5.5 kg	9 kg		12.0 kg	
	✓	✓		✓	
	667838-xx	667942-xx		667633-xx	

⁴⁾ Power loss during idle running: approx. 10% of the power loss at rated current

⁵⁾ With this 2-axis module, only the lower power stage can be used for controlling the spindle

⁶⁾ Is dissipated via water cooling, remaining heat in electrical cabinet: approx. 50 W

Modular inverters

Power supply unit

Power supply unit	Regenerative			
	UVR 120D	UVR 130D	UVR 140D	UVR 150D
Power supply	3 x 400 V AC ($\pm 10\%$); 50 Hz to 60 Hz			
Rated power output (DC link)	22 kW	30 kW	45 kW	55 kW
Peak power S6-40% (DC link)	30 kW	45 kW	65 kW	80 kW
	40 kW ²⁾	60 kW ¹⁾	80 kW ²⁾	110 kW ¹⁾
Power loss (approx.)	300 W	370 W	570 W	640 W
DC-link voltage	DC 650 V	DC 650 V	DC 650 V	DC 650 V
Current consumption 15 V/24 V	170 mA/310 mA	200 mA/400 mA	250 mA/310 mA	300 mA/540 mA
Cooling	Air	Air	Air	Air
Module width	150 mm	150 mm	200 mm	200 mm
Weight	Approx. 12 kg	Approx. 12.5 kg	Approx. 20.0 kg	Approx. 20.0 kg
Functional safety	✓	✓	✓	✓
ID	728252-xx	728248-xx	728253-xx	728255-xx

Additional components for power supply unit (see *Accessories for Inverters*)

Commutating reactor	KDR 120	KDR 130C	KDR 140	KDR 150
Line filter	EPCOS 35A	EPCOS 80A	EPCOS 80A	EPCOS 80A
Braking resistor	UP 110	UP 110	UP 110	UP 110
DC-link filter ³⁾	ZKF 110 or ZKF 120 or ZKF 130	ZKF 110 or ZKF 120 or ZKF 130	ZKF 110 or ZKF 120 or ZKF 130	ZKF 110 or ZKF 120 or ZKF 130
Surge voltage arrester	VAL-MS 230/FM	VAL-MS 230/FM	VAL-MS 230/FM	VAL-MS 230/FM
Voltage protection module ⁴⁾	SM 1xx	SM 1xx	SM 1xx	SM 1xx
Cooling	–	–	–	–

¹⁾ 0.2 s cyclic duration factor for duration of 5 s

²⁾ 4 s cyclic duration factor for duration of 20 s

³⁾ Only for direct drives

⁴⁾ Only for synchronous or torque motors with field weakening

⁵⁾ Is dissipated through water cooling or fan unit. Remaining heat in electrical cabinet: approx. 100 W

⁶⁾ For UL requirements 62 kW

	Regenerative				Nonregenerative
	UVR 160D	UVR 160DW	UVR 170D	UVR 170DW	UV 130D
	3 x 400 V AC (± 10 %); 50 Hz to 60 Hz				3 x 400 V AC (± 10 %); 50 Hz to 60 Hz
	80 kW ⁶⁾	80 kW ⁶⁾	125 kW	125 kW	30 kW
	110 kW	110 kW	180 kW	180 kW	45 kW
	160 kW ¹⁾	160 kW ¹⁾	250 kW ¹⁾	250 kW ¹⁾	60 kW ¹⁾
	930 W	930 W ⁵⁾	1 400 W ⁵⁾	1 400 W ⁵⁾	200 W
	DC 650 V	DC 650 V	DC 650 V	DC 650 V	565 V DC
	350 mA/1.1 A	350 mA/300 mA	450 mA/200 mA	450 mA/200 mA	100 mA/200 mA
	Air	Water	Fan unit	Water	Air
	250 mm	200 mm	370 mm	250 mm	150 mm
	Approx. 25.0 kg	Approx. 20.0 kg	Approx. 35.0 kg	Approx. 26.5 kg	Approx. 9.8 kg
	✓	✓	✓	✓	✓
	728257-xx	728258-xx	807429-xx	546911-xx	824215-xx

	KDR 160	KDR 160	KDR 170	KDR 170	–
	EPCOS 120A	EPCOS 120A	EPCOS 200A	EPCOS 200A	–
	UP 110	UP 110	UP 120	UP 120	PW 210
	ZKF 110 or ZKF 120 or ZKF 130 or ZKF 140	ZKF 110 or ZKF 120 or ZKF 130 or ZKF 140	ZKF 140	ZKF 140	–
	VALMS 230/FM	VALMS 230/FM	FLT-CP-3C-350	FLT-CP-3C-350	VALMS 230/FM
	SM 1xx	SM 1xx	SM 1xx	SM 1xx	SM 1xx
	–	Hose (set)	Fan unit	Hose (set)	–

Accessories for inverter systems

Commutating reactors

Regenerative inverter systems require a **KDR** commutating reactor. It suppresses system perturbation and serves as energy buffer for the boost converter. It is connected between the line filter and the power supply unit (see *Cable overview*).

The size of the commutating reactor depends on the power supply unit used.



	Use	Rated voltage	Rated current	Power loss	Rated frequency	Degree of protection	Weight	ID
KDR 120	UR 2xxD UVR 120D	3 x 400 V AC	3 x 35 A	Approx. 200 W	50/60 Hz	IP 00	Approx. 11 kg	344505-01
KDR 130C	UVR 130D	3 x 400 V AC	3 x 45 A	Approx. 250 W	50/60 Hz	IP 00	Approx. 15 kg	646271-01
KDR 140	UVR 140D	3 x 400 V AC	3 x 70 A	Approx. 340 W	50/60 Hz	IP 00	Approx. 22 kg	333068-01
KDR 150	UVR 150D	3 x 400 V AC	3 x 80 A	Approx. 350 W	50/60 Hz	IP 00	Approx. 23 kg	355253-01
KDR 160	UVR 160D UVR 160DW	3 x 400 V AC	3 x 117 A	Approx. 525 W	50/60 Hz	IP 00	Approx. 57 kg	573265-01
KDR 170	UVR 170D UVR 170DW	3 x 400 V AC	3 x 180 A	Approx. 875 W	50/60 Hz	IP 00	Approx 106 kg	735563-01

Line filters

If you are using a regenerative inverter system, you must use an **EPCOS** line filter in addition to the commutating reactor. Line filters suppress interference and ensure EMC compatible energy recovery. A 3 x 32 μ F three-phase current capacitor is integrated. The line filter is connected between line power and the commutating reactor (see *Cable overview*).

The size of the line filter depends on the power supply unit used.



	Use	Rated voltage	Rated current	Power loss	Rated frequency	Degree of protection	Weight	ID
EPCOS 35A	UR 2xxD UVR 120D	3 x 400 V AC	3 x 35 A	Approx. 50 W	50/60 Hz	IP 00	Approx. 5 kg	676759-01
EPCOS 80A	UVR 130D UVR 140D UVR 150D	3 x 400 V AC	3 x 80 A	Approx. 75 W	50/60 Hz	IP 00	Approx. 11 kg	640908-01
EPCOS 120A	UVR 160D UVR 160DW	3 x 400 V AC	3 x 120 A	Approx. 115 W	50/60 Hz	IP 20	Approx. 13.5 kg	575292-01
EPCOS 200A	UVR 170DW	3 x 400 V AC	3 x 200 A	Approx. 170 W	50/60 Hz	IP 20	Approx. 20.0 kg	735542-01

Braking resistor

During braking, motors feed energy back into the DC link. The **PW 210** braking resistor converts this energy to heat. The braking resistor must be mounted outside the electrical cabinet to allow the heat to dissipate. The PW 210 has no fan: heat is released through radiation.

When the nonregenerative inverter systems UE 240D, UE 241 D, UE 242 D and **UV 130D** are installed, the PW 210 braking resistor is required.

The PW 210 can also be used as an alternative to the integrated braking resistor in the UE 21xD.

Up to two PW 210 in parallel can be connected to the UE 230D and UE 24xD compact inverters. No more than one PW 210 can be connected to the UE 21xD and UEC 11x.



PW 210

	Spindle power	Recommended braking resistor	Continuous rating	Peak power* (approx.)	Resistance	Degree of protection	Weight	ID
PW 210	Up to 15 kW	1 x PW 210	2 kW	Approx. 27 kW	18 ohms	IP 20	Approx. 5.5 kg	333081-01
	Over 15 kW	2 x PW 210 in parallel	4 kW	Approx. 54 kW	9 ohms	IP 20	Approx. 11 kg	

* 1.5 % cyclic duration factor for 120 s duty cycle time

Braking resistor module

Regenerative inverters feed the braking energy back into the line power system. When network power fails, the energy cannot be returned. This increases the DC-link voltage and results in a switch-off of the inverters. This shutdown leads to an undesired coasting of the motors. To prevent this, HEIDENHAIN recommends the use of the **UP 1x0** braking resistor module for regenerative inverters.

UP 110



	Switching voltage	Module width	Peak power (for 2 s)	Degree of protection	Weight	ID
UP 110	DC 740 V	50 mm	Approx. 60 kW	IP 20	Approx. 7 kg	341516-01
UP 120	DC 740 V	50 mm	Approx. 150 kW	IP 20	Approx. 9 kg	605731-01

Accessories for inverter systems

DC-link filter

When direct drives (linear motors, torque motors, and in rare cases also synchronous motors) are operated with regenerative inverters, it causes voltage peaks that can destroy them. Therefore, during operation with **UVR 1xxD** and **UR 2xx** regenerative inverters, the **ZKF 1xx** DC-link filter must be used. The DC-link filter is mounted at left next to the power modules of the direct drives and the DC-link current is conducted through it. If the commutating reactor causes oscillations in the DC-link voltage, you can use a DC-link filter to prevent these oscillations. The ZKF is to be installed between the supply unit and the power module. The total power of the drives must not exceed the power rating of the filter.



ZKF 110

Please note:

The ZKF 110 differs from the ZKF 120 only in its maximum leakage current. The use of the **ZKF 110** must be inspected by a HEIDENHAIN service technician on-site to ensure that the leakage current is less than 1.3 A. With the **ZKF 120**, **ZKF 130** or **ZKF 140**, this measurement is not necessary because a leakage current of 6 A is sufficient in any case.

	Power loss	Module width	Leakage current	Power				Degree of protection	Weight	ID
				P _N	P _{S6-40%}	P _{S6-20%}	P _{max}			
ZKF 110	50 W	100 mm	< 1.3 A	30 kW	47 kW	67 kW	110 kW	IP 20	Approx. 10 kg	385764-01
ZKF 120	100 W	100 mm	< 6 A	30 kW 25 kW ¹⁾	47 kW 40 kW ¹⁾	67 kW 55 kW ¹⁾	110 kW	IP 20	Approx. 12 kg	391232-01
ZKF 130	200 W	100 mm	< 6 A	55 kW	80 kW	100 kW	110 kW	IP 20	Approx. 13 kg	531388-01
ZKF 140	200 W	100 mm	< 6 A	80 kW	110 kW	140 kW	160 kW	IP 20	Approx. 15 kg	597954-01

¹⁾ For UL approval

Accessories for coolant connection

The water-cooled inverter components UVR 1x0DW and UM 11xDW must be connected to an external coolant circuit. The connecting elements can be purchased as an accessory set.

Hose (set)

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

ID 584862-01

Two sets are necessary for each inverter component.



Fan unit

Fan for UM 116D, UVR 170D
Power supply: 230V AC, 50/60 Hz, 0.77 A, 175 W
Weight: 3.6 kg

ID 749973-01



Surge protector

Voltage surges on the supply network can damage power supply units and inverters. An overvoltage protector should therefore be installed in the supply path (preferably after the line filter) to limit any voltage peaks to max. 1350 V.

Surge protectors from the Phoenix Company are well suited to this task. One VAL-MS 230/FM module is required per phase, while the FLT-CP-3C-350 module protects all three phases. They are mounted on a top hat rail.

	Suited for	Nominal discharge surge current	IEC test class	EN type	Width	ID
VAL-MS 230/FM	All except UVR 170D(W)	20 kA	II	T2	17.7 mm	827105-01 (contains 3 units)
FLT-CP-3C-350	UVR 170D(W)	75 kA	I and II	T1 + T2	106.9 mm	826918-01

Voltage protection module

If synchronous motors (e.g. synchronous spindles, torque motors) are operated with field weakening, an **SM 1xx** voltage protection module is required. In the event of a power failure, this module prevents a voltage increase at the power connections of the motors that could destroy the inverters and motors. The voltage protection module is connected between the motor and inverter. It shorts the motor phases in case of a fault.

Operation in the field weakening range must be enabled by machine parameters in the control (see *Technical Manual for the iTNC 530*).

The maximum phase current I_{max} of the SM must be greater than the short-circuit current I_K of the motor. $I_K = U_0 / (\sqrt{3} \times X_H)$

The SM 130 features an integrated temperature switch, which (if correctly wired) prevents the drive from being switched on at temperatures above 60 °C.



SM 110

	Switching voltage	Max. phase current I_{max}	Max. braking time at I_{max}	Min. waiting time	Degree of protection	Weight	ID
SM 110	830 V	3AC 63 A	10 s	5 min.	IP 20	Approx. 2 kg	368453-01
SM 130	830 V	3AC 300 A	10 s	10 min. ¹⁾	IP 20	Approx. 6.5 kg	540739-02

¹⁾ Integrated temperature switch

Accessories for inverter systems

Capacitor modules

In case of a power failure, the danger exists that the tool and workpiece can be damaged by uncontrolled motions of the axes. The LIFTOFF function of the iTNC 530 is able to protect expensive workpieces and tools from being damaged. In case of a power failure, and if the LIFTOFF function is active, the iTNC 530 attempts to retract the tool in a defined manner using the energy remaining in the DC-link.

The capacitor modules provide support for the energy necessary for the LIFTOFF function. They can also be connected in parallel for increased energy demands.

The **CML 110** capacitor module serves to maintain the 24 V control voltage in case of a power failure. In this case the releases of the control system are maintained even after a power failure. The CML is installed in the electrical cabinet via a top hat rail.

If a PSL 130 is used as 24 V voltage supply, the CML 110 can be omitted. The PSL 130 maintains the 24 V control voltage through the supply via the DC link.

CML 110



	Supply voltage	Capacitance	Charging current	ID
CML 110	24 V DC	8.3 F	≤ 2.4 A	574087-02

For direct drives, the **CMH 120** capacitor module is also necessary to maintain the DC-link voltage in case of a power failure. The CMH 120 is mounted directly before the corresponding inverter module.

	DC-link voltage	Capacitance	Module width	ID
CMH 120	≤ 850 V DC	10.0 mF	50 mm	591116-01

CMH 120



Axis-enabling module

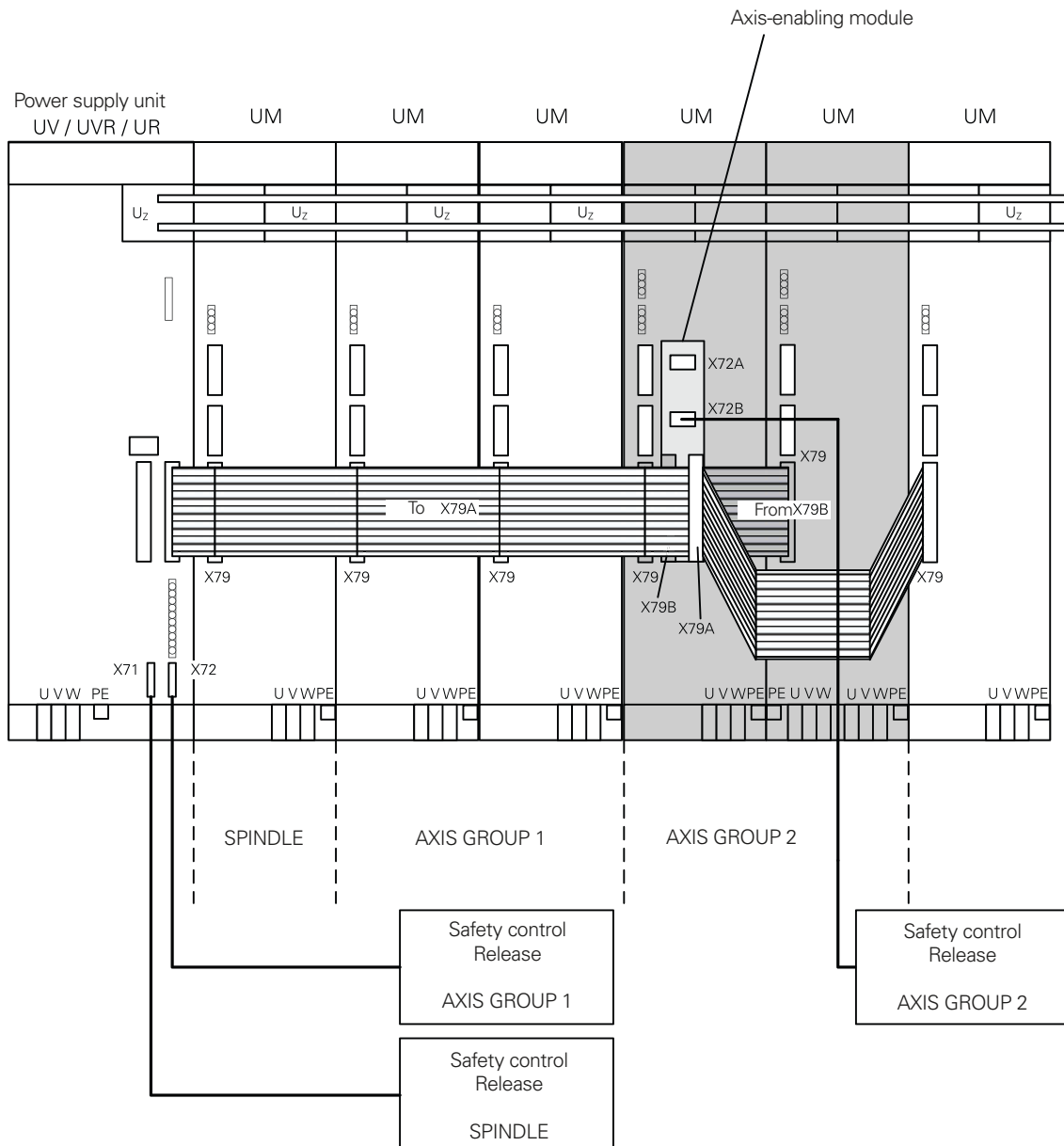
The axis-enabling module makes it possible to switch off power modules group by group. It is not needed for controls with functional safety.

The axis-release module is screwed onto the front panel of the first power module to be controlled. The axis-release signal is transmitted via a line in the unit bus from power module to power module. The axis-enabling module can specifically interrupt this line so that all 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).

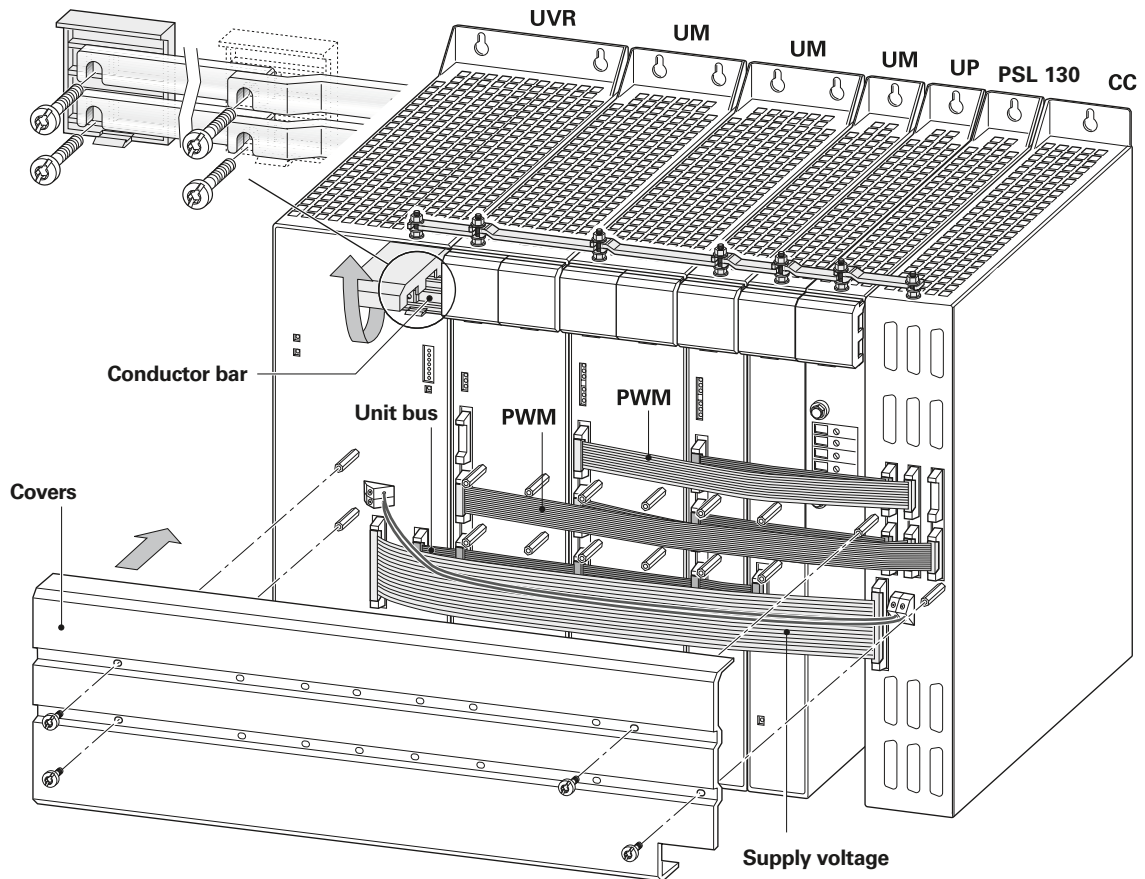
If an axis-release module is used, two unit bus cables of the appropriate lengths are necessary.

The width of the covers for the ribbon cables for the modular inverter system is reduced by the width of the axis-release module (50 mm). A suitable cover is included with the axis-release module.

ID 573732-02



Ribbon cables and covers



Cover for the ribbon cables

The ribbon cables must be covered to protect them against interference. The UV(R) power supply unit is shipped with a cover (329031-03) to protect the following modules.

- UV(R) 1x0 and
- UM 115D or
- One UM 1xxD with 100 mm width and one UM 1xxD with 50 mm width

The cover for the CC is shipped with the CC. If you use further power modules and the UP 110 resistor module, you need to order suitable covers separately.

Width	ID (1 unit)	ID (5 units in collective package)
50 mm	329031-05	538427-05
100 mm	329031-10	538427-10
150 mm	329031-15	538427-15
200 mm	329031-20	538427-20

Selecting the covers

- Add the widths of all modules between the UV(R) 1x0D and CC (including UP 110)
- Subtract 150 mm from this total width (cover included with the UV(R) 1x0).
- Select the appropriate covers from the table to protect the remaining width.
- If the axis-release module is used, the width is reduced by 50 mm

50-pin ribbon cable for supply voltage 50-pin

Connection between the CC and UV(R) 1xx power supply unit (required only once).

Length	ID
300 mm	325816-01
400 mm	325816-02
500 mm	325816-03
600 mm ¹⁾	325816-04
700 mm ¹⁾	325816-05
800 mm ¹⁾	325816-06

¹⁾ For transmission lengths greater than 600 mm, a ribbon cable is led twice to the controller unit to increase the cross section.

The use of a 5 V litz wire (2 x 4 mm²), in addition to the ribbon cable, is required for reliable power supply. The litz wire must be provided by the customer.

Selecting a cable length

UVR: Add 70 mm to the width of all modules between the UVR 1xxD and CC and select the next larger cable length.

UV 130D: Add 130 mm to the width of all modules between the UV 130D and CC and select the next larger cable length.

Module	Width
UM 111 D, UM 121 D UM 111 BD, PSL 13x	50 mm
UM 112 D, UM 122 D UM 111 BD, UM 121 BD UM 113 D, UM 114 D	100 mm
UM 115 D	150 mm
UM 116 D, UM 116 DW, UM 117 DW	200 mm
UP 110, UP 120	50 mm
UV 105	50 mm

40-pin ribbon cable for unit bus

Connection between the UV 1x0 power supply unit and the UM 1xx power modules and, if needed, the UP 110 braking resistor module (required only once).

Length	ID
300 mm	325817-01
400 mm	325817-02
500 mm	325817-03
600 mm	325817-04
700 mm	325817-05

Selecting a cable length

UVR: Add the width of all modules between the UVR 1xxD and the controller unit (including the UP 110) and choose the next larger cable length from the above table.

UV 130D: Add 80 mm to the width of all modules between the UV 130D and CC and select the next larger cable length.

Axis-release module: Two unit bus cables are required. The lengths depend on the position of the axis-release module.

20-pin ribbon cable for PWM signals

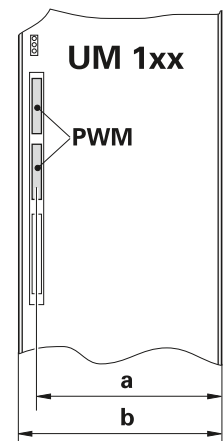
Connection between the controller unit and a UM 1xxD power module (one cable per drive).

Length	ID
100 mm	250479-07
200 mm	250479-08
300 mm	250479-09
400 mm	250479-10
500 mm	250479-11
600 mm	250479-12
700 mm	250479-13

Selecting a cable length

- See the table for distance a of the PWM input on the power module.
- Add the widths b of all modules between the respective power module and the controller unit (including UP 110 and ZFK).
- Add the distance c_n of the PWM output on the controller unit to your result (see table).
- Select the next-larger cable length from the above table.

Power module	Distance a	Module width b
MS 110, MS 111 mounting cases UM 111 BD, UM 111 D, UM 121 D	Approx. 40 mm	50 mm
UM 121 BD	Approx. 85 mm	100 mm
UM 112D, UM 113D, UM 114D, UM 122 D	Approx. 90 mm	100 mm
UM 115D	Approx. 140 mm	150 mm
UM 116D(W), UM 117 DW	Approx. 190 mm	200 mm

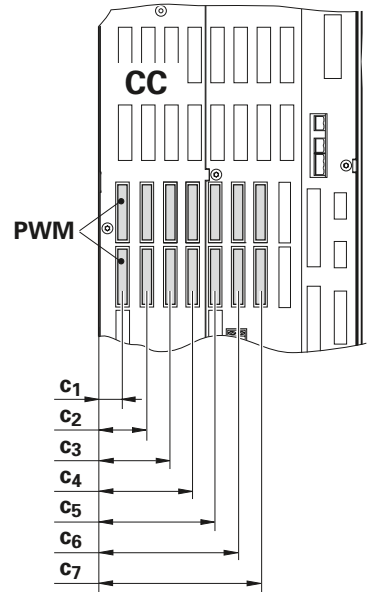


Distance c_n

	CC 422					
	Distance in mm					
	c₁	c₂	c₃	c₄	c₅	c₆
Max. 6 control loops	25	37	50	–	–	–
Max. 10 control loops	25	37	50	64	73	–
Max. 12 control loops	25	37	50	64	73	85

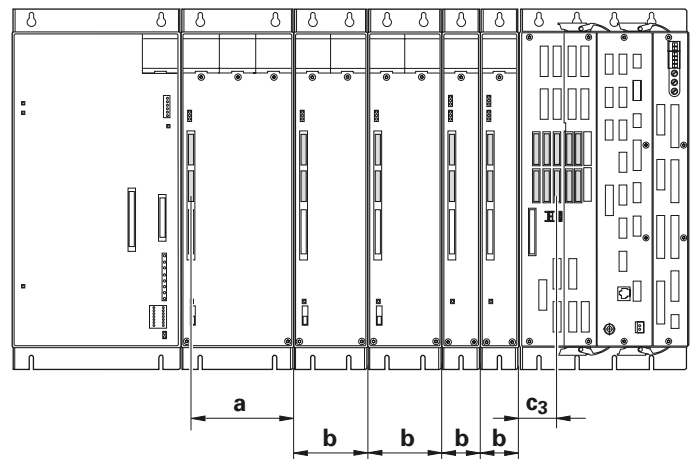
	CC 424B						
	Distance in mm						
	c₁	c₂	c₃	c₄	c₅	c₆	c₇
Max. 6 control loops	23	39	56	–	–	–	–
Max. 8 control loops	23	39	56	73	–	–	–
Max. 10 control loops	23	39	56	73	90	–	–
Max. 12 control loops	23	39	56	–	90	108	125
Max. 14 control loops	23	39	56	73	90	108	125

	CC 61xx				
	Distance in mm				
	c₁	c₂	c₃	c₄	c₅
CC 6106	23	39	56	–	–
CC 6108	23	39	56	73	–
CC 6110	23	39	56	73	92



Example

Calculating the distance l between the connectors on the UM 115D and the controller unit:
 $l = a + b_1 + b_2 + b_3 + b_4 + c_3$
 $= (140 + 100 + 100 + 50 + 50 + 56) \text{ mm}$
 $= 496 \text{ mm}$
 A 500 mm cable (the next larger length) is used to connect the PWM.



Mounting frames

When using a modular inverter system, the number of ribbon cables required for controlling the power modules increases with the number of drive motors used on the machine. In some cases it might no longer be possible to place the ribbon cables under the usual covers that offer a space of 20 mm. The mounting frames can then be used to increase the space available for the cables to 33 mm. The mounting frames are screwed onto the modular inverter components and the controller unit. Then the usual covers are mounted onto the mounting frames.

Mounting frame for:

UV(R)	UM	UM, ZKF
Width 150 to 300 mm (combinable from three parts)	Width 50 mm	Width 100 mm
ID 733543-01 ID 827085-01 ¹⁾	ID 733543-05 ID 827085-05 ¹⁾	ID 733543-10 ID 827085-10 ¹⁾

¹⁾ 50 units in collective package

Mounting frame for:

Adapter module	MS 11x UP 1x0 PSL 135 CMH 1x0	CC 6106	CC 6108 CC 6110
Width 50 mm	Width 50 mm	Width 75 mm	Width 100 mm
ID 733543-12	ID 733543-11	ID 743041-01 ID 827085-02 ¹⁾	ID 743041-02 ID 827085-03 ¹⁾

¹⁾ 50 units in collective package

Multi-row configuration

Sometimes limited space prevents the control and inverter system(s) from being mounted in the same row in the electrical cabinet, meaning that they must be mounted in separate rows.

Mounting cases for multi-row configuration

HEIDENHAIN offers special MS 1xx mounting cases that can be used to establish an electrical connection (immune to noise) between the components of the inverter system. These mounting cases are installed immediately to the right of the UV (R) power supply unit or at the start of the second row.

MS 110

The ribbon cables (device bus, PWM lines, supply bus) in the MS 110 mounting cases are connected with shielded round cables of the appropriate lengths and at the other end, these are connected again with ribbon cables.

MS 111

The MS 111 mounting case also offers the possibility of feeding 24 V DC from an external power pack. In addition, the MS 111 features two connectors for the device bus, which permits use in single-row and double-row configurations. This is necessary in rare cases, when the 24 V DC power from the UVR 1xxD power supply unit is not sufficient to supply the module fans with power. For the current consumption of the fans, refer to the specifications of the power supply units and inverter systems. Based on these values you can calculate whether feeding in the additional 24 V DC is necessary. The sum of the currents must not exceed the maximum current provided by the UV(R).

Setup without additional 24 V DC feeding

In most cases it is not necessary to supply the 24 V DC. For multi-row setup, **two MS 110 units** are used.

Setup with additional 24 V DC feeding

If feeding of the additional 24 V DC is necessary, one **MS 110** and one **MS 111** are required. The MS 110 is placed next to the UV (R) supply unit and the MS 111 in the other row.

Please note:

When using the MS 111, external 24 V DC power supply is mandatory in order to supply the fans with power. Otherwise, the inverters will overheat and shut down with the message "TEMP>>"!



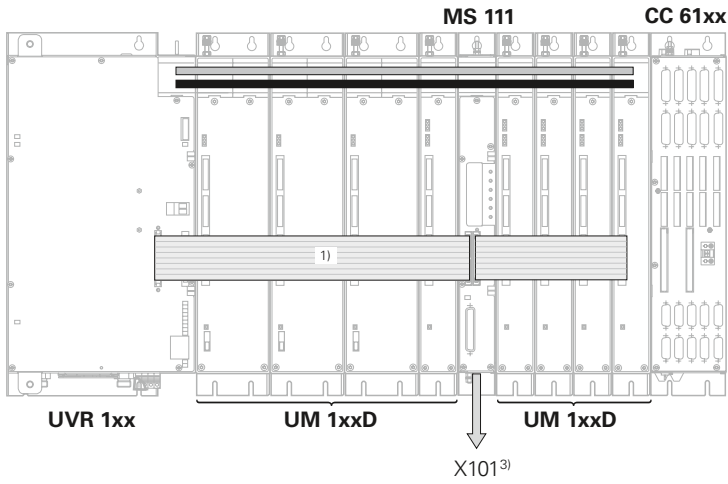
Components/cables for multi-row configuration

MS 110 mounting case	658132-01
MS 111 mounting case	673685-02
Device bus cable (shielded, round) with 37-pin D-sub connector at both ends; max. length: 3 m	664023-xx
PWM cable (round) with ribbon connector at both ends; max. length: 5 m	664332-xx
Supply bus cable (round) with ribbon connector at both ends, max. length: 5 m (required only if UV(R) 1xxD is not in the same row as CC/MC)	361508-xx
Litz wire for DC link (16 mm ² , shielded), max. length: 3 m Color: Red Color: Blue	655440-xx 655438-xx

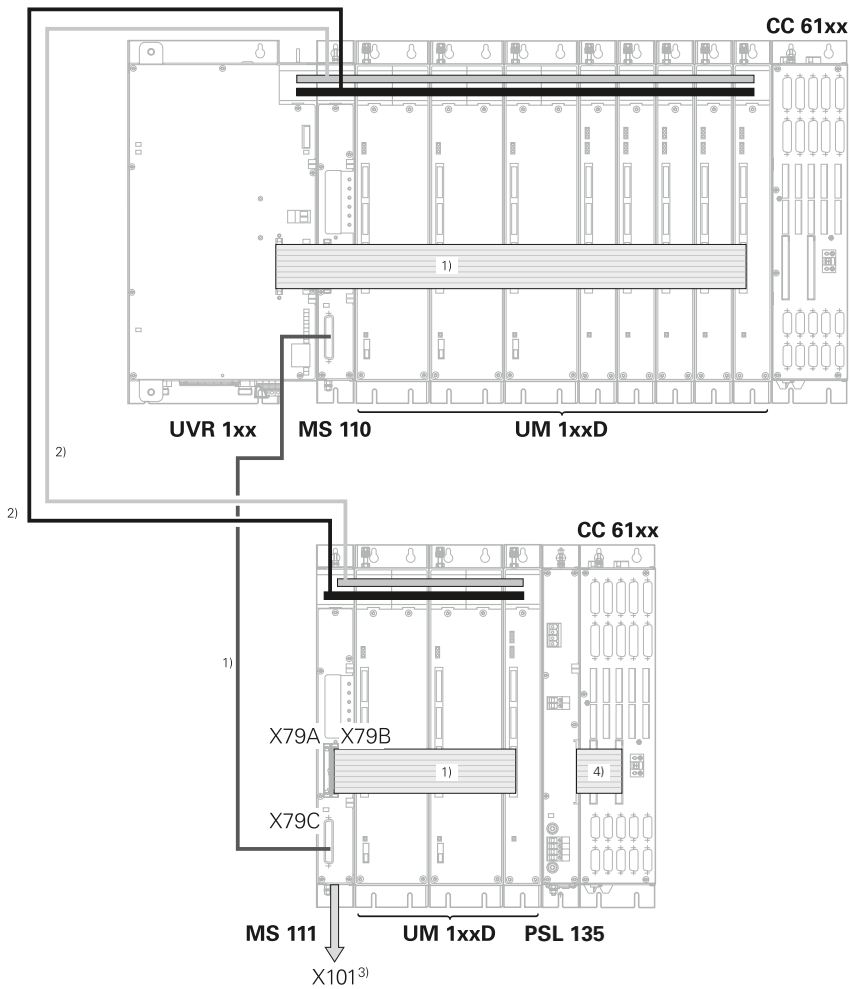
Basic circuit diagrams

Single-row arrangement—fan power supply is additional via MS 111

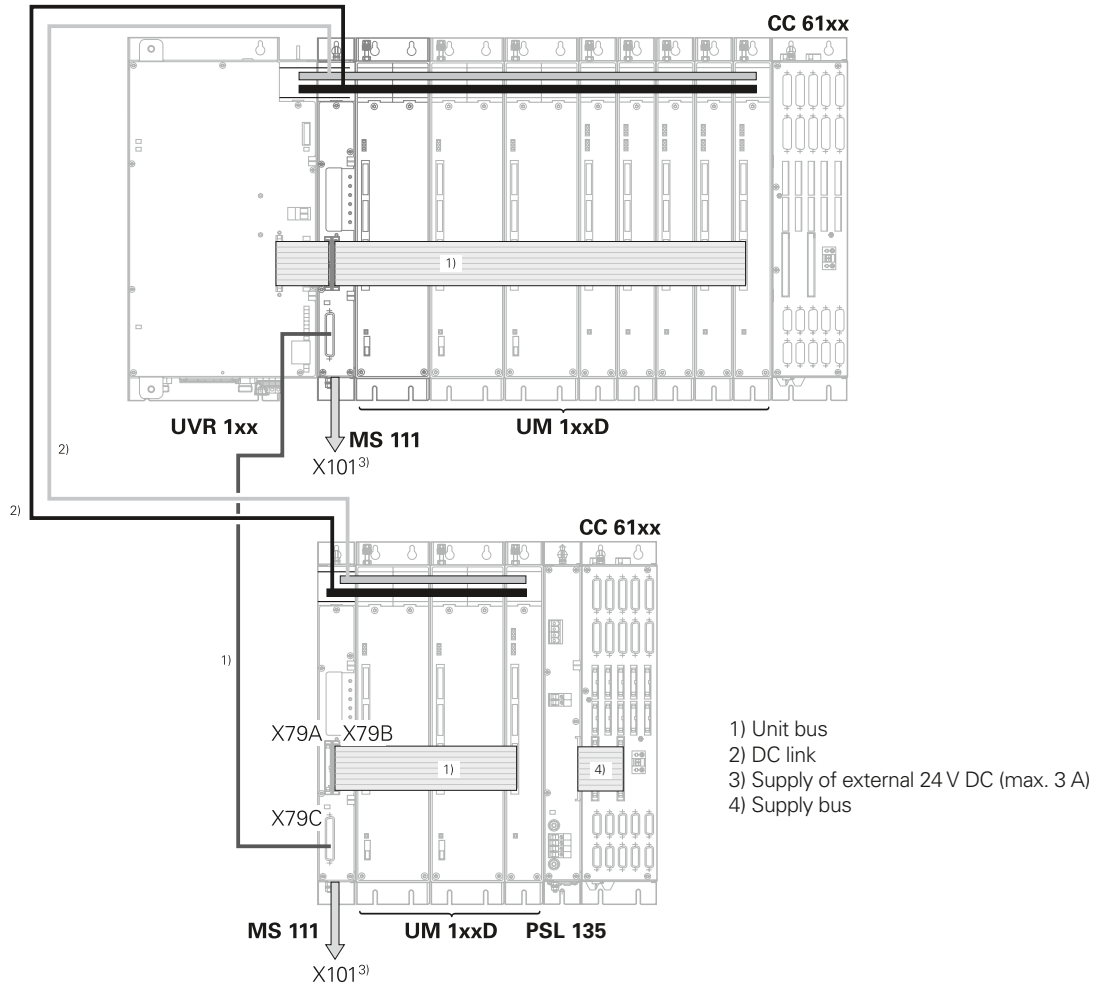
The MS 110 is mounted in the lower row, right next to the supply module; the MS 110 or—if required—the MS 111 for 24 V DC feeding is mounted in the upper row.



Double-row arrangement—fan power supply of the 2nd row via MS 111



Double-row arrangement—fan power supply of the 1st row via MS 111



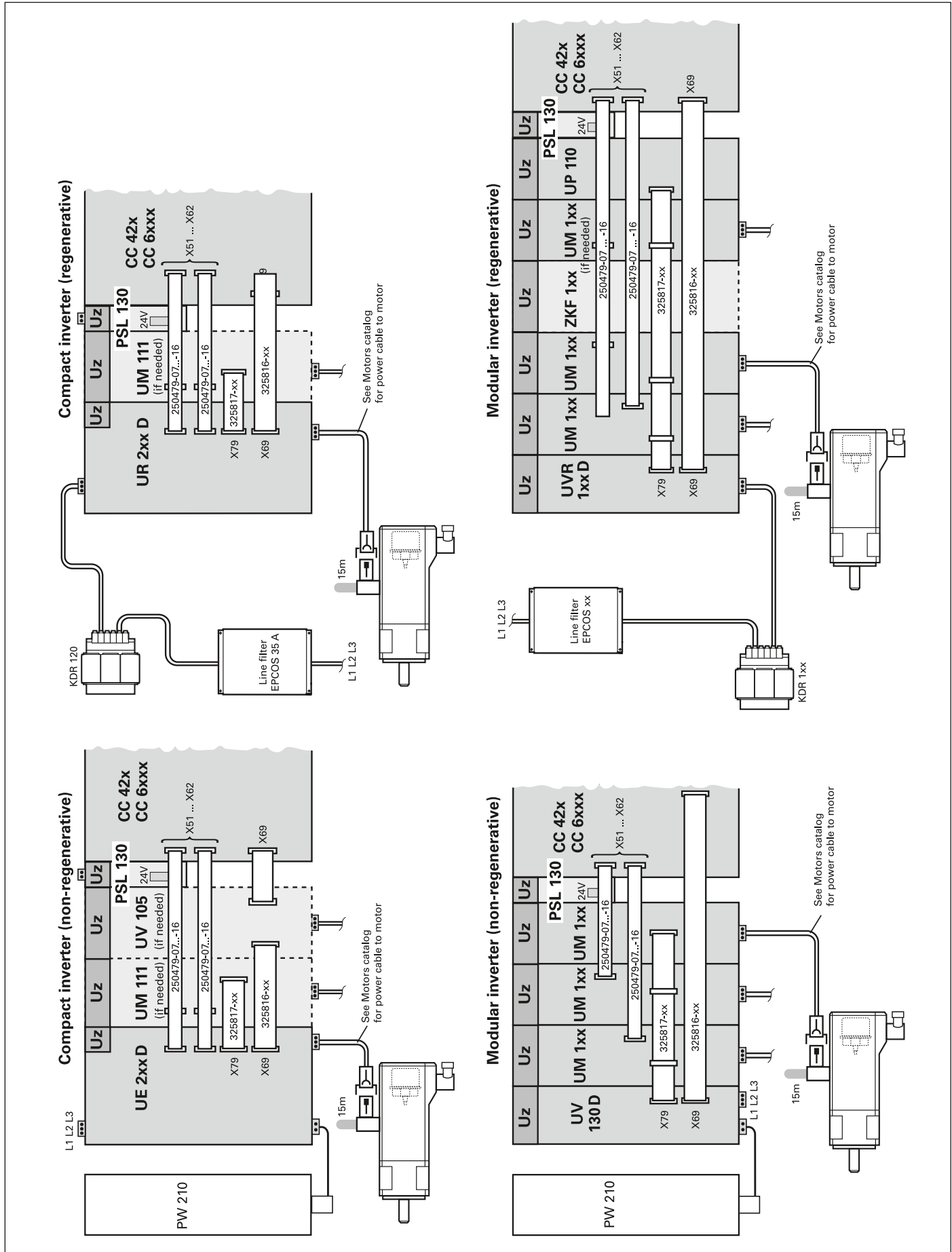
Notes

Please note the following regarding the setup of multi-row systems:

- The wires used for the DC-link connection of the power modules in the "second row" must not be longer than 3 m.
- Litz wires with 16 mm² cross section make a DC-link current of approx. 67 A possible. In a regenerative system, this results in approx. 35 kW of continuous power for the system connected by these wires. In a nonregenerative system the resulting maximum power is approx. 25 kW.
- Use fast-acting semiconductor fuses for protection of the UV(R) 1xxD on the primary side (see *Technical Manual for Inverter Systems and Motors*).
- The length of the unit bus ribbon cable must not exceed 1 m! If necessary, place the MS 110 or MS 111 in the "second row" in the center of the UMs.
- When calculating the length of the ribbon cables, make sure to include the module width of the MS 110 or MS 111.

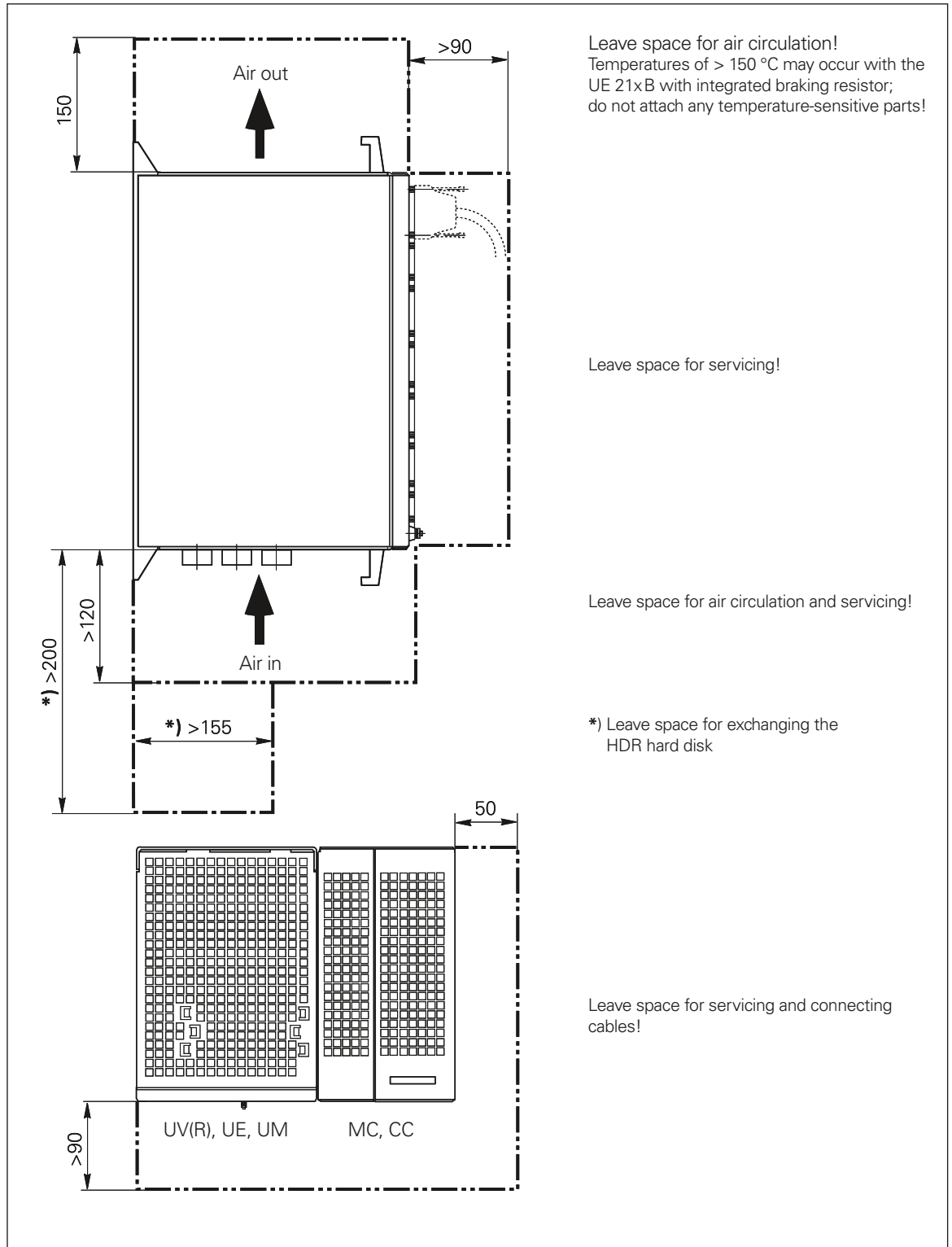
Cable overview

Inverter



Mounting information

Mounting position When mounting the control and inverter components, please observe the proper minimum clearances, space requirements, length and position of the connecting cables.



Mounting and electrical installation

Remember the following during mounting and electrical installation:

- National regulations for power installations
- Interference and noise immunity
- Operating conditions
- Mounting position

Degrees of protection

The following components fulfill the requirements for IP 54 (dust protection and splash water protection):

- Visual display unit (when properly installed)
- Keyboard unit (when properly installed)
- Machine operating panel (when properly installed)
- Handwheel

All other electrical and electronic control components (computer and controller units, inverters, etc.) must be installed in such a manner (e.g. in an electrical cabinet or housing) that fulfillment of protection class IP 54 (against dust and splash water) is guaranteed. This is the only way to avoid the deposition of dust in and on the components. Contamination is only permissible up to contamination level 2.

Electromagnetic compatibility

Intended place of operation

The units fulfill the requirements for Class A devices in accordance with the specifications in EN 55022, and are intended for use in industrially zoned areas.

Protect your equipment from interference by observing the rules and recommendations specified in the Technical Manual.

Likely sources of interference

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

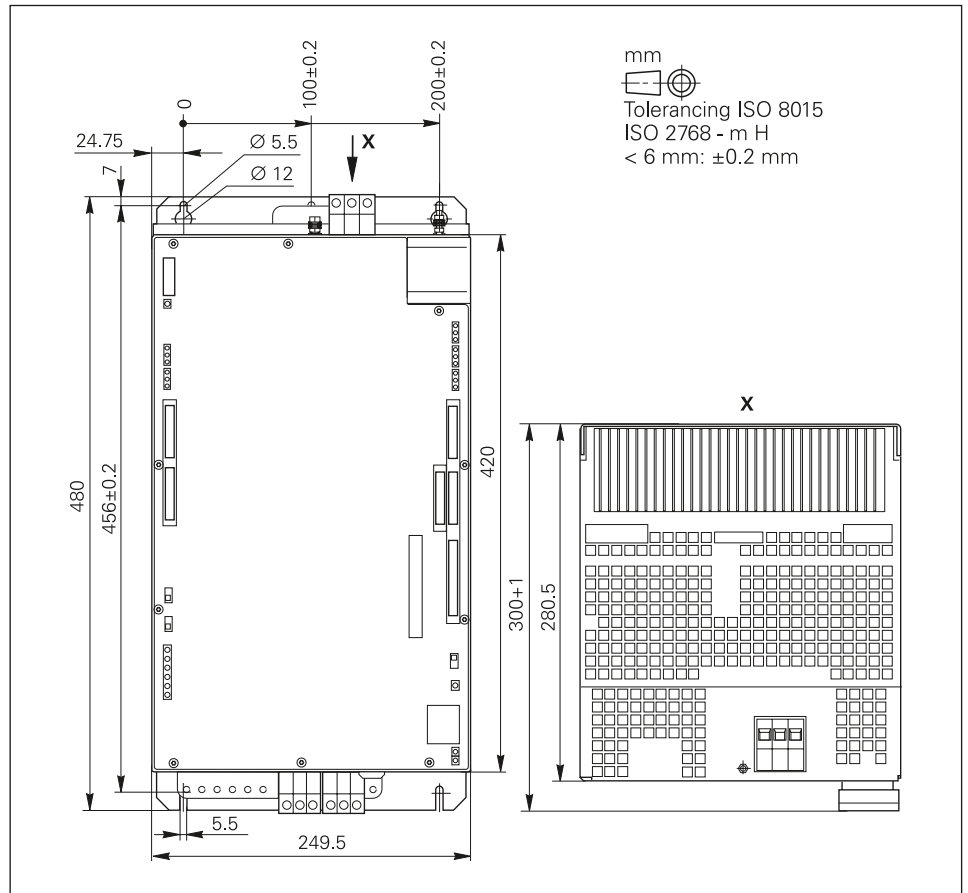
- Strong magnetic fields from transformers or electric motors
- Relays, contactors and solenoid valves
- High-frequency equipment, pulse equipment and stray magnetic fields from switch-mode power supplies
- Power lines and leads to the above equipment

Protective measures

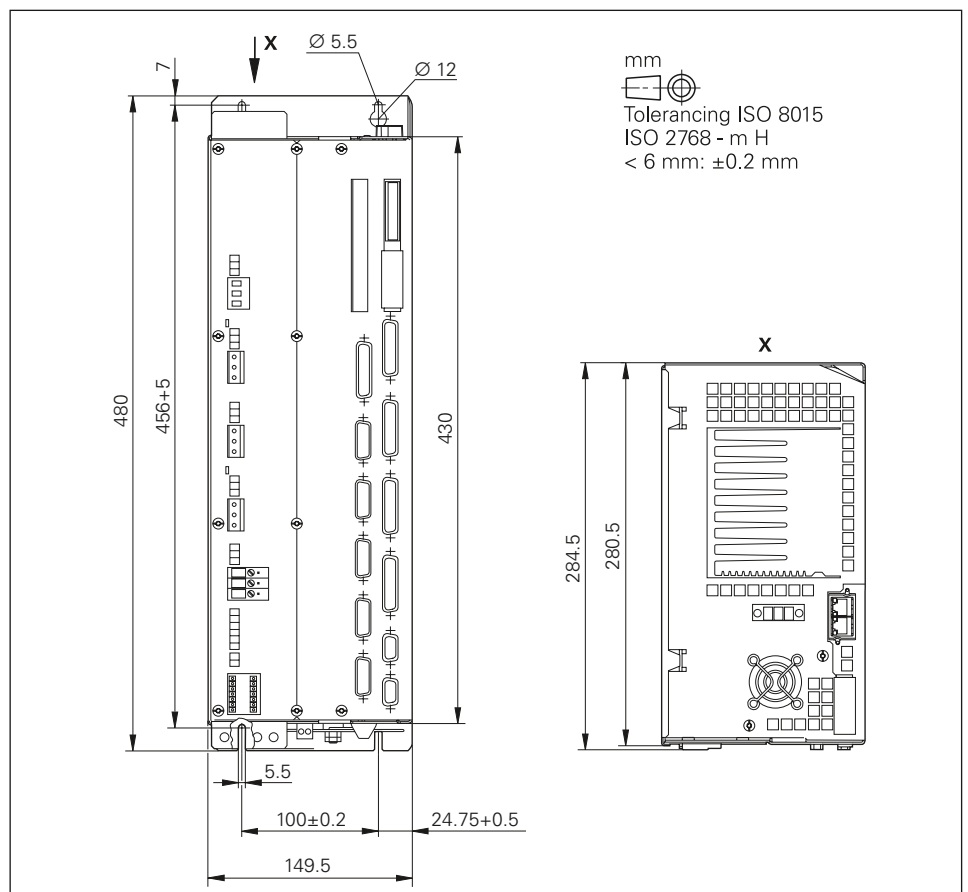
- Keep a minimum distance of 20 cm from the MC, CC and its leads to devices that carry interference signals
- Keep a minimum distance of 10 cm from the MC, CC and its leads to cables that carry interference signals. For cables in metallic ducting, adequate decoupling can be achieved by using a grounded separation shield.
- Shielding according to EN 50178
- Use equipotential bonding conductors with a cross section of 6 mm²
- Use only genuine HEIDENHAIN cables, connectors and couplings

Dimensions

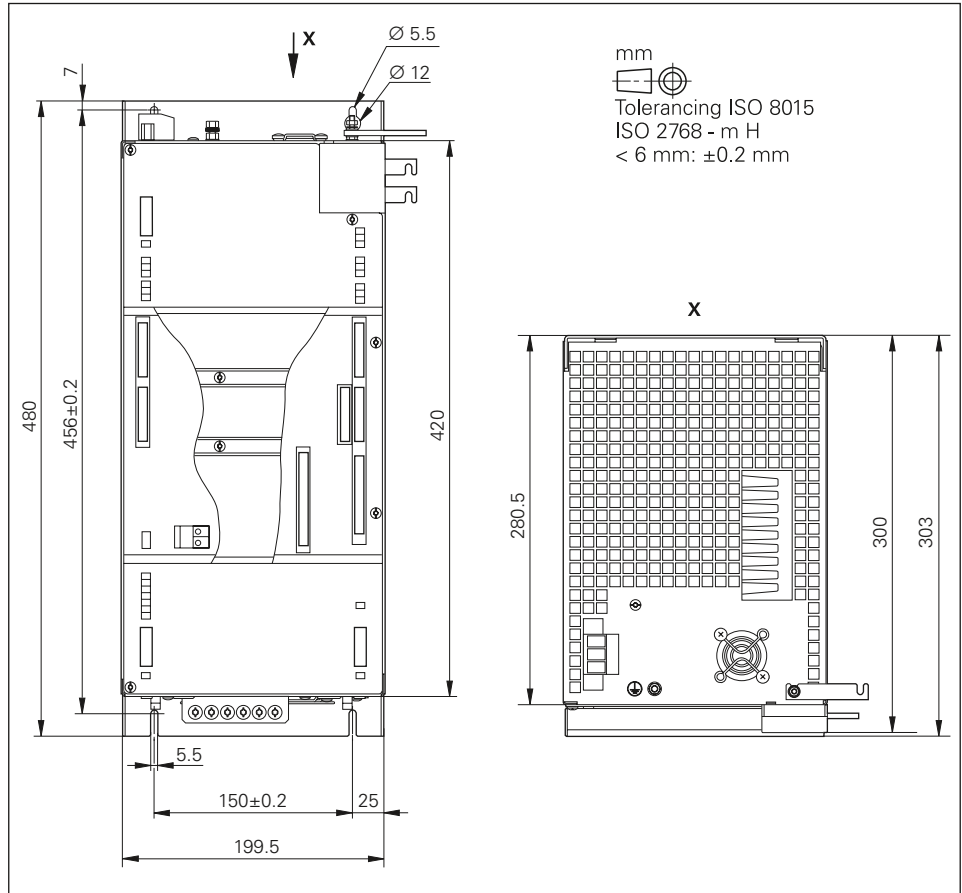
UR 2xxD series



Series UEC 111 UEC 112 UEC 113 UMC 111

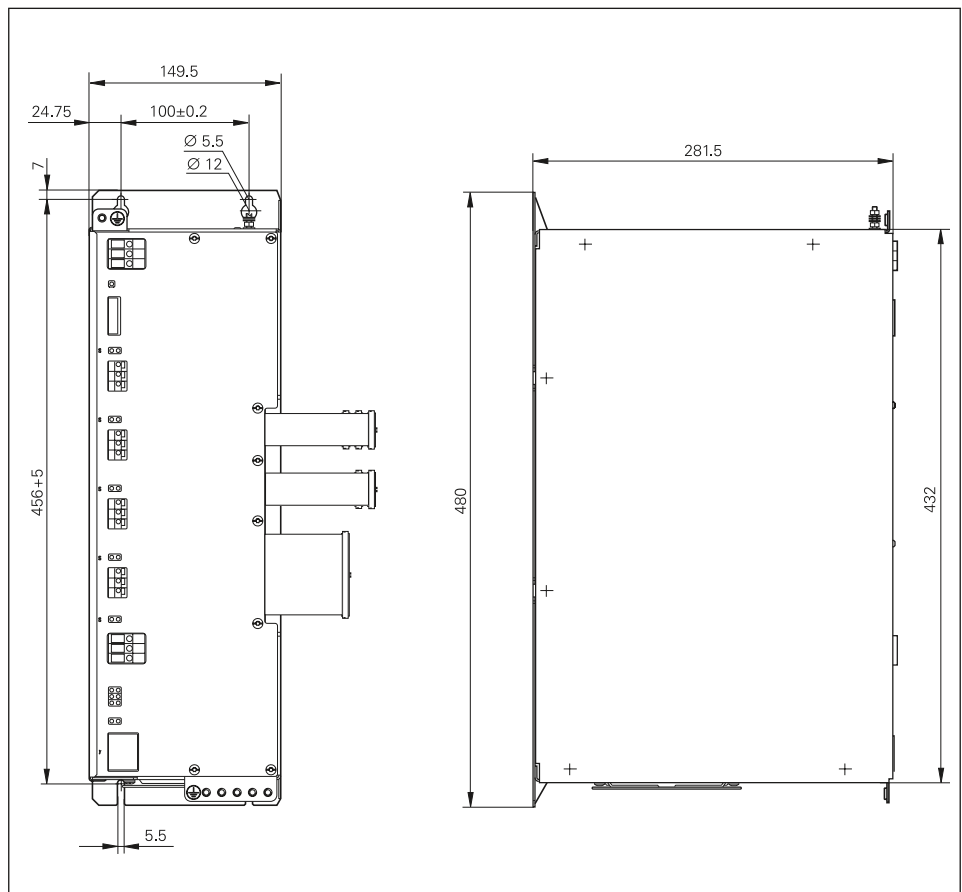


UE 2xxD series

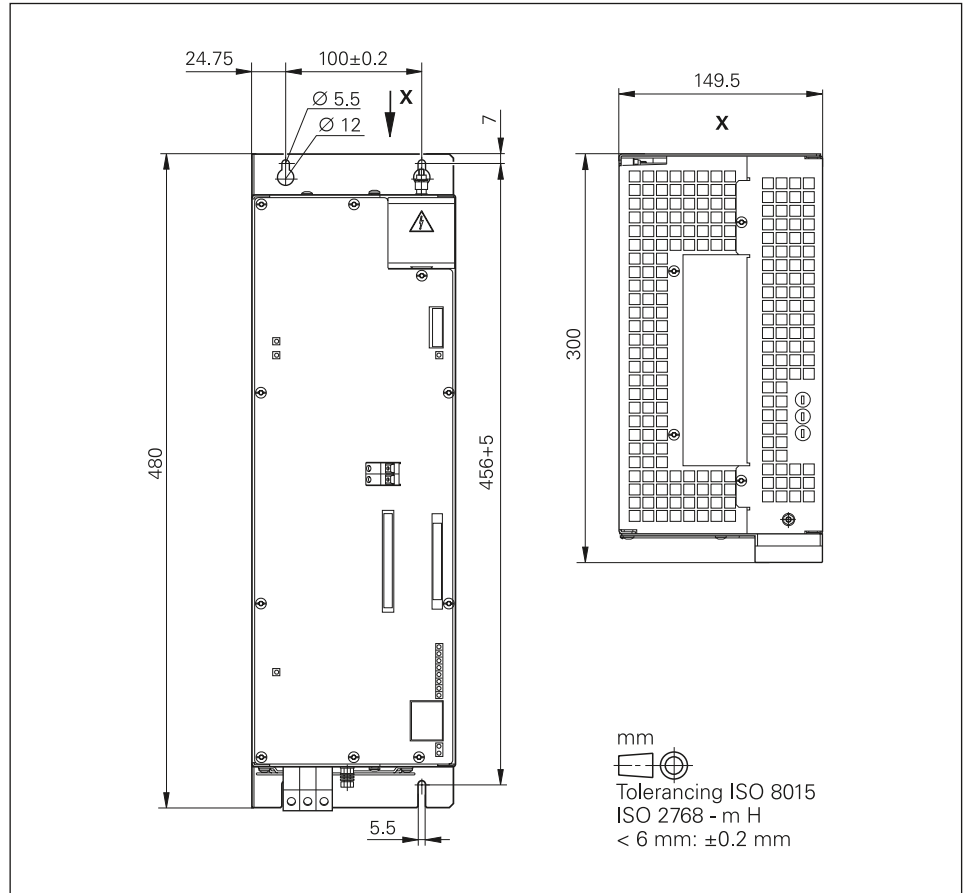


UE 1xx series

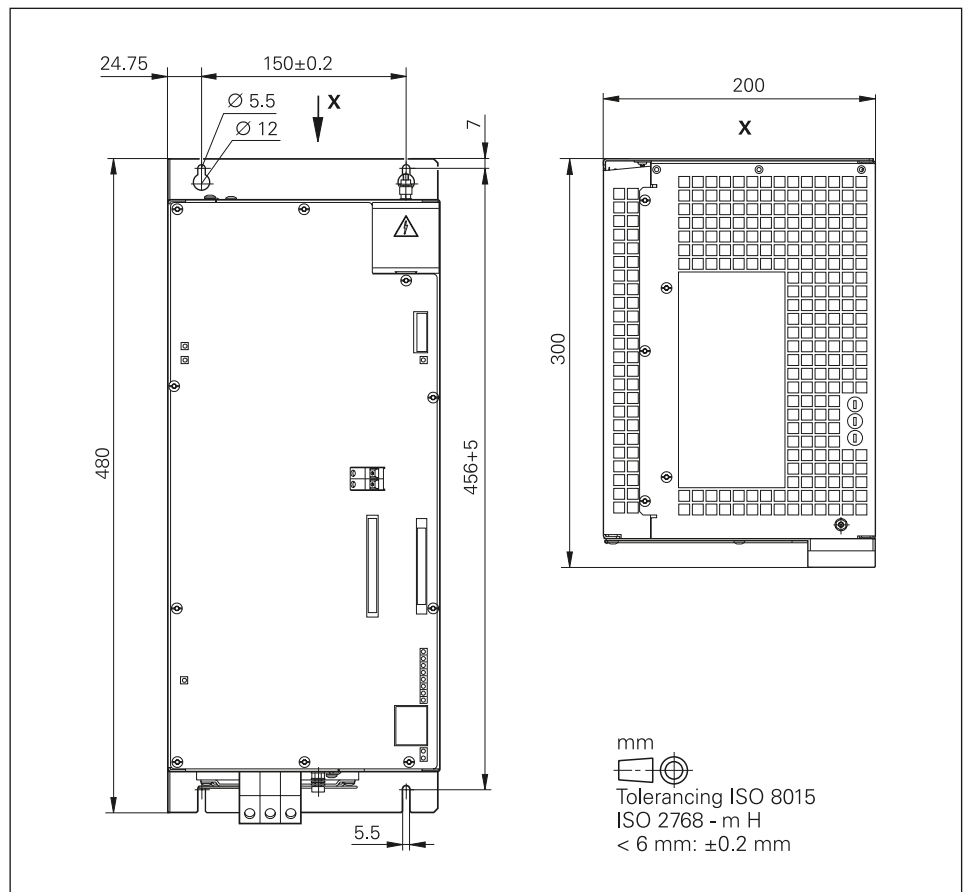
mm
 Tolerancing ISO 8015
 ISO 2768 - m H
 < 6 mm: ±0.2 mm



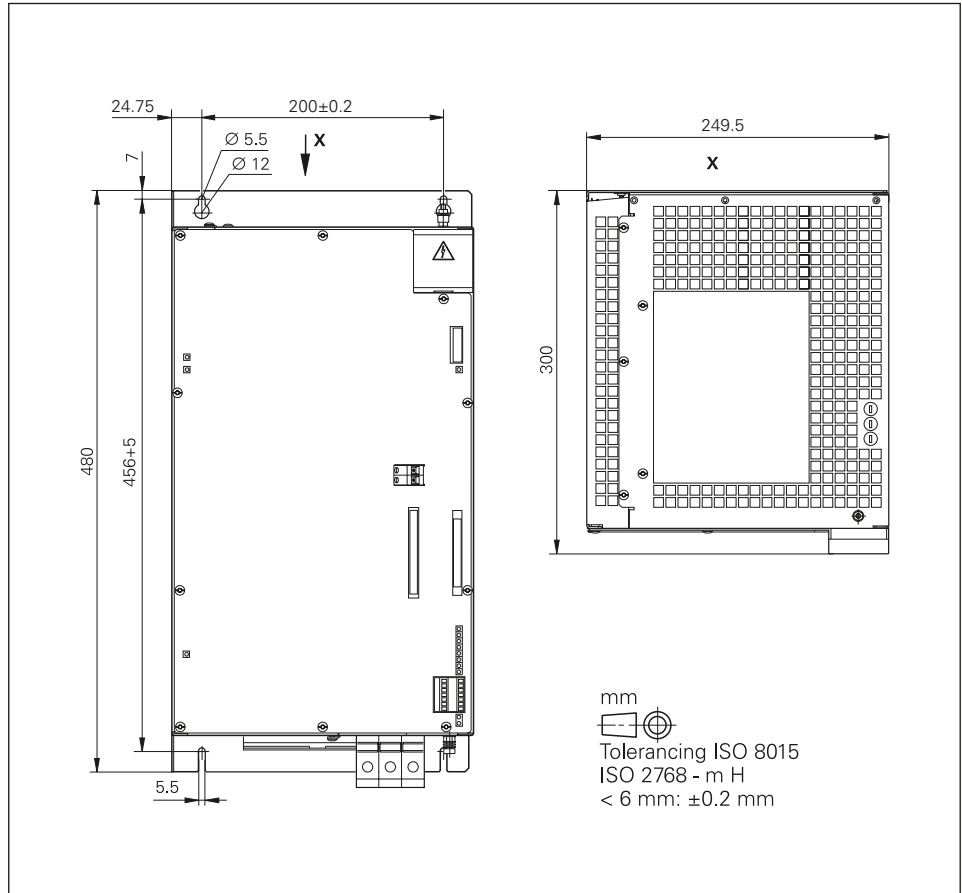
UVR 120D
UVR 130D



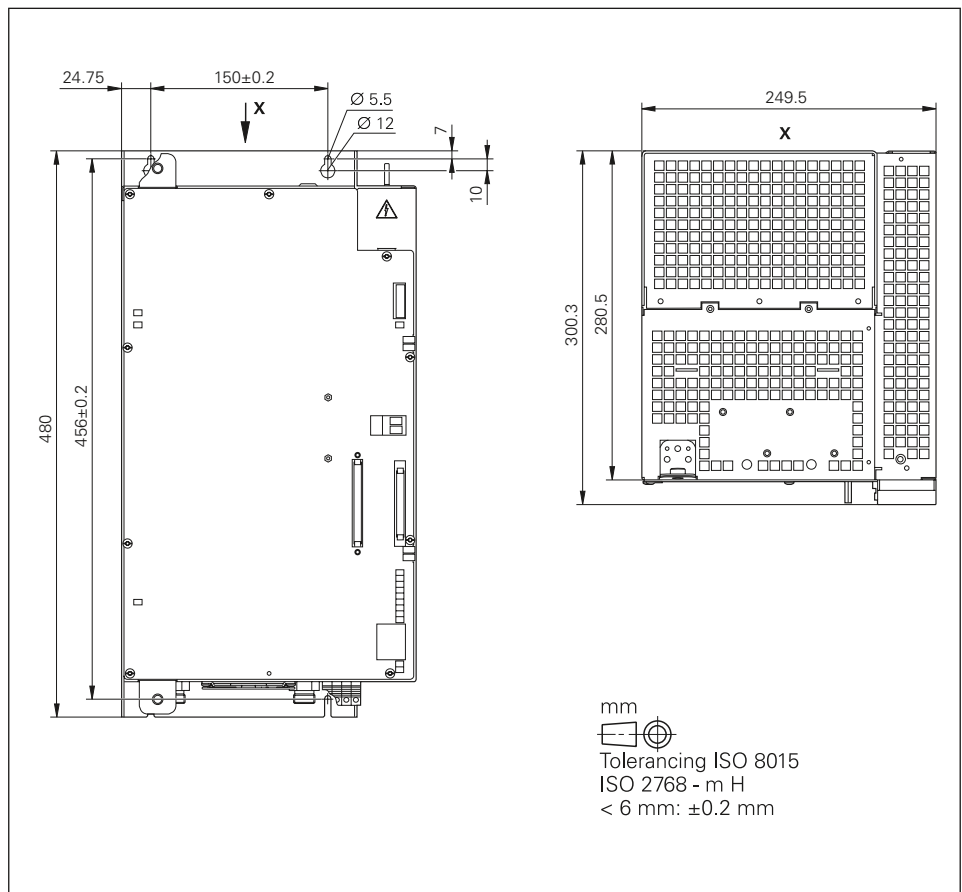
UVR 140D
UVR 150D



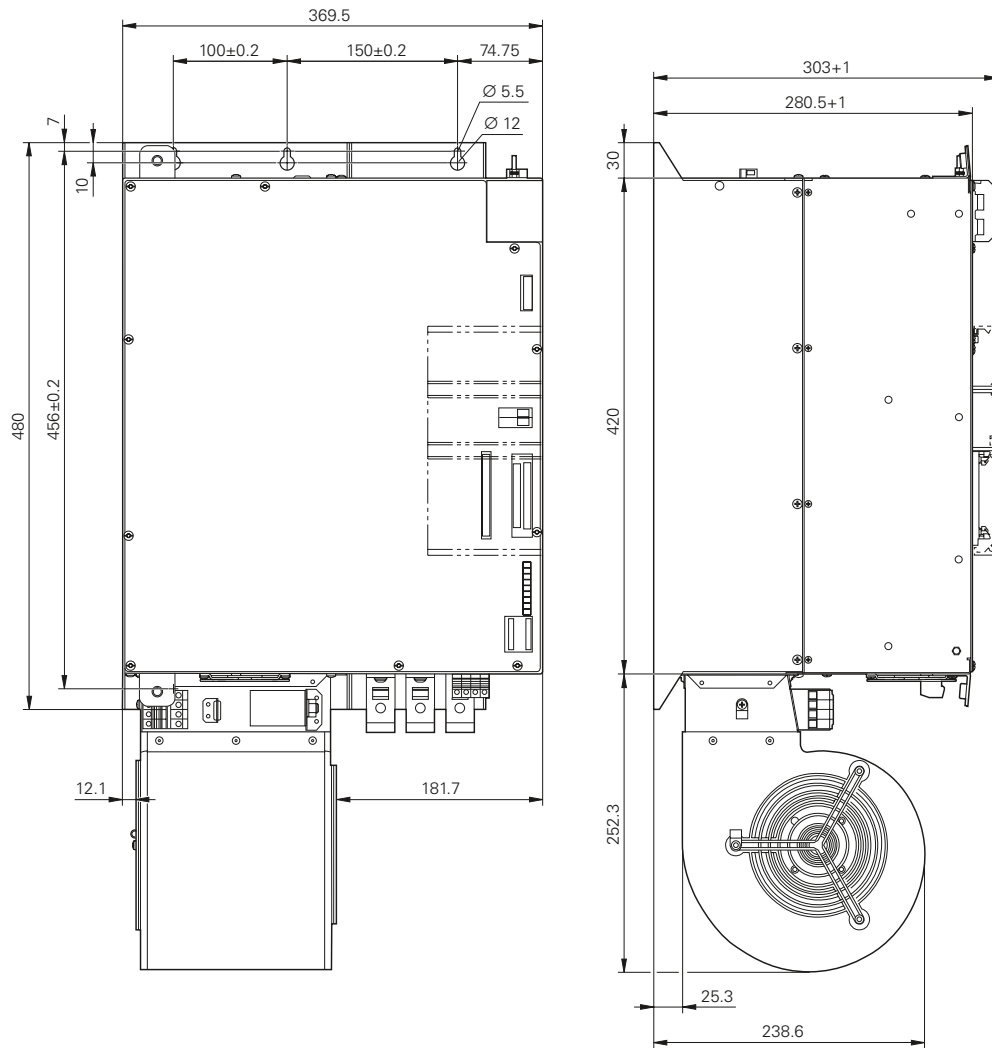
UVR 160D



UVR 160DW



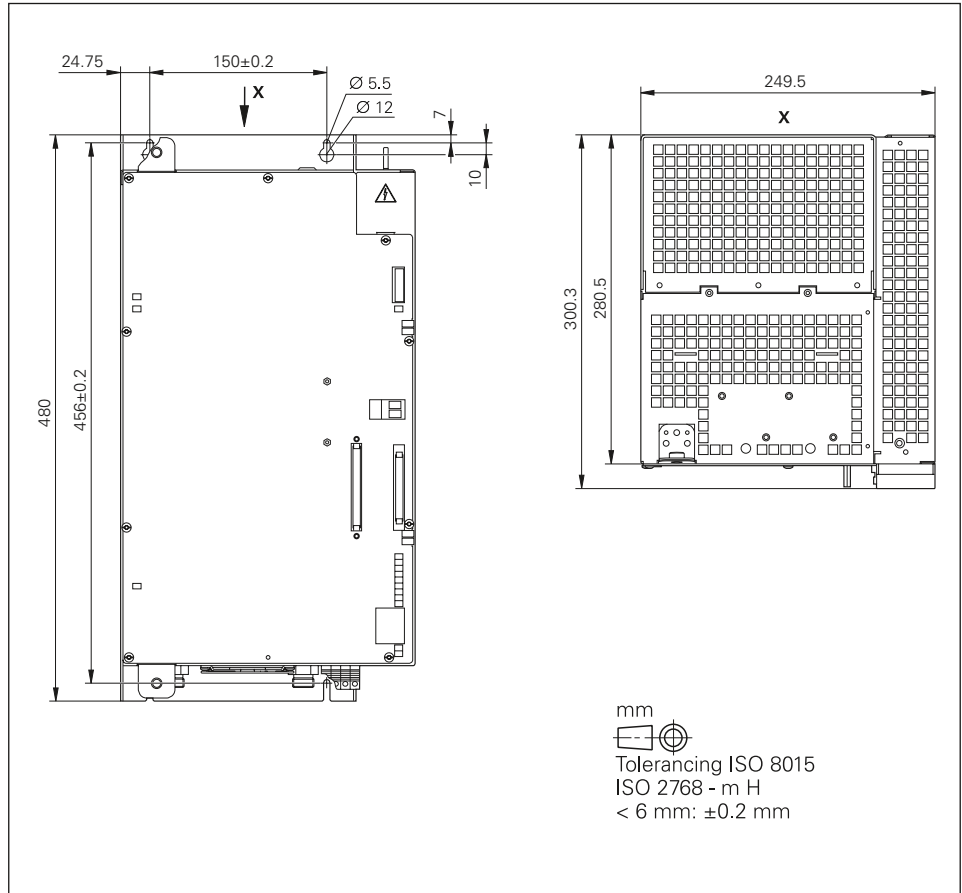
UVR 170D



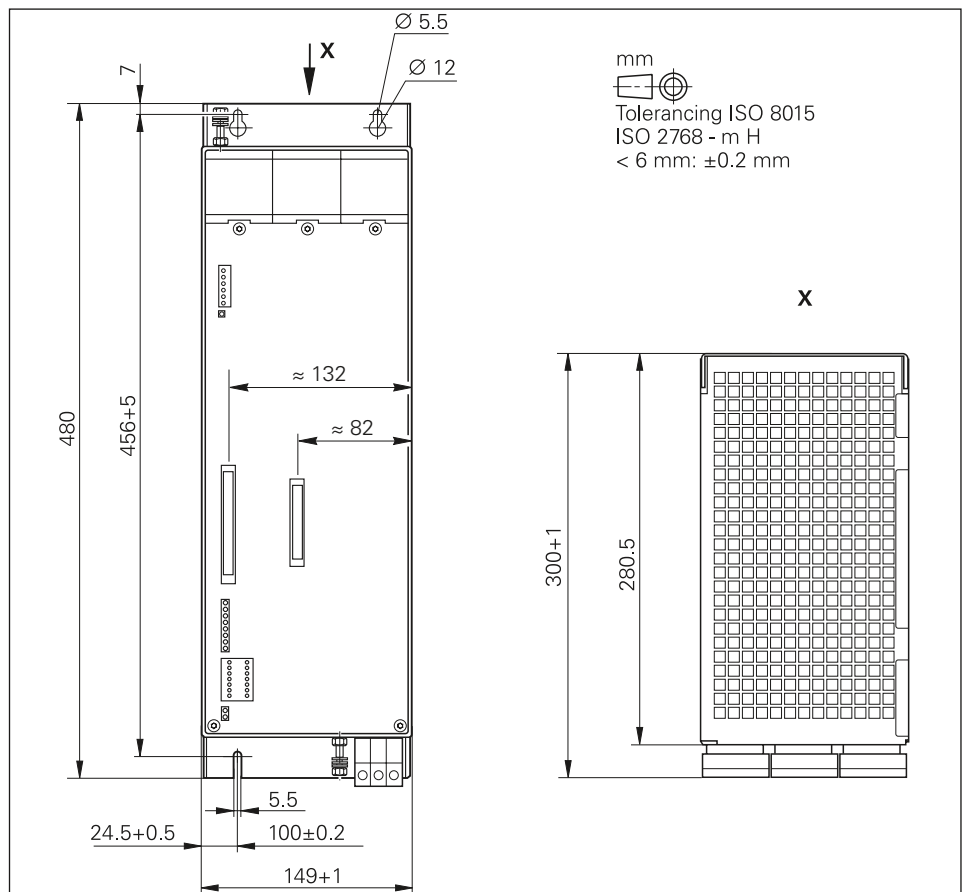
mm

Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm

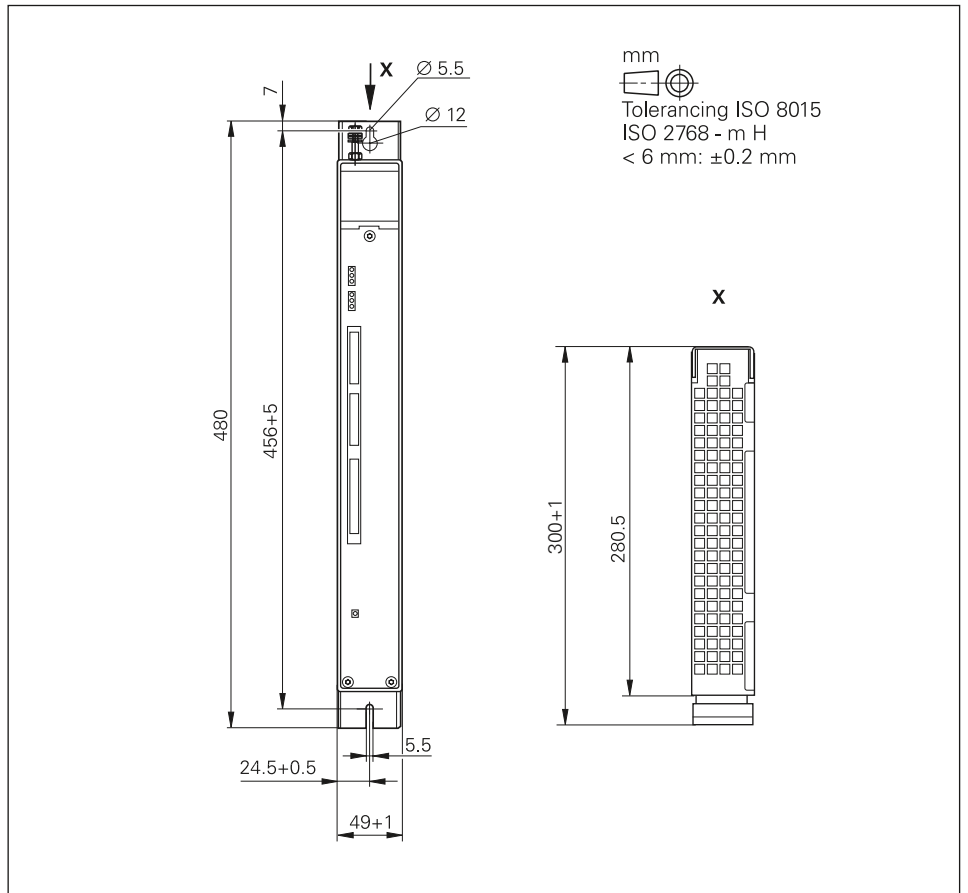
UVR 170DW



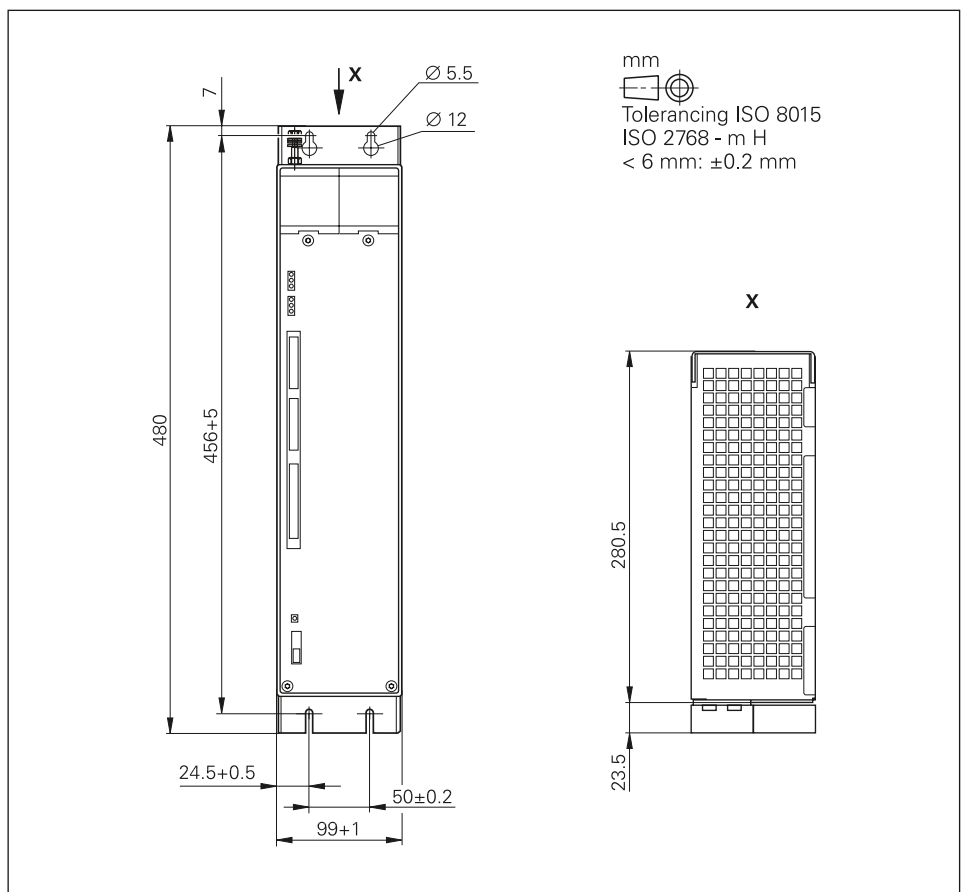
UV 130D



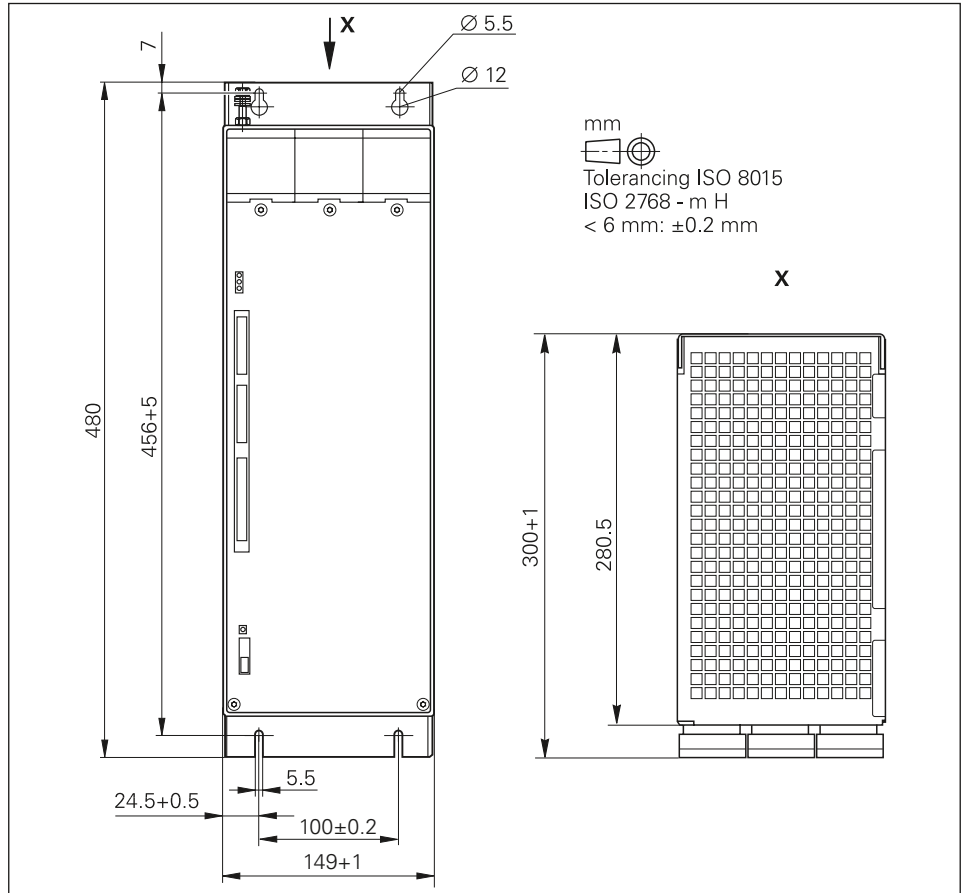
UM 111 D
 UM 111 BD
 UM 121 D



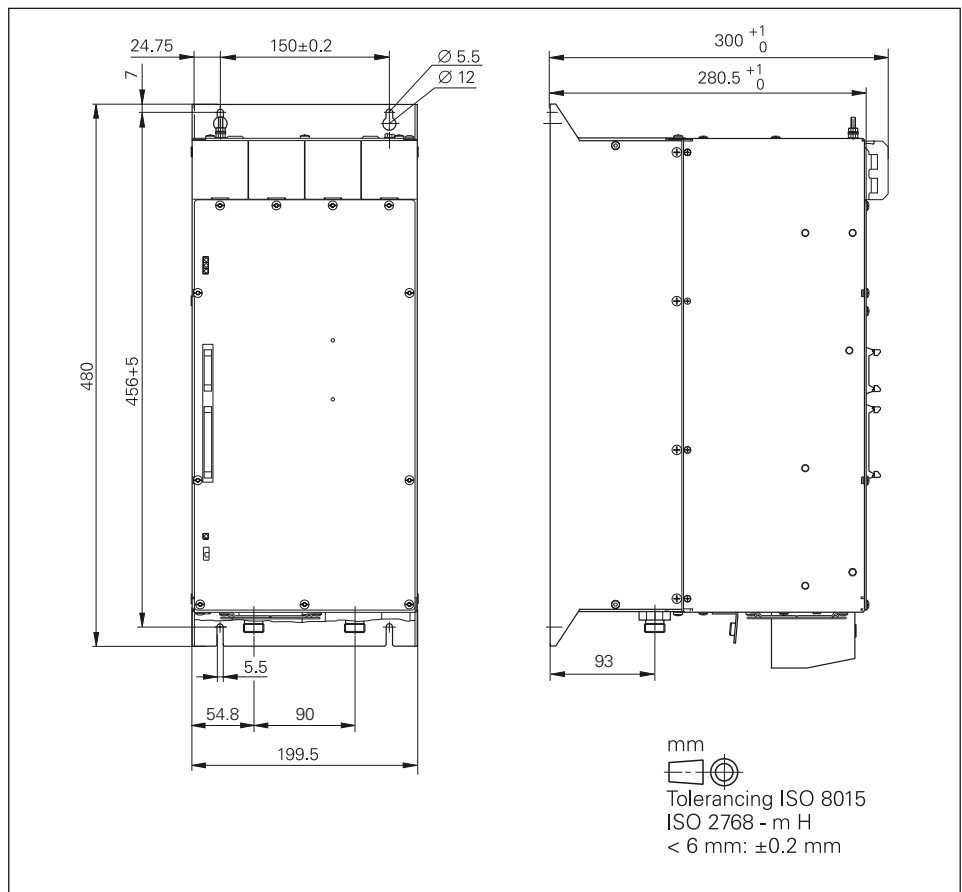
UM 112 D
 UM 113 D
 UM 114 D
 UM 121 BD
 UM 122 D



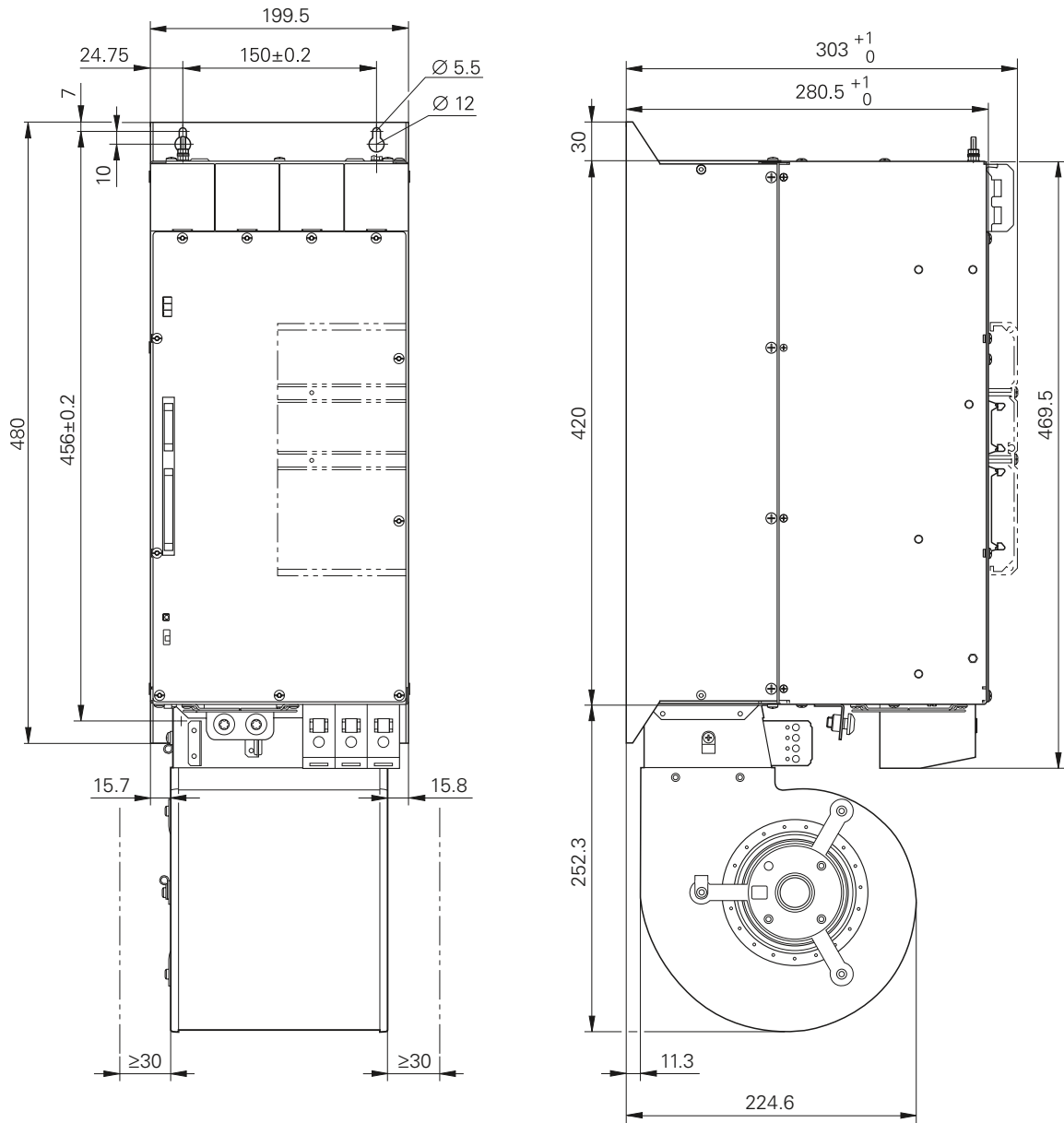
UM 115D



UM 116DW UM 117DW



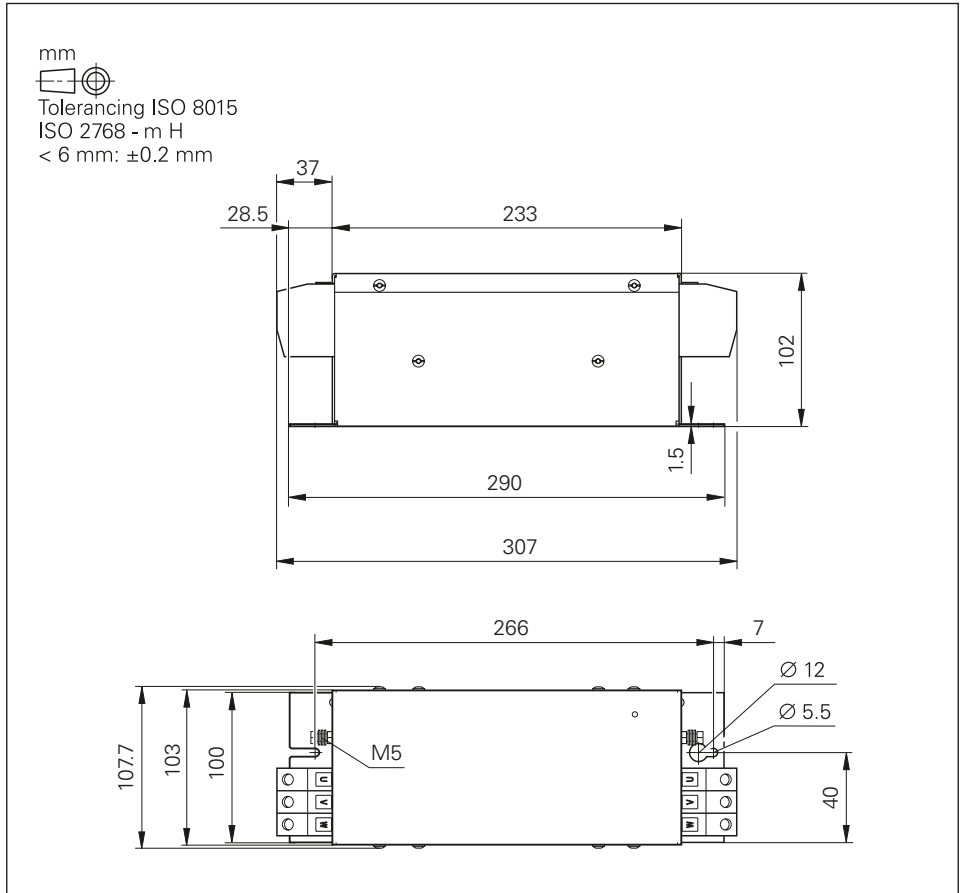
UM 116D with fan unit



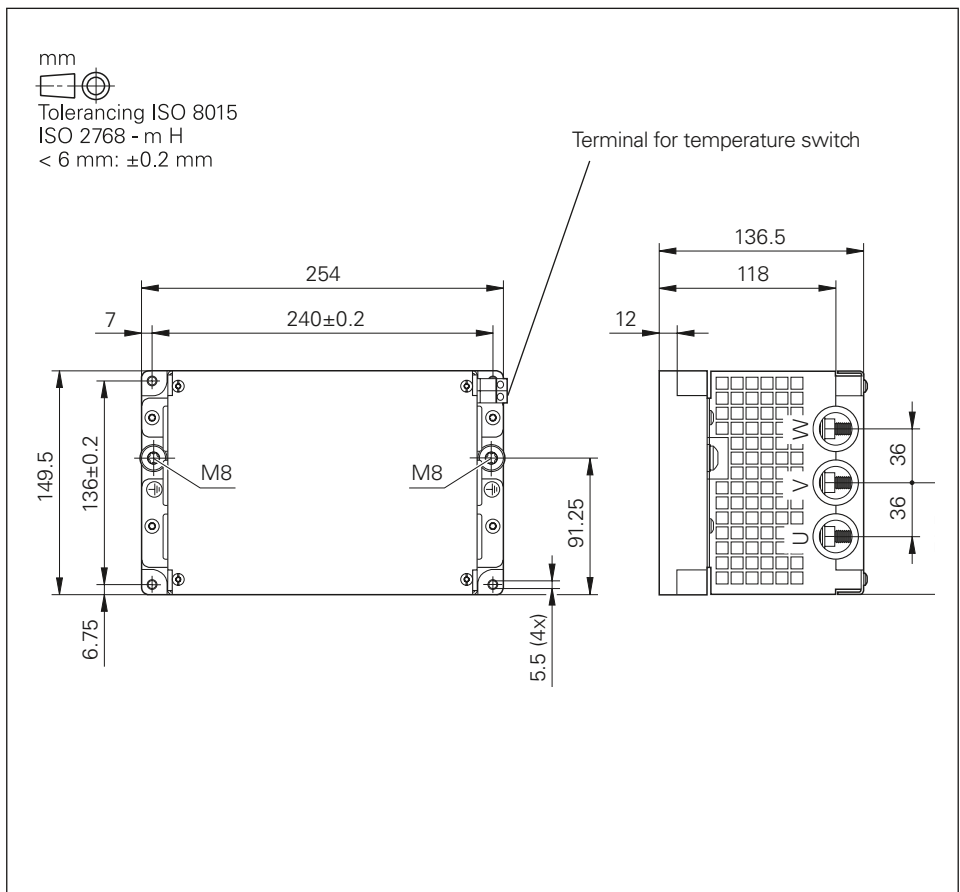
mm

 Tolerancing ISO 8015
 ISO 2768 - m H
 < 6 mm: ± 0.2 mm

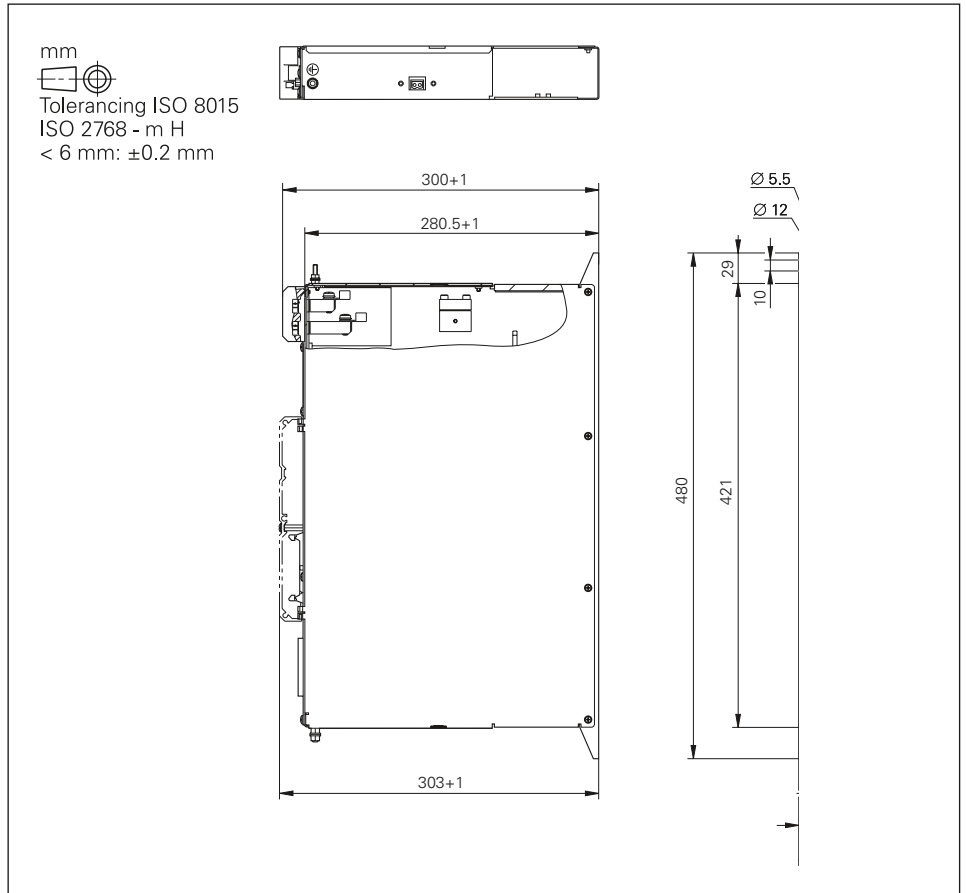
SM 110



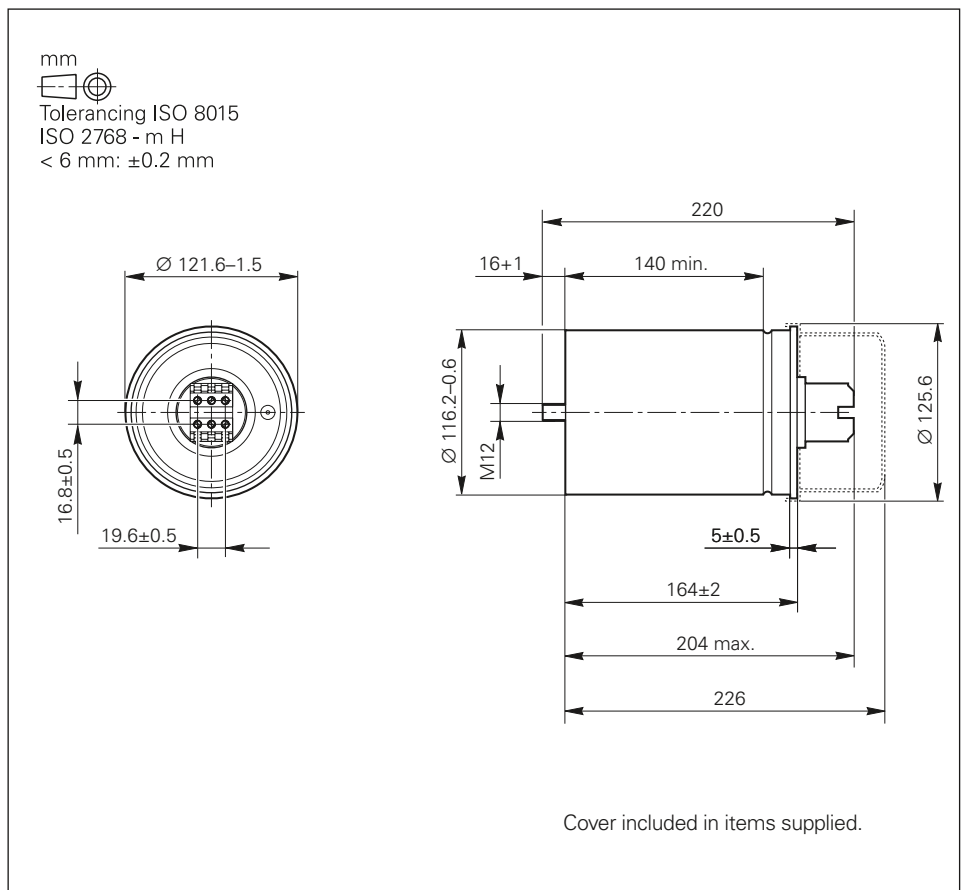
SM 130



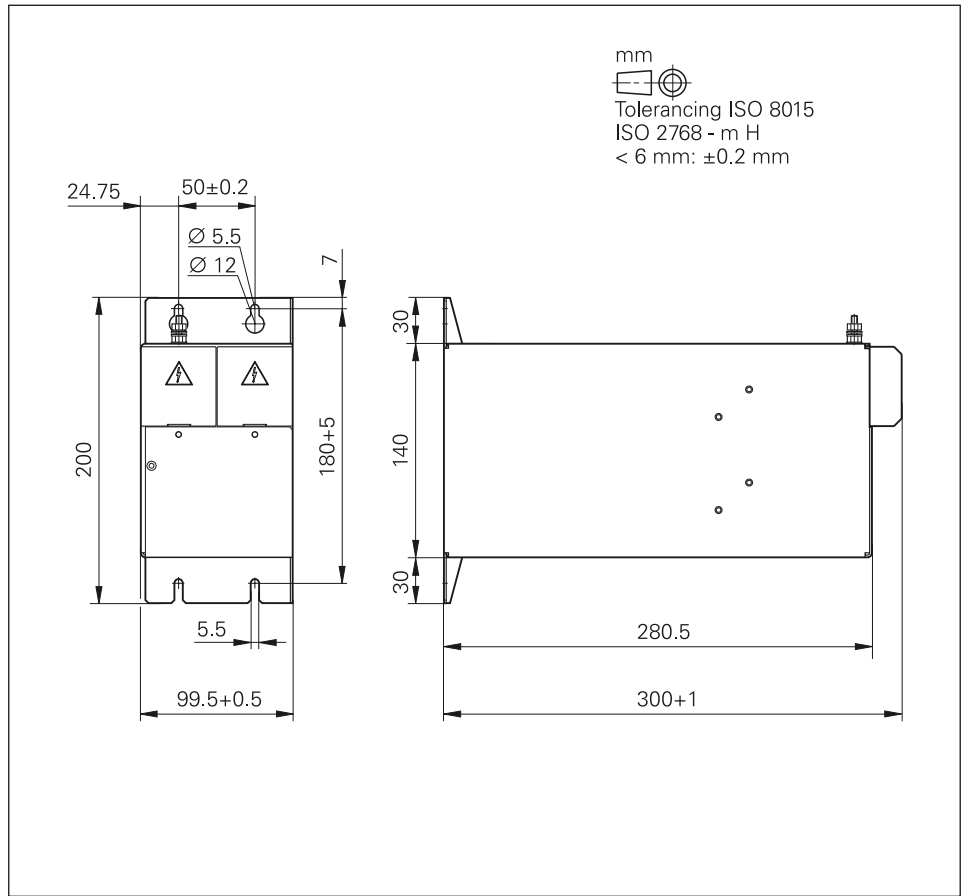
MS 110
MS 111



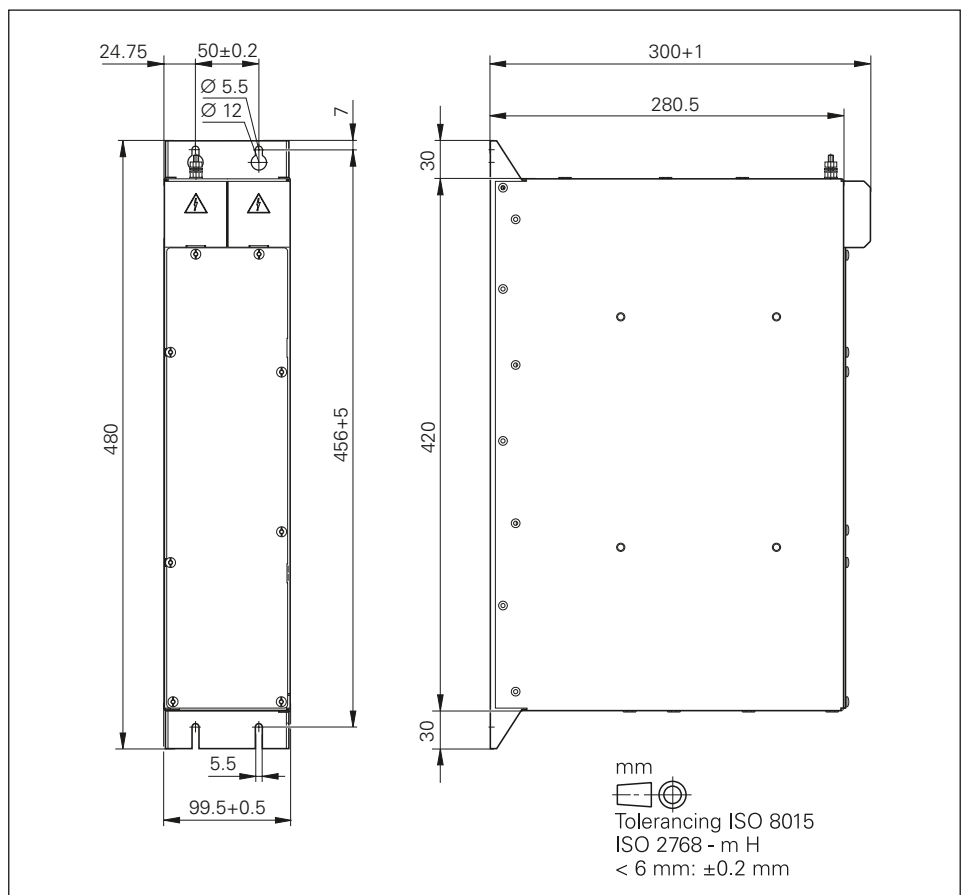
Three-phase current
capacitor



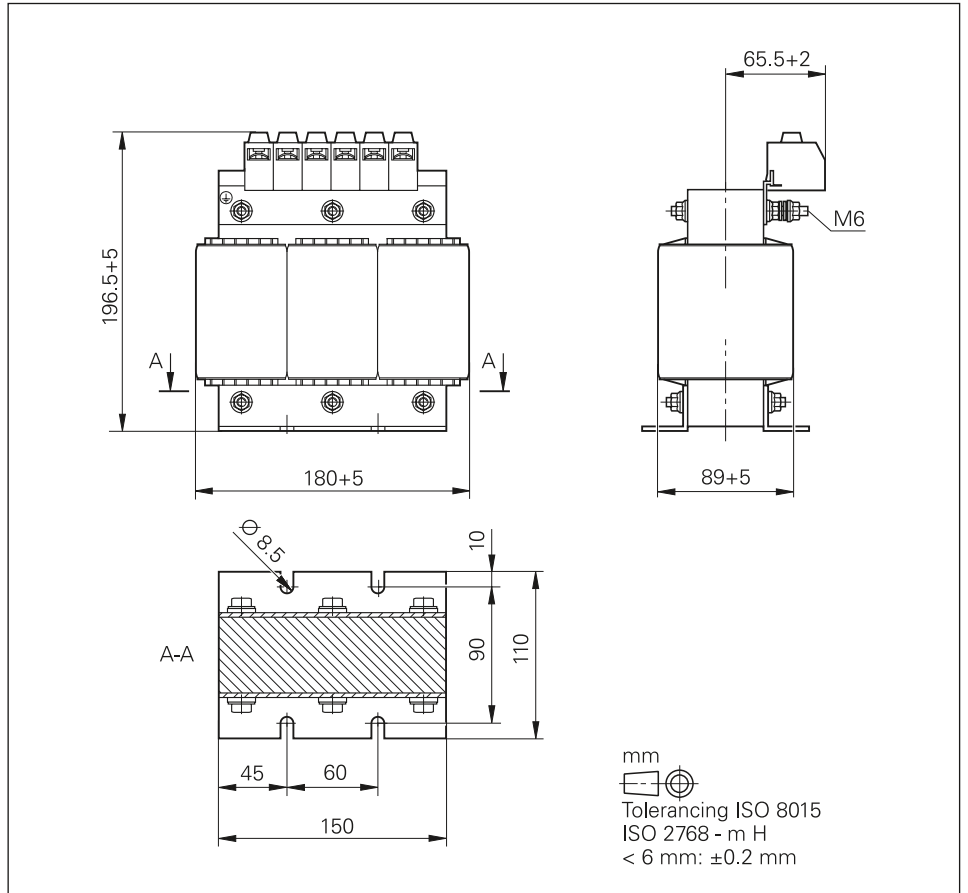
ZKF 110



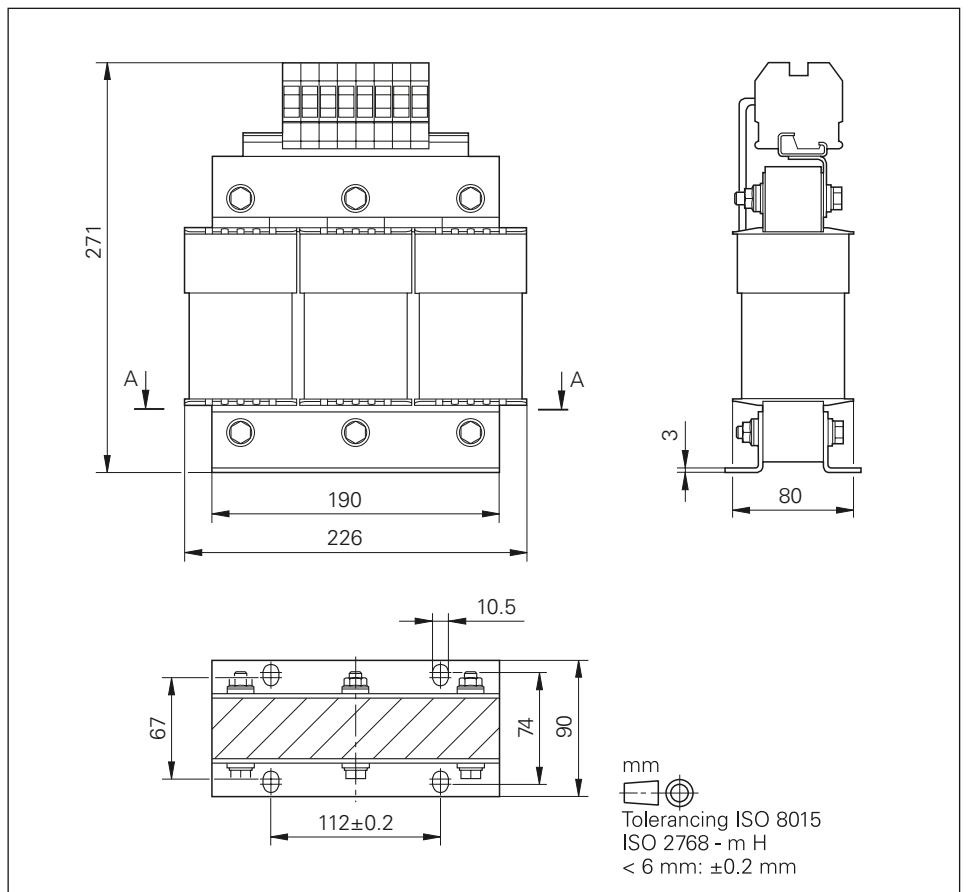
ZKF 120 ZKF 130 ZKF 140



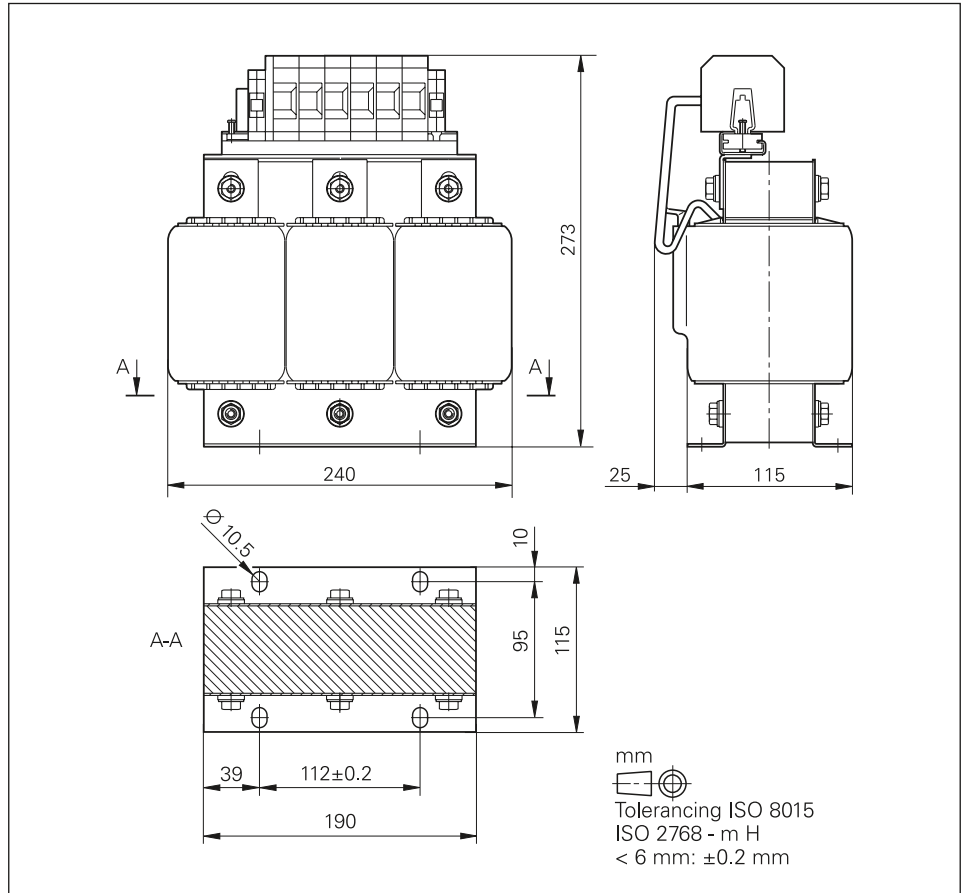
KDR 120



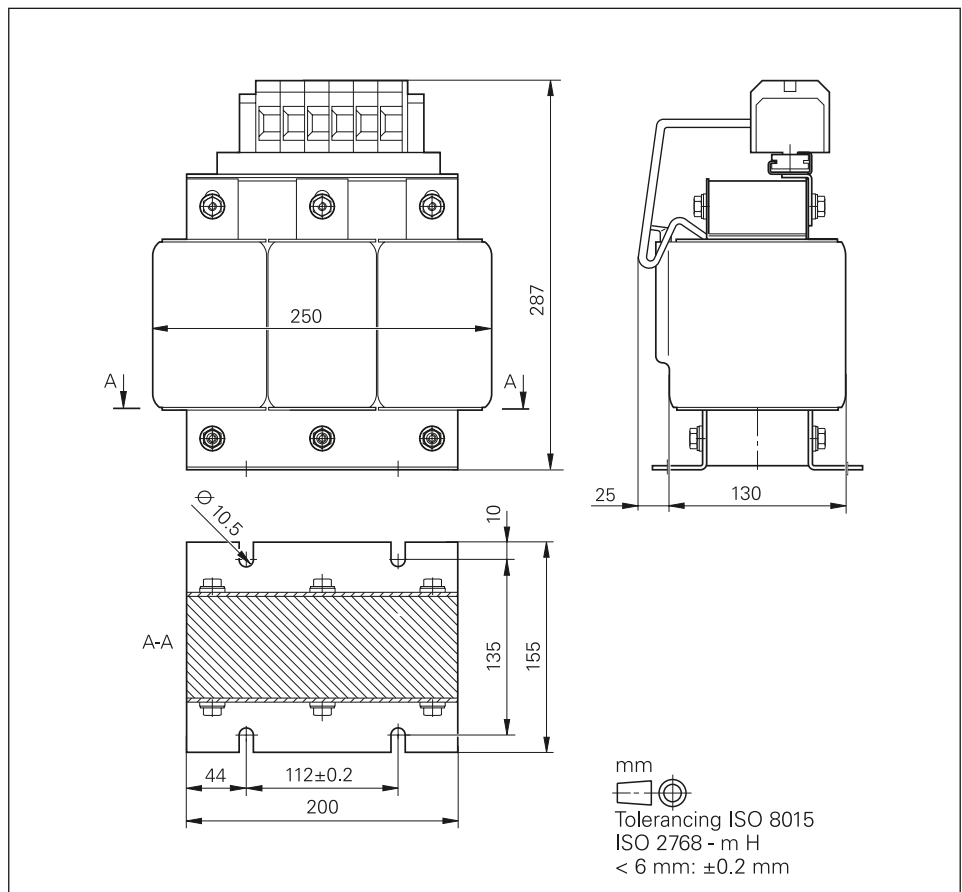
KDR 130C



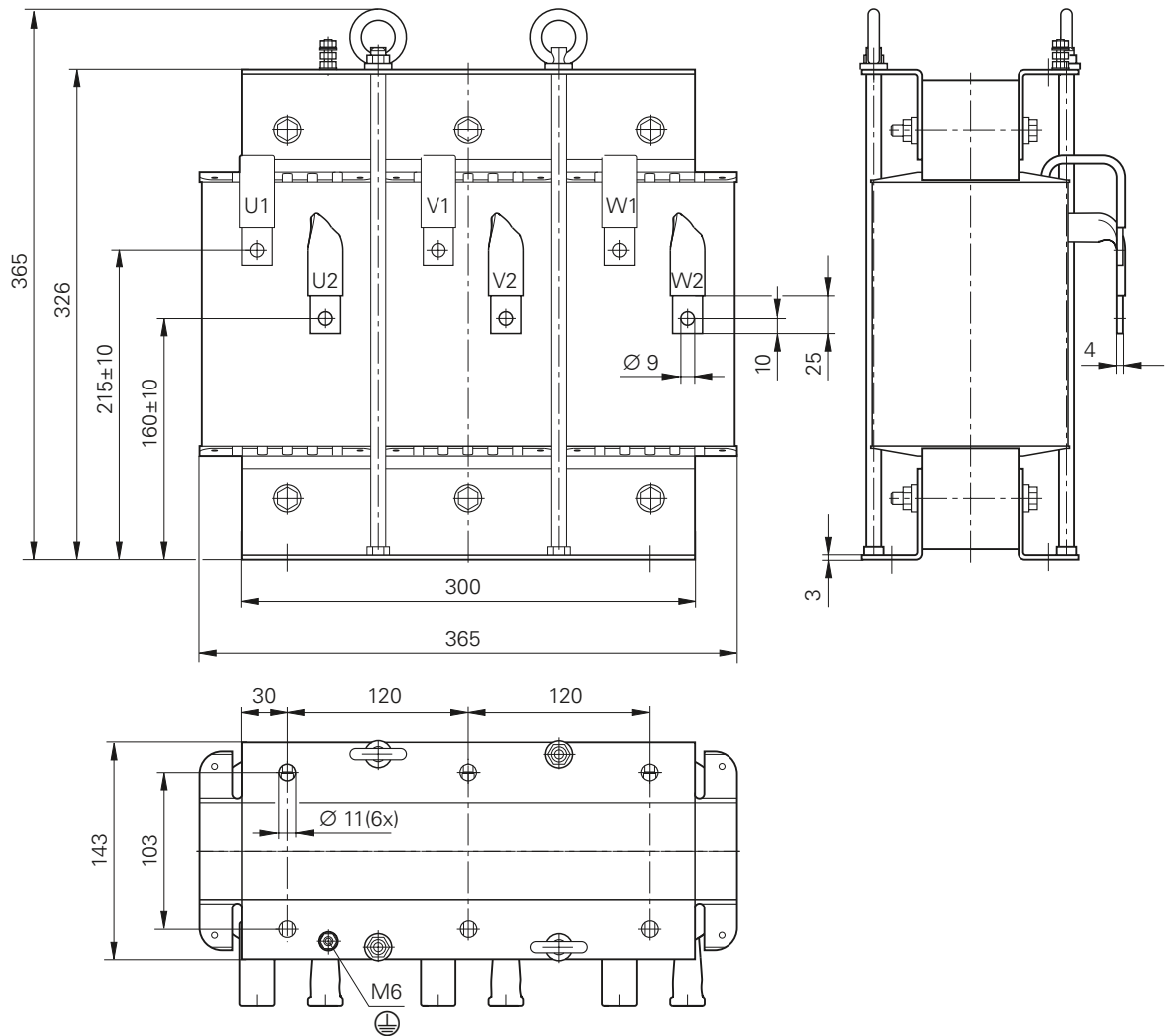
KDR 140



KDR 150



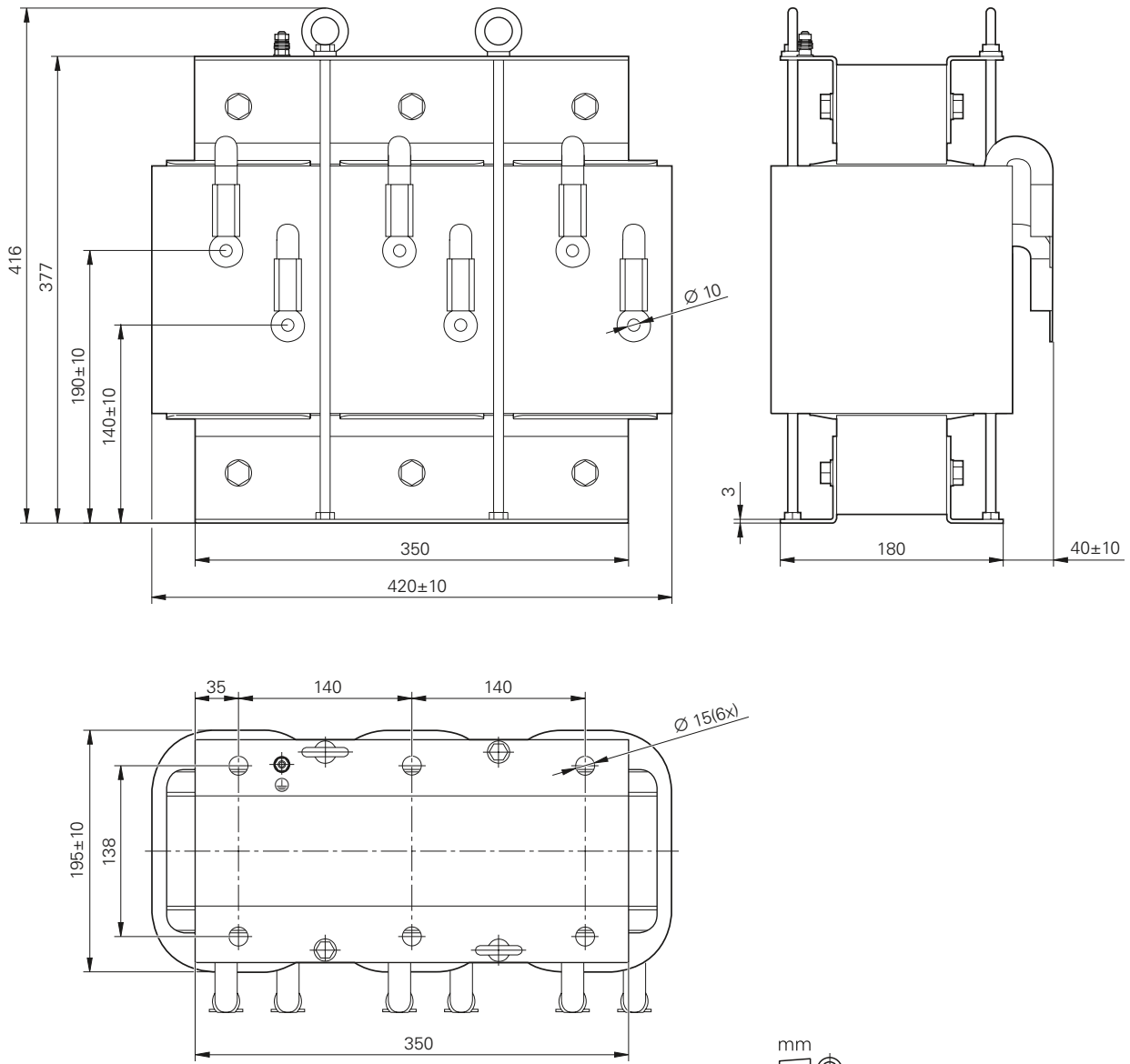
KDR 160



mm

 Tolerancing ISO 8015
 ISO 2768 - m H
 < 6 mm: ±0.2 mm

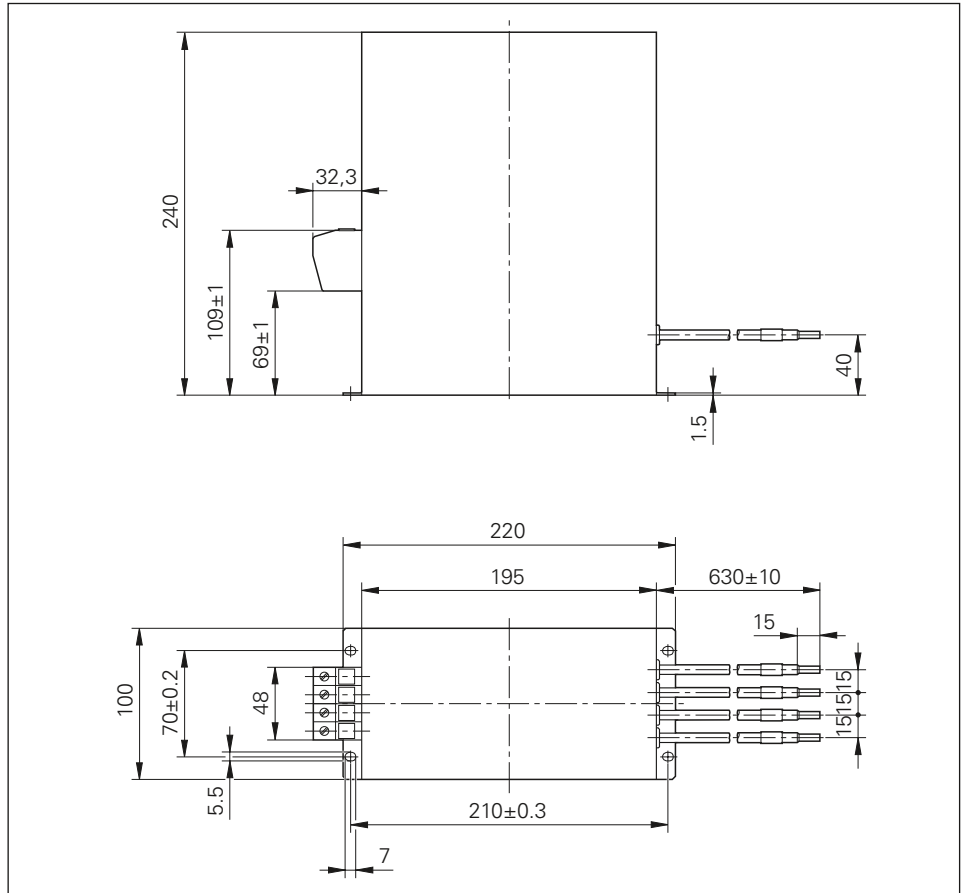
KDR 170




mm

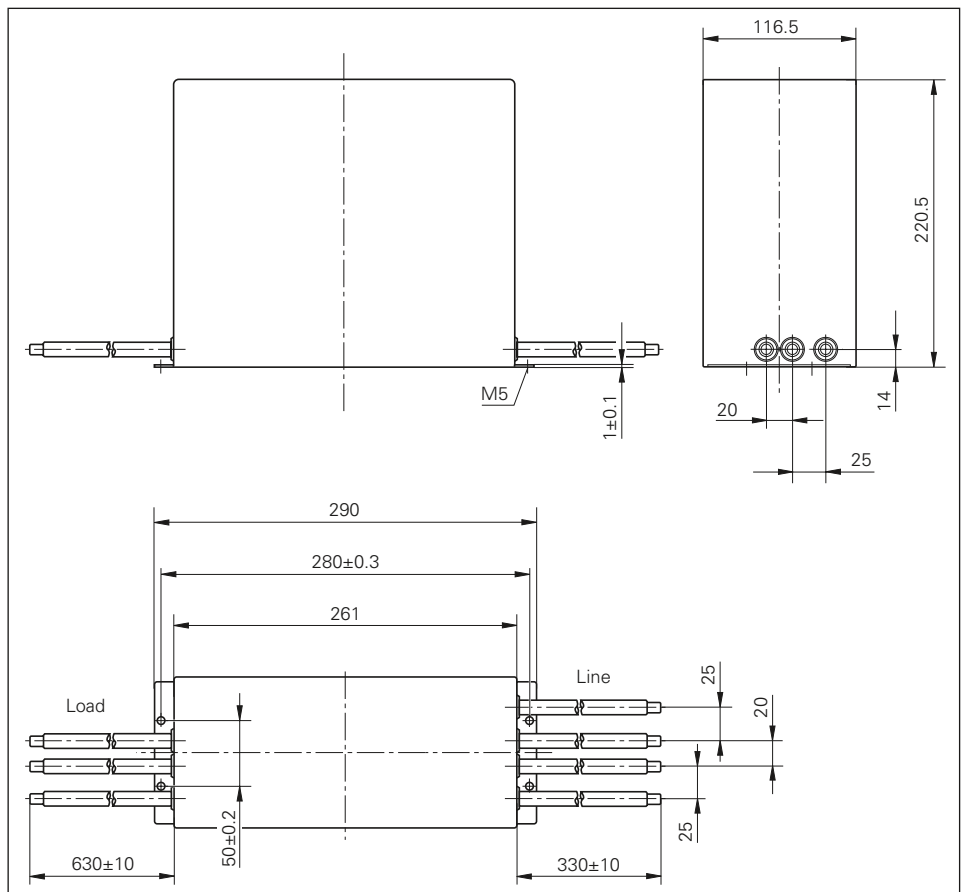
 Tolerancing ISO 8015
 ISO 2768 - m H
 < 6 mm: ± 0.2 mm

EPCOS 35A



mm

 Tolerancing ISO 8015
 ISO 2768 - m H
 < 6 mm: $\pm 0,2$ mm

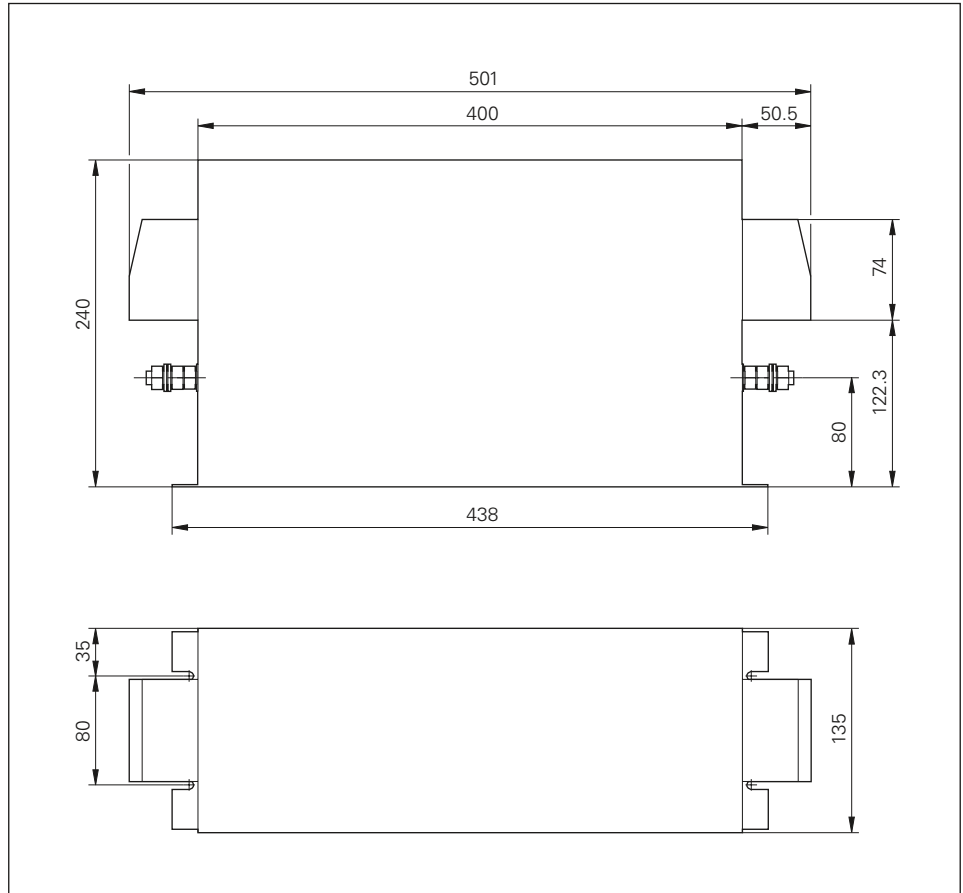
EPCOS 80A



mm

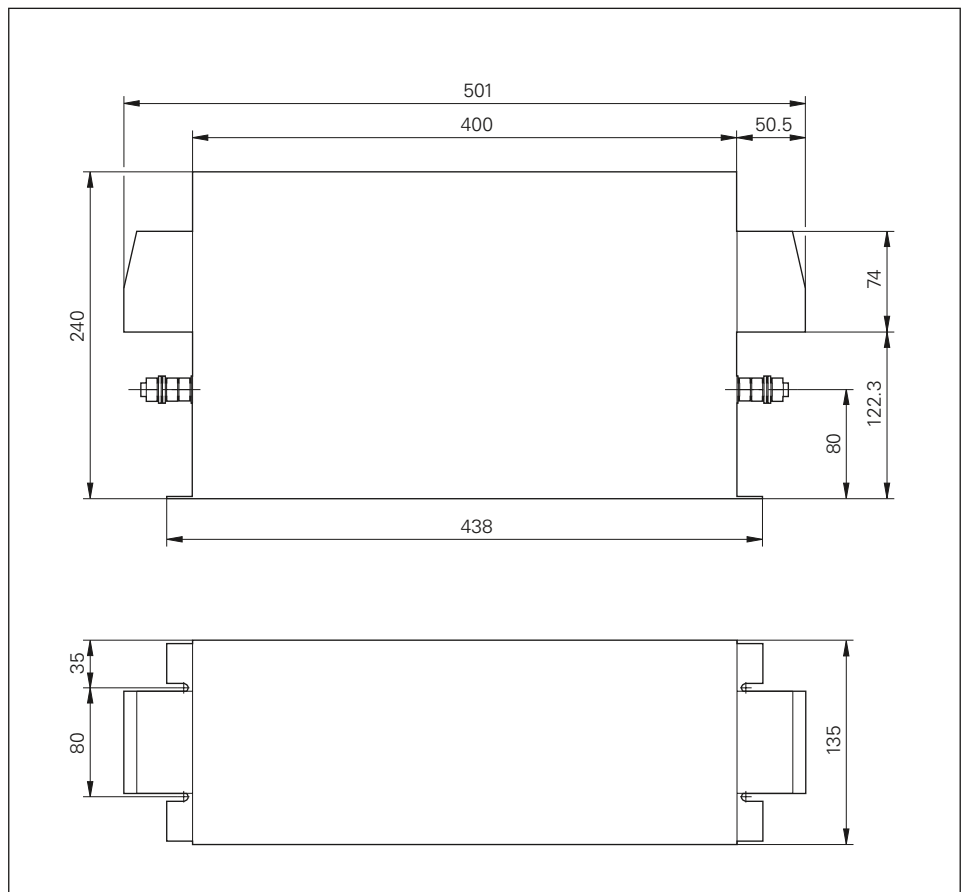
 Tolerancing ISO 8015
 ISO 2768 - m H
 < 6 mm: $\pm 0,2$ mm

EPCOS 120A



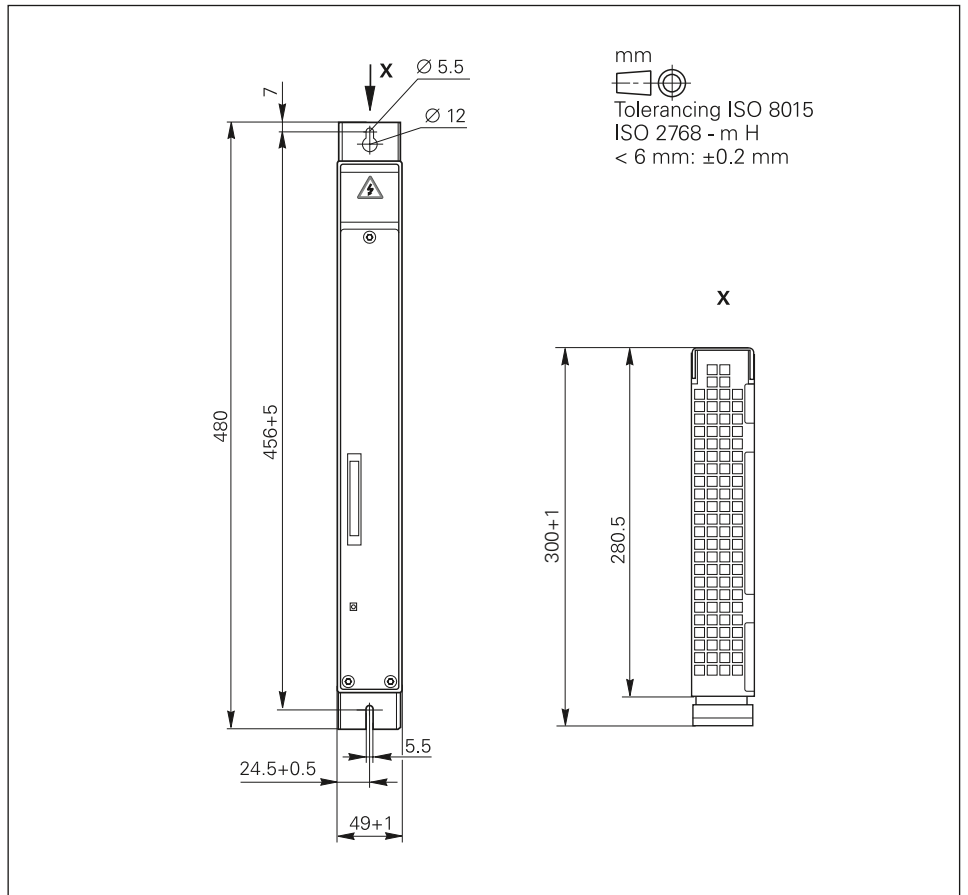
mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ± 0.2 mm

EPCOS 200A



mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ± 0.2 mm

UP 110
UP 120

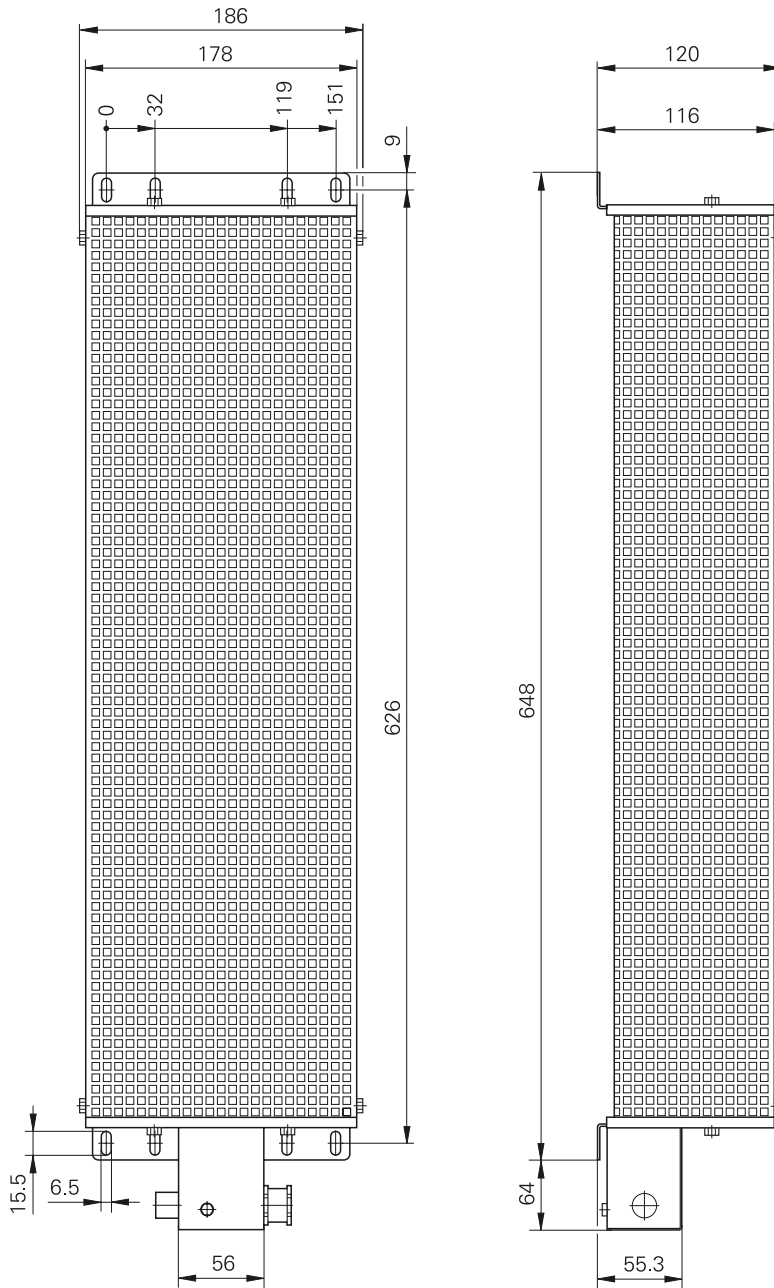


PW 210

mm



Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ± 0.2 mm



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