



HEIDENHAIN

Inverter Systems

For Gen 3 Drives of
HEIDENHAIN Controls

Information for the
Machine Tool Builder



The Gen 3 inverter systems from HEIDENHAIN are suitable for the operation of HEIDENHAIN controls with digital speed control and communication via Gbit HSCI. These drives are designed for the operation of synchronous and asynchronous motors from HEIDENHAIN.



UVR 340, CC 306
with modular inverters

Intended use	<p>The products described in this brochure:</p> <ul style="list-style-type: none"> • may be used only for NC-controlled machine tools, • may be used only in an industrial setting, for commercial applications, or in research institutions, • must be operated in accordance with the product requirements (specifications, environmental data, safety instructions, etc.), • and must be operated in an electrical cabinet. <p>The machine manufacturer must ensure that the end product meets all of the requirements of the Machinery Directive (2006/42/EC). This is particularly the case when the devices are used as part of a safety function.</p>
Improper use	<p>The devices are not intended for applications in areas where a failure would result in considerable risk to humans or the environment. Usage in potentially explosive atmospheres is prohibited.</p>
System test	<p>Controls, power modules (such as inverters, power supply units, and their accessories), motors, and encoders from HEIDENHAIN are usually integrated as components into complete systems. In such cases, comprehensive testing of the complete system is required, irrespective of the specifications of the individual devices.</p>
Parts subject to wear	<p>Power modules (power supply units, inverters, and compact inverters) from HEIDENHAIN contain parts subject to wear—particularly fans.</p>
Standards	<p>Standards (ISO, EN, etc.) apply only where explicitly stated in this brochure.</p>
Validity	<p>This brochure supersedes all previous editions, which thereby become invalid. Subject to change without notice.</p>
Precondition	<p>This brochure contains basic information about the selection of the components. All of the descriptions and specifications provided in the Technical Manuals must always be complied with.</p>

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HEIDENHAIN inverter systems

HEIDENHAIN Gen 3 inverter systems are available in different designs. The modular versions, which are available solely as regenerative systems, have a power rating of 15 kW to 135 kW. The compact versions have a power rating of up to 30 kW. The compact inverters are non-regenerative devices which, however, can be expanded with an optional regenerative module.



UVR 340

Regenerative inverter systems

With **regenerative inverter systems**, the braking energy of the motors is fed back into the power supply network. For this purpose, regenerative modular inverter systems require additional components such as a **line filter** and a **commutating reactor** (see *Accessories for inverter systems*).

Non-regenerative compact inverter systems

With **non-regenerative compact inverter systems**, the braking energy of the motors is converted into heat. That is why a **braking resistor** is mandatory (see *Accessories for inverter systems*). In addition, an optional regenerative module is available for the UEC 3xx (FS) compact inverters. For these systems, no commutating reactor or line filter is necessary in general even when a regenerative module is used.

Supply voltage

For the permissible supply voltages, please refer to the following specifications. The inverter systems are intended for connection to a TN supply network. Other power supply systems or other line voltages may need to be adapted by means of a transformer. HEIDENHAIN recommends a TN-S, TN-C, or TN-C-S network for the operation of its power modules. Please refer to the Technical Manual of your inverter system.

DC-link voltage

The inverter systems from HEIDENHAIN use a rectifier bridge circuit to convert the connected line power into the DC-link voltage and other auxiliary voltages for the power module electronics and other control components, such as for the controller unit and the main computer. The rectified and—in the case of a UVR 3xx power supply unit—closed-loop DC-link voltage is directed through the IGBTs to the drive motors with controlled frequency and voltage. Control is accomplished by PWM signals.

The closed-loop DC-link voltage is DC650V or DC720 V for modular systems with a UVR 3xx.

The open-loop DC-link voltage is DC565V to DC 680V for UEC 3xx (FS) compact inverters.

Safety functions for external safety

HEIDENHAIN inverter systems make it possible to shut down the inverters centrally over special inputs for deleting the pulse release for PWM control of the IGBTs. This is equivalent to the STO safety function. The Gen 3 inverters also support a dual-channel SBC braking system via corresponding outputs directly on the inverter. In addition, the machine manufacturer can configure an SS1 stop reaction in which emergency stop braking to standstill is performed, controlled by the controller unit.

If needed, up to eight axis groups can be formed for which separate switch-off is possible (e.g., axes for the tool magazine). For controls without integrated functional safety (FS), the safety functions are triggered over a special PL module for the **drive enable**.

Integrated functional safety (FS)

HEIDENHAIN also offers control systems with integrated functional safety (FS). These control systems offer a series of safety functions (STO, SLS, SLP, SBC, SS1, SS2, and safe PLC program), as well as easy implementation of up to four safety-related operating modes.

Control systems with functional safety (FS) feature two independently operating, redundant safety channels that collect, process, and output all safety-relevant signals. For more information on this topic, please refer to the Gen 3 Drives Technical Manual and the Functional Safety (FS) Technical Manual.

Functional safety (FS) is scalable by means of software options. Only the number of safe motors that you actually need must be enabled. For more information on these software options, please refer to the brochure for your control:

Brochure	ID
TNC7	1364560-xx
TNC 640	1303179-xx
TNC 620	895922-xx
TNC 320	1113513-xx
TNC 128	827228-xx
CNC PILOT 640	896094-xx
MANUALplus 620	743682-xx

Modular inverters

Modular inverter systems consist of the following modules:

- A UVR supply unit, including the necessary additional components (e.g., KDR, line filter)
- Multiple UM power modules for axes and spindles
- One or more controller units and an HFL cable for controlling the inverters (HFL = HEIDENHAIN Fiber Link)
- Accessories such as the CMH 3xx or UP 3xx

In modular systems, the UVR 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 UMs are supplied with the necessary 24 V supply voltage over the 24 V bus mounting.

The controller unit is connected to the modular inverters via the HFL cable and drives the IGBTs by means of PWM signals.



UM 315

Compact inverters

Systems with compact inverters consist of the following components:

- A UEC 3xx (FS) compact inverter, including the necessary additional components (e.g. braking resistor)
- Optional: multiple UM power modules for axes and spindles
- Optional: a controller unit and an HFL cable for controlling the inverters (HFL = HEIDENHAIN Fiber Link)
- Optional: regenerative module
- Accessories such as the CMH 3xx or SM 3xx

The housing of the UEC 3xx (FS) compact inverters contains both the rectifier for producing the DC-link voltage and the IGBT full bridges for up to five motors. Compact inverters are available with a power rating of 15 kW to 30 kW. For the UEC 32x (FS) and UEC 33x (FS) an external braking resistor is required additionally; for the UEC 31x (FS) it is already integrated in the device. The compact inverters can be expanded to include additional inverters and controller units of the modular system in order, for example, to retrofit axes on a machine. These inverters and controller units are connected to the compact inverter via a 24 V bus mounting and a DC-link bus mounting. Please note that the total power consumption of the connected motors must not exceed the power rating of the compact inverter!

Additional power supply

Supply units and compact inverters additionally have a DC24 V output (X90 connector). This voltage is DC-link-buffered and can be used to supply the MC main computer and other control components with a 24 V power supply.

Failure rates

For HEIDENHAIN devices, such as control components, encoders, and motors, your HEIDENHAIN contact person can provide you with additional device-specific data upon request (such as failure rates and information on fault exclusion).



UEC 325 (FS)

Modular inverter systems

System overview

Power supply for connected modules

The current consumption of the electronics of the modular inverters and controller units is largely dependent on their power rating. Thus, in the planning stage of the control system, please check the current consumption of the DC24 V supply in the *Specifications*. The power supply unit's or compact inverter's own consumption does not need to be considered in this context.

The UVR power supply units and UEC compact inverters feature an additional integrated power pack that provides a DC 24 V voltage for the control system and other PLC components:

- Supply of components that are connected to the 24 V bus mounting of the inverter group (inverters and their brakes, controller units, and electrical cabinet version of the main computer)
- Supply of further control components such as the main computer in the operating panel, monitor, machine operating panel, PL modules, etc.
- Supply of machine-specific PLC components, such as 24 V relays

The integrated power adapter is buffered by the DC link, thereby ensuring that, in the event of a power failure, the connected components will continue to be supplied so that any concluding actions, such as the LIFTOFF function, can still be performed. A complete power failure must be considered separately. As the machine manufacturer, you should consider measures for the event of a power failure where applicable.

For the performance data of the power pack, please refer to the specifications. When planning, please also consider the power requirements of the connected inverters, encoders, and controller units, in addition to the HSCI/PLC components. If the power of the +24 V power pack in the UVR 3xx or UEC 3xx power supply unit is not sufficient, the PSL 330 low-voltage power supply unit can be used additionally. For further information on project planning, please refer to the Technical Manual of your inverter system.

The +24 V supply voltage is required for the complete control system as a safely separated voltage (PELV according to EN 61800-5-1). These safely separated circuits must not be mixed with or connected to supply circuits with basic insulation or other supply circuits.

Motor currents

The modular inverters and the compact inverters are available in grades that allow for excellent adaptation to the required motor currents or torques. In addition, the PWM frequency can be adjusted to the motor current. Please bear in mind that very high spindle speeds require a higher PWM frequency.

HFL cable and bus mounting

The individual modular inverters are connected via HFL cables (optical fiber), connectors for the 24 V bus mounting, and DC-link busbars. The HFL cables must be cut to the proper length or ordered on a reel for individual assembly, and are not included in delivery.

For all modular components, the connectors for the 24 V bus mounting and the DC-link busbars for the specific device are included in delivery.

In order to connect modular components (such as UM, CC, RM) to a UEC 3xx (FS) compact inverter, one jumper plug for the 24 V bus mounting must be ordered separately.



UVR 350

A HEIDENHAIN control system with a modular inverter system typically consists of the following components:

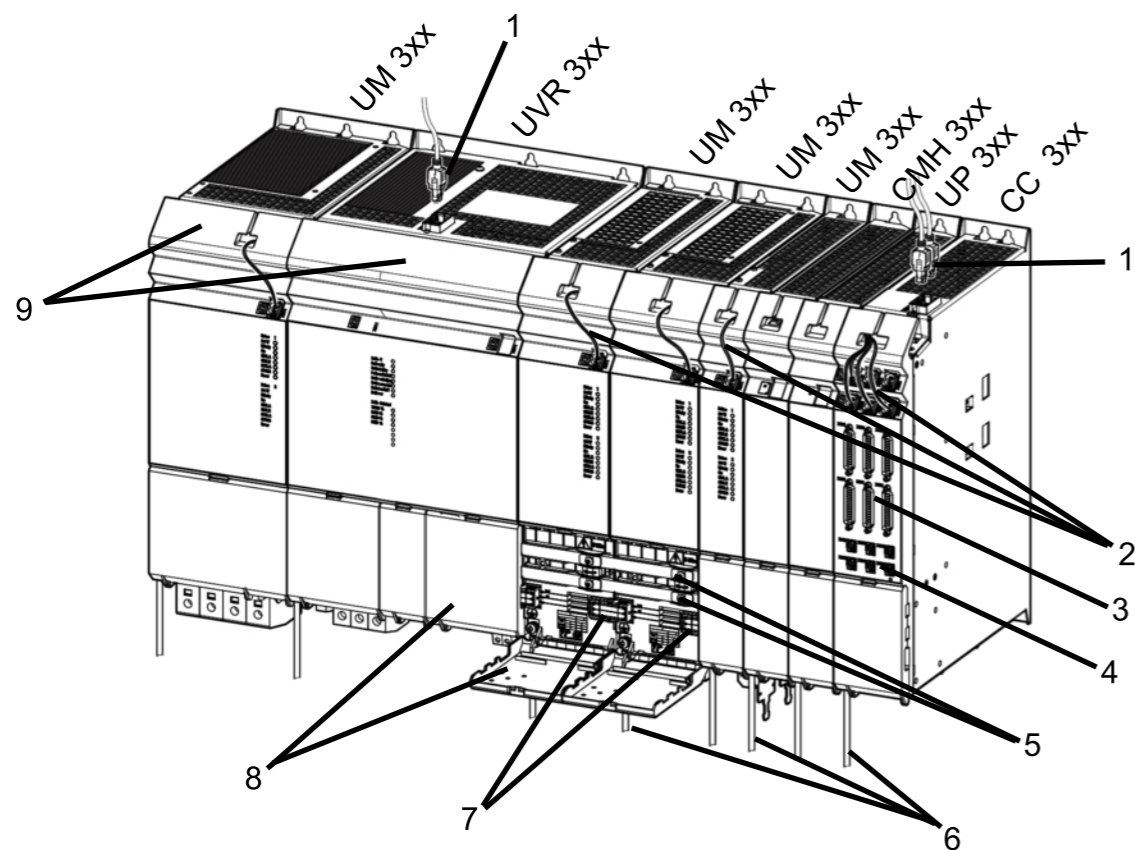
- MC main computer, monitor, keyboard, and machine operating panel
- PLB 62xx FS or PLB 62xx system PL and PAE-H 08-00-01
- CC 3xx controller unit
- UVR 3xx power supply unit
- UM 3xx modular inverters
- KDR 3xx commutating reactor
- Line filter for the UVR 3xx
- Siemens SITOP gR or gS line fuse
- UP 3xx braking resistor module (if necessary)
- Surge protector (if necessary)
- SM 3xx voltage protection module (if necessary)
- CMH 3xx capacitor module (if necessary)
- Shielded motor power cables
- Feed and spindle motors

The Gen 3 drives are notable for the following features:

- Higher peak and nominal currents with a more compact enclosure
- Fast Gbit HSCI communication all the way to the UVR 3xx power supply unit, for greater flexibility and improved diagnostics
- Digital HFL (HEIDENHAIN Fiber Link) cable for control of the inverters, for faster and interference-free data transfer
- Contiguous bus mounting for supply voltages (DC link, 24 V), allowing for very simple wiring and any arrangement or sequence of the power supply unit, power modules, controller unit, and main computer
- Hybrid connector for the connection of motor phases, the brake, and the shield with a single connecting element
- New, miniaturized connector technology for the connection of purely serial EnDat encoders



Example of the structure of a modular inverter system:



- 1 HSCI connection to the UVR and CC,
Gbit HSCI cable (ID 1257765-xx) or for > 35 m (ID 1306923-xx)
- 2 HFL cable (optical fiber cable) between the CC and UM with ID 1265351-xx (cut to length or on a roll)
- 3 Encoder inputs: 1 V_{PP} or EnDat
- 4 Encoder inputs: EnDat 2.2
- 5 DC-link bus mounting of the UVR and UM;
the required bars are supplied with the corresponding component
- 6 Protective conductor connection of each individual component;
comply with the specifications in the Technical Manual
- 7 +24 V bus mounting of the UVR, UM, CC, and accessories;
the required connectors are supplied with the corresponding component
- 8 Cover for DC-link connection and 24 V supply bar
- 9 Handle strip for carrying the components

Gbit HSCI

The introduction of the Gen 3 drives came with a transition to faster Gbit HSCI communication between the control components. Gbit HSCI enables the transmission of additional Gen 3 diagnostic data and can accommodate an expanded range of functions in the future. A transition to Gbit HSCI is therefore required for all HSCI components of the control system. Control components that support Gbit HSCI are labeled "Gen 3 ready" on the device. The ID numbers or variants of the required HSCI components (MC, MB, TE, HSCI cable) can be found in your control's Technical Manual.

Permissible number of components

Maximum permissible number of individual Gbit HSCI components as of NCK software 597110-16:

Gbit HSCI component		Maximum number in the control system ¹⁾
MC, IPC	HSCI master	1
CC, UEC (drive-control motherboards)	HSCI slave	6
UVR	HSCI slave	5
MB, PLB 600x	HSCI slave	2
PLB 6xxx (integrated in UEC 3xx (FS))	HSCI slave	7
PLB 6xxx FS (integrated in UEC 3xx FS)	HSCI slave	2
HR		5
PLD-H xx-xx-xx FS	In PLB 6xxx FS	10 ²⁾
PLD-H xx-xx-xx, PLA-H xx-xx-xx	In PLB 6xxx (FS)	25 ²⁾
PAE-H xx-xx-xx	In PLB 62xx	13 ³⁾
UEC 3xx for external safety	HSCI slave (PAE module integrated)	13 ³⁾

¹⁾ For more information on the NCK software, see the *Technical Manual* of the respective control.

²⁾ Total maximum of 1000 inputs/outputs and maximum of 10 PL units (PL, PLB, MB, TE)

³⁾ Only in systems without integrated functional safety (FS)

In an HSCI system, however, **up to 21 HSCI slaves** are permissible. During planning, please note that this maximum number must not be exceeded.

Differences between the inverter systems

Brief overview

The following images provide a comparison of the currently available inverter systems:



1xx inverter systems (UVR 1xx, UM 1xx, UE 2xx, UR 2xx, UEC 1xx)



Gen 3 drives

Inverter systems based on devices

Device/function	1xx inverter system	Gen 3 drives
Inverter	UM 1x1 to UM 1x7	UM 3x0 to UM 3x7
Power supply unit	UVR 130 to UVR 170 UV 130 D	UVR 330 to UVR 370 UEC 3xx (FS)
Controller unit	CC 6106, CC 6108, and CC 6110	CC 302, CC 306, CC 308, and CC 310
Compact inverter	UEC 1xx, UE 2xx, and UR 2xx	UEC 3xx (FS)
Regenerative module for compact inverter	None	RM 330
DC-link filter	ZKF 1x0	Not required
Commutating reactor	KDR 120 to KDR 170	KDR 330 to KDR 370
Line filter	EPCOS 35 A to 200 A	EPCOS 46 A to 202 A
DC-link capacitor module	CMH 120	CMH 320
Braking resistor module	UP 110 and UP 120	UP 310 and UP 320
Braking resistor	PW 210	PW 310
Power adapter	PSL 13x	Integrated in power supply unit or also PSL 330
External safety	Axis-enable module(s), ID 573732-xx	PAE-H 08-00-01, ID 1203881-xx
Wiring of the power modules	Ribbon cables for PWM signals, device bus, and supply bus	Optical fiber cables (HFL), bus mountings
Covers	Covers for ribbon cables	Not required
Multi-row configuration	MS 11x	Connection kits for convenient wiring
24 V capacitor module	CML 110, ID 574087-xx	Not required
Control components	MC, MB, TE, PLB with 100 Mbit HSCI	MC, MB, TE, PLB with Gbit HSCI
Motor power cables	Unshielded cables	Shielded cables
Adapter module	Adapter module, ID 352762-xx	Not required
Fan unit	For the UM 116D and UVR 170D, ID 749973-xx	Not required
Water cooling	Hose kit, ID 584862-01	Hose kit, ID 584862-01
Sine-wave drive	Not available	UMS 312
Cable extension module	Not available	CEM 330

Differences based on ID number

Power supply units

1xx inverter systems		Gen 3 drives	
UVR 120D	ID 1095625-xx	UVR 330	ID 1164511-xx
UVR 130D	ID 1095626-xx		
UVR 140D	ID 1084190-xx	UVR 340	ID 1168321-xx
UVR 150D	ID 1080611-xx	UVR 350	ID 1064350-xx
UVR 160D	ID 1095627-xx	UVR 360	ID 1118870-xx
UVR 160DW	ID 1095809-xx	UVR 360W	ID 1237086-xx
UVR 170D	ID 807429-xx	UVR 370	ID 1163158-xx
UVR 170DW	ID 546911-xx	UVR 370W	ID 1237088-xx
UV 130 D	ID 824215-xx	UEC 33x	To be designed by the machine manufacturer

Modular inverters

1xx inverter systems		Gen 3 drives	
UM 111D	ID 667945-xx	UM 310 ¹⁾	ID 1108101-xx
UM 111BD	ID 671968-xx	UM 311 ¹⁾	ID 1108147-xx
UM 112D	ID 731984-xx	UM 312	ID 1108153-xx
UM 113D	ID 730435-xx	UM 313	ID 1108164-xx
UM 114D	ID 671288-xx	UM 314	ID 1108167-xx
UM 115D	ID 671566-xx	UM 315	ID 1129203-xx
UM 116D	ID 667954-xx	UM 316	ID 1123915-xx
UM 116DW	ID 667946-xx	UM 316W	ID 1237090-xx
UM 117DW	ID 689572-xx	UM 317W	ID 1237092-xx
UM 121D	ID 667838-xx	UM 320 ¹⁾	ID 1073027-xx
UM 121BD	ID 667942-xx	UM 321 ¹⁾	ID 1107902-xx
UM 122D	ID 667633-xx	UM 322	ID 1043586-xx

¹⁾ Connectors for motor and brake connections must be ordered separately, ID 1249132-xx

Comply with the specifications for the modular inverters when migrating to the new inverter generation. The UM 3xx devices are more powerful than the previous UM 1xx units. Depending on the motor or drive system, it may be possible to use a smaller inverter with the UM 3xx devices.

Commutating reactors

1xx inverter systems		Gen 3 drives	
KDR 120	ID 344505-xx	KDR 330	ID 1164204-xx
KDR 130C	ID 646271-xx		
KDR 140	ID 333068-xx	KDR 340	ID 1164205-xx
KDR 150	ID 355253-xx	KDR 350	ID 1164206-xx
KDR 160	ID 573265-01	KDR 360	ID 1164276-xx
KDR 170	ID 735563-xx	KDR 370	ID 1164277-xx

Line filters

1xx inverter systems, without star point		Gen 3 drives, with star point S	
EPCOS 35 A	ID 676759-xx	EPCOS 46 A	ID 1169716-xx
EPCOS 80 A	ID 640908-xx	EPCOS 83 A	ID 1169717-xx
EPCOS 120 A	ID 575292-xx	EPCOS 135 A	ID 1169718-xx
EPCOS 200 A	ID 735542-xx	EPCOS 202 A	ID 1169719-xx

Braking resistor, capacitor, and voltage-protection modules

1xx inverter systems		Gen 3 drives	
UP 110	ID 341516-xx	UP 310	ID 1119332-xx
UP 120	ID 605731-xx	UP 320	ID 1119330-xx
SM 110	ID 368453-xx	SM 320	ID 1276063-xx
SM 130	ID 540739-xx	SM 330	ID 1237089-xx
CMH 120	ID 59116-01	CMH 320	ID 1164215-xx
PW 210	ID 333081-xx	PW 310	ID 1324061-xx

Controller units

1xx inverter systems		Gen 3 drives	
-		CC 302	ID 1243183-xx
CC 6106	ID 662636-xx	CC 306	ID 1074384-xx
CC 6108	ID 662637-xx	CC 308	ID 1074385-xx
CC 6110	ID 662638-xx	CC 310	ID 1243647-xx

Please note that, in contrast to the CC 61xx controller units, only half of the encoder inputs on a CC 3xx are designed for encoders with 1 V_{pp} or EnDat interface.

Compact inverters

1xx inverter systems		Gen 3 drives	
UEC 111	ID 1081002-xx	UEC 314	ID 1292240-xx
UEC 111 FS	ID 1075825-xx	UEC 314 FS	ID 1292241-xx
UEC 112	ID 1081003-xx	UEC 315	ID 1292235-xx
UEC 112 FS	ID 1075826-xx	UEC 315 FS	ID 1292237-xx
UEC 113	ID 828471-xx	UEC 31x + CC 302 + UM 3xx	To be designed by the machine manufacturer
UEC 113 FS	ID 1038694-xx	UEC 31x (FS) + CC 302 + UM 3xx	To be designed by the machine manufacturer
UMC 111 FS	ID 664231-xx	UMC 314 FS UMC 315FS	ID 1296746-xx ID 1296745-xx
UE 2xx	ID 733421-xx ID 733423-xx, ID 733424-xx, ID 733425-xx, ID 733426-xx, ID 733427-xx, ID 733428-xx	15 kW: UEC 31x (FS) 22kW: UEC 32x (FS)	To be designed by the machine manufacturer
UR 2xx	ID 741356-xx, ID 741357-xx, ID 741359-xx	22 kW: UEC 32x (FS) + RM 330	To be designed by the machine manufacturer

Comply with the specifications for the compact inverters when migrating to the new inverter generation. The UEC 3xx devices are more powerful than the previous compact inverters.

Connecting cables of the power modules and control components

1xx inverter systems		Gen 3 drives	
Ribbon cable for CC supply voltage	ID 325816-xx	Not required	
Ribbon cable for supply bus	ID 325816-xx	Not required	
Ribbon cable for device bus	ID 325817-xx	Not required	
Ribbon cable for PWM connection	ID 250479-xx	Optical fiber cable	ID 1265351-xx
Adapter module for temperature sensor	ID 336377-xx, ID 312533-xx	Can continue to be used at X40x of the CC 3xx	
HSCI cable	ID 618893-xx	Gbit HSCI cable	Up to and including 35 m: ID 1257765-xx From 40 m to 70 m: ID 1306923-xx
Monitor cable	ID 625901-xx	New HDL2 interface	ID 1161508-xx
PWM covers	ID 329031-xx, ID 538427-xx, ID 1102784-xx	Not required	
MS 11x	ID 658132-xx, ID 673685-xx	Connection kits for convenient wiring	ID 1274603-xx and ID 1278910-03

Panel MCs

1xx inverter systems		Gen 3 drives	
MC 7410	1039531-11	MC 8410 MC 8420	1175057-xx 1318472-xx
MC 7420	1066650-02		
MC 8410	1175057-01	MC 8420T	1213689-xx
MC 7410T	1034791-01		
MC 8420T	1213689-01		
MC 7522	1071597-02	MC 8512	1243919-xx
MC 8512	1243919-01		
MC 7532	1124449-01, -02	MC 8532	1189190-xx
MC 8532	1189190-01		
MC 366	1246689-01	MC 366 MC 366 (only for TNC7)	1246689-02 1246689-03

Monitors

1xx inverter systems – HDL		Gen 3 drives – HDL2	
BF 750	785080-01	–	
BF 760	732589-01		
BF 860	1169174-01	BF 860	1244875-xx
–		BF 360	1275079-xx

1xx inverter systems		Gen 3 drives	
MC 6541	1081185-02	MC 306	1180045-xx
MC 6542	1081188-03		
MC 6641	811550-02		

PLB modules

1xx inverter systems		Gen 3 drives	
PLB 6204	ID 1129809-01	PLB 6204	ID 1129809-02
PLB 6206	ID 1129812-01	PLB 6206	ID 1129812-02
PLB 6208	ID 1129813-01	PLB 6208	ID 1129813-02
PLB 6204 FS	ID 1129808-01	PLB 6204 FS	ID 1223032-01
PLB 6206 FS	ID 1129811-01	PLB 6206 FS	ID 1223033-01
PLB 6208 FS	ID 1129810-01	PLB 6208 FS	ID 1223034-01
		PLB 6210 FS	ID 1278134-xx
PLB 6104	ID 591828-xx	PLB 6104	ID 1129799-01
PLB 6106	ID 630058-xx	PLB 6106	ID 1129803-01
PLB 6108	ID 630059-xx	PLB 6108	ID 1129804-01
PLB 6104 FS	ID 590479-xx	PLB 6104 FS	ID 1129796-01
PLB 6106 FS	ID 804755-xx	PLB 6106 FS	ID 1129806-01
PLB 6108 FS	ID 804756-xx	PLB 6108 FS	ID 1129807-01

1xx inverter systems		Gen 3 drives	
MB 720	784803-02	MB 720	784803-03
MB 720 FS	805474-02	MB 720 FS	805474-03
MB 720T	1043707-02	MB 720T	1043707-03
MB 721	1164974-01	MB 721	1164974-02
MB 721 FS	1164975-01	MB 721 FS	1164975-02

Keyboard units

1xx inverter systems		Gen 3 drives	
TE 725T FS	1211940-01	TE 725T FS	1211940-02
TE 735	771898-02	–	
TE 735 FS	805493-02		
TE 735T	823058-02 1034924-02	–	
TE 745	679817-02 679817-12 1219757-01	TE 745	679817-13
TE 745 FS	805482-02 805482-12 1219759-01	TE 745 FS	805482-13
–		TE 360	1280184-xx 1284265-xx
–		TE 360 FS	1275710-xx 1284263-xx
		TE 361	1313011-xx
		TE 361 FS	1326583-xx
TE 745T	801306-03	TE 745T	801306-04

Special identification of suitability for use on Gen 3 drives

Special labels or stickers identify the suitability of control components for use in systems with Gen 3 drives:

- "Gen 3 ready" label:
Components bearing this label can be used in systems with Gen 3 drives (UVR 3xx, UM 3xx, CC 3xx) or in systems with a Gen 2 inverter system (UVR 1xx, UE 2xx, UR 2xx, CC 61xx).
Examples: MC 8410, MC 8512, MC 8532, MC 366, PLB 62xx, TE 745, TE 745 FS
- "Gen 3 exclusive" label:
Components bearing this label can be used only in systems with Gen 3 drives (UVR 3xx, UM 3xx, CC 3xx). These components are not supported in systems with a Gen 2 inverter system (UVR 1xx, UE 2xx, UR 2xx, CC 61xx).
Examples: New PLB 62xx FS, PAE-H

You will find the labels or stickers in the brochures describing your control components as well as on the packaging of the control components and on the components themselves.
The Gen 3 power modules, the CC 3xx controller unit, and the Gen 3-specific accessories, which are already clearly identifiable as belonging to Gen 3 based on their name and design, do not bear these labels.

Power supply unit

For UM 3xx inverters and other accessories, the UVR 3xx regenerative power supply unit produces the rectified DC-link voltage and the +24 V supply voltage from the connected line voltage. The DC-link voltage and the +24 V supply voltage are transmitted to the inverters and other accessories (e.g., CMH, UP, CC) via conductor bars. The CC 3xx controller unit controls the connected inverters with PWM signals sent over HFL cables.

During braking, the motors connected to the inverters can feed energy back into the DC link. The UVR 3xx feeds this energy back into the power supply network if there is such a connection. The power supply unit communicates with the control via the HSCI connection.

The UVR 3xx power supply units differ in terms of their permissible DC-link power. Refer to the specifications of the supply units.

The components required for operating the HEIDENHAIN power supply unit include the following:

- NC software with NCK version 597110-14 or higher
- MC main computer
- System PL PLB 62xx FS or PLB 62xx and PAE-H 08-00-01
- CC 3xx controller unit
- UM 3xx or UMC 3xx modular inverters
- KDR 3xx commutating reactor
- Line filter for the UVR 3xx
- Siemens SITOR gR or gS line fuse
- UP 3xx braking resistor module (if necessary)
- Surge protector (if necessary)
- SM 3xx voltage protection module (if necessary)
- CMH 3xx capacitor module (if necessary)

The total simultaneously required power of all connected UM 3xx inverters and motors must not exceed the power rating of the UVR 3xx power supply unit.



UVR 330

Power supply unit	UVR 330	UVR 340
Power supply (input side)	3AC 400 V (-10 %)³) to 3AC 480 V (+6 %)	
Rated frequency	50 / 60 Hz (50 Hz or 60 Hz)	
Phase conductor current at rated power (input side at 3AC 400 V)	46 A	68 A
Connected load (input side)	32 kW	47 kW
DC-link voltage (output side)	DC 650 V or DC 720 V	
DC-link rated power	30 kW	45 kW
DC-link power during periodic S6-40 % duty¹)	45 kW	65 kW
Maximum DC-link power ²)	60 kW	90 kW
Minimum conductor cross section and line type for power supply at X31 as per DIN VDE 0298-4 (according to table NEC 310-16)	H07 V2-K single conductor: 10 mm² (AWG 6), at least 80 °C, copper, at least AC 480 V, routing type: B1, C, or E	H07 V2-K single conductor: 16 mm² (AWG 4), at least 80 °C, copper, at least AC 480 V, routing type: B1, C, or E
Siemens SITOR gR or gS line fuse	50 A 3NE1817-0, gS or 3NE8017-1, gR	80 A 3NE1820-0, gS or 3NE1020-2, gR
Integrated power adapter with 24 V power supply	Max. 1 kW, 40 A	
Cooling method	Integrated fans	
Protection class	IP20	
Power loss during rated operation P _v	For information on the power loss values, please refer to the Technical Manual for the Gen 3 drives.	
NRTL approval	Yes	Yes
Module width	150 mm	200 mm
Mass	12.5 kg	18.5 kg
ID	1164511-xx	1168321-xx

¹) S6-40 %: at 4 minutes, 1.4-fold rated power; at 6 minutes, 0.4-fold rated power

²) Maximum power: at 4 seconds, 2-fold rated power; at 16 seconds, 0.4-fold rated power

³) Derating: If you reduce the supply voltage of 3AC 400 V by 10 %, the permissible power output likewise decreases by 10 %.

Power supply unit	UVR 350	UVR 360 UVR 360W	UVR 370 UVR 370W
Power supply (input side)	3AC 400 V (-10 %) ³⁾ to 3AC 480 V (+6 %)		
Rated frequency	50 / 60 Hz (50 Hz or 60 Hz)		
Phase conductor current at rated power (input side at 3AC 400 V)	83 A	135 A	202 A
Connected load (input side)	58 kW	94 kW	140 kW
DC-link voltage (output side)	DC 650 V or DC 720 V		
DC-link rated power	55 kW	90 kW	135 kW
DC-link power during periodic S6-40 % duty ¹⁾	80 kW	130 kW	190 kW
Max. power of DC link (4 s with 20 s cycle duration) ²⁾	110 kW	180 kW	270 kW
Minimum conductor cross section and line type for power supply at X31 as per DIN VDE 0298-4 (according to table NEC 310-16)	H07 V2-K single conductor: 25 mm ² (AWG 3), at least 80 °C, copper, at least AC 480 V, routing type: B1, C, or E	H07 V2-K single conductor: 50 mm ² (AWG 1/0), at least 80 °C, copper, at least AC 480 V, routing type: C or E	H07 V2-K single conductor: 95 mm ² (AWG 4/0), at least 80 °C, copper, at least AC 480 V, routing type: C or E
Siemens SITOP gR or gS line fuse	100 A 3NE1021-0, gS or 3NE1021-2, gR	160 A 3NE1224-0, gS or 3NE1224-2, gR	250 A 3NE1227-0, gS or 3NE1227-2, gR
Integrated power adapter with 24 V power supply	Max. 1 kW, 40 A		
Cooling method	Integrated fans	UVR 360: integrated fans UVR 360W: water	UVR 370: integrated fans UVR 370W: water
Protection class	IP20		
Power loss during rated operation P_V	For information on the power loss values, please refer to the Technical Manual for the Gen 3 drives.		
NRTL approval	Yes	Only with variant -03 or higher	Only with variant -03 or higher
Module width	200 mm	250 mm	250 mm
Mass	19 kg	22 kg	22 kg
ID	1064350-xx	UVR 360: 1118870-xx UVR 360W: 1237086-xx	UVR 370: 1163158-xx UVR 370W: 1237088-xx

¹⁾ S6-40 %: at 4 minutes, 1.4-fold rated power; at 6 minutes, 0.4-fold rated power

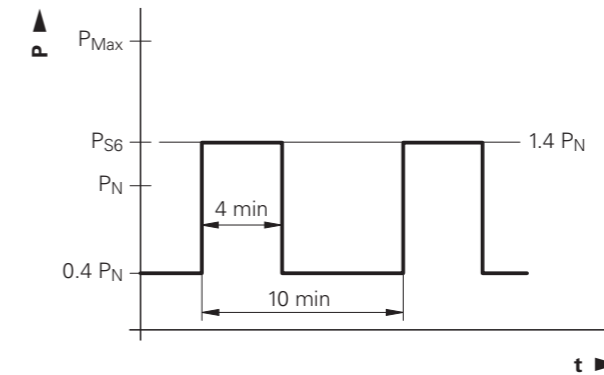
²⁾ Maximum power: at 4 seconds, 2-fold rated power; at 16 seconds, 0.4-fold rated power

³⁾ Derating: If you reduce the supply voltage of 3AC 400 V by 10 %, the permissible power output likewise decreases by 10 %.

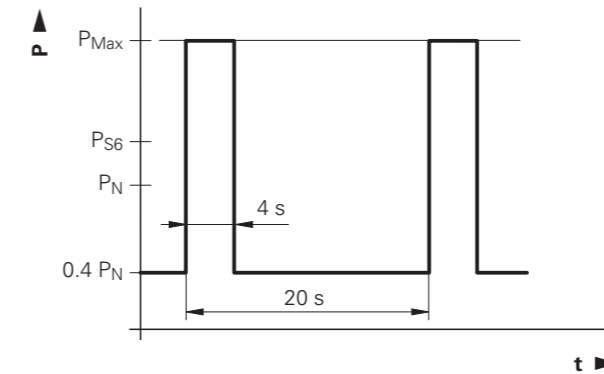
Load cycles of the supply units

Load cycles of the UVR 3xx supply units and the integrated supply units in the UEC 3xx (FS)

Load cycle for DC link power during periodic S6-40% operation:



Load cycle for DC link maximum power:



Modular inverters

Accessories for the UVR 3xx power supply units

Power supply unit	UVR 330	UVR 340
HSCI cable (mandatory)	Gbit HSCI cable	Gbit HSCI cable
Siemens SITOR gR or gS line fuse (mandatory)	50 A 3NE1817-0, gS or 3NE8017-1, gR	80 A 3NE1820-0, gS or 3NE1020-2, gR
Commutating reactor (mandatory)	KDR 330	KDR 340
Line filter (mandatory)	EPCOS 46A	EPCOS 83A
Braking resistor (optional)	UP 310	UP 310 or UP 320
Surge protector (optional)	VAL-MS 230/FM	VAL-MS 230/FM
Cooling method (device-specific)	Integrated fans	
Bus mounting of DC link and 24 V supply voltage (mandatory)	Included with the device	
Inverter (mandatory)	UM 3xx	

Power supply unit	UVR 350	UVR 360 UVR 360W	UVR 370 UVR 370W
HSCI cable (mandatory)	Gbit HSCI cable	Gbit HSCI cable	Gbit HSCI cable
Siemens SITOR gR or gS line fuse (mandatory)	100 A 3NE1021-0, gS or 3NE1021-2, gR	160 A 3NE1224-0, gS or 3NE1224-2, gR	250 A 3NE1227-0, gS or 3NE1227-2, gR
Commutating reactor (mandatory)	KDR 350	KDR 360	KDR 370
Line filter (mandatory)	EPCOS 83A	EPCOS 135A	EPCOS 202A
Braking resistor (optional)	UP 310 or UP 320	UP 320	2 x UP 320
Surge protector (optional)	VAL-MS 230/FM	VAL-MS 230/FM	FLT-SEC-T1+T2-3C-350/25-FM
Cooling method (device-specific)	Integrated fans	UVR 360: integrated fans UVR 360W: coolant hose	UVR 370: integrated fans UVR 370W: coolant hose
Bus mounting of DC link and 24 V supply voltage (mandatory)	Included with the device		
Inverter (mandatory)	UM 3xx		

An inverter is a power module (DC-AC inverter) that provides the energy for the connected motor or motors. For UM 3xx modular inverters, the UVR 3xx power supply unit generates the rectified DC-link supply voltage. The DC-link voltage is transmitted to the inverters via conductor bars, and the +24 V supply voltage is transmitted to the inverters via jumper plugs. The CC 3xx controller unit controls the connected modular inverters by means of PWM signals over HFL cables.

The UM 3xx inverters differ in the number of axes they support and the maximum currents they permit. The UM 31x inverter can be used to operate no more than one motor, and the UM 32x inverter can be used to operate up to two motors.

The components required for operating the modular HEIDENHAIN inverters include the following:

- MC main computer
- PLB 62xx FS or PLB 62xx system PL and PAE-H 08-00-01 or UEC 3xx with integrated system PL
- CC 3xx controller unit
- UVR 3xx or UEC 3xx power supply unit
- KDR 3xx commutating reactor
- Line filter for the UVR 3xx
- UP 3xx braking resistor module (if necessary)
- Surge protector (if necessary)
- SM 3xx voltage protection module (if necessary)
- Further HEIDENHAIN UM 3xx modular inverters (if necessary)
- CMH 3xx capacitor module (if necessary)

The UM 3xx inverters can be combined as desired, but the total required power of all connected UM 3xx inverters or motors must not exceed the power rating of the UVR 3xx power supply unit.



UM 314

Modular inverter	UM 310	UM 311	UM 312
Power supply	DC-link: DC 509 V to DC 720 V		
Rated current (DC 650 V, PWM frequency of 5 kHz, at rotational frequencies > 10 Hz) ¹⁾	12 A	21 A	35 A
Conductor cross section for the X8x and X38x motor connections	The required conductor cross section depends on the rated current of the inverter and the connected motor, as well as on the operating mode, the type of cable, and its manner of routing. It must be determined and protected by the machine manufacturer. The values indicated below are for operating mode 1 and a motor cable with an operating temperature of at least 80 °C. The machine manufacturer must determine the cross sections for other operating modes.		
Minimum conductor cross section for motor connections X8x, X38x at PWM frequency ≥ 3.33 kHz, as per DIN VDE 0298-4 (according to table NEC 310-16)	Min. 1.5 mm ² (AWG 14)	Min. 4 mm ² (AWG 12)	Min. 6 mm ² (AWG 8)
Minimum conductor cross section for motor connections X8x, X38x at PWM frequency ≥ 5 kHz, as per DIN VDE 0298-4 (according to table NEC 310-16)	Min. 1.5 mm ² (AWG 14)	Min. 2.5 mm ² (AWG 12)	Min. 6 mm ² (AWG 8)
Conductor type, type of routing for the specified minimum conductor cross section	Shielded cable, copper, 600/1000 V, resistant to oil and lubricants, routing type: C		
Current consumption at 24 V via bus mounting, without current for brake control: Maximum value (fans at max. speed) and value during standby (fans off)	Max. 0.7 A Standby 0.3 A	Max. 0.7 A Standby 0.3 A	Max. 1.3 A Standby 0.3 A
Power loss during rated operation P_V	For information on the power loss values, please refer to the Technical Manual for the Gen 3 drives.		
Cooling method	Integrated fans with temperature control		
Max. output current per braking connection (+24 V, HSLS)	2.5 A		
Protection class	IP20		
Maximum permissible PWM frequency	16 kHz		
NRTL approval	Yes	Yes	Yes
Module width	50 mm	50 mm	100 mm
Mass	5 kg	5 kg	7.5 kg
ID	1108101-xx	1108147-xx	1108153-xx

¹⁾ Derating at rotating field frequencies < 10 Hz: see *Derating of the output currents*

Modular inverter	UM 313	UM 314	UM 315
Power supply	DC-link: DC 509 V to DC 720 V		
Rated current (DC 650 V, PWM frequency of 5 kHz, at rotational frequencies > 10 Hz) ¹⁾	60 A	90 A	130 A
Conductor cross section for the X8x and X38x motor connections	The required conductor cross section depends on the rated current of the inverter and the connected motor, as well as on the operating mode, the type of cable, and its manner of routing. It must be determined and protected by the machine manufacturer. The values indicated below are for operating mode 1 and a motor cable with an operating temperature of at least 80 °C. The machine manufacturer must determine the cross sections for other operating modes.		
Minimum conductor cross section for motor connections X8x, X38x at PWM frequency ≥ 3.33 kHz, as per DIN VDE 0298-4 (according to table NEC 310-16)	Min. 16 mm ² (AWG 4)	Min. 35 mm ² (AWG 2)	Min. 70 mm ² (AWG 2/0)
Minimum conductor cross section for motor connections X8x, X38x at PWM frequency ≥ 5 kHz, as per DIN VDE 0298-4 (according to NEC 310-16)	Min. 16 mm ² (AWG 6)	Min. 25 mm ² (AWG 2)	Min. 50 mm ² (AWG 1)
Conductor type, type of routing for the specified minimum conductor cross section	Shielded cable, copper, 600/1000 V, resistant to oil and lubricants, routing type: C		
Current consumption at 24 V via bus mounting, without current for brake control: Maximum value (fans at max. speed) and value during standby (fans off)	Max. 1.3 A Standby 0.3 A	Max. 1.3 A Standby 0.3 A	Max. 2.1 A Standby 0.3 A
Power loss during rated operation P_V	For information on the power loss values, please refer to the Technical Manual for the Gen 3 drives.		
Cooling method	Integrated fans with temperature control		
Max. output current per braking connection (+24 V, HSLS)	2.5 A		
Protection class	IP20		
Maximum permissible PWM frequency	16 kHz		
NRTL approval	Yes	Yes	Yes
Module width	100 mm	100 mm	150 mm
Mass	9.5 kg	10 kg	17 kg
ID	1108164-xx	1108167-xx	1129203-xx

¹⁾ Derating at rotating field frequencies < 10 Hz: see *Derating of the output currents*

Modular inverter	UM 316 UM 316W	UM 317 UM 317W
Power supply	DC-link: DC 509 V to DC 720 V	
Rated current (DC 650 V, PWM frequency of 5 kHz, at rotational frequencies > 10 Hz) ¹⁾	230 A	320 A
Conductor cross section for the X8x and X38x motor connections	The required conductor cross section depends on the rated current of the inverter and the connected motor, as well as on the operating mode, the type of cable, and its manner of routing. It must be determined and protected by the machine manufacturer. The values indicated below are for operating mode 1 and a motor cable with an operating temperature of at least 80 °C. The machine manufacturer must determine the cross sections for other operating modes.	
Minimum conductor cross section for motor connections X8x, X38x at PWM frequency ≥ 3.33 kHz, as per DIN VDE 0298-4 (according to table NEC 310-16)	Min. 120 mm ² or 2 x 50 mm ² (300 kcmil or 2 x AWG 2/0)	Min. 2 x 70 mm ² (2 x AWG 4/0)
Minimum conductor cross section for motor connections X8x, X38x at PWM frequency ≥ 5 kHz, as per DIN VDE 0298-4 (according to table NEC 310-16)	Min. 95 mm ² or 2 x 50 mm ² (250 kcmil or 2 x AWG 2/0)	Min. 2 x 70 mm ² (2 x AWG 3/0)
Conductor type, type of routing for the specified minimum conductor cross section	Shielded cable, copper, oil and lubricant-resistant, 600/1000 V, routing type: C	
Current consumption at 24 V via bus mounting, without current for brake control Maximum value (fans at max. speed) and value during standby (fans off)	UM 316 max. 3.9 A UM 316W max. 0.7 A Standby 1.3 A	UM 317 max. 3.9 A UM 317 standby 1.4 A UM 317W max. 1.0 A UM 317W standby 1.0 A
Power loss during rated operation P _v	For information on the power loss values, please refer to the Technical Manual for the Gen 3 drives.	
Cooling method	UM 316: integrated fans with temperature control UM 316W: water	UM 317: integrated fans with temperature control UM 317W: water
Max. output current per braking connection (+24 V, HSLS)	2.5 A	
Protection class	IP20	
Maximum permissible PWM frequency	16 kHz	
NRTL approval	Yes	Yes
Module width	200 mm	200 mm
Mass	UM 316: 25 kg UM 316W: 17 kg	UM 317: 27 kg UM 317W: 19 kg
ID	UM 316: 1123915-xx UM 316W: 1237090-xx	UM 317: 1145290-xx UM 317W: 1237092-xx

¹⁾ Derating at rotating field frequencies < 10 Hz: see *Derating of the output currents*

Modular inverter	UM 320	UM 321	UM 322
Power supply	DC-link: DC 509 V to DC 720 V		
Rated current per drive (DC 650 V, PWM frequency of 5 kHz, at rotational frequencies > 10 Hz) ¹⁾	12 A	21 A	35 A
Conductor cross section for the X8x and X38x motor connections	The required conductor cross section depends on the rated current of the inverter and the connected motor, as well as on the operating mode, the type of cable, and its manner of routing. It must be determined and protected by the machine manufacturer. The values indicated below are for operating mode 1 and a motor cable with an operating temperature of at least 80 °C. The machine manufacturer must determine the cross sections for other operating modes.		
Minimum conductor cross section for motor connections X8x, X38x at PWM frequency ≥ 3.33 kHz, as per DIN VDE 0298-4 (according to table NEC 310-16)	Min. 1.5 mm ² (AWG 14)	Min. 4 mm ² (AWG 12)	Min. 10 mm ² (AWG 8)
Minimum conductor cross section for motor connections X8x, X38x at PWM frequency ≥ 5 kHz, as per DIN VDE 0298-4 (according to table NEC 310-16)	Min. 1.5 mm ² (AWG 14)	Min. 2.5 mm ² (AWG 12)	Min. 6 mm ² (AWG 8)
Conductor type, type of routing for the specified minimum conductor cross section	Shielded cable, copper, 600/1000 V, resistant to oil and lubricants, routing type: C		
Current consumption at 24 V via bus mounting, without current for brake control Maximum value (fans at max. speed) and value during standby (fans off)	Max. 1.3 A Standby 0.4 A	Max. 1.3 A Standby 0.4 A	Max. 1.7 A Standby 0.4 A
Power loss during rated operation P _v	For information on the power loss values, please refer to the Technical Manual for the Gen 3 drives.		
Cooling method	Integrated fans with temperature control		
Max. output current per braking connection (+24 V, HSLS)	2.5 A		
Protection class	IP20		
Maximum permissible PWM frequency	10 kHz		
NRTL approval	Yes	Yes	Yes
Module width	50 mm	50 mm	100 mm
Cooling method	Fans		
Mass	6 kg	6 kg	10 kg
ID	1073027-xx	1107902-xx	1043586-xx

¹⁾ Derating at rotating field frequencies < 10 Hz or DC-link voltage = DC 720 V: see *Derating of the output currents*

Output currents

Output currents of the UM 3xx modular inverters based on the PWM frequency at a DC-link voltage of DC 650 V:

Currents	PWM frequency	UM 310, UM 320	UM 311, UM 321	UM 312, UM 322	UM 313
Rated current I_{Nr} , BM 1 Current $0.7 \cdot I_{Nr}$, BM 2 Current S6-40 %, BM 3 Maximum current I_{MaxAC} , BM 4, 5	3.3 kHz	14 A 9.5 A 20 A 28 A	24.5 A 17 A 35 A 49 A	40 A 28 A 57 A 80 A	70 A 49 A 99 A 140 A
	4.0 kHz	13 A 9 A 18 A 26 A	23 A 16 A 32.5 A 46 A	38 A 26.5 A 53.5 A 76 A	66 A 46 A 93 A 132 A
	5.0 kHz	12 A 8.5 A 17 A 24 A	21 A 14.5 A 30 A 42 A	35 A 24.5 A 50 A 70 A	60 A 42 A 85 A 120 A
	6.6 kHz	11 A 7.5 A 15.5 A 22 A	19 A 13.5 A 27 A 38 A	31.5 A 22 A 44.5 A 63 A	54 A 37.5 A 76 A 108 A
8.0 kHz	10 A 7 A 14 A 20 A	17.5 A 12 A 24.5 A 35 A	28.5 A 20 A 40 A 57 A	49 A 34.5 A 69 A 98 A	
	10 kHz	8.5 A 6 A 12 A 17 A	15 A 10.5 A 21 A 30 A	24 A 17 A 34 A 48 A	42 A 29.5 A 60 A 84 A
	13.3 kHz ¹⁾	7 A 5 A 10 A 14 A	12 A 8.5 A 17 A 24 A	19.5 A 13.5 A 27.5 A 39 A	35 A 24.5 A 49 A 70 A
	16.0 kHz ¹⁾	6 A 4 A 8.5 A 12 A	10 A 7 A 14 A 20 A	16 A 11 A 23 A 32 A	29 A 20.5 A 41 A 58 A

¹⁾ Not for UM 32x

For UM 32x modular inverters for two drives, the following applies:

The stated output current is the current for each drive. In cyclic operation (S6-40 %), however, only one of the two drives may be operated.

For a description of the BM x operating modes or load cycles, please refer to Page 35.

PWM frequencies > 5 kHz require software option 49.

Output currents of the UM 3xx modular inverters based on the PWM frequency at a DC-link voltage of DC 650 V:

Currents	PWM frequency	UM 314	UM 315	UM 316 UM 316W	UM 317 UM 317W
Rated current I_{Nr} , BM 1 Current $0.7 \cdot I_{Nr}$, BM 2 Current S6-40 %, BM 3 Maximum current I_{MaxAC} , BM 4, 5	3.3 kHz	99 A 69.5 A 140 A 198 A	142 A 99.5 A 200 A 284 A	265 A 185.5 A 295 A 375 A	350 A 245 A 400 A 500 A
	4.0 kHz	95 A 66.5 A 134 A 190 A	137 A 96 A 193 A 274 A	251 A 175.5 A 281 A 354 A	338 A 236.5 A 384 A 477 A
	5.0 kHz	90 A 63 A 127 A 180 A	130 A 91 A 184 A 260 A	230 A 161 A 260 A 325 A	320 A 224 A 360 A 455 A
	6.6 kHz	80 A 56 A 113 A 160 A	117 A 82 A 165 A 234 A	205 A 143.5 A 233 A 289 A	287 A 201 A 323 A 405 A
8.0 kHz	72 A 50.5 A 102 A 144 A	106 A 74 A 150 A 212 A	186 A 130 A 212 A 262 A	260 A 182 A 294 A 367 A	
	10 kHz	60 A 42 A 85 A 120 A	90 A 63 A 127 A 180 A	156 A 109 A 180 A 220 A	220 A 154 A 250 A 310 A
	13.3 kHz	49.5 A 34.5 A 70 A 99 A	74.5 A 52 A 105 A 149 A	130 A 91 A 150 A 183 A	181 A 126.5 A 206 A 255 A
	16.0 kHz	41 A 28.5 A 58 A 82 A	62 A 43.5 A 88 A 124 A	110 A 77 A 125 A 156 A	150 A 105 A 170 A 212 A

For a description of the BM x operating modes or load cycles, please refer to Page 35.

PWM frequencies > 5 kHz require software option 49.

Planning and selection of the inverter

The selection of the inverter depends on the currents required by the connected motor. In many cases, the inverter is selected based on the stall current of the motor being used. For selection of the inverter, HEIDENHAIN recommends the following:

For a feed axis without a weight load or without a high load from process forces, or for a spindle:

- Rated current of the inverter (rotating field frequency > 10 Hz or BM 1 operating mode) ≥ motor stall current

For feed axes with a weight load or with a high load from process forces, make sure to consider the derating of the inverter output current mentioned below:

- Rated derating current (current at a rotating field frequency < 10 Hz or operating mode BM 2) ≥ Motor stall current where: Rated derating current (BM 2) = Rated current of the inverter (rotating field frequency > 10 Hz) · 0.7

Derating of the output currents

Derating based on the rotating field frequency of the motor:

At rotating field frequencies of < 10 Hz (electrical frequency), the following derating must be considered for the limit values of the output currents:

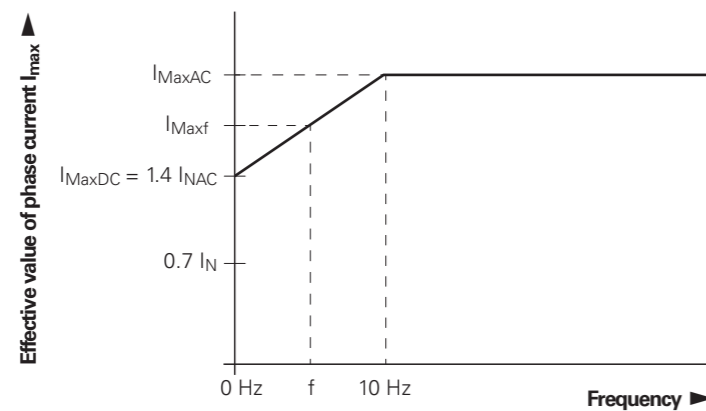
Current value from the specification tables (BM 1) · 0.7 = Current at rotating field frequencies of < 10 Hz or BM 2 operating mode

Example:

Rated current of the UM 314 (5 kHz, rotating field frequency > 10 Hz) = 90 A (BM 1)

Rated current of the UM 314 (5 kHz, rotating field frequency = 0 Hz) = 90 A · 0.7 = 63 A (BM 2)

In addition, a further derating must be taken into account for the maximum current at standstill. The following applies: $I_{MaxDC} = 1.4 \cdot I_{NAC}$. The image below illustrates this relationship:



Derating based on the DC-link voltage:

At a DC-link voltage that is constantly greater than DC 650 V (e.g., DC 680 V or DC 720 V; for example, with connection to a grid with 3AC 480 V), a 10% derating of the rated currents must be taken into account.

UMS 3xx

A sine-wave drive is a power module (DC-AC inverter) that provides the energy for the connected motor or motors as a sinusoidal output voltage.

General information

For UMS 3xx modular sine-wave drives, the UVR 3xx power supply unit generates the rectified DC-link supply voltage. The DC-link voltage is transmitted to the inverters via conductor bars, and the +24 V supply voltage is transmitted to the inverters via jumper plugs. The CC 3xx controller unit controls the connected modular (sine-wave) inverters by means of PWM signals over HFL cables.

The UMS 3xx sine-wave drive is compatible with the UVR 3xx and UEC 3xx(FS) power supply units. In contrast to the UM 3xx inverters, the sine-wave drives provide a nearly sinusoidal output voltage or a sinusoidal current at the output terminals. This significantly reduces the current harmonics occurring at the motor, which is particularly advantageous for high speed spindles:

- Higher speeds especially for HF spindles (speeds up to 180,000 rpm, rotating field frequencies up to 3 kHz)
- Lower voltage load for motor winding with long cable lengths
- Avoidance of static charges in the spindle rotor (spark erosion)
- Compact solution compared to external solutions (all-in-one instead of required external filters)

A UMS 312 sine-wave drive can be used to operate no more than one motor.

Please note that shielded motor power cables may be used only to connect the UMS 312.

The components required for operating the modular HEIDENHAIN sine-wave drives in an inverter network include the following:

- NC software with NCK version 597110-16 or higher
- MC main computer
- System PL PLB 62xx FS or PLB 62xx and PAE-H 08-00-01 or UEC 3xx with integrated system PL
- CC 3xx controller unit
- UVR 3xx power supply unit or UEC 3xx (FS) and the associated necessary accessories
- UP 3xx braking resistor module (if necessary)
- Surge protector (if necessary)
- Voltage protection module SM 3xx as needed (for the need of a voltage protection module, the same conditions apply to the UMS as to a UM 3xx)
- Further HEIDENHAIN UM 3xx modular inverters (if necessary)
- CMH 3xx capacitor module (if necessary)

The UM 3xx and UMS 3xx inverters can be combined as desired, but the total required power of all connected UM 3xx and UMS 3xx inverters or motors must not exceed the power rating of the UVR 3xx power supply unit or the UEC 3xx (FS) compact inverter.



UMS 312

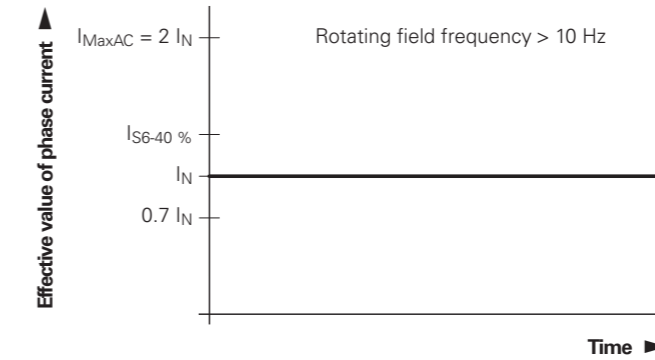
Specifications

Modular inverter	UMS 312
Power supply	DC-link DC 509 to DC 720V
Rated current, BM 1 (DC 650 V, for rotational frequencies > 10 Hz) ¹⁾	40 A
Current 0.7 · I _N , BM 2	28 A
Current S6-40 %, BM 3	50 A
Maximum current in BM 4, BM 5 (DC 650 V, for rotational frequencies > 10 Hz)	60 A
Conductor cross section for X8x motor connections	The required conductor cross section depends on the rated current of the inverter and the connected motor, as well as on the operating mode, the type of cable, and its manner of routing. It must be determined and protected by the machine manufacturer, if necessary. The values indicated below are for operating mode 1 and a motor cable with an operating temperature of at least 80 °C. The machine manufacturer must determine the cross sections for other operating modes.
Minimum conductor cross section for motor connections X8x as per DIN VDE 0298-4 (according to Table NEC 310-16)	Min. 6 mm ² (AWG 8)
Conductor type, type of routing for the specified minimum conductor cross section	Shielded cable, copper, 600/1000 V, resistant to oil and lubricants, routing type: C
Current consumption at 24 V via bus mounting, without current for brake control: Maximum value (fans at max. speed) and value during standby (fans off)	Max. 2.0 A Standby 1.0 A
Cooling method	Integrated, temperature-controlled fans
Max. output current per braking connection (+24 V, HSLS)	2.5 A
Protection class	IP20
Permissible PWM frequencies for the control loop	5 kHz, 10 kHz or 16 kHz
Maximum possible rotating field frequency	3 kHz
NRTL approval	Yes
Module width	100 mm
Mass	11 kg
ID	1296558-xx

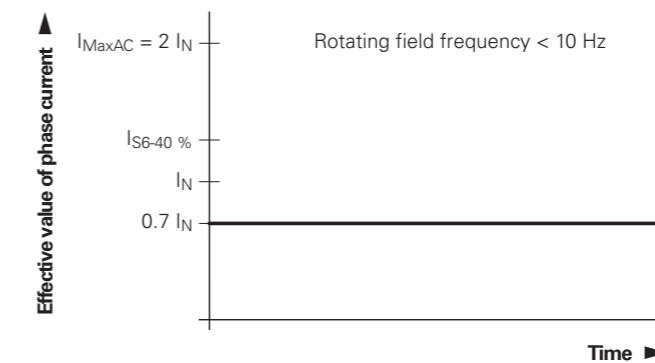
¹⁾ Derating at rotational frequencies < 10 Hz or DC-link voltage = DC 720 V: see *Derating of the output currents*

Load cycles or operating modes of the motor outputs on UM 3xx, UEC 3xx (FS), UMC 3xx (FS)

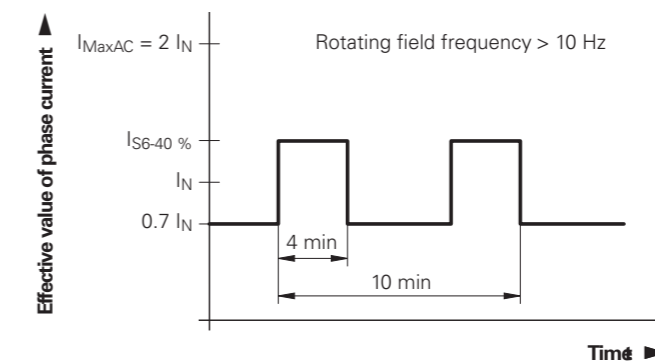
BM 1 operating mode, rated current at rotating field frequencies > 10 Hz (electrical frequency):



BM 2 operating mode, rated current at rotating field frequencies > 10 Hz (electrical frequency):



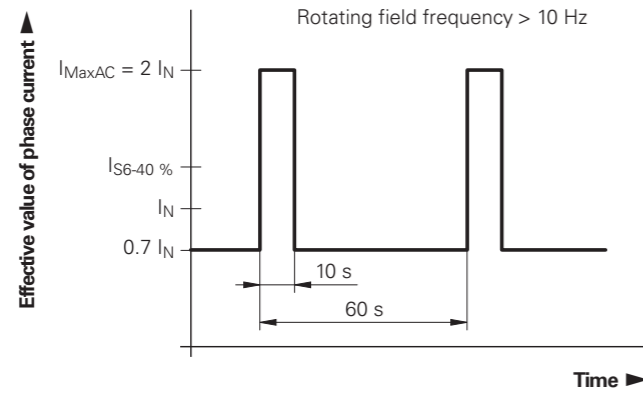
BM 3 operating mode, current at S6-40% at rotating field frequencies > 10 Hz (electrical frequency):



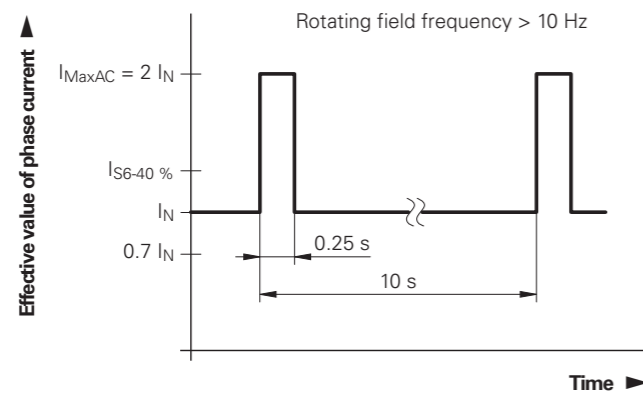
The BM3 operating mode is not supported on the UMC 3xx(FS)!

Controller unit

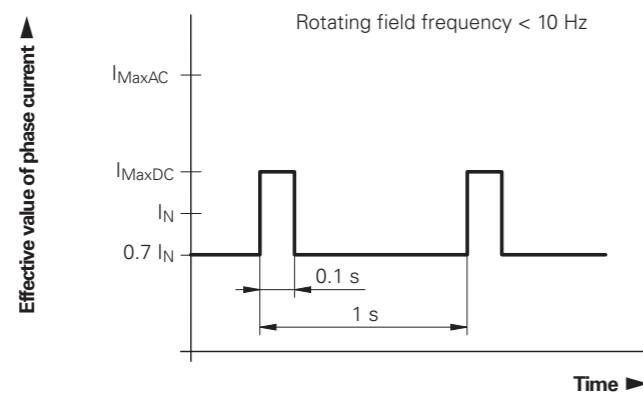
BM 4 operating mode, maximum current at rotating field frequencies > 10 Hz (electrical frequency) I_{Max} or I_{MaxAC} :



BM 5 operating mode, maximum current at rotating field frequencies > 10 Hz (electrical frequency) and rated current between the pulses I_{Max} or I_{MaxAC} :



BM 6 operating mode, maximum current at rotating field frequencies < 10 Hz (electrical frequency) I_{MaxDC} or $I_{Maxf < 10Hz}$:



Due to the very short cycle times of their integrated position, speed, and current feedback control, controller units from HEIDENHAIN are equally suitable for conventional motors, direct drive motors (linear motors, torque motors), and HSC spindles. They allow for high control-loop gain and short reaction times to changing machining forces, thereby enabling high contour fidelity and workpiece surface quality. The CC 3xx controller unit is connected to the other control components over HSCI, and it controls the connected modular inverters with PWM signals over HFL cables.

The CC 3xx controller units differ in terms of the number of possible control loops and thus also by the number of connectable encoders. The CC 3xx does not differentiate between a position or speed encoder at the encoder inputs. The type of connected encoder is determined solely based on the configuration of the controller unit by the machine manufacturer. Half of the encoder inputs of a CC 3xx provide the option of connecting encoders with the 1 V_{PP} interface or any EnDat interface, while the other half (Mini IO connectors) enables the connection of purely serial encoders with EnDat 2.2.

The number of usable control loops depends on the controller unit itself and on the enabled control loops on the SIK. Additional control loops can be ordered at a later time as needed by means of a software option. Refer to the brochure or the Technical Manual of your control.



CC 308

Controller unit	CC 302	CC 306	CC 308	CC 310
Power supply	+24 V via 24 V supply bar at X76			
Digital control loops	Max. 2 (single-speed)	Max. 6 (single-speed)	Max. 8 (single-speed)	Max. 10 (single-speed)
Encoder inputs	2 x 1 V _{pp} , EnDat 2 x EnDat 2.2	6 x 1 V _{pp} , EnDat 6 x EnDat 2.2	8 x 1 V _{pp} , EnDat 8 x EnDat 2.2	10 x 1 V _{pp} , EnDat 10 x EnDat 2.2
HFL cable connections	2	6	8	10
SPI expansion slots	2	2	2	2
Analog drives via SPI modules CMA-H	Max. 2	Max. 4	Max. 4	Max. 4
24 V current consumption via bus mounting ¹⁾	0.6 A	0.8 A	1.3 A	1.4 A
Cooling method	Integrated fans			
Protection class	IP20			
Power loss during rated operation ¹⁾	13 W	18 W	30 W	33 W
NRTL approval	Yes	Yes	Yes	Yes
Module width	50 mm	75 mm	100 mm	125 mm
Mass	3.2 kg	3.75 kg	4 kg	4.25 kg
ID	1243183-xx	1074384-xx	1074385-xx	1243647-xx

¹⁾ Current consumption without connected encoders or other devices

Cycle times

At f _{PWM}	Current controller	Speed controller		Position controller
		Single-speed	Double-speed	
3333 Hz	150 μs	300 μs	150 μs	Same as for speed controller
4000 Hz	125 μs	250 μs	125 μs	
5000 Hz	100 μs	200 μs	100 μs	
6666 Hz	75 μs	-	150 μs	
8000 Hz	62.5 μs	-	125 μs	
10 000 Hz	50 μs	-	100 μs	
13 333 Hz	37.5 μs	-	75 μs	
16 000 Hz	31.25 μs	-	62.5 μs	

Single-speed, double-speed

Single-speed control loops are usually sufficient for linear and torque motors, and for conventional axes. **Double-speed control loops** (option 49) are preferable for HSC spindles and difficult-to-control axes. In the default setting, all axes are set to single-speed. Every axis that is switched from single-speed to double-speed can reduce the number of available control loops. PWM frequencies greater than 5 kHz require double-speed control loops. This requires option 49 to be enabled. Please refer to the Technical Manual of the Gen 3 drives.

EIB 5000 sensor box

The EIB 5000 sensor box from HEIDENHAIN is recommended for measuring the temperature of direct drive motors. Various versions of the sensor box are available:

EIB 5181

External interface box for use in applications with torque or linear motors:

- Processing of information from up to three temperature sensors and calculation of compensation for the transmission timing behavior of the temperature measurement
- Parameterization of the input/output characteristics via the DIP switches provided on the device
- Design: modular, electrical cabinet
- Data interface: 1 V_{pp}, EnDat 2.1, or EnDat 2.2 (depending on the connected encoder)

ID 1231387-xx

EIB 5281

Close-to-application temperature measurement of a direct drive motor:

- Input: Encoder with EnDat 2.1 interface and three temperature sensors
- Output: EnDat 2.1 interface, particularly for connection to a HEIDENHAIN TNC

An appropriate variant of the EIB 5281 may be needed depending on the direct drive motor. Before delivery, the variant is programmed for a particular combination of the following factors:

- Configuration of the temperature sensors
- Time constant for temperature measurement: a specific compensation value for the transmission timing behavior of the temperature measurement

ID 1281777-xx

Adapter connector for temperature sensor

For applications with purely serial EnDat 2.2 encoders, the adapter connector offers the option of interposing an external KTY or PT 1000 temperature sensor (e.g., of linear and torque motors) and route it to the speed encoder input of the controller unit.

The adapter connector can also be used in conjunction with encoders with EnDat02 or 1 V_{pp} interface. The adapter connector is plugged directly onto the speed encoder input (X15 to X20) of the controller unit.

KTY adapter connector ID 367770-xx
Mass ≈ 0.1 kg

Additional cables are required for the use of multiple adapter connectors on one controller unit because the connector for an external KTY or PT 1000 temperature sensor does not permit the mounting of multiple adapter connectors in a row on the CC 61xx.



	Encoders with EnDat interface (EnDat2.1, EnDat2.2)	Encoders with 1 V _{pp} interface
1 m cable	ID 336377-01	ID 312533-01
3 m cable	ID 336377-03	ID 312533-03

Accessories for modular inverter systems

Accessories for UM 3xx modular inverters

Modular inverter	UM 3x0, UM 3x1	UM 3x2, UM 313, UM 314, UM 315, UM 316, UMS 312	UM 316W, UM 317W
HFL cable (mandatory)	One piece for connection to the controller unit		
Cooling method (device-specific)	Fans integrated in device		Water cooling via coolant hose (must be ordered separately)
Bus mounting of DC link and 24 V supply voltage (mandatory)	Included with the device		
Connectors for motor/brake connection (mandatory)	Connectors for X38x (must be ordered separately):	Included with the device	
Shield plate for shield connection (optional)		Depends on the inverter type, must be ordered separately	
Power cables for connecting motors (mandatory)	For information on HEIDENHAIN power cables for motors, please refer to the brochure or to the Technical Manual for the motors.		
Voltage protection module (optional)	SM 320 for UM 3x0 to UM 315 SM 330 for UM 316, UM 316W and UM 317W		
Power supply unit (mandatory)	UVR 3xx, UEC 3xx (FS)		

KDR 3xx commutating reactor

Regenerative power supply units require a KDR commutating reactor, which suppresses system perturbations and serves as an energy buffer for the step-up converter. It is connected between the line filter and the power supply unit.

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



KDR 350

Commutating reactor	KDR 330	KDR 340	KDR 350
Rated voltage	3AC 400 V (-10 %) ¹⁾ to 3AC 480 V (+6 %)		
Rated frequency	50 / 60 Hz		
Rated current at 3AC 400 V to 3AC 480 V (effective value)	46 A to 39 A	68 A to 57 A	83 A to 70 A
Maximum current (peak value)	125 A	187 A	227 A
Inductance of a winding	600 µH ±15 %	470 µH ±15 %	
Protection	IPXXB	With variant -02 or higher: IPXXB Variant -01: IP00	
Power loss during rated operation P _V	For information on the power loss values, please refer to the Technical Manual for the Gen 3 drives.		
NRTL approval	Yes	Yes	Yes
Mass	7 kg	11.5 kg	13 kg
Used for	UVR 330	UVR 340	UVR 350
ID	1164204-xx	1164205-xx	1164206-xx

¹⁾ Derating: If you reduce the supply voltage of 400 V by 10 %, the permissible power output likewise decreases by 10 %.

Commutating reactor	KDR 360	KDR 370
Rated voltage	3AC 400 V (-10 %)¹) to 3AC 480 V (+6 %)	
Rated frequency	50 / 60 Hz	
Rated current at 3AC 400 V to 3AC 480 V (effective value)	135 A to 113 A	202 A to 169 A
Maximum current (peak value)	371 A	555 A
Inductance of a winding	380 µH ±15 %	260 µH ±15 %
Protection rating	Variant -02 or higher: IPXXB Variant -01: IP00	
Power loss during rated operation P _v	For information on the power loss values, please refer to the Technical Manual for the Gen 3 drives.	
NRTL approval	Yes	Yes
Mass	24 kg	30 kg
Used for	UVR 360(W)	UVR 370(W)
ID	1164276-xx	1164277-xx

¹) Derating: If you reduce the supply voltage of 400 V by 10 %, the permissible power output likewise decreases by 10 %.

Line filter

If regenerative supply units are used, then a line filter is required in addition to the commutating reactor. Line filters suppress line-bound interference and ensure EMC-compatible energy recovery for the HEIDENHAIN inverter system. An S star point for the connection of a UVR 3x0 is provided on the load side by means of integrated capacitors. The line filter must be connected between the grid connection and the commutating reactor.

The line filter must be selected based on the supply unit being used.



EPCOS 83 A

Line filter	EPCOS 46A	EPCOS 83A	EPCOS 135A	EPCOS 202A
Protection class	IP20			
Power loss during rated operation P _v	For information on the power loss values, please refer to the Technical Manual for the Gen 3 drives.			
UL certification	Yes	Yes	Yes	Yes
Mass	4 kg	7 kg	9 kg	19 kg
Used for	UVR 330	UVR 340, UVR 350	UVR 360	UVR 370
ID	1169716-xx	1169717-xx	1169718-xx	1169719-xx

UP 3x0 braking resistor module

In regenerative inverter systems, the braking energy of the motors is normally fed back into the power supply network. If, in rare cases, the power supply network is interrupted, then the braking energy can no longer be returned. When the motors are braked, the regenerated energy leads to an excessive increase in DC-link voltage. If a maximum DC-link voltage of 800 V is reached, the supply unit switches off all of the connected inverters by means of the DRIVE OFF signal (de-energized). On motors without a brake, this can lead to uncontrolled coasting behavior.

To prevent a power failure from damaging the machine and workpiece as a result of axes coasting to a stop, the regenerated energy or DC-link voltage should be dissipated with the UP 310 or UP 320 braking resistor module.

In certain cases, a brake integrated into the motor may be sufficient, or coasting to a stop can be considered noncritical (e.g., a spindle coasting to a stop while the guard doors are closed). However, the machine manufacturer must decide on this matter for each use case.

The UP 320 is available for powerful, regenerative inverter systems. The peak power can additionally be doubled by connecting two UP 320 units in parallel.

The machine manufacturer is responsible for selecting a suitable UP 3xx depending on the peak power that will be present when the drives are braked in the event of a power failure.



UP 310

Braking resistor module	UP 310	UP 320
Switching voltage (on)	DC 790 V (DC-link voltage)	
Switching voltage (off)	DC 757 V (DC-link voltage)	
Peak power (for max. two seconds)	75 kW	150 kW 300 kW, if two UP 320 are connected in parallel
Resistance	72 Ω	3.6 Ω
Protection class	IP20	
NRTL approval	Yes	Yes
Module width	50 mm	50 mm
Mass	6.5 kg	7 kg
ID	1119332-xx	1119330-xx

Accessories for coolant connection

For the use of high-power axis motors or spindle motors, HEIDENHAIN also offers water-cooled power modules: the UVR 360W, UVR 370W, UM 316W, and UM 317W. Despite their high power rating, they are compact and emit only a small amount of heat into the electrical cabinet. The water-cooled components must be connected separately to a closed coolant loop via a distributor. As a suitable accessory, use pressure-tested HEIDENHAIN water hoses.

Hose (kit)

Accessories for power modules with water cooling: UVR 360W, UVR 370W, UM 316W, and UM 317W
Coolant hose: One kit contains the following (two kits required per power module):

- One pressure hose, length: 3 m
- One coupling joint for connection to the distributor block: M18 x 1.5

One coolant hose kit

ID 584862-01



CEM 330 filter module

The CEM 330 filter module has been approved for use only in modular systems of Gen 3 drives.

The CEM is used to increase the maximum permissible overall line length of all power cables connected to the inverters. Without the use of a CEM 330, the maximum possible overall line length depends on the line filter being used.

For planning and configuration of the CEM 330, please refer to the Technical Manual of the Gen 3 drives.

The CEM 330 filter module is mounted in an existing inverter row and the DC-link voltage is routed through the module. Thanks to the CEM, the permissible motor line length for inverters that are arranged downstream of the CEM is increased. The CEM 330 is placed between the UM 3xx and the UVR 3xx whose interference is to be suppressed, next to the UVR 3xx. A CEM 330 can be placed each to the left and to the right of the UVR 3xx.

Example of the sequence of components: UVR power supply unit -> UM inverter with permissible line length of the line filter being used (e.g., 500 m with EPCOS 202A) -> CEM filter module -> UM inverter whose interference is to be suppressed, with a line length requiring a CEM module.



CEM 330

Cable extension module	CEM 330
Rated voltage	DC-link voltage U_z DC 509 V to DC 720 V
DC-link rated power output that may be routed via the CEM	max. 135 kW, at $U_z \geq$ DC 650 V max. 30 kW, at $U_z <$ DC 650 V
Maximum DC-link power that may be routed via the CEM	270 kW (concerning load cycle for maximum power of the UVR)
Necessity of a CEM	Please refer to the Technical Manual of the Gen 3 drives during the planning stage
Protection class	IP20
NRTL approval	Only with variant -02 or higher
Module width	100 mm
Mass	\approx 9 kg
ID	1354532-xx

PAE-H switch-off module

The PAE-H switch-off module for control systems with external safety is required in HEIDENHAIN control systems if all of the following conditions apply:

- The drives are digitally controlled by one or more CC 3xx controller units
- Integrated functional safety (FS) from HEIDENHAIN is not used in this system

The PAE-H switch-off module makes it possible to initiate the SS1, STO, and SBC safety functions for up to eight drives or axis groups. For this purpose, the PAE-H provides eight dual-channel inputs. In addition, the SBC function can be triggered simultaneously for all drives. This is done using an additional dual-channel input. A PAE-H must be used in a system with external safety, and no more than this one PAE-H can be used. The PAE-H can be operated in any slot of a PLB 62xx or PLB 61xx without FS. The PAE-H must be integrated with the IOconfig PC tool. A PAE-H is not required in systems with integrated functional safety (FS) and is therefore not supported there.

Please follow the basic circuit diagram of your control for wiring the PAE-H inputs. The basic circuit diagrams for Gen 3 can be found in the Technical Manual for the Gen 3 Drives.

Compact inverters

UEC 3xx (FS)

In addition to the inverter, the UEC 3xx (FS) non-regenerative compact inverters include the power supply unit, a controller unit, and PLC inputs/outputs. They offer a complete solution for machines with a limited number of axes and low power demands.

Components

A UEC 3xx or UEC 3xx FS consists of the following components:

Controller units

- Position controller, speed controller, current controller
- HSCI interface
- Interfaces to the speed and position encoders
- With variant -03 or higher of the UEC 32x(FS), UEC 33x(FS): 1 x HFL connection for connecting a UM 3xx

Power module

- Power supply unit
- Inverter
- Connections for motors and motor holding brakes
- UEC 32x (FS), UEC 33x (FS): connection for external braking resistor
- UEC 31x (FS): integrated braking resistor
- Connections for tapping the DC-link voltage and +24 V supply voltage

System PL

- Interfaces for one workpiece touch probe and one tool touch probe
- Integrated PLC I/Os (expandable with PL 61xx)
- Configuration with IOconfig PC software
- UEC 3xx FS: with integrated functional safety (FS) and dual-channel FS I/Os for use in SPLC program
- UEC 3xx: dual-channel inputs for triggering STO and SBC for the connected drives (function same as a PAE-H module)

The components required for operating the compact inverter from HEIDENHAIN include the following:

- NC software
 - NCK version 597110-15 or higher or
 - NCK version 597110-17 Service Pack 01 or higher, if the additional HFL connection of the UEC 32x(FS), UEC 33x(FS) with variant -03 or higher is to be used
- MC main computer
- UEC 32x (FS), UEC 33x (FS): PW 31x braking resistor
- Siemens SITOR gR or gS line fuse
- Connectors for X38x:
 - UEC 314 (FS): 4 pieces, UEC 315 (FS): 5 pieces
 - UEC 324 (FS): 2 pieces, UEC 325 (FS): 3 pieces
 - UEC 334 (FS): 2 pieces, UEC 335 (FS): 3 pieces
- Surge protector (if necessary)
- SM 3xx voltage protection module (if necessary)
- X76 jumper plugs for connection of optional modular components (e.g. UM 3xx, RM 330, CC 3xx) (if necessary)
- Further HEIDENHAIN UM 3xx modular inverters (if necessary)
- One additional CC 3xx controller unit (if necessary)
- RM 330 regenerative module (if necessary)
- CMH 3xx capacitor module (if necessary)
- PLB 61xx expansion PLs (if necessary)
- Shield plates for X81, X82 (if necessary)



UEC 325 FS, variant -03

All UEC 3xx(FS) compact inverters can be expanded with UM 3xx modular inverters for up to four additional drive motors. For the UEC 31x(FS) and for the UEC 32x(FS) and UEC 33x(FS) up to and including variant -02, an additional CC 3xx is always required. The UEC 32x(FS) and UEC 33x(FS) with variant -03 or higher provide an additional HFL connection and additional encoder inputs. This makes it possible to connect an additional UM 31x or UM 32x modular inverter to one of these UECs without an additional CC controller unit. The UEC 3x4(FS) and UEC 3x5(FS) thus support a maximum of 6 drive motors with two encoders each without an additional CC, only by connecting additional UM 3xx inverters.

However, please note that the total power, acceleration power, and braking power of all drive motors, including additionally connected UM 3xx inverters or motors, must not exceed the maximum permissible rating (DC-link power, currents, braking power etc.) of the UEC 3xx (FS). Furthermore, the maximum permissible DC-link capacitance must not be exceeded.

Power supply unit The integrated power supply unit generates the rectified DC-link voltage and the +24 V supply voltage from the connected line voltage. The power module (DC-AC inverter) in the UEC 3xx (FS) provides the energy to the connected motor(s).

Conductor bars and CC 3xx controller units The DC-link voltage is routed to the outside via bus mountings in the lower area of the UEC 3xx (FS) and the +24 V supply voltage via jumper plugs to enable the optional connection of UM 3xx modular inverters and additional CC 3xx controller units. These components of the modular inverter system must always be arranged to the right of the UEC 3xx (FS).

Differences The different variants of the UEC 3xx (FS) compact inverters differ in the DC-link power, the number of axes, the permissible maximum currents, and the safety concept. Refer to the specifications of the compact inverters. In addition, the UEC 32x(FS) and UEC 33x(FS) with variant -03 or higher have an additional HFL output and encoder inputs for direct connection of a UM 3xx to the UEC.

RM 330 regenerative module The UEC 3xx(FS) compact inverters are non-regenerative inverter systems. However, the compact inverters can be operated as a regenerative inverter system via an optional RM 330 regenerative feedback module.

Compact inverter	UEC 314, UEC 314 FS	UEC 315, UEC 315 FS
Power supply (input side)	3AC 400 V (-10 %) to 3AC 480 V (+6 %)	
Rated frequency	50 to 60 Hz	
Phase conductor current at rated power (input side at 3AC 400 V)	35 A	
Connected load (input side)	16 kW	
DC-link voltage (output side); Range for maximum tolerance band of the input voltage	DC 509 V to DC 720V	
DC-link rated power	15 kW	
DC-link power during periodic S6-40% duty	22.5 kW	
Max. power of DC-link (4 s with cycle duration of 20 s)	30 kW	
Min. conductor cross section for voltage supply at X31 as per VDE 0298-4 (according to UL 508A)	6 mm ² (AWG 10) Copper, at least 70 °C	
Siemens SITOP gR or gS line fuse	35 A 3NE8 003-1, gR or 3NE1 803-0, gS	
Integrated 24 V power supply unit	max. 600 W, 24 A	
Number of motor connections	4	5
Rated current (PWM frequency of 5 kHz, for rotating field frequencies > 10 Hz¹⁾)	<ul style="list-style-type: none"> • Drive 1: 21 A • Drive 2: 21 A • Drives 3, 4: 10 A 	<ul style="list-style-type: none"> • Drive 1: 21 A • Drive 2: 21 A • Drives 3, 4, 5: 10 A
Overview of the output currents	Page 55	
Conductor cross section for the X38x motor connection	The required conductor cross section depends on the rated current of the inverter and the connected motor, as well as on the operating mode, the type of cable, and its manner of routing. It must be determined and protected by the machine manufacturer, if necessary. The values indicated below are for operating mode 1 and a motor cable with an operating temperature of at least 80 °C. The machine manufacturer must determine the cross sections for other operating modes.	
Minimum conductor cross section for the X38x motor connections at a PWM frequency ≥ 3.33 kHz, as per VDE 0298-4 (according to UL 508A)	X381, X382: at least 4 mm ² (AWG 10) X383 to X385: at least 1.5 mm ² (AWG 14)	
Minimum conductor cross section for the X38x motor connections at a PWM frequency ≥ 5 kHz, as per VDE 0298-4 (according to UL 508A)	X381, X382: at least 2.5 mm ² (AWG 12) X383 to X385: at least 1.5 mm ² (AWG 14)	
Conductor type, type of routing for the specified minimum conductor cross sections	Shielded cable, copper, 600/1000 V, resistant to oil and lubricants, routing type: C	
Maximum possible PWM frequency	10 kHz	
Braking resistor	Integral braking resistor <ul style="list-style-type: none"> • 2.1 kW continuous power • 27 kW maximum power for 1.8 s at a cycle duration of 120 s 	

¹⁾ Derating at rotating field frequencies < 10 Hz: see *Derating of the output currents*

Compact inverter	UEC 314, UEC 314 FS	UEC 315, UEC 315 FS
Max. current consumption 24 V via conductor-bar connection without current for brake control	Power is supplied via an integrated power pack	
Power loss during rated operation	660 W	740 W
Cooling method	Integrated fans	
Number of free I/Os	Single-channel PLC inputs: 38 Fixed inputs: -ES.A, -ES.B, -REF-SPPL UEC 3xx FS: Single-channel free PLC outputs: 28 UEC 3xx: Single-channel free PLC outputs: 47 Fixed outputs: -STO.A.G and for UEC 3xx FS additionally -STOS.A.G, -TEST.A, -TEST.B UEC 3xx FS: Dual-channel SPLC inputs: 8 UEC 3xx FS: Dual-channel SPLC outputs: 8 UEC 3xx: inputs for axis release: 8 (function same as a PAE-H module)	
Touch probes	EnDat touch probes as of NCK software 597110-16	
Max. output current per braking connection (+24 V, HSLS)	Drive 1: 2.0 A Drives 2 to 5: 2.0 A each (max. 6 A in total)	
HFL connections	Not present	
Encoder inputs	4 x 1 V _{PP} , EnDat 4 x EnDat 2.2	5 x 1 V _{PP} , EnDat 5 x EnDat 2.2
Digital control loops	Max. 6 (single-speed)	
SPI expansion slots	1	
Protection class	IP20	
NRTL approval	Only as of variant -02	
Module width	200 mm	200 mm
Mass	21 kg	22 kg
ID	UEC 314: 1292240-xx UEC 314 FS: 1292241-xx	UEC 315: 1292235-xx UEC 315 FS: 1292237-xx

¹⁾ Derating at rotating field frequencies < 10 Hz: see *Derating of the output currents*

Compact inverter	UEC 324, UEC 324 FS	UEC 325, UEC 325 FS
Power supply (input side)	3AC 400 V (-10 %) to 3AC 480 V (+6 %)	
Rated frequency	50 to 60 Hz	
Phase conductor current at rated power (input side at 3AC 400 V)	47 A	
Connected load (input side)	24 kW	
DC-link voltage (output side); Range for maximum tolerance band of the input voltage	DC 509 V to DC 720V	
DC-link rated power	22 kW	
DC-link power during periodic S6-40% duty	33 kW	
Max. power of DC-link (4 s with cycle duration of 20 s)	44 kW	
Min. conductor cross section for voltage supply at X31 as per VDE 0298-4 (according to UL 508A)	10 mm ² (AWG 6) Copper, at least 70 °C	
Siemens SITOR gR or gS line fuse	50 A 3NE8 017-1, gR or 3NE1 817-0, gS	
Integrated 24 V power supply unit	max. 600 W, 24 A	
Number of motor connections	4	5
Rated current (PWM frequency of 5 kHz, for rotating field frequencies > 10 Hz¹⁾)	<ul style="list-style-type: none"> • Drive 1: 31 A • Drive 2: 28 A • Drives 3, 4: 14 A 	<ul style="list-style-type: none"> • Drive 1: 31 A • Drive 2: 28 A • Drives 3, 4, 5: 14 A
Overview of the output currents	Page 56	
Conductor cross section for the X8x and X38x motor connections	The required conductor cross section depends on the rated current of the inverter and the connected motor, as well as on the operating mode, the type of cable, and its manner of routing. It must be determined and protected by the machine manufacturer, if necessary. The values indicated below are for operating mode 1 and a motor cable with an operating temperature of at least 80 °C. The machine manufacturer must determine the cross sections for other operating modes.	
Minimum conductor cross section for the X8x and X38x motor connections at a PWM frequency ≥ 3.33 kHz, as per VDE 0298-4 (according to UL 508A)	X8x: min. 6 mm ² (AWG 8) X38x: min. 1.5 mm ² (AWG 14)	
Minimum conductor cross section for the X8x and X38x motor connections at a PWM frequency ≥ 5 kHz, as per VDE 0298-4 (according to UL 508A)	X8x: min. 4 mm ² (AWG 10) X38x: min. 1.5 mm ² (AWG 14)	
Conductor type, type of routing for the specified minimum conductor cross sections	Shielded cable, copper, 600/1000 V, resistant to oil and lubricants, routing type: C	
Maximum possible PWM frequency	10 kHz	
Braking resistor	PW 310 external braking resistor required	
Max. current consumption 24 V via conductor-bar connection without current for brake control	Power is supplied via an integrated power pack	
Power loss during rated operation	790 W	890 W

¹⁾ Derating at rotating field frequencies < 10 Hz: see *Derating of the output currents*

Compact inverter	UEC 324, UEC 324 FS	UEC 325, UEC 325 FS
Cooling method	Integrated fans	
Number of free I/Os	Single-channel PLC inputs: 38 Fixed inputs: -ES.A, -ES.B, -REF-SPPL UEC 3xx FS: Single-channel free PLC outputs: 28 UEC 3xx: Single-channel free PLC outputs: 47 Fixed outputs: -STO.A.G and for UEC 3xx FS additionally -STOS.A.G, -TEST.A, -TEST.B UEC 3xx FS: Dual-channel SPLC inputs: 8 UEC 3xx FS: Dual-channel SPLC outputs: 8 UEC 3xx: inputs for axis release: 8 (function same as a PAE-H module)	
Touch probes	EnDat touch probes as of NCK software 597110-16	
Max. output current per braking connection (+24 V, HSLs)	Drive 1: 2.0 A Drives 2 to 5: 2.0 A each (max. 6 A in total)	
HFL connections	Up to and including variant -02: not available Variant -03 or higher: 1x HFL output	
Encoder inputs	Up to and including variant -02: 4 x 1 V _{PP} , EnDat 4 x EnDat 2.2 Variant -03 or higher: 6 x 1 V _{PP} , EnDat 6 x EnDat 2.2	Up to and including variant -02: 5 x 1 V _{PP} , EnDat 5 x EnDat 2.2
Digital control loops	Max. 6 (single-speed)	
SPI expansion slots	Not present	
Protection class	IP20	
NRTL approval	Only as of variant -02	
Module width	250 mm	250 mm
Mass	23 kg	24 kg
ID	UEC 324: 1295692-xx UEC 324 FS: 1295693-xx	UEC 325: 1295694-xx UEC 325 FS: 1295696-xx

1) Derating at rotating field frequencies < 10 Hz: see *Derating of the output currents*

Compact inverter	UEC 334, UEC 334 FS	UEC 335, UEC 335 FS
Power supply (input side)	3AC 400 V (-10 %) to 3AC 480 V (+6 %)	
Rated frequency	50 to 60 Hz	
Phase conductor current at rated power (input side at 3AC 400 V)	59 A	
Connected load (input side)	32 kW	
DC-link voltage (output side); Range for maximum tolerance band of the input voltage	DC 509 V to DC 720V	
DC-link rated power	30 kW	
DC-link power during periodic operation S6-40 %	45 kW	
Max. power of DC-link (4 s with cycle duration of 20 s)	60 kW	
Min. conductor cross section for voltage supply at X31 as per VDE 0298-4 (according to UL 508A)	16 mm ² (AWG 4) Copper, at least 70 °C	
Siemens SITOP gR or gS line fuse	63 A 3NE8 018-1, gR or 3NE1 818-0, gS	
Integrated 24 V power supply unit	max. 600 W, 24 A	
Number of motor connections	4	5
Rated current (PWM frequency of 5 kHz, for rotating field frequencies > 10 Hz ¹⁾)	<ul style="list-style-type: none"> • Drive 1: 46 A • Drive 2: 35 A • Drives 3, 4: 21 A 	<ul style="list-style-type: none"> • Drive 1: 46 A • Drive 2: 35 A • Drives 3, 4, 5: 21 A
Overview of the output currents	Page 57	
Conductor cross section for the X8x and X38x motor connections	The required conductor cross section depends on the rated current of the inverter and the connected motor, as well as on the operating mode, the type of cable, and its manner of routing. It must be determined and protected by the machine manufacturer, if necessary. The values indicated below are for operating mode 1 and a motor cable with an operating temperature of at least 80 °C. The machine manufacturer must determine the cross sections for other operating modes.	
Minimum conductor cross section for the X8x and X38x motor connections at a PWM frequency ≥ 3.33 kHz, as per VDE 0298-4 (according to UL 508A)	X8x: min. 10 mm ² (AWG 6) X38x: min. 4 mm ² (AWG 10)	
Minimum conductor cross section for the X8x and X38x motor connections at a PWM frequency ≥ 5 kHz, X38x as per VDE 0298-4 (according to UL 508A)	X81: min. 10 mm ² (AWG 8) X82: min. 6 mm ² (AWG 10) X38x: min. 2.5 mm ² (AWG 12)	
Conductor type, type of routing for the specified minimum conductor cross sections	Shielded cable, copper, 600/1000 V, resistant to oil and lubricants, routing type: C	
Maximum possible PWM frequency	10 kHz	
Braking resistor	PW 310 external braking resistor required	
Power loss during rated operation	1100 W	1240 W
Cooling method	Integrated fans	

1) Derating at rotating field frequencies < 10 Hz: see *Derating of the output currents*

Compact inverter	UEC 334, UEC 334 FS	UEC 335, UEC 335 FS
Number of free I/Os	Single-channel PLC inputs: 38 Fixed inputs: -ES.A, -ES.B, -REF-SPPL UEC 3xx FS: Single-channel free PLC outputs: 28 UEC 3xx: Single-channel free PLC outputs: 47 Fixed outputs: -STO.A.G and for UEC 3xx FS additionally -STOS.A.G, -TEST.A, -TEST.B UEC 3xx FS: Dual-channel SPLC inputs: 8 UEC 3xx FS: Dual-channel SPLC outputs: 8 UEC 3xx: inputs for axis release: 8 (function same as a PAE-H module)	
Touch probes	EnDat touch probes as of NCK software 597110-16	
Max. output current per braking connection (+24 V, HSLs)	Drive 1: 2.0 A Drives 2 to 5: 2.0 A each (max. 6 A in total)	
HFL connections	Up to and including variant -02: not available Variant -03 or higher: 1x HFL output	
Encoder inputs	Up to and including variant -02: 4 x 1 V _{PP} , EnDat 4 x EnDat 2.2 Variant -03 or higher: 6 x 1 V _{PP} , EnDat 6 x EnDat 2.2	Up to and including variant -02: 5 x 1 V _{PP} , EnDat 5 x EnDat 2.2
Digital control loops	Max. 6 (single-speed)	
SPI expansion slots	Not present	
Protection class	IP20	
NRTL approval	Only as of variant -02	
Module width	250 mm	250 mm
Mass	24 kg	25 kg
ID	UEC 334: 1295698-xx UEC 334 FS: 1295700-xx	UEC 335: 1295702-xx UEC 335 FS: 1294744-xx

¹⁾ Derating at rotating field frequencies < 10 Hz: see *Derating of the output currents*

Output currents

Output currents of the **UEC 314 (FS), UEC 315 (FS)** compact inverter based on the PWM frequency at a line voltage of 3AC 400 V:

Currents	PWM frequency	Drive 1	Drive 2	Drives 3, 4, 5
Rated current I _N , BM 1 Current 0.7 · I _N , BM 2 Current S6-40 %, BM 3 Maximum current I _{MaxAC} , BM 4, 5	3.3 kHz	25 A 17.5 A 35 A 50 A	25 A 17.5 A No BM 3 50 A	12 A 8 A No BM 3 24 A
	4.0 kHz	23 A 16 A 32 A 46 A	23 A 16 A No BM 3 46 A	11 A 7.5 A No BM 3 22 A
	5.0 kHz	21 A 15 A 29 A 42 A	21 A 15 A No BM 3 42 A	10 A 7.5 A No BM 3 20 A
	6.6 kHz	17.5 A 12 A 24.5 A 35 A	17.5 A 12 A No BM 3 35	8 A 5.5 A No BM 3 16 A
	8.0 kHz	15 A 10.5 A 21 A 30 A	15 A 10.5 A No BM 3 30 A	7 A 4.5 A No BM 3 14 A
	10 kHz	12.5 A 8.5 A 17.5 A 25 A	12.5 A 8.5 A No BM 3 25 A	6 A 4 A No BM 3 12 A

For a description of the BM x operating modes or load cycles, please refer to Page 35.

PWM frequencies > 10 kHz are not supported by the UEC 3xx (FS).

PWM frequencies > 5 kHz require software option 49.

Output currents of the **UEC 324 (FS), UEC 325 (FS)** compact inverter based on the PWM frequency at a line voltage of 3AC 400 V:

Currents	PWM frequency	Drive 1	Drive 2	Drives 3, 4, 5
Rated current I_{Nr} , BM 1 Current $0.7 \cdot I_{Nr}$, BM 2 Current S6-40 %, BM 3 Maximum current I_{MaxAC} , BM 4, 5	3.3 kHz	37 A 25.5 A 51.5 A 74 A	33.5 A 23 A 46.5 A 67 A	16.5 A 11.5 A No BM 3 33 A
	4.0 kHz	34 A 23.5 A 47.5 A 68 A	30.5 A 21 A 42 A 61	15 A 10.5 A No BM 3 30 A
	5.0 kHz	31 A 22 A 43 A 62 A	28 A 20 A 39 A 56 A	14 A 10 A No BM 3 28 A
	6.6 kHz	26 A 18 A 36 A 52 A	23.5 A 16.5 A 32.5 A 47	11.5 A 8.0 A No BM 3 23 A
8.0 kHz	22.5 A 15.5 A 31.5 A 45 A	20 A 14 A 28 A 40 A	10 A 7 A No BM 3 20 A	
				10 kHz

For a description of the BM x operating modes or load cycles, please refer to Page 35.

PWM frequencies > 10 kHz are not supported by the UEC 3xx (FS).

PWM frequencies > 5 kHz require software option 49.

Planning and selection of the compact inverter

Output currents of the **UEC 334 (FS), UEC 335 (FS)** compact inverter based on the PWM frequency at a line voltage of 3AC 400 V:

Currents	PWM frequency	Drive 1	Drive 2	Drives 3, 4, 5
Rated current I_{Nr} , BM 1 Current $0.7 \cdot I_{Nr}$, BM 2 Current S6-40 %, BM 3 Maximum current I_{MaxAC} , BM 4, 5	3.3 kHz	50 A 35 A 70 A 100 A	42 A 29 A 58.5 A 84 A	25 A 17.5 A No BM 3 50 A
	4.0 kHz	50 A 35 A 70 A 100 A	38.5 A 26.5 A 53.5 A 77 A	23 A 16 A No BM 3 46 A
	5.0 kHz	46 A 31 A 64 A 92 A	35 A 25 A 49 A 70 A	21 A 15 A No BM 3 42 A
	6.6 kHz	38.5 A 26.5 A 53.5 A 77 A	29 A 20 A 40.5 A 58 A	17.5 A 12 A No BM 3 35 A
	8.0 kHz	33.5 A 23 A 46.5 A 67 A	25.5 A 17.5 A 35.5 A 51 A	15 A 10.5 A No BM 3 30 A
	10 kHz	28 A 19.5 A 39.5 A 56 A	21 A 14.5 A 29 A 42 A	12.5 A 8.5 A No BM 3 25 A

For a description of the BM x operating modes or load cycles, please refer to Page 35.

PWM frequencies > 10 kHz are not supported by the UEC 3xx (FS).

PWM frequencies > 5 kHz require software option 49.

The selection of the compact inverter depends on the currents required by the connected motor. In many cases, the inverter is selected based on the stall current of the motor being used. For selection of the inverter, HEIDENHAIN recommends the following:

For a feed axis without a weight load or without a high load from process forces, or for a spindle:

- Rated current of the inverter (rotating field frequency > 10 Hz or BM 1 operating mode) \geq motor stall current

For feed axes with a weight load or with a high load from process forces, make sure to consider the derating of the inverter output current mentioned below:

- Rated derating current (current at a rotating field frequency of < 10 Hz or BM 2 operating mode) \geq Motor stall current where: rated derating current (BM 2) = rated current of the inverter (rotating field frequency > 10 Hz or BM 1) \cdot 0.7

Derating of the output currents

Derating based on the rotating field frequency of the motor:

At rotating field frequencies of < 10 Hz (electrical frequency), the following derating must be considered for the limit values of the output currents:

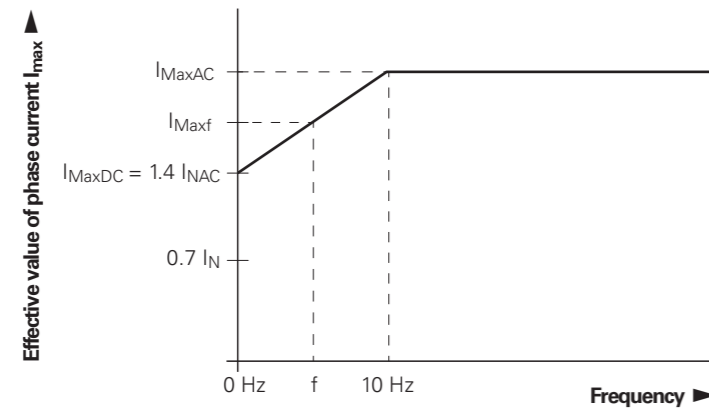
Current value from the specification tables (BM 1) · 0.7 = Current at rotating field frequencies of < 10 Hz or BM 2 operating mode

Example:

Rated current of the UEC 314 (FS), drive 1 (5 kHz, rotating field frequency > 10 Hz) = 21 A (BM 1)

Rated current of the UEC 314 (FS), drive motor 1 (5 kHz, rotating field frequency = 0 Hz) = 21 A · 0.7 = 15 A (BM 2)

In addition, a further derating must be taken into account for the maximum current at standstill. The following applies: $I_{MaxDC} = 1.4 \cdot I_{NAC}$. The image below illustrates this relationship:

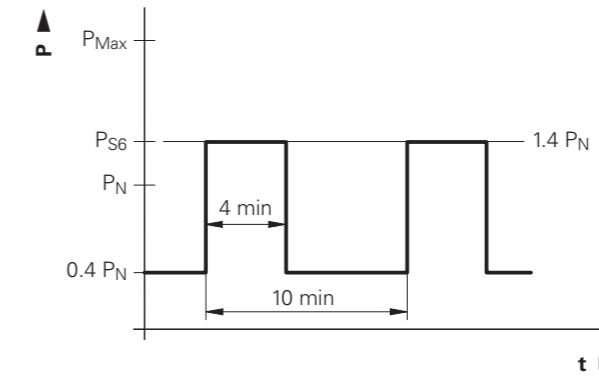


Derating based on the supply or line voltage:

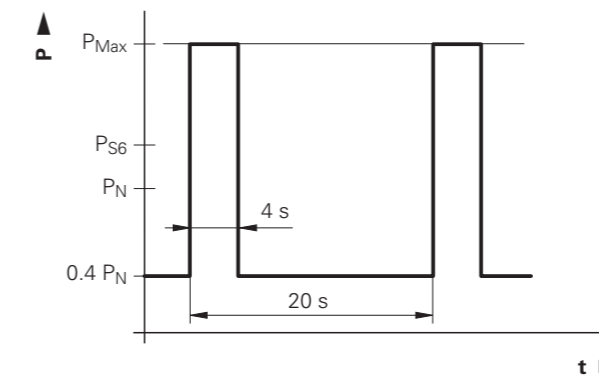
At a line voltage or supply voltage of > 3AC 440 V (e.g. a grid with 3AC 480 V), a 10 % derating of the rated currents must be taken into account.

Load cycles of the power supply units in the UEC 3xx (FS)

Load cycle for DC link power during periodic S6-40% operation:



Load cycle for DC link maximum power:



UMC 31x FS

The non-regenerative UMC 3xx FS compact inverters include, in addition to the inverter, a controller unit and PLC inputs/outputs. However, a power supply unit is not included, which means that the UMC 3xx FS must be supplied by a suitable external DC link.

They represent an extension for secondary axes with low power demands in existing inverter systems. The UMC 3xx FS compact inverters are particularly suitable for decentralized applications such as additional pallet change or tool change systems.

In contrast to the UEC 3xx (FS), the UMC 3xx FS only supports the control of axis motors, but not linear, torque or spindle motors.

Components

A UMC 3xx FS contains:

Controller unit

- Position controller, speed controller, current controller
- HSCI interface
- Interfaces to the speed and position encoders

Power module

- Inverter
- Connections for motors and motor holding brakes
- Connections for feeding the DC-link voltage
- Connections for feeding the +24 V DC voltage supply

System PL

- Integrated PLC-I/Os (expandable with PLB 61xx (FS))
- Configuration with IOconfig PC software
- Dual-channel FS I/Os for use in SPLC program

The components required for operating the UMC 3xx FS compact inverter from HEIDENHAIN include the following:

- NC software with NCK version 597110-16 or higher
- MC or PNC main computer
- Fuse for protecting the DC-link connection between power supply unit and UMC 3xx FS
- External supply unit, e.g. UVR 3xx, UEC 3xx (FS) for the DC-link supply and 24 V supply
- Connectors for X38x:
 - UMC 314 (FS): 4 pieces, UMC 315 (FS): 5 pieces
- Shield plate for connector X33 (if necessary)

Power supply unit

An external power supply unit (e.g. UVR 3xx) must provide the rectified DC-link voltage and the +24 V DC voltage supply. The power modules (DC-AC inverters) in the UMC 3xx FS then provide the energy to the connected motor(s). Please note that no other inverter may be connected to a UMC 3xx FS!

Differences

The UMC 3xx FS compact inverters differ in the number of axes and the permissible maximum currents. Refer to the specifications of the specific compact inverter.



UMC 315 FS

Specifications of the power module of the UMC 3xx FS compact inverters

Compact inverter	UMC 314 FS	UMC 315 FS
Power supply (input side)	DC 509 V to DC 720 V (rectified DC-link voltage, e.g. of a UVR 3xx or UEC 3xx (FS)) DC +24 V PELV (DC +25 V ±5 %, e.g. of a UVR 3xx or UEC 3xx (FS))	
Power consumption of the UMC at the +24 V	Typical power consumption 330 W, including: <ul style="list-style-type: none"> • 6 A total current for brake outputs • 1.3 A for fan at maximum speed • Requirements of internal supply voltages • Supply for EnDat encoders 	
Min. conductor cross section for voltage supply at X33 as per VDE 0298-4 (according to UL 508A)	6 mm ² (10 mm ² recommended) Operating temperature at least 70 °C	
Fuse protection of power supply from the supply unit (DC-link connection)	Mersen DCT20-2, 20 A	
Integrated 24 V power supply unit	–	
Number of motor connections	4	5
Rated current (PWM frequency of 5 kHz, at rotating field frequencies > 10 Hz)	<ul style="list-style-type: none"> • Drives 1, 2, 3: 10 A • Drive 4: 15 A 	<ul style="list-style-type: none"> • Drives 1, 2, 3, 4: 10 A • Drive 5: 15 A
Overview of the output currents	Page 63	
Conductor cross section for the X38x motor connection	The required conductor cross section depends on the following factors and must be determined and, if necessary, fused by the machine manufacturer: <ul style="list-style-type: none"> • Rated current of the inverter and the connected motor • Operating mode • Cable type • Cable routing type The values below are given for operating mode 1 and a motor cable designed for an operating temperature of at least 80 °C. Cross sections for other operating modes must be defined by the machine manufacturer.	
Min. conductor cross section for motor connection as per VDE 0298-4 (according to UL 508A)	<ul style="list-style-type: none"> • X381, X382, X383: Min. 1.0 mm² (AWG16) • X384: Min. 1.5 mm² (AWG 14) 	<ul style="list-style-type: none"> • X381, X382, X383, X384: Min. 1.0 mm² (AWG16) • X385: Min. 1.5 mm² (AWG 14)
Cable type	Shielded cable, copper, 600/1000 V, resistant to oil and lubricants	
Routing type for the specified minimum conductor cross section	Routing type C	
Maximum possible PWM frequency	10 kHz	
Braking resistor	Not necessary: the regulation of the DC-link voltage must be handled by the power supply unit used (e.g. UVR 3xx with UP 3xx)	
Max. current consumption DC 24 V without current for brake control	≈ 11 A	
Power loss during rated operation	≈ 250 W	≈ 260 W
Cooling method	Integrated, temperature-controlled fans	

¹⁾ Derating at rotating field frequencies < 10 Hz: see *Derating of the output currents*

Compact inverter	UMC 314 FS	UMC 315 FS
Number of free I/Os	<ul style="list-style-type: none"> • Single-channel PLC inputs: 46 • Fixed inputs: -REF-SP-PL • Single-channel free PLC outputs: 28 • Fixed outputs: -STO.A.G, -STOS.A.G, -TEST.A, -TEST.B • Dual-channel SPLC inputs: 16 • Dual-channel SPLC outputs: 8 	
Touch probes	Interface(s) not included	
SPI expansion slots	Interface(s) not included	
Max. output current per braking connection (+24 V, HSLs)	Drives 1 to 5: 2.0 A each (max. 6 A in total)	
Protection class	IP20	
NRTL approval	Yes	Yes
Module width	150 mm	150 mm
Mass	11.5 kg	12 kg
ID	1296746-xx	1296745-xx

¹⁾ Derating at rotating field frequencies < 10 Hz: see *Derating of the output currents*

Output currents

Output currents of the UMC 3xx FS compact inverters based on the PWM frequency at a DC-link voltage of DC 650 V:

	PWM frequency	UMC 314 FS	UMC 314 FS
		Axes 1 to 3	Axis 4
		UMC 315 FS	UMC 315 FS
		Axes 1 to 4	Axis 5
	3.3 kHz	On request from HEIDENHAIN	
Rated current I_N , BM 1 Current $0.7 \cdot I_N$, BM 2 Maximum current I_{MaxAC} , BM 4, 5	4.0 kHz	11 A 7.7 A 22 A	15 A 10.5 A 30 A
	5.0 kHz	10 A 7.0 A 20 A	15 A 10.5 A 30 A
	6.6 kHz	8.4 A 5.88 A 16.8 A	12.6 A 8.82 A 25.2 A
	8.0 kHz	7.3 A 5.11 A 14.6 A	11 A 7.7 A 22 A
	10 kHz	6.1 A 4.27 A 12.2 A	9.1 A 6.37 A 18.2 A

For a description of the BM x operating modes or load cycles, please refer to the Technical Manual of the Gen 3 drives.

For a description of the BM x operating modes or load cycles, please refer to Page 35.

PWM frequencies > 10 kHz are not supported by the UMC 3xx (FS).

PWM frequencies > 5 kHz require software option 49.

Accessories for compact inverters

Planning and selection of the UMC 3xx FS compact inverter

The selection of the compact inverter depends on the currents required by the connected motor. In many cases, the inverter is selected based on the stall current of the motor being used.

For selection of the inverter, HEIDENHAIN recommends the following:

For a feed axis without a weight load or without a high load from process forces, or for a spindle:

- Rated current of the inverter (rotating field frequency > 10 Hz) ≥ Motor stall current

For feed axes with a weight load or with a high load from process forces, make sure to consider the derating of the inverter output current mentioned below:

- Rated derating current (current at a rotating field frequency < 10 Hz) ≥ Motor stall current
where: Rated derating current = Rated current of the inverter (rotating field frequency > 10 Hz) / 0.7

Derating of the output currents

Derating based on the rotating field frequency of the motor:

For rotating field frequencies of < 10 Hz (electrical frequency), observe the following derating for the output current limits:

Current at rotating field frequency of < 10 Hz = Current value (from the tables in the specifications) · 0.7

Example:

Rated current of the UMC 314, drive 1 (5 kHz, rotating field frequency > 10 Hz) = 10 A

Rated current of the UMC 314, drive 1 (5 kHz, rotating field frequency = 0 Hz) = 10 A · 0.7 = 7 A

Compact inverter	UEC 31x (FS)	UEC 32x (FS)	UEC 33x (FS)
HSCI cable (mandatory)	Gbit HSCI cable	Gbit HSCI cable	Gbit HSCI cable
Siemens SITOR gR or gS line fuse (mandatory)	35 A 3NE8 003-1, gR or 3NE1 803-0, gS	50 A 3NE8017-1, gR or 3NE1817-0-0, gS	63 A 3NE8018-1, gR or 3NE1818-0, gS
Connectors for motor/brake connection (mandatory)	Connectors for X38x (must be ordered separately):		
	For UEC 314 (FS): 4 pieces For UEC 315 (FS): 5 pieces	For UEC 324 (FS): 2 pieces For UEC 325 (FS): 3 pieces	For UEC 334 (FS): 2 pieces For UEC 335 (FS): 3 pieces
Shield plate for shield connection (optional)	Integrated in X38x connector	Must be ordered separately for connectors X81 and X82 Integrated in X38x connector	
Power cables for connecting motors (mandatory)	For information on HEIDENHAIN power cables to the motor, please refer to the brochure or to the Technical Manual for the motors.		
Braking resistor (mandatory)	Integrated	PW 310	PW 310
Surge protector (optional)	VAL-MS 230/FM		
Regenerative module (optional)	RM 330		
Voltage protection module (optional)	SM 320		
Bus mounting of DC link and 24 V supply voltage for connection of optional modular components (e.g. UM 3xx, RM 330, CC 3xx)	One X76 jumper plug must be ordered separately: ID 1043632-51 DC-link conductor bars are included with the optional modular component		
Additional modular inverter(s) (optional)	UM 3xx + CC 3xx, for up to four additional motors. CC is mandatory.	Up to and incl. variant -02: UM 3xx + CC 3xx, for up to four additional motors. CC is mandatory.	
		Variant -03 or higher: An additional UM 3xx inverter can be connected without an additional CC. In this case an HFL is also required. UM 3xx + CC 3xx, for up to four additional motors. A CC from the second UM 3xx is mandatory.	
Capacitor module (optional)	CMH 320		

PW 310 braking resistor

The PW braking resistors convert the energy fed back into the DC-link during braking into heat.

The PW 310 braking resistors mainly cool via convection of the surrounding air. The braking resistor must be mounted outside the electrical cabinet to allow the heat to dissipate. Otherwise, the cooling system of the electrical cabinet must be configured accordingly.

Either one PW 310 or two PW 310 can be connected in parallel to the UEC 32x (FS) and UEC 33x (FS) compact inverters.



PW 310

Braking resistor module	PW 310	2 x PW 310 (parallel connection of two PW 310)
Continuous power	2 kW	4 kW
Peak power (1.5 % cyclic duration factor at a cycle time of 120 s)	27 kW	54 kW
Permissible energy quantity	48.6 kW s	97.2 kW s
Resistor	22 ohms	11 ohms
UL certification	Yes	Yes
IP rating	IP20	IP20
Mass	6.7 kg	2 x 6.7 kg
ID	1324061-01	2 x 1324061-01

When planning the values for the braking resistor, please note the additional information in the Technical Manual of the Gen 3 drives.

Regenerative module

With the UEC 3xx (FS) non-regenerative compact inverters, the excess braking energy of the motors is normally dissipated via a braking resistor. Optionally, the braking energy can also be returned to the line power via the RM 330 regenerative module. For this purpose, the RM 330 is mounted to the right of the UEC 3xx (FS) and connected to the UEC via X76 and the DC conductor bars. The energy is fed back into the power supply network by connecting the RM 330 to the supply network in parallel to the UEC.

To prevent damage to the machine and workpiece in the event of a power failure, an additional PW braking resistor is also required when using an RM 330 for the UEC 32x (FS) and UEC 33x (FS).

The machine manufacturer is responsible for selecting the braking resistor depending on the peak power that will be present when the drives are braked in the event of a power failure.

One X76 jumper plug for connecting the RM 330 to a UEC 3xx (FS) must be ordered separately (ID 1043632-51).

When using an RM 330, note that the closing voltage (start of energy recovery, approx. DC 570 V at 3AC 400 V) is significantly lower than the switching voltage at which a braking resistor becomes active (approx. DC 780 V). When braking at the limit of current, for example, this can lead to slower braking of the axes and spindles, since less current can flow through the motor in the field weakening range due to the lower voltage. When using an RM 330, therefore please note that possible parameter adjustments or additional tests on the machine may be necessary.



RM 330

Regenerative module	RM 330
DC-link voltage (input side)	DC 509 V to DC 720 V
Line power (output side)	3AC 400 V (-10 %) to 3AC 480 V (+6 %)
Rated frequency of line power	50/60 Hz
Switch-on voltage (start of energy recovery)	If DC-link voltage > rectified line voltage (approx. DC 570 V at 3AC 400 V)
Rated power	1 kW
Peak power (max. 2 s feedback at a cycle duration of 120 s)	60 kW ¹⁾
Min. conductor cross section for voltage supply at X31 as per VDE 0298-4 (according to UL 508A)	4 mm ² (AWG 12)
IP rating	IP20
NRTL approval	Only with variant -02 or higher
Module width	50 mm
Mass	7.7 kg
ID	1215138-xx

¹⁾ Derating: If you reduce the line voltage of 3AC 400 V by 10%, the permissible peak power likewise decreases by 10%.

The permissible energy regeneration P_R depends on the energy regeneration time t_R and the cycle duration T as follows:

$$P_R = (T / t_R) * 1 \text{ kW}$$

The following requirements must be met:

- $P_R \leq P_{MAX}$
- The regenerated energy must not exceed 120 kWs within the cycle duration.

X76 jumper plugs

Jumper plugs for the connection of +24 V, 0 V, and DRIVE OFF when connecting modular components to a UEC 3xx (FS):

- Max. 30 A for the +24 V connection
- You need to order a connector separately if you want to extend the UEC 3xx (FS) by adding modular components (e.g. UM 3xx, CC 3xx, RM 330)

One piece ID 1043632-51



Terminating holder for jumper plug X76

Bracket for the jumper plug that protrudes from the right edge of a Gen 3 combination with 50 mm modules:

- Bracket for X76
- Simple mounting as for 24 V connection set

One piece ID 1352462-01



General accessories for inverter systems

Motor and brake connection

- Connector for motor and brake connection:
- For UM 310, UM 311, UM 320, UM 321, UEC 3xx (FS), UMC 3xx (FS)
 - X38x hybrid connectors (not included in delivery; must be ordered separately)

One piece	ID 1249132-03,	Straight version
20 pieces	ID 1249132-01,	Straight version
One piece	ID 1249132-05,	Angled 150° to the left
20 pieces	ID 1249132-04,	Angled 150° to the left
One piece	ID 1249132-07,	Angled 210° to the right
20 pieces	ID 1249132-06,	Angled 210° to the right



Surge protectors

The Phoenix VAL-MS 230/FM single-pole surge protector and the three-pole FLT-SEC-T1+T2-3C-350/25-FM are used to protect HEIDENHAIN power modules from overvoltages on the conductors or from the mains. These surge protectors are also equipped with a double-throw switch as a remote indicator switch.

Surge protector	VAL-MS 230/FM	FLT-SEC-T1+T2-3C-350/25-FM
Manufacturer	Phoenix	Phoenix
IEC test class	II	I + II
EN type	T2	T1 + T2
Rated voltage	230 V	240 V
Rated frequency	50 / 60 Hz	50 / 60 Hz
Protector rated voltage (L-N)	AC 275 V	AC 350 V
Nominal discharge surge current	20 kA	25 kA (L -PEN)
Maximum discharge current	40 kA	- - -
Module width	Approx. 17.7 mm	Approx. 106.8 mm
ID	827105-01 (contains three pieces)	826918-01

The optional surge protector should preferably be installed after the fuses and the line filter for the HEIDENHAIN power modules as seen from the power connection. HEIDENHAIN recommends the shortest possible lines between the supply unit and the surge protector to ensure best possible protection for the HEIDENHAIN power modules.

If this is difficult due to the electrical cabinet design or the wiring, then the overvoltage protector may also be installed prior to the line filter.

SM voltage protection module

If synchronous motors or direct drive motors, such as synchronous spindles or torque motors, are operated in the field weakening range (e.g., as main spindle drives), then a power interruption (e.g., power failure) of the inverters can cause a voltage increase at the power connections of the motor or inverter. This voltage increase can damage the inverters and the motor. To prevent this, an SM voltage-protection module must be installed in the motor supply line between the motor and the inverter. If a fault occurs, the SM will short-circuit the motor phases. The released braking energy is converted into heat.

Operation in the field weakening range must be enabled through machine parameters of the control. Please refer to the Technical Manual of your control.

You can use the following formula to decide whether an SM voltage protection module must be used:

$$N_{Max} = (850 \text{ V} \cdot N_{Rated}) / (U_0 \cdot \sqrt{2})$$

The resulting N_{Max} has the following meaning: if the motor is operated at a speed greater than the speed N_{Max} , then a voltage protection module must be used. Please also note the production tolerances applying to the respective motor specifications. For example, the actual no-load voltage can be more than 10% higher than stated in the specifications. Take this into account when considering whether an SM 3xx is required.

For the selection of the SM voltage-protection module, the short-circuit current of the motor is decisive (evident from the motor data).

The rated current of the motor and the maximum short-circuit current I_k of a motor must be less than the maximum phase current of the SM:

$$\text{Where: } X_L = X_{str1} + X_H + X_{Series \text{ reactor}}$$

If $X_{str1} = 0$ and $X_{Series \text{ reactor}} = 0$, then: $X_L = X_H$ in Ohm

In this case, the following applies to the short-circuit current:

$$I_k = U_0 / (\sqrt{3} \cdot X_H)$$

Choosing between the SM 320 and SM 330:

- If $I_k < 200 \text{ A}$, then SM 320
- If $200 \text{ A} < I_k < 350 \text{ A}$, then SM 330

The following data must be taken from the motor table of the control:

(The data is not always expressed in the base unit in the motor table. In the above-mentioned formula, the values must be entered in the base units.)

- U_0 : no-load voltage [V]
- X_{str1} : stator leakage reactance [ohm]
- $X_{series \text{ reactor}}$: reactance of the series reactor [ohm]
- X_L : inductive reactance [ohm] (note: in the motor table the value is expressed in [milliohm])
- X_H : magnetizing reactance [ohm] (note: in the motor table the value is expressed in [milliohm])



SM 320

If a Wye/Delta protective circuit is used when operating synchronous motors or direct drive motors in the field weakening range, then the voltage protection function of the protective module for the motor may be lost if the connection between the SM and the motor is disconnected by, for example, contactors. In order to maintain the voltage protection function, the following must apply: even in the event of a power failure, the control of any motor contactors must be ensured in such a way that the motor remains connected to the SM. In a HEIDENHAIN system, this can be achieved if the +24V PLB supply, as well as the supply of the PLC outputs for the Wye contactor and the Delta contactor of the relevant motor, are supplied from the power adapter of the UVR, because this is DC-link-buffered.

Voltage-protection module	SM 320	SM 330
Switching voltage	DC 830 V	
Maximum phase current	200 A	-
Connection type	SM between UM and motor (in series)	Stub lines from UM to SM (parallel)
Maximum permissible short-circuit current time ranges: < 1s 1 s to 20 s	Max. 400 A Max. 200 A	Max. 700 A Max. 350 A
Minimum waiting time between <i>n</i> switching events	$n \leq 2$: <ul style="list-style-type: none"> • 10 min for a short-circuit duration of less than 10 s • 20 min for a short-circuit duration of between 10 s and 20 s $n \geq 3$: 60 min	
PWM frequency	3.3 kHz to 16 kHz	
Suited for	UM 3x0, UM 3x1, UM 3x2, UM 313, UM 314, UM 315 UEC 3xx (FS) UMS 312	UM 316(W), UM 317W
NRTL approval	Yes	Yes
Protection class	IP20	
Mass	≈ 3.8 kg	
ID	1276063-xx	1237089-xx

CMH 3xx capacitor module

A CMH 3xx capacitor module may be required for maintaining the DC-link voltage to perform a LIFTOFF if a power failure occurs. This is necessary, for example, in order to perform a complete LIFTOFF when direct drives are used.

You can connect more than one CMH 3xx in parallel in a modular inverter system in order to increase the available capacitance for the DC-link voltage. However, a total capacitance of 40 mF must not be exceeded in an inverter system with a UVR 3xx! The capacitances of the individual power modules must also be taken into account.

For the UEC 3xx (FS) compact inverters, no more than one CMH 3xx may be used.



CMH 320

Capacitor module	CMH 320
Power supply	DC-link voltage DC 509 V to DC 720 V
Maximum voltage	DC 800 V
Rated capacitance	10 mF
Power loss with DC-link voltage of DC 650 V	≈ 30 W
Power loss with DC-link voltage of DC 720 V	≈ 36 W
NRTL approval	Yes
Mass	6.7 kg
ID	1164215-xx

PSL 330 low-voltage power supply unit

The PSL 330 low-voltage power supply unit generates a +24 V output voltage from the connected line voltage and/or DC-link voltage. This can be used as +24 V supply voltage for the connected UM 3xx inverters, motor brakes connected to these, other Gen 3 components and other accessories.

The PSL 330 is required if the power of the integrated +24 V power pack in the UVR 3xx or UEC 3xx power supply unit is not sufficient. This may be the case if many modular inverters and many motors with holding brakes are used, for example. Modular components of Gen 3, which are then arranged to the right of the PSL 330, can be supplied with the alternative +24 V from the PSL via the +24 V busbar connection. In addition, the PSL 330 also provides the +24 V output voltage via a connector on the underside, so that devices can also be supplied that are not connected to the +24 V busbar connection (jumper plug X76).

Due to the mains supply (3AC via X31), the output voltages of the PSL 330 are available when the machine's main switch is turned on. The mains supply is mandatory for proper operation of the PSL 330.

The additional necessary DC-link supply (DC) of the PSL 330 via the DC-link voltage of a UVR 3xx or UEC 3xx(FS) means that the voltage fed into the DC-link by the motors that are still running can be used during line voltage failures. This buffered DC-link voltage enables the PSL 330 to provide temporary maintenance of the +24 V output voltage in the event of a power failure.



PSL 330

Power pack	PSL 330
AC power supply (input side)	3AC 400 V (-10%) to 3AC 480 V (+6%)
AC rated frequency	50 / 60 Hz
Phase conductor current at rated power (input side at 3AC 400 V)	1.3 A
Connected load (input side)	Approx. 700 W
DC power supply (input side)	DC-link current DC 509 to DC 720 V of a UVR 3xx or UEC 3xx(FS)
Minimum conductor cross section and line type for power supply at X31 as per DIN VDE 0298-4 (according to table NEC 310-16)	H07 V2-K single conductor: 1.5 mm ² (AWG 14), at least 80 °C, copper, at least AC 480 V, routing type: B2, C, or E Pre-fuses for line protection are to be selected by the machine manufacturer
Integrated power pack with 24 V power supply	Output voltage: DC +25 V ±3.0% max. 650 W, 26 A total Please refer to the Technical Manual of the Gen 3 drives during the planning stage <ul style="list-style-type: none"> • max. 20 A via X76 • max. 26 A via X90
Cooling method	Integrated fan
Protection class	IP20
Power loss during rated operation P _v	For information on the power loss values, please refer to the Technical Manual for the Gen 3 drives.
Low-voltage cut-off limit during operation on DC-link voltage	from < 350 V
NRTL approval	Yes

Power pack	PSL 330
Module width	50 mm
Mass	3.6 kg
ID	1356546-xx

Multi-row configuration

In some cases, limited space prevents the control and/or the power modules from being installed in a single row or in a continuous row within the electrical cabinet. This usually means that the devices must be installed in multiple rows or side by side in separate rows.

Components like inverters and controller units in every row must be connected to a 24 V supply bar at X76 and, possibly, the DC-link voltage. These supply voltages are provided by one or more power supply units. If each row has its own power supply unit, then the components in this row can standardly be connected to the supply voltages via the corresponding bus mountings. Often, however, only one power supply unit is used in a multi-row configuration. Special connection kits from HEIDENHAIN must then be used to electrically connect the individual power module rows.

Connection kit for +24 V and DRIVE OFF (X76)

- Optional accessory for a multi-row or discontinuous configuration
- For lateral mounting at the outermost component of a power module row
- Line cross section: 4 mm², for up to 30 A

X76 connection kit	Length	ID
	2 m	1274603-02
	3 m	1274603-03



Connection kit for DC link

- Optional accessory for a multi-row or discontinuous configuration
- For lateral mounting at the outermost component of a power module row
- Includes a shield plate for connecting the shield and which serves as strain relief for UVR 3xx or components with a width ≤ 75 mm
- Line cross section: 10 mm², for up to 55 A

Connection kit DC-link	Length	ID
	2 m	1278910-02
	3 m	1278910-03



Shield plates

The shield plates are an optional accessory, and are not included with the modular inverters or compact inverters.

Modular inverters:

The various shield plates are optional accessories for the shield connection of the motor power cable. They are each mounted with screws to the UM modular inverter and must not be used for strain relief. The screws are included in delivery.

Shield plate	Quantity	ID
UM 312, UM 322	1	1271547-01
	10	1271547-02
UM 313, UM 314	1	1271564-01
	10	1271564-02
UM 315	1	1271566-01
	5	1271566-02
UM 316, UM 317	1	1271567-01

Compact inverters:

The various shield plates are optional accessories for:

- The shield connection of the motor power cables for the UEC 32x (FS) and UEC 33x (FS) for the two powerful axes at X81 and X82
- The shield connection of the cable for the DC-link voltage of the UMC 31x FS at X33

The shield plates must not be used as strain relief. The screws are included in delivery.

Shield plate	Quantity	ID
UEC 32x(FS), UEC 33x(FS)	2	1325070-01
UMC 31x FS	1	1351044-01

HSCI connection

With the Gen 3 drives, communication between the HSCI components is carried out over Gbit cables with gray HSCI connectors. Previous HSCI cables have black connectors.

The Gbit HSCI cable (ID 1257765-xx) can also be used in place of the HSCI cable for 100 Mbit (ID 618893-xx). However, the reverse is not possible. Control systems that require Gbit HSCI can be operated only with the Gbit HSCI cable. The HSCI cables from HEIDENHAIN are suitable for use in drag chains.

HSCI cable

ID	Minimum bend radius (rigid configuration)	Minimum bend radius (frequent flexing)	Diameter	Max. length	HSCI
618893-xx	≥ 40 mm	≥ 100 mm	6.8 mm	70 m	100 Mbit
1257765-xx	≥ 40 mm	≥ 100 mm	7.2 mm	35 m	Gbit
1306923-xx	≥ 60 mm	≥ 150 mm	9.6 mm	70 m	Gbit
Two short connecting pieces with the specifications of ID 1257765-xx are included in the items supplied.					

Cable lengths

Cable	ID
0.20 m Gbit HSCI cable	1257765-A2
0.30 m Gbit HSCI cable	1257765-A3
0.50 m Gbit HSCI cable	1257765-A5
1.00 m Gbit HSCI cable	1257765-01
2.00 m Gbit HSCI cable	1257765-02
3.00 m Gbit HSCI cable	1257765-03
4.00 m Gbit HSCI cable	1257765-04
6.00 m Gbit HSCI cable	1257765-06
7.00 m Gbit HSCI cable	1257765-07
8.00 m Gbit HSCI cable	1257765-08
9.00 m Gbit HSCI cable	1257765-09
10.00 m Gbit HSCI cable	1257765-10
12.00 m Gbit HSCI cable	1257765-12
15.00 m Gbit HSCI cable	1257765-15
17.00 m Gbit HSCI cable	1257765-17
20.00 m Gbit HSCI cable	1257765-20
25.00 m Gbit HSCI cable	1257765-25
30.00 m Gbit HSCI cable	1257765-30
35.00 m Gbit HSCI cable	1257765-35

Kit	ID
40 m	1306923-40
50 m	1306923-50
60 m	1306923-60
70 m	1306923-70

The kit (ID 1306923-xx) comprises:

- 2 x 20 cm long connecting pieces (specifications identical to ID 1257765-xx) comprising:
 - 1 x standard HSCI connector for connection to HSCI components
 - 1 x Gbit HSCI cable, 7.2 mm in diameter
 - 1 x special coupling for connection to Gbit HSCI cable for lines 40 m or longer (diameter: 9.6 mm)
- 1 x Gbit HSCI cable, 9.6 mm in diameter (specifications identical to ID 1306923-xx) and 40 m to 70 m in length, with two special couplings for connection to the connecting piece



HFL (optical fiber)

Length of the HFL cable

The HFL cable lets you connect the UM 3xx modular inverters to the CC 3xx controller units for PWM-control of the inverters.

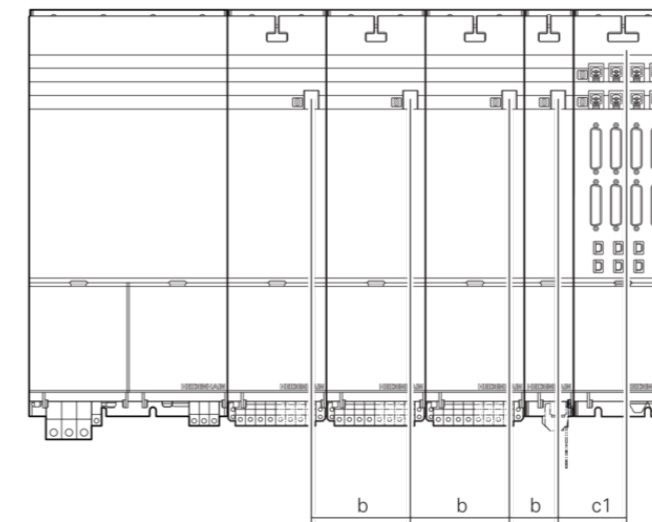
For the length of the optical fiber cable from the CC 3xx controller unit to the UM 3xx power module, HEIDENHAIN recommends the following:

When the UM 3xx power module is located to the left of the CC 3xx controller unit:

Length of HFL = width of the module to be connected (b) + width of all modules (b) between the UM and the CC + 300 mm (c1)

For example, the following arrangement:

UVR 340, UM 314, UM 313, UM 322, UM 321, CC 308

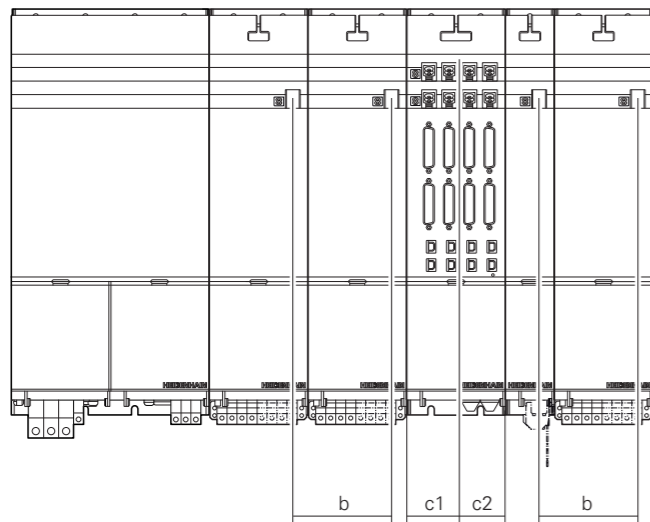


- CC 308 to UM 314: 650 mm
- CC 308 to UM 313: 550 mm
- CC 308 to UM 322: 450 mm
- CC 308 to UM 321: 350 mm

When the UM 3xx power module is located to the right of the CC 3xx controller unit:

Length of HFL = width of the module to be connected (b) + width of all modules (b) between the UM and the CC + 200 mm (c2)

For example, the following arrangement:
UVR 340, UM 314, UM 313, CC 308, UM 321, UM 322



CC 308 to UM 314: 500 mm
CC 308 to UM 313: 400 mm
CC 308 to UM 321: 300 mm
CC 308 to UM 322: 350 mm

Orderable variants of the HFL connection

Rolls of optical fiber cable	ID number
10 m roll of optical fiber cable, for assembly by the machine manufacturer	1265351-90
50 m roll of optical fiber cable, for assembly by the machine manufacturer	1265351-92
100 m roll of optical fiber cable, for assembly by the machine manufacturer	1265351-95

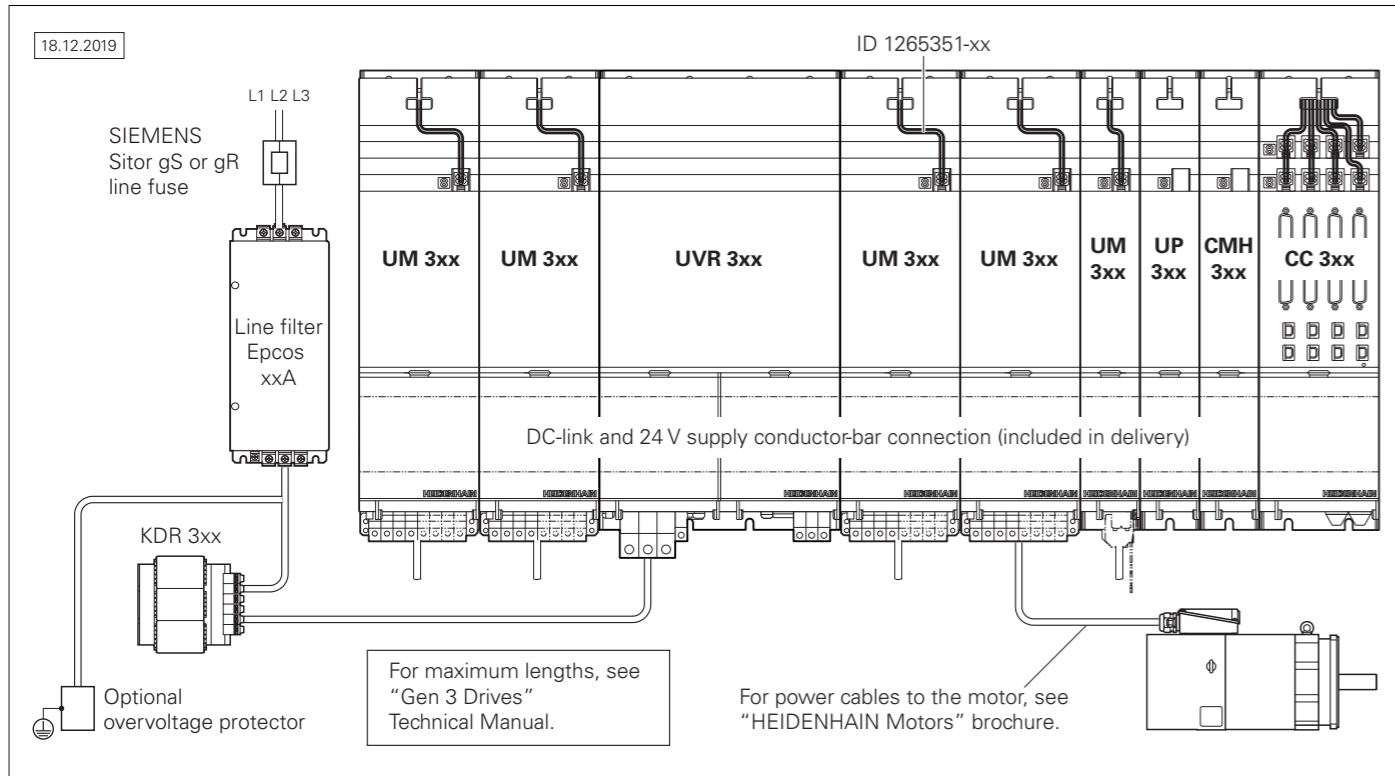
Cutting the optical fiber cable to length requires the following tool:

- Rennsteig pliers for "cutting and stripping duplex cable" (order number 8002 0012 3, available on request from Hoffmann Werkzeuge)
- Replacement cutting tools for these pliers, also available from Hoffmann Werkzeuge with order number 8000 0005 0 0 (safety cutting device, must be replaced after 2500 cuts)

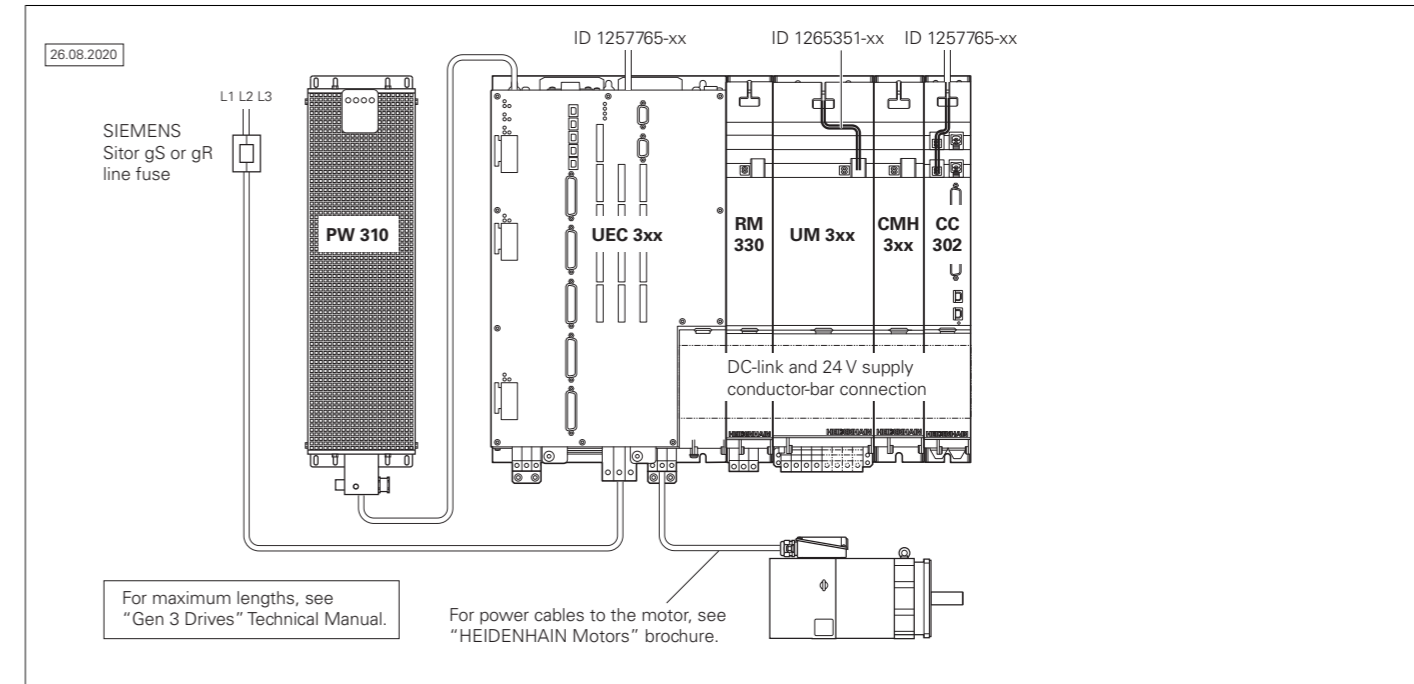
Optical fiber cable cut to length	ID number
0.30 m optical fiber cable	1265351-01
0.35 m optical fiber cable	1265351-02
0.40 m optical fiber cable	1265351-03
0.45 m optical fiber cable	1265351-04
0.50 m optical fiber cable	1265351-05
0.55 m optical fiber cable	1265351-06
0.60 m optical fiber cable	1265351-07
0.65 m optical fiber cable	1265351-08
0.70 m optical fiber cable	1265351-09
0.75 m optical fiber cable	1265351-10
0.80 m optical fiber cable	1265351-11
0.85 m optical fiber cable	1265351-12
0.90 m optical fiber cable	1265351-13
0.95 m optical fiber cable	1265351-14
1.00 m optical fiber cable	1265351-15
1.10 m optical fiber cable	1265351-17
1.20 m optical fiber cable	1265351-19
1.30 m optical fiber cable	1265351-21
1.40 m optical fiber cable	1265351-23
1.50 m optical fiber cable	1265351-25
1.60 m optical fiber cable	1265351-27
1.70 m optical fiber cable	1265351-29
1.80 m optical fiber cable	1265351-31
1.90 m optical fiber cable	1265351-33
2.00 m optical fiber cable	1265351-35

Overview of cables

Modular inverter system



UEC 3xx (FS) compact inverter



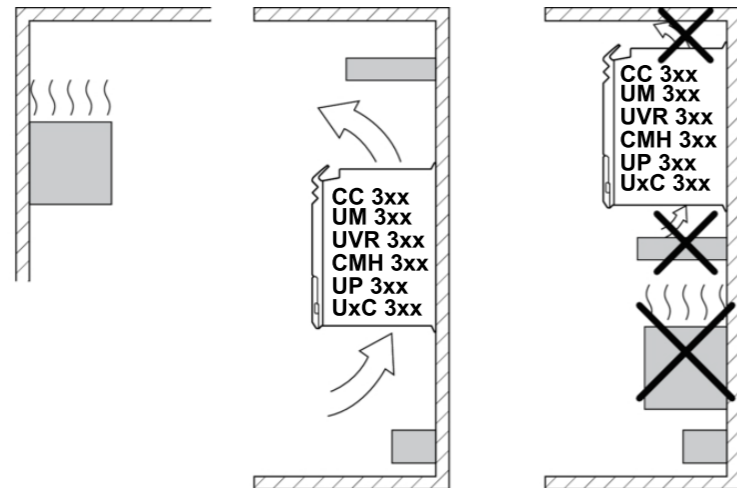
Mounting information

Mounting position

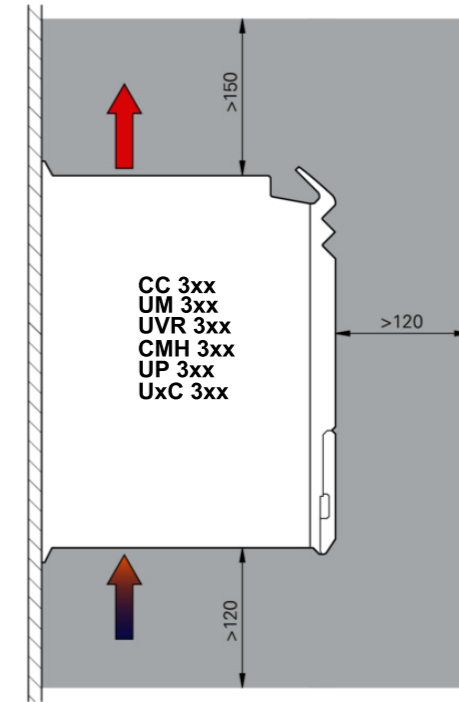
Please note the following when mounting the HEIDENHAIN power modules:

- The HEIDENHAIN power modules and control components must be operated only in enclosures or electrical cabinets that fulfill at least protection class IP54 in accordance with the European enclosure specifications. Ensure that, depending on the location of the machine, at least equivalent requirements are fulfilled. The machine manufacturer is responsible for this.
- The HEIDENHAIN power modules and control components must be mounted vertically in the electrical cabinet.
- Minimum clearances that must be maintained
- Required clearances for air circulation and servicing
- Appropriate length of the cables
- Permissible bend radii of the cables
- Do not mount any other devices that generate or dissipate heat below or in the immediate vicinity of the HEIDENHAIN power modules. Air that has already been heated should be prevented from being sucked in for the cooling of the HEIDENHAIN power modules.
- Professional mounting in connection with other devices in the electrical cabinet (see the following drawings).
- All of the HEIDENHAIN control components or devices (CC, MC, BF, MB, TE, UV(R), UR, UE, UEC, UMC, KDR, SM, etc.) must be operated only in enclosures suitable for this purpose, such as electrical cabinets or panels. Fire-protective housings that meet the fire protection requirements at the place of installation must be used as enclosures. The enclosures must also provide protection against electric shock.

Arrangement of HEIDENHAIN components



Clearances for HEIDENHAIN components



Mounting and electrical installation

- For mounting and the electrical connection, comply with the following:
- National regulations for low-voltage installations at the operating site of the machine or components
 - National regulations regarding interference and noise immunity at the operating site of the machine or components
 - National regulations regarding electrical safety and operating conditions at the operating site of the machine or components
 - Specifications for the installation position
 - Specifications of the Technical Manual

Protection classes

- The following components fulfill the requirements for protection class IP54 (dust- and splash-proof protection):
- Display unit (when properly installed)
 - Keyboard unit (when properly installed)
 - Machine operating panel (when properly installed)
 - Handwheel

All electric and electronic control components must be installed in an environment (e.g., electrical cabinet, enclosure) that fulfills the requirements of protection class IP54 (dust- and splash-proof protection) in order to fulfill the requirements of pollution degree 2. All components of the OEM operating panel must, like the HEIDENHAIN operating panel components, comply with protection class IP54.

Dimensions

Electromagnetic compatibility

During installation, pay special attention to the following factors with regard to electromagnetic compatibility.

Intended place of operation

HEIDENHAIN power modules and their accessories comply with the following standards based on Directive 2014/30/EC:

- Interference as per EN 61800-3, Category C3 and EN 50370-1
- Noise immunity in accordance with EN 61800-3, second environment, and EN 50370-2

Protect your equipment from interference by following the rules and recommendations on EMC provided in the Technical Manual for the Gen 3 drives. In particular, ensure that you follow the protective measures regarding an electromagnetically compliant configuration.

Place of operation

The inverter systems and power modules from HEIDENHAIN are intended for operation in industrial and mixed-use areas. The devices conform to EN 50370 (product-family standard for machine tools) and EN 61800-3, and fulfill the requirements for an industrial low-voltage supply network. The devices are not intended to be used on a public low-voltage supply network that supplies households. The devices may cause high-frequency interference.

The product conforms to category C3 as per EN 61800-3. This product can cause radio interference in residential areas. This would require the operator to ensure that appropriate measures are taken.

Installation elevation

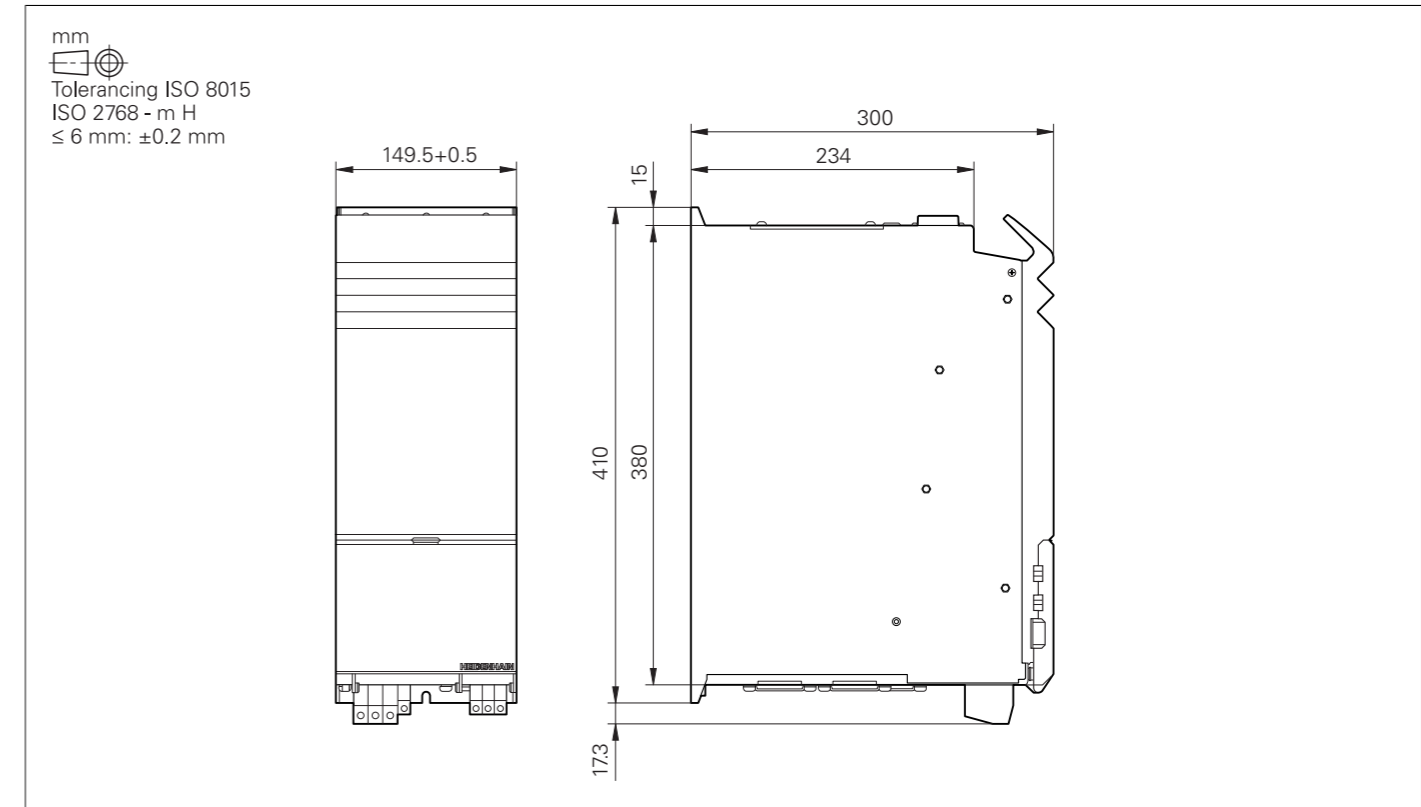
The maximum installation elevation for HEIDENHAIN power modules and the pertaining accessories (UVR, UM, UEC, KDR, line filter, PSL, etc.) for direct connection to line power is 2000 m above sea level. This is due to the fact that, up to an installation elevation of 2000 m above sea level, the HEIDENHAIN power modules and their accessories comply with Overvoltage Category III as per EN 61800-5-1 and UL 61800-5-1

At an installation elevation of greater than 2000 m above sea level up to a maximum permissible installation elevation of 3000 m, HEIDENHAIN power modules, as well as the control system, must be operated in a supply network that complies with overvoltage category II as per EN 61800-5-1 and UL 61800-5-1. This can be attained, for example, by means of an upstream isolating transformer.

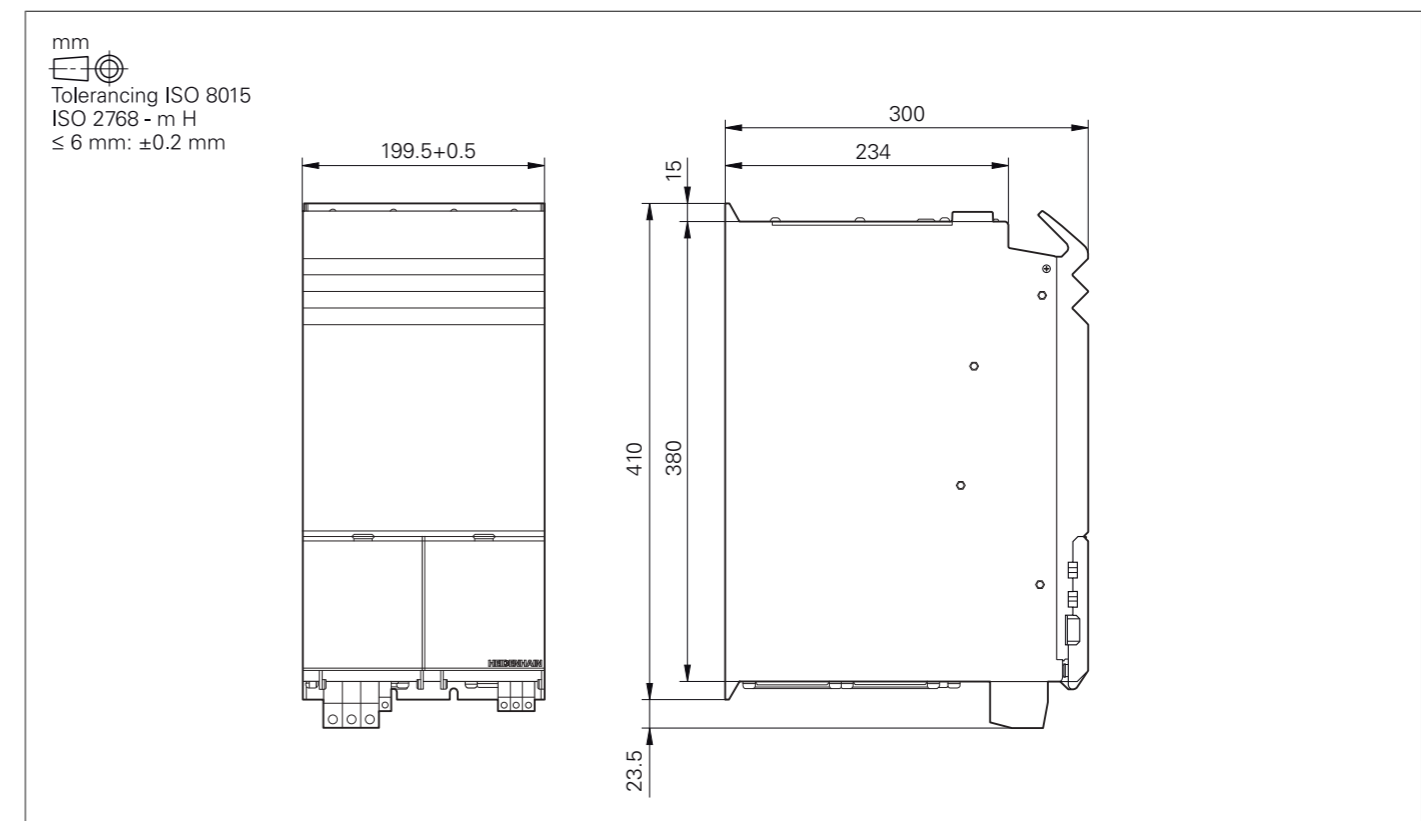
Be aware of degraded performance due to current derating when HEIDENHAIN power modules are installed at elevations of greater than 1000 m above sea level. Interpolation is linear for current derating:

- 1000 m to 2000 m: 100% to 85%
- 2000 m to 3000 m: 85% to 75%

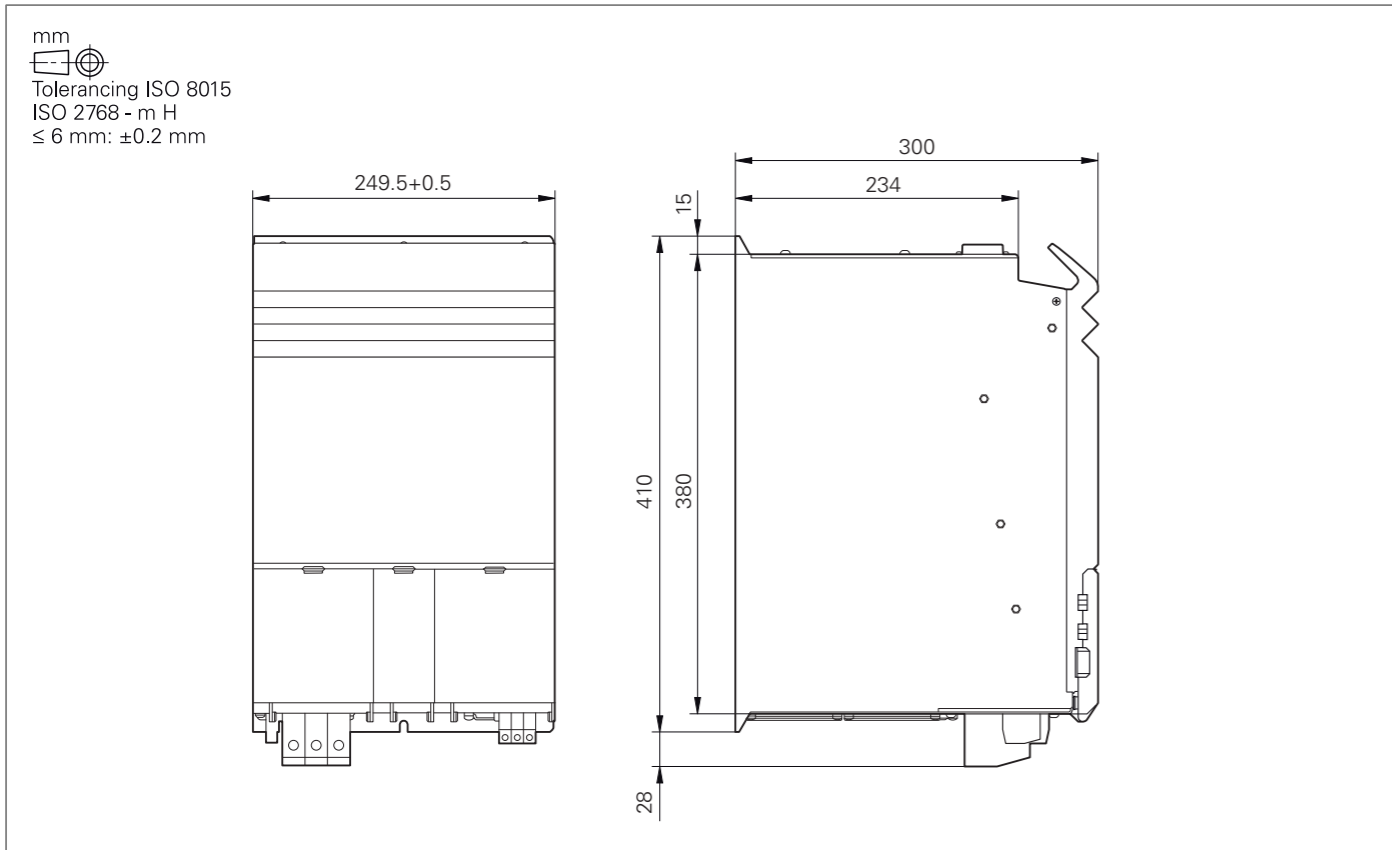
UVR 330



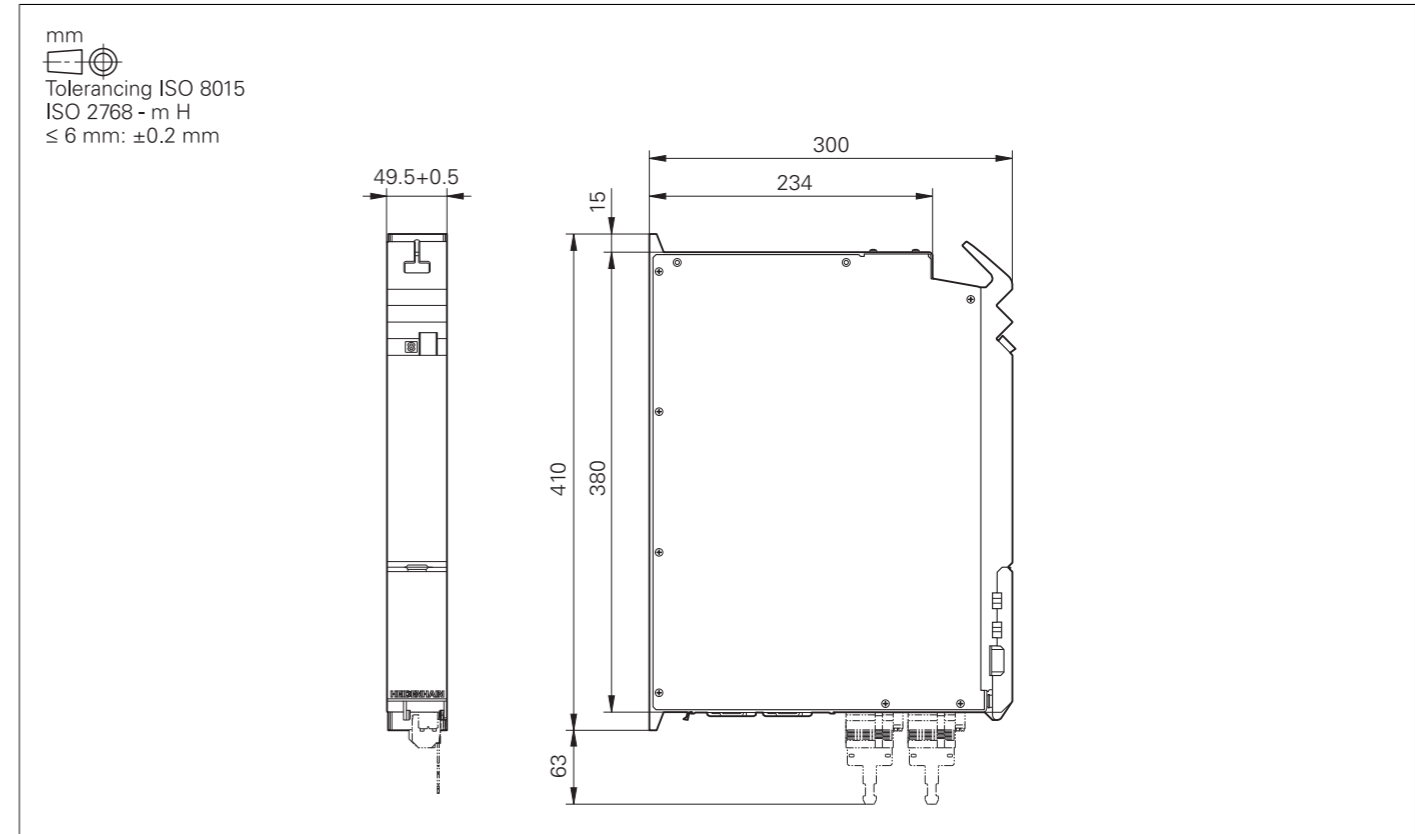
UVR 340, UVR 350



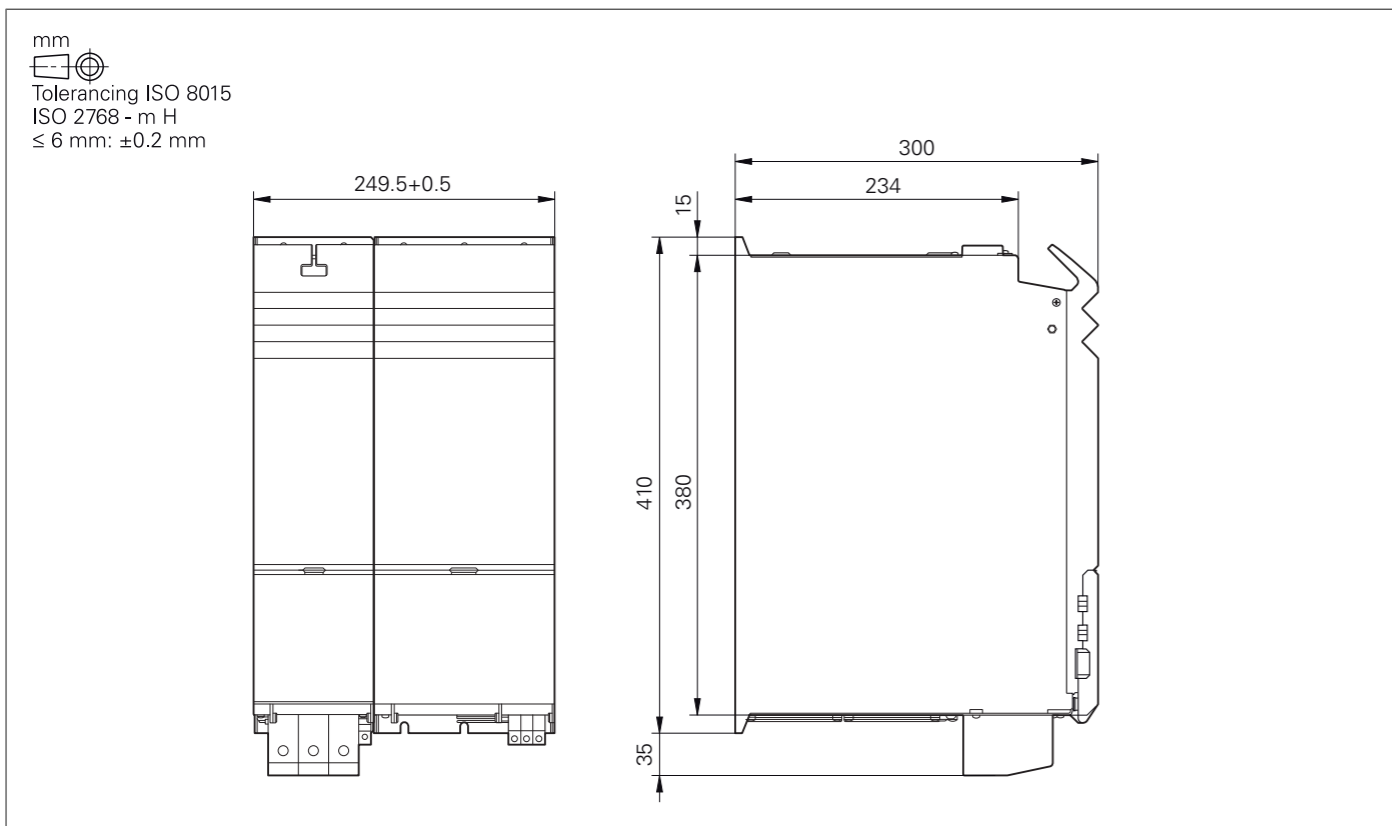
UVR 360(W)



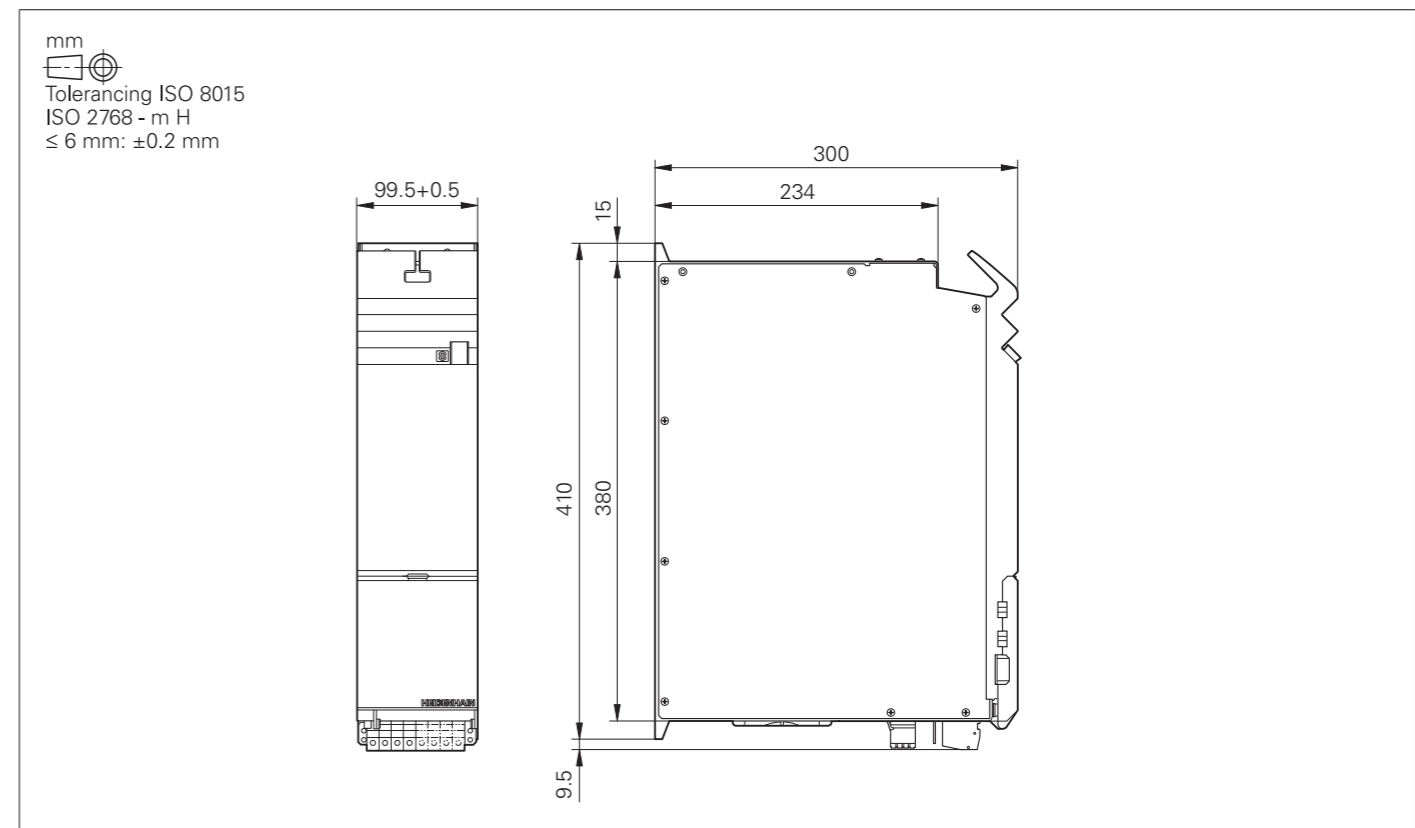
UM 310, UM 311, UM 320, UM 321

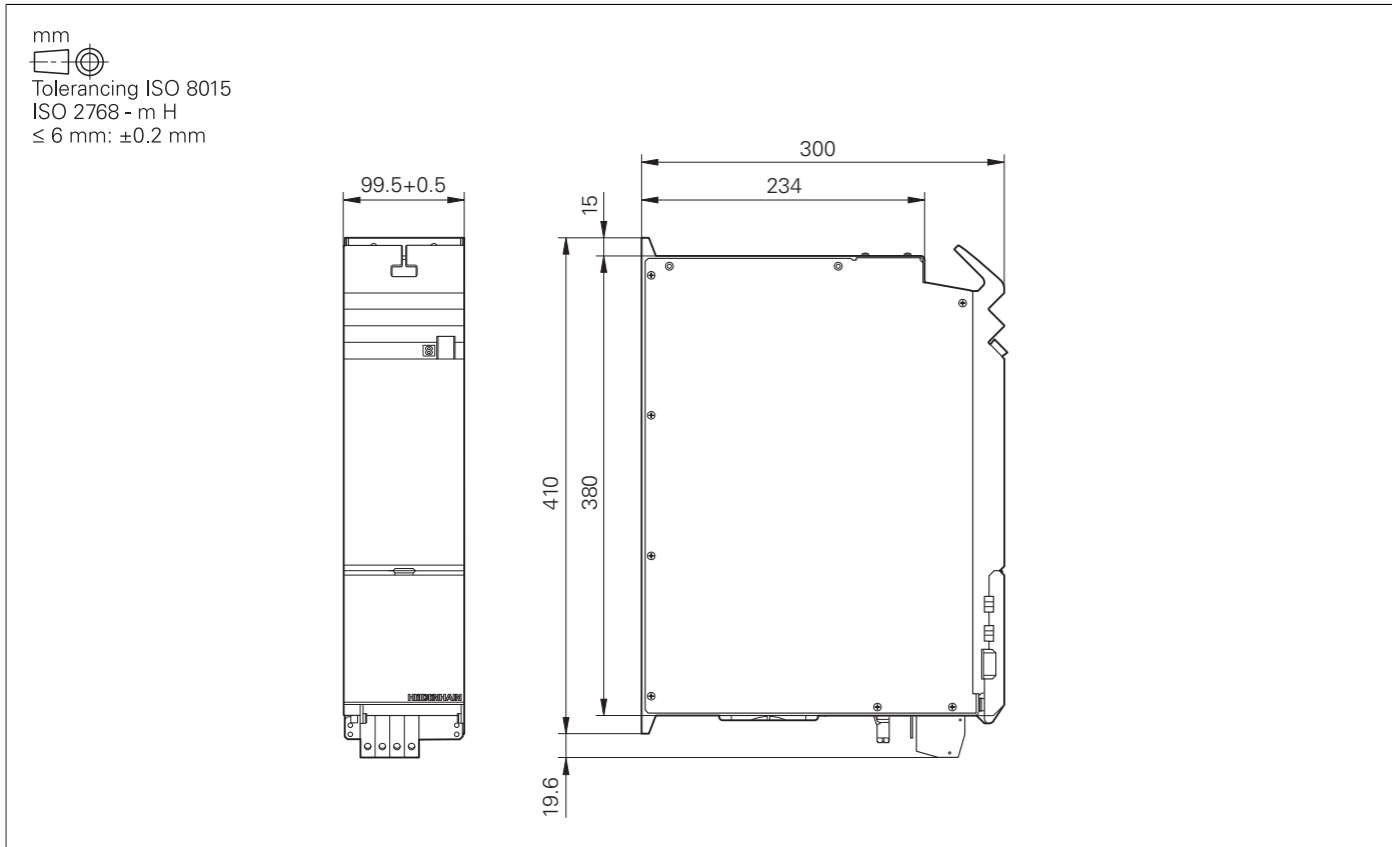
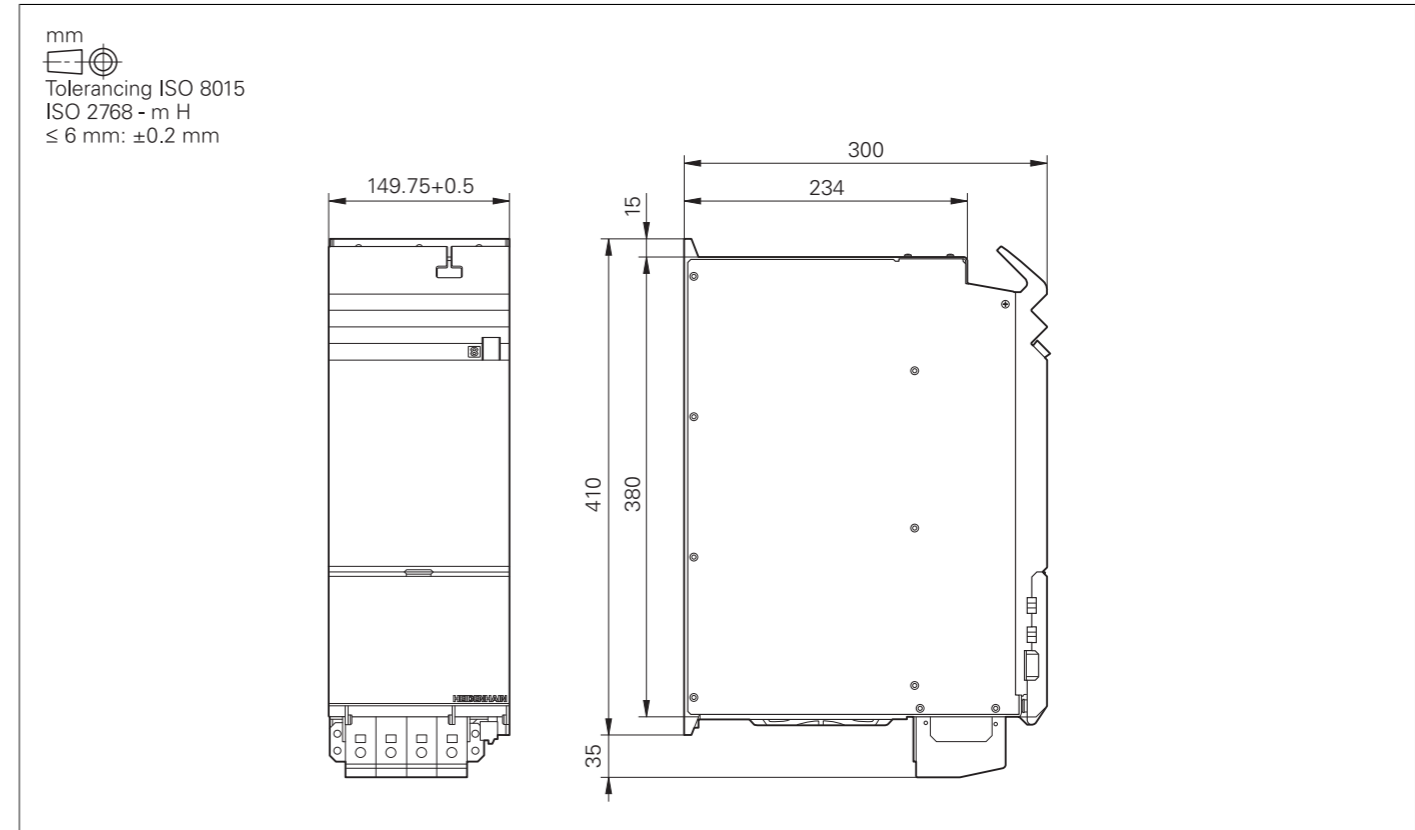
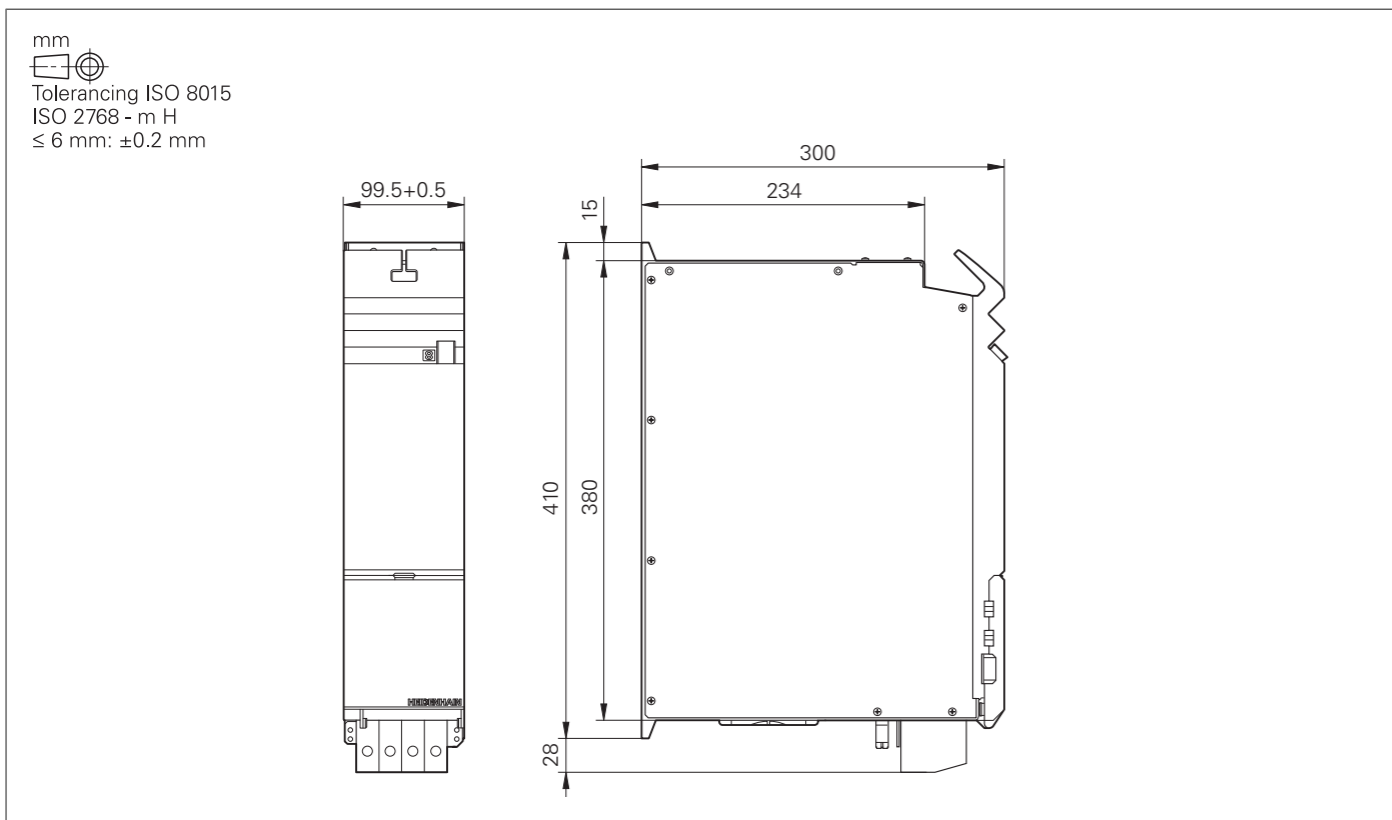


UVR 370(W)



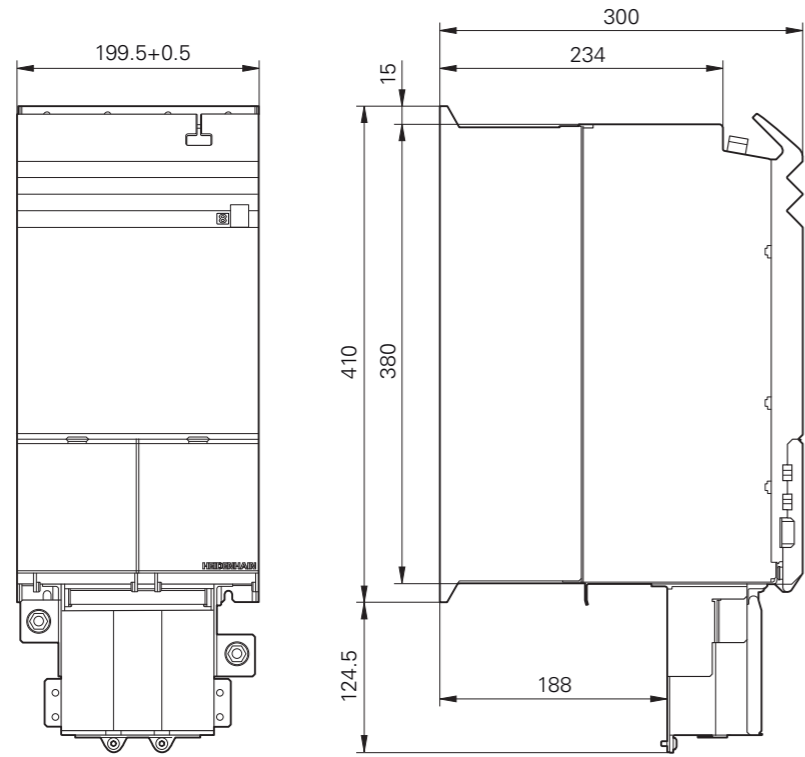
UM 312, UM 322



UM 313**UM 315****UM 314**

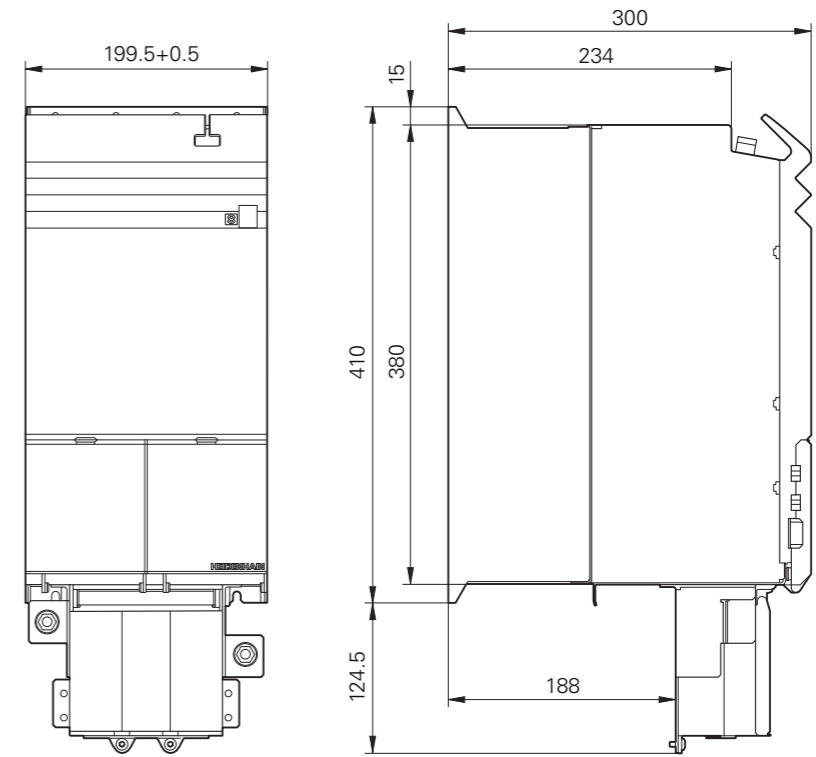
UM 316

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

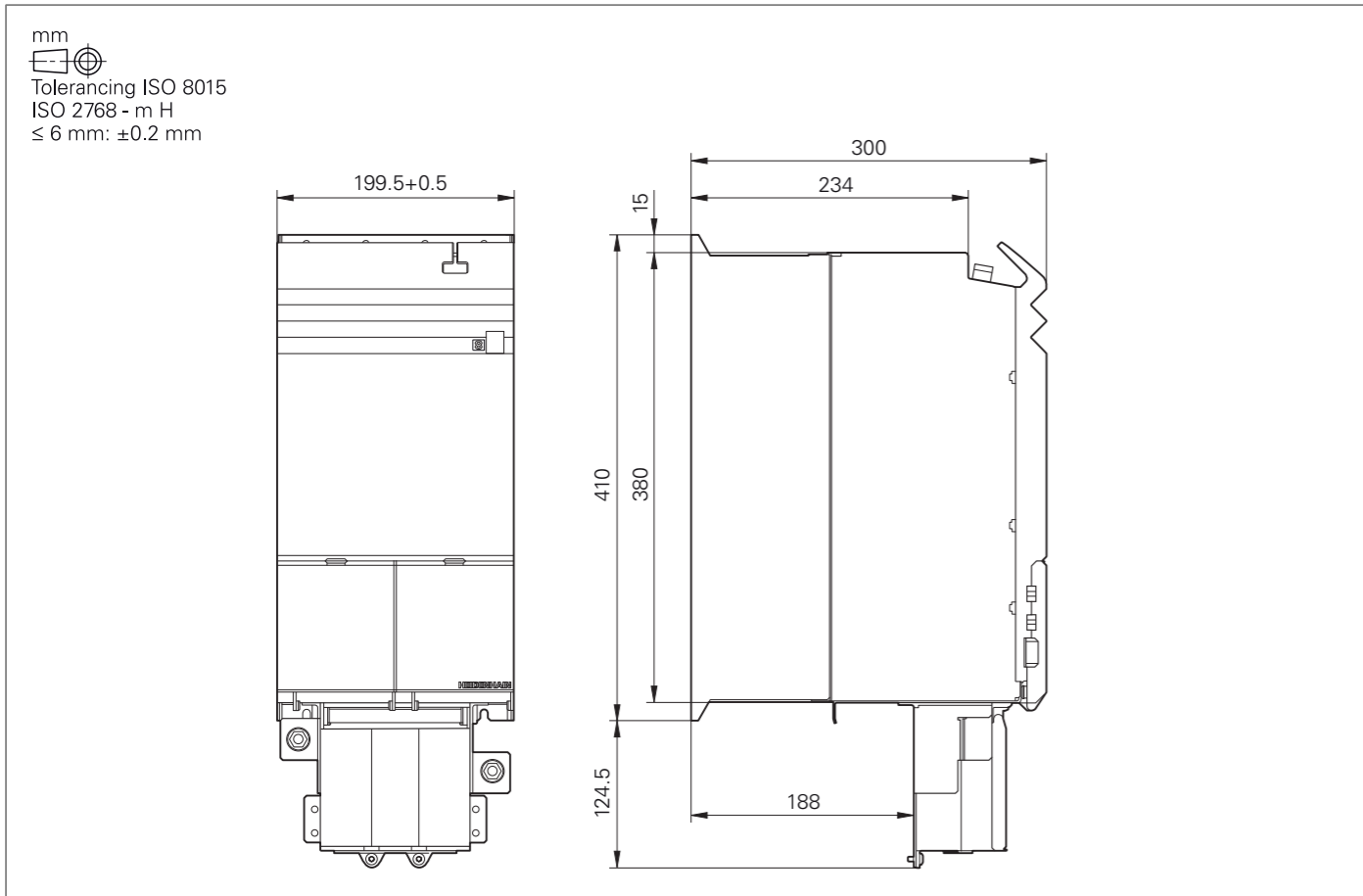


UM 316W

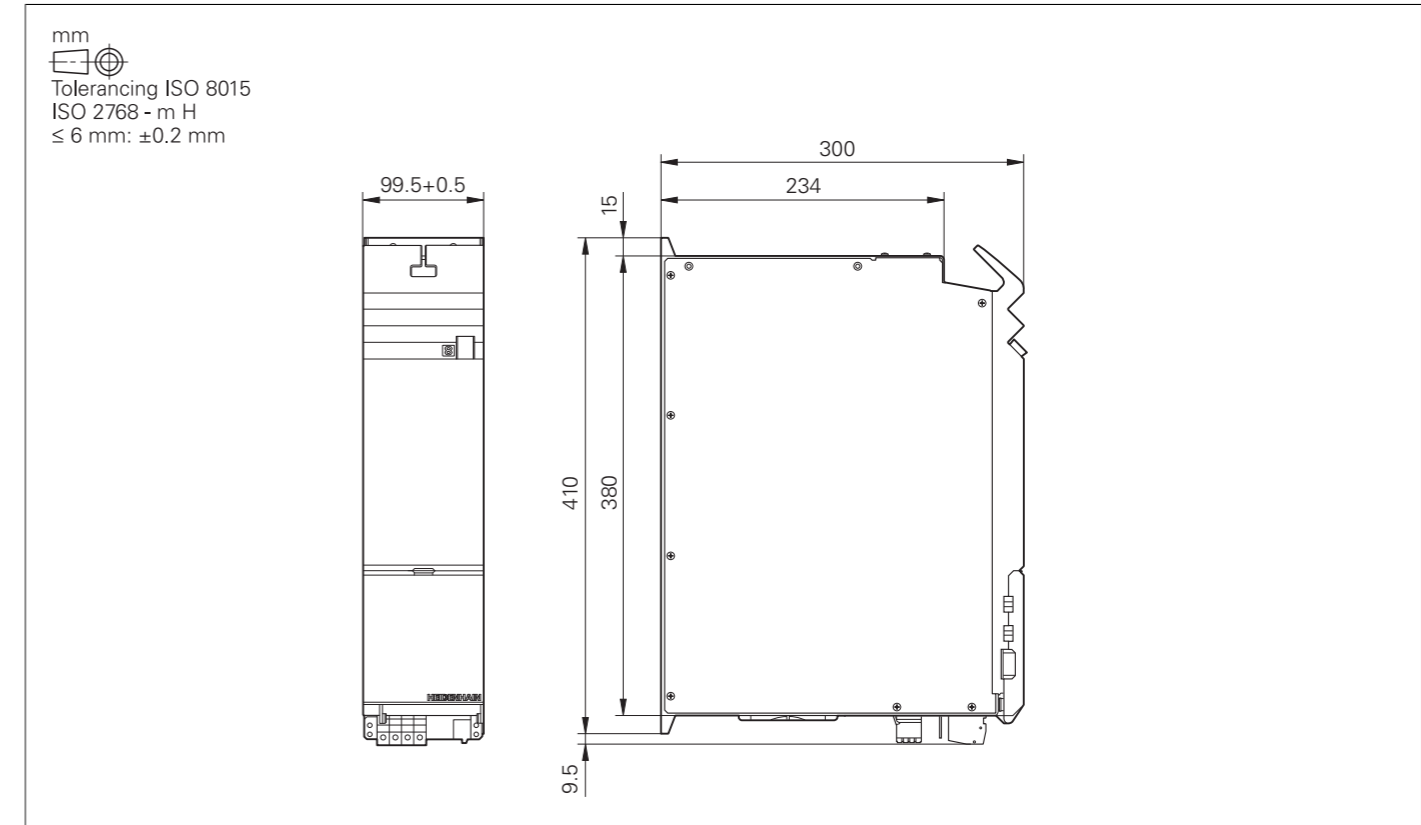
mm
Tolerancing ISO 8015
ISO 2768 - m H
≤ 6 mm: ±0.2 mm



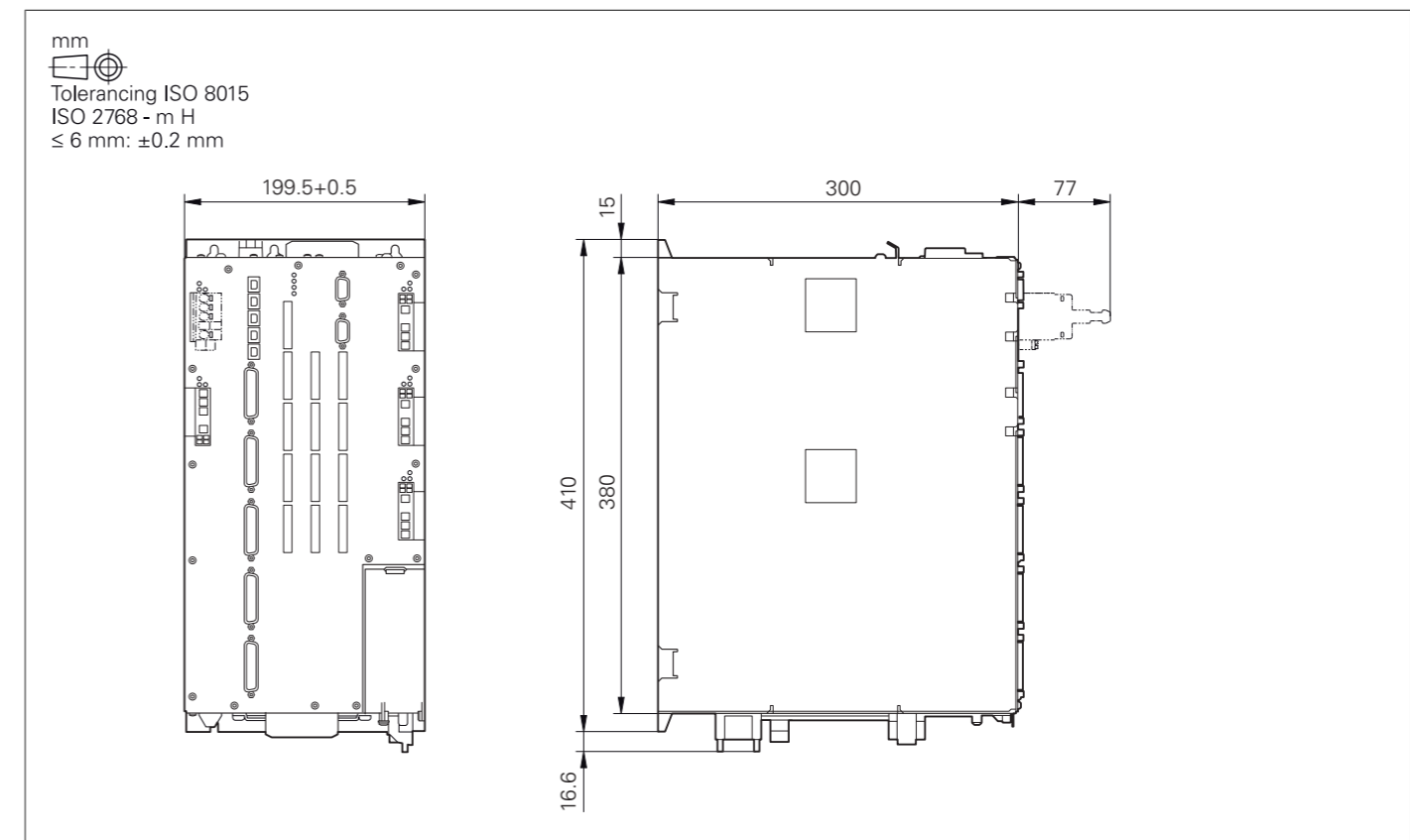
UM 317W



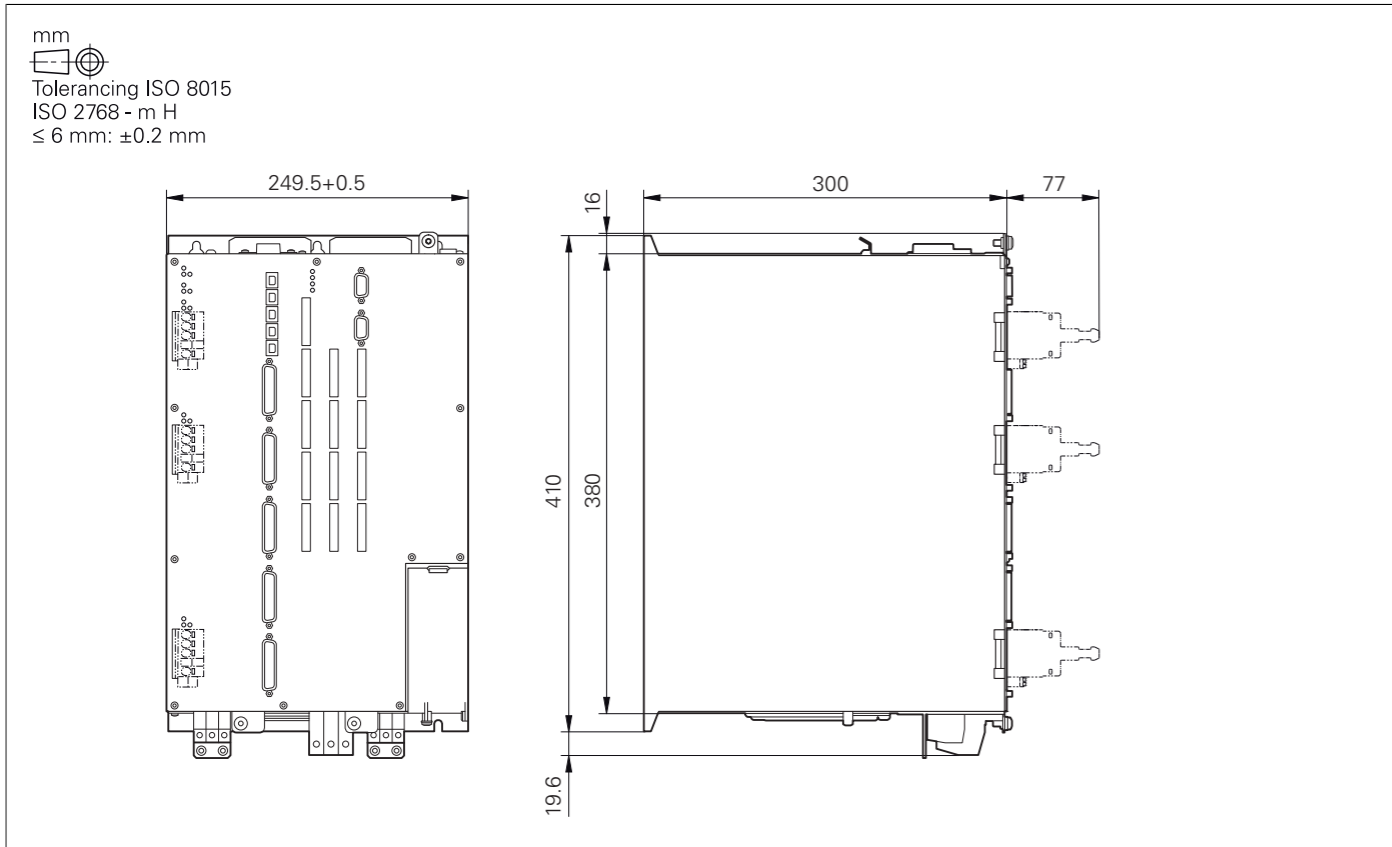
UMS 312



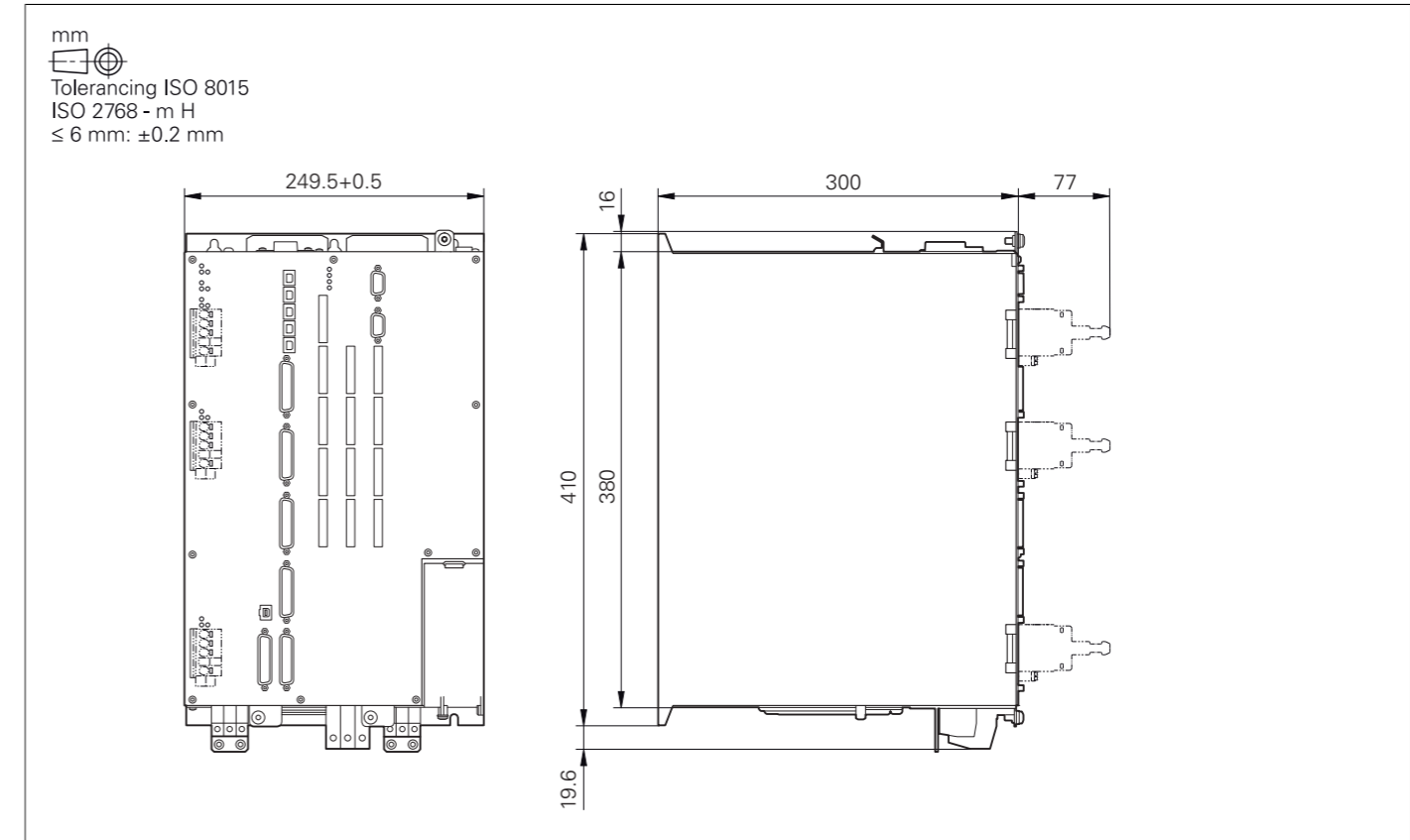
UEC 31x (FS)



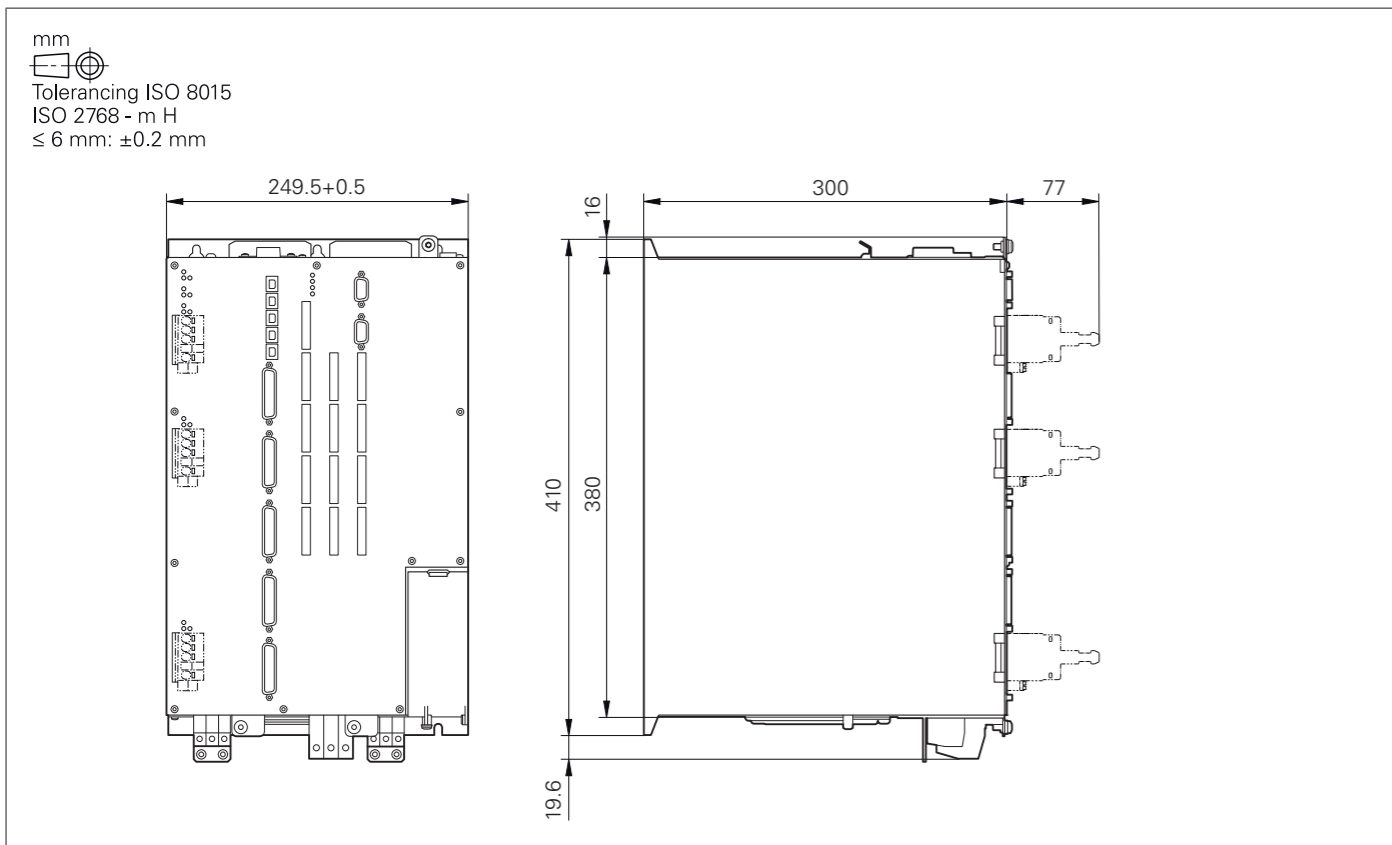
UEC 32x (FS) up to and including variant -02



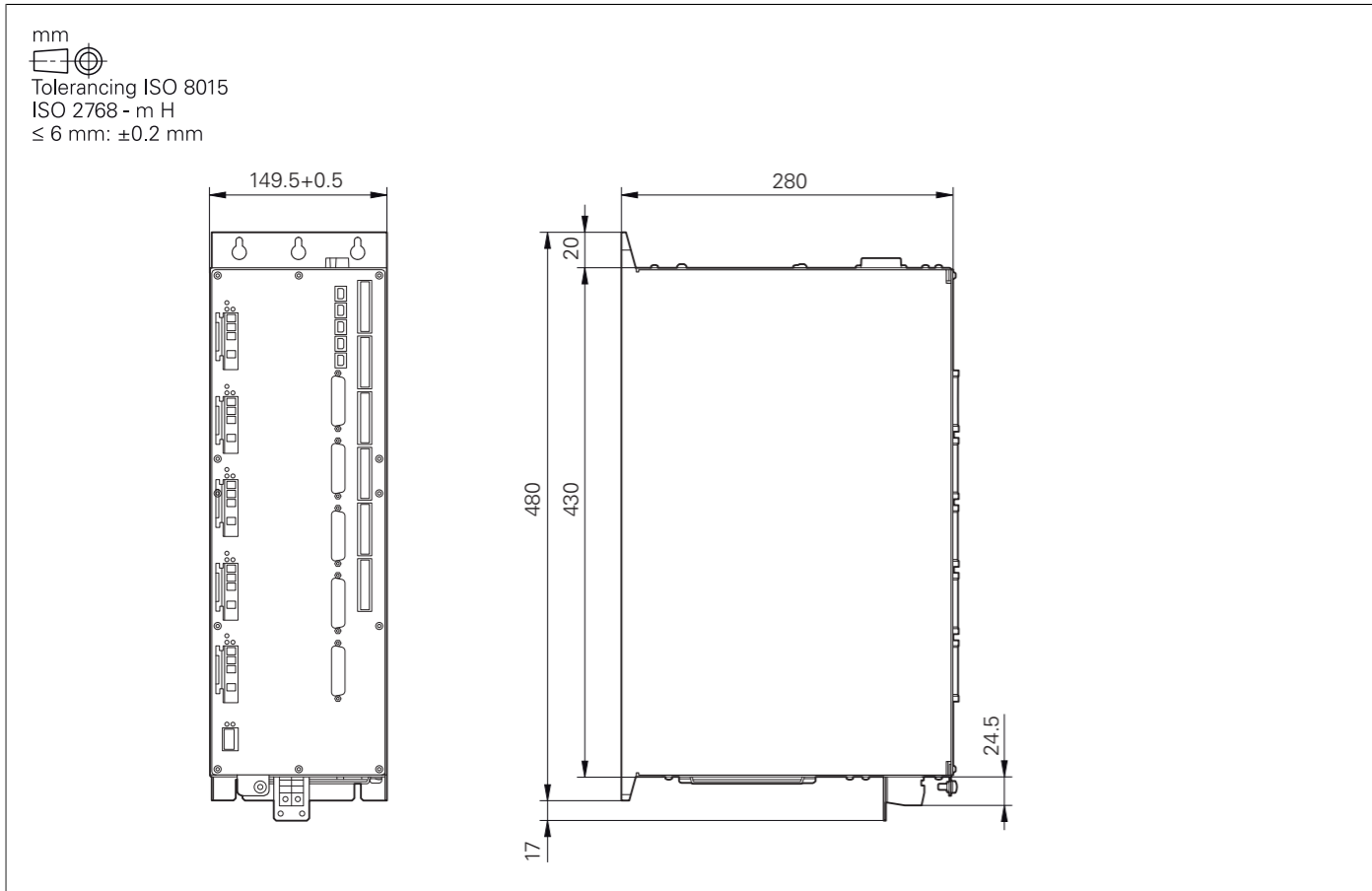
UEC 32x (FS), UEC 33x (FS) with variant -03 or higher



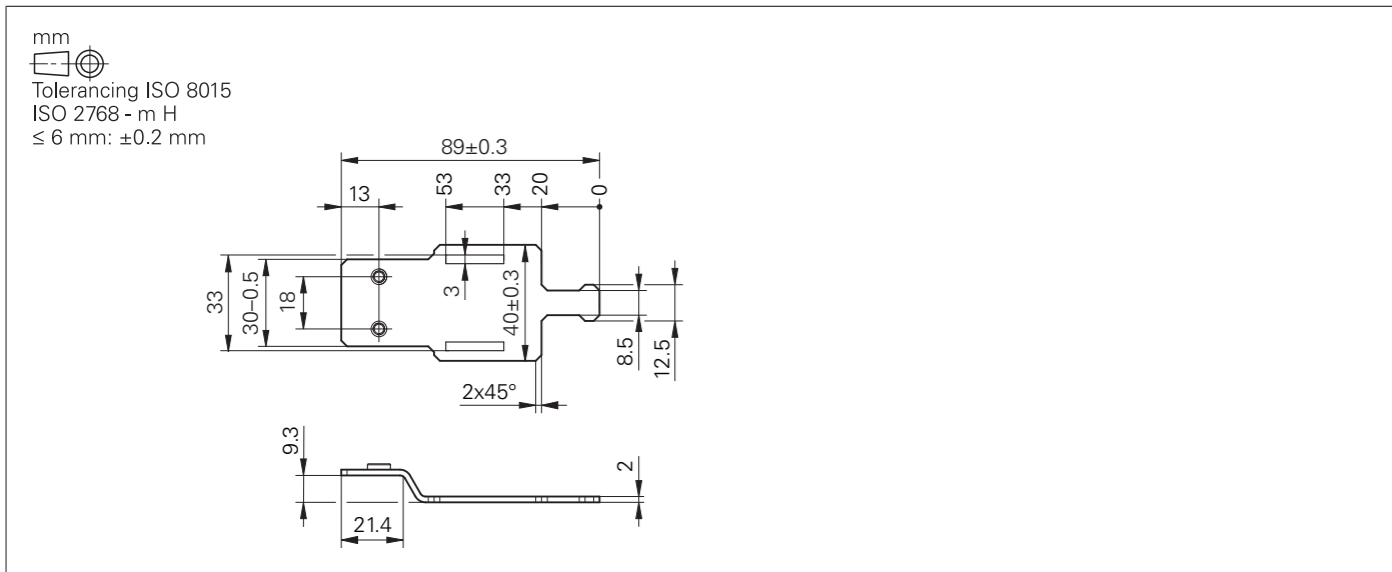
UEC 33x (FS) up to and including variant -02



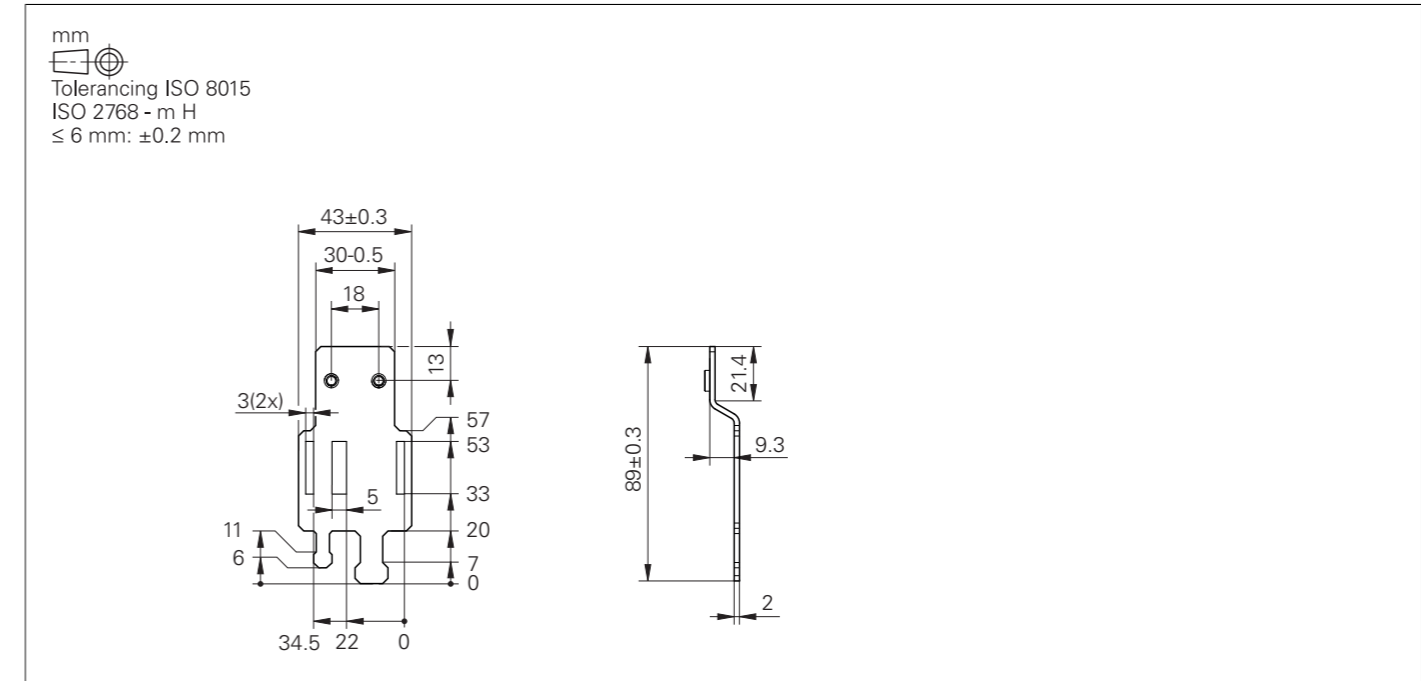
UMC 31x FS



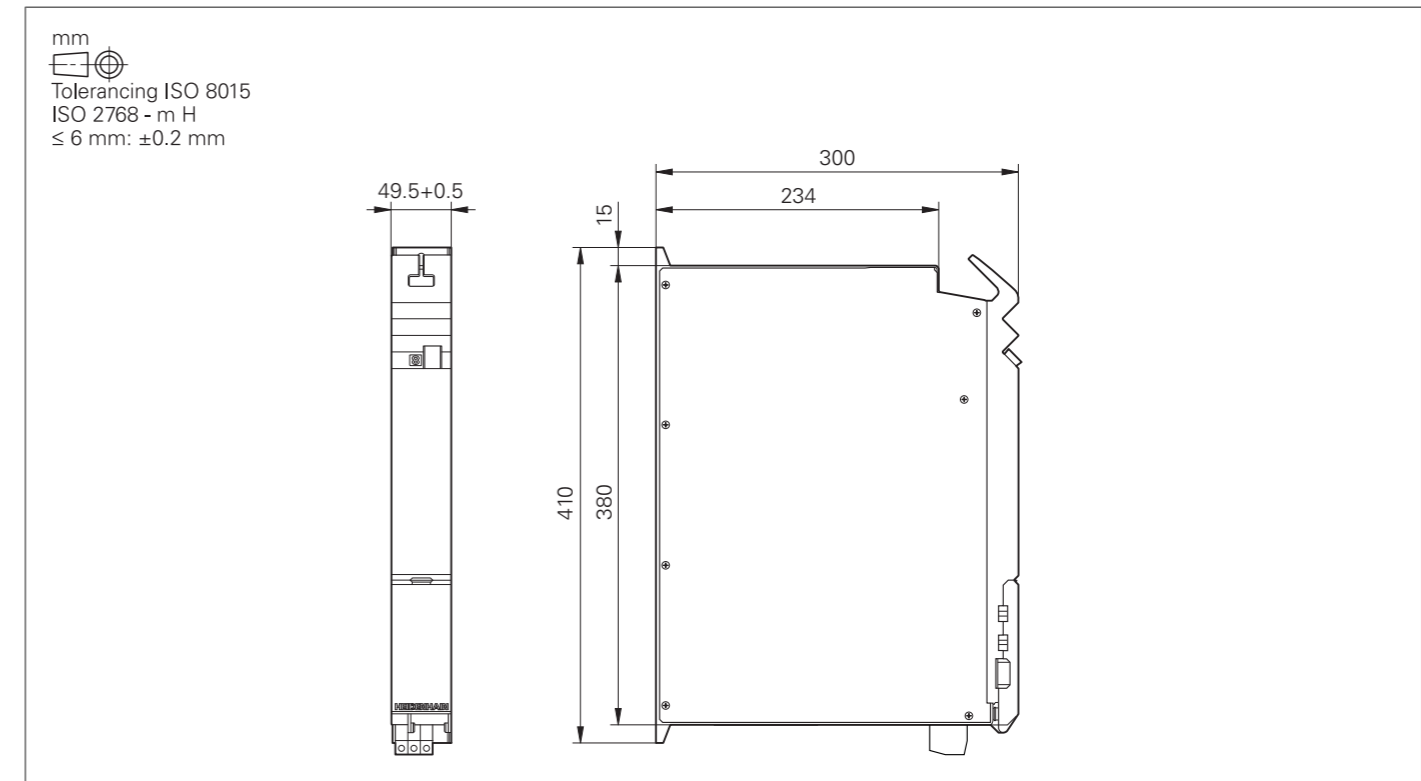
Shield plate for UEC 32x (FS), UEC 33x (FS)



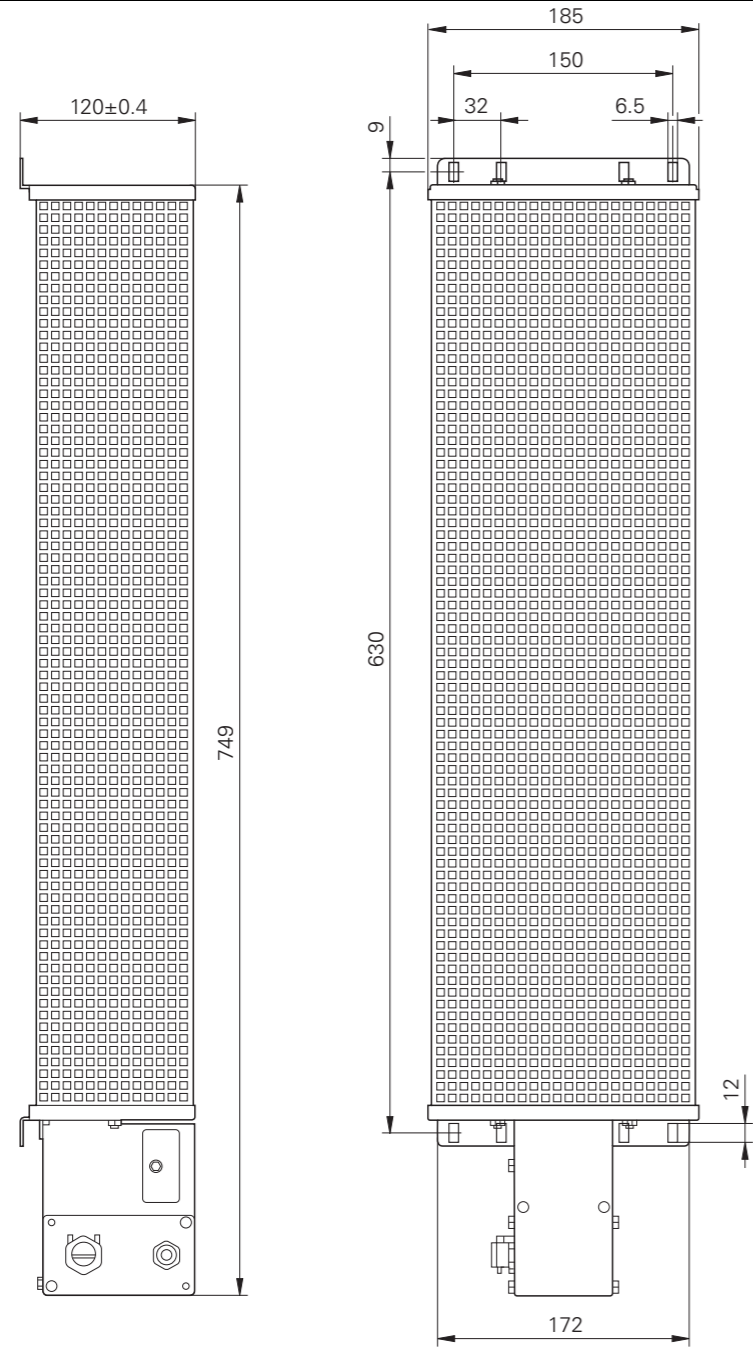
UMC 31x FS



RM 330

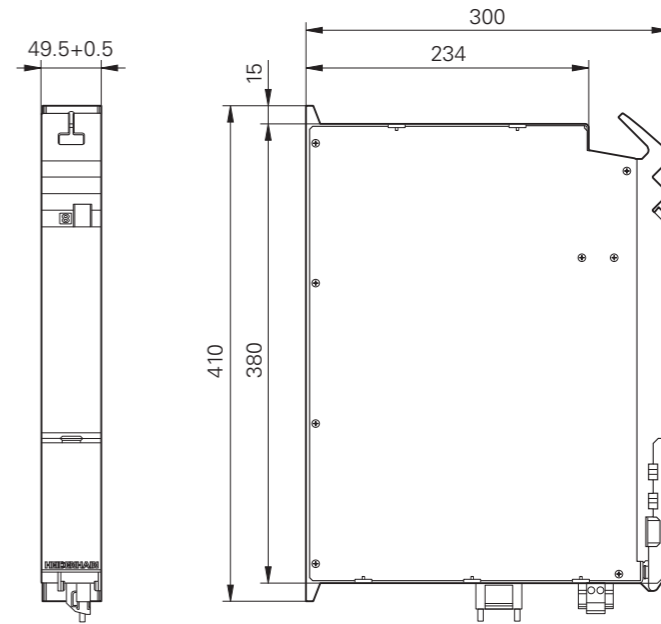


PW 310




PSL 330

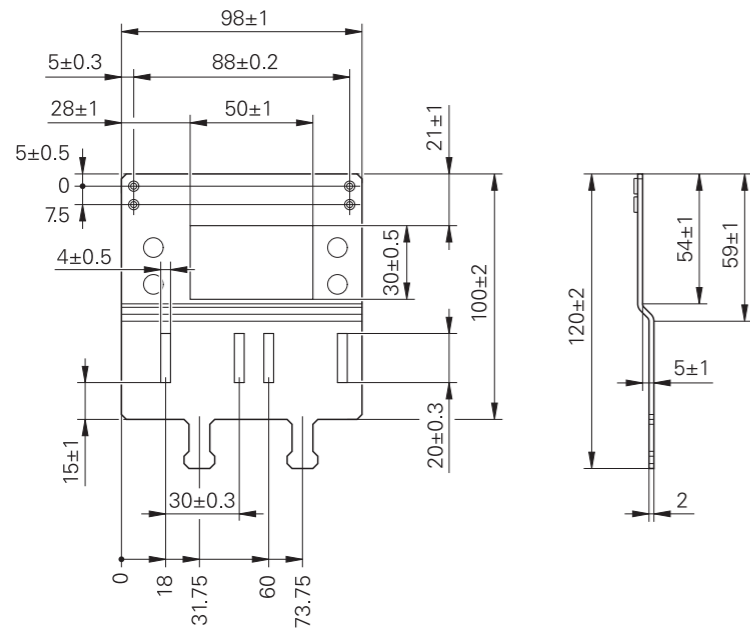
mm
Tolerancing ISO 8015
ISO 2768 - m H
 ≤ 6 mm: ± 0.2 mm



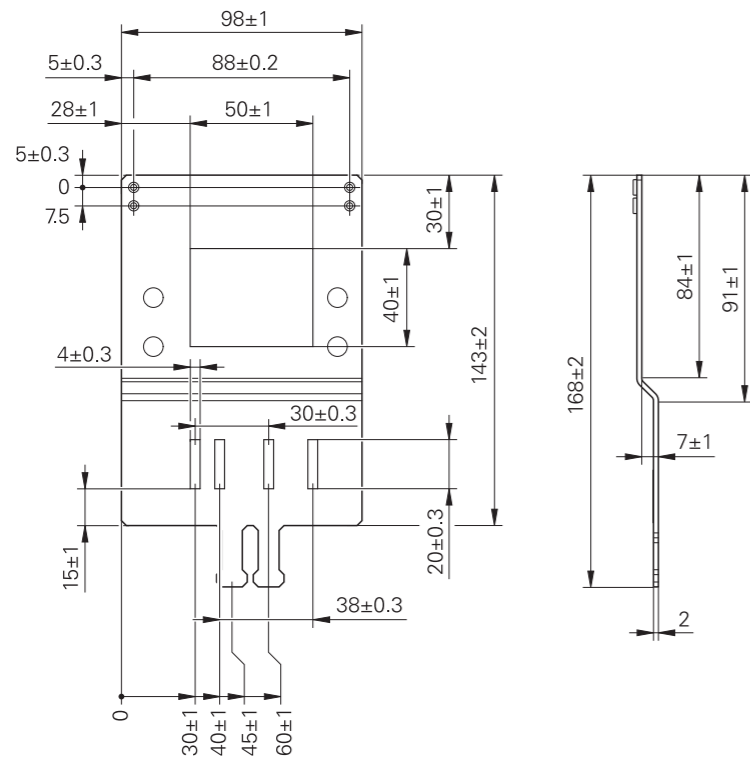
Shield plate for UM 312, UM 322, UM 313, UM 314

mm

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


UM 312 / UM 322



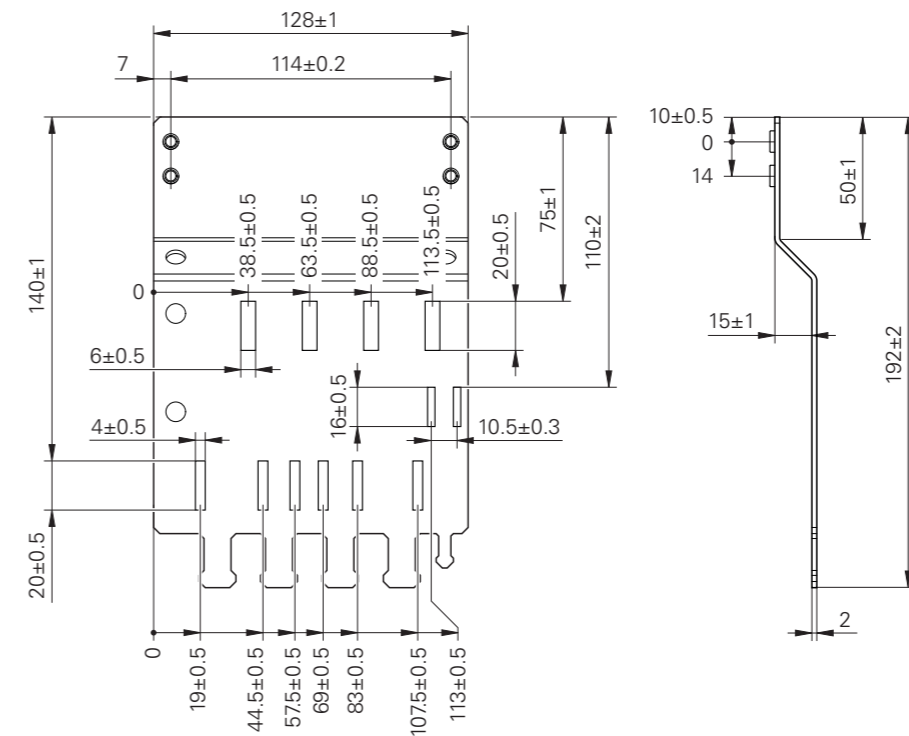
UM 313 / UM 314



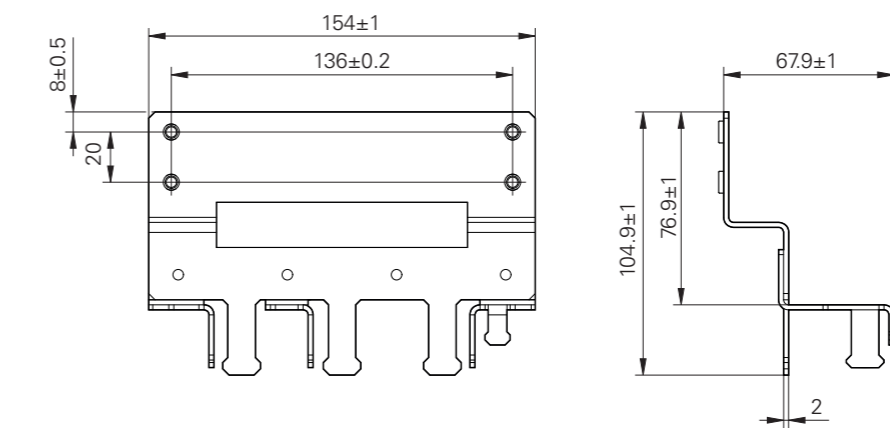
Shield plate for UM 315, UM 316, UM 317

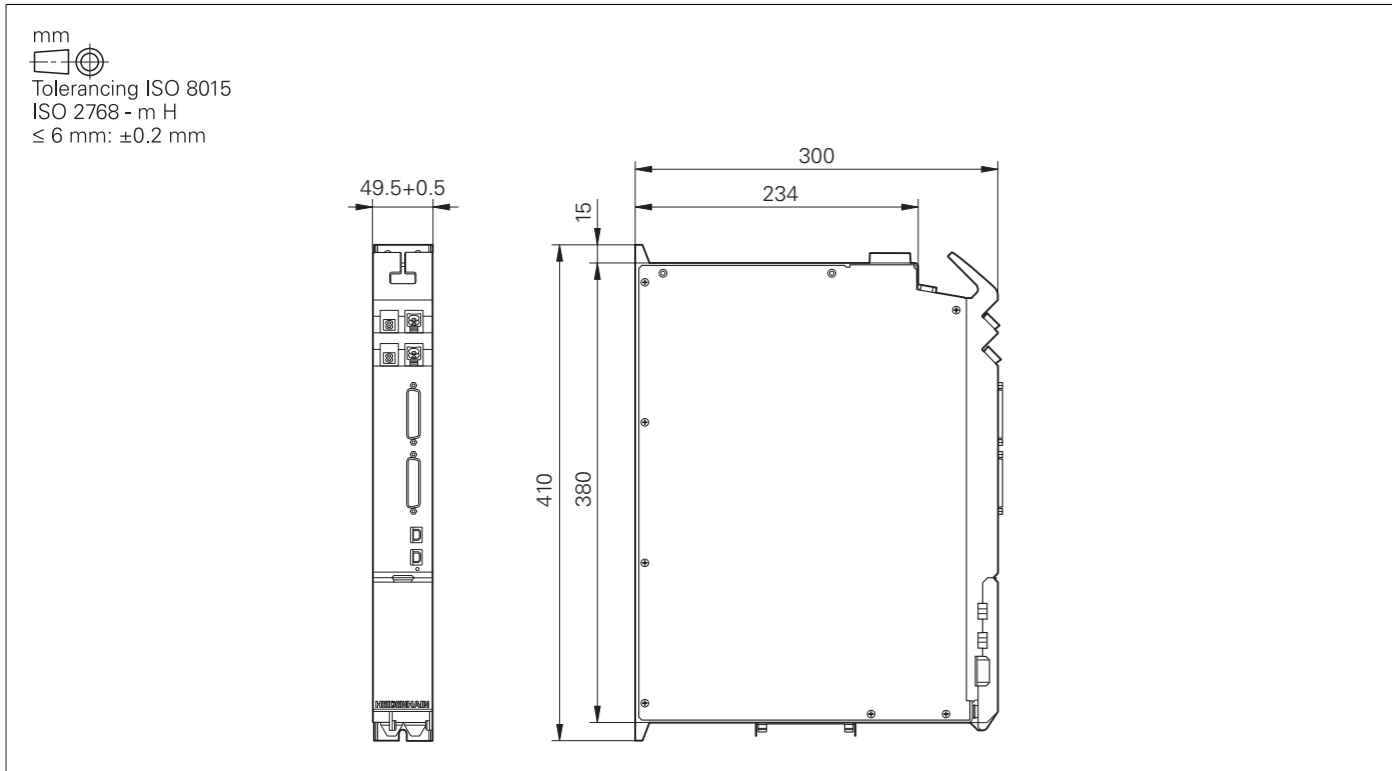
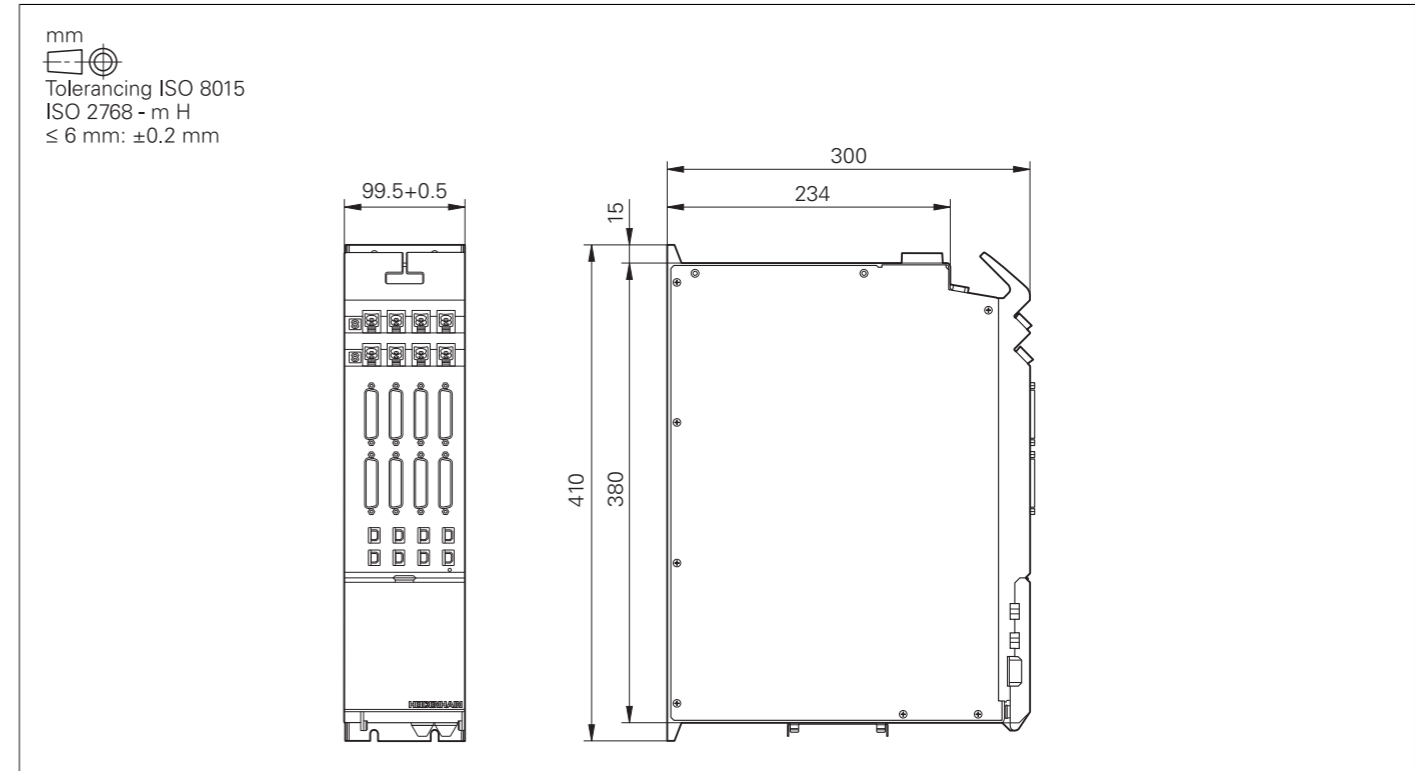
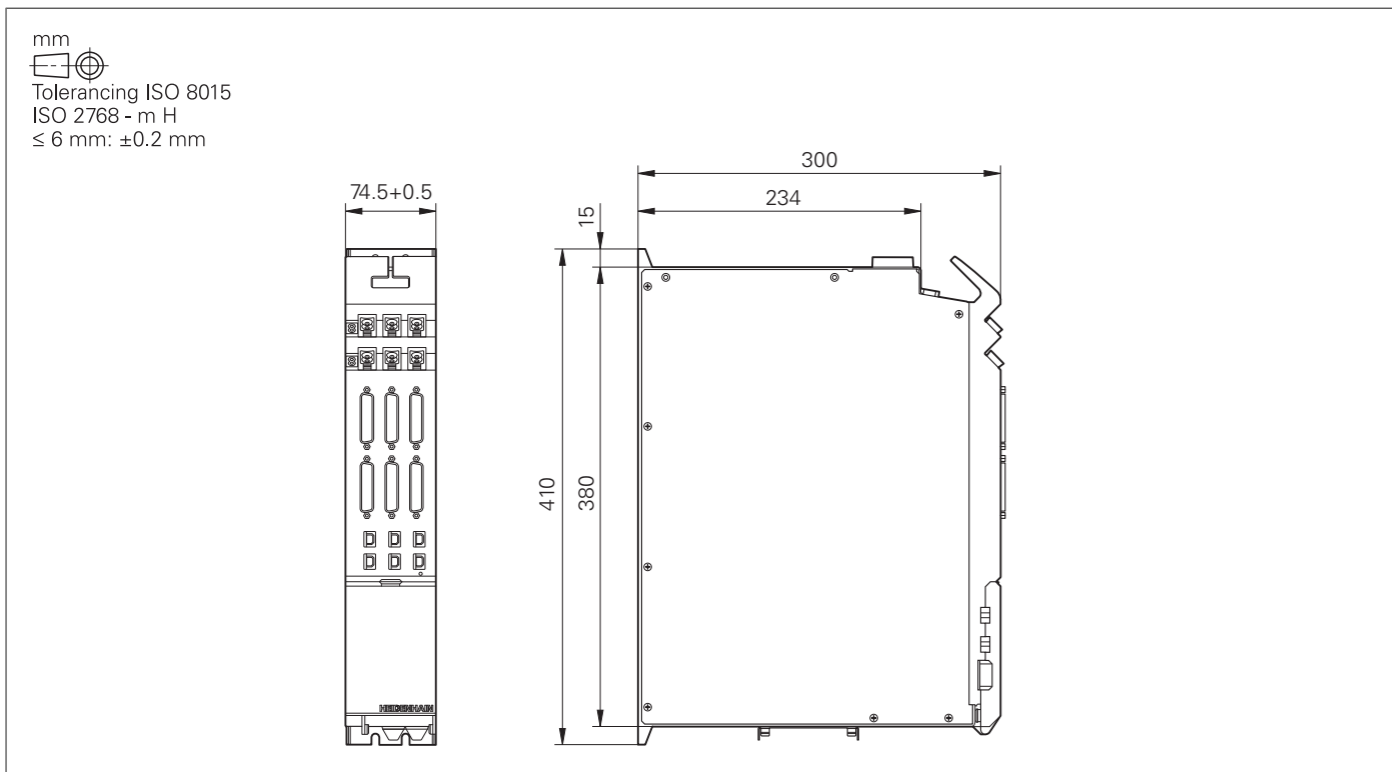
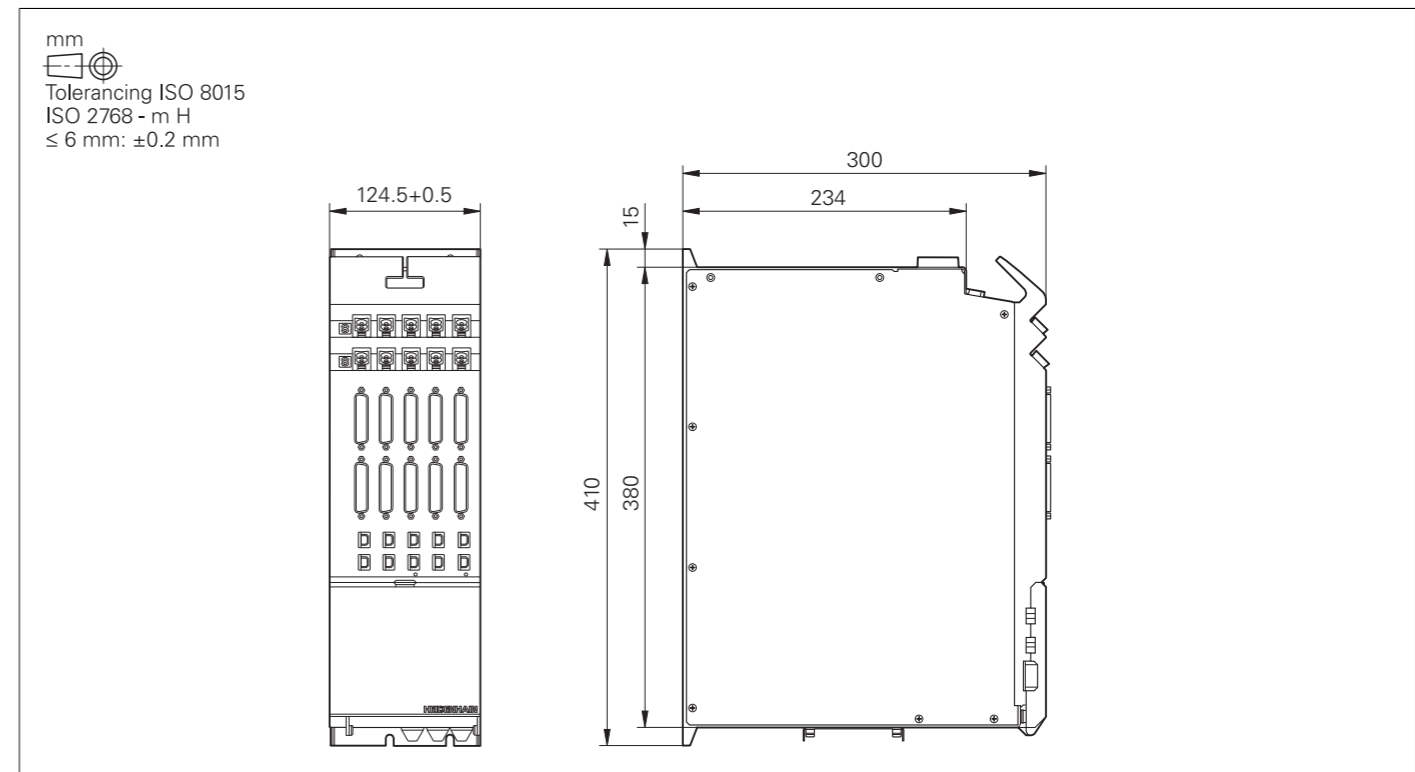
mm

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

UM 315

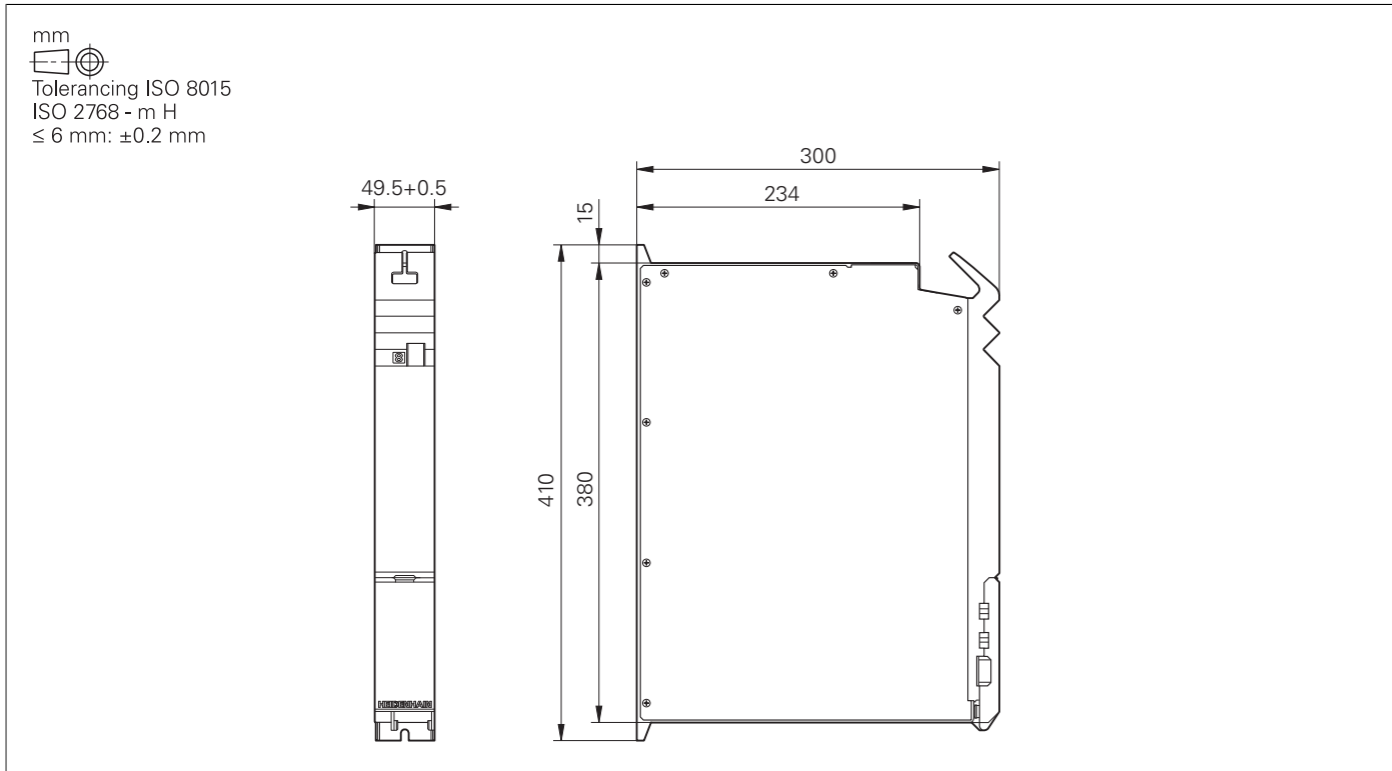


UM 316(W) / UM 317W

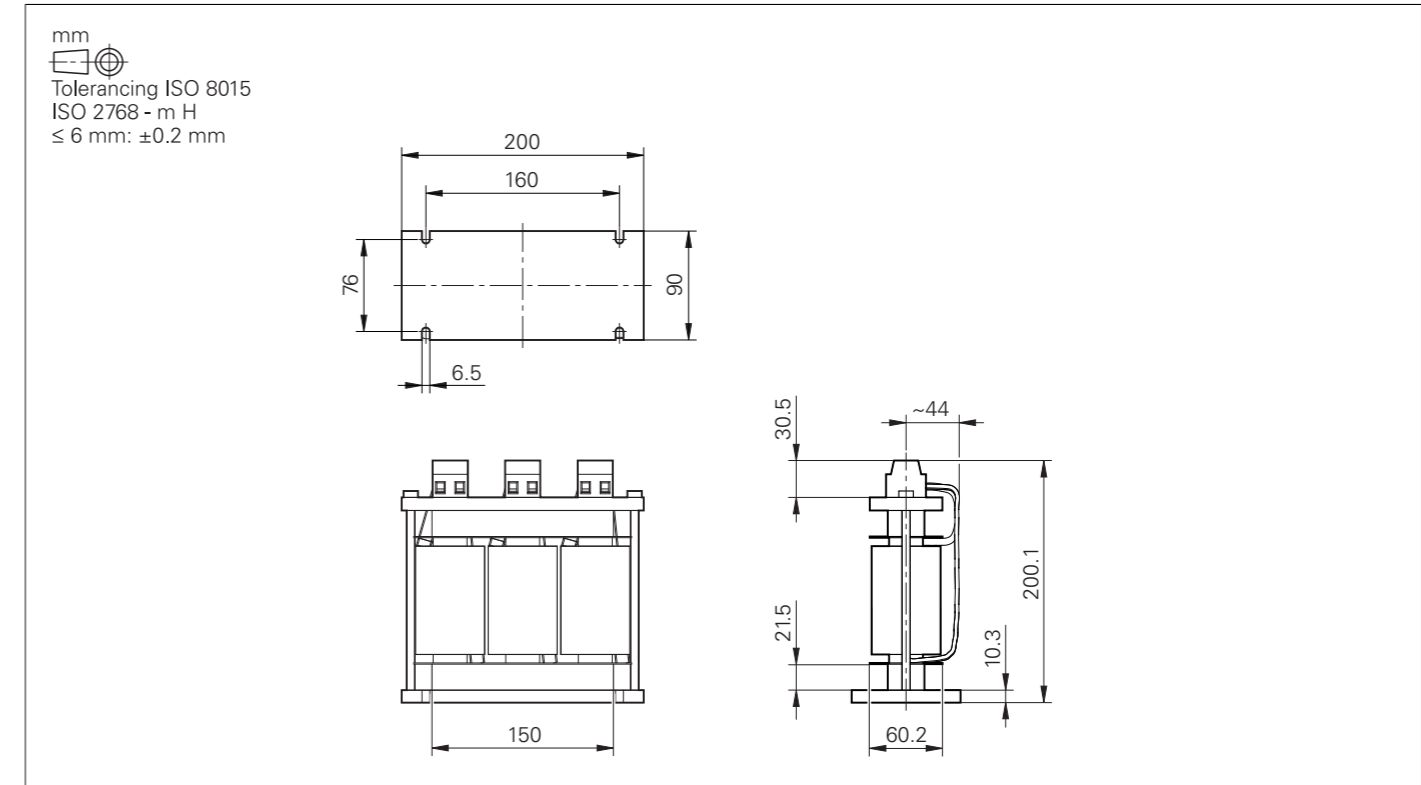


CC 302**CC 308****CC 306****CC 310**

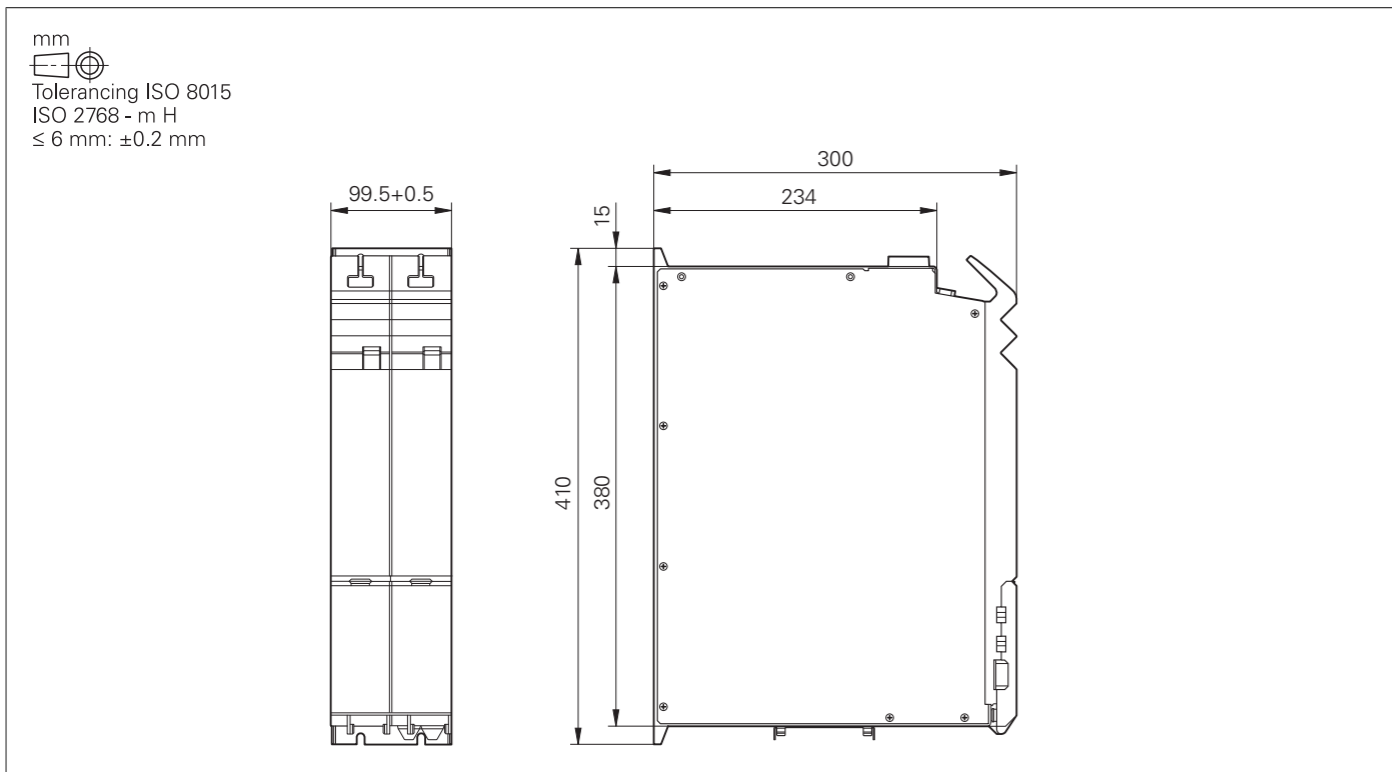
CMH 320, UP 310, UP 320



KDR 330

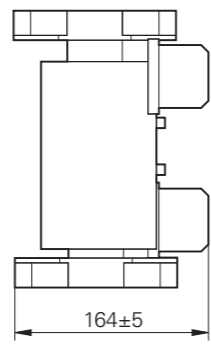
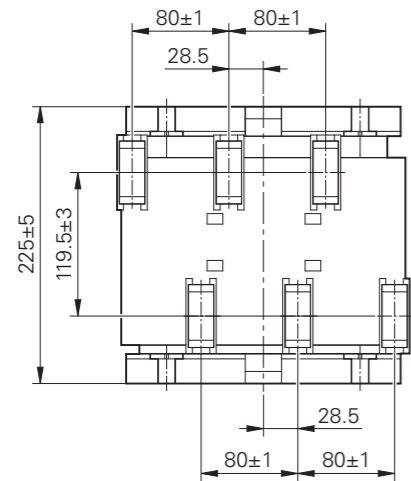
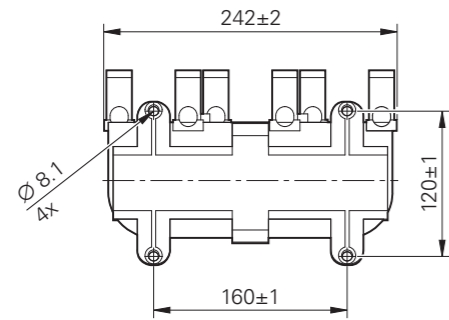


CEM 330

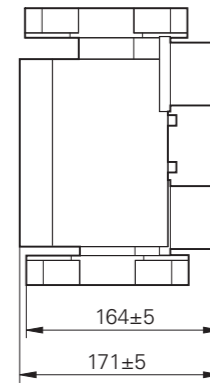
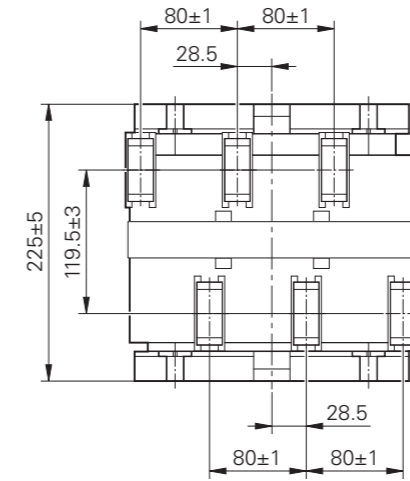
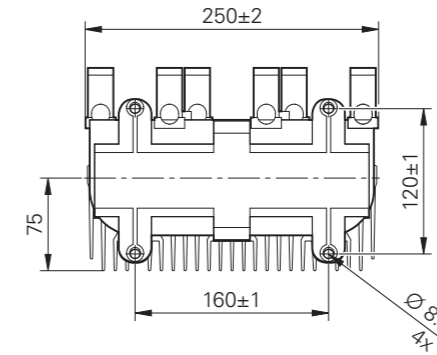


KDR 340

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

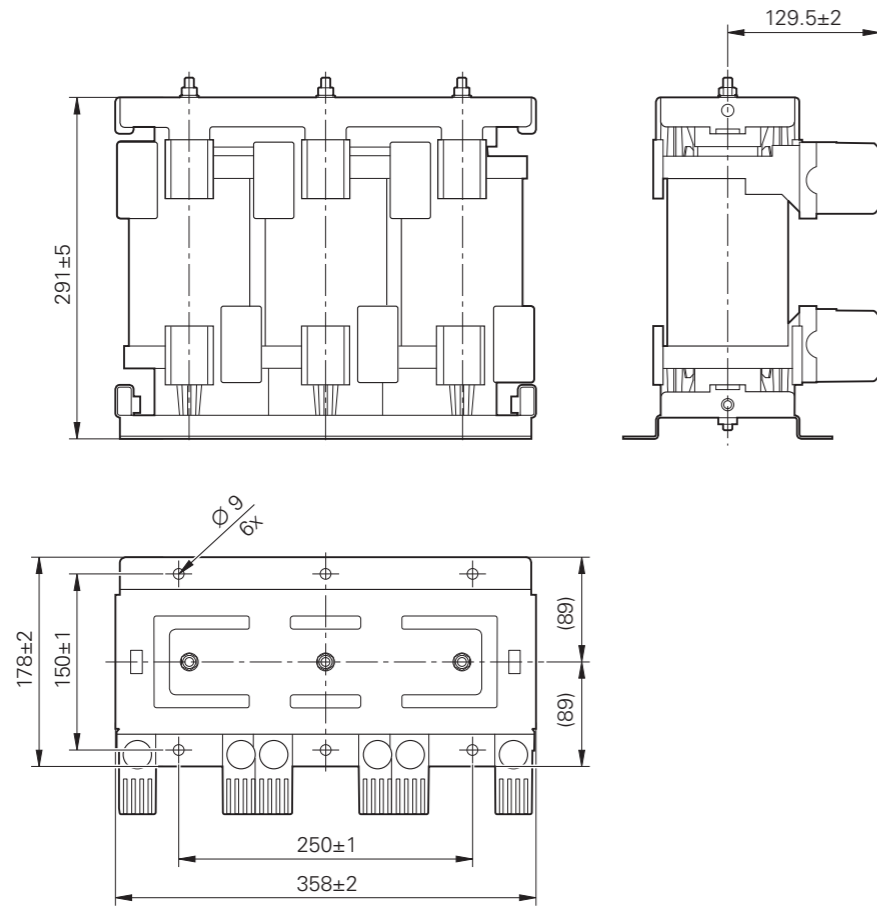
**KDR 350**

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



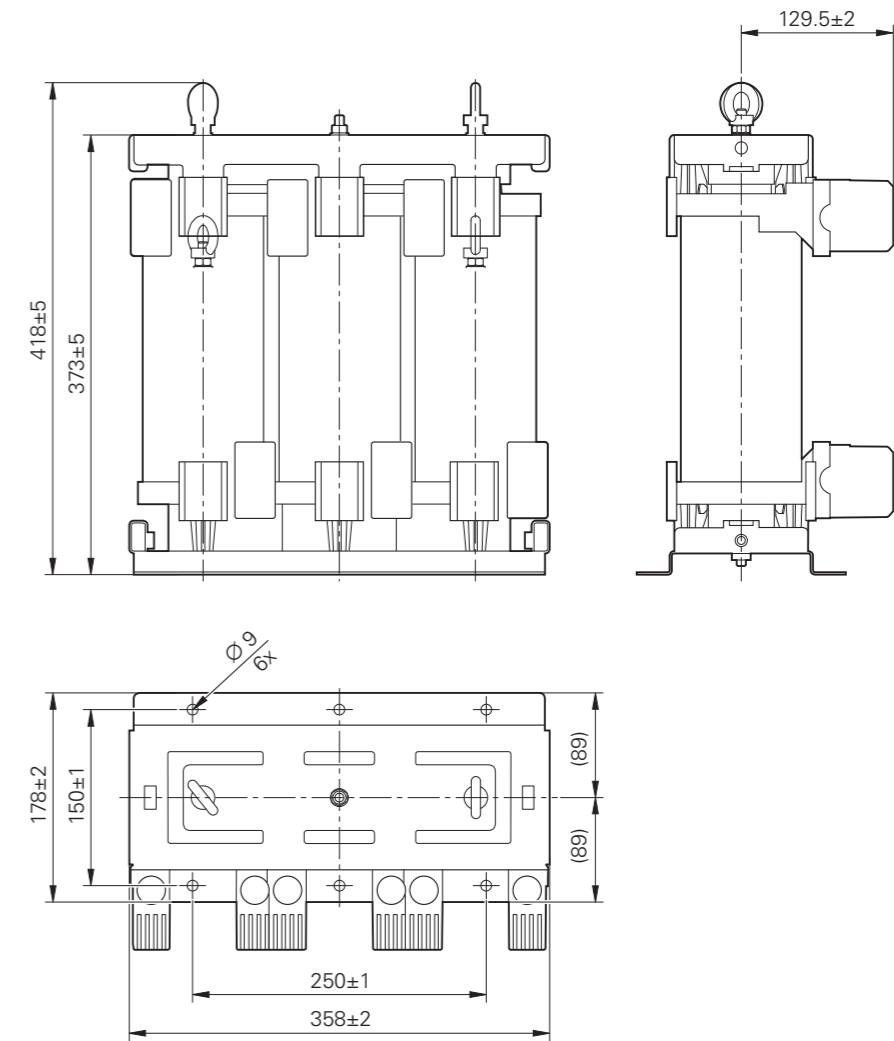
KDR 360

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

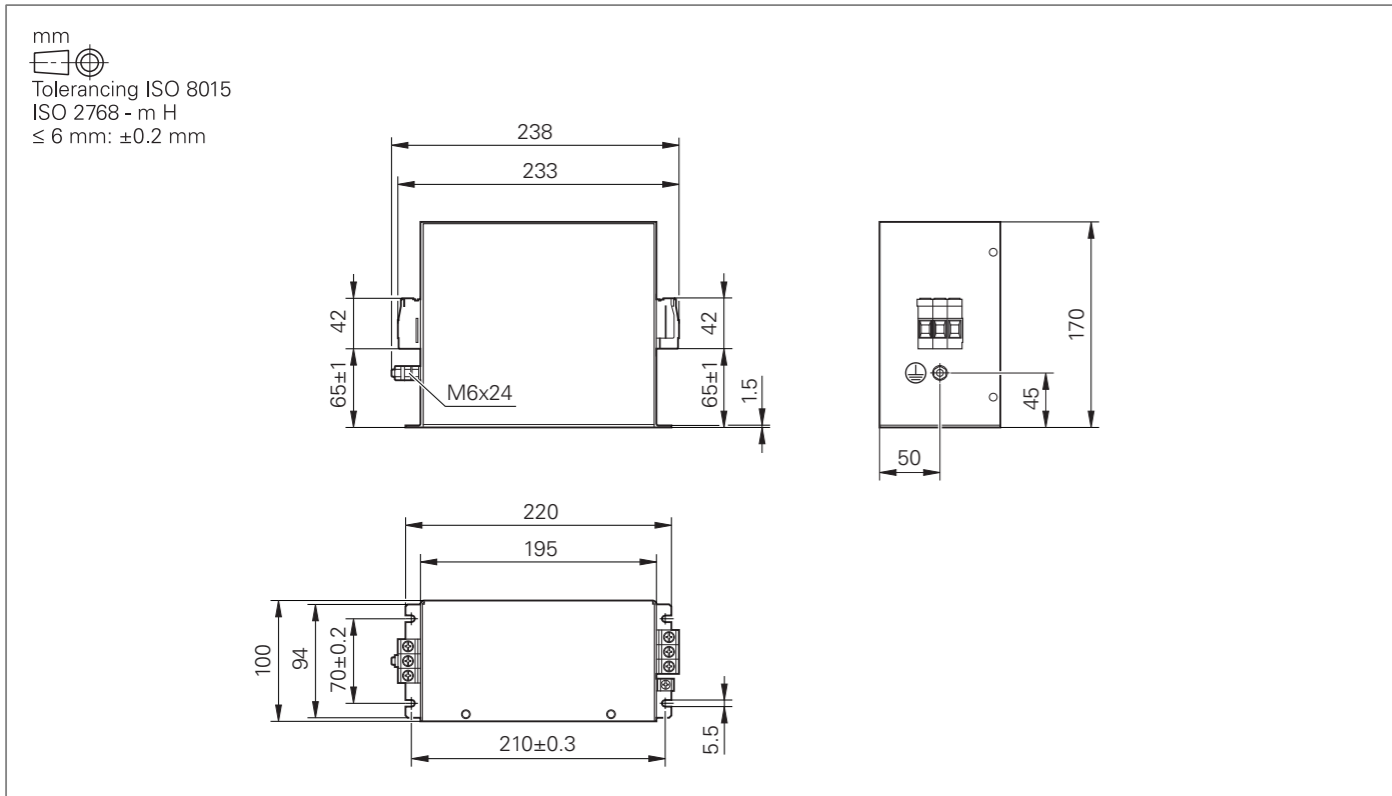


KDR 370

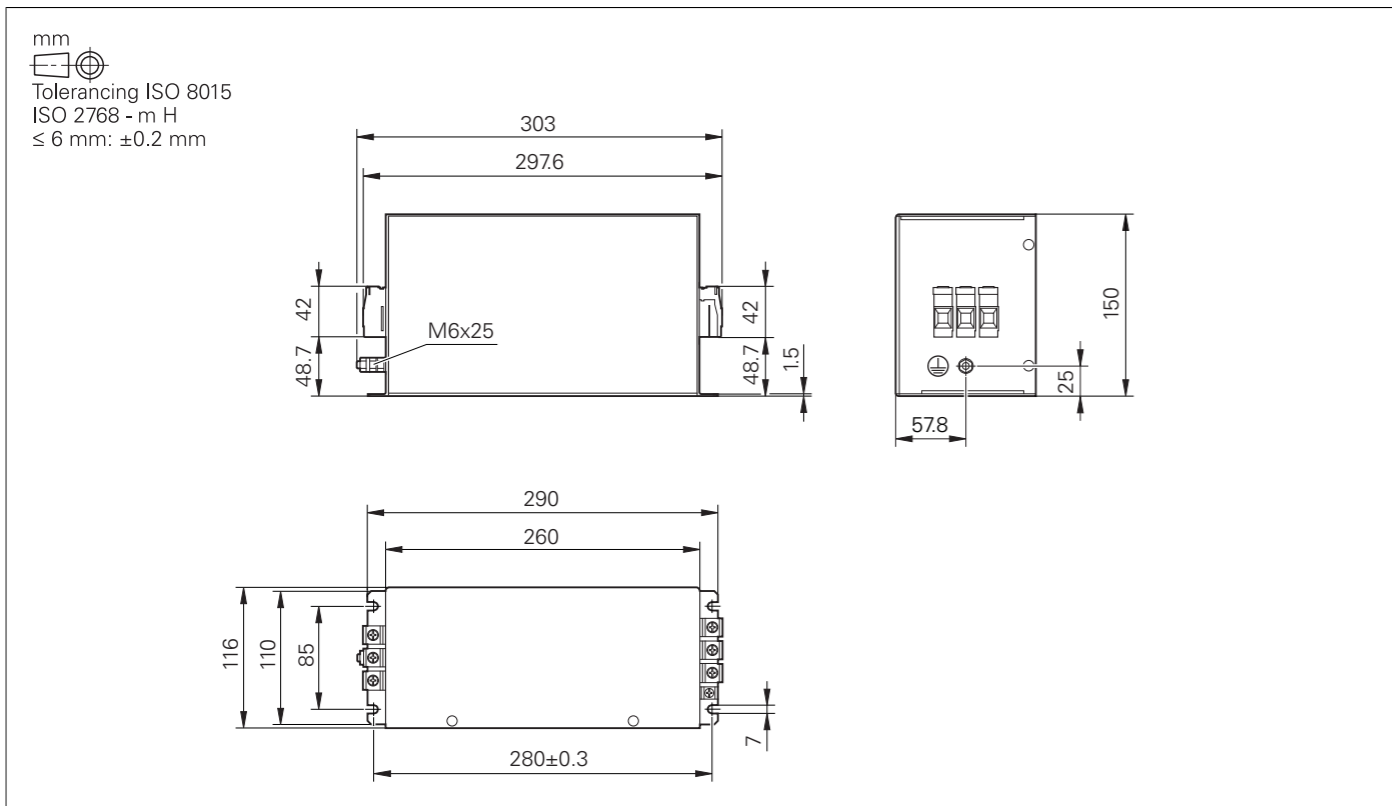
mm
Tolerancing ISO 8015
ISO 2768 - m H
≤ 6 mm: ±0.2 mm



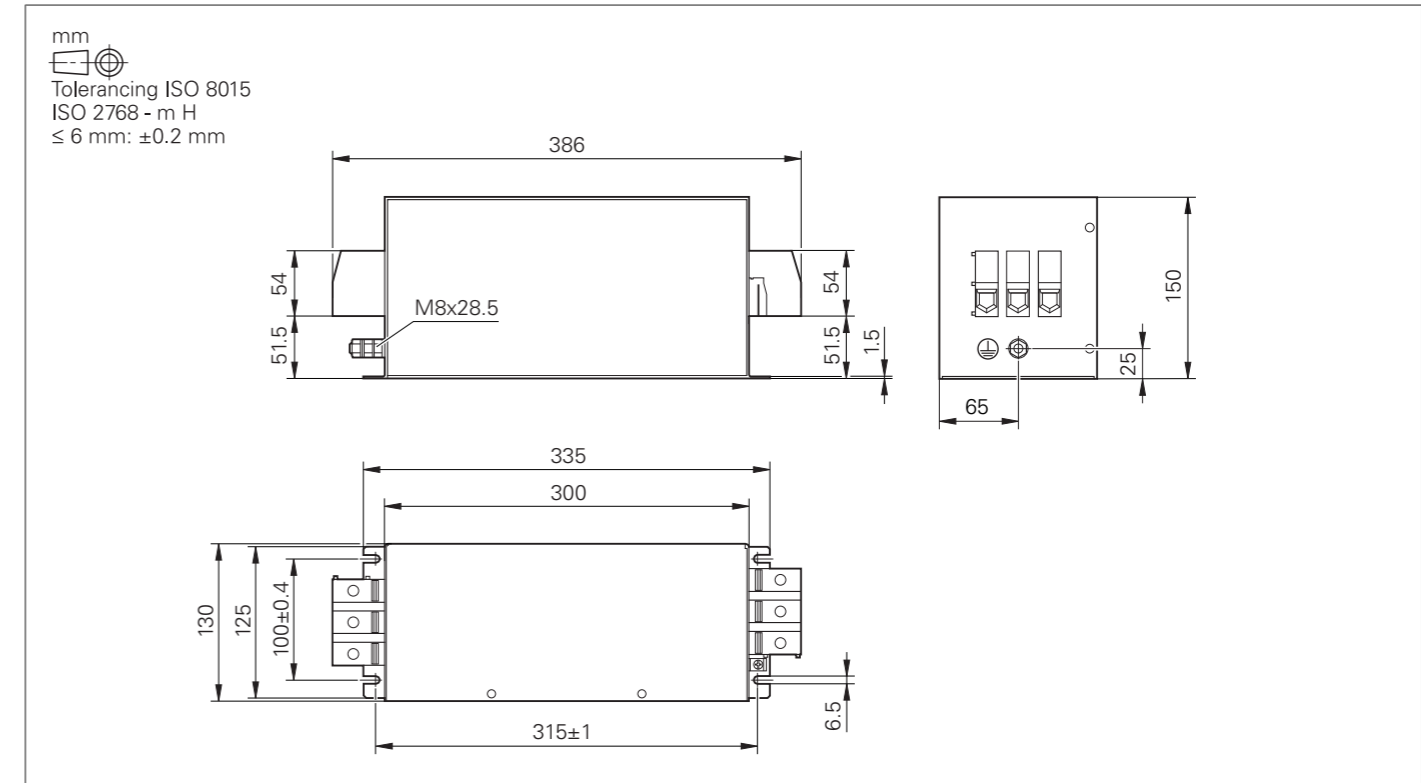
Line filter 46A



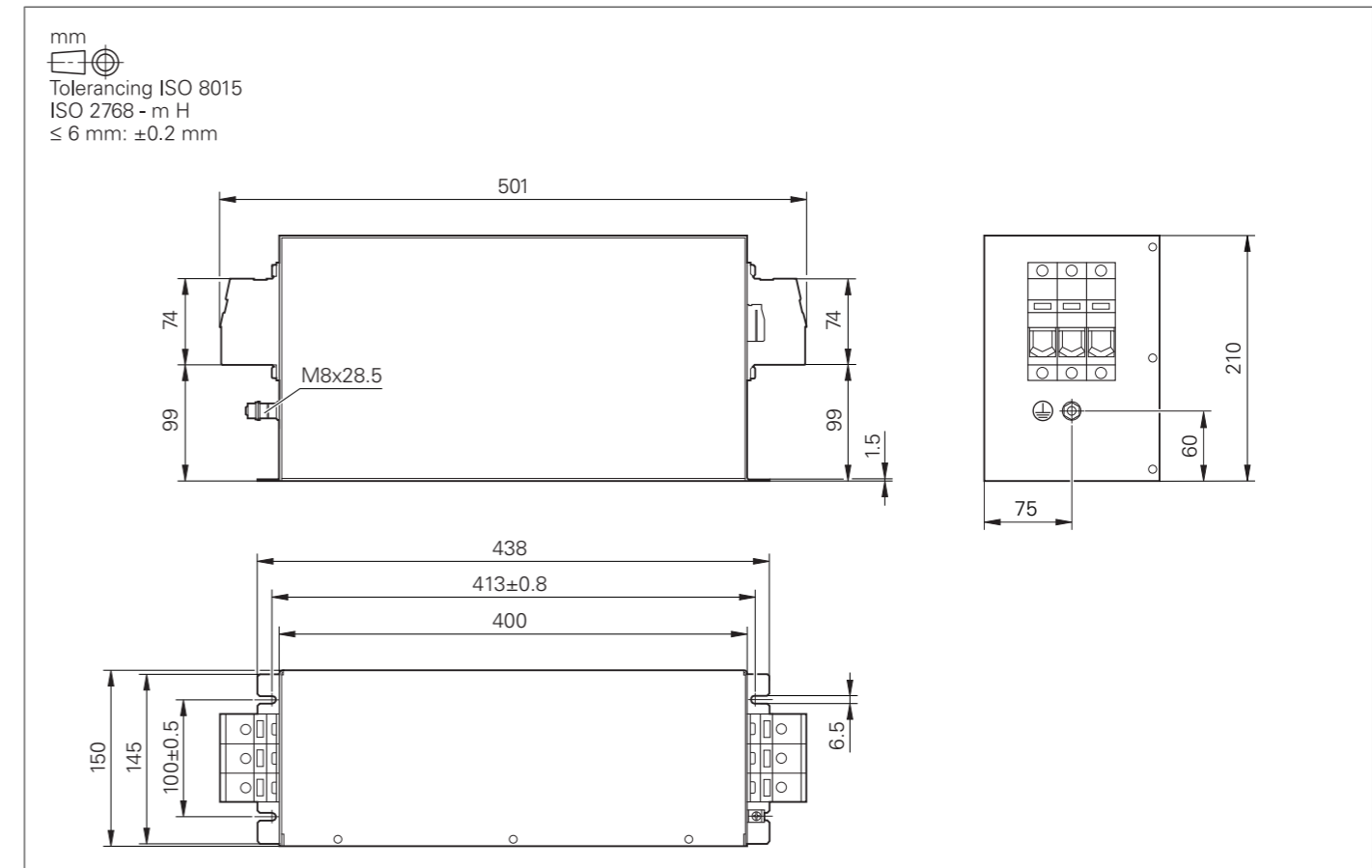
Line filter 83A



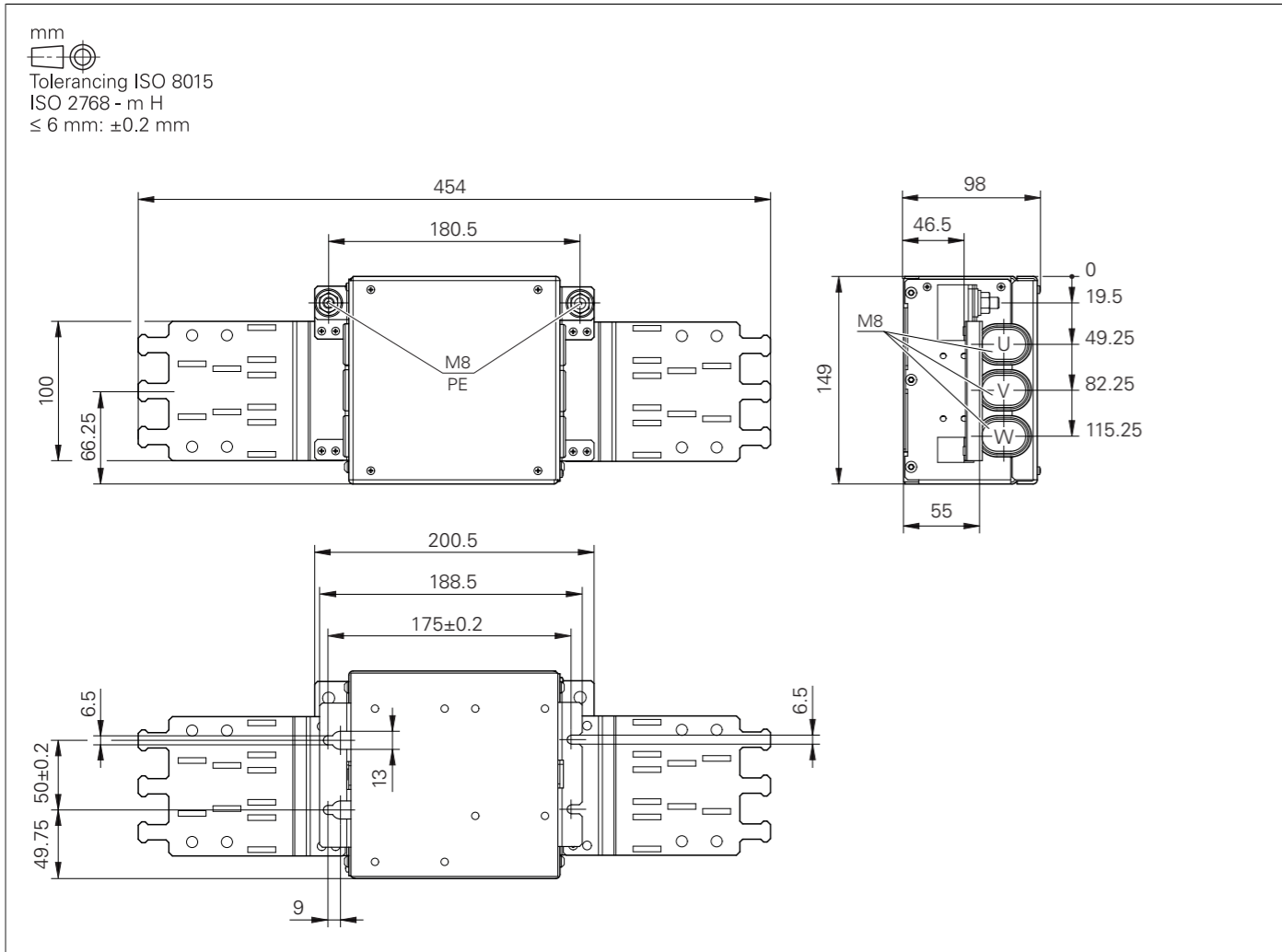
Line filter 135A



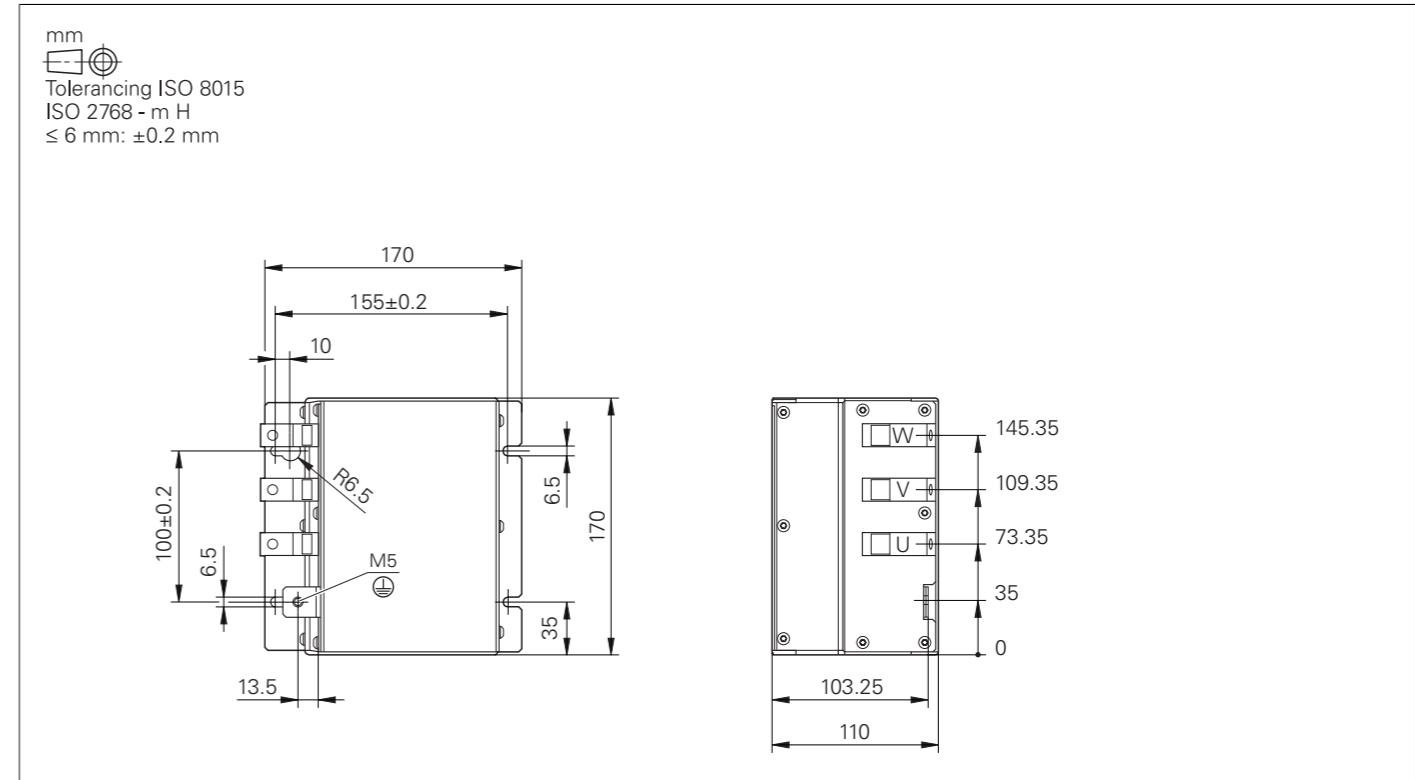
Line filter 202A



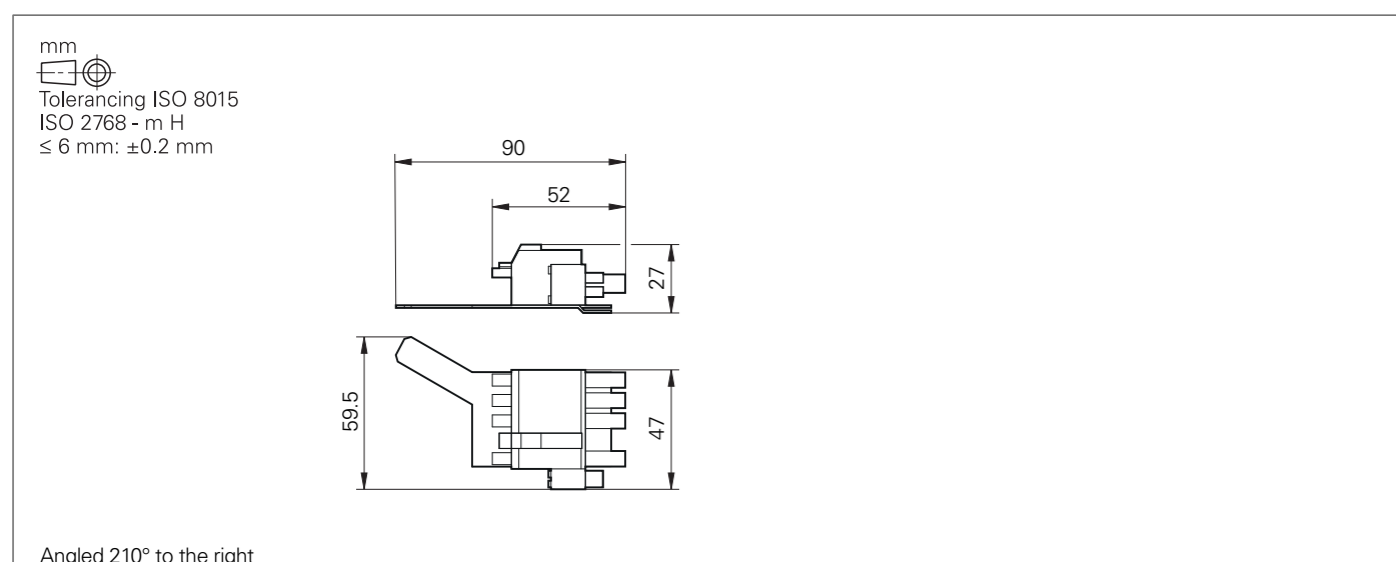
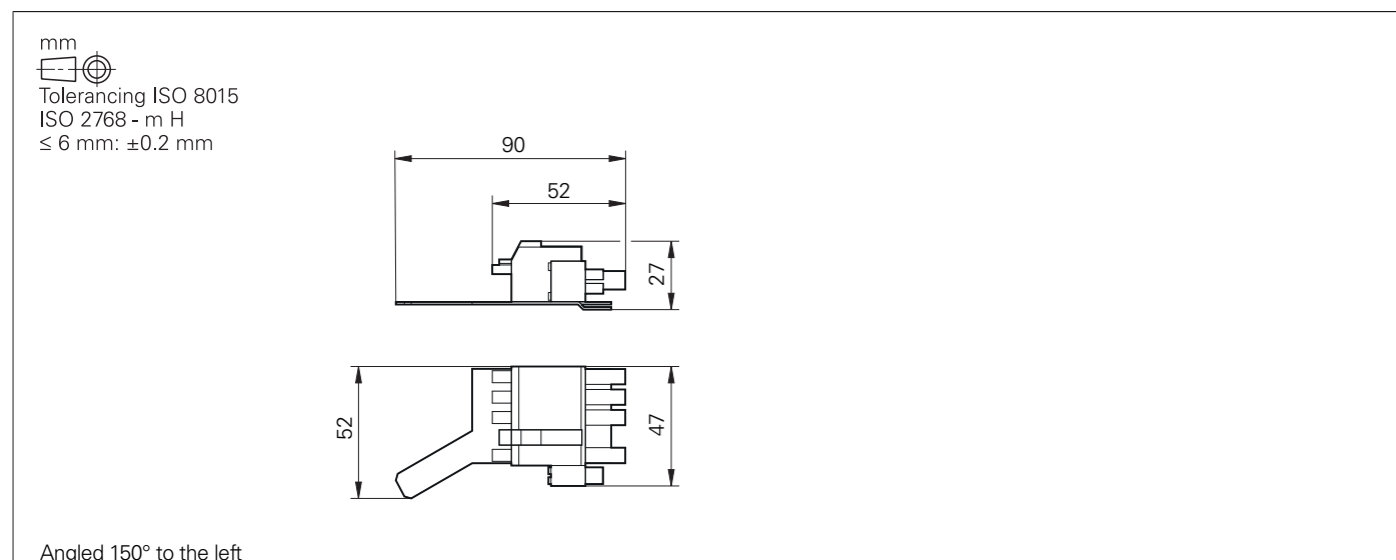
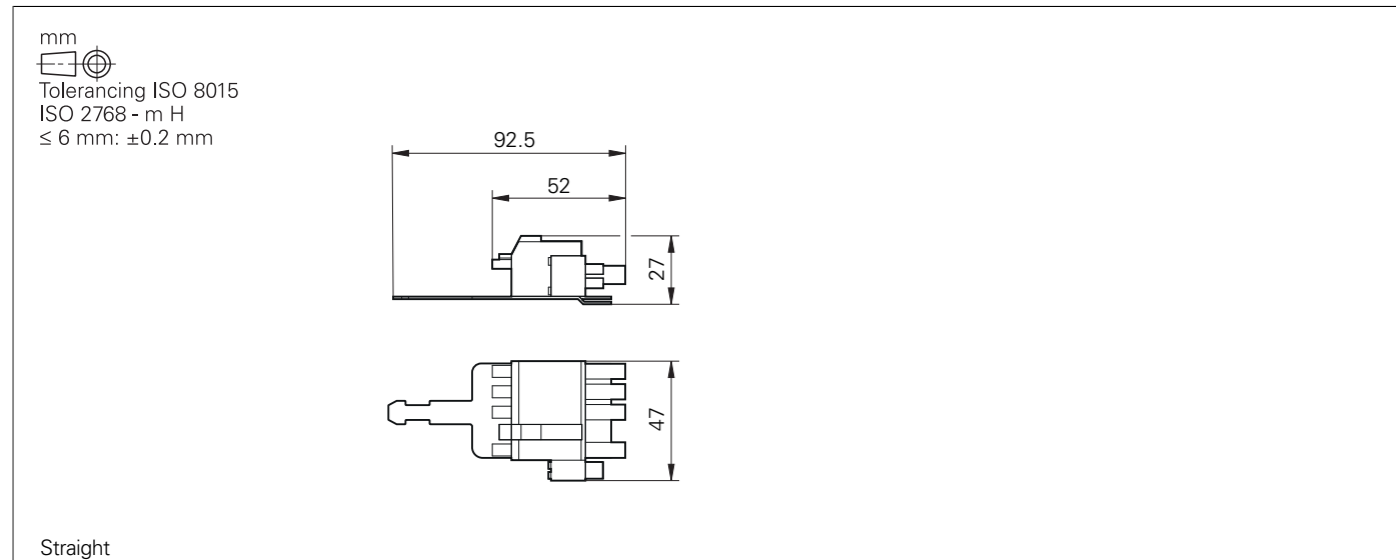
SM 320



SM 330



X38x connectors



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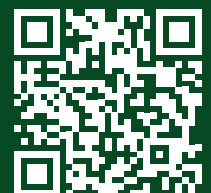
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Mastering nanometer accuracy



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