Compax3H Installation Manual

High power devices

Paper version

C3Manager-Compax3H
Unterlagen / Software
user guides / tools
manuels / tools:

- **Compax3 - DVD (english, deutsch, français)**
  +
- **StartUp Guide (english / deutsch)**
- **Compax3H Installations-Handbuch deutsch**
- **Compax3H Installation Manual english**
- **Manuel technique Compax3H français**

192-120149 N04

September 2008

Release R08-0

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Nonwarranty clause

We checked the contents of this publication for compliance with the associated hard and software. We can, however, not exclude discrepancies and do therefore not accept any liability for the exact compliance. The information in this publication is regularly checked, necessary corrections will be part of the subsequent publications.

Production site:

Reg. Nr. 36 38

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1. Notes on the Documents Supplied

Compax3 – Installtion manual

The present manual contains the installation instructions for the associated Compax3 device series (refer to Chapter “Device Assignment“).

This installation manual does contain only the basic information; for more detailed information please refer to the Help-files of the individual Compax3 device types.

Compax3 - DVD

C3 ServoManager

The enclosed self-starting* DVD contains the “C3 ServoManager“ software tool for configuring, optimizing etc. Compax3.
Please use always the latest C3 ServoManager version,

Parker Integrated Engineering Tool

Furthermore, the "Parker Integrated Engineering Tool", a software tool for the project management of several Parker Motion Control products, can be found on the C3 DVD.
Several axes are managed in a common project. The Compax3 ServoManager is integrated per "Plug & Play" for each Compax3 axis. The configuration, optimization,.take place in the same way as in an independently working C3 ServoManager.

The "C3 ServoManager" software tool is also functioning independently from the Parker Integrated Engineering Tool!

Online help system

After the installation of the ServoManager you can copy the desired Online help system with the "C3 ServoManager Help Installer" (you can select the C3 device type as well as the desired language) to your PC. The help system can be called up directly from the ServoManager. You will find the complete description of the selected device type in these online help files.
Please note that the help files are associated with defined device and software versions.

Catalogs

The catalogs supplied provide an overview of and information on the Compax3 device series.

Adobe Acrobat Reader®

For reading PDF files you need the "Adobe Acrobat Reader", a software tool which is available free of charge. and it is distributed and generally accepted throughout the world. You can also download it directly from the Adobe website at: www.adobe.com/products/acrobat.

* If your PC has not been set up accordingly, start the "start.htm" file on the CD.

1.1 C3 ServoManager

Installation of the C3 ServoManager

The Compax3 ServoManager can be installed directly from the Compax3 DVD. Click on the appropriate hyperlink or start the installation program "C3Mgr_Setup_V.... .exe" and follow the instructions.

PC requirements

Recommendation:

Operating system:	MS Windows XP SP2 / MS Windows 2000 as from SP4 / (MS Vista)
Browser:	MS Internet Explorer 6.x
Processor:	Intel Pentium 4 / Intel Core 2 Duo / AMD Athlon class as from >=2GHz
RAM memory:	>= 1024MB
Hard disk:	>= 20GB available memory
Drive:	DVD drive
Monitor:	Resolution 1024x768 or higher
Graphics card:	on onboard graphics (for performance reasons)
Interface:	USB

Minimum requirements:

Operating system:	MS Windows XP SP2 / MS Windows 2000 as from SP4
Browser:	MS Internet Explorer 6.x
Processor:	>= 1.5GHz
RAM memory:	512MB
Hard disk:	10GB available memory
Drive:	DVD drive
Monitor:	Resolution 1024x768 or higher
Graphics card:	on onboard graphics (for performance reasons)
Interface:	USB

Note:

- For the installation of the software you need administrator authorization on the target computer.
- Several applications running parallelly, reduce the performance and operability.
- especially customer applications, exchanging standard system components (drivers) in order to improve their own performance, may have a strong influence on the communication performance or even render normal use impossible.
- Operation under virtual machines such as Vware Workstation 6/ MS Virtual PC is not possible.
- Onboard graphics card solutions reduce the system performance by up to 20% and cannot be recommended.
- Operation with notebooks in current-saving mode may lead, in individual cases, to communication problems.

Connection between PC and Compax3

Your PC is connected with Compax3 via a RS232 cable (SSK1) and an adapter cable.
Connect SSK1 cable to the adapter cable (COM ½ interface at the PC to programming port – telephone socket under the upper cover).*
Start the Compax3 ServoManager and make the setting for the selected interface in the "**Options Communication settings RS232/RS485...**" menu.

* please make sure that a suitable strain relief is used at the telephone socket of the programming port if a SSK1 >2m is utilized.

Device Selection

In the menu tree under device selection you can read the device type of the connected device (Online Device Identification) or select a device type (Device Selection Wizard).

Configuration

Then you can double click on "Configuration" to start the configuration wizard. The wizard will lead you through all input windows of the configuration.

Contents

2. Introduction

In this chapter you can read about:

2.1 Device assignment

This manual is valid for the following devices:

- Compax3H050V4 + supplement
- Compax3H090V4 + supplement
- Compax3H125V4 + supplement
- Compax3H155V4 + supplement

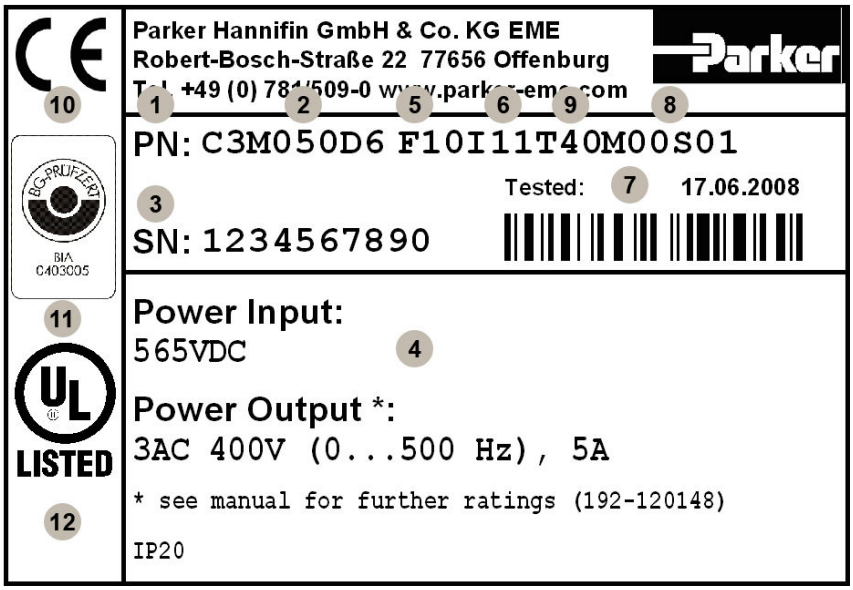
The following items are furnished with the device:

- Manuals
  - Startup Guide (german / english)
  - Installation manual (german, english, french)
  - Compax3 DVD
- Device accessories
  - Phoenix connector for X3 and X4
  - SSK32/20: RS232 adapter cable (programming port C3HxxxV4 – SSK1 – PC)
  - VBK17/01: SubD jumper mounted

2.2 Type specification plate

You will find the exact description of the device on the type specification plate, which can be found on the device:

Compax3 - Type specification plate:



Explanation:

1	Type designation The complete order designation of the device (2, 5, 6, 9, 8).
2	**C3:** Abbreviation for Compax3 **S025:** Single axis device, nominal device current in 100mA (025=2.5A) **M050:** Multi-axis device, nominal device current in 100mA (050=5A) **H050:** High power device, nominal device current in 1A (050=50A)
	D6: Designation nominal supply **V2:** Mains supply voltage (2=230VAC/240VAC, 4=400VAC/480VAC)
3	Unique number of the particular device
4	Nominal supply voltage Power Input: Input supply data Power Output: Output data
5	Designation of the feedback system **F10:** Resolver Feedback **F11:** SinCos© / Single- or Multiturn **F12:** Feedback module for direct drives
6	Device interface **I10:** Analog, step/direction and encoder input **I11 / I12:** Digital Inputs / Outputs and RS232 / RS485 **I20:** Profibus DP / **I21:** CANopen / **I22:** DeviceNet / **I30:** Ethernet Powerlink / **I31:** EtherCAT **C10:** integrated controller C3 *power*PL*m*C **C13:** integrated controller C3 *power*PL*m*C with Profibus
7	Date of factory test
8	Options **Mxx:** I/O extension, HEDA **Sx:** optional safety technology on the C3M
9	Technology function **T10:** Servo controller **T11:** Positioning **T30:** Motion control programmable according to IEC61131-3 **T40:** Electronic cam
10	CE compliance
11	Certified safety technology
12	UL certification

2.3 Packaging, transport, storage

Packaging material and transport

Caution! ***The packaging material is inflammable, if it is disposed of improperly by burning, lethal fumes may develop.***

The packaging material must be kept and reused in the case of a return shipment. Improper or faulty packaging may lead to transport damages.
Make sure to transport the drive always in a safe manner and with the aid of suitable lifting equipment (**weight** (see page 36, see page 36)). Do never use the electric connections for lifting. Before the transport, a clean, level surface should be prepared to place the device on. The electric connections may not be damaged when placing the device.

First device checkup

- Check the device for signs of transport damages.
- Verify, if the indications on the **type identitfications plate** (see page 8) correspond to your requirements.
- Check if the consingment is complete.

Storage

If you do not wish to mount and install the device immediately, make sure to store it in a dry and clean environment. Make sure that the device is not stored near strong heat sources and that no metal chippings can get into the device.

Disposal

This product contains materials that fall under the special disposal regulation from 1996, which corresponds to the EC directory 91/689/EEC for dangerous disposal material. We recommend to dispose of the respective materials in accordance with the respectively valid environmental laws. The following table states the materials suitable for recycling and the materials which have to be disposed of separately.

Material Option	suitable for recycling	Disposal
Metal	yes	no
Plastic materials	yes	no
Circuit boards	no	yes

Please dispose of the circuit boards according to one of the following methods:

- Burning at high temperatures (at least 1200°C) in an incineration plant licensed in accordance part A or B of the environmental protection act.
- Disposal via a technical waste dump which is allowed to take on electrolytic aluminium condensers. Do under no circumstances dump the circuit boards at a place near a normal waste dump.

2.4 Safety Instructions

In this chapter you can read about:

2.4.1. General hazards

General Hazards on Non-Compliance with the Safety Instructions
The device described in this manual is designed in accordance with the latest technology and is safe in operation. Nevertheless, the device can entail certain hazards if used improperly or for purposes other than those explicitly intended.
Electronic, moving and rotating components can

- constitute a hazard for body and life of the user, and
- cause material damage

Designated use

The device is designed for operation in electric power drive systems (VDE0160). Motion sequences can be automated with this device. Several motion sequences can be combined by interconnecting several of these devices. Mutual interlocking functions must be incorporated for this purpose.

2.4.2. Safety-conscious working

This device may be operated only by qualified personnel.
Qualified personnel in the sense of these operating instructions consists of:

- Persons who, by virtue to their training, experience and instruction, and their knowledge of pertinent norms, specifications, accident prevention regulations and operational relationships, have been authorized by the officer responsible for the safety of the system to perform the required task and in the process are capable of recognizing potential hazards and avoiding them (definition of technical personnel according to VDE105 or IEC364),
- Persons who have a knowledge of first-aid techniques and the local emergency rescue services.
- Persons who have read and will observe the safety instructions.
- Those who have read and observe the manual or help (or the sections pertinent to the work to be carried out).

This applies to all work relating to setting up, commissioning, configuring, programming, modifying the conditions of utilization and operating modes, and to maintenance work.
This manual and the help information must be available close to the device during the performance of all tasks.

2.4.3. Special safety instructions

- Check the correct association of the device and its documentation.
- Never detach electrical connections while voltage is applied to them.
- Safety devices must be provided to prevent human contact with moving or rotating parts.
- Make sure that the device is operated only when it is in perfect condition.
- Implement and activate the stipulated safety functions and devices.
- Operate the device only with the housing closed.
- Make sure that all axes are sufficiently fixed.
- Attention during configuration downloads with master - slave couplings (electronic gear, cam)
  Deactivate the drive before starting the configuration download: Master and Slave axis
- Check that all live terminals are secured against contact. Fatal voltage levels of to 850V occur.
- Do not bypass power direct current

Due to movable machine parts and high voltages, the device can pose a lethal danger. Danger of electric shock in the case of non-respect of the following instructions. The device corresponds to DIN EN 61800-3, i.e. it is subject to limited sale. The device can emit disturbances in certain local environments. In this case, the user is liable to take suitable measures.

- The device must be permanently grounded due to high earth leakage currents.
- The drive motor must be grounded with a suitable protective lead.
- The devices are equipped with high voltage DC condensers. Before removing the protective cover, the discharging time must be awaited. After switching off the energy, it may take up to 5 minutes to discharge the capacitors. Danger of electric shock in case of non respect.
- Before you can work on the device, the supply voltage must be switched off at the L1, L2 and L3 clamps. Wait at least 3 minutes so that the power direct current may sink to a secure value (<50V). Check with the aid of a voltmeter, if the voltage at the DC+ and DC- clamps has fallen to a value below 50V (not possible on the Compax3M).
- Do never perform resistance tests with elevated voltages (over 690V) on the wiring without separating the circuit to be tested from the drive.
- In the event of a device exchange it is absolutely necessary to transfer the configuration determining the correct operation of the drive to the device, before the device is put into operation.
- The device contains electrostatically sensitive components. Please heed the electrostatic protection measures while working at/with the device as well as during installation and maintenance.

Attention hot surface!

The heat dissipator can reach very high temperatures (>70°C)

Protective covers

The user is responsible for protective covers and/or additional safety measures in order to prevent damages to persons and electric accidents.

2.5 Warranty conditions

- The device must not be opened.
- Do not make any modifications to the device, except for those described in the manual.
- Make connections to the inputs, outputs and interfaces only in the manner described in the manual.
- Fix the devices according to the **mounting instructions**. (see on page 20)
  We cannot provide any guarantee for any other mounting methods.

Note on exchange of options

Compax3 options must be exchanged in the factory to ensure hardware and software compatibility.

- When installing the device, make sure the heat dissipators of the device receive sufficient air and respect the recommended mounting distances of the devices with integrated ventilator fans in order to ensure free circulation of the cooling air.
- Make sure that the mounting plate is not exposed to external temperature influences.

2.6 Conditions of utilization

In this chapter you can read about:

2.6.1. Conditions of utilization for CE-conform operation

- Industry and trade -

The EC guidelines for electromagnetic compatibility 2006/95/EC and for electrical operating devices for utilization within certain voltage limits 2004/108/EC are fulfilled when the following boundary conditions are observed:

Operation of the devices only in the condition in which they were delivered, i.e. with all housing panels.

In order to ensure contact protection, all mating plugs must be present on the device connections even if they are not wired.

Mains filter: A mains filter is required in the mains input line if the motor cable exceeds a certain length. Filtering can be provided centrally at the plant mains input or separately at the mains input to each device.

Use of the devices in a commercial and residential area (limit values of Class C2 in accordance with EN 61800-3)

The following mains filters are available for independent utilization:

Device: Compax3	Order No.:	Condition:
H050V4	NFI02/01	Only for motor lines longer than 10m
H090V4	NFI02/02	Only for motor lines longer than 10m
H1xxV4	NFI02/03	Only for motor lines longer than 10m

Use in the industrial area (limit values class C3 in accordance with EN 61800-3)

Longer motor cable lengths are possible in industrial areas.

Connection length: Connection between mains filter and device:

unshielded: < 0.5m
shielded < 5m (fully shielded on ground – e.g. ground of control cabinet)

Motor and Feedback cable:

Operation of the devices only with motor and feedback cables whose plugs contain a special full surface area screening.

Requirements for Compax3H motor cable

A motor output filter is required for motor cables >50m. Please contact us.

Shielding connection of the motor cable

The motor cable should be fully screened and connected to the Compax3 housing. The shield of the motor cable must also be connected with the motor housing. The fixing (via plug or screw in the terminal box) depends on the motor type.

Requirements for encoder cable Compax3: < 100 m

Requirements for other cables Corresponding to the specifications of the terminal clamp with a temperature range of up to 75°C.

Motors: Operation with standard motors.

Control: Use only with aligned controller (to avoid control loop oscillation).

Grounding: Connect the filter housing and the Compax3 to the cabinet frame, making sure that the contact area is adequate and that the connection has low resistance and low inductance.
Never mount the filter housing and the device on paint-coated surfaces!

Cable installation: Signal lines and power lines should be installed as far apart as possible.
Signal leads should never pass close to excessive sources of interference (motors, transformers, contactors etc.).

Accessories: Make sure to use only the accessories recommended by Parker

Connect all cable shields at both ends, ensuring large contact areas!

Warning:

This is a product in the restricted sales distribution class according to EN 61800-3. In a domestic area this product can cause radio frequency disturbance, in which case the user may be required to implement appropriate remedial measures.

2.6.2. Conditions of utilization for UL certification Compax3H

UL certifiction for Compax3H

conform to UL:	◆ according to UL508C
Certified	◆ E-File_No.: E235 342

The UL certification is documented by a “UL“ logo on the device (type specification plate).

“UL“ logo

Conditions of utilization

- The devices are only to be installed in a degree of contamination 2 environment (maximum).
- The devices must be appropriately protected (e.g. by a switching cabinet).
- Tightening Tourque of the Field Wiring Terminals.

Terminal clamps – max. line cross section

The line cross sections must correspond to the locally valid safety regulations. The local regulations have always priority.

	Power clamps (minimum/maximum section)	
C3H050V4	2.5 / 16mm^2	
	massive	multiwire
C3H090V4	16 / 50mm^2	25 / 50mm^2
C3H1xxV4	25 / 95mm^2	35 / 95mm^2

The standard connection clamps of Compax3H090V4 and Compax3H1xxV4 are not suitable for flat line bars.

- Temperature rating of field installed conductors shall be at least 75°C Do only use copper lines.
- Maximum Surrounding Air Temperature: 45°C.
- Short Circuit Rating - Suitable for use on a circuit capable of delivering not more than 10000 RMS symmetrical amperes and 480 volts maximum.

ATTENTION Danger of electric shock.

Upon removing power to the equipment, wait minimum 5 minutes before accessing the drive to ensure internal voltage levels are less than 50VDC.

- The drive provides internal motor overload protection.
  This must be set so that 200% of the nominal motor current are not exceeded.
- Cable cross-sections
  - Mains input: corresponding to the recommended fuses.
  - Motor cable: corresponding to the nominal output currents
  - This device is provided with Solid State Short Circuit (output) Protection.

2.6.3. Current on the mains PE (leakage current)

This product can cause a direct current in the protective lead. If a residual current device (RCD) is used for protection in the event of direct or indirect contact, only a type B (all current sensitive) RCD is permitted on the current supply side of this product . On the other hand a different protective measure must be taken, such as for example separation from the environment by double or enforced insulation or separation from the supply network by a transformer.
Please heed the connection instructions of the RCD supplier.
Mains filters do have high leakage currents due to their internal capacity. An internal mains filter is usually integrated into the Compax3 servo controllers.
Additional leakage currents are caused by the capacities of the motor cable and of the motor windings. Due to the high clock frequency of the power output stage, the leakage currents do have high-frequency components. Please check if the FI protection switch is suitable for the individual application.
If an external mains filter is used, an additional leakage current will be produced.
The figure of the leakage current depends on the following factors:

- Length and properties of the motor cable
- Switching frequency
- Operation with or without external mains filter
- Motor cable with or without shield network
- Motor housing grounding (how and where)

Remark:

- The leakage current is important with respect to the handling and usage safety of the device.
- A pulsing leakage current occurs if the supply voltage is switched on.

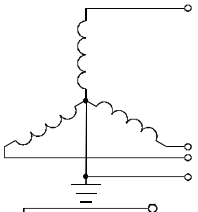
Please note:

The device must be operated with effective grounding connection, which must comply with the local regulations for high leakage currents (>3.5mA).
Due to the high leakage currents it is not adviseable to operate the servo controller with an earth leakage circuit breaker.

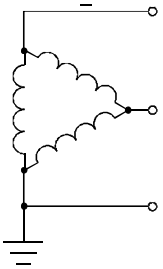
2.6.4. Supply networks

The Compax3 servo controller series is designed for fixed connection to TN networks (TN-C, TN-C-S or TN-S). Please note that the line-earth voltage may not exceed 300VAC.

- When grounding the neutral conductor, mains voltages of up to 480VAC are permitted.



- When grounding an external conductor (delta mains, two-phase mains), mains voltages (external conductor voltages) of up to 300VAC are permitted.



Servo controllers which are to be connected to an IT network must be provided with a separating transformer. Then the Compax3 device is operated locally like in a TN network. The secondary sided center of the separating transformer must be grounded and connected to the PE connector of the Compax3.

2.7 Manufacturer's Declaration of Conformity

As defined by the EU Electromagnetic Compatibility (EMC) Directive 89/336/EEC and

the EU Directive relating to electrical equipment designed for use within certain voltage limits (Low Voltage Directive) 73/23/EEC

We (the manufacturer)

Parker Hannifin GmbH & CoKG

hereby declare that the designated product

Device type: Compact servo control unit

Device type: Compax C3HxxxV4FxxIxxTxxMxx

is, by virtue of its design concept and construction, and with reference to the version which we have put into circulation, fully compliant with the following standards or standard-related documentation.

Applied harmonized Standards, in particular:

Electromagnetic Compatibility	
EN 61 800-3 **VDE 0160 part 100**	EMC product standard for adjustable speed electrical power drive systems including specific test methods
Safety	
EN 61 800-5-1 **VDE 0160 part 105**	Safety requirements for adjustable speed electrical power drive systems

Caution!

This manufacturer's declaration is only valid if the operational parameters comply with the chapter on “Operating Conditions” as defined in the Product Handbook. If there are any deviations or modifications to the product, this declaration shall cease to apply.

3. Compax3 device description

In this chapter you can read about:

3.1 State of delivery

Compax3 is delivered without configuration!
After switching on the 25VDC supply, the red LED is flashing while the green LED is dark.
Please configure the device with the help of the Windows-Software “Compax3 – ServoManager“!

3.2 Meaning of the status LED - Compax3 axis controller

Device status LEDs	Right LED (red)	Left LED (green)
Voltages missing	off	off
During the booting sequence	alternately flashing	
No configuration present. SinCos© feedback not detected. Compax3 IEC61131-3 program not compatible with Compax3 Firmware. no Compax3 IEC61131-3 program For F12: Hall signals invalid.	Flashes slowly	off
Axis without current excitation	off	Flashes slowly
Power supplied to axis; commutation calibration running	off	Flashes quickly
Axis with current excitation	off	on
Axis in fault status / fault present / axis energized (error reaction 1)	Flashes quickly	on
Axis in fault status / fault present / axis deenergized (error reaction 2)	on	off
Compax3 faulty: Please contact us.	on	on

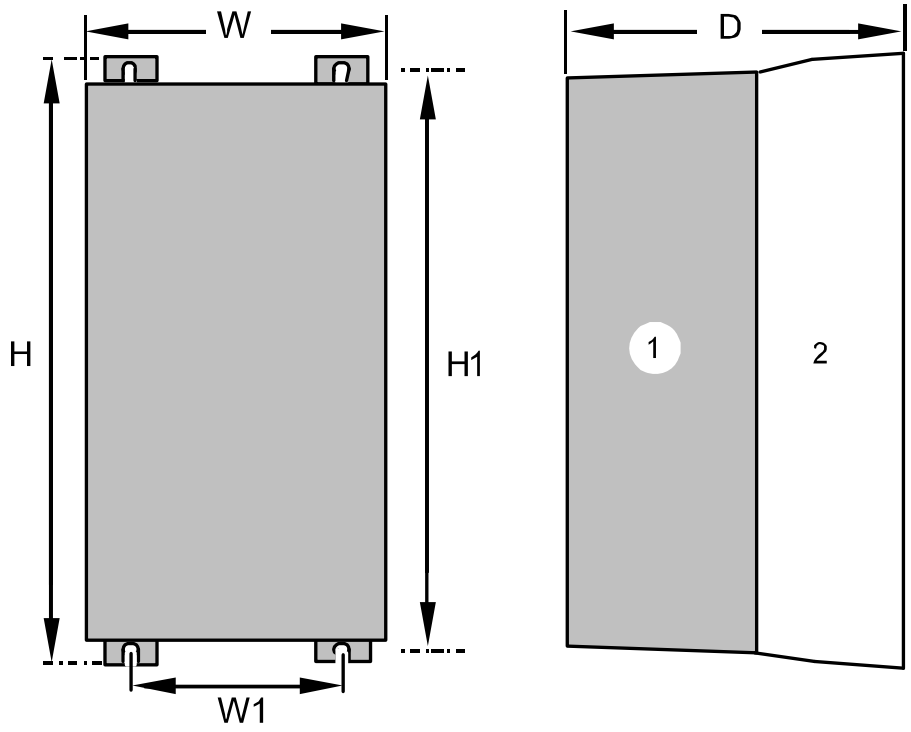
Note on Compax3H: The **internal** device status LEDs are only connected to the **external** housing LEDs, if the RS232 jumper at X10 is fitted to the control and the upper dummy cover is fitted.

3.3 Mounting and dimensions C3H

In this chapter you can read about:

The devices must be mounted vertically on a level surface in the control cabinet.

Dimensions:



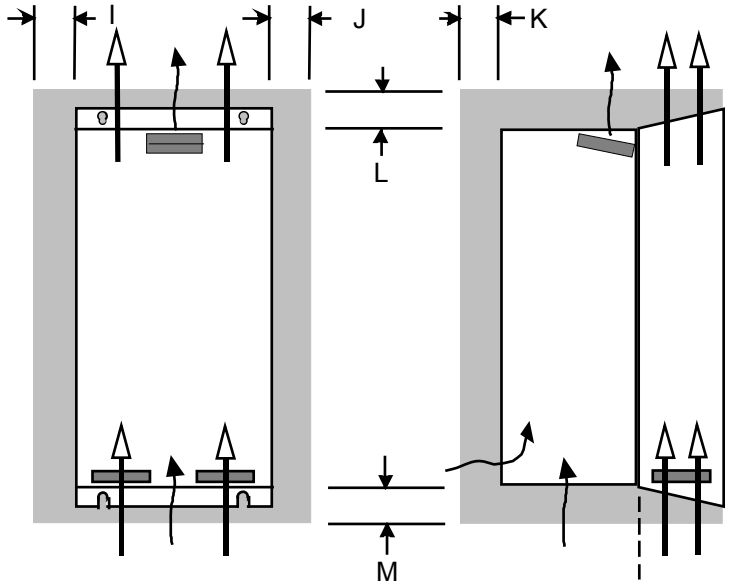
(1): Electronics
(2): Head dissipator

	H	H1	D	W	W1
C3H050V4	453mm	440mm	245mm	252mm	150mm
C3H090V4	668.6mm	630mm	312mm	257mm	150mm
C3H1xxV4	720mm	700mm	355mm	257mm	150mm

Mounting: 4 screws M6

Ventilation: During operation, the device radiates heat (power loss). Please provide for a sufficient mounting distance below and above the device in order to ensure free circulation of the cooling air. Please do also respect the recommended distances of other devices. Make sure that the mounting plate is not exhibited to other temperature influences than that of the devices mounted on this very plate.
If two or more devices are combined, the mounting distances are added.

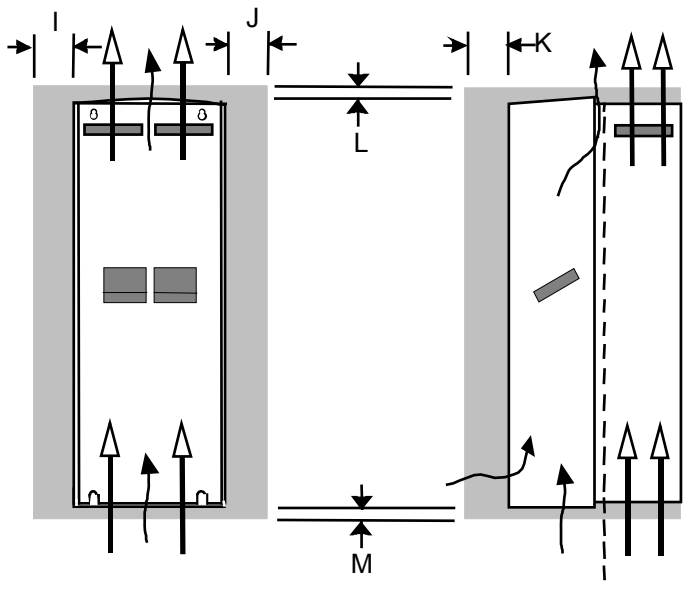
3.3.1. Mounting distances, air currents Compax3H050V4



in mm

	I	J	K	L	M
C3H050V4	15	5	25	70	70

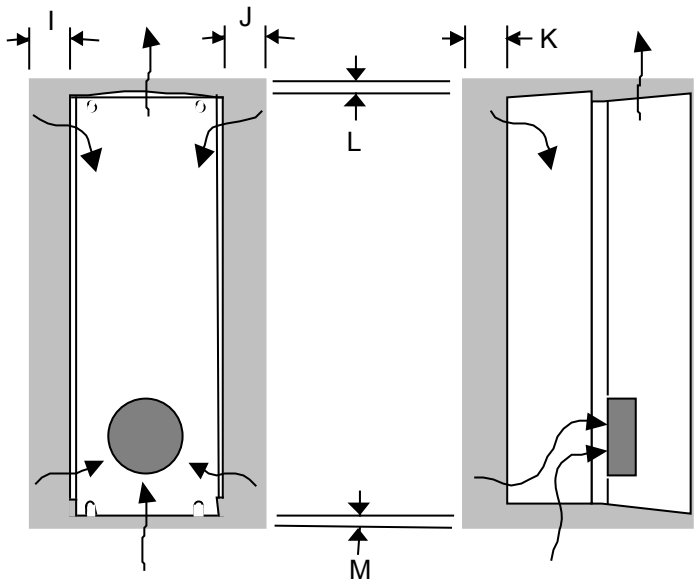
3.3.2. Mounting distances, air currents Compax3H090V4



in mm

	I	J	K	L	M
C3H090V4	0	0	25	70	70

3.3.3. Mounting distances, air currents Compax3H1xxV4



in mm

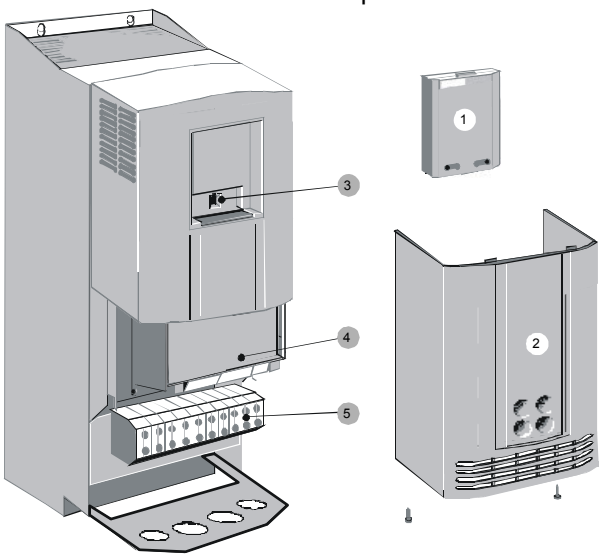
	I	J	K	L	M
C3H1xxV4	0	0	25	70	70

3.4 Connections of Compax3H

In this chapter you can read about:

3.4.1. Compax3H plugs/connections

The following figure is an example for all sizes.
The fitting of the different controller plugs depends on the extension level of Compax3.



(1): Dummy cover with display of the **external** device status LEDs.

(2): lower clamp cover, fixed by 2 screws at the device bottom.

(3): RS232 programming interface
Connection to the PC via adapter cable SSK32/20 (furnished with the device) and standard RS232 cable SSK1.

(4): Controlling

(5): Power connections

Always switch devices off before wiring them!

Dangerous voltages are still present until 5 minutes after switching off the power supply!

Caution!

If the control voltage is missing and if the X10-X10 jumper is not fitted (VBK17/01) on the control part, the availability of power voltage is not displayed.

PE connection

The PE connection is made with 10mm^2 via a grounding screw at the bottom of the device.

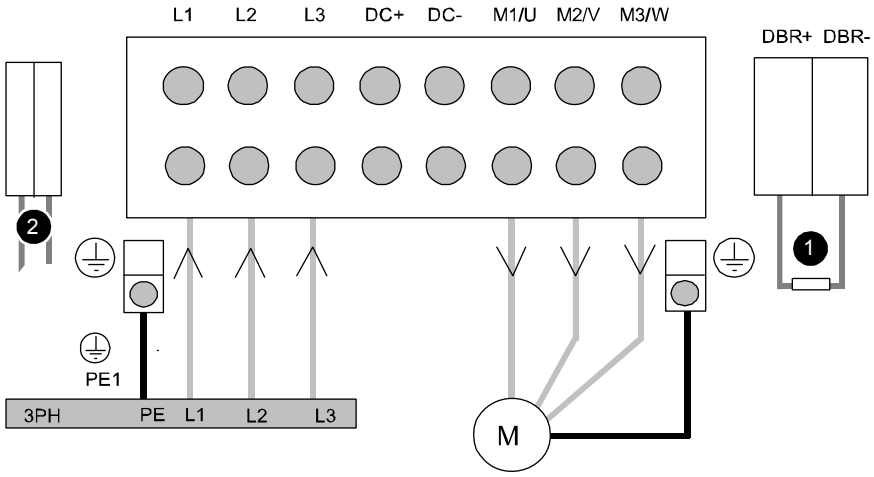
Attention hot surface!

Metal parts can heat up to a temperature of 90°C during operation.

3.4.2. Connection of the power voltage

The terminal block of the drive can be found under the front cover. It is secured with 2 screws at the bottom of the device. Remove the bottom cover in order to access the conection clamps.
Make sure that all live parts are covered by the housing after installation.

Illustration of the connection clamps exemplarily for all sizes:



L1, L2, L3: 3 phase mains connection
M1, M2, M3: Motor connections
DC+, DC-: DC link voltage
(1) DBR+ und DBR-: Connection of external braking resistor
(2) AUX1, AUX2: only with C3H1xxV4 external supply (AC) for device ventilator L, N

- All shields must be connected via a cable joint to the cable feedthrough plate.
- Braking resistor and cable must be shielded if they are not installed in a control cabinet.

The standard connection clamps of C3H090V4 and C3H1xxV4 are **not** suitable for flat line bars.

Terminal clamps – max. line cross section

The line cross sections must correspond to the locally valid safety regulations. The local regulations have always priority.

	Power clamps (minimum/maximum section)	
C3H050V4	2.5 / 16mm²	
	massive	multiwire
C3H090V4	16 / 50mm²	25 / 50mm²
C3H1xxV4	25 / 95mm²	35 / 95mm²

The standard connection clamps of Compax3H090V4 and Compax3H1xxV4 are not suitable for flat line bars.

Cover plate for cable feedthrough

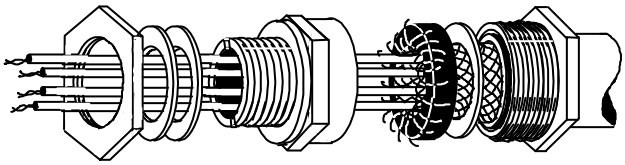
The cable feedthrough holes have the following dimensions:	
C3H050V4	28.6mm for M20, PG16 and ½" NPT (America). 37.3mm for M32, PG29 and 1" NPT (America).
C3H090V4	22.8mm for M20, PG16 and ½" NPT (America). 28.6mm for M25, PG21 and ¾" NPT (America). 47.3mm for M40, PG36 and 1¼"" NPT (America). 54.3mm for M50, PG42and 1½" NPT (America).
C3H1xxV4	22.8mm for M20, PG16 and ½" NPT (America) 28.6mm for M25, PG21 and ¾" NPT (America)

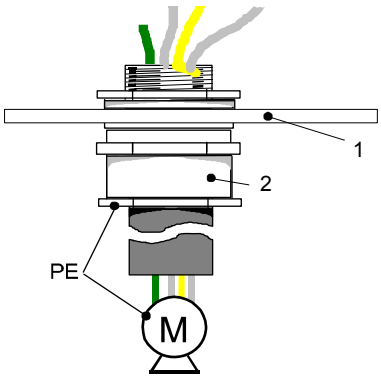
Recommended tightening torques

	High voltage supply	Braking Resistor	Grounding
C3H050V4	4Nm / 15.88kg-in	4Nm / 15.88kg-in	4.5Nm / 18.14kg-in
C3H090V4	6-8Nm / 53-70lb-in	6-8Nm / 53-70lb-in	6-8Nm / 53-70lb-in
C3H1xxV4	15-20Nm / 132-177lb-in	0.7Nm / 2.77kg-in	42Nm / 375lb-in

Cable joints

Use metallic cable joints permitting a 360° shielding in order to comply with the EMC directive.





1: Cable feedthrough plate

2: metallic joint with 360° shielding for EMC compliant design

The device must be grounded without interruption according to EN 61800-5-1. The mains supply lines must be protected with a suitable fuse or a circuit breaker (FI switches or earth fault fuses ar e not recommended).

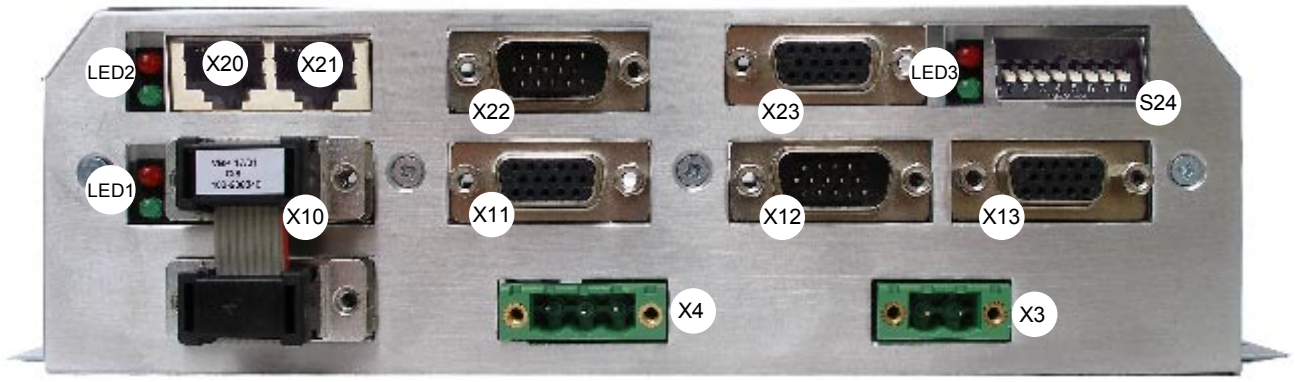
For installation in accordance with EN 61800-5-1 mm Europe:

- For grounding without interruption, two separate protective leads (<10mm² cross-section) or one lead (>10mm² cross-section) are required. Each protective lead must meet the requirements according to EN 60204.

3.4.3. Compax3H connections front plate

Communication and signal interfaces

Showcase front plate of the control (number of connectors depends on the extension level of the Compax3)

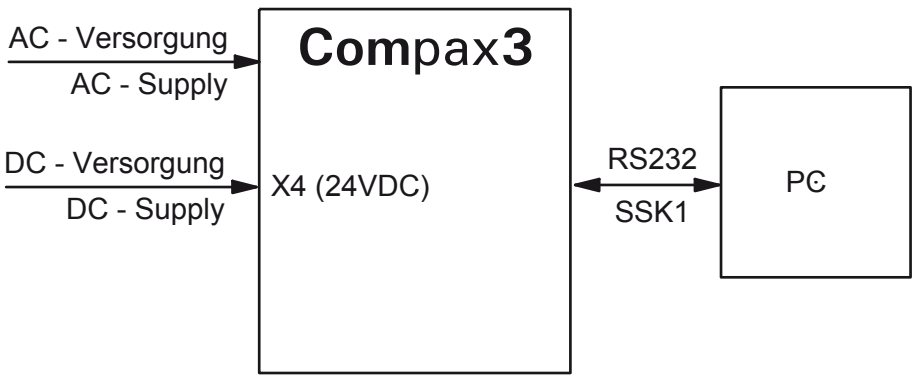


X3	Motor brake	**X20**	HEDA in (Option)	
X4	24VDC	**X21**	HEDA out (Option)	
X10	RS232/RS485 with jumper to the programming interface	**X22**	Inputs Outputs (Option M10/12)	
X11	Analogue/Encoder	**X23**	Bus (Option)	connector type depends on the bus system!
X12	Inputs/Outputs	**S24**	bus settings	
X13	Motor position feedback	**LED1**	Device status LEDs	
		LED2	HEDA LEDs	
		LED3	Bus LEDs	

Note on Compax3H: The **internal** device status LEDs are only connected to the **external** housing LEDs, if the RS232 jumper at X10 is fitted to the control and the upper dummy cover is fitted.
The RS232 programming interface under the upper dummy cover is only available if the X10 jumper at the controller is fitted.

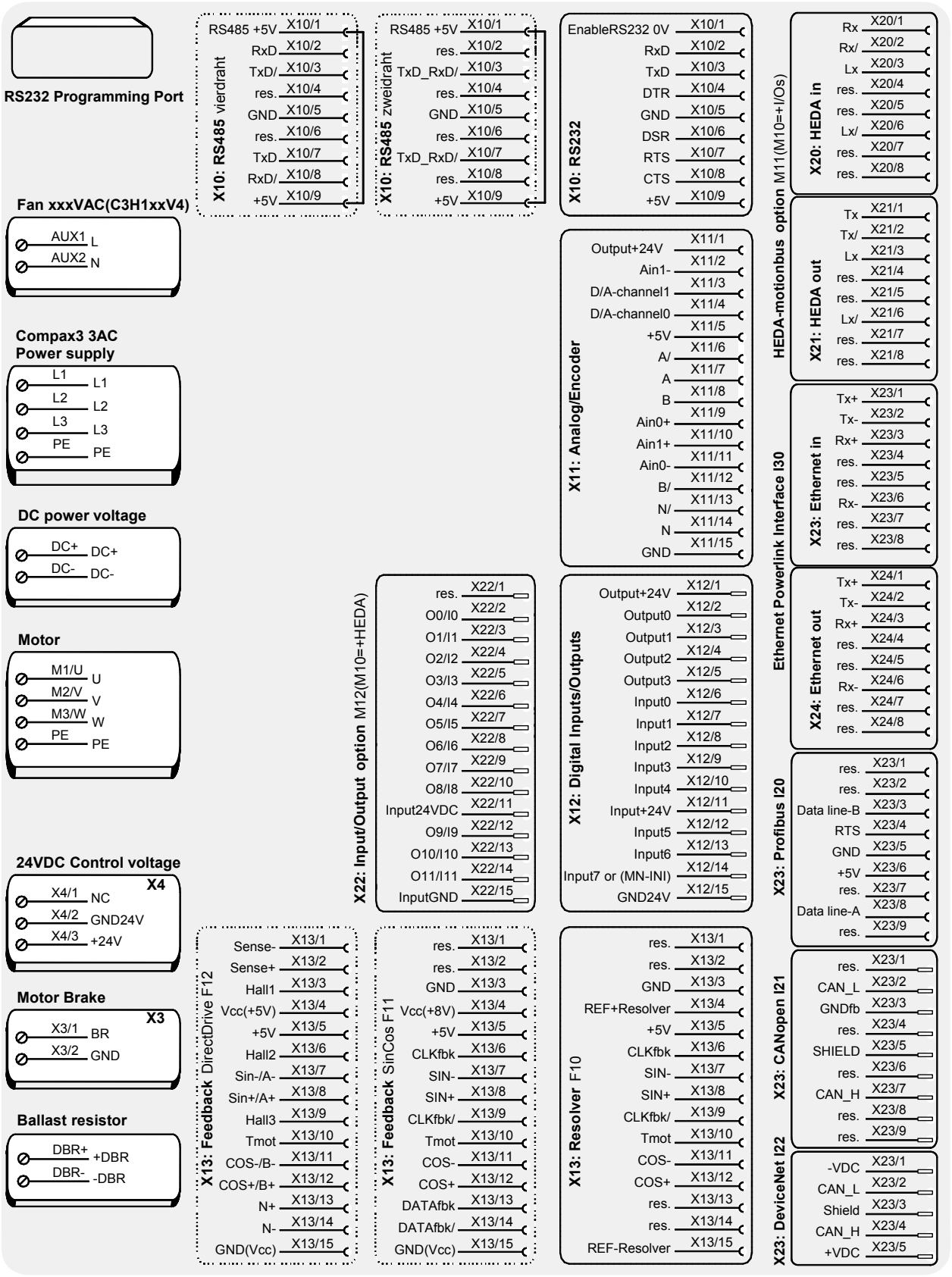
3.4.4. Plug and pin assignment C3H

Overview



Further information on the assignment of the plug mounted at the particular device can be found below!

In detail: The fitting of the different plugs depends on the extension level of Compax3. In part, the assignment depends on the Compax3 option implemented.



The RS232 programming interface under the upper dummy cover is only available if the X10 jumper at the controller is fitted.

Please note C3H1xxV4 uses a ventilator fan which must be externally supplied via separate connections. The ventilator fan is available in two versions for single phase feed: 220/240VAC; 110/120VAC

3.4.5. Motor / Motor brake C3H

Connection clamps of motor - figure (see on page 24)

PIN	Designation
M1/U	U (motor)
M2/V	V (motor)
M3/W	W (motor)
PE	PE (motor)

Requirements for Compax3H motor cable

A motor output filter is required for motor cables >50m. Please contact us.

Shielding connection of the motor cable

The motor cable should be fully screened and connected to the Compax3 housing. The shield of the motor cable must also be connected with the motor housing. The fixing (via plug or screw in the terminal box) depends on the motor type.

Motor holding brake!

Connect the brake only on motors which have a holding brake! Otherwise make no brake connections at all.

Requirements cables for motor holding brake

If a motor holding brake is present, **a cable** of the motor holding brake must be fed on the device side through the toroidal core ferrite provided as accessory ZBH0x/xx (63Ω @1MHz, di=5.1mm), in order to ensure error-free switching on and off of the motor holding brake.

Connection of motor brake X3 figure (see on page 26)

PIN	Designation
1	BR
2	GND

Motor holding brake output

Motor holding brake output	Compax3
Voltage range	21 – 27VDC
Maximum output current (short circuit proof)	1.6A
Minimum output current	150mA

3.4.6. Control voltage 24 VDC C3H

Connection of control voltage 24VDC figure (see on page 26)

Plug X4 Pin	Description	
1	NC	NC
2	Gnd 24 V	GND
3	+24V	24 VDC (power supply)

Control voltage 24VDC Compax3S and Compax3H

Controller type	Compax3
Voltage range	21 - 27VDC
Mains module	with switch-on current limitation, due to capacitive load
Fuse	MTP miniature circuit breaker or "delayed action fuse", due to capacitive load
Current drain of the device	0.8A
Total current drain	0.8 A + Total load of the digital outputs + current for the motor holding brake
Ripple	0.5Vpp
Requirement according to safe extra low voltage (SELV)	yes
Short-circuit proof	conditional (internally protected with 3.15AT)

3.4.7. Mains connection Compax3H

Device protection

Avoid permanent switching on and off so that the charging connection is not overloaded.

Connection of mains voltage figure (see on page 24)

Mains connection Compax3Hxxx 3*400VAC

Device type Compax3	H050V4	H090V4	H125V4	H155V4
Supply voltage	Three-phase 3*400VAC 350-528VAC / 50-60Hz			
Input current	66Arms	95Arms	143Arms	164Arms
Output current	50Arms	90Arms	125Arms	155Arms
Maximum fuse rating per device(=short circuit rating)Branch circuit protection according to UL	80A	100A	160A	200A
	JDDZ class K5, JDRX class H	JDDZ class H5, JDRX class H		

Mains connection Compax3Hxxx 3*480VAC

Device type Compax3	H050V4	H090V4	H125V4	H155V4
Supply voltage	Three-phase 3*480VAC 350-528VAC / 50-60Hz			
Input current	54Arms	82Arms	118Arms	140Arms
Output current	43Arms	85Arms	110Arms	132Arms
Maximum fuse rating per device(=short circuit rating)Branch circuit protection according to UL	80A	100A	160A	200A
	JDDZ class K5, JDRX class H	JDDZ class H5, JDRX class H		

3.4.8. Braking resistor / supply voltage C3H

The energy generated during braking operation is absorbed by the Compax3 storage capacity.
If this capacity is too small, the braking energy must be drained via a braking resistor.

3.4.8.1 Connect braking resistor C3H

Connection of braking resistor - figure (see on page 24)

PIN	Designation
DBR+	+ Braking resistor
DBR-	- Braking resistor

Braking operation of Compax3HxxxV4

Controller type	H050V4	H090V4	H125V4	H155V4
Capacitance / storable energy	2600µF / 602Ws	3150µF / 729Ws	5000µF / 1158Ws	5000µF / 1158Ws
Minimum braking-resistance	24Ω	15Ω	8Ω	8Ω
Maximum continuous current	30A	45A	83A	83A

Mimimum line cross section: 2.5mm²
Maximum line length: 2m
Maximum output voltage: 830VDC

3.4.8.2 Power supply voltage DC C3H

Connection of power voltage - figure (see on page 24)

PIN	Description
DC+	+ DC high voltage supply
DC-	- DC high voltage supply

Warning!

Do not connect any braking resistor on DC+/DC- .

3.4.8.3 Connection of the power voltage of 2 C3H 3AC devices

In order to improve the conditions during brake operation, the DC power voltage of 2 servo axes may be connected.
The capacity as well as the storable energy are increased; furthermore the braking energy of one servo axis may be utilized by a second servo axis, depending on the application.

It is not permitted to connect the power voltage in order to use one brake circuit for two servo axes, as this function cannot be ensured reliably.

Note the following:

Caution! In case of non-compliance with the following instructions, the device may be destroyed!

- You can only connect two similar servo axes (same power supply; same rated currents)
- Connected servo axes must always be fed separately via the AC power supply.
- If the external pre-fuse of one of the servo axes takes action, the second servo axis must also be disconnected automatically.

Please connect as follows:

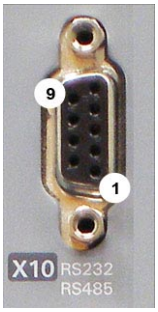
Servo axis 1 DC+ with servo axis 2 DC+
Servo axis 1 DC- with servo axis 2 DC-

- Figure (see on page 24)

3.5 Signal interfaces

In this chapter you can read about:

3.5.1. RS232 / RS485 interface (plug X10)



Interface selectable by contact functions assignment of X10/1:
X10/1=0V RS232
X10/1=5V RS485

PIN X10	RS232 (Sub D)
1	(Enable RS232) 0V
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	+5V

RS485 2-wire

PIN X10	RS485 two wire (Sub D) Pin 1 and 9 jumpered externally
1	Enable RS485 (+5V)
2	res.
3	TxD_RxD/
4	res.
5	GND
6	res.
7	TxD_RxD
8	res.
9	+5V

RS485 4-wire

PIN X10	RS485 four wire (Sub D) Pin 1 and 9 jumpered externally
1	Enable RS485 (+5V)
2	RxD
3	TxD/
4	res.
5	GND
6	res.
7	TxD
8	RxD/
9	+5V

USB - RS232/RS485 converter

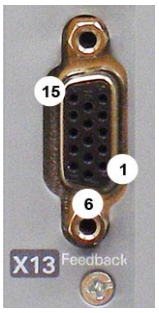
The following USB - RS232 converters were tested:

- ATEN UC 232A
- USB GMUS-03 (available under several company names)
- USB / RS485: **Moxa Uport 1130** http://www.moxa.com/product/UPort_1130.htm
- Ethernet/RS232/RS485: **NetCom 113** http://www.vscom.de/666.htm

Note on Compax3H

If X10 at the control unit is used, the programming interface as well as the external device status LEDs are out of order due to the removal of the X10 jumper!

3.5.2. Resolver / feedback (connector X13)



PIN X13	Feedback /X13 High Density /Sub D (depending on the Feedback module)		
	Resolver (F10)	**SinCos (F11)**	**EnDat 2.1 (F12)**
1	Reserved	Reserved	Sense -*
2	Reserved	Reserved	Sense +*
3	GND	GND	Reserved
4	REF-Resolver+	Vcc (+8V)	Vcc (+5V) * max. 350mA load
5	+5V (for temperature sensor)		
6	Reserved	Reserved	CLKfbk
7	SIN-	SIN-	SIN- / A- (Encoder)
8	SIN+	SIN+	SIN+ / A+ (Encoder)
9	Reserved	Reserved	CLKfbk/
10	Tmot*	Tmot*	Tmot*
11	COS-	COS-	COS- / B- (Encoder)
12	COS+	COS+	COS+ / B+ (Encoder)
13	Reserved	DATAfbk	DATAfbk
14	Reserved	DATAfbk/	DATAfbk/
15	REF-Resolver-	GND (Vcc)	GND (Vcc)

*X13 Pin10 Tmot may not be connected at the same time as X15 (on Compaxx3M).

Resolver cables can be found in the accessories chapter of the device description.
SinCos© - cables can be found in the accessories chapter of the device description.
EnDat cable GBK38 can be found in the accessories chapter of the device description

PIN X13	Feedback /X13 High Density /Sub D
	Direct drives (F12)
1	Sense -*
2	Sense +*
3	Hall1 (digital)
4	Vcc (+5V) * max. 350mA load
5	+5V (for temperature- and hall-sensors)
6	Hall2 (digital)
7	SIN-, A- (Encoder) or analog Hall sensor
8	SIN+, A+, (Encoder) or analog Hall sensor
9	Hall3 (digital)
10	Tmot*
11	COS-, B- (Encoder) or analog Hall sensor
12	COS+, B+ (Encoder) or analog Hall sensor
13	N+
14	N-
15	GND (Vcc)

*X13 Pin10 Tmot may not be connected at the same time as X15 (on Compaxx3M).

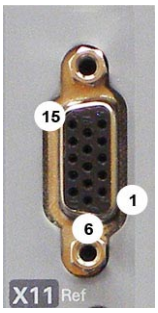
Note on F12:

*+5V (Pin 4) is measured and controlled directly at the end of the line via Sense – and Sense +.
Maximum cable length: 100m

Caution!

- Pin 4 and Pin 5 must under no circumstances be connected!
- Plug in or pull out feedback connector only in switched off state (24VDC switched off).

3.5.3. Analog / Encoder (plug X11)

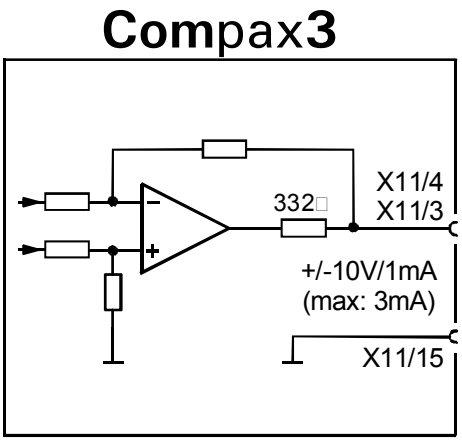


PIN X11	Reference High Density Sub D		
		Encoders	SSI
1	+24V (output) max. 70mA		
2	Ain1 -: analog input - (14Bit; max. +/-10V)		
3	D/A monitor channel 1 (±10V, 8-bit resolution)		
4	D/A monitor channel 0 (±10V, 8-bit resolution)		
5	+5V (output for encoder) max. 150mA		
6	- Input: steps RS422 (5V - level)	**A/** (Input / simulation)	Clock-
7	+ Input: steps RS422 (5V - level)	**A** (Input / simulation)	Clock+
8	+ Input: direction RS422 (5V - level)	**B** (Input / simulation)	
9	Ain0 +: analog input + (14Bit; max. +/-10V)		
10	Ain1 +: analog input + (14Bit; max. +/-10V)		
11	Ain0 -: analog input - (14Bit; max. +/-10V)		
12	- Input: direction RS422 (5V - level)	**B/** (Input / simulation)	
13	Reserved	**N/** (Input / simulation)	DATA-
14	Reserved	**N** (Input / simulation)	DATA+
15	GND		

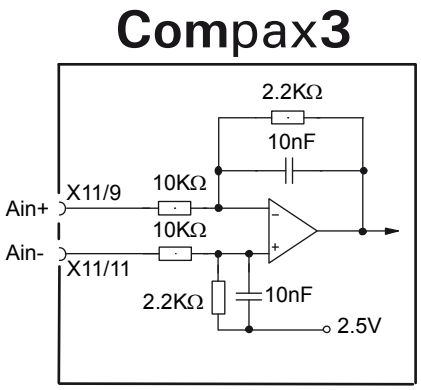
Technical data X11 (see on page 39)

3.5.3.1 Wiring of analog interfaces

Output



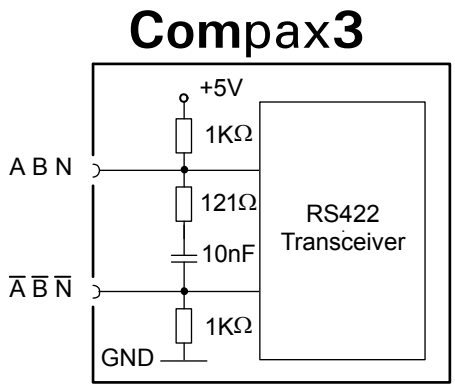
Input



Please note: with Ain- on earth and Ain+ open, 2.02V are read in.

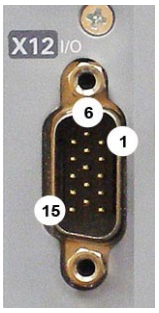
Structure image of the internal signal processing of the analog inputs
Ain1 (X11/10 and X11/2) has the same wiring!

3.5.3.2 Connections of the encoder interface



The input connection is available in triple (for A & /A, B & /B, N & /N)

3.5.4. Digital inputs/outputs (plug X12)



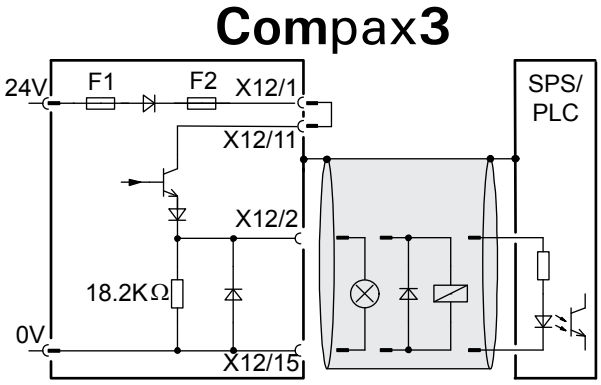
Pin X12	Input/output	I/O /X12 High density/Sub D
1	Output	+24VDC output (max. 340mA)
2	O0	Output 0 (max. 100mA)
3	O1	Output 1 (max. 100mA)
4	O2	Output 2 (max. 100mA)
5	O3	Output 3 (max. 100mA)
6	I0	Input 0
7	I1	Input 1
8	I2	Input 2
9	I3	Input 3
10	I4	Input 4
11	I	24V input for the digital outputs Pins 2 to 5
12	I5	Input 5
13	I6	Input 6
14	I7	Input 7
15	Output	Gnd 24 V

All inputs and outputs have 24V level.
The exact assignment depends on the the device type!
You will find the description of the device-specific assignment in the online help which can be opened from the Compax3 – ServoManager.

Maximum capacitive loading of the outputs: 50nF (max. 4 Compax3 inputs).

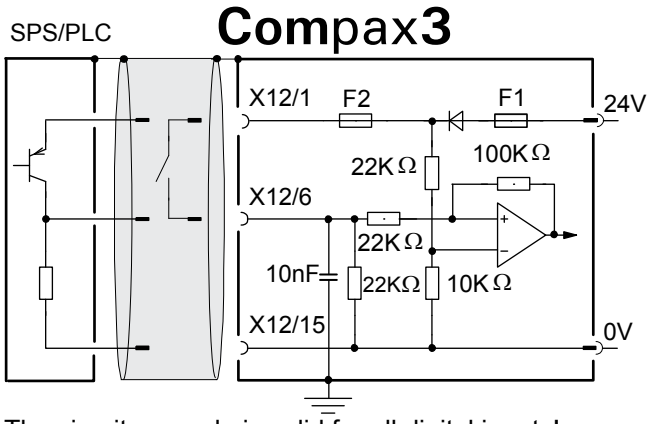
3.5.4.1 Connection of the digital Outputs/Inputs

Wiring of digital outputs



The circuit example is valid for all digital outputs!
The outputs are short circuit proof; a short circuit generates an error.

Status of digital inputs



The circuit example is valid for all digital inputs!
Signal level:

- > 9.15V = "1" (38,2% of the control voltage applied)
- > 8.05V = "0" (33.5% of the control voltage applied)

F1: delayed action fuse
F2: quick action electronic fuse; can be reset by switching the 24VDC supply off and on again.

4. Technical data

Size / weight of Compax3H

Mounting (see on page 20)

Controller type	Dimensions HxWxD [mm]	Weight [kg]
Compax3H050V4	453 x 252 x 245	17,4
Compax3H090V4	668.6 x 257 x 312	32,5
Compax3H125V4	720 x 257 x 355	41
Compax3H155V4	720 x 257 x 355	41

Protection class IP20 when mounted in a control cabinet (not for Compax3H1xxxV4)

Mains connection Compax3Hxxx 3*400VAC

Device type Compax3	H050V4	H090V4	H125V4	H155V4
Supply voltage	Three-phase 3*400VAC 350-528VAC / 50-60Hz			
Input current	66Arms	95Arms	143Arms	164Arms
Output current	50Arms	90Arms	125Arms	155Arms
Maximum fuse rating per device(=short circuit rating)Branch circuit protection according to UL	80A	100A	160A	200A
	JDDZ class K5, JDRX class H	JDDZ class H5, JDRX class H		

Mains connection Compax3Hxxx 3*480VAC

Device type Compax3	H050V4	H090V4	H125V4	H155V4
Supply voltage	Three-phase 3*480VAC 350-528VAC / 50-60Hz			
Input current	54Arms	82Arms	118Arms	140Arms
Output current	43Arms	85Arms	110Arms	132Arms
Maximum fuse rating per device(=short circuit rating)Branch circuit protection according to UL	80A	100A	160A	200A
	JDDZ class K5, JDRX class H	JDDZ class H5, JDRX class H		

Control voltage 24VDC Compax3S and Compax3H

Controller type	Compax3
Voltage range	21 - 27VDC
Mains module	with switch-on current limitation, due to capacitive load
Fuse	MTP miniature circuit breaker or "delayed action fuse", due to capacitive load
Current drain of the device	0.8 A
Total current drain	0.8 A + Total load of the digital outputs + current for the motor holding brake
Ripple	0.5Vpp
Requirement according to safe extra low voltage (SELV)	yes
Short-circuit proof	conditional (internally protected with 3.15AT)

Output data Compax3Hxxx at 3*400VAC

Controller type	H050V4	H090V4	H125V4	H155V4
Output voltage	3x 0-400V			
Nominal output current	50Arms	90Arms	125Arms	155Arms
Pulse current for 5s *	75Arms	135Arms	187.5Arms	232.5Arms
Power	35kVA	62kVA	86kVA	107kVA
Switching frequency	8kHz	8kHz	8kHz	8kHz
Power loss for In	880W	900W	1690W	1970W

* during low speeds, the overload time is reduced to 1s. Limit:
< 2.5 electric revolutions/s (= actual revolutions/s * number of pole pairs) resp. > 2.5 pitch/s

Output data Compax3Hxxx at 3*480VAC

Controller type	H050V4	H090V4	H125V4	H155V4
Output voltage	3x 0-480V			
Nominal output current	43Arms	85Arms	110Arms	132Arms
Pulse current for 5s *	64.5Arms	127.5Arms	165Arms	198Arms
Power	35kVA	70kVA	91kVA	109kVA
Switching frequency	8kHz	8kHz	8kHz	8kHz
Power loss for In	850W	1103W	1520W	1800W

* during low speeds, the overload time is reduced to 1s. Limit:
< 2.5 electric revolutions/s (= actual revolutions/s * number of pole pairs) resp. > 2.5 pitch/s

Resolution of the motor position

For option F10: Resolver Feedback	◆ Position resolution: 16Bit (= 0.005°) ◆ Absolute accuracy: ±0,167°
For option F11: SinCos©	◆ Position resolution: 13.5Bit/Encoder sine period => 0.03107°/encoder resolution
For option F12:	◆ Maximum position resolution ◆ Linear: 24 Bits per motor magnet spacing ◆ Rotary: 24 bits per motor revolution ◆ For 1Vss sine-cosine encoders (e.g. EnDat): 13.5 bits / graduation of the scale of the encoder ◆ For RS 422 encoders: 4x encoder resolution ◆ Accuracy of the feedback zero pulse acquisition = accuracy of the feedback resolution ◆ Resolution for analog hall sensors with 1Vss signal: 13.5 bits / motor magnet spacing

Accuracy

The exactitude of the position signal is above all determined by the exactitude of the feedback system used.

Motors and feedback systems supported

Motors **Direct drives** ◆ Linear motors ◆ Torque motors	◆ Sinusoidal commutated synchronous motors ◆ Maximum rotating field frequency: 1,000Hz ◆ Max. velocity at 8 pole motors: 15000min^{-1}. ◆ General max. speed: 60*1000/number of pole pairs in [min^{-1}]. ◆ Max. number of poles = 600 ◆ Sinusoidal commutated asynchronous motors ◆ Maximum rotating field frequency: 1,000Hz ◆ Max. speed: 60*1000/number of pole pairs - slip in [min$^{-1)}$]. ◆ Field suppression: typically up to triple (higher on request). ◆ Temperature sensor: KTY84-130 (insulated according to EN60664-1 or IEC60664-1) ◆ 3 phase synchronous direct drives
Position encoder (Feedback)	**Option F10: Resolver Feedback**
LTN:	◆ JSSBH-15-E-5 ◆ JSSBH-21-P4 ◆ RE-21-1-A05 ◆ RE-15-1-B04
Tamagawa:	◆ 2018N321 E64
Siemens:	◆ 23401-T2509-C202
	Option F11: SinCos©
	◆ Singleturn (SICK|Stegmann) ◆ Multiturn (SICK|Stegmann) Absolute position up to 4096 motor revolutions. ◆ Rotary feedback with HIPERFACE® interface: For example: SRS50, SRM50, SKS36, SKM36, SEK52

Special encoder systems for direct drives	Option F12
Analog hall sensors	◆ Sine - Cosine signal (max. 5Vss*; typical 1Vss) 90° offset ◆ U-V signal (max. 5Vss*; typical 1Vss) 120° offset.
Encoder (linear or rotatory)	◆ Sine-cosine (max. 5Vss*; typical 1Vss) (max. 400kHz) or ◆ TTL (RS422) (max. 5MHz) with the following modes of commutation: ◆ Automatic commutation or ◆ Digital hall sensors (e.g. DiCoder©)
Digital, bidirectional interface	◆ All EnDat 2.1 or EnDat 2.2 feedback systems with incremental track (sine-cosine track) ◆ linear or rotary ◆ max. 400kHz Sine-Cosine
Distance coded feedback systems	◆ Distance coding with 1VSS - Interface ◆ Distance coding with RS422 - Interface (Encoder)

*Max. differential input between SIN- (X13/7) and SIN+ (X13/8).

Motor holding brake output

Motor holding brake output	Compax3
Voltage range	21 – 27VDC
Maximum output current (short circuit proof)	1.6A
Minimum output current	150mA

Insulation requirements

Protection class	Protection class I according to EN60664-1
Protection against human contact with dangerous voltages	According to En 61800-5-1
Overvoltage category	Voltage class III according to EN 60664-1
Pollution degree	Degree of contamination 2 according to EN 60664-1 and EN 61800-5-1

Environmental conditions Compax3H

General ambient conditions	In accordance with **EN 60 721-3-1 to 3-3** Climate (temperature/humidity/barometric pressure): Class 3K3	
Permissible ambient temperature:		
Operation Storage Transport	0 to +45 C Class 3K3 –25 to +70 C Class 2K3 –25 to +70 C Class 2K3	
Tolerated humidity:	No condensation	
Operation Storage Transport	<= 85% Class 3K3 <= 95% Class 2K3 <= 95% Class 2K3	(Relative humidity)
Elevation of operating site	<=1000m above sea level for 100% load ratings <=2000m above sea level for 1% / 100m power reduction Please inquire for greater elevations	
Mechanic resonances:	EN 60068-2-6 (sinusoidal excitation)	
Sealing	IP20 protection class according to EN 60 529	

Cooling Compax3S and Compax3H

Cooling mode:	C3S025V2 ... S150V4: Convection C3S300V4 & C3H: Forced air ventilation with fan in the heat dissipator **Air flow rate:** 459m³/h (C3H)
Supply:	C3S300V4, C3H050, C3H090 internal C3H125, C3H155 external 220/240VAC: 140W, 2.5µF, Stator - 62Ω Optionally on request: 110/120VAC: 130W, 10µF, Stator - 16Ω **Circuit breaker:** 3A

EMC limit values Compax3S and Compax3H

EMC interference emission	Limit values according to EN 61 800-3, Limit value class C3/C4 without additional mains filter: **Information on C2 limit value classes** (see on page 13)
EMC disturbance immunity	Industrial area limit values in accordance with EN 61 800-3

EC directives and harmonised EC norms

EC low voltage directive 2006/95/EG	**EN 61800-5-1**, Standard for electric power drives with settable speed; requirements to electric safety **EN 60664-1**, isolation coordinates for electricale equipment in low-voltage systems **EN 60 204-1, Machinery norm**, partly applied
EC-EMC directive 2004/108/EG	**EN 61 800-3, EMC norm** Product standard for variable speed drives

Detailed information on the technical data of the Compax3 devices can be found in the Help- or PDF-files of the individual Compax3 device types.

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