

VT-HPC-1-1X

Digital control electronics for axial piston pumps

Operating instructions
RE 30237-B/08.2020

Replaces: 09.2019
English



The data specified serves to describe the product. If information on the use of the product is given, it is only to be regarded as application examples and recommendations. Catalog information does not constitute warranted properties. The information given does not release the user from the obligation of own judgment and verification. Our products are subject to a natural process of wear and aging.

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The cover shows an example configuration. The product supplied may therefore differ from the figure shown.

The original operating instructions were prepared in German.

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1 About this documentation

NOTICE

PLC functionality!

The PLC functionality described in this documentation has not yet been implemented at the time of publication of these operating instructions.

1.1 Validity of the documentation

This documentation is valid for the digital control electronics for axial piston pumps, VT-HPC of series 1X:

This documentation is intended for fitters, operators, service technicians, system operators and machine manufacturers.

This documentation contains important information on the safe and appropriate installation, transport, commissioning, maintenance, operation, removal and simple troubleshooting of the product.

- ▶ Read this documentation thoroughly, especially chapter 2 “Safety instructions“ and chapter 3 “General notes on damage to material and the product“, before working with the digital control electronics.

1.2 Required and supplementary documentation




- ▶ Only commission the product, when you have the documents marked with the book symbol  at hand and have understood and observed them.

Table 1: Required and supplementary documentation

Title	Document number	Document type
 Digital control for axial piston pumps, type VT-HPC-1-1X	RE 30237	Data sheet
 Online help in commissioning software IndraWorks		Integrated help
Rexroth HydraulicDrive, Parameters	www.boschrexroth.com/hpc	Parameter description
Rexroth HydraulicDrive, Functions	www.boschrexroth.com/hpc	Functional description
Rexroth HydraulicDrive, Diagnostic Messages	www.boschrexroth.com/hpc	Description of diagnostic messages
Rexroth HydraulicDrive, Rexroth IndraMotion MLD (2G)	www.boschrexroth.com/hpc	Application manual
Rexroth HydraulicDrive, Rexroth IndraMotion MLD (2G), Libraries	www.boschrexroth.com/hpc	Library description

1.3 Representation of information

In order that this documentation allows you to work directly and safely with your product, standardized safety notes, symbols, terms and abbreviations are used. For better understanding, they are explained in the following sections.

1.3.1 Safety instructions




This documentation contains safety notes in chapter 2.6 “Product-specific safety instructions“ and chapter 3 “General notes on damage to material and the product“ as well as before a sequence of activities or instructions for action, which involve the risk of personal injury or damage to equipment. The measures described for averting the hazard have to be observed.

Safety notes are structured as follows:

 SIGNAL WORD
<p>Type and source of danger! Consequences in case of non-compliance</p> <ul style="list-style-type: none"> ▶ Hazard avoidance measures

- **Warning symbol:** draws attention to a hazard
- **Signal word:** identifies the degree of danger
- **Type and source of danger!:** specifies the type and source of danger
- **Consequences:** describes the consequences in case of non-compliance
- **Precaution:** Specifies how the danger can be prevented


Table 2: Hazard classes according to ANSI Z535.6-2006

Warning sign, signal word	Meaning
 DANGER	Indicates a dangerous situation which will cause death or severe injury if not avoided.
 WARNING	Indicates a dangerous situation which may cause death or severe injury if not avoided.
 CAUTION	Indicates a dangerous situation which may cause minor or medium (personal) injury if not avoided.
NOTICE	Damage to property: The product or the environment could be damaged.

1.3.2 Symbols

The following symbols indicate notices which are not safety-relevant but increase the comprehensibility of the documentation.

Table 3: Meaning of the symbols

Symbol	Meaning
	If this information is not observed, the product cannot be used and/or operated optimally.
▶	Individual, independent action
1.	Numbered instruction: The numbers indicate that the activities are to be carried out consecutively.
2.	
3.	

1.3.3 Designations

The following designations are used in this documentation:

Table 4: Designations

Term	Meaning
VT-HPC-1-1X	Digital control electronics for axial piston pumps
Pump control	VT-HPC-1-1X
IndraWorks	Software
RE xxxxx	Rexroth document in English language

1.3.4 Abbreviations

The following abbreviations are used in this documentation:

Table 5: Abbreviations

Abbreviation	Meaning
CPU	Central Processing Unit
EMC	Electromagnetic compatibility
FAT32	32-bit File Allocation Table
FC	Frequency converter
HPC	Hydraulic Pump Control
I/O	Inputs/Outputs
n.c.	Not connected
PC	Personal Computer
PELV	Protective Extra Low Voltage
PLC	Programmable Logic Control

2 Safety instructions

2.1 General information on this chapter

The digital control electronics VT-HPC-1-1X for axial piston pumps has been manufactured according to good engineering practice. There is, however, still a risk of personal injury or damage to equipment if you do not observe this chapter and the safety instructions contained in this documentation.

- ▶ Read these instructions completely and thoroughly before working with the product.
- ▶ Keep this documentation in a location where it is accessible to all users at all times.
- ▶ Always pass the product together with the required documentation to third parties.

2.2 Intended use

The product is an electrical component.

You may use the product as follows:

- For controlling the pressure and/or swivel angle of a hydraulic A4 pump with HS5 control.

The product is intended exclusively for professional use and not for private usage. Operation according to the intended use also implies that you have read and understood this documentation completely, especially chapter 2 "Safety instructions".

2.3 Improper use

Any use other than described in the section “Intended use” is considered as improper and is therefore not permitted.

Bosch Rexroth AG does not assume any liability for damage caused by improper use. The risks arising from improper use lie exclusively with the user.

Improper use includes, but is not limited to:

- operating the digital pump control outside the specified performance limits and operating conditions, especially the prescribed ambient conditions;
- the use as safety-related part of controls in the sense of ISO 13849. Functional safety must be realized by means of appropriate, additional components.

2.4 Personnel qualifications

The activities described in this documentation require basic knowledge of electrics and hydraulics as well as knowledge of the associated technical terms. To ensure safe usage, these activities may therefore only be carried out by qualified personnel or under the direction and supervision of qualified personnel.

Qualified personnel are those who are able to recognize potential hazards and apply the appropriate safety measures due to their professional training, knowledge and experience, as well as their understanding of the relevant conditions pertaining to the work to be undertaken. An expert must observe the relevant specific professional rules and have the necessary expertise.

With regard to hydraulic products, expertise means, for example:

- The ability to read and entirely understand hydraulic circuit diagrams,
- the complete understanding in particular of interrelationships with regard to safety equipment and
- knowledge of the function and structure of hydraulic components.

Operating the digital pump control VT-HPC-1-1X implies that the operator is familiar with the PC program IndraWorks. A description of the use of the program IndraWorks as well as First Steps for its use are provided on the Internet at <http://www.boschrexroth.com>. We recommend that users attend a product-specific training by Bosch Rexroth.



Bosch Rexroth offers measures that support your qualification in specific fields.

You can find an overview of training contents on the Internet at:

<http://www.boschrexroth.com> Or contact our online support via the e-mail address support.nc-systems@boschrexroth.de

2.5 General safety instructions

- Observe the valid regulations on accident prevention and environmental protection.
- Observe the safety regulations and provisions of the country in which the product is used/applied.
- Exclusively use Rexroth products in technically perfect condition.
- Observe all notices on the product.
- Persons who install, commission, operate, demount or maintain Rexroth products must not consume any alcohol, drugs or pharmaceuticals that may affect their ability to respond.
- Only use accessory and spare parts approved by the manufacturer in order to rule out personnel hazards arising from unsuitable spare parts.
- Adhere to the technical data and ambient conditions specified in the product documentation.
- The installation or use of inappropriate products in safety-relevant applications could result in unintended operating states when being used which in turn could cause personal injuries and/or damage to property. Therefore, use the product only in safety-relevant applications such as in explosion protection areas or in safety-related parts of a control (functional safety), if this use is expressly specified and permitted in the documentation.
- You may commission the product only when it has been established that the final product (for example, a machine or system), in which the Rexroth product is installed, complies with national regulations, safety regulations and standards relevant for the application.

2.6 Product-specific safety instructions

WARNING

Dangerous motion!

Risk of injury due to incorrect connection or incorrect activation of the digital axis control electronics and resulting unforeseeable machine movements.

- ▶ Observe safety in accordance with EN 13849 or IEC 62061.
- ▶ If persons have to enter the hazard zone while the control is active, provide superordinate monitoring functions or measures for personal safety. The plant manufacturer/user has to rate and dimension these measures on the basis of a risk and failure analysis according to the specific situation on site. The safety regulations valid for the system have to be taken into account for this.
- ▶ Failures and defects in the control current or the energy supply can result in uncontrolled machine movements. Observe safety in accordance with EN 13849 or IEC 62061.
- ▶ The electronics emits interference to other electronics within the permitted limit values. This can cause malfunction in the control process. Only use electronics that feature sufficient immunity to electromagnetic interference, or provide appropriate shielding.
- ▶ The electronics of the digital pump control VT-HPC-1-1X responds to electromagnetic interference from non-shielded, improperly installed or wrongly connected signal cables. If the limit values given in the data sheet are exceeded, malfunction or uncontrolled movements are possible. Adhere to the limit values given in the data sheet, use only electronics below the EMC limit values or provide proper shielding.
- ▶ Electrostatic processes, an inadequate grounding concept or missing equipotential bonding can lead to damage to the electronics and hence cause malfunction or uncontrolled movements of the machine. Ensure proper grounding and provide equipotential bonding.
- ▶ Using the product outside the specified IP protection class can result in short-circuit and malfunction and hence in uncontrolled machine movements. Therefore, use the product only within the IP protection class and in environments as specified in the data sheet.
- ▶ Provide safety functions for personal safety separately. The digital pump control VT-HPC-1-1X itself does not include safety functions for personal safety and is no safety-related component.

High electric voltage through incorrect connection!

Danger to life, risk of injury due to electric shock.

- ▶ When carrying out any work, disconnect the relevant machine section from the power supply and protect it against being switched on again.
- ▶ Only connect devices, electrical components and lines which feature protective extra low voltage (PELV) to connections or terminals having voltages from 0 to 50 Volt.
- ▶ Only connect voltages and power circuits that feature safe isolation from dangerous voltages. Safe electrical isolation can be achieved with, for example, isolating transformers, safe opto-couplers or mains-free battery operation.

 **WARNING****Lightning!**

Risk of uncontrolled machine movements.

- ▶ An inadequate grounding concept or missing equipotential bonding can lead to damage to the electronics. Provide for equipotential bonding of the device.

2.7 Personal protective equipment

Check determined personal protective equipment for completeness and protective effect and wear it (observe customer regulations and list of personal protective equipment).

2.8 Operator's obligations

The operation of installations, systems and machines basically requires the implementation of a holistic IT security concept which is state-of-the-art in terms of technology. Accordingly, Bosch Rexroth products and their properties must be considered as components of installations, systems and machines for their holistic IT security concept.

Unless otherwise documented, Bosch Rexroth products are designed for operation in local, physically and logically secured networks with access restrictions for authorized persons, and they are not classified according to IEC 62443-4-2.

3 General information on damage to property and damage to the product

The warranty is valid exclusively for the configuration delivered.

- Warranty claims will be rejected in the case of improper installation, commissioning and operation as well as in the case of use not in accordance with the intended purpose and/or improper handling.

NOTICE

High voltage!

The digital pump control may be damaged.

- ▶ Wire the digital pump control only when disconnected from the power supply.

Wrong cables! Power loss, scorching of cable!

Risk of damage to the product!

- ▶ Only use the cables specified in the data sheet with the respective cable cross-sections for the digital pump control.

Overloading!

Risk of overloading and damage to the supply cable in the case of insufficient dimensioning and/or operation with several electrical devices.

- ▶ Provide current limitation by overload protection.
- ▶ Select appropriate rating of power supply unit and cables.

Short-circuit!

Risk of overloading and damage of the supply cable in the case of defects of the electrical device.

- ▶ Provide current limitation by overload protection.

Impermissible temperature range!

Risk of overheating. The device can be thermally destroyed.

- ▶ Adhere to the specification in the data sheet.

4 Scope of delivery

The scope of delivery includes:

- Digital pump control VT-HPC-1-1X
- Mating connectors for XD1, XG20 and XG21:
 - XD1: Weidmüller BLZF 3.50/03/180F SN BK
 - XG20: Weidmüller B2CF 3.50/30/180 LH SN BK
 - XG21: Weidmüller B2CF 3.50/14/180 LH SN BK

Accessories such as cables and mains adaptor and cable sets are not included in the scope of supply, but have to be ordered separately. See also chapter 7.2 “Recommended accessories” on page 16.

5 About this product

5.1 Performance description

The VT-HPC-1-1X is a digital control electronics for axial piston pumps with PLC functionality according to IEC 61131-3. The VT-HPC-1-1X can be used to realize closed-loop swivel angle/pressure controls.

For carrying out project planning and parameterizing the VT-HPC-1-1X the user can utilize the engineering tool IndraWorks.

5.2 Product description

With regard to immunity to interference, resistance to mechanical vibration and shock and climate resistance, the VT-HPC-1-1X is designed for use in harsh industrial environments.

Controller variants	<p>The VT-HPC-1-1X comprises three configurable controller variants:</p> <ul style="list-style-type: none"> • Closed-loop pressure control • Closed-loop swivel angle control
Operating modes	<p>These allow, among others, the following control modes to be implemented:</p> <ul style="list-style-type: none"> • Closed-loop pressure control / (open/closed-loop) flow control • Closed-loop pressure/swivel angle control • Direct valve control
Command values and actual values	<p>Command values are provided via the bus interfaces (XF20/XF21 or XF30), via the analog interface (XG20/XG21) or alternatively via an internal PLC program. The actual value signals are fed back to the higher-level control either via the bus interfaces (XF20/XF21 or XF30) or the analog/digital interface (XG20).</p>
PLC functionality	<p>The VT-HPC-1-1X offers the possibility of programming according to IEC 61131-3. To this end, firmware version HDx-20/V08 or higher is required. The PLC functionality is enabled via a separate SD card VT-SD-HPC-PLC-10VXX. This card is not included in the scope of the supply of the VT-HPC-1-1X, but has to be ordered separately. See section 7.2 “Recommended accessories” on page 16.</p>
Engineering tool IndraWorks	<p>Parameterization and diagnostics as well the implementation of the project are carried out using the PC software IndraWorks Ds, which is available for the individual control types as download on the Internet at www.boschrexroth.com/Indraworks. It allows you to parameterize the VT-HPC-1-1X individually and adapt it to the requirements of your system. Moreover, IndraWorks supports you in commissioning and diagnostics and provides for convenient data administration on the PC. A precondition for this is the PC operating system Windows 7 or higher. For creating a user-specific PLC program, the engineering tool IndraWorks MLD has to be used. IndraWorks MLD has to be ordered separately. For commissioning the VT-HPC-1-1X, IndraWorks version 14V14 or higher has to be used.</p>

Monitoring The digital control electronics features comprehensive monitoring functions, fault detection and more.

- Undervoltage
- Communication errors
- Cable break for analog sensor inputs and swivel angle sensor
- Short-circuit monitoring for analog/digital outputs
- Monitoring of the microcontroller (watchdog)
- Temperature of electronics
- Overcurrent of 24 V sensor voltages and digital outputs
- Control deviation pump controller

Memory card The VT-HPC-1-1X is provided with a slot for an SD memory card. It can be used for saving the PLC program and other optional data. Only SD memory cards with SPI bus interfacing are supported. When the control is switched on, the card must be plugged, otherwise it is not recognized. Non-FAT-formatted cards are automatically formatted (FAT32).

For process interfacing, the digital axis control VT-HPC-1-1X is equipped with analog and digital inputs/outputs and with various bus systems. For more complex machines it is useful to employ a higher-level control that, in conjunction with the VT-HPC-1-1X, holistically controls the motion sequence of the machine and monitors it in view of safety.

Main fields of application of the VT-HPC-1-1X are special machines, presses and transfer systems.

The technology functions comprise:

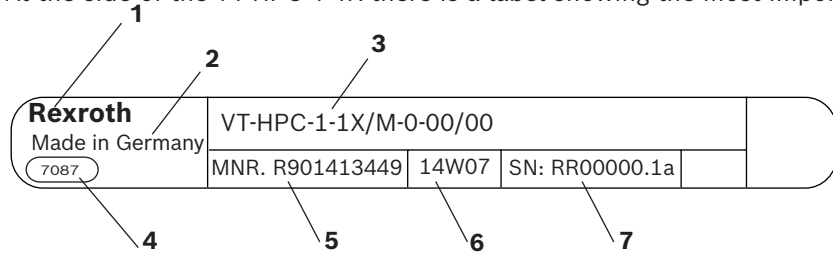
- Closed-loop pressure control
- Closed-loop swivel angle control

The basis for function of the VT-HPC-1-1X is the creation of application-specific parameter sets and, if required, user programs. These data are generated on the PC and sent via TCP/IP to the VT-HPC-1-1X. The combination of user program and parameter sets is called project.

The technical data, operating conditions and operating limits of the pump control VT-HPC-1-1X can be found in data sheet 30237.

5.3 Identification of the product

At the side of the VT-HPC-1-1X there is a label showing the most important data.



- | | |
|------------------------------|-----------------------------|
| 1 Word mark | 5 Material number |
| 2 Country of origin | 6 Date of production |
| 3 Material short text | 7 Serial number |
| 4 Plant | |

6 Transport and storage

There are no special instructions for transporting this product. You must, however, observe the notes in chapter 2. "General safety instructions" and comply with the ambient conditions for storage and transport which are detailed in the technical data sheet 30237.

6.1 Storing the VT-HPC-1-1X

To prepare the VT-HPC-1-1X for storage and further use, proceed as follows:

- ▶ Use the original packaging for storage.
- ▶ Comply with the admissible storage temperature range of +5 °C to +40 °C.
- ▶ Protect the VT-HPC-1-1X against dust, humidity and UV radiation.

7 Installation

NOTICE

Risk of short-circuit!

Water may condense within the housing!

- ▶ Let the VT-HPC-1-1X acclimate itself for several hours, as otherwise water may condense in the housing.

The housing of the VT-HPC-1-1X is provided with cooling slots. According to the specified protection class, dirt and fluids may easily enter and cause malfunction and short-circuit! The reliable operation of the VT-HPC-1-1X is thus no longer ensured.

- ▶ When working on the VT-HPC-1-1X, observe strictest cleanliness and make sure that no fluids will enter the housing.

Major potential differences!

Risk of destruction of the VT-HPC-1-1X by plugging or unplugging connectors under voltage.

- ▶ Switch off power supply to the relevant system part before installing the unit or plugging or unplugging connectors.

7.1 Installation conditions

- ▶ When installing the product, strictly adhere to the ambient conditions specified in data sheet 30237.

NOTE:

- ▶ Keep the surroundings free from electrically conductive contamination (acids, bases, corrosive agents, salts, metal vapors, etc.) and do not expose the device to these substances. Generally rule out any deposits according to protection class IP 20. Avoid contact with the hydraulic fluid.

The VT-HPC-1-1X is intended for mounting on DIN rails in the control cabinet. The dimensions of the individual variants are given in data sheet 30237.

- ▶ Before commissioning, make sure that all the seals and plugs of the plug-in connections are correctly installed to ensure that they are leak-proof and no fluids or foreign particles can enter the product.

7.2 Recommended accessories

We recommend the use of the following accessories for connecting the axis control VT-HPC-1-1X. These accessories are not included in the scope of delivery, but can be ordered separately from Bosch Rexroth:

Table 6: Accessories

Designation	Material no.
CONNECTION PLUG 6ES7972-0BA42-0XA0 for port XF30 (PROFIBUS)	R901312863
Connection cable PC VT-HPC (RJ45, XF20 or XF21) RKB0011/005,0, length: 5 m	R911321548
Commissioning software IndraWorks Ds of version 14V14 or higher (without PLC functionality)	--
Commissioning software IndraWorks MLD of version 14V14 or higher	--
Commissioning software IndraWorks Suite as version 14V14 or higher	--

Designation	Material no.
SD memory card XA-SD01 (1 GByte)	R911173844
SD card for PLC functionality VT-SD-HPC-PLC-10VXX	R901444436
Shielding "SERVICEPAKET VT-HPC...-1X/M...Schirmung*ET"	R961011117



IndraWorks Ds can be used only for parameterization and diagnostics. IndraWorks MLD is required, if the PLC functionality according to IEC 61131-3 is to be used additionally. The commissioning software IndraWorks MLD or Suite is subject to licensing. For further information, please visit www.boschrexroth.com/hmc

7.3 Installing the VT-HPC-1-1X

- ▶ Lay the cables and lines so that they cannot be damaged and no one can stumble over them.
- ▶ By snapping the housing of the VT-HPC-1-1X on a conductive and earthed DIN mounting rail, the earth connection is established with the rear wall of the control cabinet. This constitutes the grounding of the VT-HPC-1-1X.
- ▶ Before installing the device, note the details given on the nameplate. If nameplates are no longer visible or legible after installation you will have the data at hand at any time.

Mount the VT-HPC-1-1X as follows on a DIN mounting rail in the control cabinet:

1. Disconnect the relevant system part from the power supply.
2. Snap the back panel of the VT-HPC-1-1X carefully into position on the DIN mounting rail. Mechanical contact points on the rear panel of the VT-HMC...1X ensure firm seating on the mounting rail and the connection of the housing to the grounding system of the control cabinet.

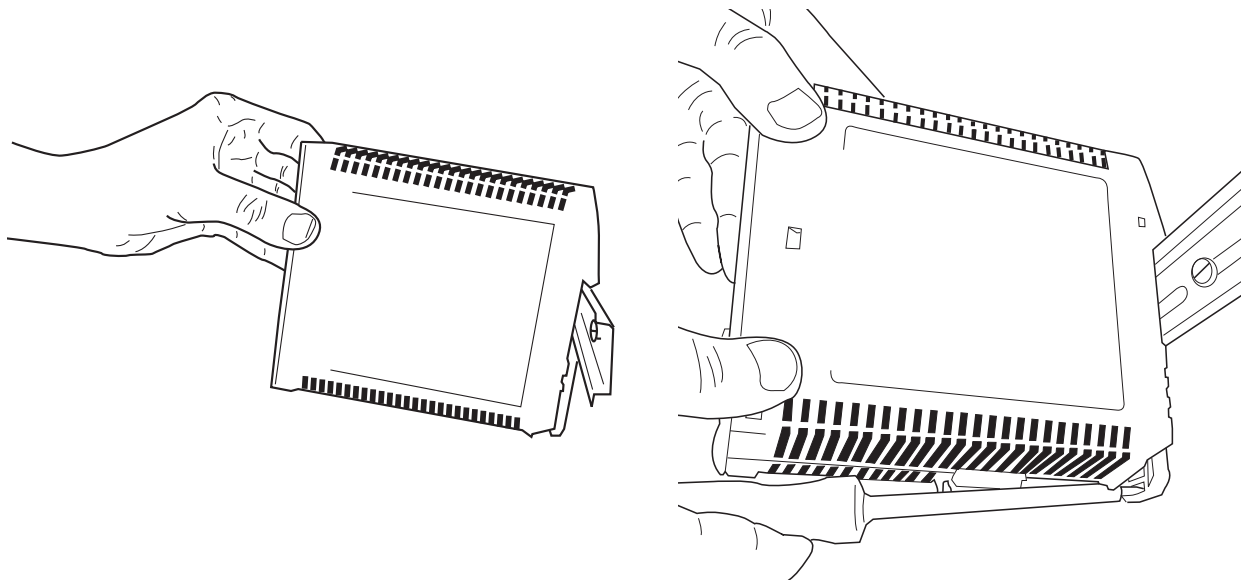


Fig. 1: Mounting the VT-HPC-1-1X on the DIN mounting rail

Should the spring-loaded latch not snap in automatically, it can be released using a screwdriver. After having positioned the latch, let it spring back to the snapped-in position.

Observe the following notes when mounting the control electronics VT-HPC-1-1X

- ▶ For mounting, observe the notes on applicable standards and operating conditions in the data sheet.
- ▶ Use low-capacitance cables.
- ▶ Whenever possible, execute cable connections without intermediate terminals.
- ▶ Install sensor cables separately.
- ▶ When sources of electromagnetic disturbance are used (e.g. frequency converter), malfunction may occur. Avoid the direct installation of the VT-HPC..1X in the direct vicinity to sources of disturbance.
- ▶ The distance to aerial lines, radio sources and radar equipment must be at least 1 m.
- ▶ Do not lay signal cables near power cables.
- ▶ Execute the installation so that when differential inputs are used, both inputs are always activated or deactivated simultaneously.
- ▶ Do not use silicone-containing sealing, adhesive, or insulating agents.
- ▶ The system ground is an essential part of EMC protection of the pump control. It dissipates interference, which is transported to the pump control via data and voltage supply cables. This function can only be ensured, if the system ground itself does not inject interference into the control electronics.
- ▶ See to it that the installation position provides ease of maintenance, i.e. unhindered access to connection lines. Free access to the connection side must be guaranteed.

7.3.1 Place of installation

The VT-HPC-1-1X should not be installed next to power electronics (e.g. frequency converters, etc.). The power supply unit of the VT-HPC-1-1X should be installed as close to the VT-HPC-1-1X as possible.

NOTE: UV radiation!

Extended exposure to UV radiation can lead to discoloration.

- ▶ Do not install the VT-HPC-1-1X at a place exposed to direct sunlight.

7.3.2 Voltage supply

- ▶ Keep the connection as short as possible and install supply and return conductors (+24 V/GND) together. For voltage, see data sheet 30237.
- ▶ Install power cables consisting of two individual wires (voltage supply) in parallel or as twisted cable.

7.3.3 Supply of external components

Analog components such as pressure cells can be supplied via the digital outputs at XG20.

Precondition: The supply of the VT-HPC-1-1X meets the requirements of the pressure cell.

For further notes on currents, etc., please refer to data sheet 30237.

7.3.4 Shield

For signal cables, use only cables with a copper braid shield. Connect the cable shield on one side on a large area using a grounding bar. For this, mount the grounding bar as close as possible to the VT-HPC-1-1X and strip the sheath off around the cable at the appropriate position. Observe the installation notes given in the data sheet of the grounding bar (e.g. from Wago: U-shaped busbar, art. no. 790-191, shield clamping saddle, art. no. 790-116).

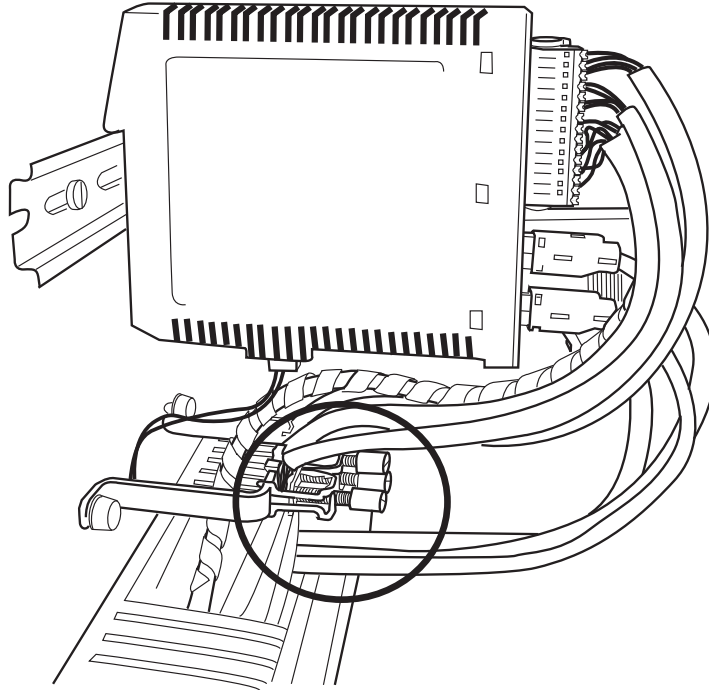


Fig. 2: Shielding of the VT-HPC-1-1X

7.3.5 General notes on shielding

- ▶ Install signal and power cables as far away from each other as possible and do not install them in parallel.
- ▶ Do not route signal cables through strong magnetic fields.
- ▶ Whenever possible, install signal cables without any interruptions. If intermediate terminals are required, use a terminal block with shield busbar.
- ▶ Cables should only have the number of wires actually required. If this is impossible, connect unused wires with each other and connect them to ground on one side in the control cabinet.

Table 7: Recommended cable variants

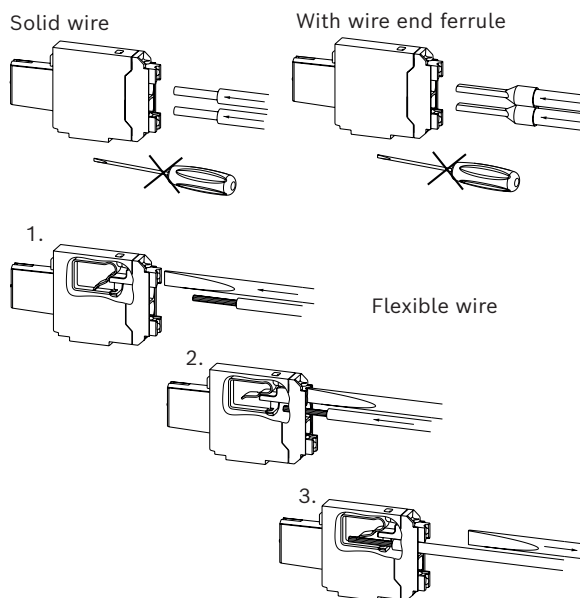
Interface	Cable type	Maximum length [m]	Minimum cross-section [mm ²]	Remarks
Digital in/out	In the control cabinet: Single wires outside the control cabinet: Shielded	30	0.25 to 1.0	
Analog in voltage	Twisted pair, shielded	50	0.25 to 1.0	
Analog in current	Twisted pair, shielded	50	0.25 to 1.0	
Analog out voltage	Shielded	50	0.25 to 1.0	
Analog out current	Shielded	50	0.25 to 1.0	
Ethernet	CAT5e			1: 1 connection cable with field buses (PROFINET, EtherNet/IP...) according to specification of the user organization
Supply	In the control cabinet: Single wires outside the control cabinet: Shielded	50	0.25 to 1.0	
PROFIBUS	*	*	*	* = according to the specification of the PROFIBUS user organization (standard)
Valve cable	Non-shielded	30	0.5 to 1.5	

Table 8: Clamping range, rated connection

	Min.	Max.
Single-wire	0.2 mm ²	1.5 mm ²
Finely-stranded	0.2 mm ²	1.5 mm ²

The length to be stripped is 10 mm each.

7.3.6 Connecting the individual contacts

**Fig. 3: XG20/XG21: "PUSH-IN" contact**

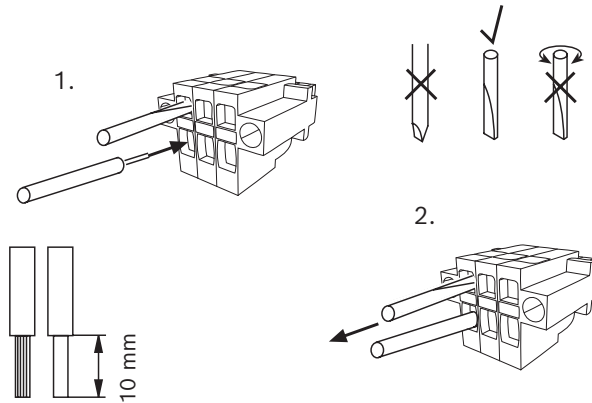


Fig. 4: XD1: Tension spring terminals

The tightening torque for mounting connector XD1 is 0.2 - 0.25 Nm.

7.3.7 Wiring instructions

XG20, encoder/DIO/AIO			
Signal	Pin	Pin	Signal
Do4 ¹⁾	a1	b1	AGND
AI1+	a2	b2	Ai1-/Cin1 ²⁾
AI2+	a3	b3	Ai2-/Cin2 ²⁾
AI3+	a4	b4	Ai3-/Cin3 ²⁾
AI4+	a5	b5	Ai4-/Cin4 ²⁾
Ao1	a6	b6	AGND
Ao2	a7	b7	AGND
Di1	a8	b8	Di2
Di3 ¹⁾	a9	b9	Di4
Do1	a10	b10	Do2
Reserved	a11	b11	Reserved
Reserved	a12	b12	Reserved
Reserved	a13	b13	Reserved
Reserved	a14	b14	GND
Do3 ¹⁾	a15	b15	GND

XG21			
Signal	Pin	Pin	Signal
Ma+	a1	b1	Reserved
Ma-	a2	b2	Reserved
Reserved	a3	b3	Reserved
Reserved	a4	b4	Reserved
Ai_sv	a5	b5	Cin_sv
Vsv	a6	b6	GNDsv
Ai5+	a7	b7	Ai5-/Cin5 ²⁾

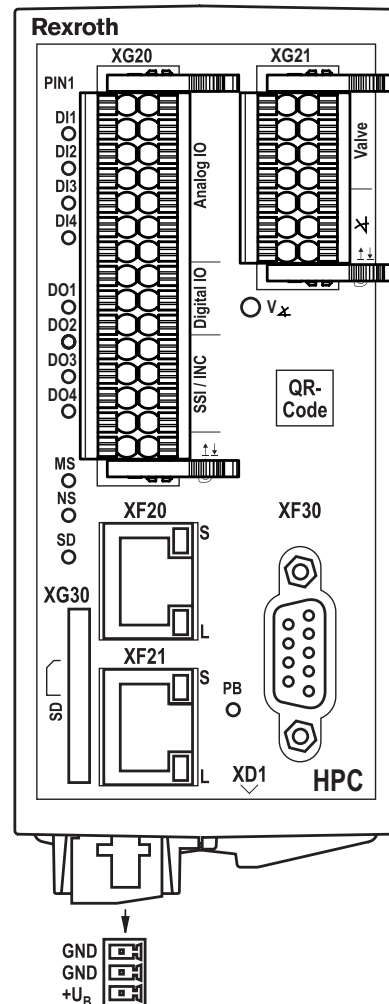


Fig. 5: Pinout VT-HPC

- 1) All digital outputs can be used as voltage supply pin for sensors.
- 2) Wire current inputs (Cin) for XG20 only to pin b2 ... b5, leave pin a2... a5 unconnected. For XG21, connect pin b7, leave pin a7 unconnected.

7.3.8 Wiring example: Pressure sensor at analog input 1

Current input

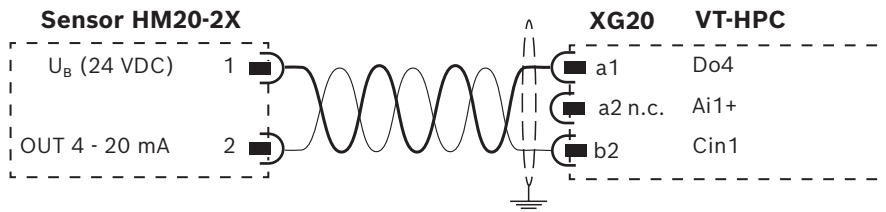


Fig. 6: Sensor supplied from VT-HPC-1-1X (2-conductor cable)

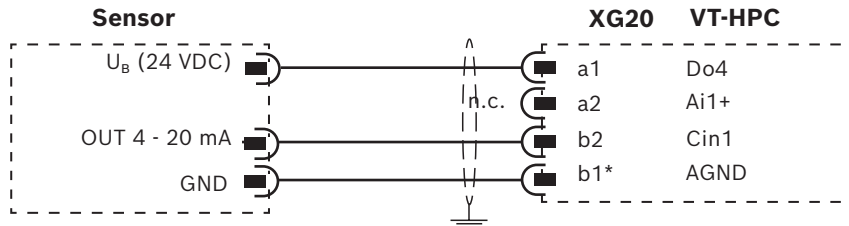


Fig. 7: Sensor supplied from VT-HPC-1-1X (3-conductor cable)

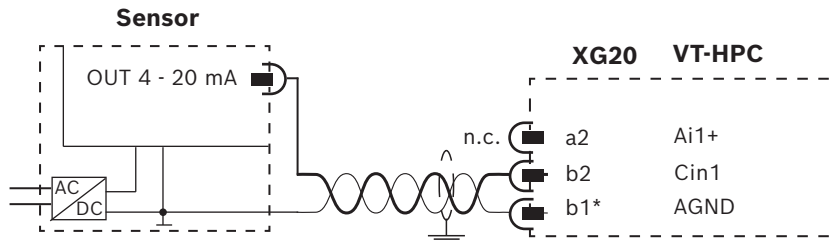


Fig. 8: Device/sensor supplied externally

Voltage input

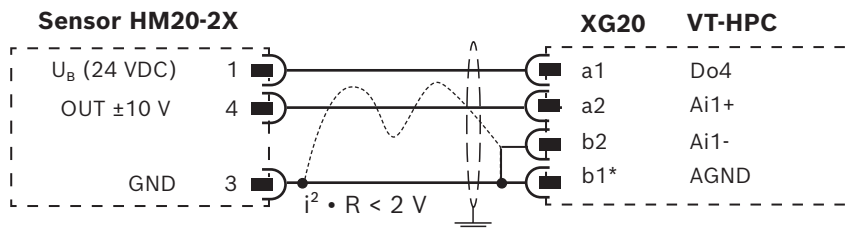


Fig. 9: Sensor supplied from VT-HPC-1-1X (3-conductor cable)

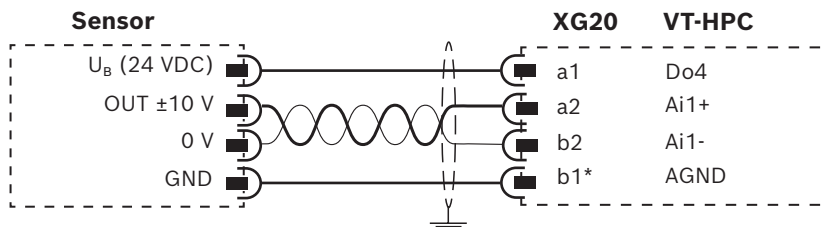


Fig. 10: Sensor supplied from VT-HPC-1-1X (4-conductor cable)

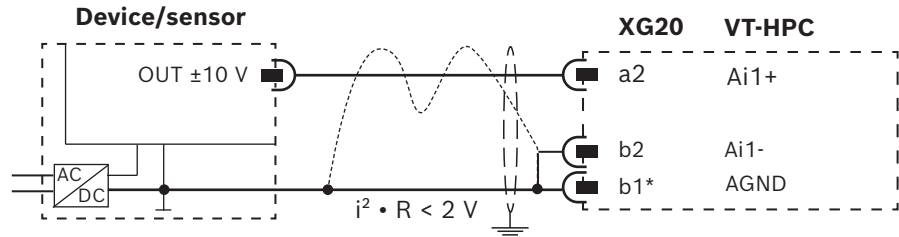


Fig. 11: Device/sensor supplied externally (4-conductor cable)

* or b6 or b7

- - - For compensating for the voltage drop on the GDN cable, the connection b2 - b1 can be made on the sensor. Precondition: $i^2 \cdot R < 2 \text{ V}$

7.3.9 Wiring example: Swivel angle sensor at analog input

Current input

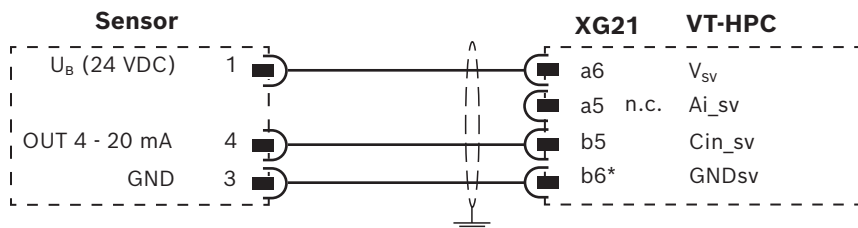


Fig. 12: Swivel angle sensor with current interface

Voltage input

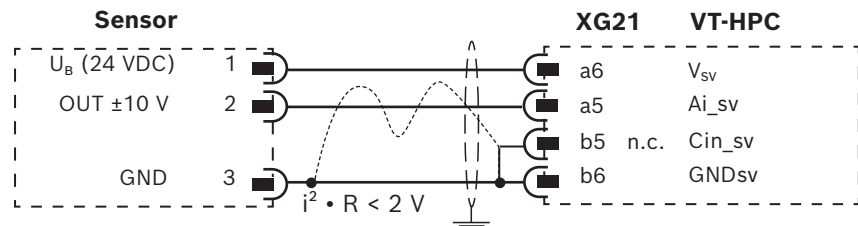


Fig. 13: Swivel angle sensor with voltage interface

NOTE:

When swivel angle sensors are used, which feature both a voltage and a current output, only the specifically required input may be connected on the HPC. The other output has to remain non-connected (see wiring example).

7.3.10 Wiring example of valve

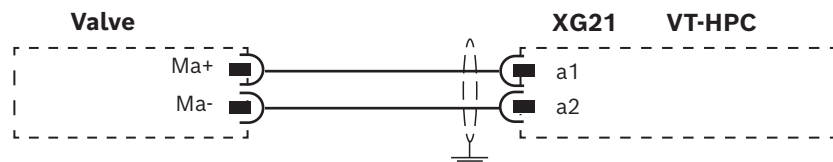


Fig. 14: Valve

7.3.11 Suppressing interference of the system

Should interference occur in conjunction with signals of the VT-HPC-1-1X, inspect the interference suppression of other electrical components, e.g. as follows:

Possible causes of faults	
Switched inductance	DC: anti-parallel free-wheeling diode across actuator winding
	AC: type-related R/C combination across actuator winding
Electric motors	R/C combinations from each motor winding to ground
Frequency converter	Input filter in the voltage supply of the frequency converter
	Motor control lines shielded and installed separately from other cables and/or output filter for motor cables
	Extensive contact of the frequency converter housing to the rear wall of the control cabinet

8 Commissioning

8.1 Initial commissioning

NOTICE

Uncontrolled plugging and unplugging of connectors!

The device can be destroyed! Damage to the control system caused by incorrect installation is not covered by the warranty!

- ▶ Before carrying out any installation work or plugging or unplugging connectors from the product, disconnect the device from the power supply or the voltage source or de-energize it reliably.
- ▶ Observe the protection class, the voltage supply and the environmental conditions according to data sheet 30237.

A prerequisite for the function of the VT-HPC-1-1X is its parameterization and programming (→ creation of the PLC application) using the software IndraWorks Ds or IndraWorks MLD.

- IndraWorks Ds can be used only for parameterization and diagnostics.
- IndraWorks MLD is required, if the PLC functionality according to IEC 61131-3 is to be used additionally (enabling via SD card VT-SD-HPC-PLC-10VXX).

For commissioning, the VT-HPC-1-1X has to be ready for operation, connected to the PC via the Ethernet interface (XF20 or XF21) and be online.

8.1.1 Creating a project with IndraWorks MLD and online parameterization

1. Select menu item “Project > Scan for Devices...”.
2. In the dialog “Scan for Devices” select “HydraulicDrive (Ethernet)” as device to be searched for and confirm the selection by clicking the button “Next”.
3. The dialog “Network search” appears, in which you have to set under “Network connection” the Ethernet interface of your PC to which the VT-HPC-1-1X is connected.

4. In the subsequent dialog, select the VT-HPC-1-1X found by clicking the checkbox “Apply” and terminate the dialog by clicking the button “Finish”.

This adds the VT-HPC-1-1X to the IndraWorks project.

5. Then, select menu item “Project > Switch Devices Online“ to establish a connection with the VT-HPC-1-1X. The VT-HPC-1-1X can then be parameterized via the dialog windows.
6. Create PLC applications (for this, IndraWorks MLD is required)
 - 6.1 To create an empty PLC application for the VT-HPC-1-1X, double-click with the left mouse button on the entry “MLD > Logic” in the Project Explorer.
 - 6.2 Confirm the subsequent dialog “Create Logic” by clicking OK. This causes the empty PLC application to be created in the Project Explorer below the entry “MLD > Logic”.

In this PLC application you can program the VT-HPC-1-1X (e.g. motion sequence).

- 6.3 To upload the PLC application to VT-HPC-1-1X, select menu item “Debug > Login” and confirm the subsequent dialog by clicking “Yes”.

This transmits the PLC application to the VT-HPC-1-1X.

7. Save the project by selecting menu item “File > Save”.

Further information on the operation, engineering, programming and diagnostics of the VT-HPC-1-1X by means of IndraWorks can be found in the help menus of the program (→ e.g. menu item “Drive Help > HYDRV*-HDx-20VRS“ for firmware version HDx-20VRS).

8.1.2 Commissioning software IndraWorks DS (MLD)

For commissioning and later operation, the PC program IndraWorks is available to the user. It serves for parameterization, diagnostics and programming of the VT-HPC-1-1X.

Operating principle, menus and dialog windows are adapted to the individual variants of the VT-HPC-1-1X.

IndraWorks offers the following functions:

- Comfortable dialog functions for parameterization
- PLC program creation according to IEC 61131-3 (IndraWorks MLD)
- Comprehensive options for displaying process variables
- Recording and graphical representation of up to 8 process variables with wide selection of trigger options
- Dialog window for the simple configuration of the data exchange (PROFIBUS DP, PROFINET RT, EtherCAT, EtherNet/IP) with a higher-level control

The PC program “IndraWorks” is not included in the scope of delivery of the VT-HPC-1-1X.

Download on the Internet: www.boschrexroth.com/hpc

8.1.3 Installation requirements

The following system requirements must be met for the operator program:

- IBM-compatible PC, at least Pentium IV
- CPU clock frequency 2 GHz
- RAM: 4 GB
- 5 GB free hard disk space on drive C: (incl. temporary memory for installation)
- DVD drive
- Graphics resolution
 - 800x600 pixels
 - Color depth 16 bits
- Ethernet-based service interface for connection of the VT-HPC-1-1X;

Recommended system requirements:

- IBM-compatible PC, i5 Quad Core
- RAM: 4 GB with 64-bit operating systems

Supported operating systems:

- Microsoft Windows XP Professional with at least SP3 (32-bit or 64-bit variant)
- Microsoft Windows 7 (32-bit or 64-bit version)

9 Operation

A prerequisite for the function of the VT-HPC-1-1X is its parameterization and, if necessary, programming (→ creation of the PLC application) using the software IndraWorks Ds or IndraWorks MLD.

9.1 Diagnostics

The software IndraWorks offers users comprehensive diagnostic options. Moreover, the VT-HPC-1-1X features an error and diagnostic message memory, in which the errors occurred last are logged. This memory can be evaluated by means of the IndraWorks software.

10 Maintenance

10.1 Cleaning and care

NOTICE

Ingress of contaminants and humidity!

Malfunction!

- ▶ When working on the VT-HPC-1-1X, observe strictest cleanliness.
- ▶ Prevent the ingress of humidity and dirt into the perforated housing of the VT-HPC-1-1X.
- ▶ Only use a dry and dust-free cloth for cleaning.

Solvents and aggressive cleaning agents!

Damage to the surface of the VT-HPC-1-1X and faster aging.

- ▶ Never use solvents or aggressive cleaning agents.

Proceed as follow for cleaning and care:

- ▶ Check all plug-in and clamped connections of the VT-HPC-1-1X at least once a year for correct fit and damage.
- ▶ Check cables for rupture and crushes. Have damaged or defective cables replaced immediately!
- ▶ Clean the parts of the housing using a dry and dust-free cloth.

10.2 Repair

The VT-HPC-1-1X can only be replaced as a complete unit.

Unauthorized modifications of the VT-HPC-1-1X are not permitted for safety reasons!

10.3 Spare parts

When ordering spare parts, please state the material number of the relevant spare parts.

Table 9: Spare parts

Material number	
R961011116	CONNECTOR KIT VT-HPC...-1X/M...*ET



You can order spare parts from the address given in chapter 16.1 "List of addresses".

11 Demounting and replacement

For replacement, a screwdriver is necessary.

11.1 Preparing for demounting

Decommission the entire system as described in the general instructions for the system. In any case, bring the system to a safe state, shut it down, depressurize and disconnect it from the power supply and secure it against being switched on again.

11.2 Demounting

NOTICE

Electric arc and short-circuit!

Risk of destruction of system components.

- ▶ Put plug-in connectors down in a way that no short-circuit fault can occur.

Proceed as follows to demount the VT-HPC-1-1X:

1. Disconnect connection cables and unplug connectors.
2. Loosen the latch from its snapped-in position using a screwdriver.
3. Carefully remove the VT-HPC-1-1X from the DIN mounting rail while the latch is pulled out.

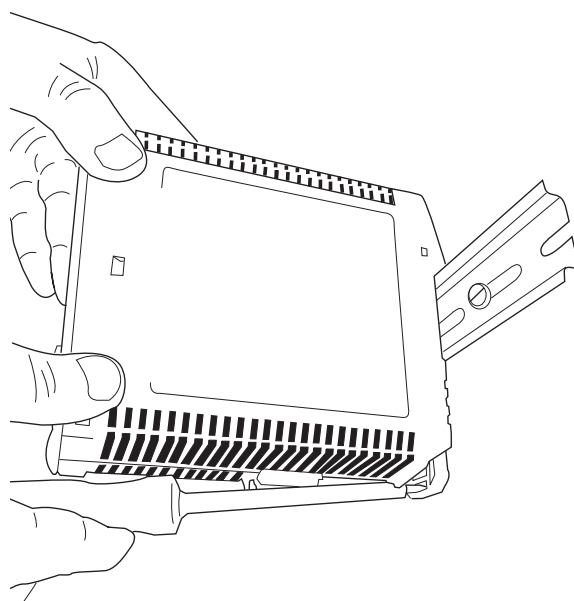


Fig. 15: Removing the VT-HPC-1-1X from the DIN mounting rail

11.3 Preparing the components for storage or further use

Proceed as follows in order to prepare the VT-HPC-1-1X for storage and further use:

- ▶ Use the original packaging for storage.
- ▶ Observe the permissible storage temperature range specified in RE 30237.
- ▶ Protect the VT-HPC-1-1X against dust and humidity.

12 Disposal

12.1 Environmental protection

Careless disposal of the VT-HPC-1-1X and the packaging material can lead to pollution of the environment.

- ▶ Therefore, dispose of the VT-HPC-1-1X and the packaging material in accordance with the currently applicable regulations in your country and recycle the material.

12.2 Return to Bosch Rexroth AG

Products manufactured by us can be returned to us free of charge for disposal. A precondition for this is, however, that the product is free from any contaminants. When returned, the products must not contain any inappropriate foreign substances or third-party components.

Send the components free domicile to the following address:

Bosch Rexroth AG

Service Industriehydraulik [Industrial hydraulics]

Bgm.-Dr.-Nebel-Strasse 8

97816 Lohr am Main

13 Extension and modification

The control electronics VT-HPC-1-1X must be neither extended nor converted. If you convert the VT-HPC-1-1X, the warranty becomes void.

Only optional accessories may be used, see chapter 7.2 “Recommended accessories” on page 16.

14 Troubleshooting

14.1 How to proceed for troubleshooting

Always act systematically and focused, even under pressure of time. Random and imprudent disassembly and changing of settings might result in the inability to ascertain the original cause of fault.

- First obtain a general overview of how your product works in conjunction with the entire system.
- Try to find out whether the product has functioned properly in conjunction with the overall system before the error occurred first.
- Try to determine any changes of the overall system in which the product is integrated:
 - Were there any changes to the product's application conditions or area of application?
 - Were there any changes (e.g. retrofit) or repairs carried out on the complete system (machine/system, electrics, control) or on the product?
If yes: What were they?
 - Was the product or machine used as intended?
 - How did the fault become apparent?
 - Try to get a clear idea of the cause of error. Ask the direct (machine) operator.
- For troubleshooting, use the diagnostic possibilities of IndraWorks.

If you cannot rectify the fault that occurred, contact one of the contact addresses which can be found at www.boschrexroth.com or in the “list of addresses” in chapter 16.1.

15 Technical data

For the technical data of the axis control VT-HPC series 1X, please refer to the technical data sheet 30237.

16 Annex

16.1 List of addresses

Contact for service and spare parts

Bosch Rexroth AG
Service Industriehydraulik
Bürgermeister-Dr.-Nebel-Strasse 8
97816 Lohr am Main
Germany

Phone +49 (0) 9352/40 50 60
E-mail service@boschrexroth.de

Outside Germany you will find service subsidiaries in your vicinity on the Internet at www.boschrexroth.com

Headquarters

Bosch Rexroth AG
Zum Eisengießer 1
97816 Lohr am Main
Germany

Phone +49 (0) 9352/40 30 20
Email my.support@boschrexroth.com

The addresses of our sales and service network and sales organizations can be found at www.boschrexroth.com/addresses

Email address for support

Email support.nc-systems@boschrexroth.com

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pspdint.h, version 0.1.12

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Mail Stop 573

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San Jose

CA 95134, USA

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Alexey Zelkin

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Andrey A. Chernov

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S. L. Moshier

Author: S. L. Moshier.

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Todd C. Miller

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<Todd.Miller@courtesan.com>

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lwIP 2.1.2 - TCP/IP stack

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Author(s):

- Adam Dunkels <adam@sics.se>
- Simon Goldschmidt <goldsimon@gmx.de>
- Dirk Ziegelmeier <dziegel@gmx.de>

lwIP 2.1.2 – SNMP agent

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Author(s):

- Dirk Ziegelmeier <dziegel@gmx.de>
- Christiaan Simons <christiaan.simons@axon.tv>
- Martin Hentschel <info@cl-soft.de>
- Elias Oenal <lwip@eliasoenal.com>
- Leon Woestenberg <leon.woestenberg@axon.tv>

Bosch Rexroth AG

Industrial Hydraulics

Zum Eisengießer 1

97816 Lohr a. Main

Germany

Phone +49 (0) 9352 / 40 30 20

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