RE 30239
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Replaces: 2018-04

rexroth
A Bosch Company

Digital axis control

Type VT-HMC

HMC_25093

- Component series 1X
- Digital axis controllers for one or two electro-hydraulic axes
- Function: position, pressure, force, velocity, substitutional closed-loop control (position/force or p/Q)
- Communication: Sercos, PROFINET RT, EtherCAT, EtherNET/IP, POWERLINK, optionally PROFIBUS, analog
- Parameterizable via standard Ethernet

CE

RoHS

Features

- PLC functionality according to IEC 61131-3, optional
- BEST IN CLASS hydraulic controllers
- Bus connection (slave)/Service interface (TCP/IP) switchable by parameters (Sercos, EtherNet IP, PROFINET RT, EtherCAT, PROFIBUS, Powerlink)
- Measurement system of hydraulic axes:
  – Incremental or absolute (SSI, Endat2.2)
  – Analog ±10 V and 4 ... 20 mA
- CE mark according to EMC Directive 2004/108/EC

Contents

Ordering code

		01		02		03		04		05		06		07
VT	**–**	**HMC**	**–**		**–**	**1X**	**/**	**M**	**–**		**–**	**00**	**/**	**00**

Type

01	Digital axis control for hydraulic drives	**HMC**

Axis controls

02	1 axis	**1**
	2 axes	**2**

Component series

03	Component series 10 ... 19 (10 ... 19: unchanged technical data and pin assignment)	**1X**

Interface

04	Multi-Ethernet	**M**

Bus connection

05	**With** Profibus	**P**
	Without Profibus	**0**

Software option

06	Standard	**00**

Hardware option

07	Standard	**00**

Available variants

Type	Material no.
VT-HMC-1-1X/M-0-00/00	R901361289
VT-HMC-1-1X/M-P-00/00	R901361305
VT-HMC-2-1X/M-0-00/00	R901441904
VT-HMC-2-1X/M-P-00/00	R901361303

Included within the scope of delivery:
Mating connector for
- XD1 (Weidmüller BLZF 3.50/03/180F SN BK BX)
- XG20/XG21 (Weidmüller B2CF 3.50/30/180F SN BK BX)

Function

Description
The VT-HMC (Hydraulic Motion Controller) is a digital controller with integrated axis controller and programming functionality according to IEC 61131-3 (optional).
The following controller functionalities are available:
- Position control
- Force control
- Pressure control
- Substitutional closed-loop control (position/force or p/Q)
- Velocity control
- Position synchronization master/slave, average, min/max (optional)

This enables, amongst others, the following operating modes:
- Valve direct control
- Drive-controlled position control
- Drive-controlled positioning
- Positioning block operation
- Torque-/force control/valve direct control

Command value presetting is done via the bus interfaces (XF20/XF21 or XF30), via the analog interface (XG20/XG21) or, alternatively, via an internal PLC program. Axis variant 2 enables independent operation or synchronization control of the axes.

The feedback information of the actual value signals to the superior control system is provided optionally either via the bus interfaces (XF20/XF21 or XF30) or the analog/digital interface (XG20/XG21). For function blocks for communication with the superior control system see "www.boschrexroth.com/HMC".

The controller parameters are set via one of the two Ethernet interfaces (XF20/XF21) using the freely available software Indraworks DS (integrated switch functionality).

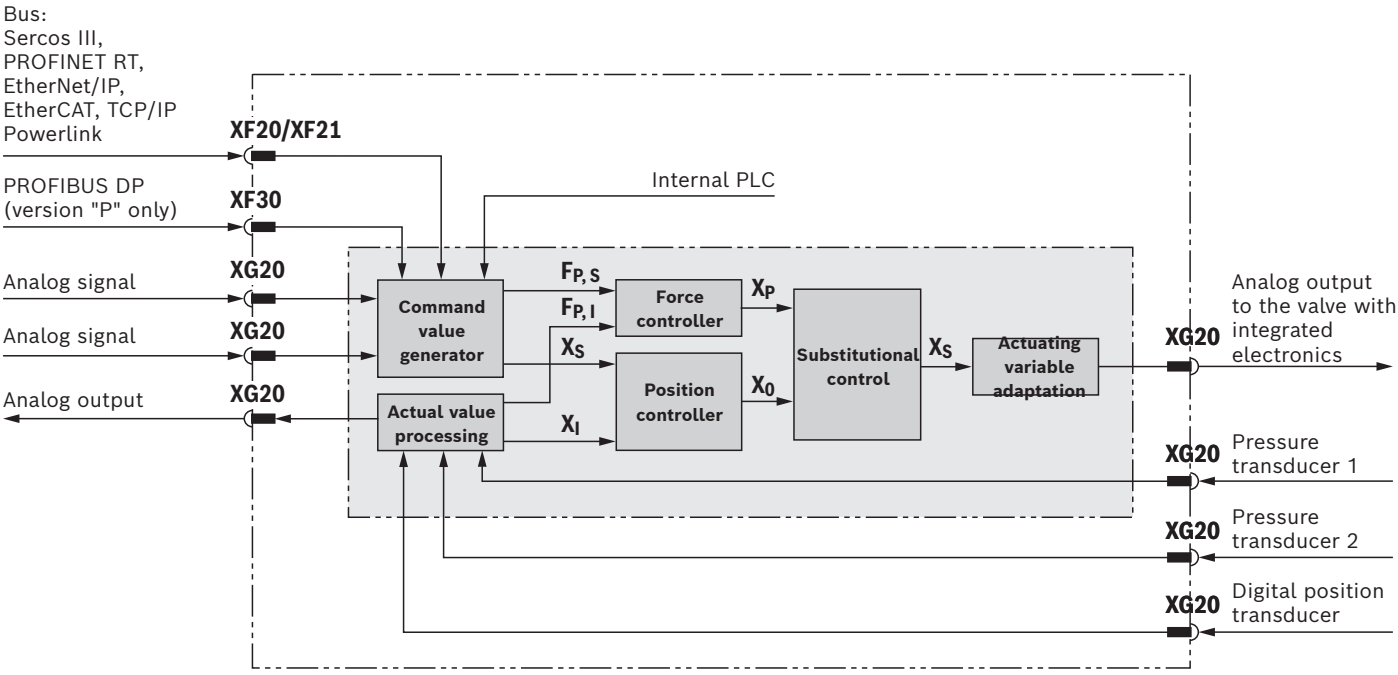
Monitoring
The digital control electronics enable comprehensive monitoring functions/error detection, including
- Undervoltage
- Communication error
- Cable break for analog sensor inputs (4 ... 20 mA) and digital position measurement system
- Short-circuit monitoring for analog/digital outputs
- Monitoring of the microcontroller (watchdog)
- Temperature of the integrated electronics
- Over-current of 24 V sensor voltage and digital outputs

IndraWorks MLD or DS PC program
To implement the project planning task and to parameterize the VT-HMC, the IndraWorks engineering tool (see accessories) may be used:
- Project planning
- Parameterization
- Preparation of the PLC program (IndraWorks MLD requirement)
- Commissioning
- Diagnosis
- Comfortable administration of all data on a PC
- Requirement: PC operating system Windows 7, 8, 10

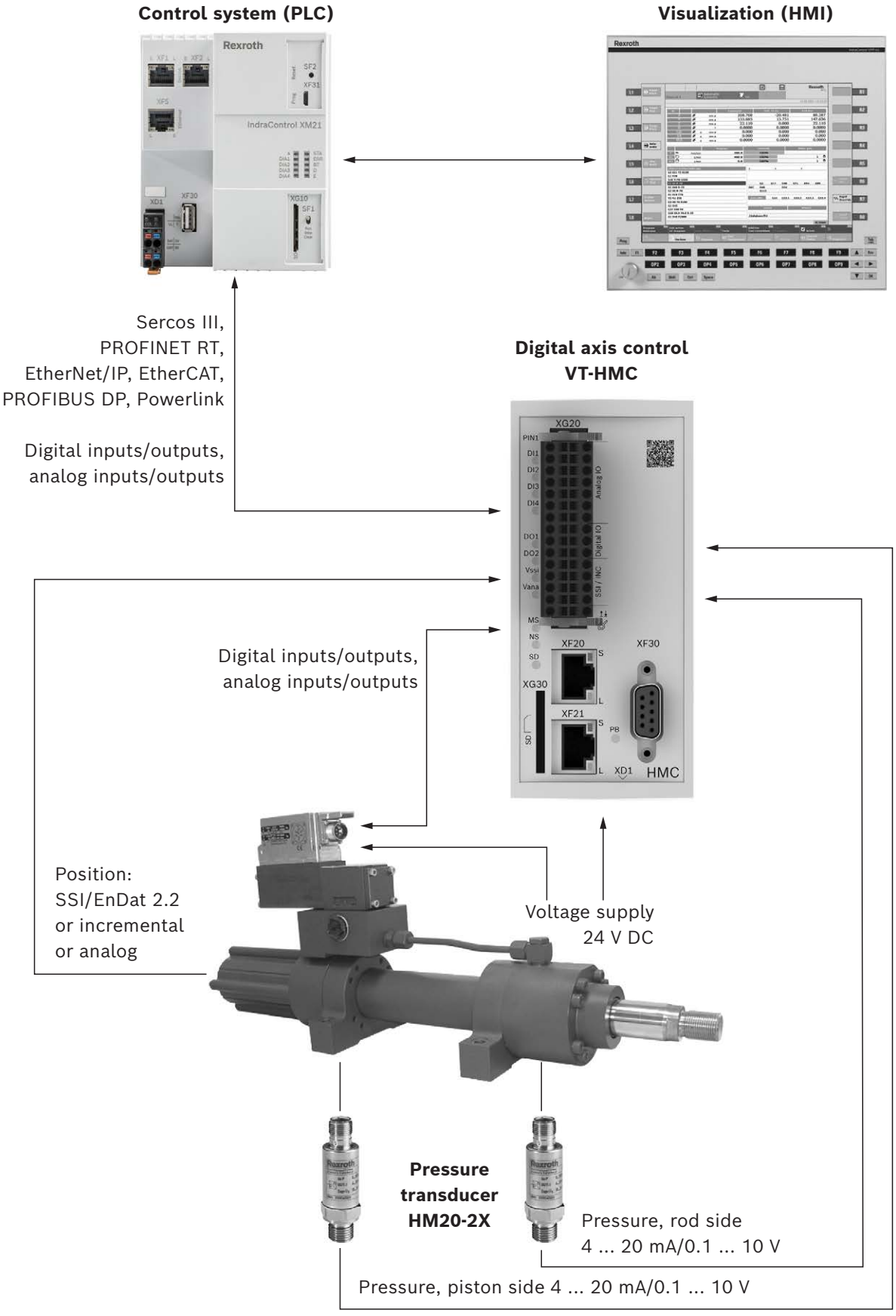
Slot for one SD memory card
The following data may be saved:
- PLC program
- Any other data

Only SD memory cards with SPI bus connection are supported (no SDHC memory cards).
The card must already be inserted when the device is switched on, otherwise it will not be detected. Cards that are not FAT-formatted are formatted automatically (FAT 32). The maximum capacity of the supported memory cards is 4 GB.

Controller functions



System overview (example)



Technical data

General		
Protection class according to EN 60529		IP20
Ambient temperature range	°C	–20 ... 60
Maximum admissible temperature change	°C/min	5
Transport temperature range	°C	–40 ... +70
Recommended storage temperature with UV protection	°C	+5 ... +40
Relative air humidity	%	10 ... 95 (without condensation)
Maximum altitude for use	m	2000
UV resistance		Housing is only partly UV resistant. Extended exposure to radiation may cause color changes.
Transport shock according to DIN EN 60068-2-27		15 g / 11 ms / 3 axes
Sine test according to DIN EN 60068-2-6		10 ... 500 Hz / maximum of 2 g / 10 cycles / 3 axes
Noise test according to DIN EN 60068-2-64		20 ... 500 Hz / 2.2 g RMS / 6.6 g peak / 30 min. / 3 axes
Free fall (in original packaging)	m	1 (see 61131-2)
Electro-magnetic compatibility (EMC)		
▶ EN 61000-6-2 / EN 61131-2		
– EN 61000-4-2 ESD	kV	4 CD / 8 AD with BWK B
– EN 61000-4-3 HF radiated	V/m	10 (80 ... 2700 MHz) with BWK A
– EN 61000-4-4 Burst	kV	2 with BWK B
– EN 61000-4-5 Surge	kV	0.5 / (sym. / asym.) with BWK B
– EN 61000-4-6 HF conducted	V_{eff}	10 (150 kHz ... 80 MHz) with BWK A
– EN 61000-4-8 Magnetic field 50/60 Hz	A/m	100 with BWK A
▶ EN 61000-6-3 / EN 61000-6-4 / EN 61131-2		
– EN 55016-2-1 Interference voltage	MHz	0,15 ... 30, class A, EN 55022
– EN 55016-2-3 Radio interference field strength	MHz	30 ... 1000, class A, EN 55022
Installation position		Vertical. For the ventilation of the assembly, the ventilation slots of the top and bottom side must be at least 2 cm away from covers, walls, etc.
Assembly		Top hat rail TH35-7.5 or TH35-15 according to EN 60715
Housing material		Glass-fiber reinforced polyamide plastic
Resistance against aggressive media		Contact with conductive dusts is not admissible. Avoid contact with hydraulic fluids.
Weight	kg	0.6
Dimensions		see page10
Conformity		CE according to the EMC directive CE according to the RoHS directive

Technical data

Electric				
Operating voltage	▶ Nominal voltage	VDC	24	
	▶ Lower limit	VDC	17.5	
	▶ Upper limit	VDC	30	
Maximum admissible residual ripple (40 ... 400 Hz)		V_{PP}	5 (observe the admissible limits)	
Total current consumption			1 axis	2 axes
	▶ Running empty	A	0.2 ... 0.3	0.3 ... 0.5
	▶ Maximum load	A	0.9 ... 1.1 [1]	1.8 ... 2.2 [1]
Power loss (at 24 V)			< 8	< 14
External fuse		A	3.15, time-lag	
Bus systems			PROFIBUS DP (max. 12 MBaud acc. to IEC61158), Sercos III, PROFINET RT, EtherNet/IP, EtherCAT [2], Powerlink [2]	
Parameterization interface			Ethernet	
Scan time position controller (minimum)		ms	0.5	
Booting time		s	<15 (from switch on until the position control system is active)	
Digital inputs Di	▶ Quantity		4	8
	▶ Low level	V	–3 ... 5	
	▶ High level	V	11 ... U_B	
	▶ Current consumption at high level	mA	2 ... 15	
	▶ Reference potential		GND	
Digital outputs Do	▶ Quantity		2	4
	▶ Low level	V	0 ... 3	
	▶ High level	V	14,5 ... U_B	
	▶ Current carrying capacity	mA	50 (short-circuit-proof)	
	▶ Signal delay time	ms	0.5 ... 1.2 (depending on the set performance)	
	▶ Reference potential		GND	
Analog inputs Ai	▶ Number (current or voltage parameterizable)		4	8
	▶ Resolution	Bit	14 [3]	
	▶ Voltage inputs (differential inputs)			
	– Measurement range	V	–10 ... +10	
	– Input resistance	kΩ	200 ±10%	
	– Linearity at 20°C	mV	<20	
	– Noise	mV	±15	
	– Temperature drift	mV/10 K	<12	
	▶ Current inputs (reference to AGND)			
	– Input current	mA	4 ... 20 (0 ... 20 physically)	
	– Input resistance	Ω	100 (measuring resistance plus FET plus diode)	
	– Linearity at 20°C	µA	<20	
	– Temperature drift	µA/10 K	<12	

[1] External fuse protection required

[2] With the EtherCAT (profile CoE) and Powerlink bus systems, support of the second axis is only possible upon request

[3] related to ±12 V (1.465 mV/LSB) or 20.7 mA (1.27 µA/LSB)

Technical data

Supply for sensors $V_{encoder\_ANA}$	▶ Supply voltage	V	U_B – 4 (max. load) ... U_B – 2.5 (running empty)	
	▶ Maximum supply current	mA	100	
Analog outputs Ao	▶ Number (current or voltage parameterizable)		2	4
	▶ Resolution	Bit	16 [4]	
	▶ Voltage outputs			
	– Output range	V	–10 ... +10 (0 ... 10 by software)	
	– Minimum load impedance	Ω	1000	
	– Linearity and noise at 20°C	mV	<25	
	– Temperature drift	mV/10 K	<12	
	▶ Current outputs			
	– Output range	mA	0 ... 20 (4 ... 20 by software)	
	– Maximum load	Ω	500	
	– Linearity and noise at 20°C	µA	<35	
	– Temperature drift	µA/10 K	<12	
Digital position transducers (encoders)	▶ Voltage supply for encoder (optional)			
	– +5 V_{enc}	VDC	5 ±5%	
	– $V_{encoder\_SSI}$	V	U_B ... 3 (max. load) ... U_B (running empty)	
	▶ Maximum supply current	mA	300	
	▶ Incremental transducer (transducer with TTL output)			
	– Encoder signals		Two impulse series (A and B, electrically shifted by 90°) and a reference signal (Z) or single ended	
	– Signal form		RS485	
	– Maximum input frequency	kHz	250	
	▶ SSI transducer (due to the higher control quality, a transducer with clock synchronization should be used)			
	– Coding		Gray or binary	
	– Data width	Bit	18 ... 28	
	– Transfer frequency	kBit/s	80 ... 500	
	– Line receiver / line driver		RS485	
	▶ Endat encoder		2.2	

[4] 0.334 mV/LSB (Least Significant Bit)

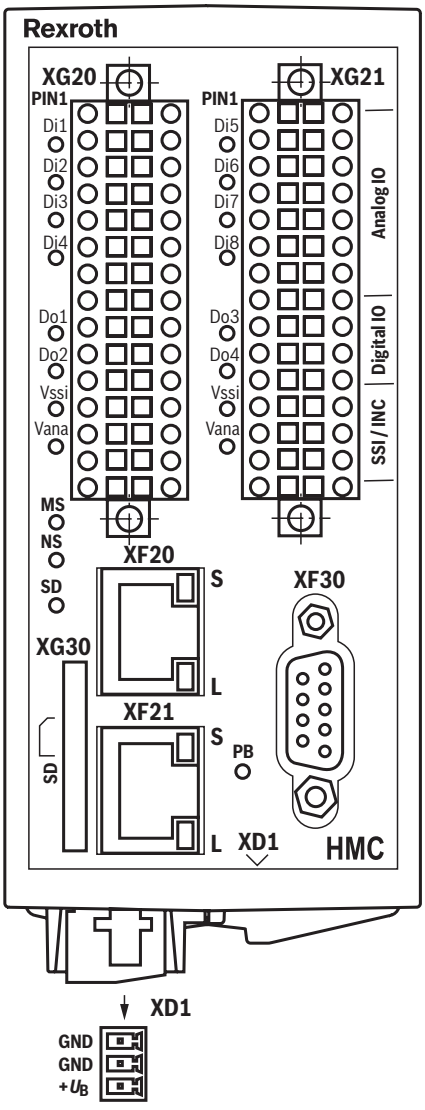
Pin assignment

XG20, XG21 [1], encoder/DIO/AIO

Signal	Pin	Pin	Signal
Vencoder_ANA (U_B)	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	a9	b9	Di4
Do1	a10	b10	Do2
R–	a11	b11	R+
CLK–/A–	a12	b12	CLK+/A+
Data–/B–	a13	b13	Data+/B+
+5Venc	a14	b14	GND
Vencoder_SSI (U_B)	a15	b15	GND

1) Only with 2-axis variant. XG20 and XG21 can be swapped. The scope of delivery of the 2-axis variant includes coding pins (see operating instructions 30239-B).

2) Wire current inputs (Cin) only at pin b2 ... b5, leave pin a2 ... a5 open. Reference potential: AGND (see operating instructions 30239-B)



XF20, XF21 (Ethernet connections)

Signal	Pin
TD+	1
TD–	2
RD+	3
–	4
–	5
RD–	6
–	7
–	8

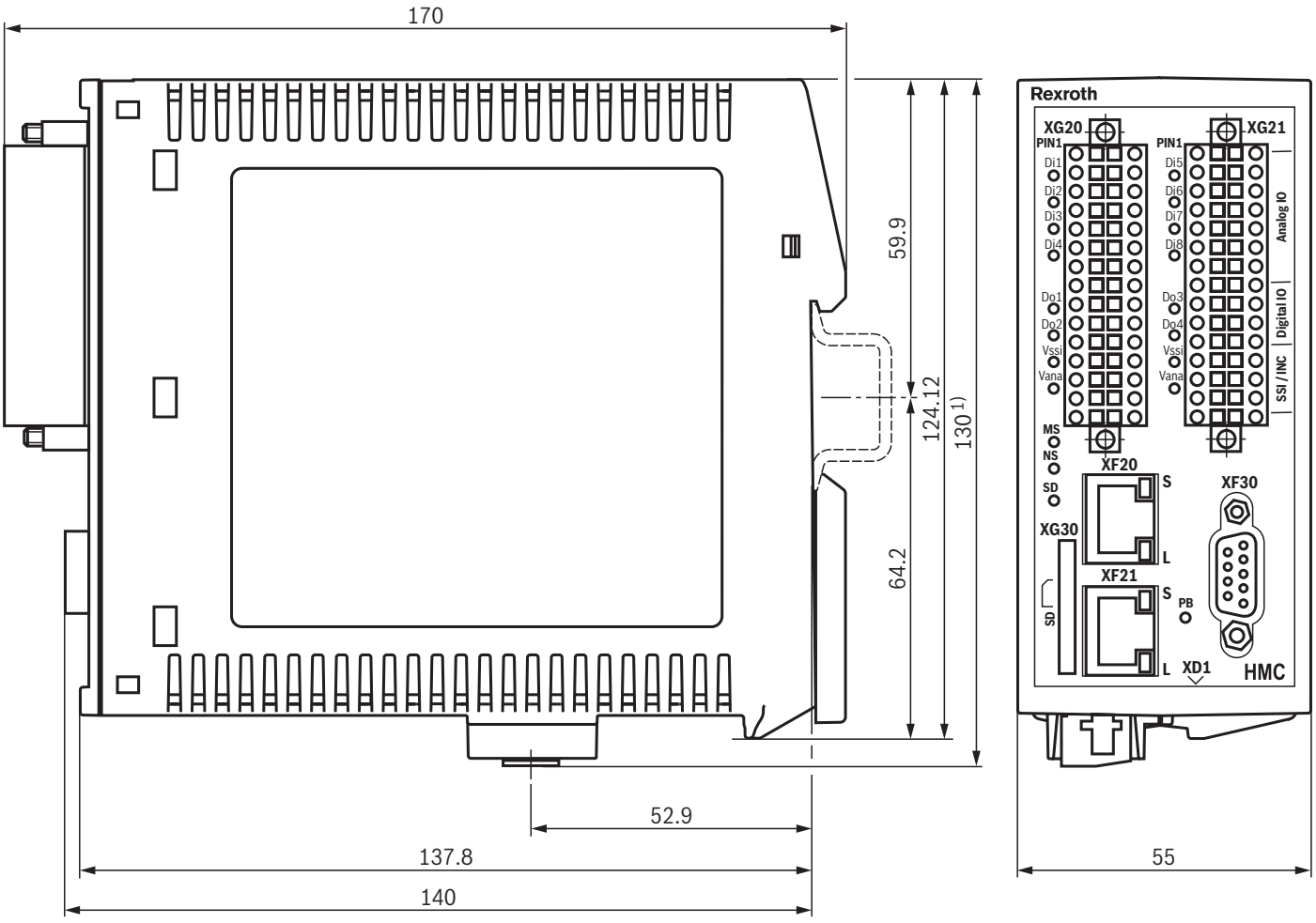
XD1, Power

Pin	Signal
1	GND
2	GND
3	+U_B (17.5 ... 30 V)

XF30, PROFIBUS DP (only for variant "P")

Pin	Signal
1	reserved
2	reserved
3	RxD/TxD-P
4	CNTR-P
5	DGND
6	VP
7	reserved
8	RxD/TxD-N
9	reserved

Dimensions
(dimensions in mm)



Status LED	Display status
Module (MS)	
Off	No voltage supply
Green-red, flashing	Initialization
Green, flashing	Parameterization mode active
Green	Operating mode active, Drive active
Orange, flashing	Warning
Red, flashing	Error
illuminated red	Exception is available
Network status (NS)	
Off	No voltage supply
Green	Operation
SD card (SD)	
Off	No SD card available
Green, flashing	SD card not ready for operation
Green	SD card available and ready for operation

Status LED	Display status
Digital inputs (Di1 ... Di8) 2)	
Off	Logic input "0"
Green	Logic input "1"
Digital outputs (Do1 ... Do4, $V_{\not L}$) 3)	
Off	Logic output "0"
Orange	Logic output "1"
Profibus (PB)	
Off	Bus not active
Green	Bus in "Data_Exchange" status

Notice:
For a detailed description of the diagnosis LEDs, please refer to the functional description Rexroth HydraulicDrive HDx20.

1) +15 mm for connecting/disconnecting the plug-in connector
2) 1-axis variant Di1 ... Di4
3) 1-axis variant Do1 ... Do2

Accessories (separate order)

Denomination	Material no.
CONNECTOR 6ES7972-0BA42-0XA0 for port XF30 (Profibus)	R901312863
CONNECTOR SET VT-HMC...-1X/M...*ET	R961011116
VT-SD-HMC-SYNC-000-001-000-000	R901512467
SERVICE PACKAGE VT-HMC..-1X/MSHIELDING&	R961011117
MEMORY CARD XA-SD01 (1 GByte)	R911173844
BUS CABLE PC VT-HMC RKB0011/005.0 (RBS0016-REB0400-RBS0016), length 5 m	R911321548
Commissioning software IndraWorks DS as of version 14V12 (without PLC functionality)	–
Commissioning software IndraWorks MLD (as of version 14)	R911347042
Commissioning software IndraWorks Suite (as of version 14)	R911342952

Project planning and maintenance instructions

☞ **Maintenance instructions:**

- The devices have been tested in the plant and are supplied with default settings.
- Only complete devices can be repaired.
- Repaired devices are returned with default settings. User-specific settings will not be applied. The machine end-user will have to retransfer the corresponding user parameters.

☞ **Notices:**

- The supply voltage must be permanently connected; otherwise, bus communication is not possible.
- Connectors may only be plugged or unplugged in the de-energized condition.
- In especially EMC-sensitive environments, additional measures must be taken (depending on the application, e.g. shielding, filtration) [1)]
- **Wiring information**
  - Maximum possible spatial separation between signal and load lines.
  - Do not lead signal lines through magnetic fields.
  - If possible, install signal lines without intermediate terminals.
  - Do not install signal lines in parallel to the load lines.
  - Connect cable shields (see the operating instructions 30239-B)
  - For digital inputs and outputs, the max. recommended cable length is 30 m.
  - Only use shielded lines for sensors (incremental, absolute or analog). Max. recommended cable length: 50 m; also observe the sensor manufacturers' information.
  - The signals of the connector XG20/XG21 are not galvanically separated. A potential reference therefore always has to be established when connecting external devices.
- For additional notices, see IndraWorks online help and operating instructions 30239-B.
- The upper and lower ventilation slots must not be concealed by adjacent devices in order to provide for sufficient cooling.
- Observe the installation information in the operating instructions 30239-B.

1) For use in household or small business applications, special precautions, such as installation of a shielded housing and appropriately approved filter systems, are required to fulfill the emission requirements according to EN 61000-6-3.

Further information

▶ Digital axis control VT-HMC...1X	Operating instructions 30239-B
▶ CE Declaration of Conformity	upon request
▶ Operation VT-HMC (from 18V12 software version):	
– Functional description Rexroth HydraulicDrive HDx-20	30338-FK
– Parameter description Rexroth HydraulicDrive HDS-16, HDx-17 ... 20	30330-PA
– Description of diagnosis Rexroth HydraulicDrive HDS-16, HDx-17 ... 20	30330-WA
▶ Installation, commissioning and maintenance of proportional valves	Data sheet 07800
▶ Assembly, commissioning and maintenance of hydraulic systems	Data sheet 07900
▶ Commissioning software and documentation	www.boschrexroth.com/HMC
▶ Support	support.nc-systems@boschrexroth.de

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