rexroth
A Bosch Company

ctrlX XC20 Servo Drive

Instruction Manual
R912010720

Edition 01

Record of Revision

Edition	Release Date	Notes
DOK-XDRV**-XC20****UL*-IN01-EN-E	2026.03	First release

Purpose of Documentation

This documentation provides information on the installation and operation of the described products, by persons trained and qualified to work with electrical installations.

Liability

The specified data is intended for product description purposes only and shall not be deemed to be a guaranteed characteristic unless expressly stipulated in the contract. All rights are reserved with respect to the content of this documentation and the availability of the product.

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1 Important notes

1.1 Safety instructions

1.1.1 General information

- Do not attempt to install and operate the components of the electric drive and control system without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation prior to working with these components. If you do not have the user documentation for the components, contact our Rexroth sales representative. Ask for these documents to be sent immediately to the person or persons responsible for the safe operation of the components.
- If the supplied documents contain some information you do not understand, it is absolutely necessary that you ask Rexroth for explanation before you start working at or with the components.
- If the component is resold, rented and/or passed on to others in any other form, these safety instructions must be delivered with the component in the official language of the user's country.
- Only qualified persons may work with components of the electric drive and control system or within its proximity.

  In terms of this Instruction Manual, qualified persons are those persons who are familiar with the installation, mounting, commissioning and operation of the components of the electric drive and control system, as well as with the hazards this implies, and who possess the qualifications their work requires. To comply with these qualifications, it is necessary, among other things,

  – to be trained, instructed or authorized to switch electric circuits and components safely on and off, to ground them and to mark them,
  – to be trained or instructed to maintain and use adequate safety equipment,
  – to attend a course of instruction in first aid.
- The technical data, connection and installation conditions of the components are specified in the respective application documentations and must be followed at all times.
- If the components take the form of hardware, then they must remain in their original state, in other words, no structural changes are permitted. It is not permitted to decompile software components or alter source codes.
- Do not mount damaged or faulty components or use them in operation.
- Only use accessories and spare parts approved by Rexroth.
- Follow the safety regulations and requirements of the country in which the electric components of the electric drive and control system are operated.
- Proper and correct transport, storage, mounting and installation, as well as care in operation and maintenance, are prerequisites for optimal and safe operation of the component.

Improper use of these components, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, could result in property damage, injury, electric shock or even death.

- Solid State motor overload protection operates when reach 120% of motor FLA within 2h, 150% of motor FLA within 8min and prior to reach 720% of motor FLA.
- Motor overtemperature sensing is required.
- Input and output terminals shall be connected with suitable

  UL-Listed(ZMVV/7 or ZMLF/7) or R/C (ZMVV2/8) ring lugs.

1.1.2 Protection against contact with electrical parts and housings

This section concerns components of the electric drive and control system with voltages of more than 50 volts.

Contact with parts conducting voltages above 50 volts can cause personal danger and electric shock. When operating components of the electric drive and control system, it is unavoidable that some parts of these components conduct dangerous voltage.

High electrical voltage! Danger to life, risk of injury by electric shock or serious injury!

- Only qualified persons are allowed to operate, maintain and/or repair the components of the electric drive and control system.
- Follow the general installation and safety regulations when working on power installations.
- Before switching on, the equipment grounding conductor must have been permanently connected to all electric components in accordance with the connection diagram.
- Even for brief measurements or tests, operation is only allowed if the equipment grounding conductor has been permanently connected to the points of the components provided for this purpose.
- Before accessing electrical parts with voltage potentials higher than 50 V, you must disconnect electric components from the mains or from the power supply unit. Secure the electric component from reconnection.
- With electric components, observe the following aspects:

  Always wait 10 minutes after switching off power to allow live capacitors to discharge before accessing an electric component. Measure the electrical voltage of live parts before beginning to work to make sure that the equipment is safe to touch.
- Install the covers and guards provided for this purpose before switching on.

- Never touch any electrical connection points of the components while power is turned on.
- Do not remove or plug in connectors when the component has been powered.
- Under specific conditions, electric drive systems can be operated at mains protected by residual-current-operated circuit-breakers sensitive to universal current (RCDs/RCMs).
- Secure built-in devices from penetrating foreign objects and water, as well as from direct contact, by providing an external housing, for example a control cabinet.

High housing voltage and high leakage current! Danger to life, risk of injury by electric shock!

- Before switching on and before commissioning, ground or connect the components of the electric drive and control system to the equipment grounding conductor at the grounding points.
- Connect the equipment grounding conductor of the components of the electric drive and control system permanently to the main power supply at all times. The leakage current is greater than 3.5 mA.
- Establish an equipment grounding connection with a minimum cross section according to the table below. With an outer conductor cross section smaller than 10 mm^2 (8 AWG), the alternative connection of two equipment grounding conductors is allowed, each having the same cross section as the outer conductors.

Cross section outer conductor	Minimum cross section equipment grounding conductor Leakage current ≥ 3.5 mA	
	1 equipment grounding conductor	2 equipment grounding conductors
1.5 mm^2 (16 AWG)	10 mm^2 (8 AWG)	2 × 1.5 mm^2 (16 AWG)
2.5 mm^2 (14 AWG)		2 × 2.5 mm^2 (14 AWG)
4 mm^2 (12 AWG)		2 × 4 mm^2 (12 AWG)
6 mm^2 (10 AWG)		2 × 6 mm^2 (10 AWG)
10 mm^2 (8 AWG)		-
16 mm^2 (6 AWG)	16 mm^2 (6 AWG)	-
25 mm^2 (4 AWG)		-
35 mm^2 (2 AWG)		-
50 mm^2 (1/0 AWG)	25 mm^2 (4 AWG)	-
70 mm^2 (2/0 AWG)	35 mm^2 (2 AWG)	-
...	...	...

Tab. 1-1: Minimum cross section of the equipment grounding connection

M5 screws are required for grounding, with a torque of 5NM for the grounding screws.

1.1.3 Battery safety

Batteries consist of active chemicals in a solid housing. Therefore, improper handling can cause injury or property damage.

Risk of injury by improper handling!

- Do not attempt to reactivate low batteries by heating or other methods (risk of explosion and cauterization).
- Do not attempt to recharge the batteries as this may cause leakage or explosion.
- Do not throw batteries into open flames.
- Do not dismantle batteries.
- When replacing the battery/batteries, do not damage the electrical parts installed in the devices.
- Only use the battery types specified for the product.

Environmental protection and disposal! The batteries contained in the product are considered dangerous goods during land, air, and sea transport (risk of explosion) in the sense of the legal regulations. Dispose of used batteries separately from other waste. Observe the national regulations of your country.

1.2 Intended use

This product may only be used for the mentioned applications under the specified application, ambient and operating conditions.

This product is exclusively intended for use in machines and systems in an industrial environment. This is to be understood as applications according to IEC 60204-1 "Safety of machinery, Electric equipment of machines" and NFPA 79 "Electrical Standard for Industrial Machinery".

Components of the ctrlX XC20 Servo Drive system are products of Category C3 (with restricted distribution) in accordance with IEC 61800-3. This Category comprises EMC limit values for line-based and radiated noise emission. Compliance with this Category (limit values) requires the appropriate measures of interference suppression to be used in the drive system (e.g., mains filters, shielding measures).

These components are not provided for use in a public low-voltage mains supplying residential areas. If these components are used in such a mains, high-frequency interference is to be expected. This can require additional measures of interference suppression.

2 Ratings and dimensions

2.1 Ambient and operating conditions

⚠ WARNING Lethal electric shock by live parts with more than 50 V!

Only operate the device

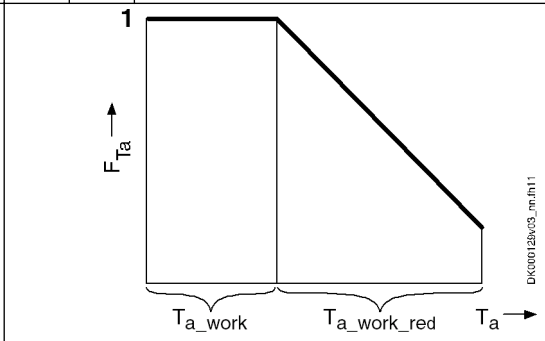
- with the connectors plugged on (even if no lines have been connected to the connectors) and
- with the equipment grounding conductor connected!

Control cabinet

The devices in the ctrlX XC20 Servo Drive product range, as well as their additional components (except for some braking resistors), have to be mounted in control cabinets.

Check that the ambient and operating conditions, in particular the control cabinet temperature, are complied with by calculating the heat levels in the control cabinet. Afterwards, make the corresponding measurements to confirm that ambient and operating conditions have actually been observed. In the technical data of the individual components, the power dissipation is specified as an important input value for calculating the heat levels.

Ambient and operating conditions

Description	Symbol	Unit	Value
Conductive dirt contamination			Not allowed (You can protect the devices against conductive dirt contamination, e.g., by mounting them in control cabinets with a degree of protection of IP54 in accordance with IEC529.)
Degree of protection (IEC60529)			IP20 [2)]
Use within scope of CSA/UL			
Temperature during storage			-25 ... +55
Temperature during transport			-25 ... +70
Installation altitude	h_{nom}	m	1000
Ambient temperature range	T_{a_work}	°C	0 ... 40
Derating vs. Ambient temperature: The performance data is reduced by the factor F_{Ta} in the ambient temperature range $T_{a\_work\_red}$: $F_{TA} = 1 - [(T_a - 40) \times f_{Ta}]$ Example: With an ambient temperature T_a = 50°C and a load factor f_{Ta} = 2%, the rated power is reduced to $P_{DC\_cont\_red} = P_{DC\_cont} \times F_{Ta} =$ $P_{DC\_cont} \times (1 - [(50 - 40) \times 0.02]) = P_{DC\_cont} \times 0.8$ Operation at ambient temperatures outside of T_{a_work} and $T_{a\_work\_red}$ is not allowed!			
	$T_{a\_work\_red}$	°C	40 ... 55
	f_{Ta}	%/K	2

Description	Symbol	Unit	Value		
Simultaneous derating for ambient temperature **and** installation altitude			Permissible product performance derating f × FTa		
			Derating factor (for fTa = 2 %/K)		
			[°C]	[m]	
				1000	2000
			25	1	1
			30	1	0.96
			35	1	0.88
			40	1	0.8
			45	0.9	0.72
			50	0.8	0.64
			55	0.7	0.56
Relative humidity		%	5 ... 95		
Absolute humidity		g/m^3	1 ... 29		
Moisture condensation			Not allowed		
Climatic category (IEC 60721)			3K3		
Allowed pollution degree			Class 3C1		
Allowed dust, steam			EN 50178 Tab. A.2		
Vibration sine: Amplitude (peak-peak) at 10 ... 57 Hz [1)]		mm	0.15		
Vibration sine: Acceleration at 57 ... 150 Hz [1)]		g	1		
Overvoltage category			III (according to IEC 60664-1)		

1) According to EN 60068-2-6
2) Reduced performance data for drive controllers: permitted DC bus continuous power, permitted mains voltage, braking resistor continuous power, continuous current

Tab. 2-1: Ambient and operating conditions

2.2 Drive controllers

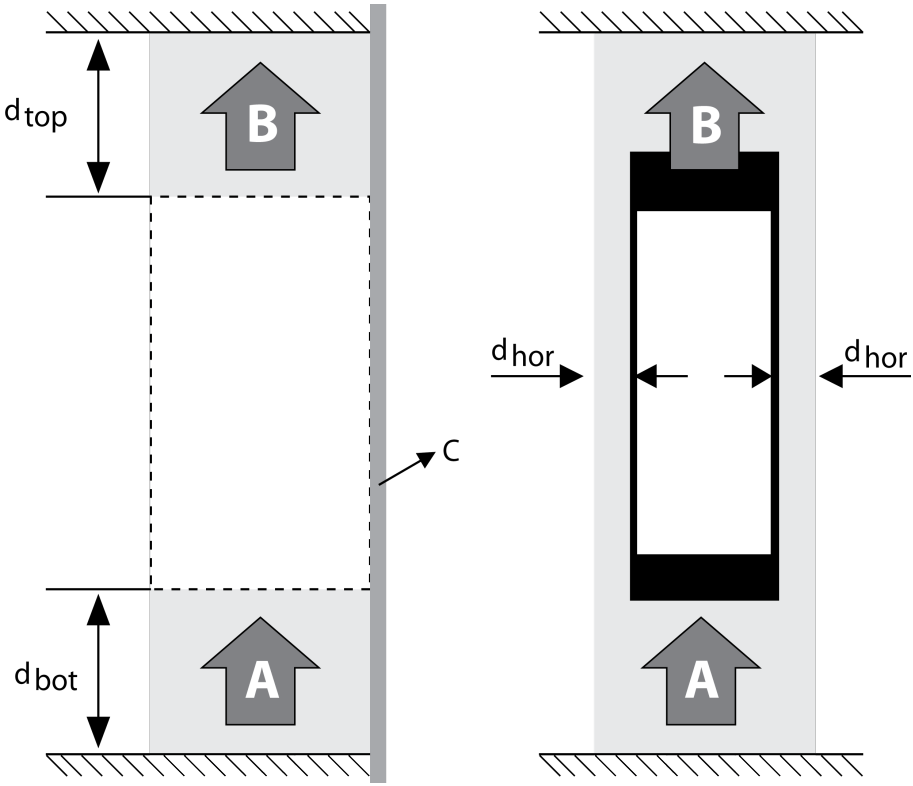
UL ratings and dimensions (XC20)

Description	Symbol	Unit	XC20-W0005	XC20-W0007	XC20-W0012	XC20-W0023	XC20-W0033	XC20-W0050
Listing in accordance with UL standard			UL 61800-5-1					
Listing in accordance with CSA standard			C22.2 No. 274-17					
UL-Files			E328841					
Pollution degree			2					
Ambient temperature range with nominal data	T_{amax}	°C	40					
Mass	m	kg	1.08			1.54		2.14
Device depth[2)]	T	mm	196					
Device height[1)]	H	mm	190			200		230
Device width[3)]	B	mm	50			65		80
Minimum distance on the top of the device[4)]	d_{top}	mm	80					
Minimum distance on the bottom of the device[5)]	d_{bot}	mm	80					
Horizontal spacing at the device[6)]	d_{hor}	mm	0					
Rated control voltage input[7)]	U_{N3}	V	24					
Rated control current input[8)]	I_{N3}	A	3.6			4.0		
Short circuit current rating	SCCR	A rms	42000					
Rated input voltage, power[9)]	U_{LN_nenn}	V	3AC 380Y/220...440Y/254					
Mains frequency	f_{LN}	Hz	50 ... 60					
Rated input current	I_{LN}	A	1.9	2.9	4.5	8	10.8	17.3
Branch circuit protection fuse[10)]			6A Class J/Class CC			15A Class J/Class CC		25A Class J/ Class CC
Required wire size in accordance with UL 508 A (internal wiring);[11)]	A_{LN}	AWG	14					10 (Input wire) 12 (Output wire)
Field wiring material (material; conductor temperature; class)			Cu; 75 °C; 1					
Output voltage	U_{out}	V	0 ... 440					

Description	Symbol	Unit	XC20-W0005	XC20-W0007	XC20-W0012	XC20-W0023	XC20-W0033	XC20-W0050
Output current	I_{out}	A	1.7	2.3	4	7.6	10.5	16
Output frequency range[12)]	f_{out}	Hz	0 ... 599					

1) 2) 3) Housing dimensions
4) 5) 6) See fig. "Air intake and air outlet at device"
7) Comply with supply voltage for motor holding brake;
The following power supply unit has to be used in the scope of CSA/UL:
● UL508-certified ● output voltage: DC 24V
8) See information on "Rated power consumption control voltage input at U_{N3}"
9) Mains input L1, L2, L3; For use on a solidly grounded wye source only.
10) Use cUL-listed fuses. Suitable for use on a circuit capable of delivering not more than 42000 rms symmetrical amperes,440 Volts maximum. If using inverse-time circuit breakers (in this case, you are obligated to prove opposite UL that an appropriate circuit breaker was used) or type E combination motor controllers instead of recommended fuses, see UL 61800-5-1, section 5.2.3.6.2DV.4.1.3.
11) Copper wire; PVC-insulation (conductor temperature 75 °C; $T_a \leq 40$ °C) in accordance with NFPA 79 chapter 12 and UL 508A chapter 28
12) Depending on switching frequency which was set in parameter P-0-0001

Tab. 2-2: UL ratings and dimensions



A Air intake
B Air outlet
C Mounting surface in the control cabinet

d_{top} Distance top
d_{bot} Distance bottom
d_{hor} Distance horizontal

Fig. 2-1: Air intake and air outlet at device

2.3 China RoHS 2

https://www.boschrexroth.com.cn/zh/cn/certificates/china-rohs2/

3 Overview of documentations

3.1 Motors

Title	Type of documentation	Document typecode[1)] DOK-MOTOR*-...	Material number
MC20 Synchronous Servomotors	Project Planning Manual	DOK-MOTOR*-MC20*******-ITxx-ZH-E	R912010420

1) In the documentation typecodes, "xx" is a placeholder for the current edition of the documentation (e.g.: PR01 is the first edition of a Project Planning Manual)

Tab. 3-1: Documentations – motors

4 Instructions for use

4.1 Overcurrent protection

Protect the components against overcurrent:

- Integral solid state short circuit protection does not provide branch circuit protection.
- Branch circuit protection has to be provided externally.

  For the North American sales region, individual branch circuit protection on the mains side is mandatory before each device.
- Dimension the branch circuit protection according to the "Branch circuit protection fuse" data (see Ratings and dimensions)

⚠ WARNING

Lethal electric shock from live parts with more than 50 V!

Risk of burns by hot housing surfaces! Risk of fire!

The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire or electric shock, current-carrying parts and other components of the controller should be examined and replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

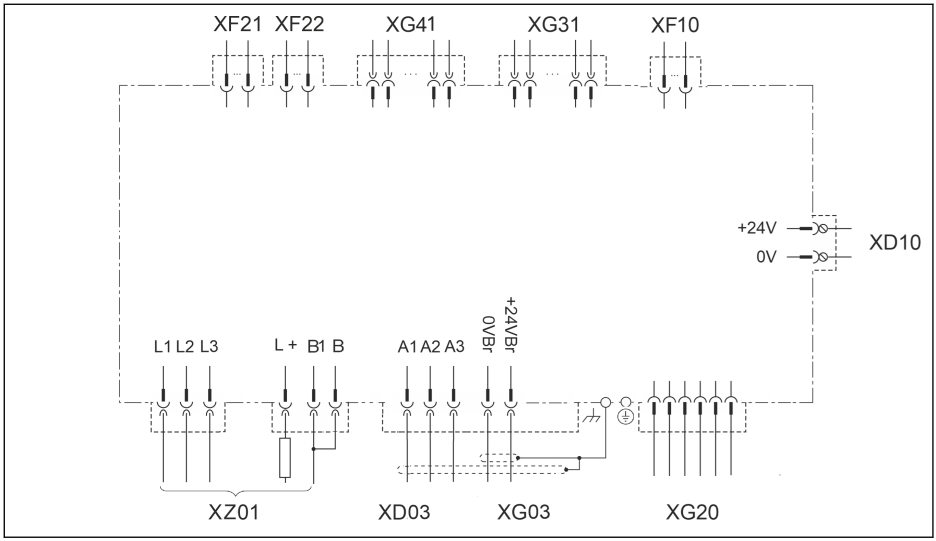
⚠ AVERTISSEMENT Danger de mort par électrocution par des pièces sous tension de plus de 50 V !

Risque de brûlures via surfaces de boîtier chaudes ! Risque d'incendie !

Le déclenchement du dispositif de protection du circuit de dérivation peut être dû à une coupure qui résulte d'un courant de défaut. Pour limiter le risque d'incendie ou de choc électrique, examiner les pièces porteuses de courant et les autres éléments du contrôleur et les remplacer s'ils sont endommagés. En cas de grillage de l'élément traversé par le courant dans un relais de surcharge, le relais tout entier doit être remplacé.

4.2 Connection

4.2.1 Overall connection diagram



XZ01	Main power supply input, external brake resistor	XG20	Encoder interface
XD10	24 V power supply (control voltage)	XG31	I/O terminal interface
XF21, XF22	Control communication interfaces	XG41	STO interface (optional)
XF10	Engineering communication interface	XG03	Motor brake interface
		XD03	Motor power interface

Fig. 4-1: Overall connection diagram

4.2.2 Symbols (connection diagram)

Symbol	Description
	Pin
	Female connector
	Male connector (pin at connector; female [device])
	Spring terminal (female [connector], pin at device)
	Screw terminal (female [connector], pin at device)
	Screw connection at device
	Electrical connection at device housing (e.g., for cable shield connection)

Tab. 4-1: Symbols (connection diagram)

5 Service and support

Our worldwide service network provides an optimized and efficient support. Our experts offer you advice and assistance should you have any queries. You can contact us 24/7.

Service

Our technology-oriented Competence Center in Shanghai, is responsible for all your service-related queries for electric drive and controls.

Contact the Service Hotline and Service Helpdesk under:

Phone:	+86 021-2091 7305
Fax:	+86 021-2091 7305
E-mail:	svf@boschrexroth.com.cn
Internet:	http://www.boschrexroth.com

Additional information on service, repair (e.g. delivery addresses) and training can be found on our internet sites.

Service worldwide

Outside CN, please contact your local service office first. For hotline numbers, refer to the sales office addresses on the internet.

Preparing information

To be able to help you more quickly and efficiently, please have the following information ready:

- Detailed description of malfunction and circumstances
- Type plate specifications of the affected products, in particular type codes and serial numbers
- Your contact data (phone and fax number as well as your e-mail address)

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