

User Guide

VX Remote I/O

EtherCAT/Profinet Coupler, Input and Output Modules

Part Number: 3101A068

Issue: 1

Original Instructions

For the purposes of compliance with the EU Machinery Directive 2006/42/EC, the English version of this manual is the Original Instructions.
Manuals in other languages are Translations of the Original Instructions.

Documentation

Manuals are available to download from the following locations: <http://www.drive-setup.com/ctdownloads>

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Registered Office

Nidec Control Techniques Ltd

**The Gro
Newtown
Powys
SY16 3BE
UK**

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Issue Number: 2

CONTROL TECHNIQUES



EU Declaration of Conformity

1. Product identification

Electronic input/ output modules

Bus Couplers
VX1200, VX1300
Digital input modules
VX1008, VX1018, VX1009, VX1019
Digital output modules
VX2008, VX2018, VX2009, VX2019, VX2208
Analogue input modules
VX3204, VX3008, VX3018, VX3304, VX3404
Analogue output modules
VX4204, VX4008, VX4018
Multifunction modules
VX5001, VX5002, VX5012
Communication modules
VX6201, VX6004
Power modules (including bus end cover)
VX6201, VX6004

2. Name and address of the manufacturer

Nidec Control Techniques Ltd, The Gro, Newtown, Powys, SY16 3BE, UK

Registered in England and Wales. Company Reg. No. 01236886

3. This declaration is issued under the sole responsibility of the manufacturer

4. The object of the declaration is in conformity with the relevant European Union harmonisation legislation.

Low Voltage Directive (2014/35/EU)

Electromagnetic Compatibility Directive (2014/30/EU)

Restriction of Hazardous Substances Directive (2011/65/EU).

5. References to the relevant harmonised standards used

The products listed above have been designed and manufactured in accordance with the following European harmonised standards:

6. Signed for and on behalf of:



Jon Holman-White
Vice President of Research and Development
Nidec Control Techniques Ltd
Date: 7th October 2019
Newtown, Powys, UK.

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1 Safety information

1.1 Warnings, Cautions and Notes



A Warning contains information which is essential for avoiding a safety hazard.

WARNING



A Caution contains information which is necessary for avoiding a risk of damage to the product or other equipment.

NOTE

A Note contains information which helps to ensure correct operation of the product.

1.2 Installation and Use

The information given in this publication is derived from tests and calculations on sample products. It is provided to assist in the correct application of the product, and is believed to correctly reflect the behaviour of the product when operated in accordance with the instructions. The provision of this data does not form part of any contract or undertaking. Where a statement of conformity is made with a specific standard, the manufacturer takes all reasonable measures to ensure that its products are in conformance. Where specific values are given these are subject to normal engineering variations between samples of the same product. They may also be affected by the operating environment and details of the installation arrangement.

The manufacturer accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation of the equipment.



WARNING - This warning applies to products intended to be used with variable speed drives.

The adjustable speed drive uses high voltages and currents, carries a high level of stored electrical energy, and is used to control mechanical plant which can cause injury.

Close attention is required to the electrical installation and the system design to avoid hazards either in normal operation or in the event of equipment malfunction.

System design, installation, commissioning and maintenance must be carried out by personnel who have the necessary training and experience. They must read this safety information and the instruction manual carefully.

Failure to observe the following instructions can cause physical injury or death, or damage to the equipment.

1.3 Enclosure

The drive is intended to be mounted in an enclosure which prevents access except by trained and authorized personnel, and which prevents the ingress of contamination.

It is designed for use in an environment classified as pollution degree 2 in accordance with IEC 60664-1. This means that only dry, non-conducting contamination is acceptable.

1.4 Competence of the installer

The drive must be installed by professional installers who are familiar with the requirements for safety and EMC. The installer is responsible for ensuring that the end product or system complies with all the relevant laws in the country where it is to be used.

1.5 Repairs

Users must not attempt to repair a drive if it is faulty. It must be returned to the supplier of the drive.

1.6 Electric Shock and Fire Hazards



WARNING - Dangerous voltage

Where products are supplied by or connected to mains voltages, the voltages used can cause severe electrical shock and/or burns, and could be lethal. Extreme care is necessary at all times when working with or adjacent to the equipment. Refer to the relevant documentation.

1.6.1 AC supply

The AC supply must be isolated before any servicing work is performed, other than adjustments to the settings or parameters specified in the manual.

1.6.2 Live terminals

Some types of signal and control lines carry hazardous voltages (120/240 V) and can cause severe electric shock and may be lethal.

1.6.3 Isolation device

The AC supply must be removed from the drive using an approved isolation device before any servicing work is performed, other than adjustments to the settings or parameters specified in the manual.

1.6.4 Stored charge

The drive contains capacitors that remain charged to a potentially lethal voltage after the power supply has been disconnected. If the drive has been energized, the power supply must be isolated at least ten minutes before work may continue.

1.7 Electrical installation

1.7.1 Protective Ground (Earth) connection

The ground loop impedance must conform to the requirements of local safety regulations. The drive must be grounded by a connection capable of carrying the prospective fault current until the protective device (fuse or circuit breaker) disconnects the supply. The ground connections must be inspected and tested at appropriate intervals.

1.7.2 Fuses

The supply to the drive must be installed with suitable protection against overload and short-circuits. The tables in the relevant documentation show recommended fuse ratings. Failure to observe these installation instructions could result in fire.

1.7.3 Cables

The cable sizes in the relevant documentation are only a guide. The mounting and grouping of cables affects their current-carrying capacity, in some cases smaller cables may be acceptable but in other cases a larger cable is required to avoid excessive temperature or voltage drop. Refer to local wiring regulations for the correct size of cables. Failure to observe these installation instructions could result in fire.

1.7.4 Terminal connections and torque settings

Loose power connections can be a fire risk. Always ensure that terminals are tightened to the specified torques. Refer to the tables in the relevant documentation.



WARNING - Fire Risk

Braking resistors operate at very high temperatures for short periods. The following precautions are essential to avoid the risk of fire in the event of unexpectedly high braking energy or loss of control of the braking circuit.

- Locate the braking resistor so that inadvertent personal contact with hot surfaces is not possible
- Do not mount braking resistors on a combustible surface
- Provide adequate ventilation
- Mount the braking resistor or reactor in the orientation specified in the data sheet
- The metal case of the braking resistor must be grounded
- Use cable with insulation that is capable of withstanding high temperatures

Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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- Provide independent protection against a loss of control by the braking control system in the drive - refer to the relevant documentation.

1.7.5 High voltage insulation (flash) testing

High voltage insulation (flash) testing should not be carried out on the drive.

1.7.6 ELV terminals

The control terminals are only single insulated from the mains supply, and hence must be prevented from human contact by an additional isolation barrier, for example a terminal cover.

1.7.7 SELV terminals

Drive terminals that are SELV can be safely connected to other SELV equipment.

ELV terminals require an additional insulation barrier between them and other SELV equipment if it is unacceptable to compromise the SELV classification of the SELV equipment.

1.7.8 Products connected by plug and socket

An electric shock hazard exists if the drive is supplied via a plug and socket. When unplugged, the pins of the plug may carry a potentially lethal voltage until the internal capacitors have discharged. This can take up to 10 minutes.

It is recommended that a shrouded plug is used that complies with IEC 60309. If the use of a shrouded plug is not possible, then to avoid any possibility of electric shock from the pins, a means must be provided for automatically isolating the plug from the drive (for example a latching relay).

1.8 Setting up, commissioning and maintenance



It is essential that changes to the drive settings are given careful consideration. Depending on the application, a change could have an impact on safety. Appropriate precautions must be taken against inadvertent changes or tampering. Some specific settings which require particular care are listed below. This is not an exclusive list. Other settings may have an impact on safety in specific applications.

1.8.1 Lifting and handling

Many of the drives weigh in excess of 15 kg (33 lb). Use appropriate safeguards when lifting these models. A full list of drive weights can be found in the installation instructions.

1.8.2 Output circuit and motor protection

The Motor Rated Current parameter must be set correctly to avoid a risk of overheating and fire in the event of motor overload. In some applications motor temperature protection may also be required.

1.8.3 STOP, Enable and Safe Torque Off functions (where applicable)

These functions do not remove dangerous voltages from the equipment or any external option unit, nor do they isolate the motor from dangerous voltages.

Automatic start

Some parameter settings may cause the motor to start unexpectedly.

Restore default parameter set

Depending on the application, this may cause unpredictable or hazardous operation.

1.9 Safety of machinery, safety-critical applications

Within the European Union all machinery in which this product is used must comply with Machinery Directive 2006/42/EC.

The design of safety-related control systems must only be done by personnel with the required training and experience. The Safe Torque Off function will only ensure the safety of a machine if it is correctly incorporated into a complete safety system. The system must be subject to a risk assessment to confirm that the residual risk of an unsafe event is at an acceptable level for the application.

1.10 Electromagnetic compatibility (EMC)

The product is designed to comply with international standards in a typical installation. Installation instructions are provided in the *Power Installation Guide* and EMC data sheet. If the installation is poorly designed or other equipment does not comply with international standards for EMC, the product might cause or suffer from disturbance due to electromagnetic interaction with other equipment. It is the responsibility of the installer to ensure that the equipment or system into which the product is incorporated complies with the relevant EMC legislation in the country of use.

Within the European Union, equipment into which this product is incorporated must comply with the Electromagnetic Compatibility Directive 2014/30/EU.

1.11 Copyright

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EtherCAT is a registered and patented technology licensed by Beckhoff Automation GmbH, Germany.

Profinet is a trademark and patented technology licensed by the PROFIBUS & PROFINET International user organisation(PI).

2 Mechanical installation

Figure 2-1 Bus Coupler in unlocked position

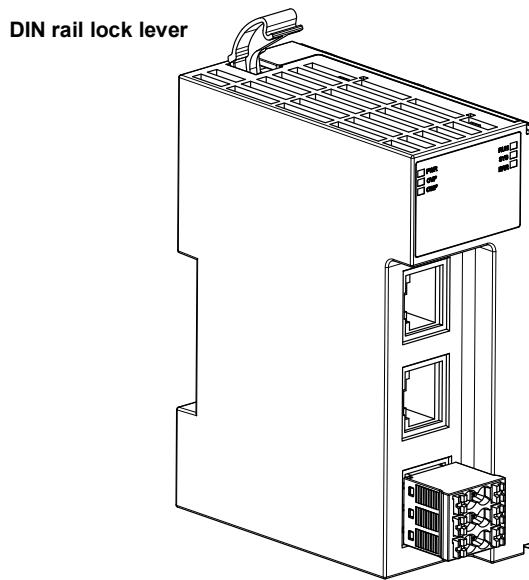


Figure 2-2 Bus Coupler with DIN rail fixed in place and locked position

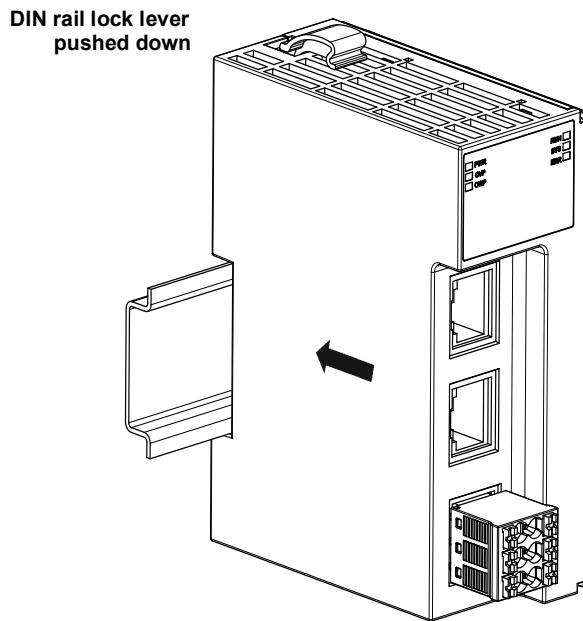
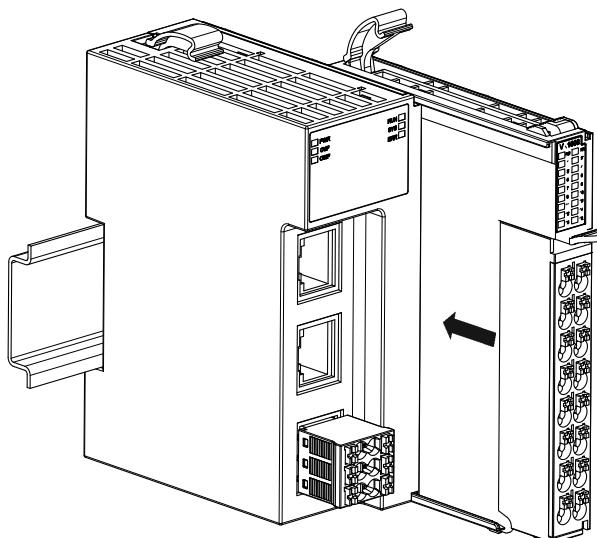
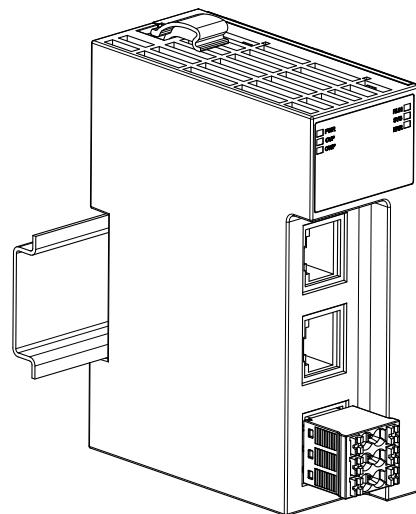


Figure 2-3 Adding an additional I/O Module to the Bus Coupler



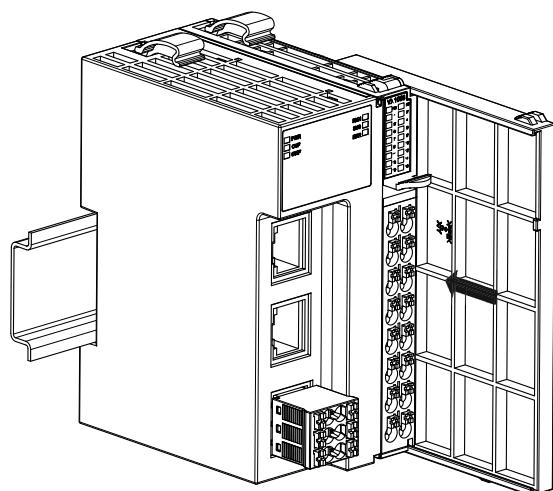
- Slide the I/O Module in the direction shown to attach it to the Bus Coupler (1).
- Align the 6 gold pins on the I/O Module into the slots of the Bus Coupler (2).

Figure 2-4 Locking the I/O Module onto the DIN rail



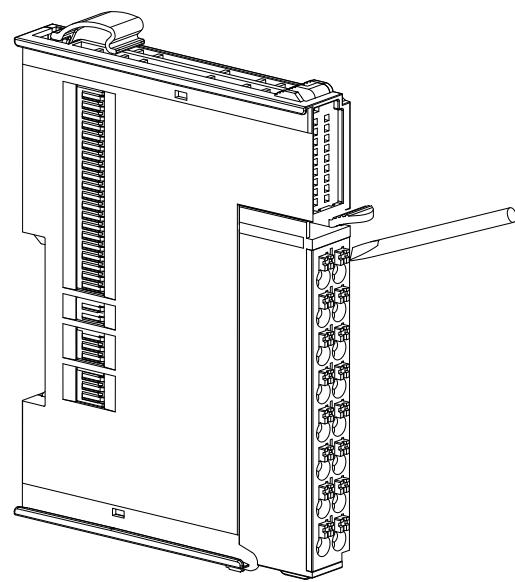
- Rotate the bottom DIN rail lock lever back into the I/O Module body to lock the module to the DIN rail as shown above.

Figure 2-5 Attaching the End Cover to the final I/O Module



- Attach the End Cover to the final I/O Module by sliding in direction shown (1).

Figure 2-6 Wiring the connector within the I/O Module



- Push the Insertion tool into the rectangular slot as shown above (1).
- Insert stripped wire into the circular terminal connection, then release / remove the insertion tool to hold wire in place (2).

Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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Figure 2-7 Removing the Connector from the I/O Module or BusCoupler

- Pull the tab in the direction shown to release the Connector from the I/O Module (1).
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-
-
-
-
-

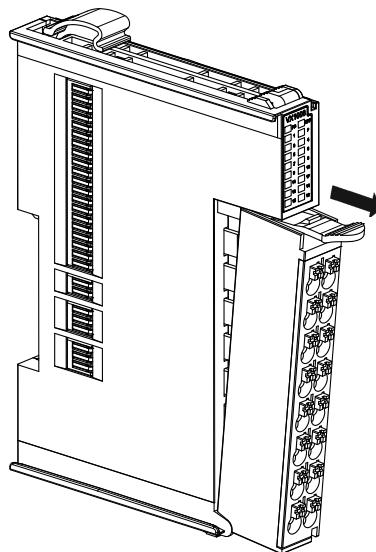
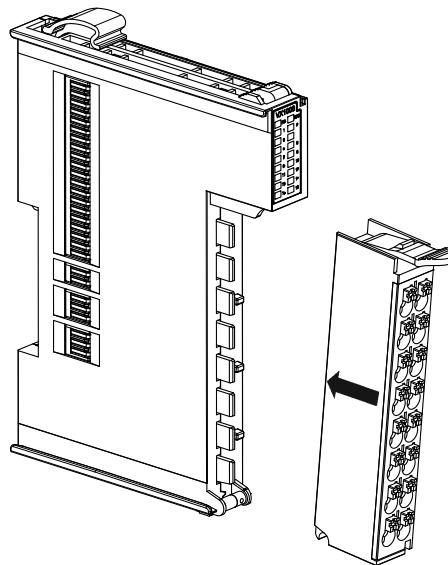


Figure 2-8 Installing the Connector to the I/O Module or Bus Coupler

- The Connector is installed by aligning the circular cut out on the Connector onto the rounded equivalent piece of the I/O Module (1).



2.1 Installation space

Figure 2-9 Minimum distances for horizontal installation

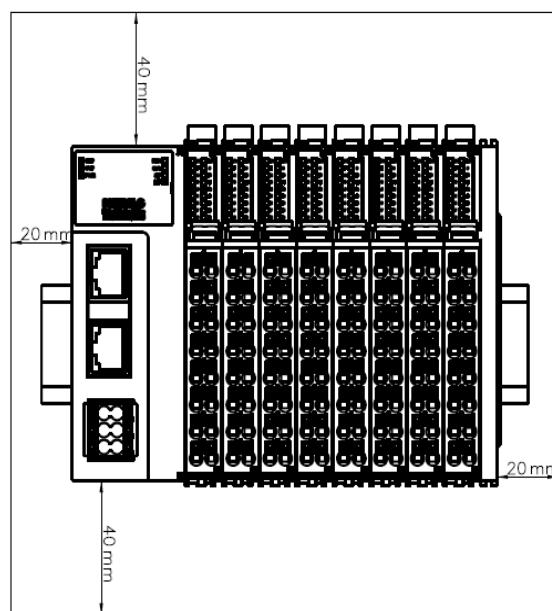
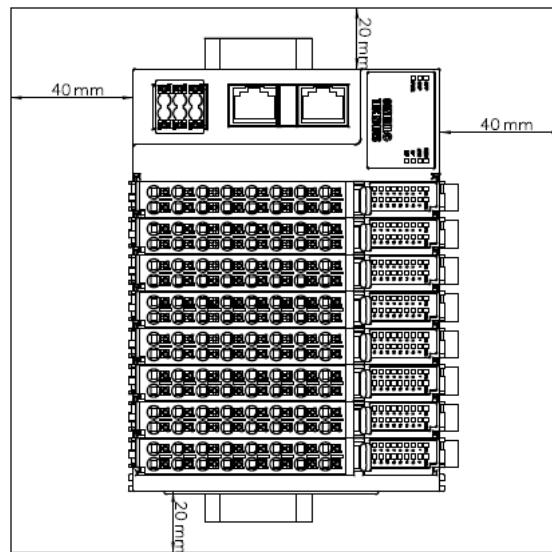


Figure 2-10 Minimum distances for vertical installation



3 Product information

3.1 Product list

	Category	Type	Order Code	Description
1	Bus Coupler	VX1200	0150A000	EtherCAT Coupler
2		VX1300	0150A001	PROFINET Coupler
3	Digital Input	VX1008	0231A024	8CH Digital Input-PNP
4		VX1018	0231A025	8CH Digital Input-NPN
5		VX1009	0231A026	16CH Digital Input-PNP
6		VX1019	0231A027	16CH Digital Input-NPN
7	Digital Output	VX2008	0231A028	8CH Digital Output-PNP
8		VX2018	0231A029	8CH Digital Output-NPN
9		VX2009	0231A030	16CH Digital Output-PNP
10		VX2019	0231A031	16CH Digital Output-NPN
11		VX2208	0231A032	8CH Relay output
12	Analog Input	VX3204	0231A033	4CH Voltage/Current configurable analog input (16bit resolution)
13		VX3008	0231A034	8CH Voltage input
14		VX3018	0231A035	8CH Current input
15		VX3304	0231A036	4CH RTD input
16		VX3404	0231A037	4CH TC input
17	Analog Output	VX4204	0231A038	4CH Voltage/Current configurable analog output
18		VX4008	0231A039	8CH Voltage output (16bit resolution)
19		VX4018	0231A040	8CH Current output (16bit resolution)
20	Multifunctional	VX5001	0231A041	1CH incremental encoder interface,differential
21		VX5002	0231A042	2CH incremental encoder interface,24V/PNP
22		VX5012	0231A043	2CH incremental encoder interface,24V/NPN
23	Communication	VX6201	0231A044	1CH RS485 or 1CH RS232
24		VX6004	0231A045	4CH communication interface, IO-Link, master
25	System	VX9001	0231A046	Bus end cover
26		VX9521	0231A047	Power supply terminal 5V/2A
27		VX9008	0231A048	Voltage distribution module 24V/8-channel

3.2 Introduction

The EtherCAT Coupler connects EtherCAT, the real-time Ethernet system, with the modular, extendable electronic terminal blocks. A unit consists of a Bus Coupler, and one end terminal.

The Bus Coupler recognises the connected Bus Terminals and automatically allocates them into the EtherCAT process image. The Bus Coupler is connected to the network via the upper Ethernet interface. The lower RJ 45 socket may be used to connect further EtherCAT devices in the same strand.

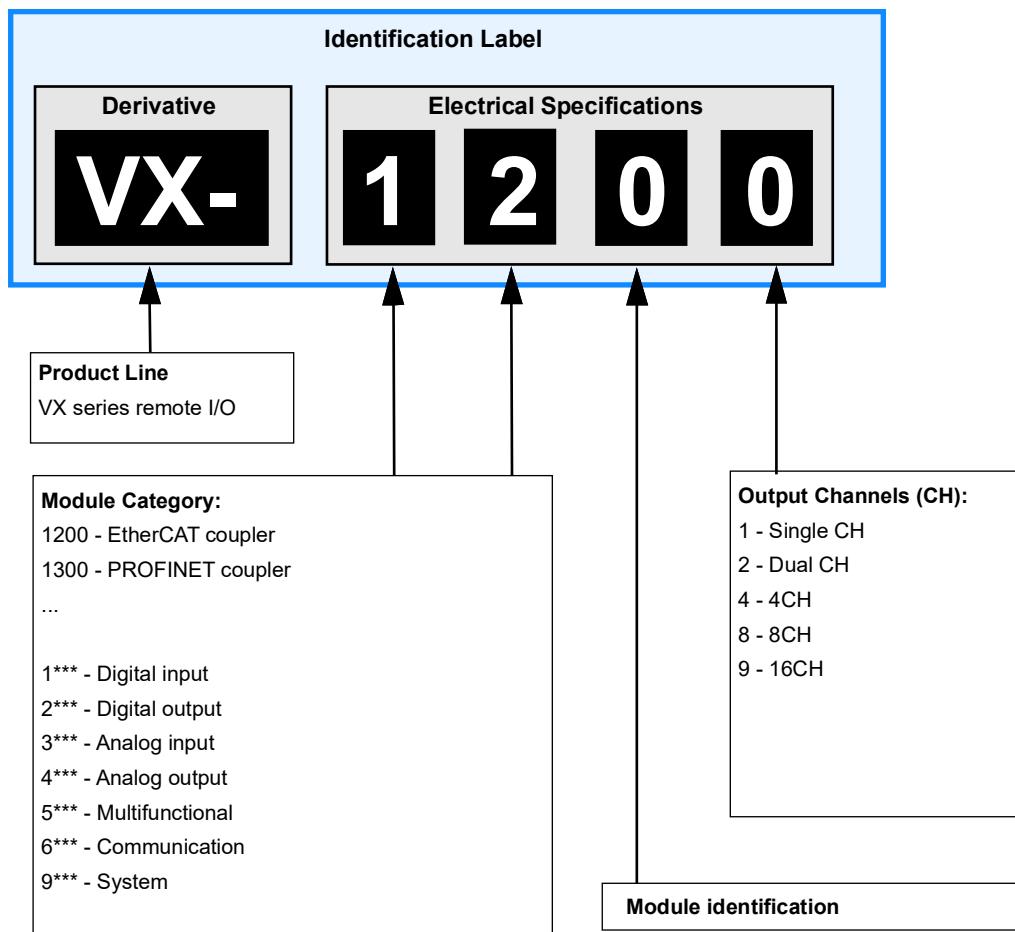
In the EtherCAT network, the EtherCAT Coupler can be installed anywhere in the Ethernet signal transfer section (100BASE-TX) – except directly at the switch.

EtherCAT (Ethernet Control Automation Technology) is the Ethernet solution for industrial automation, characterized by outstanding performance and particularly simple handling. EtherCAT enables the Ethernet star topology to be replaced with a simple line structure. Optionally, EtherCAT may also be wired in the “classic” way using switches, in order to integrate further Ethernet devices. The master requires no special plug-in card and can be implemented on any existing Ethernet controller using a very simple interface. EtherCAT is therefore also well suited to small and medium control applications, where it will also open up new areas of application for distributed I/Os.

3.3 Model number

The way in which the model numbers for the VX remote I/O are formed is illustrated below:

Figure 3-1 Model number



3.4 Rating information

Figure 3-2 Side etched label (Bus coupler)

- 1.Control Techniques Logo
- 2.Serial number
- 3.Product model
- 4.Product specification
- 5.Coupler protocol logo
- 6.Manual download QR code
- 7.Manufacturer control QR code
- 8.Manual
- 9.PASS logo
- 10.Wiring indication
- 11.WEEE and CE logo
- 12.LED cover

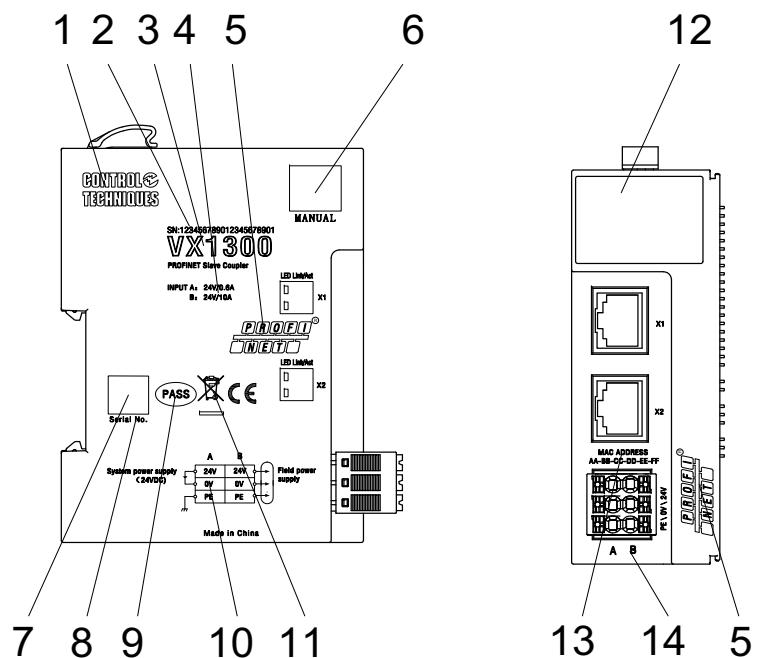
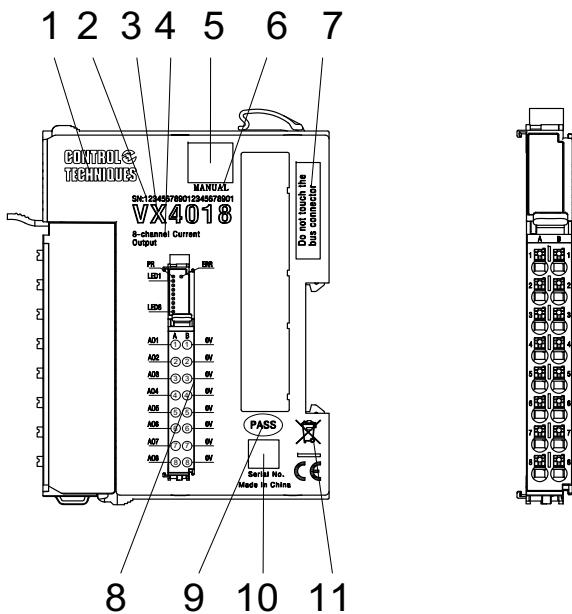
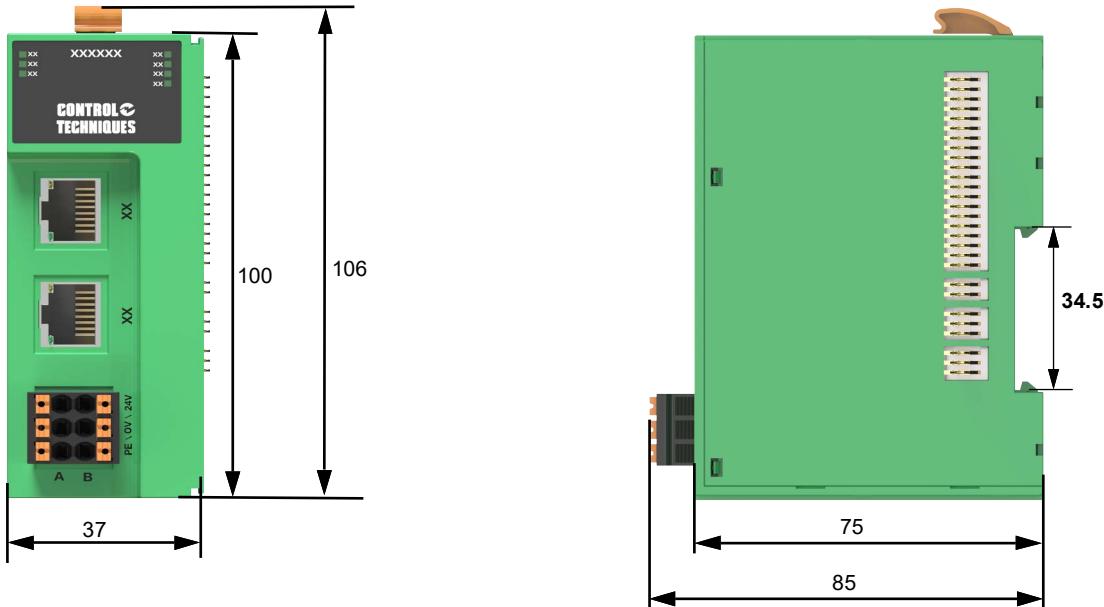


Figure 3-3 Side etched label (AI,AO,DI,DO,Comms etc. module)

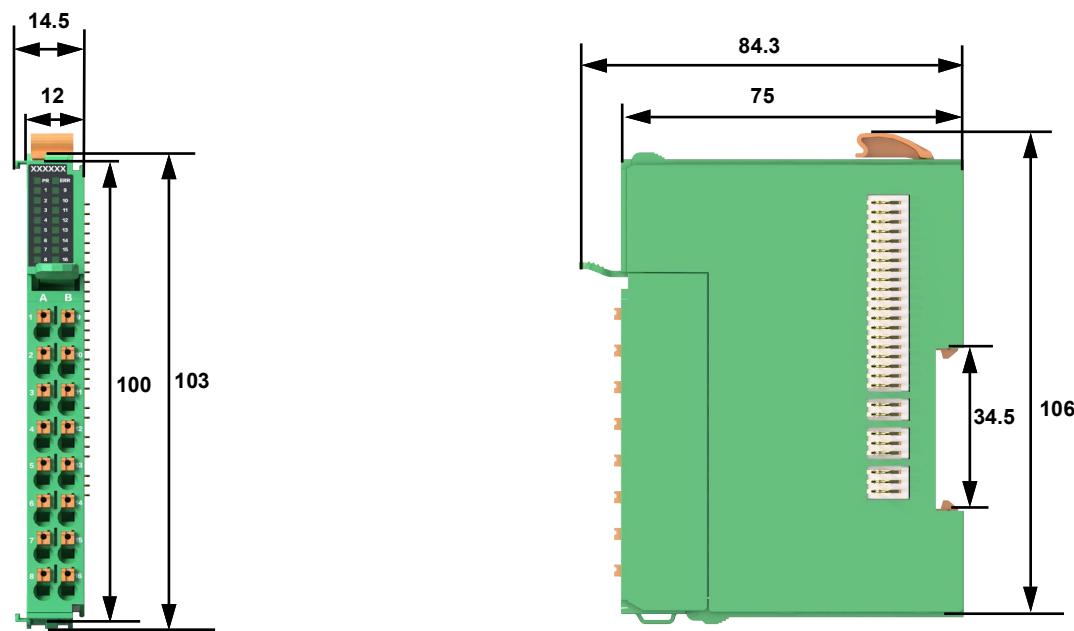
- 1.Control Techniques Logo
- 2.Serial number
- 3.Product model
- 4.Product specification
- 5.Manual download QR code
- 7.Warning label
- 8.Wiring indication
- 9.PASS logo
- 10.Manufacturer control QR code
- 11.WEEE and CE logo



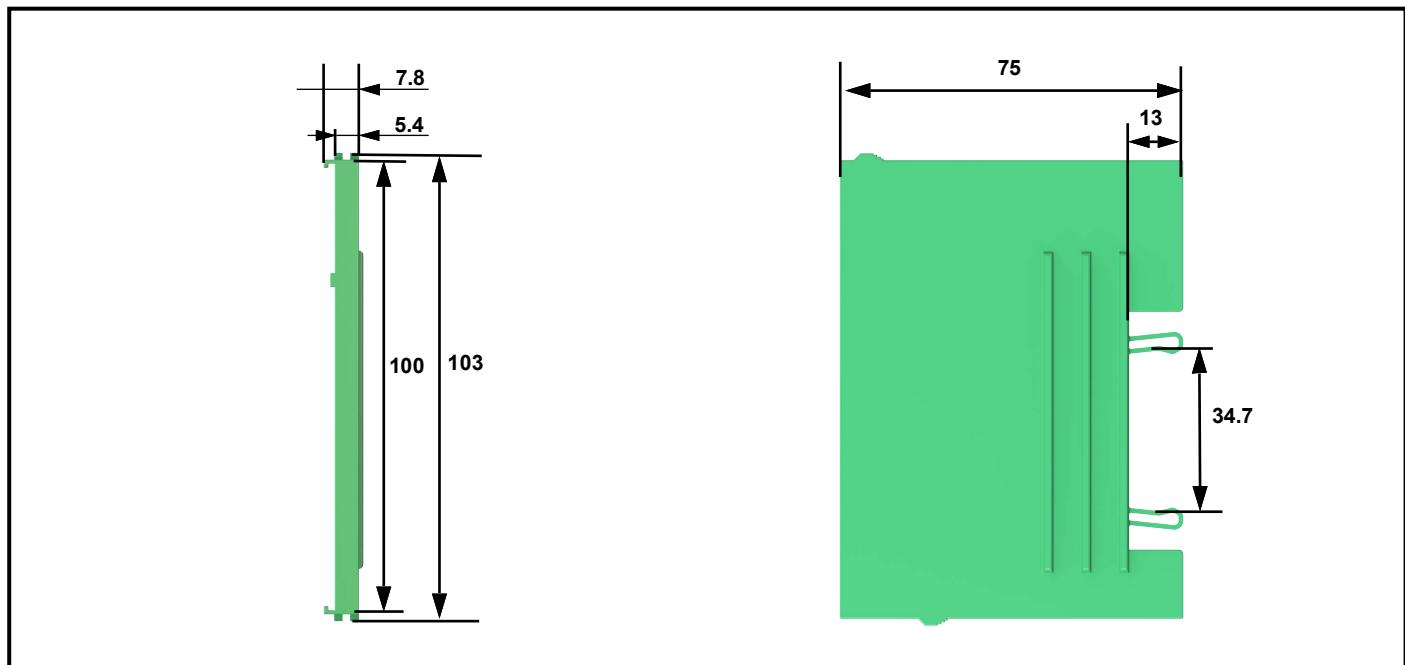
3.5 Dimensions (Couplers ;Unit(mm))



3.6 Dimensions (all other modules excluding Couplers and Bus end cover;Unit(mm))



3.7 Dimensions (Bus end cover; Unit(mm))



Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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4 Electrical installation

4.1 Power supply requirements

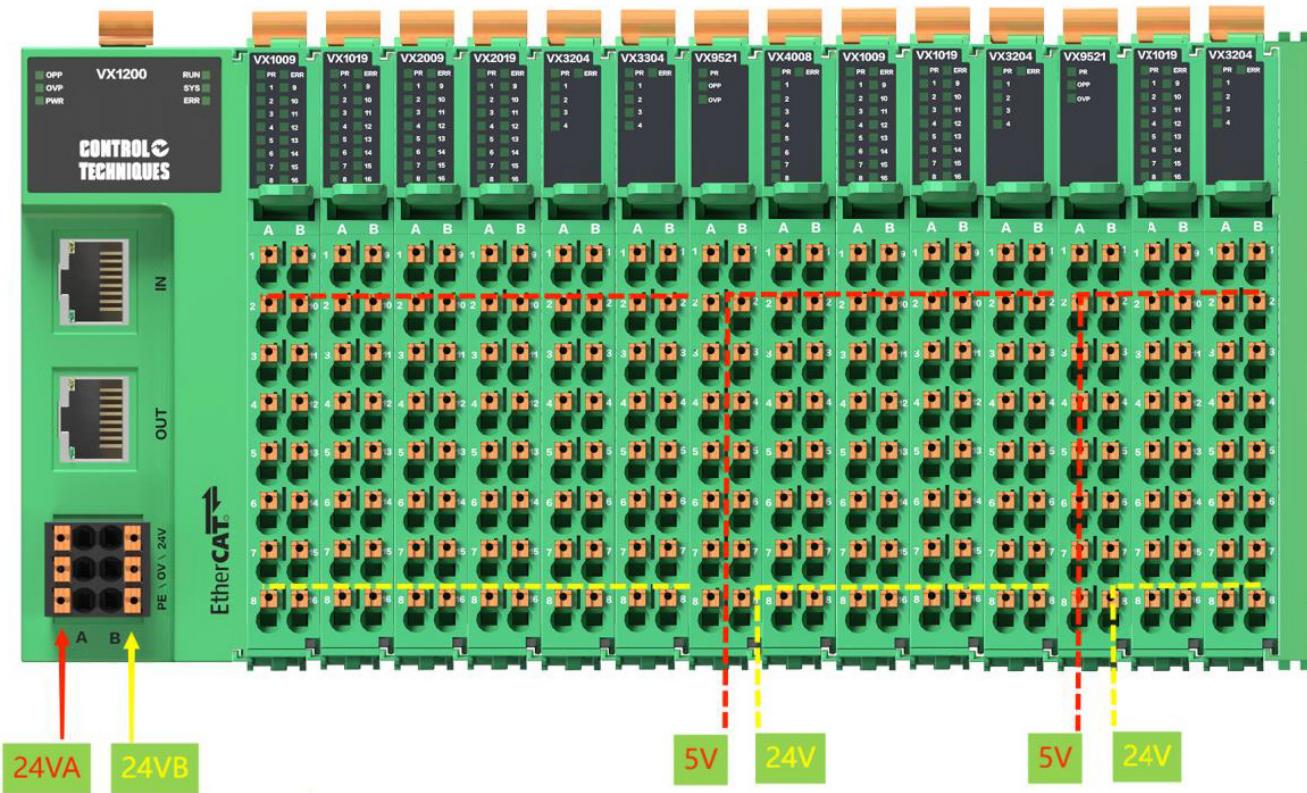
The I/O210-BC Bus Coupler provides user connections for "system power", "field power" and "field ground".

Refer to the individual Bus Coupler sections for details of connection

NOTE

System and Field power must be supplied from separated power supplies.

Figure 4-1 Current path



Note: 24VA internal to 5V to power the coupler and IO module (System Power); 24VB powers the IO module (Field Power).

Power supply concept with fieldbus coupler:

The VX system uses two internal current paths. A standard fieldbus coupler supplies the system and the field power bus path separated via two connections galvanically. This field power enables a separate supply for sensors and actuators. The system power supply is limited by a maximum value. This value depends on the fieldbus coupler used. If the sum of the system current consumption of all the I/O modules should exceed this value, an additional system power supply module is necessary. Furthermore, if the current consumption of field-side exceeds 10A. A custom-fit refreshing to re-feeding the power and creating potential group by power-feed modules is easily feasible. The figure shows the general supply concept. For detailed description and calculation of the current demand please regard figure 4-3.

Figure 4-2 Each model and current consumption

Name	Model	Maximum current consumption/ A (DC5V)
Profibus	VX1300	0.37584

Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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EtherCAT	VX1200	0.33264
digital Input	VX1009	0.047
	VX1019	0.047
digital output	VX2009	0.038
	VX2019	0.038
Analog Input	VX3204	0.181
	VX3304	0.11
	VX3404	0.061
	VX3018	0.090
Analog output	VX4008	0.26
	VX4018	0.079
Power Module	VX5002	0.066
	VX5012	0.069
Interaction module	VX6201	0.054
Power supply module	VX9521	0
	VX9008	0

Figure 4-3 If the total current demand exceeds 10A, additional power supply is required, as shown below for examples

Module no.	Module type	Current requirement of connected devices(A)	Simultaneity factor	Current following calculation of simultaneity factor per module	Current requirement of system cumulative(A)	Current requirement of system cumulative with PF
1st module	VX2009	0.7	0.5	0.35	0.35	0.35
2nd module	VX2009	0.4	0.4	0.16	0.51	0.51
3rd module	VX2009	0.5	0.7	0.35	0.86	0.86
4th module	VX2009	1.0	1.0	1.0	1.86	1.86
5th module	VX2009	2.0	0.5	1.0	2.86	2.86
6th module	VX2009	1.0	0.7	0.7	3.56	3.56
7th module	VX2009	2.0	0.6	1.2	4.76	4.76
8th module	VX2009	0.7	0.8	0.56	5.32	5.32
9th module	VX2009	2.0	1.0	2.0	7.32	7.32
10th module	VX2009	1.5	0.8	1.2	8.52	8.52
11th module	VX2009	0.7	1.0	0.7	9.22	9.22
	VX9521					
12th module	VX2009	0.9	1.0	0.9	10.12	0.9
13th module	VX2009	2.0	0.5	1.0	11.12	1.9
14th module	VX2009	0.5	0.8	0.4	11.52	2.3

Note: (1) Current requirement of connected devices: The total current output of the same module will be different with different loads.

(2) Simultaneity factor: Under the same module, the connected devices may do not work at the same time, so the simultaneity factor is the quotient of the maximum current and the total current under the module.

(3) Current following calculation of Simultaneity factor per module=Current requirement of connected devices * Simultaneity factor.

An example uses a row of VX2009 (16 PNP output) modules. The actual demand current and the location of the feed module are determined by the mathematical combination of the current demand of the field-connected sensor and the simultaneity factor of the output port.

Since the sum of current requirements in the 12th rank exceeds 10A in the table above, it is necessary to install a feed module after the 11th position.

Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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For example:

Simultaneity factor is for field power 24V, the power supply capacity of the coupler is 10A, assuming with 4 DO modules, the maximum load current of each DO module (Current requirement of connected devices) is 4A, but the Simultaneity factor is only 50%. That is, the Current following calculation of simultaneity factor per module is 2A, and the Current requirement of system—cumulative is 8A, so that there is no need for the feed module VX9521. If the cumulative load current exceeds 10A in this way, you need to add the feed module VX9521.

5 EtherCAT & PROFINET Bus Coupler

5.1 VX1200/VX1300 introduction

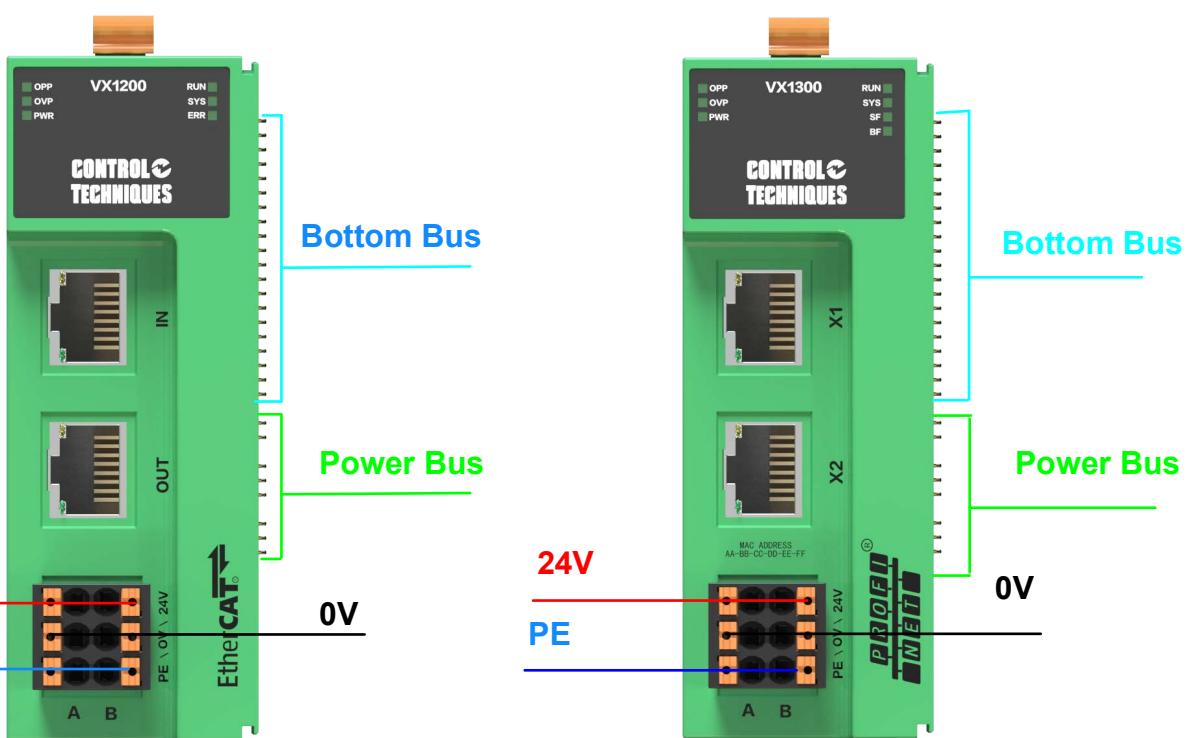


Table 5-1 Pin Description

Pin number	EtherCAT Signal description	PROFINET Signal description
A1	System Power, 24 V	
B1	Field Power, 24 V	
A2	System Power, 0 V	
B2	Field Power, 0 V	
A3	Functional Ground	
B3	Functional Ground	



The modules are not hot swappable and must not be removed when the power is on.



System and Field power must be supplied from separated power supplies.

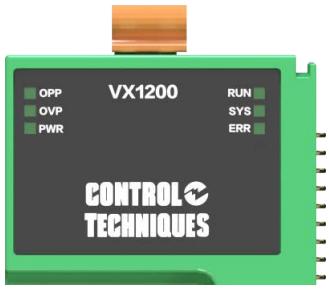
Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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5.2 Specification

		EtherCAT	PROFINET
Environmental specifications			
Operating temperature		-20 °C to 60 °C	
Storage temperature		-40 °C to 85 °C	
Relative humidity		5 % to 95 % non-condensing	
Operating altitude		2000 m	
Mounting		DIN rail	
Input specification			
Adapter Type	EtherCAT	PROFINET	
Maximum Expansion Module		32 slots	
Maximum Length Bus Line	Up to 100 m from EtherCAT switch	Up to 100 m from PROFINET switch	
Maximum Nodes	Limited by EtherCAT specification	Limited by PROFINET specification	
Refresh performance 1-16 IO	6 ms to refresh 128 bytes		
Refresh performance 17-32 IO	10 ms to refresh 128 bytes		
Baud Rate	10/100 Mbps, Auto-negotiation, Full duplex		
Protocol	EtherCAT	PROFINET	
Station-Address Set-up	Configuration through the master		
Interface Connector	RJ45 socket x 2		
Indicator	6 LEDs	7 LEDs	
	1 Green, Field Power Status (PWR)	(PWR) 1 Green, Field Power Status	
	1 Red, O ver Power Pointor (OPP)	(OPP) 1 Red, O ver Power Pointor	
	1 Red, Over Voltage Pointor (OVP)	(OVP) 1 Red, Over Voltage Pointor	
	1 Green, Bus Coupler's Status (RUN)	(RUN) 1 Green, Bus Coupler's Status	
	1 Green, System Status (SYS)	(SYS) 1 Green, System Status	
	1 Red, System Error (ERR)	(SF)	
		(BF)	
Field Power Detection	Approximately 14 Vdc		
General specifications			
System Power	Supply Voltage: 24 Vdc nominal Supply Voltage Range: 18 to 36 Vdc protection Output Current limit (minimum 2.0A) Reverse polarity protection		
Power Dissipation	300 mA typical @ 5 Vdc	350 mA typical @ 5 Vdc	
Shock operating	IEC 60068-2-27		
Vibration resistance	Sine Vibration (Based on IEC 60068-2-6) •5 Hz ≤ f ≤ 8.4 Hz: 3.5 mm amplitude •8.4 Hz < f ≤ 150 Hz: 1 g acceleration		
Flammability ratings	UL 94 V-0		
Current for I/O Module	1.7A @ 5 Vdc	1.65A @ 5 Vdc	
EMC Resistance Burst/ESD	EN 61000-6-2: 2019 EN 61000-6-4:2019		
Ingress Protection	IP20		
Product certifications	CE		
Isolation	System power to internal logic: Non-isolation System power I/O driver: Isolation		
Field Power	Supply Voltage: 24 Vdc nominal (Maximum 32 Vdc) Field Power Range is different depending on I/O Module series, Refer to I/O Modules Specification		
Maximum Current Field Power	DC 10 A Max		
Weight	130g		
Module size	37 mm x 75mm x 100 mm		

5.3 VX1200(EtherCAT) LED Indicator

Figure 5-1 LED Indicator



	Number	LED COLOR	LED Function	OFF Signal		ON Signal	
	OVP		Over Voltage Pointor	LED OFF	Normal Voltage	LED Red	Overvolatage
	OPP		Over Power Pointor	LED OFF	Normal Power	LED Red	Overpower
	PWR		System Power	LED OFF	Power off	LED Green	Operational state
	RUN		Bus Coupler's Status	LED OFF	no expansion module or no power	LED green LED Flashing Green	Exchanging I/O data Pre-Operation
	SYS		System Status	LED OFF	IO Not Running	LED Flashing Red Green(1Hz) LED Flashing Red Green(5Hz)	Normal Communication IO Lost
	ERR		System Error	LED OFF	IO Not Normal	LED Green	EtherCAT Communication Abnormal

5.4 VX1300(PROFINET) LED Indicator

Figure 5-2 LED Indicator



	Number	LED COLOR	LED Function	OFF Signal		ON Signal	
	OVP		Over Voltage Pointor	LED OFF	Normal Voltage	LED Red	Overvolatage
	OPP		Over Power Pointor	LED OFF	Normal Power	LED Red	Overpower
	PWR		System Power	LED OFF	Power off	LED Green	Operational state
	RUN		Run Status	LED OFF	no expansion module or no power	LED green	Exchanging I/O data
	SYS		System Status	LED OFF	IO Not Running	LED Flashing Green Green(1Hz) LED Flashing Green Green(5Hz)	Normal Communication IO Lost
	SF		Profinet Diagnostic State	LED OFF	Normal Power	LED Red	Diagnostic
	BF		Link State	LED OFF	Normal Power	LED Red LED Flashing	Diagnostic NO find IO

5.5 VX1200 &VX1300 RJ-45 Socket

RJ-45	Signal name	Description
1	TD+	Transmit+
2	TD-	Transmit-
3	RD+	Receive+
4	-	-
5	-	-
6	RD-	Receive-
7	-	-
8	-	-
Case	Shield	-



The modules are not hot swappable and must not be removed when the power is on.



System and Field power must be supplied from separated power supplies.

6 Digital Input

6.1 VX1008 / 1018 / 1009 / 1019 Digital Input (24V/PNP/24V/NPN)

Figure 6-1 VX1008(24V PNP 8Points)

Figure 6-2 VX1018(24V NPN 8Points)

Figure 6-3 VX1009(24V PNP 16Points)

Figure 6-4 VX1019(24V NPN 16Points)

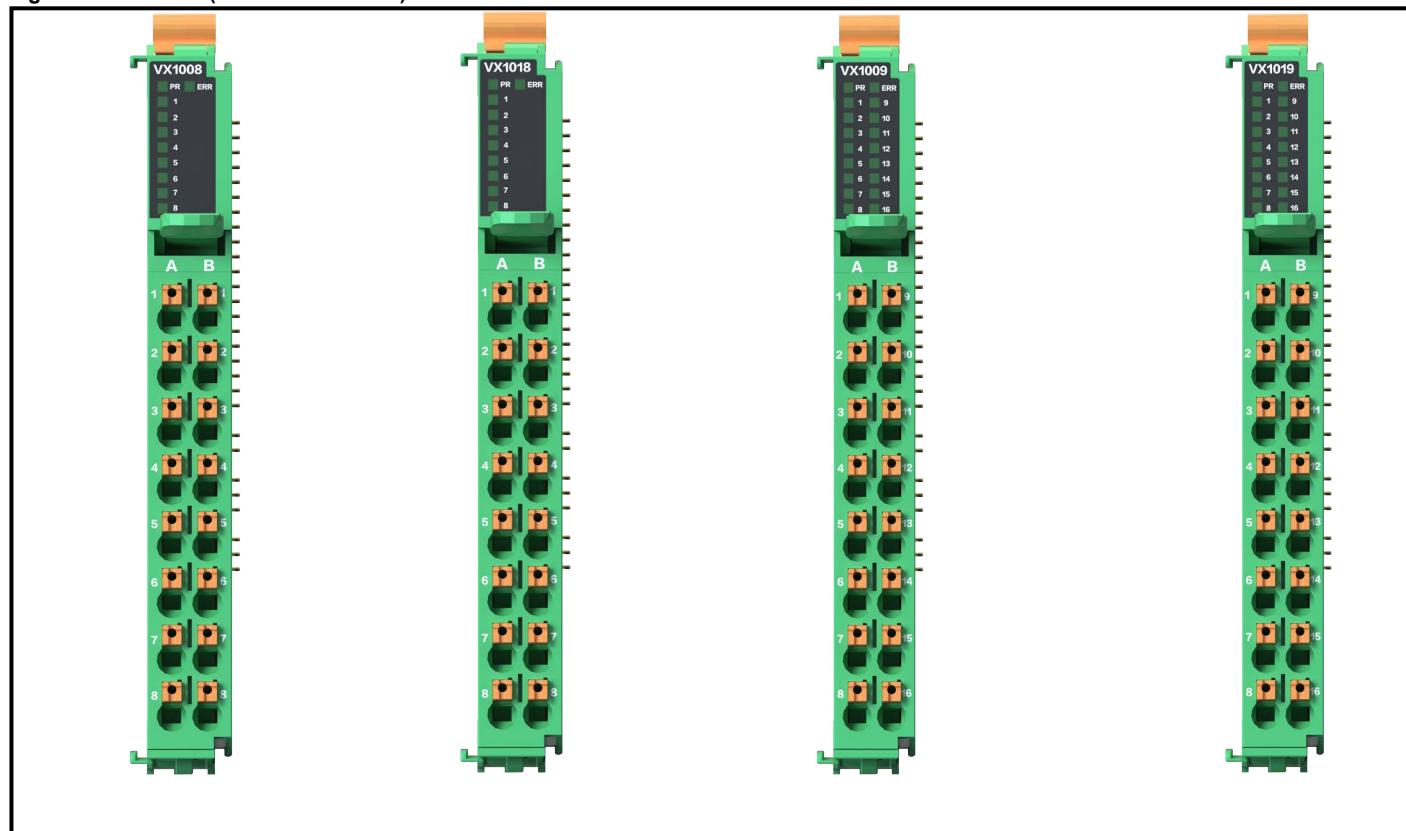
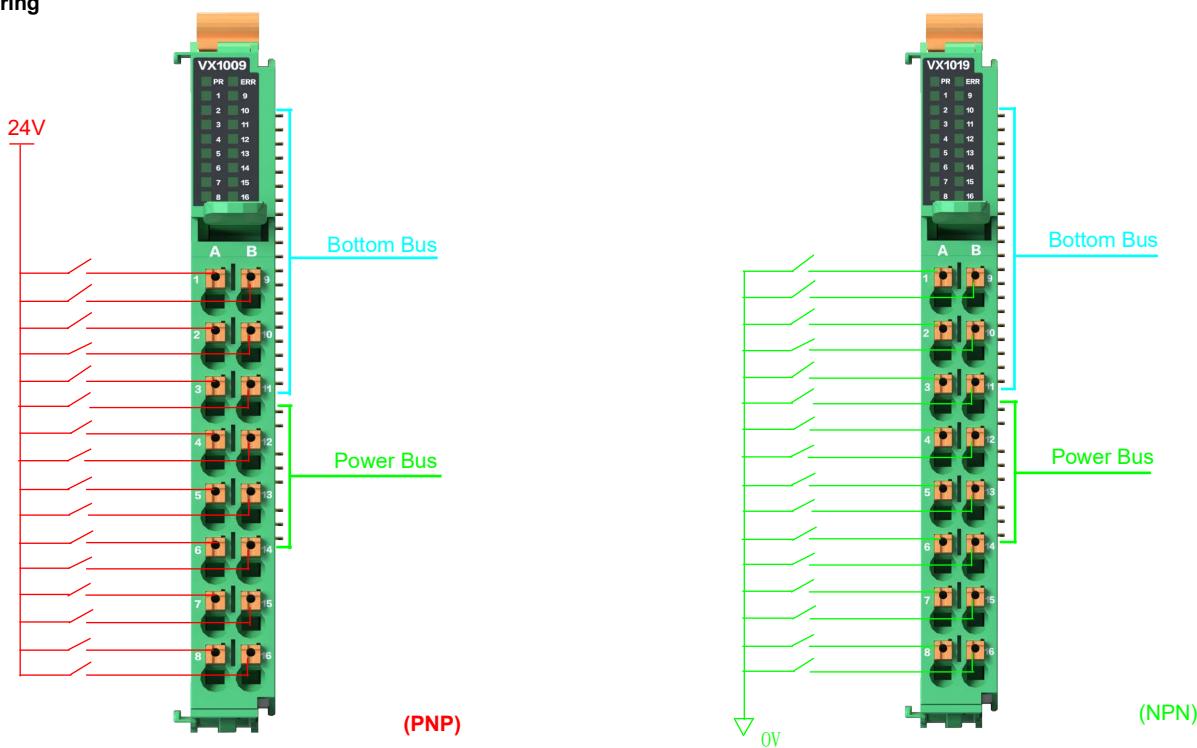


Figure 6-5 Wiring



Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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Table 6-1 Specification

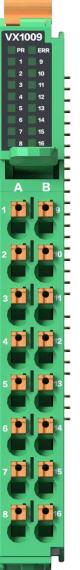
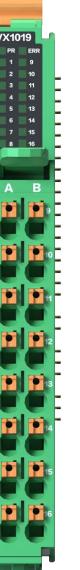
	VX1008	VX1018	VX1009	VX1019
Environmental specifications				
Operation temperature		-20 °C to 60 °C		
Storage temperature		-40 °C to 85°C		
Relative humidity		5 % to 90 % non-condensing		
Mounting		DIN rail		
Input specifications				
Inputs Per Module	8 Points Sink Type (Positive Logic)	8 Points Source Type (Negative Logic)	16 Points Sink Type (Positive Logic)	16 Points Source Type (Negative Logic)
Indicators(Input Status)	8 Green LEDs		16 Green LEDs	
ON-state Voltage	24 Vdc (Min. 15 Vdc to Max. 32 Vdc)	-15 Vdc (Min. 15 Vdc to Max. 30 Vdc)	24 Vdc (Min. 15 Vdc to Max. 32 Vdc)	-15 Vdc (Min. 15 Vdc to Max. 30 Vdc)
ON-state Current		Max. 3mA / point @ 30 Vdc		
OFFstate voltage	5 Vdc @ 25 °C	-5 Vdc @ 25 °C	5 Vdc @ 25 °C	-5 Vdc @ 25 °C
Input Signal Delay		OFF to ON: Max. 0.2 ms. ON to OFF: Max. 0.2 ms		
Input Filter		Adjustable, up 1 to 10 ms, default 3ms		
Nominal Input Impedance	5.1kΩ typical	10.2kΩ typical	5.1kΩ typical	10.2kΩ typical
Common Type		1 Common,Common(AGND)		
General specifications				
Shock operating		IEC 60068-2-27		
Vibration resistance		Based on IEC 60068-2-6 Sine Vibration •5 Hz ≤ f ≤ 8.4 Hz: 3.5 mm amplitude •8.4 Hz < f ≤ 150 Hz: 1g acceleration		
Industrial Emissions		EN 61000-6-4: 2019		
Industrial Immunity		EN 61000-6-2: 2019		
Installation position		Vertical and horizontal installation is available		
Certificates		CE		
Power Dissipation		Max. 55 mA @ 5 Vdc		
Isolation		opto-coupler		
Field Power		Supply Voltage: 24 Vdc nominal Voltage Range: 15 to 32 Vdc Power Dissipation: 3 mA/channel @ 24 Vdc		
Wiring		I/O Cable Max. 1 mm ²		
Weight		60 g		
Module size		12 mm x 75 mm x 100 mm		
Pin Description				
1	Input Channel 1	Input Channel 1	Input Channel 1	Input Channel 1
2	Input Channel 2	Input Channel 2	Input Channel 2	Input Channel 2
3	Input Channel 3	Input Channel 3	Input Channel 3	Input Channel 3
4	Input Channel 4	Input Channel 4	Input Channel 4	Input Channel 4
5	Input Channel 5	Input Channel 5	Input Channel 5	Input Channel 5
6	Input Channel 6	Input Channel 6	Input Channel 6	Input Channel 6
7	Input Channel 7	Input Channel 7	Input Channel 7	Input Channel 7
8	Input Channel 8	Input Channel 8	Input Channel 8	Input Channel 8
9	-		Input Channel 9	Input Channel 9
10	-		Input Channel 10	Input Channel 10
11	-		Input Channel 11	Input Channel 11
12	-		Input Channel 12	Input Channel 12
13	-		Input Channel 13	Input Channel 13
14	-		Input Channel 14	Input Channel 14
15	-		Input Channel 15	Input Channel 15
16	-		Input Channel 16	Input Channel 16

* Operating temperature

-20 °C to 60 °C temperature range specification can be guaranteed under the following conditions. Supply voltage : 26.4 V below. Otherwise, temperature specification can be guaranteed with -20 °C to 60 °C.

6.2 LED Indicator

Table 6-2 VX1009 / 1019 Digital Input (24V/PNP NPN) LED Indicator

Module	Number	LED Color	LED function	Off Signal Status		On Signal Status	
	PR		Power	LED Off	power off	LED Green	power on
	ERR		Error	LED Off	no error	LED Red	error occurred
	1		Input Channel 1				in normal operation
	2		Input Channel 2				
	3		Input Channel 3				
	4		Input Channel 4				
	5		Input Channel 5				
	6		Input Channel 6				
	7		Input Channel 7				
	8		Input Channel 8				
	9		Input Channel 9				
	10		Input Channel 10				channel error occurred
	11		Input Channel 11				
	12		Input Channel 12				
	13		Input Channel 13				
	14		Input Channel 14				
	15		Input Channel 15				
	16		Input Channel 16				

7 Digital Output

7.1 VX2008 / 2018 & 2009 & 2019 Digital Output (24V/PNP/24V/NPN)

Figure 7-1 VX2008(24V PNP 8Points)

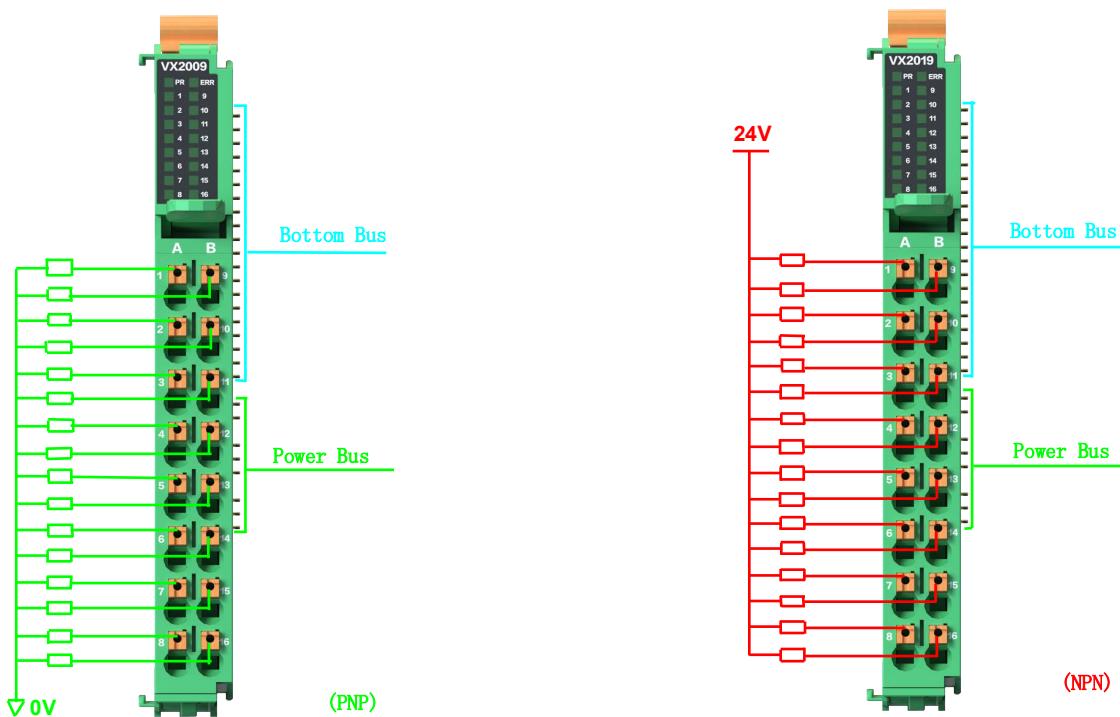
Figure 7-2 VX2018(24V NPN 8Points)

Figure 7-3 VX2009(24V PNP 16Points)

Figure 7-4 VX2019 (24V NPN 16Points)



Figure 7-5 Wiring



Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Power module	Comms Module	System Module	Appendix
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Table 7-1 Specification

	VX2008	VX2018	VX2009	VX2019
Environmental specifications				
Operation temperature		-20 °C to 60 °C		
Storage temperature		-40 °C to 85°C		
Relative humidity		5 % to 90 % non-condensing		
Mounting		DIN rail		
Output specifications				
Outputs Per Module	8 Points Sink Type (Positive Logic)	8 Points Source Type (Negative Logic)	16 Points Sink Type (Positive Logic)	16 Points Source Type (Negative Logic)
Indicators	8 Green Output Status LEDs		16 Green Output Status LEDs	
Output Voltage Range	Norminal 24 Vdc (Min. 15 to Max.32 Vdc)	Norminal 0 Vdc (Min. 15 to Max.30 Vdc)	Norminal 24 Vdc (Min. 15 to Max.32 Vdc)	Norminal 0 Vdc (Min. 15 to Max.30 Vdc)
ON-state Voltage Drop		Max. 0.3 Vdc @ 25 °C Max. 0.5 Vdc @ 70 °C		
OFF-state Leakage Current		Max. 20µA		
Output Signal Delay		OFF to ON: Max. 0.3 ms. ON to OFF: Max. 0.3 ms		
Output Current Rating		Max. 0.5 A per Channel / Max 8 A per module		
Short Circuit Protection		Yes		
Protective circuit		Constant current with thermal switch-off and automatic restart		
Response time of the current limiting circuit		< 40 µs		
Common Type		1 Common,Common(AGND)		
General specifications				
Shock operating		IEC 60068-2-27		
Vibration resistance		Based on IEC 60068-2-6 Sine Vibration •5 Hz ≤ f ≤ 8.4 Hz: 3.5 mm amplitude •8.4 Hz < f ≤ 150 Hz: 1g acceleration		
Industrial Emissions		EN 61000-6-4: 2019		
Industrial Immunity		EN 61000-6-2: 2019		
Installation position		Vertical and horizontal installation is available		
Product certifications		CE		
Power Dissipation		Max. 55 mA @ 5 Vdc		
Isolation		opto-coupler		
Field Power		Supply Voltage: 24 Vdc nominal Voltage Range: 15 to 32 Vdc Power Dissipation: 3 mA/channel @ 24 Vdc		
Wiring		I/O Cable Max. 1 mm ²		
Weight		60 g		
Module size		12 mm x 75 mm x 100 mm		
Pin Description				
1	Output Channel 1	Output Channel 1	Output Channel 1	Output Channel 1
2	Output Channel 2	Output Channel 2	Output Channel 2	Output Channel 2
3	Output Channel 3	Output Channel 3	Output Channel 3	Output Channel 3
4	Output Channel 4	Output Channel 4	Output Channel 4	Output Channel 4
5	Output Channel 5	Output Channel 5	Output Channel 5	Output Channel 5
6	Output Channel 6	Output Channel 6	Output Channel 6	Output Channel 6
7	Output Channel 7	Output Channel 7	Output Channel 7	Output Channel 7
8	Output Channel 8	Output Channel 8	Output Channel 8	Output Channel 8
9	-		Output Channel 9	Output Channel 9
10	-		Output Channel 10	Output Channel 10
11	-		Output Channel 11	Output Channel 11
12	-		Output Channel 12	Output Channel 12
13	-		Output Channel 13	Output Channel 13
14	-		Output Channel 14	Output Channel 14
15	-		Output Channel 15	Output Channel 15
16	-		Output Channel 16	Output Channel 16

7.2 LED Indicator

Table 7-2 VX2009 2019 Digital Output LED Indicator

Module	Number	LED Color	LED function	Off Signal Status		On Signal Status	
VX2009	PR	[Green]	Power	LED Off	power off	LED Green	power on
VX2019	ERR	[Red]	Error	LED Off	no error	LED Red	error occurred
	1	[Green]	Output Channel 1	LED Off	no output signal	LED Green	in normal operation
	2	[Green]	Output Channel 2				
	3	[Green]	Output Channel 3				
	4	[Green]	Output Channel 4				
	5	[Green]	Output Channel 5				
	6	[Green]	Output Channel 6				
	7	[Green]	Output Channel 7				
	8	[Green]	Output Channel 8				
	9	[Green]	Output Channel 9			LED Off	channel error occurred
	10	[Green]	Output Channel 10				
	11	[Green]	Output Channel 11				
	12	[Green]	Output Channel 12				
	13	[Green]	Output Channel 13				
	14	[Green]	Output Channel 14				
	15	[Green]	Output Channel 15				
	16	[Green]	Output Channel 16				

8 Analog Input

8.1 VX3008 / 3018 / 3204 / 3304 / 3404

Figure 8-1 VX3008 (8 Channels, 0-20 mA, 4-20 mA, 16 Bits)

Figure 8-2 VX3018 (8 Channels, 0-20 mA, 4-20 mA, 16 Bits)

Figure 8-3 VX3204 (4 Channels, Voltage(0-5V,±5 V,0-10V,±10V) or Current (0-20mA, 4-20mA)

Figure 8-4 VX3304 (Analog input, 4 Channels, RTD / Resistance Input)

Figure 8-5 VX3404 (Analog input, 4 Channels, Thermocouple mV Input)

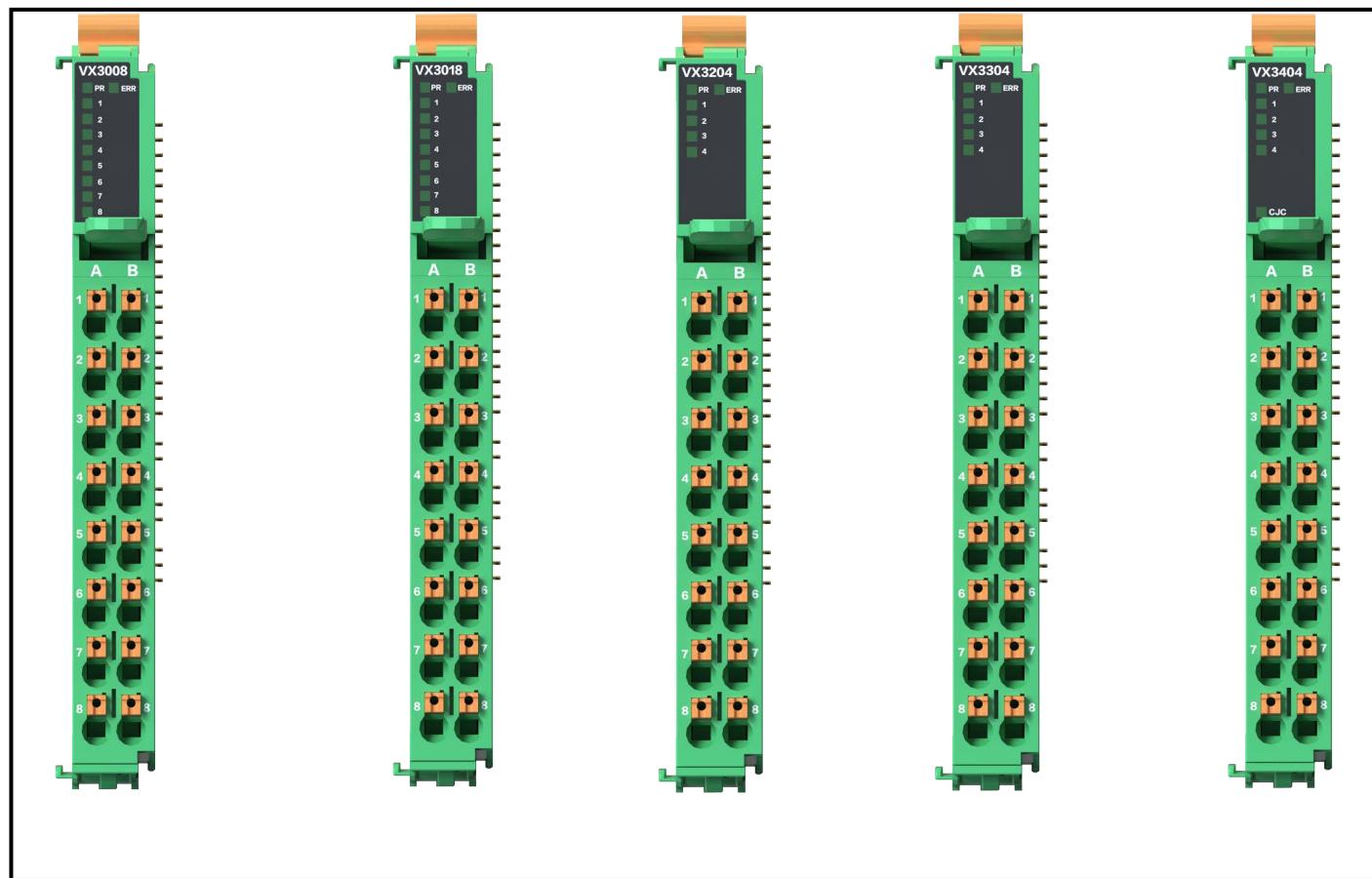
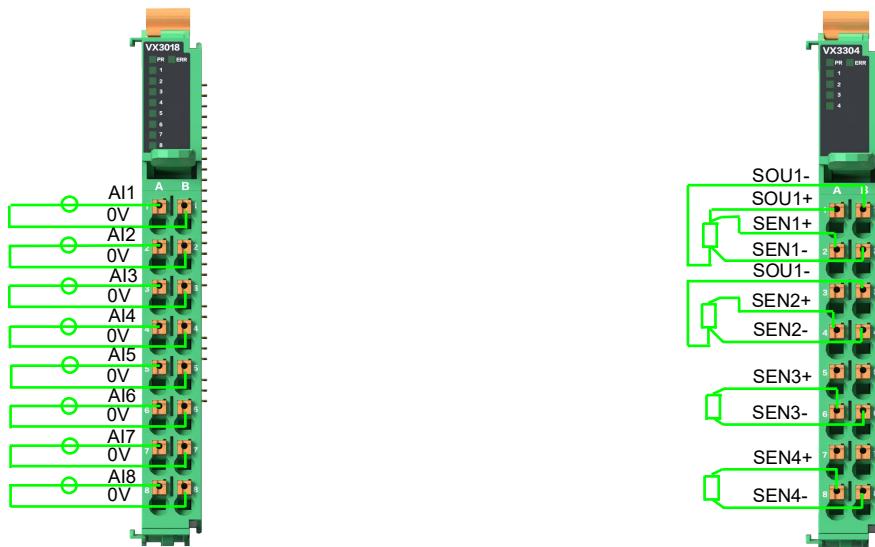


Figure 8-6 VX3018 VX3304 Wiring



Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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Table 8-1 Specification

	VX3204	VX3008 (TBC)	VX3018	VX3304	VX3404
Environmental specifications					
Operation temperature			-20 °C to 60 °C		
Storage temperature			-40 °C to 85°C		
Relative humidity			5 % to 90 % non-condensing		
Mounting			DIN rail		
Input specifications					
Inputs Per Module	4 CH single ended, non-isolated between channels	-	8 CH single ended, non-isolated between channels	4CH	4CH
Indicators (Input Status)	4 Red LED	-	8 Green LED	4 Red LED	4 Green LED 1 Green CJ LED
Resolution in Ranges	16 bits Signed	-	16 bits Signed	-	-
Input (V/C) Ranges	V:(0-5V, ±5V, 0-10V, ±10V) I:(0-20mA, 4-20mA)	-	0-20mA, 4-20mA	-	-
Data Format			16 bits Integer		
Excitation Current	-	-	-	About 500µA	-
Module Accuracy	±0.1% Full Scale @ 25°C ambient ±0.3% Full Scale @ -40°C, 70°C			PT100, PT1000 Input Range 0.5°C Full Scale @25°C ambient All Type Input Range ±0.2% Full Scale @ 25 °C ambient ±0.3% Full Scale @ -40, 70 °C ambient	Rec Input Range ±0.01% Rec Scale @25°C ambient ±0.5% Rec Scale @ -40-70°C C/D Type Rec Input Range ±0.5% Rec Scale @ -40-70°C External Cold Junction(PT100) ±2 °C Rec Scale @ -40-70°C
Sensor Types	-	-	-	RTD	Range
	-	-	-	PT100	-200°C-800°C
	-	-	-	PT200	-200°C-630°C
	-	-	-	PT500	-200°C-630°C
	-	-	-	PT1000	-50°C-300°C
	-	-	-	NI120	-79°C-309°C
	-	-	-	-	-
	-	-	-	-	S 0°C-1700°C
	-	-	-	-	R 0°C-1700°C
Connection	-	-	-	2/3/4 wire	2 wire
Cold-junction compensation	-	-	-	-	Internal & external (Pt100), int. accuracy ≤10 K
Temperature Coefficient	-	-	-		±50 ppm/K max
Input Impedance	I:100Ω U:100KΩ	-	100Ω	-	-
Diagnostic	Field Power Off:LED Off Field Power On:Over input range LED On			Sensor open or range over, then conversion data = 0x7FFF(32767)	Sensor open or range over, then conversion data = 0x7FFF(32767) *Connected External CJ : CJ LED On. Not Connected External CJ : CJ LED Off.
Resolution of Data	-	-	-	RTD Type : ±0.1°C, Input Type : 100MΩ, 10MΩ,20MΩ,50MΩ	-
Conversion Time	800µs/All CHs	-	≤ 1ms/All CHs, ≤ 0.125ms/CH	< 200ms All CHs	< 200ms All CHs
Common Type	1 Common,Common(AGND)			-	-
General specifications					
Shock operating			IEC 60068-2-27		

Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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VX3204	VX3008 (TBC)	VX3018	VX3304	VX3404
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Environmental specifications							
Vibration resistance	Based on IEC 60068-2-6 Sine Vibration •5Hz ≤ f ≤ 8.4Hz: 3.5mm amplitude •8.4Hz < f ≤ 150Hz: 1g acceleration						
Industrial Emissions	EN 61000-6-4: 2019						
Industrial Immunity	EN 61000-6-2: 2019						
Installation position	Vertical and horizontal installation is available						
IP Ratings	IP 20						
Certificate	CE						
Power Dissipation	Max. 260mA @5Vdc			Max. 190mA @5Vdc			
Isolation	Opto-coupler						
Field Power	Supply Voltage: 24Vdc nominal Voltage Range: 18- 32Vdc Power Dissipation: Max. 25mA +sensor@ 24Vdc	-	Supply Voltage: 24Vdc nominal Voltage Range: 18-32 Vdc Power Dissipation: Max. 30mA@24Vdc	Not used, Field Power passes through to the next module			
Wiring	I/O Cable Max. 1 mm2						
Weight	60 g						
Module size	12 mm x 75 mm x 100 mm						
Pin Description							
A1	Input Channel 1	-	AI1	Source 1+	TC Channel 0+		
A2	24V	-	AI2	Sence 1+	TC Channel 1+		
A3	Input Channel 2	-	AI3	Source 2+	TC Channel 2+		
A4	24V	-	AI4	Sence 2+	TC Channel 3+		
A5	Input Channel 3	-	AI5	Source 3+	Cold Junction Sensor		
A6	24V	-	AI6	Sence 3+	Cold Junction Sensor		
A7	Input Channel 4	-	AI7	Source 4+	Cold Junction Sensor		
A8	24V	-	AI8	Sence 4+	Cold Junction Sensor		
B1	AGND	-	0V	Source 1-	TC Channel 0-		
B2	0V	-	0V	Sence 1-	TC Channel 1-		
B3	AGND	-	0V	Source 1-	TC Channel 2-		
B4	0V	-	0V	Sence 1-	TC Channel 3-		
B5	AGND	-	0V	Source 1-	AGND		
B6	0V	-	0V	Sence 1-	AGND		
B7	AGND	-	0V	Source 1-	AGND		
B8	0V	-	0V	Sence 1-	AGND		

RTD=Resistance Temperature Detector

8.2 LED Indicator

Table 8-2 VX3204 LED Indicator (4 Channels, Voltage(0-5V,±5 V,0-10V,±10V) or Current (0-20mA, 4-20mA)

Module	Number	LED Color	LED function	Normal Operation		Over-range		
				Power	LED Off	Power off	LED Green	power on
	PR		Power	LED Off	No error	LED Off	LED Green	power on
	ERR		Error	LED Off	No error	LED Off	LED Red	error occurred
	1		Input CH 1	LED Off	Normal operation	LED Red	> 23.52mA (Max.0-20 mA) > 22.81mA (Max.4-20 mA) < 1.185mA (Min. 4-20 mA)	
	2							
	3							
	4							

Table 8-3 VX3018 LED Indicator (8 Channels, 0-20 mA, 4-20 mA, 16 Bits)

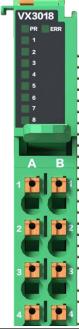
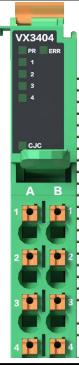
Module	Number	LED Color	LED function	Normal Operation		Over Range Check	
				Power	LED Off	power off	LED Green
	PR	Green	Power	LED Off	power off	LED Green	power on
	ERR	Red	Error	LED Off	no error	LED Red	error occurred
	1	Red	Input CH 1	LED Off	Normal Operation	> 22.81mA (Max. Range Over, 4-20 mA)-Channel OFF	
	2	Red	Input CH 2				
	3	Red	Input CH 3				
	4	Red	Input CH 4				
	5	Red	Input CH 5				
	6	Red	Input CH 6				
	7	Red	Input CH 7				
	8	Red	Input CH 8				

Table 8-4 VX3304 LED Indicator (Analog input, 4 Channels, RTD / Resistance Input)

Module	Number	LED Color	LED function	Off Signal		On Signal	
				Power	LED Off	Power off	LED Green
	PR	Green	Power	LED Off	Power off	LED Green	power on
	ERR	Red	Error	LED Off	No error	LED Red	error occurred
	1	Red	Input CH 1	LED Off	Input Sensor Open or Input Range Valid	LED Red	Sensor Connected and Input Range Over
	2	Red	Input CH 2				
	3	Red	Input CH 3				
	4	Red	Input CH 4				

Table 8-5 VX3404 LED Indicator (Analog input, 4 Channels, Thermocouple mV Input)

Module	Number	LED Color	LED function	Off Signal		On Signal		External CJC Connected	Internal CJC Connected		
				Power	LED Off	Power off	LED Green	power on			
	PR	Green	Power	LED Off	Power off	LED Green	power on				
	ERR	Red	Error	LED Off	No error	LED Red	error				
	1	Red	Input CH 1	LED Off	Input Sensor Open or Input Range Valid	LED Red	Sensor Connected and Input Range Over				
	2	Red	Input CH 2								
	3	Red	Input CH 3								
	4	Red	Input CH 4								
	5	Green	CJC					LED Green (External CJC Enable)	LED Off (Internal CJC Enable)		

CJC=Cold Junction Compensating

Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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8.3 Data Value

8.3.1 Mapping data (VX3204,3018,3304,3404)

Bit No.	VX3204								VX3018								VX3304								VX3404							
	B7	B6	B5	B4	B3	B2	B1	B0	B7	B6	B5	B4	B3	B2	B1	B0	B7	B6	B5	B4	B3	B2	B1	B0	B7	B6	B5	B4	B3	B2	B1	B0
Byte 0	Ch1 Low byte								Ch1 Low byte								Ch1 Low byte								Ch1 Low byte							
Byte 1	Ch1 High byte								Ch1 Highbyte								Ch1 High byte								Ch1 High byte							
Byte 2	Ch2 Low byte								Ch2 Low byte								Ch2 Low byte								Ch2 Low byte							
Byte 3	Ch2 High byte								Ch2 High byte								Ch2 High byte								Ch2 High byte							
Byte 4	Ch3 Low byte								Ch3 Low byte								Ch3 Low byte								Ch3 Low byte							
Byte 5	Ch3 High byte								Ch3 High byte								Ch3 High byte								Ch3 High byte							
Byte 6	Ch4 Low byte								Ch4 Low byte								Ch4 Low byte								Ch4 Low byte							
Byte 7	Ch4 High byte								Ch4 High byte								Ch4 High byte								Ch4 High byte							
Byte 8									Ch5 Low byte																							
Byte 9									Ch5 High byte																							
Byte 10									Ch6 Low byte																							
Byte 11									Ch6 High byte																							
Byte 12									Ch7 Low byte																							
Byte 13									Ch7 High byte																							
Byte 14									Ch8 Low byte																							
Byte 15									Ch8 High byte																							

8.3.2 VX3204 Data Value / Current / Voltage

Measurement range	Current / Voltage		Decimal (D)		Hexadecimal		Range		Conversion							
0-20mA S7 format	>23.52mA		32767		0x7FFF		Overloading		$D = 27648 \times I / 20$ $I = D \times 20 / 27648$							
	20 mA		27648		0x6C00		Nominal range									
	10 mA		13824		0x3600											
	0 mA		0		0x0000											
4-20mA S7 format	>22.81mA		32767		0x7FFF		Overloading		$D = 27648 \times (I - 4) / 16$ $I = D \times 16 / 27648 + 4$							
	20mA		27648		0x6C00		Nominal range									
	12mA		13824		0x3600											
	4mA		0		0x0000											
	<1.185mA		-32768		0x8000		Underloading									
0-10V S7 format	>11.759V		32767		0x7FFF		Overloading		$D = 27648 \times U / 10$ $U = D \times 10 / 27648$							
	10V		27648		0x6C00		Nominal range									
	5V		13824		0x3600											
	0V		0		0x0000											
±10V S7 format	>11.759 V		32767		0x7FFF		Overloading		$D = 27648 \times U / 10$ $U = D \times 10 / 27648$							
	10V		27648		0x6C00		Nominal range									
	5V		13824		0x3600											
	0V		0		0x0000											
	-5V		-13824		0xCA00		Underloading									
	-10V		-27648		0x9400											
	<-11.759V		-32768		0x8000											
0-5V S7 format	>5.879V		32767		0x7FFF		Overloading		$D = 27648 \times U / 5$ $U = D \times 5 / 27648$							
	5V		27648		0x6C00		Nominal range									
	2.5V		13824		0x3600											
	0V		0		0x0000											
±5V S7 format	-2.5V		-13824		0xCA00		Underloading		$D = 27648 \times U / 5$ $U = D \times 5 / 27648$							
	-5V		-27648		0x9400											
	<-5.879V		-32768		0x8000											

Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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8.3.3 VX3018 Data Value

Measurement range	Current / Voltage	Decimal (D)	Hexadecimal	Range	Conversion	
0-20mA S7 format	>23.52mA	32767	0x7FFF	Overloading	$D = 27648 \times I / 20$ $I = D \times 20 / 27648$	
	20 mA	27648	0x6C00	Nominal range		
	10 mA	13824	0x3600			
	0 mA	0	0x0000			
4-20mA S7 format	>22.81mA	32767	0x7FFF	Overloading	$D = 27648 \times (I - 4) / 16$ $I = D \times 16 / 27648 + 4$	
	20mA	27648	0x6C00	Nominal range		
	12mA	13824	0x3600			
	4mA	0	0x0000			
	<1.185mA	-32768	0x8000	Underloading		

8.3.4 VX3304 Data Value / Current / Voltage

Measurement Range	Value in °C	0.1° resolution	Range
PT100	-2000		Underloading
	8000		Overloading
	-32768		Wire break
PT200	-2000		Underloading
	-6300		Overloading
	-32768		Wire break
PT500	-2000		Underloading
	6300		Overloading
	-32768		Wire break
PT1000	-500		Underloading
	3000		Overloading
	-32768		Wire break
NI120	-790		Underloading
	3090		Overloading
	-32768		Wire break

8.3.5 VX3404 Data Value

Measurement Range	Value in °C 0.1° resolution	Range
K	-1000	Underloading
	13700	Overloading
	32767	Wire break
J	-1000	Underloading
	12000	Overloading
	32767	Wire break / Cold Comp. Err
T	-1000	Underloading
	4000	Overloading
	32767	Wire break / Cold Comp. Err
E	-1000	Underloading
	10000	Overloading
	32767	Wire break / Cold Comp. Err
N	-1000	Underloading
	13000	Overloading
	32767	Wire break / Cold Comp. Err
S	0	Underloading
	17000	Overloading
	32767	Wire break / Cold Comp. Err
R	0	Underloading
	17000	Overloading
	32767	Wire break / Cold Comp. Err
B	6000	Underloading
	18000	Overloading
	32767	Wire break / Cold Comp. Err

Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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Measurement Range		Value in °C 0.1° resolution	Range
C		0	Underloading
		23200	Overloading
		32767	Wire break / Cold Comp. Err

8.3.6 VX3204 Parameter Data

Channel	Description	Options	Default
CH1	Measurement range	1(0-10V)	1(0-10V)
CH2		2(-10-10V)	
CH3		3(0-5V)	
CH4		4(-5-5V)	
		5(0-20mA)	
		6(4-20mA)	

All values are stored in Bus Coupler's EEPROM.

8.3.7 VX3018 Parameter Data

Channel	Description	Options	Default	
CH1	Measurement range	1(4-20mA)	1(4-20mA)	
CH2				
CH3		2(0-20mA)		
CH4				
CH5				
CH6				
CH7				
CH8				

All values are stored in Bus Coupler's EEPROM.

8.3.8 VX3304 Parameter Data

Channel	Description	Options	Default
CH1	Measurement range	1(PT100)	1(PT100)
CH2		2(PT200)	
CH3		3(PT500)	
CH4		4(PT100)	
CH1	Connection type	5(NI120)	1(3-Wire)
CH2		0(2-Wire)	
CH3		1(3-Wire)	
CH4		2(4-Wire)	
CH1	Conversion Time	0(Level1)	0(Level1)
CH2		1(Level2)	
CH3		2(Level3)	
CH4		3(Level4)	

All values are stored in Bus Coupler's EEPROM.

8.3.9 VX3404 Parameter Data (16 Bytes)

Channel	Description	Options	Default
CH 1	Measurement range	1(K)	1(K)
CH 2		2(J)	
CH 3		3(T)	
CH 4		4(E)	
CH 1		5(N)	
CH 2		6(S)	
CH 3		7(R)	
CH 4		8(B)	
CH1-CH4	channel Compensation	9(C)	
CH 1	Conversion Time	0(Level1)	0(Level1)
CH 2		1(Level2)	
CH 3		2(Level3)	
CH 4		3(Level4)	
CH1-CH4		4(Level5)	
CH 1	Conversion Time	5(Level6)	
CH 2		0(Internal)	0(Internal)
CH 3		1(External)	
CH 4		0(Internal)	

Unit of Cold Junction Temperature is 0.1°C, Value 254 means 25.4°C

*0: Compensation Cold junction Temperature = Cold junction Temperature - Cold Junction Temperature Offset

*1: Compensation Cold Junction Temperature = Cold Junction Temperature Offset

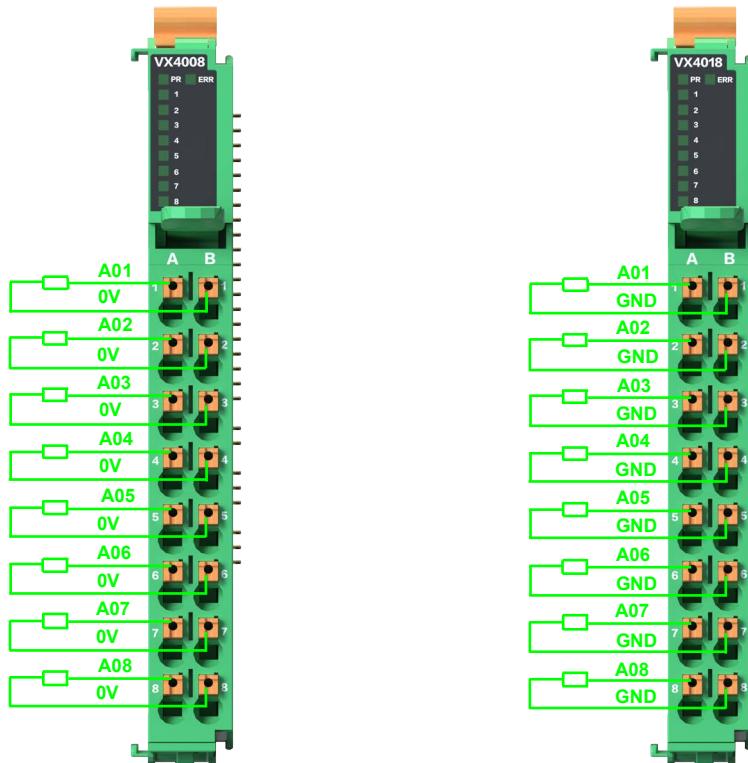
Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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9 Analog Output

9.1 VX4008 / 4018

Figure 9-1 VX4008 (8 Channels, Voltage 0-5 V, ±5 V, 0-10 V, ±10 V)

Figure 9-2 VX4018 (8 Channels, Current 0-20 mA, 4-20 mA 16 bits)



9.2 Specification

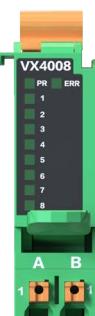
	VX4008	VX4018
Environmental specifications		
Operation temperature	-20 °C to 60 °C	
Storage temperature	-40 °C to 85°C	
Relative humidity	5 % to 90% non-condensing	
Mounting	DIN rail	
Output specifications		
Outputs Per Module	8 Channels Single Ended	
Indicators (Input Status)	8 Red LEDs	
Resolution in Ranges	16 bits: 2.76 mV/bit	16 Bits (Include Sign), 15 bits: 0.72µA/bit
Output Ranges	0-5V, ±5V, 0-10V, ±10V	0-20mA, 4-20mA
Data Format	16 bits Integer	
Module Accuracy	±0.1% Full Scale @ 25°C ambient ±0.3% Full Scale @ -40°C, 70°C	
Load Impedance	Max. 5 kΩ	Max. 750Ω
Diagnostic	Field Power On: No output LED Off Field Power On: Over output range LED On	
Conversion Time	Max. 150 µsec/ All channels	Max. 250 µsec/ All channels
Common Type	1 Common, Common(AGND)	
General specifications		
Shock operating	IEC 60068-2-27	

VX4008

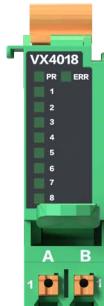
VX4018

Environmental specifications	
Vibration resistance	Based on IEC 60068-2-6 Sine Vibration •5Hz ≤ f ≤ 8.4Hz: 3.5mm amplitude •8.4Hz < f ≤ 150Hz: 1g acceleration
Industrial Emissions	EN 61000-6-4: 2019
Industrial Immunity	EN 61000-6-2: 2019
Installation position	Vertical and horizontal installation is available
IP Ratings	IP20(IEC 60529)
Certificate	CE
Power Dissipation	Max. 285mA @5Vdc
Isolation	I/O to Logic:Opto-coupler Field power:Non-isolation
Field Power	Supply Voltage: 24Vdc nominal Voltage Range: 18-32Vdc Power Dissipation: Max. 35mA@ 24Vdc
Wiring	I/O Cable Max. 1 mm2
Weight	60 g
Module size	12 mm x 75 mm x 100 mm
Pin Description	
A1	AO Channel 1
A2	AO Channel 2
A3	AO Channel 3
A4	AO Channel 4
A5	AO Channel 5
A6	AO Channel 6
A7	AO Channel 7
A8	AO Channel 8
B1	0V
B2	0V
B3	0V
B4	0V
B5	0V
B6	0V
B7	0V
B8	0V

9.3 VX4008 LED Indicator

Module	Number	LED Color	LED function	Normal Operation		Over Range Check		
				Power	LED Off	power off	LED Green	power on
	PR		Error	Power	LED Off	power off	LED Green	power on
	ERR			Error	LED Off	no error	LED Red	error occurred
	1			Output CH 1		Normal Operation		> 11.759V (Max.Range Over)-Channel OFF
	2			Output CH 2				<-11.759 (Min. Range Over,-10 to 10 V)-Channel OFF
	3			Output CH 3				> 5.879V (Max. Range Over)-Channel OFF
	4			Output CH 4				< -5.879V (Min. Range Over, -5-5 V)-Channel OFF
	5			Output CH 5				
	6			Output CH 6				
	7			Output CH 7				
	8			Output CH 8				

9.4 VX4018 LED Indicator

Module	Number	LED Color	LED function	Normal Operation		Over Range Check		
	PR	Green	Power	LED Off	power off	LED Green	power on	
	ERR	Red	Error	LED Off	no error	LED Red	error occurred	
	1	Red	Output CH 1	LED Off	Normal Operation	LED Red	> 22.81 mA (Max. Range Over,4-20mA)-Channel OFF <-1.185mA(Min. Range Over,4-20mA)-Channel OFF > 23.52mA (Max. Range Over,0-20mA)-Channel OFF	
	2	Red	Output CH 2					
	3	Red	Output CH 3					
	4	Red	Output CH 4					
	5	Red	Output CH 5					
	6	Red	Output CH 6					
	7	Red	Output CH 7					
	8	Red	Output CH 8					

9.5 VX4008 Data Value / Voltage

Measurement range	Current / Voltage	Decimal (D)	Hexadecimal	Range	Conversion	
0-10V S7 format	>11.759V	32767	0x7FFF	Overloading	D = 27648 x U / 10 U = D x 10 / 27648	
	10V	27648	0x6C00	Nominal range		
	5V	13824	0x3600			
	0V	0	0x0000			
±10V S7 format	>11.759 V	32767	0x7FFF	Overloading	D = 27648 x U / 10 U = D x 10 / 27648	
	10V	27648	0x6C00	Nominal range		
	5V	13824	0x3600			
	0V	0	0x0000			
	-5V	-13824	0xCA00	Underloading		
	-10V	-27648	0x9400			
	<-11.759V	-32768	0x8000			
0-5V S7 format	>5.879V	32767	0x7FFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648	
	5V	27648	0x6C00	Nominal range		
	2.5V	13824	0x3600			
	0V	0	0x0000			
±5V S7 format	>5.879V	32767	0x7FFF	Overloading	D = 27648 x U / 5 U = D x 5 / 27648	
	5V	27648	0x6C00	Nominal range		
	2.5V	13824	0x3600			
	0V	0	0x0000			
	-2.5V	-13824	0xCA00	Underloading		
	-5V	-27648	0x9400			
	<-5.879V	-32768	0x8000			

9.6 VX4018 Data Value / Voltage

Measurement range	Current / Voltage	Decimal (D)	Hexadecimal	Range	Conversion	
0-20mA S7 format	>23.52mA	32767	0x7FFF	Overloading	D = 27648 x I / 20 I = D x 20 / 27648	
	20 mA	27648	0x6C00	Nominal range		
	10 mA	13824	0x3600			
	0 mA	0	0x0000			
4-20mA S7 format	>22.81mA	32767	0x7FFF	Overloading	D = 27648 x (I - 4) / 16 I = D x 16 / 27648 + 4	
	20mA	27648	0x6C00	Nominal range		
	12mA	13824	0x3600			
	4mA	0	0x0000			
	<1.185mA	-32768	0x8000	Underloading		

9.7 Mapping data (VX4008,4018)

VX4008 & 4018								
Bit No.	B7	B6	B5	B4	B3	B2	B1	B0
Byte 0	AO Ch1 Low byte							
Byte 1	AO Ch1 Highbyte							
Byte 2	AO Ch2 Low byte							
Byte 3	AO Ch2 High byte							
Byte 4	AO Ch3 Low byte							
Byte 5	AO Ch3 High byte							
Byte 6	AO Ch4 Low byte							
Byte 7	AO Ch4 High byte							
Byte 8	AO Ch5 Low byte							
Byte 9	AO Ch5 High byte							
Byte 10	AO Ch6 Low byte							
Byte 11	AO Ch6 High byte							
Byte 12	AO Ch7 Low byte							
Byte 13	AO Ch7 High byte							
Byte 14	AO Ch8 Low byte							
Byte 15	AO Ch8 High byte							



Output Module Data - 8 byte Output Data								
Channel	Description	Options	Default					
CH1								
CH2								
CH3								
CH4								
CH5								
CH6								
CH7								
CH8								

9.8 VX4008 Parameter Data

Channel	Description	Options	Default
CH1			
CH2			
CH3			
CH4			
CH5			
CH6			
CH7			
CH8			

Output range

1 (0-10V)
2 (-10V-10V)
3 (0-5V)
4 (-5-5V)

1 (0-10V)

9.9 VX4018 Parameter Data

Channel	Description	Options	Default
CH1			
CH2			
CH3			
CH4			
CH5			
CH6			
CH7			
CH8			

1 (4-20mA)
2 (0-20mA)

1 (4-20mA)

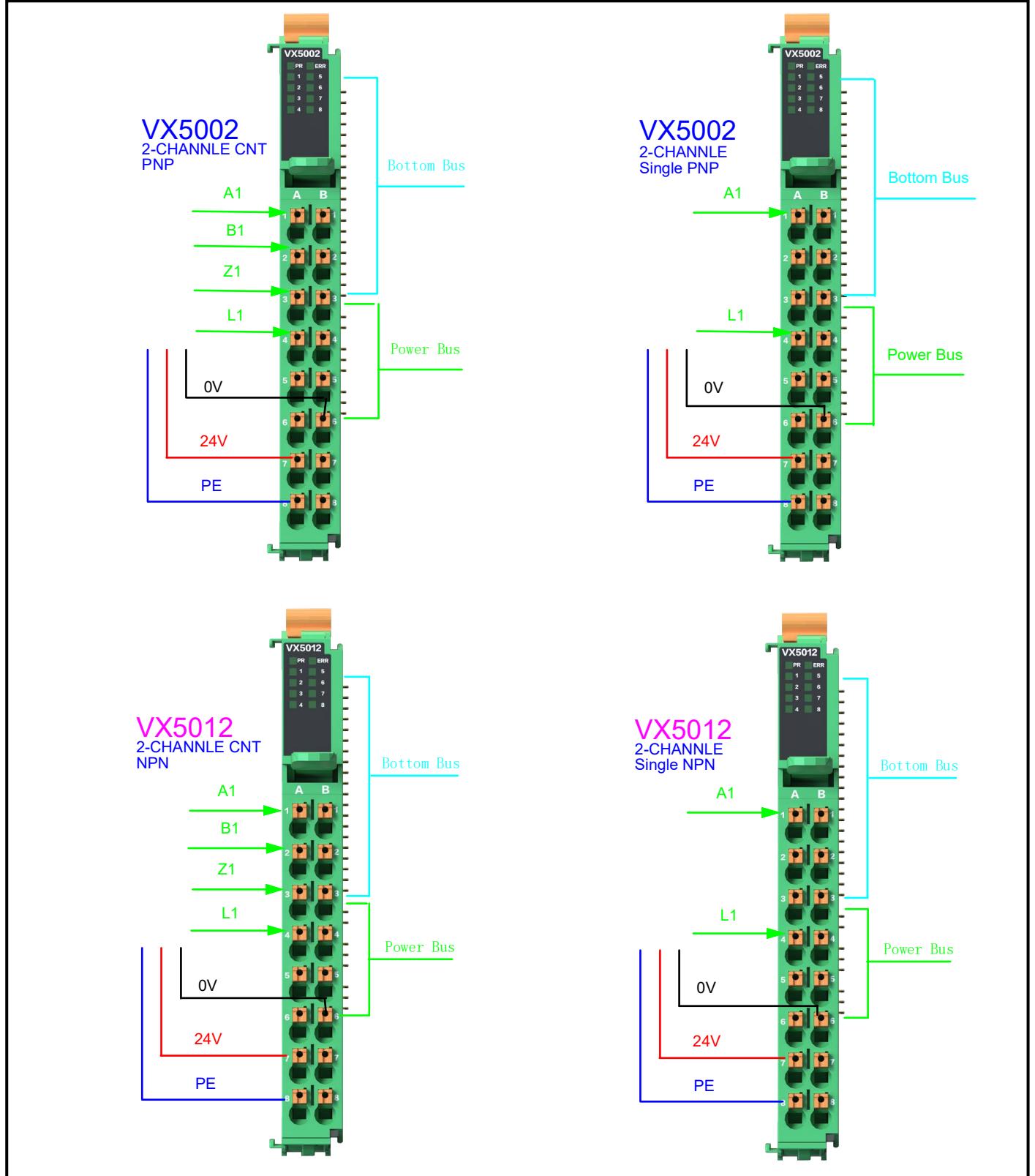
Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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10 Multifunction Module

10.1 VX5002 VX5012 High speed counter

Figure 10-1 VX5002 (2 Channels, 24V, PNP) wiring diagram

Figure 10-2 VX5012 (2 Channels, 24V, NPN) wiring diagram



10.2 Pin Descriptions

VX5002 / 5012	
Pin number	Description
A1	A1
A2	B1
A3	Z1
A4	L1
A5	NC
A6	24V
A7	24V
A8	PE
B1	A2
B2	B2
B3	Z2
B4	L2
B5	NC
B6	0V
B7	0V
B8	PE

10.3 Parameter Data

VX5002 / VX5012			
Channel	Description	Options	Default
CH1 CH2	Encoder Filtering	1 (0-1kHz) 2 (1-3kHz) 3 (3-24kHz) 4 (24-70kHz) 5 (70-100kHz) 6 (100-850kHz) 7 (850kHz-1MHz)	1(0-1kHz)
	Encoder Count Multiples	1 (rate) 2 (rate) 4 (rate)	4 (rate)
	Encoder Count Mode	1 (Single) 2 (Encoder)	1 (Single)
	Encoder Count Range	0(0~4294967295)/ - 1(2147483648~2147483647)	0(0~4294967295)

10.4 PDO Data

VX5002 / VX5012		
PDO	Description	
Down Digital (2 Byte)	Enable Set Initvalue Of CH1	1Bit
	Enable Z Phase Of CH1	1Bit
	Count Direction Of CH1	1Bit
	Enable CH1	1Bit
	Enable Latch Of CH1	1Bit
	Enable Set Initvalue Of CH2	1Bit
	Enable Z Phase Of CH2	1Bit
	Counting Direction Of CH2	1Bit
Down Analog (8 Byte)	Enable CH2	1Bit
	Enable Latch Of CH2	1Bit
Up Digital (1 Byte)	Initial Count Value Of CH1	4Byte
	Initial Count Value Of CH2	4Byte
	Latch Signal Of CH1	1Bit
	Latch Signal Of CH2	1Bit
Up Analog (16 Byte)	Enable Signal Of CH1	1Bit
	Enable Signal Of CH2	1Bit
	Count Value Of CH1	4Byte
	Latch Value Of CH1	4Byte
	Count Value Of CH2	4Byte
	Latch Value Of CH2	4Byte

Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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10.5 Specification

Table 10-1 Specification

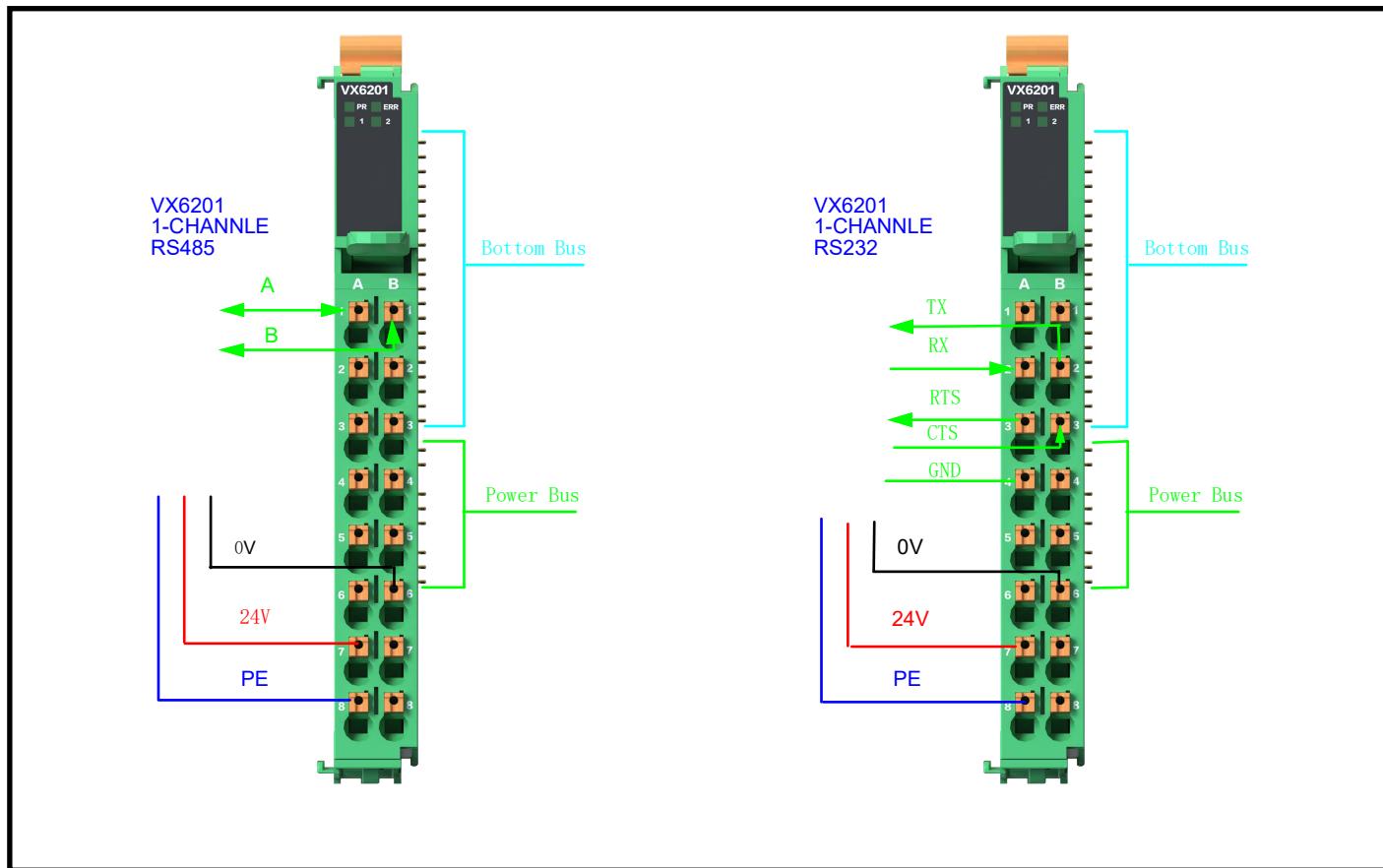
Environmental specifications	
Operating temperature	-20 °C to 60 °C
Storage temperature	-40 °C to 85 °C
Relative humidity	5 % to 95 % non-condensing
Mounting	DIN rail
Output specification	
Outputs Per Module	6 Channels Single Ended/3 Channels Differential Signal
Indicators (Logic side)	6 Green Output Status LEDs
ON-state Voltage	-15 Vdc (Min. 15Vdc to Max. 30Vdc)
ON-state Current	Max. 3 mA/ point @ 30 Vdc
OFF-state voltage	-5 V @ 25 °C
Input Signal Delay	OFF to ON: Max. 0.2 ms ON to OFF: Max. 0.2 ms
Input Filter	Adjustable, up to 10 ms, default 3ms
Nominal Input Impedance	10.2 KΩ typical
Common Type	1 Common, Common (AGND)
General specifications	
Shock operating	IEC 60068-2-27
Vibration resistance	Sine Vibration (Based on IEC 60068-2-6) • 5 Hz ≤ f ≤ 8.4 Hz: 3.5 mm amplitude • 8.4 Hz < f ≤ 150 Hz: 1 g acceleration
EMC Resistance Burst/ESD	EN 61000-6-2: 2019 EN 61000-6-4:2019
Ingress Protection	IP20
Installation Position	Vertical and horizontal installation is available
Product certifications	CE
Isolation	I/O to Logic: Opto-coupler Isolation Field power: Non-Isolation
Field Power	Supply Voltage: 24 Vdc nominal Voltage Range: 18 to 32 Vdc Power Dissipation? Max. 35 mA @ 24 Vdc
Wiring	I/O Cable Max. 1mm ²
Weight	60g
Module size	12mm x 75mm x 100 mm

Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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11 Communication Module

11.1 VX6201 RS485/RS232 Communication Module

Figure 11-1 VX6201 (Single Channel, RS485 or RS232, Modbus RTU Master) wiring diagram



Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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11.2 Specification

Table 11-1 Specification

Environmental specifications	
Operating temperature	-20 °C to 60 °C
Storage temperature	-40 °C to 85 °C
Relative humidity	5 % to 95 % non-condensing
Mounting	DIN rail
General specifications	
Type	RS232 or RS485
Transfer rate	300...115200 Bps
Supply Voltage	24 VDC
Current of power supply output	max. 500 mA
Terminating resistor RS485/RS232	120Ω
System Input Voltage range	15 Vdc to 32 Vdc
Indicators	2 Green LEDs for Communication Indicator
Shock operating	IEC 60068-2-27
Vibration resistance	Sine Vibration (Based on IEC 60068-2-6) •5 Hz ≤ f ≤ 8.4 Hz: 3.5 mm amplitude •8.4 Hz < f ≤ 150 Hz: 1 g acceleration
EMC Resistance Burst/ESD	EN 61000-6-2: 2019 EN 61000-6-4: 2019
Ingress Protection	Variable/IP20(IEC 60529)
Installation Position	Vertical and horizontal installation is available
Product certifications	CE
Power Dissipation	Max. 200mA @ 5 Vdc
Isolation	I/O to Logic: Opto-coupler Isolation Field power: Non-Isolation
Field Power	Supply Voltage: 24 Vdc nominal Voltage Range:18 to 32 Vdc Power Dissipation:Max. 35 mA @ 24 Vdc
Wiring	I/O Cable Max. 1mm ²
Weight	60g
Module size	12mm x 75mm x 100 mm

* Operating temperature

-20 °C to 60 °C temperature range specification can be guaranteed under the following conditions.

>Current for I/O modules :0.4 A below.

>Otherwise, temperature specification can be guaranteed with -40 °C to 60 °C.

11.3 VX6201 LED Indicator

Table 11-2 LED Indicator

Module	Name	LED COLOR	LED Function	Off Signal		On Signal	
	1		Communication	LED OFF	No Communication		Flashing Green is Nomal Operation
	2		Communication	LED OFF	No Communication		Flashing Green is Nomal Operation
	PR		Power Point	LED OFF	No Power		The power is on
	ERR		System Error	LED OFF	Communication is normal		Communication err

11.4 Pin Description

VX6201	
Pin number	Description
A1	A
A2	RX
A3	RTS
A4	GND
A5	NC
A6	24V
A7	24V
A8	PE
B1	B
B2	TX
B3	CTS
B4	NC
B5	NC
B6	0V
B7	0V
B8	PE

11.5 Parameter Data

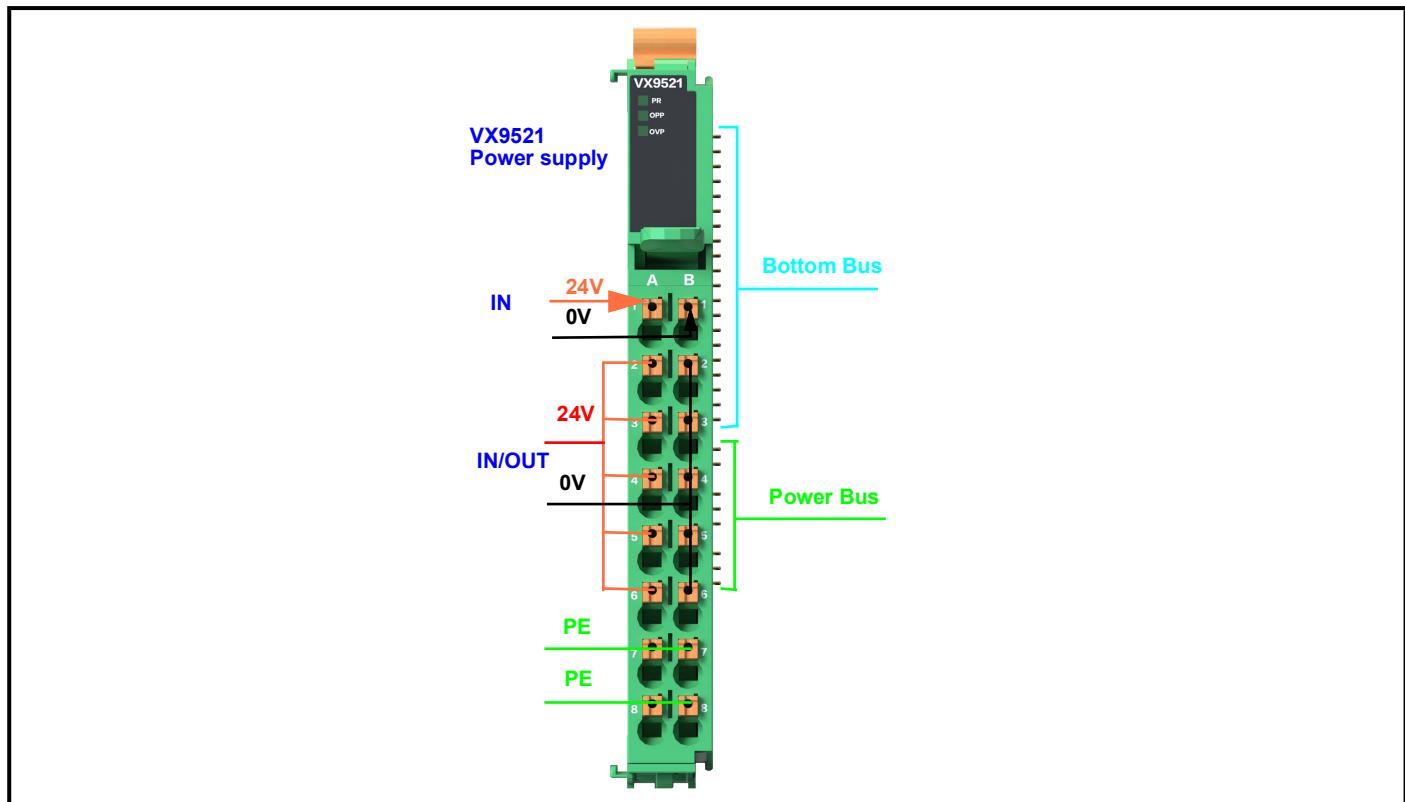
VX6201			
Channel	Description	Options	Default
1	Baudrate	0(1200) 1(2400) 2(4800) 3(9600) 4(14400) 5(19200) 6(38400) 7(56000) 8(57600) 9(115200)	3(9600)
1	Data Bits	8(8 Data Bits)	8(8 Data Bits)
1	Parity Bits	0(None) 1(Odd) 2(Even)	2(Even)
1	Stop Bits	1 (1 Stop Bit) 2 (2 Stop Bits)	1 (1 Stop Bit)

Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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12 System module

12.1 VX9521 Power Module

Figure L.1 VX9521(powerFeedIn)wiringdiagram



12.2 Pin Description

Pin number	Signal description
A1	24V-IN
A2	24V-IN/OUT
A3	24V-IN/OUT
A4	24V-IN/OUT
A5	24V-IN/OUT
A6	24V-IN/OUT
A7	PE
A8	PE
B1	0V
B2	0V
B3	0V
B4	0V
B5	0V
B6	0V
B7	PE
B8	PE

Technical Data

Field Power Voltage	Nominal 24 VDC •Max. 10A
Vibration resistance	•Operating Temperature -40 °C to 50 °C : Max. 10 A • 50 °C to 70 °C : Max. 7 A
Indicators	1 Green LED 2 Red LED
General Specifications	
System Power Dissipation	Max. 30 mA @ 5 Vdc
Wiring	I/O Cable Max. 1 mm ²
Weight	60 g Max
Module size	12 mm x 75 mm x 100 mm

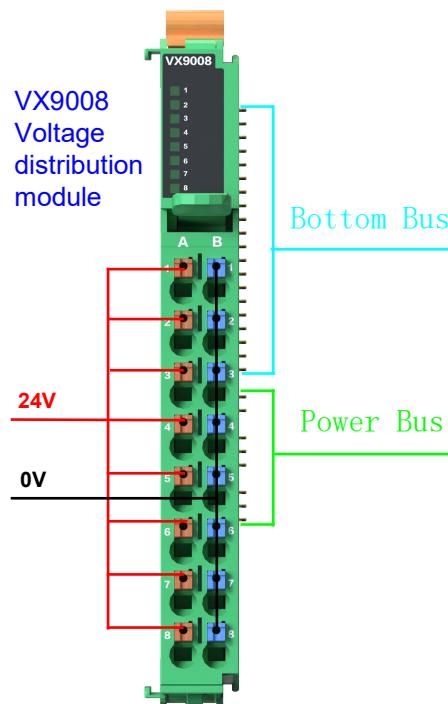
12.3 VX9521 Technical Data

Table 12-1 LED Indicator

Module	LED name	LED colour	LED Function	Off Signal		On Signal	
	PR	Green	Power Point	LED OFF	Power is not supplied to the unit	LED Green	Power On
	OPP	Red	Over Power Point	LED OFF	Normal	LED Red	Over Power
	OVP	Red	Over Voltage Point	LED OFF	Normal	LED Red	Overvoltage or Lowvoltage

12.4 VX9008 Power Module

Figure 12-2 VX9008 (Power Distribution) wiring diagram

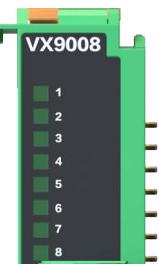


12.5 VX9008 Technical Data

Technical Data	
Field Power Voltage	Nominal 24 Vdc
Power supply	24V/0.5A per channel
Indicators	8Green LED
General Specifications	
System Power	Max. 0 mA @ 5 Vdc
Wiring	I/O Cable Max.1 mm ²
Weight	60 g Max
Module size	12 mm x 75 mm x 100 mm
Environment Condition	Refer to 'Environment Specification'

12.6 VX9008 LED Indicator

12.6.1 LED Indicator

Module	LED name	LED Colour	LED Function	Off Signal		On Signal	
	1-8	Green	Internal Bus Status	LED OFF	Network adapter is not connected to this module or NO POWER	LED Green	After normal initialization of IO-Bus communication

Safety information	Product information	Mechanical installation	Electrical installation	EtherCAT Coupler	PROFINET Coupler	Digital Input	Digital Output	Analog Input	Analog Output	Multifunc Module	Comms Module	System Module	Appendix
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Appendix