

Rexroth VisualMotion 9

Multi-Axis Motion Control

using GPP and GMP Firmware

R911292836
Edition 03

Project Planning Manual



Title	VisualMotion 9 Multi-Axis Motion Control using GPP and GMP Firmware
Type of Documentation	Project Planning Manual
Document Typecode	DOK-VISMOT-VM*-09VRS**-PR03-EN-P
Internal File Reference	Document Number, 120-2300-B314-03/EN Part of Box Set, 20-09V-EN (Material No.: 293201)
Purpose of Documentation	<p>This documentation describes ...</p> <ul style="list-style-type: none"> • the controls and components used with the VisualMotion 9 multi-axis motion control system and optional interfaces, such as Ethernet, Fieldbus, Option Card PLS, Link Ring.

Record of Revisions	Description	Release Date	Notes
	DOK-VISMOT-VM*-09VRS**-PR01-EN-P	10/01	Initial Release
	DOK-VISMOT-VM*-09VRS**-PR02-EN-P	12/02	2nd Release
	DOK-VISMOT-VM*-09VRS**-PR03-EN-P	01/04	3 rd Release

Copyright	© 2003 Bosch Rexroth AG Copying this document, giving it to others and the use or communication of the contents thereof without express authority, are forbidden. Offenders are liable for the payment of damages. All rights are reserved in the event of the grant of a patent or the registration of a utility model or design (DIN 34-1).
Validity	The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract. All rights are reserved with respect to the content of this documentation and the availability of the product.
Published by	Bosch Rexroth AG Bgm.-Dr.-Nebel-Str. 2 • D-97816 Lohr a. Main Tel.: +49 (0)93 52/40-0 • Fax: +49 (0)93 52/40-48 85 • Telex: 68 94 21 Bosch Rexroth Corporation • Electric Drives and Controls 5150 Prairie Stone Parkway • Hoffman Estates, IL 60192 • USA Tel.: 847-645-3600 • Fax: 847-645-6201 http://www.boschrexroth.com/ Dept. ESG4 (DPJ)
Note	This document has been printed on chlorine-free bleached paper.

Table of Contents

1 VisualMotion 9 Overview	1-1
1.1 System Overview	1-1
1.2 GPP 9 System Overview.....	1-1
GPP 9 System Components.....	1-2
GPP 9 PLC Support.....	1-2
GPP 9 Interface Support.....	1-2
Drive I/O Support	1-3
1.3 GMP 9 System Overview.....	1-3
GMP 9 Firmware Features.....	1-4
GMP 9 System Components	1-4
GMP 9 Interface Support	1-4
Drive I/O Support	1-4
1.4 Supporting Documentation.....	1-5
Additional VisualMotion Documentation for GPP/GMP 9 Firmware	1-5
RECO02.2 SERCOS I/O Modules	1-5
DIAX04 Digital Drive Documentation for SSE Firmware	1-5
DIAX04 Digital Drive Documentation for ELS Firmware.....	1-5
ECODRIVE03 Digital Drive Documentation for SMT02 Firmware	1-5
ECODRIVE03 Digital Drive Documentation for SGP01 Firmware	1-6
ECODRIVE03 Digital Drive Documentation for SGP03 Firmware	1-6
ECODRIVE03 Digital Drive Documentation for SGP20 Firmware	1-6
ECODRIVE Cs Digital Drive Documentation for MGP01 Firmware	1-6
Windows Help System for Drives	1-6
Control and Drive Systems Electronic Documentation.....	1-7
WinPCL Documentation.....	1-7
1.5 Bosch Rexroth's Digital Drive Families	1-7
DIAX04 Digital Drive Family.....	1-7
ECODRIVE Digital Drive Family	1-9
2 Important Usage Directions	2-1
2.1 Appropriate Use	2-1
Introduction	2-1
Areas of Use and Application.....	2-2
2.2 Inappropriate Use.....	2-2
3 Safety Instructions for Electric Drives and Controls	3-1
3.1 Introduction.....	3-1
3.2 Explanations.....	3-1
3.3 Hazards by Improper Use	3-2
3.4 General Information	3-3
3.5 Protection Against Contact with Electrical Parts	3-5

3.6	Protection Against Electric Shock by Protective Low Voltage (PELV).....	3-6
3.7	Protection Against Dangerous Movements.....	3-7
3.8	Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting	3-9
3.9	Protection Against Contact with Hot Parts	3-10
3.10	Protection During Handling and Mounting	3-10
3.11	Battery Safety.....	3-11
3.12	Protection Against Pressurized Systems	3-11
4	VisualMotion Control System	4-1
4.1	PPC-R Overview	4-1
	PPC-R Hardware	4-1
	PPC-R Specifications.....	4-3
	Supply Voltage, Digital I/O and Watchdog.....	4-5
	SUP-E01-PPC-R Battery Accessory.....	4-7
4.2	PPC-P11.1 (PCI-Version) Overview	4-9
	PPC-P11.1 Hardware	4-9
	PCI Hardware Requirements.....	4-10
	Soft/Slot PLC Interface to PPC-P11.1	4-10
	PPC-P11.1 Specifications.....	4-11
	Supply Voltage, Digital I/O	4-12
	Installation Guidelines for PPC-P11.1	4-13
4.3	Serial Communication	4-14
	Serial Interface Pin Assignment.....	4-15
4.4	PPC Diagnostic Displays	4-15
	Normal Operations.....	4-15
	Error Codes.....	4-15
4.5	PPC Memory Cards	4-16
4.6	PPC SERCOS.....	4-16
4.7	MTS-R Overview.....	4-17
	MTS-R Hardware	4-17
	MTS-R Specifications	4-18
	Supply Voltage and Watchdog	4-20
	Rechargeable Battery	4-20
	Setting the Parameters of the PROG Interface	4-21
	Setting the Parameters of the COM Interface.....	4-22
	Interface Pin Assignments for MTS-R	4-22
	MTS-R H1 Status and Diagnostic Display	4-22
	Connecting the PPC-R and MTS-R	4-23
4.8	RECO 02 Hardware	4-25
	RECO02 I/O Modules	4-25
	Remote SERCOS Coupling Unit.....	4-25
	Mounting the RECO RMB Base Rack	4-26
	Slot Addressing of the RMB02.2 Racks.....	4-28
4.9	System Grounding	4-29
5	System I/O Modules	5-1

5.1	PPC-R Motion Control System	5-1
5.2	MTS-R and PPC-R Motion Control System.....	5-2
5.3	Supported I/O Devices	5-3
	Local RECO02 I/O Station	5-3
	SERCOS I/O Stations	5-3
	DIAx I/O Module	5-4
	ECODRIVE EMD I/O Module.....	5-4
5.4	Configuring I/O Modules	5-5
	Accessing RECO02 I/O Modules.....	5-5
	Configuring Local RECO I/O Modules for the MTS-R	5-9
	DIAx Digital I/O Modules	5-10
	DIAx Analog Input I/O Module.....	5-11
	Configuring EMD I/O Modules for DKC22.3	5-12
6	Fieldbus Slave Interfaces	6-1
6.1	Profibus-DP Fieldbus Slave Interface	6-1
	Pin Assignment of Connector X75.....	6-2
	Profibus Diagnostics	6-2
	Profibus Specifications.....	6-3
6.2	DeviceNet Fieldbus Slave Interface	6-4
	Pin Assignment of Connector X85.....	6-4
	DeviceNet Diagnostics	6-5
	DeviceNet Specifications	6-6
6.3	ControlNet Fieldbus Slave Interface	6-7
	Channel A ControlNet Interface.....	6-7
	Channel B ControlNet Interface	6-7
	ControlNet Network Access Port	6-7
	ControlNet Diagnostics	6-8
	ControlNet Specifications.....	6-9
6.4	EtherNet and EtherNet/IP	6-10
	EtherNet Network Access Port	6-10
	EtherNet Diagnostics	6-10
	EtherNet and EtherNet/IP Specifications.....	6-11
6.5	Interbus Fieldbus Slave Interface	6-13
	Pin Assignment of Connector X65.....	6-13
	Pin Assignment of Connector X66	6-13
	Interbus Diagnostics	6-14
	Interbus Specifications.....	6-15
7	Option Card PLS and Link Ring Interfaces	7-1
7.1	Option Card PLS for PPC-R and PPC-P11.1	7-1
	Connecting Supply Voltage.....	7-2
	Option Card PLS Specifications	7-3
7.2	DAQ03 for PPC-R and PPC-P11.1	7-4
	DAQ03 Diagnostics.....	7-5
	DAQ03 Specifications	7-5

Cable Connections for DAQ03.....	7-6
8 VisualMotion Human Machine Interfaces	8-1
8.1 Overview	8-1
8.2 BTC06	8-1
BTC06 Specifications.....	8-2
Standard Features	8-3
Optional Features	8-4
Safety Concept	8-4
Enclosure Dimensions	8-5
BTC06 Accessories	8-7
BTC06 Connections	8-8
Enclosure Connection from BTC to Control.....	8-10
BTC06 to PPC-R Connections.....	8-11
8.3 BTV Human Machine Interface.....	8-13
BTV04/05/06 Overview	8-13
BTV Features	8-14
Typical Applications	8-16
9 Fiber Optic Cable(LWL)	9-1
9.1 Data Transmission Ring Structure	9-1
Fiber Optic Transmission Path Installation	9-1
Fiber Optic Cable Types	9-2
Fiber Optic Cable Accessories.....	9-3
9.2 Project Planning Notes.....	9-3
Maximum Transmission Length	9-4
Technical Data	9-4
General Safety Guidelines	9-4
Handling	9-5
9.3 System Setup	9-6
Preparations.....	9-6
SERCOS Drive Address Settings	9-6
Changing the SERCOS Transmission Baudrate	9-8
Setting the Optic Transmitter Output Power	9-9
10 Hardware and Firmware Configurations	10-1
10.1 PPC-R Hardware and Firmware	10-1
PPC-R01.2 Hardware Configurations	10-1
PPC-R02.2 Hardware Configurations	10-4
10.2 PPC-P11.1 Hardware and Firmware	10-9
PPC-P11.1 Hardware Configurations	10-9
10.3 Upgrading Control Firmware	10-10
GPP 9 and Boot Loader Firmware.....	10-10
GMP 9 and Boot Loader Firmware	10-11
PPC Memory Cards (Blank)	10-12
10.4 BTC06.2 Hardware and Firmware	10-13

BTC06.2 Hardware	10-13
BTC06 Firmware.....	10-13
10.5 BTV Hardware and Firmware.....	10-15
BTV Firmware	10-15
11 Typecodes	11-1
11.1 Typecode Description	11-1
PPC-R01.2 Typecode	11-1
PPC-R02.2 Typecode	11-2
PPC-P11.1 Typecode	11-3
BTC06.2 Typecode	11-4
BTV04.2 Typecode	11-4
BTV05.2 Typecode	11-5
BTV06.1 Typecode	11-5
BTZ01.1 Typecode	11-6
12 Drawings	12-1
12.1 Dimensional Sheets, Wiring Diagrams RECO	12-1
Mounting Dimensions Module Carrier RMB02.2-02	12-1
Mounting Dimensions Module Carrier RMB02.2-04	12-2
PPC-R01.2 and PPC-R02.2.....	12-3
DAQ03.1R.....	12-4
Profibus Fieldbus Slave Interface DPS01.....	12-4
Interbus Fieldbus Slave Interface IBS03	12-5
DeviceNet Fieldbus Slave Interface DNS03	12-5
ControlNet Fieldbus Slave Interface CNS01	12-6
RME02.2-16-DC024 Input Module	12-7
RME02.2-32-DC024 Input Module	12-9
RME02.2-16-AC115 Input Module.....	12-11
RMA02.2-16-DC024-200 Output Module	12-13
RMA02.2-32-DC024-050 Output Module	12-15
RMA02.2-16-AC230-200 Output Module.....	12-17
RMA02.2-16-RE230-200 Output Module.....	12-19
RMC02.2-2E-1A Analog Module	12-21
12.2 Dimensional Sheet, Terminal Diagrams Drives	12-24
SERCOS interface DSS02.1M.....	12-24
Input / Output interface DEA.....	12-25
Analog interface with Actual Position Value Output DAE02.1M	12-27
13 Index	13-1

1 VisualMotion 9 Overview

1.1 System Overview

VisualMotion is a programmable multi-axis motion control system capable of controlling up to 40 intelligent digital drives from Bosch Rexroth. The PC software used for programming and commissioning is VisualMotion Toolkit.

VisualMotion 9 supports the following hardware and firmware versions:

- PPC-R01.2 / PPC-R02.2 using GPP 9 firmware (RECO02-version)
- PPC-P11.1 using GMP 9 firmware (PCI-version)

1.2 GPP 9 System Overview

The PPC-R is a stand-alone multi-axis motion control. It has the RECO02 form factor, a form factor used by Bosch Rexroth for motion controls, PLCs and I/O modules. These devices share the RECO02 back-plane bus for data exchange.

It is recommended to use the VisualMotion motion control with Rexroth's DIAX04 and/or ECODRIVE digital servo drives. The communication between control and digital servo drives is performed using the SERCOS interface, the international standard for real-time communication for digital servo drives.

VisualMotion can provide multi-axis coordinated or non-coordinated motion control with tightly integrated logic control functions. The GPP 9 firmware supports a variety of applications, from general motion control to sophisticated multiple master electronic line shafting (ELS) and robotics.

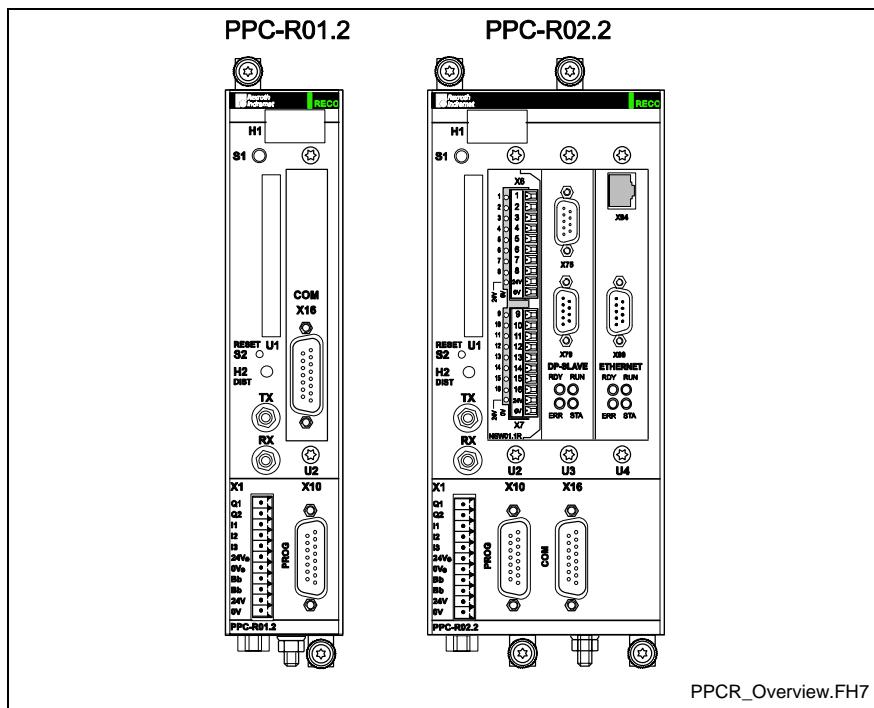


Fig. 1-1: PPC-R Motion Control

GPP 9 System Components

The VisualMotion GPP 9 system is comprised of the following components:

- PPC-R01.2 control with one expansion slot using GPP 9 firmware
- PPC-R02.2 control with three expansion slots using GPP 9 firmware
- RECO02 I/O modules (Local and SERCOS)
- VisualMotion Toolkit (VMT) Windows program for motion control programming, parametrization, system diagnostics and motion control management. VMT also includes DDE and OPC servers. These servers are the communication protocol between Windows programs and the control.
- Up to 40 intelligent digital drives can be connected to one control over SERCOS
 - DIAX04 (using SSE03 or ELS05 firmware) drives and motors
 - ECODRIVE03 (using SMT02, SGP01, SGP03 or SGP20 firmware) drives and motors
 - ECODRIVE Cs (using MPG01 firmware) drives and motors
- HMI interfaces (BTC06, BTV04, BTV05, BTV06)

GPP 9 PLC Support

The Rexroth MTS-R is a PLC unit that interfaces with the VisualMotion control (PPC-R) and is available preconfigured in two sizes.

- MTS-R01.1 with one expansion slot
- MTS-R02.1 with three expansion slot

Note: The expansion slot(s) on the MTS-R can be configured with fieldbus master interface or serial interface cards.

GPP 9 Interface Support

VisualMotion GPP 9 supports the following optional interfaces:

Fieldbus Interfaces

- Profibus-DP slave interface (32 words)
- Interbus slave interface (16 words)

Note: The word size in parenthesis indicates the maximum number of words allowed in the cyclic telegram for both the Input and Output directions.

- DeviceNet, ControlNet or EtherNet/IP slave interface (32 words)

Note: When using EtherNet/IP in a VisualMotion 9 system, no other fieldbus interface card (i.e., Profibus, DeviceNet, ControlNet, Interbus) or the MTS-R PLC interface can be installed.
EtherNet/IP uses firmware version FMC-ETH01*-PHT-02VRS-NN.

Option Card PLS, Link Ring, and Ethernet Interfaces

- Option Card Programmable Limit Switch (16 or 32 outputs)
- Link Ring for Master/Slave interfacing of VisualMotion controls
- Ethernet Interface

Note: The same EtherNet hardware is used for both EtherNet/IP fieldbus and standard EtherNet TCP/IP networking communication. When enabled as an EtherNet/IP fieldbus interface in VisualMotion 9 using GPP 9 firmware, standard TCP/IP communication between VisualMotion Toolkit over the same network is possible.

Drive I/O Support

Bosch Rexroth digital drives support the following I/O devices:

- DEA0x.2M ($x = 4, 5$ or 6) I/O cards for DIAX04 digital drives
- EMD I/O module using the EcoX interface for DKC22.3 digital drives using SGP20 firmware

1.3 GMP 9 System Overview

The PPC-P11.1 (PCI-version) is a PC-based stand-alone multi-axis motion control. The GMP 9 firmware used with the PPC-P is designed to work as a complete motion control solution. A host PC containing a Logic Controller (SoftPLC) handles the system logic, fieldbus and Ethernet communications.

Just like the PPC-R, the PPC-P supports Rexroth DIAX04 and ECODRIVE03 digital servo drives. Communication between the control and digital servo drives is performed via the SERCOS interface.



Fig. 1-2: PPC-P11.1 Motion Control

GMP 9 Firmware Features

All firmware functionality supported in GPP 9 will also be supported in GMP 9 with the following restriction:

- VisualMotion fieldbus slave interfaces are not supported
- Ethernet interface is not supported

GMP 9 System Components

The VisualMotion GMP 9 system is composed of the following components:

- PPC-P control using GMP firmware
- Optional SERCOS RECO02 I/O modules
- VisualMotion Toolkit (VMT) Windows program for motion control programming, parametrization, system diagnostics and motion control management. VMT also includes DDE and OPC servers. These servers are the communication protocol between Windows programs and the control.
- Up to 40 intelligent digital drives can be connected to one control over the SERCOS ring
 - DIAX04 (using SSE03 or ELS05 firmware) drives and motors
 - ECODRIVE03 (SMT02, SGP01, SGP03 and SGP20 firmware) drives and motors
 - ECODRIVE Cs (using MPG01 firmware) drives and motors
- HMI interfaces (BTC06, BTV04, BTV05, BTV06)

Note: When using VisualMotion's I/O Setup tool to assign registers to physical outputs, the location (either input or output registers) will determine which device is the "master" of the particular set of physical outputs. If they are mapped to the PPC output section, then the PPC will have control of the outputs. If they are mapped to the PPC input section, then the SoftPLC will have control over the physical outputs.

GMP 9 Interface Support

VisualMotion GMP 9 supports the following optional interfaces:

- second Serial interface
- Up to 2 Option Card Programmable Limit Switch with 16 outputs each
- Link Ring for Master/Slave interfacing of VisualMotion controls

Drive I/O Support

Bosch Rexroth digital drives support the following I/O devices:

- DEA0x.2M (x = 4, 5 or 6) I/O cards for DIAX04 digital drives
- EMD I/O module using the EcoX interface for DKC22.3 digital drives using SGP20 firmware

1.4 Supporting Documentation

The information in this manual is intended for users and programmers of the Rexroth VisualMotion control. In addition to this manual, the following supporting documentation is available:

Additional VisualMotion Documentation for GPP/GMP 9 Firmware

Type of Manual	Typecode	Material Number
Box Set 20-09V-EN	DOK-VISMOT-VM*-09VRS**-2001-EN-P	293201
Application Manual	DOK-VISMOT-VM*-09VRS**-AW02-EN-P	292839
Functional Description	DOK-VISMOT-VM*-09VRS**-FK01-EN-P	292840
Troubleshooting Guide	DOK-VISMOT-VM*-09VRS**-WA03-EN-P	292841

Table 1-1: Additional VisualMotion Documentation

RECO02.2 SERCOS I/O Modules

Type of Manual	Typecode	Material Number
Configuration	DOK-CONTRL-RECO02.2**-PR01-EN-P	283915

Table 1-2: RECO02.2 Module Documentation

DIAX04 Digital Drive Documentation for SSE Firmware

Type of Manual	Typecode	Material Number
Functional Description	DOK-DIAX04-SSE-03VRS**-FK01-EN-P	284050
Parameter Description	DOK-DIAX04-SSE-03VRS**-PA01-EN-P	284051
Troubleshooting	DOK-DIAX04-SSE-03VRS**-WA01-EN-P	284052
Drive Configurations	DOK-DIAX04-SSE-03VRS**-IF02-EN-P	284045
Firmware Version Notes	DOK-DIAX04-SSE-03VRS**-FV01-EN-P	284044

Table 1-3: DIAX04 SSE03 Documentation

DIAX04 Digital Drive Documentation for ELS Firmware

Type of Manual	Typecode	Material Number
Functional Description	DOK-DIAX04-ELS-05VRS**-FKB1-EN-P	276260
Troubleshooting	DOK-DIAX04-ELS-05VRS**-WAR1-EN-P	276258
Drive Configurations	DOK-DIAX04-ELS-05VRS**-IF02-EN-P	276256
Firmware Version Notes	DOK-DIAX04-ELS-05VRS**-FVN1-EN-P	276254

Table 1-4: DIAX04 ELS05 Documentation

ECODRIVE03 Digital Drive Documentation for SMT02 Firmware

Type of Manual	Typecode	Material Number
Project Planning	DOK-ECODR3-DKC**.3****-PR05-EN-P	280107
Functional Description	DOK-ECODR3-SMT-02VRS**-FK01-EN-P	285846
Parameter Description	DOK-ECODR3-SMT-02VRS**-PA01-EN-P	285850
Troubleshooting	DOK-ECODR3-SMT-02VRS**-WA01-EN-P	285852
Firmware Version Notes	DOK-ECODR3-SMT-02VRS**-FV01-EN-P	285851

Table 1-5: ECODRIVE03 SMT01 Documentation

ECODRIVE03 Digital Drive Documentation for SGP01 Firmware

Type of Manual	Typecode	Material Number
Project Planning	DOK-ECODR3-DKC**.3****-PR05-EN-P	280107
Functional Description	DOK-ECODR3-SGP-01VRS**-FKB1-EN-P	279095
Parameter Description	DOK-ECODR3-SGP-01VRS**-PAR1-EN-P	283218
Troubleshooting	DOK-ECODR3-SGP-01VRS**-WAR1-EN-P	279096
Firmware Version Notes	DOK-ECODR3-SGP-01VRS**-FVN1-EN-P	280282

Table 1-6: ECODRIVE03 SGP01 Documentation

ECODRIVE03 Digital Drive Documentation for SGP03 Firmware

Type of Manual	Typecode	Material Number
Project Planning	DOK-ECODR3-DKC**.3****-PR05-EN-P	280107
Functional Description	DOK-ECODR3-SGP-03VRS**-FKB1-EN-P	295671
Parameter Description	DOK-ECODR3-SGP-03VRS**-PAR1-EN-P	295673
Troubleshooting	DOK-ECODR3-SGP-03VRS**-WAR1-EN-P	295675
Firmware Version Notes	DOK-ECODR3-SGP-03VRS**-FVN1-EN-P	295677

Table 1-7: ECODRIVE03 SGP03 Documentation

ECODRIVE03 Digital Drive Documentation for SGP20 Firmware

Type of Manual	Typecode	Material Number
Project Planning	DOK-ECODR3-DKC**.3****-PR05-EN-P	280107
Functional Description	DOK-DRIVE*-SGP-20VRS**-FK01-EN-P	289469
Parameter Description	DOK-DRIVE*-SGP-20VRS**-PA01-EN-P	289471
Troubleshooting	DOK-DRIVE*-SGP-20VRS**-WA01-EN-P	289472
Firmware Version Notes	DOK-DRIVE*-SGP-20VRS**-FV02-EN-P	289470

Table 1-8: ECODRIVE03 SGP20 Documentation

ECODRIVE Cs Digital Drive Documentation for MGP01 Firmware

Type of Manual	Typecode	Material Number
Project Planning	DOK-ECODR3-DKC**.3-CS*-PR01-EN-P	295758
Functional Description	DOK-DRIVE*-MGP-01VRS**-FK01-EN-P	296549
Parameter Description	DOK-DRIVE*-MGP-01VRS**-PA01-EN-P	296551
Troubleshooting	DOK-DRIVE*-MGP-01VRS**-WA01-EN-P	296553
Firmware Version Notes	DOK-DRIVE*-MGP-01VRS**-FV01-EN-P	296555

Table 1-9: ECODRIVE03 SGP20 Documentation

Windows Help System for Drives

Windows help systems for all of Bosch Rexroth's digital drives are available on CD-ROM:

Description	Typecode	Material Number
DRIVEHELP - Help files for drives	DOK-GENERL-DRIVEHELP**-GN07-MS-D0600	282411

Table 1-10: DRIVEHELP CD-ROM

Control and Drive Systems Electronic Documentation

The documents refer to in this manual are available on Bosch Rexroth's documentation CD-ROM. This CD-ROM contains the current control and drive systems documentation for products sold by Bosch Rexroth.

Description	Typecode	Material Number
Electronic Documentation for Control and Drive Systems	DOK-GENERL-CONTR*DRIVE-GN13-EN-D0650	281883

Table 1-11: Documentation CD-ROM

WinPCL Documentation

Description	Typecode	Material Number
WinPCL 04VRS Application Manual	DOK-CTRL-WINPCL*4VRS-AW01-EN-P	294569

Table 1-12: Documentation CD-ROM

1.5 Bosch Rexroth's Digital Drive Families

Bosch Rexroth's digital drive families are comprised of power supplies, drive controllers and their associated motors. The DIAX04 and ECODRIVE digital drive families are fully capable of using the functions available in the VisualMotion control.

DIAX04 Digital Drive Family

The modular concept in the Rexroth DIAX04 digital drive family enables a flexible combination of digital drive controllers to one power supply unit.

Note: Power supplies and digital drive controllers are combined based on their power requirements. Refer to the following application manual:

- DIAX04 HVE and HVR 2nd Generation Power Supply Units
Material Number: 280641
DOK-POWER*-HVE+HVR**G2-AW06-EN-P
-

DIAX04 Power Supplies

Power supply units of the HV* line support the power and control voltage of Bosch Rexroth digital drive controllers of the HD* line. DIAX04 power supplies require a mains voltage of 3 x AC 380 ... 480 V.

• **HVE:**

The HVE power supply uses a bleeder resistor to absorb regenerative power that is fed back from the attached digital drive controllers. The following HVE power supplies are available:

- **HVE02.2**
can output a continuous mechanical power of up to 18kW.
- **HVE03.2**
can output a continuous mechanical power of up to 28kW.
- **HVE04.2**
can output a continuous mechanical power of up to 72kW.

• **HVR:**

The HVR power supply uses current regeneration to regenerate power that is fed back from the attached digital drive controllers. The following HVR power supplies are available:

- **HVR02.2**
can output a continuous mechanical power of up to 20kW.
- **HVR03.2**
can output a continuous mechanical power of up to 36kW.

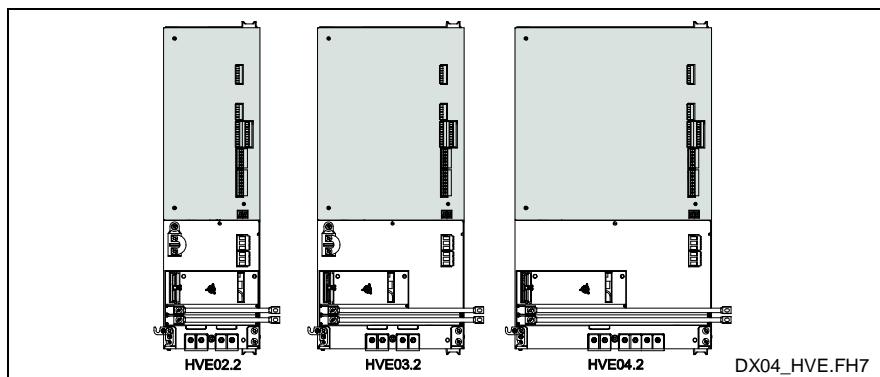


Fig. 1-3: DIAX04 HVE Power Supplies

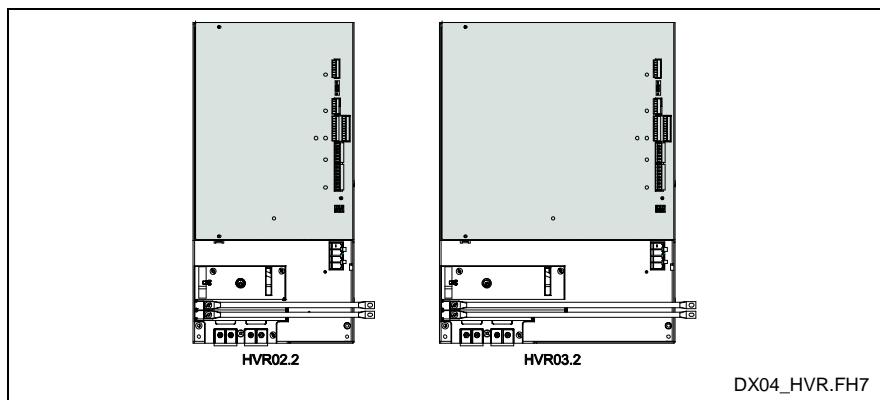


Fig. 1-4: DIAX04 HVR Power Supplies

DIAX04 Digital Drive Controllers

The following digital drive controllers are part of the DIAX04 drive family.

- **HDD:**
The HDD02.2 is a dual axes digital drive controller with two slots for plug-in cards (one per axis) and a continuous drive output of up to approximately 8 kW.
- **HDS:**
The HDS digital drive controller is designed with three slots (HDS02.2) or four slots (HDS03/04) for plug-in cards. The following HDS drives are available:
 - **HDS02.2**
can output a continuous mechanical power of up to 11 kW.
 - **HDS03.2**
can output a continuous mechanical power of up to 27 kW.
 - **HDS04.2**
can output a continuous mechanical power of up to 65 kW.
 - **HDS05.2**
can output a continuous mechanical power of up to 95 kW.

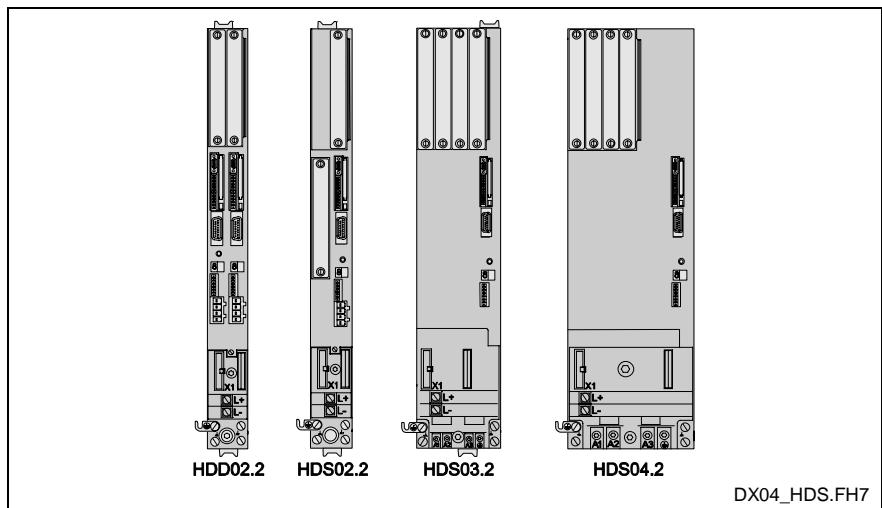


Fig. 1-5: DIAX04 Digital Drive Controllers

ECODRIVE Digital Drive Family

The ECODRIVE digital drive family incorporates a power supply section with a drive controller in one package.

ECODRIVE03 Digital Drive Controllers

The following DKC digital drive controllers using SGP or SMT firmware are supported by GPP 9 and GMP 9 firmware.

- **DKC02.3-016**
can output a continuous mechanical power of up to 0.5 kW.
- **DKC02.3-040 or DKC22.3-040**
can output a continuous mechanical power of up to 1.2 kW.
- **DKC02.3-100 or DKC22.3-100**
can output a continuous mechanical power of up to 9.6 kW.
- **DKC02.3-200 or DKC22.3-200**
can output a continuous mechanical power of up to 21.6 kW.

Note: The DKC digital drive controller requires additional components to output the mechanical power listed above. Refer to the following project planning manual for complete details:

- ECODRIVE03 Drive Controllers
DOK-ECODR3-DKC**.3****-PR05-EN-P
-

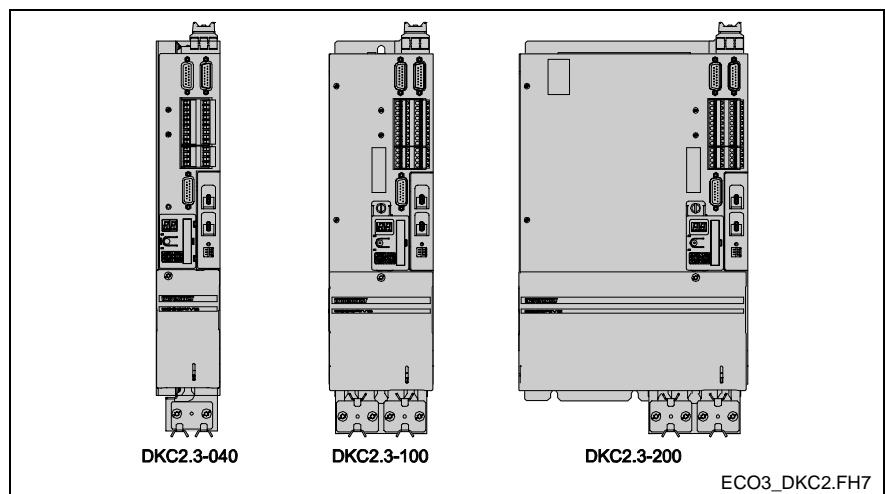


Fig. 1-6: ECODRIVE03 Digital Drive Controllers

Motors used with DIAX04 and ECODRIVE03

All DIAX04 and ECODRIVE03 digital drive controllers are capable of operating all rotating and linear motors of the MHE, MKD, MKD, 2AD, 1MB, MBS, MBW, ADF, LAF and LSF series.

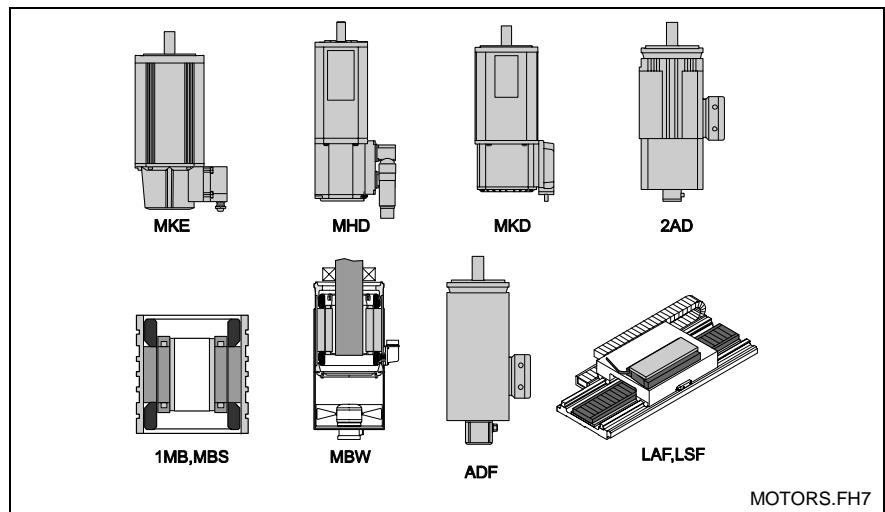


Fig. 1-7: Motors used with DIAX04 and ECODRIVE03

ECODRIVE Cs Digital Drive Controllers

The following DKC digital drive controllers using MGP firmware are supported by GPP 9 and GMP 9 firmware:

- **DKC02.3-004**
- **DKC02.3-008**
- **DKC02.3-012**
- **DKC02.3-018**

Refer to the *ECODRIVE Cs Project Planning* manual for mechanical output power.



Fig. 1-8: ECODRIVE Cs Digital Drive Controllers

Motors used with ECODRIVE Cs

Each MSM motor is combined with a DKC02.3 ECODRIVE Cs controller. Refer to the *ECODRIVE Cs Project Planning* manual for drive - motor combinations.



Fig. 1-9: Motor used with ECODRIVE Cs

2 Important Usage Directions

2.1 Appropriate Use

Introduction

Bosch Rexroth products represent state-of-the-art developments and manufacturing. They are tested prior to delivery to ensure operating safety and reliability.

The products may only be used in the manner that is defined as appropriate. If they are used in an inappropriate manner, then situations can develop that may lead to property damage or injury to personnel.

Note: Bosch Rexroth, as manufacturer, is not liable for any damages resulting from inappropriate use. In such cases, the guarantee and the right to payment of damages resulting from inappropriate use are forfeited. The user alone carries all responsibility of the risks.

Before using Bosch Rexroth products, make sure that all the prerequisites for appropriate use of the products are satisfied:

- Personnel that in any way, shape or form uses our products must first read and understand the relevant safety instructions and be familiar with appropriate use.
- If the product takes 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 products or alter source codes.
- Do not mount damaged or faulty products or use them in operation.
- Make sure that the products have been installed in the manner described in the relevant documentation.

Areas of Use and Application

VisualMotion made by Bosch Rexroth is designed for the control of servo drives.

Control and monitoring of the drive system may require additional sensors and actors.

Note: The components may only be used with the accessories and parts specified in this document. If a component has not been specifically named, then it may not be either mounted or connected. The same applies to cables and lines.

Operation is only permitted in the specified configurations and combinations of components using the software and firmware as specified in the relevant function descriptions.

The motion control and every drive controller has to be parameterized/programmed before starting it up, making it possible for the motor to execute the specific functions of an application.

VisualMotion, the motion control solution, has been developed for use in single or multiple axis drives and control tasks.

Typical applications of VisualMotion are:

- motion control in general automation,
- handling and assembly systems,
- packaging and foodstuff machines,
- printing and paper converting machines and
- textile machines.

The motion control and drive system may only be operated under the assembly, installation and ambient conditions as described in this document (temperature, system of protection, humidity, EMC requirements, etc.) and in the position specified.

2.2 Inappropriate Use

Using VisualMotion components outside of the above referenced areas of application or under operating conditions other than those described in this document and in specified technical data is defined as "inappropriate use".

VisualMotion components may not be used if

- they are subject to operating conditions that do not meet the specified ambient conditions in this document. This includes, for example, operation under water, in the case of extreme temperature fluctuations or extremely high maximum temperatures or if
- Bosch Rexroth has not specifically released them for that intended purpose. Please note the specifications outlined in the general Safety Guidelines!

3 Safety Instructions for Electric Drives and Controls

3.1 Introduction

Read these instructions before the initial startup of the equipment and eliminate the risk of bodily harm or material damage. Follow these safety instructions at all times.

Do not attempt to install or start up this equipment without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation of the equipment prior to working with the equipment at any time. If you do not have the user documentation for your equipment, contact your local Bosch Rexroth representative to send this documentation immediately to the person or persons responsible for the safe operation of this equipment.

If the equipment is resold, rented, transferred, or passed on to others, then these safety instructions must be delivered with the equipment.



Improper use of this equipment, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, may result in material damage, bodily harm, electric shock or even death!

3.2 Explanations

The safety instructions describe the following degrees of hazard seriousness in compliance with ANSI Z535. The degree of hazard seriousness informs about the consequences resulting from non-compliance with the safety instructions.

Warning symbol with signal word	Degree of hazard seriousness according to ANSI
 DANGER	Death or severe bodily harm will occur.
 WARNING	Death or severe bodily harm may occur.
 CAUTION	Bodily harm or material damage may occur.

Fig. 3-1: Hazard classification (according to ANSI Z535)

3.3 Hazards by Improper Use



DANGER

**High voltage and high discharge current!
Danger to life or severe bodily harm by electric
shock!**



DANGER

**Dangerous movements! Danger to life, severe
bodily harm or material damage by
unintentional motor movements!**



WARNING

**High electrical voltage due to wrong
connections! Danger to life or bodily harm by
electric shock!**



WARNING

**Health hazard for persons with heart
pacemakers, metal implants and hearing aids in
proximity to electrical equipment!**



CAUTION

**Surface of machine housing could be extremely
hot! Danger of injury! Danger of burns!**



CAUTION

**Risk of injury due to improper handling! Bodily
harm caused by crushing, shearing, cutting and
mechanical shock or incorrect handling of
pressurized systems!**



CAUTION

**Risk of injury due to incorrect handling of
batteries!**

3.4 General Information

- Bosch Rexroth AG is not liable for damages resulting from failure to observe the warnings given in this documentation.
- Read the operating, maintenance and safety instructions in your language before starting up the machine. If you find that you can not completely understand the documentation for your product, please ask your supplier to clarify.
- Proper and correct transport, storage, assembly and installation as well as care in operation and maintenance are prerequisites for optimal and safe operation of this equipment.
- Only persons who are trained and qualified for the use operation of the equipment may work on this equipment or within its proximity. The persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the equipment as well as an understanding of all warnings and precautionary measures noted in these instructions.
Furthermore, they must be trained, instructed and qualified to switch electrical circuits and equipment on and off in accordance with technical safety regulations, to ground them and to mark them according to the requirements of safe work practices. They must have adequate safety equipment and be trained in first aid.
- Only use spare parts and accessories approved by the manufacturer.
- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- The equipment is designed for installation in industrial machinery.
- The ambient conditions given in the product documentation must be observed.
- Use only safety features and applications that are clearly and explicitly approved in the Project Planning Manual.
For example, the following areas of use are not permitted: construction cranes, elevators used for people or freight, devices and vehicles to transport people, medical applications, refinery plants, transport of hazardous goods, nuclear applications, applications sensitive to high frequency, mining, food processing, control of protection equipment (also in a machine).
- The information given in this documentation with regard to the use of the delivered components contains only examples of applications and suggestions.
The machine and installation manufacturer must
 - make sure that the delivered components are suited for his individual application and check the information given in this documentation with regard to the use of the components,
 - make sure that his application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.
 - Startup of the delivered components is only permitted once it is sure that the machine or installation in which they are installed complies with the national regulations, safety specifications and standards of the application.

- Operation is only permitted if the national EMC regulations for the application are met.
The instructions for installation in accordance with EMC requirements can be found in the documentation "EMC in Drive and Control Systems."
The machine or installation manufacturer is responsible for compliance with the limiting values as prescribed in the national regulations.
- Technical data, connections and operational conditions are specified in the product documentation and must be followed at all times.

3.5 Protection Against Contact with Electrical Parts

Note: This section refers to equipment and drive components with voltages above 50 Volts.

Touching live parts with voltages of 50 Volts and more with bare hands or conductive tools or touching ungrounded housings can be dangerous and cause electric shock. In order to operate electrical equipment, certain parts must unavoidably have dangerous voltages applied to them.



High electrical voltage! Danger to life, severe bodily harm by electric shock!

- ⇒ Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain or repair this equipment.
 - ⇒ Follow general construction and safety regulations when working on high voltage installations.
 - ⇒ Before switching on power, the ground wire must be permanently connected to all electrical units according to the connection diagram.
 - ⇒ Do not operate electrical equipment at any time, even for brief measurements or tests, if the ground wire is not permanently connected to the points of the components provided for this purpose.
 - ⇒ Before working with electrical parts with voltage higher than 50 V, the equipment must be disconnected from the mains voltage or power supply. Make sure the equipment cannot be switched on again unintended.
 - ⇒ The following should be observed with electrical drive and filter components:
Wait five (5) minutes after switching off power to allow capacitors to discharge before beginning to work. Measure the voltage on the capacitors before beginning to work to make sure that the equipment is safe to touch.
 - ⇒ Never touch the electrical connection points of a component while power is turned on.
 - ⇒ Install the covers and guards provided with the equipment properly before switching the equipment on. Prevent contact with live parts at any time.
 - ⇒ A residual-current-operated protective device (RCD) must not be used on electric drives! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.
 - ⇒ Electrical Components with exposed live parts and uncovered high voltage terminals must be installed in a protective housing, for example in a control cabinet.
-

To be observed with electrical drive and filter components:



**High electrical voltage on the housing!
High leakage current! Danger to life, danger of
injury by electric shock!**

- ⇒ Connect the electrical equipment, the housings of all-electrical units and motors permanently with the safety conductor at the ground points before power is switched on. Look in the connection diagram. This is even necessary for brief tests.
- ⇒ Connect the safety conductor of the electrical equipment always permanently and firmly to the supply mains. Leakage current exceeds 3.5 mA in normal operation.
- ⇒ Use a copper conductor with at least 10-mm² cross section over its entire course for this safety conductor connection!
- ⇒ Prior to startups, even for brief tests, always connect the protective conductor or connect with ground wire. Otherwise, high voltages can occur on the housing that lead to electric shock.

3.6 Protection Against Electric Shock by Protective Low Voltage (PELV)

All connections and terminals with voltages between 0 and 50 Volts on Bosch Rexroth products are protective low voltages designed in accordance with international standards on electrical safety.



**High electrical voltage due to wrong
connections! Danger to life, bodily harm by
electric shock!**

- ⇒ Only connect equipment, electrical components and cables of the protective low voltage type (PELV = Protective Extra Low Voltage) to all terminals and clamps with voltages of 0 to 50 Volts.
- ⇒ Only electrical circuits may be connected which are safely isolated against high voltage circuits. Safe isolation is achieved, for example, with an isolating transformer, an opto-electronic coupler or when battery-operated.

3.7 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of the connected motors. Some common examples are:

- improper or wrong wiring of cable connections
- incorrect operation of the equipment components
- wrong input of parameters before operation
- malfunction of sensors, encoders and monitoring device
- defective components
- software or firmware errors

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

The monitoring in the drive components will normally be sufficient to avoid faulty operation in the connected drives. Regarding personal safety, especially the danger of bodily injury and material damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.

**Dangerous movements! Danger to life, risk of injury, severe bodily harm or material damage!**

- ⇒ Secure personal safety by means of qualified and tested higher-level monitoring device or measures integrated in the installation. Unintended machine motion is possible if monitoring device are disabled, bypassed or not activated.
- ⇒ Pay attention to unintended machine motion or other malfunction in any case of operation.
- ⇒ Keep free and clear of the machine's range of motion and moving parts. Possible measures to prevent people from accidentally entering the machine's range of movement:
 - use safety fences
 - use safety guards
 - use protective coverings
 - install light curtains or light barriers
- ⇒ Fences and coverings must be strong enough to resist maximum possible momentum, especially if solved parts can fly into the environment.
- ⇒ Mount the emergency stop switch in the immediate reach of the operator. Verify that the emergency stop works before startup. Don't operate the machine if the emergency stop is not working.
- ⇒ Isolate the drive power connection by means of an emergency stop circuit or use a starting lockout to prevent unintentional start.
- ⇒ Make sure that the drives are brought to a safe standstill before accessing or entering the danger zone. Safe standstill can be achieved by switching off the power supply contactor or by safe mechanical locking of moving parts.
- ⇒ Secure vertical axes against falling or dropping after switching off the motor power by, for example:
 - mechanically securing the vertical axes
 - adding an external braking/ arrester/ clamping mechanism
 - ensuring sufficient equilibration of the vertical axesThe standard motor brake or an external brake controlled directly by the drive controller is not sufficient to guarantee personal safety!

- ⇒ Disconnect electrical power to the equipment using a master switch and secure the switch against reconnection for:
 - maintenance and repair work
 - cleaning of equipment
 - long periods of discontinued equipment use
- ⇒ Prevent the operation of high-frequency, remote control and radio equipment near electronics circuits and supply leads. If the use of such equipment cannot be avoided, verify the system and the installation for possible malfunctions in all possible positions of normal use before initial startup. If necessary, perform a special electromagnetic compatibility (EMC) test on the installation.

3.8 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated near current-carrying conductors and permanent magnets in motors represent a serious health hazard to persons with heart pacemakers, metal implants and hearing aids.



Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

WARNING

- ⇒ Persons with heart pacemakers, hearing aids and metal implants are not permitted to enter following areas:
 - Areas in which electrical equipment and parts are mounted, being operated or started up.
 - Areas, in which parts of motors with permanent magnets are being stored, operated, repaired or mounted.
- ⇒ If it is necessary for a person with a heart pacemaker to enter such an area, then a doctor must be consulted prior to doing so. Heart pacemakers that are already implanted or will be implanted in the future, have a considerable variation in their electrical noise immunity. Therefore, there are no rules with general validity.
- ⇒ Persons with hearing aids, metal implants or metal pieces must consult a doctor before they enter the areas described above. Otherwise, health hazards will occur.

3.9 Protection Against Contact with Hot Parts



**Housing surfaces could be extremely hot!
Danger of injury! Danger of burns!**

- ⇒ Do not touch housing surfaces near sources of heat!
Danger of burns!
- ⇒ After switching the equipment off, wait at least ten (10) minutes to allow it to cool down before touching it.
- ⇒ Do not touch hot parts of the equipment, such as housings with integrated heat sinks and resistors.
Danger of burns!

3.10 Protection During Handling and Mounting

Under certain conditions, incorrect handling and mounting of parts and components may cause injuries.



Risk of injury by incorrect handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock!

- ⇒ Observe general installation and safety instructions with regard to handling and mounting.
- ⇒ Use appropriate mounting and transport equipment.
- ⇒ Take precautions to avoid pinching and crushing.
- ⇒ Use only appropriate tools. If specified by the product documentation, special tools must be used.
- ⇒ Use lifting devices and tools correctly and safely.
- ⇒ For safe protection wear appropriate protective clothing, e.g. safety glasses, safety shoes and safety gloves.
- ⇒ Never stand under suspended loads.
- ⇒ Clean up liquids from the floor immediately to prevent slipping.

3.11 Battery Safety

Batteries contain reactive chemicals in a solid housing. Inappropriate handling may result in injuries or material damage.



Risk of injury by incorrect handling!

- ⇒ Do not attempt to reactivate discharged batteries by heating or other methods (danger of explosion and cauterization).
- ⇒ Never charge non chargeable batteries (danger of leakage and explosion).
- ⇒ Never throw batteries into a fire.
- ⇒ Do not dismantle batteries.
- ⇒ Do not damage electrical components installed in the equipment.

Note: Environmental protection and disposal! The batteries contained in the product should be considered as hazardous material for land, air and sea transport in the sense of the legal requirements (danger of explosion). Dispose batteries separately from other waste. Observe the legal requirements in the country of installation.

3.12 Protection Against Pressurized Systems

Certain motors and drive controllers, corresponding to the information in the respective Project Planning Manual, must be provided with pressurized media, such as compressed air, hydraulic oil, cooling fluid and cooling lubricant supplied by external systems. Incorrect handling of the supply and connections of pressurized systems can lead to injuries or accidents. In these cases, improper handling of external supply systems, supply lines or connections can cause injuries or material damage.



Danger of injury by incorrect handling of pressurized systems!

- ⇒ Do not attempt to disassemble, to open or to cut a pressurized system (danger of explosion).
- ⇒ Observe the operation instructions of the respective manufacturer.
- ⇒ Before disassembling pressurized systems, release pressure and drain off the fluid or gas.
- ⇒ Use suitable protective clothing (for example safety glasses, safety shoes and safety gloves)
- ⇒ Remove any fluid that has leaked out onto the floor immediately.

Note: Environmental protection and disposal! The media used in the operation of the pressurized system equipment may not be environmentally compatible. Media that are damaging the environment must be disposed separately from normal waste. Observe the legal requirements in the country of installation.

4 VisualMotion Control System

4.1 PPC-R Overview

The PPC-R control can be used with VisualMotion's GPP 9 firmware and is designed to plug directly into the RECO02 rack from Bosch Rexroth. The RECO02 rack can hold the PPC-R along with RECO02 I/O modules, allowing communication along the RECO02 back-plane bus.

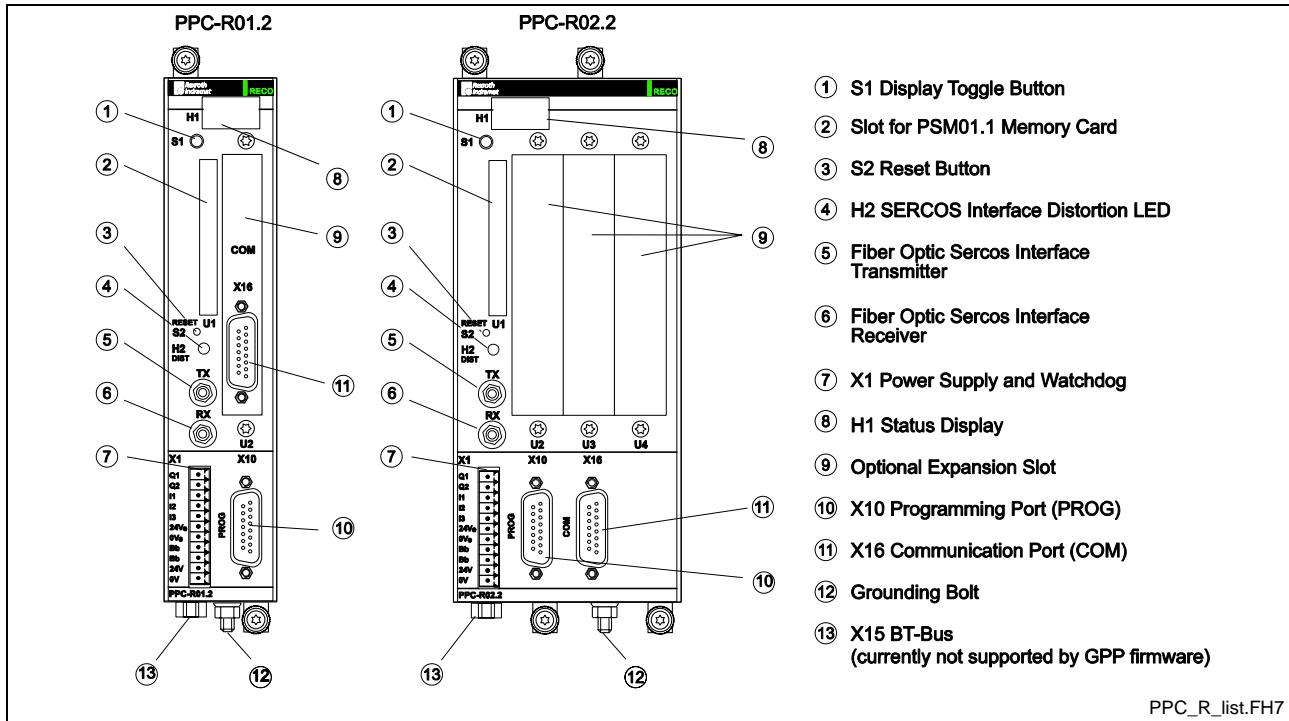


Fig. 4-1: PPC-R01.2 and PPC-R02.2

PPC-R Hardware

Note: Refer to chapter 10 for a complete listing of available configurations for the PPC-R motion control.

- Single or double slot width versions
 - PPC-R01.2, with one expansion slot
 - PPC-R02.2, with three expansion slots
- Fieldbus slave interface cards (only one fieldbus slave interface card can be used in a PPC-R at one time)
 - Profibus fieldbus slave interface
 - Interbus fieldbus slave interface
 - DeviceNet, ControlNet or EtherNet/IP fieldbus slave interface

Note: When using EtherNet/IP in a VisualMotion 9 system, no other fieldbus interface card (i.e., Profibus, DeviceNet, ControlNet, Interbus) or the MTS-R PLC interface can be installed.

EtherNet/IP fieldbus uses the following firmware version:
FMC-ETH01*-PHT-02VRS-NN.

- Additional interfaces
 - Optional Card Programmable Limit Switch
 - Link Ring (DAQ03)
 - Ethernet Card (same hardware used for EtherNet/IP)

Note: The same EtherNet hardware is used for both EtherNet/IP fieldbus and standard EtherNet TCP/IP networking communication. When enabled as an EtherNet/IP fieldbus interface in VisualMotion 9 using GPP 9 firmware, standard TCP/IP communication between VisualMotion Toolkit over the same network is possible.

- 4-digit alphanumeric display (H1)
- PCMCIA flash memory card (U1)
- SERCOS Interface for up to 40 drives
- Two serial interface ports available with a software selectable baud rate of 9600 to 115200 (Default: 9600)
 - PPC-R01.2: X10 (second serial port configuration in slot U2 when no other configuration is used.)
 - PPC-R02.2: X10 and X16

Note: The standard RS-232 interface cable used for connecting to VisualMotion Toolkit, via a 9 pin PC COM port, is the IKB0005.

PPC-R Specifications

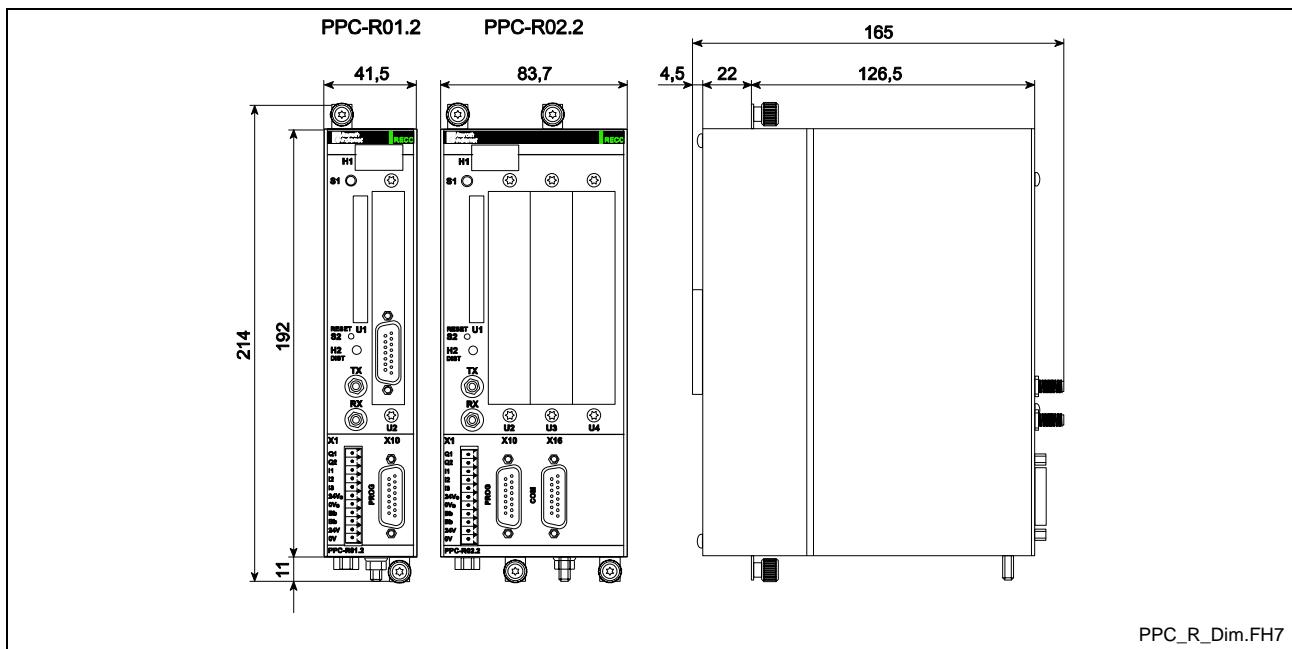


Fig. 4-2: PPC-R01.2 and PPC-R02.2 Dimensions

General Specifications for PPC-R

Permissible cable cross section for incoming power:	Up to 1.5 mm ²
Mounting style:	Using RMB02.2 racks on TS 35x27x15 DIN rails
Protection rating:	IP20, DIN VDE 0470, EN 60529
Humidity:	5 – 78 %, no condensation (operating) 5 – 95 %, no condensation (transport) DIN 40 040 Class F
Atmospheric pressure:	860 ... 1080 hPa, 1500 m (operating) 660 ... 1080 hPa, 3500 m (transport)
Ambient operating temperature: Storage and transport temperature:	0 ... 45 °C (32 ... 113 °F), DIN 40 040 Class KV -25 ... 70 °C (-13 ... 158 °F)
Weight: PPC-R01.2 PPC-R02.2	1.00 kg (2.2 lbs.) 1.3 kg (2.87 lbs.)

Supply Voltages for PPC-R

Nominal value:	24 VDC
Permissible ripples:	4 Vss within the permissible voltage range
Permissible voltage range:	19 ... 30 VDC, including ripples
Maximum current consumption: PPC-R01.2 PPC-R02.2	0.7 A (+ supply voltage for I/O modules up to 2.6 A) 1.2 A (+ supply voltage for I/O modules up to 2.6 A)

Digital Input and Output Rating for PPC-R

Digital Input:	Current draw, isolated $V_{i,Low} = 0V \dots 5V$: $V_{i,High} = 15V \dots 30V$
Digital Output:	Current rating = 0.5 A, isolated Response (delay) time = 400 μ s max.

Battery Backup for PPC-R

Internal clock: A Real-time clock that maintains accurate time of diagnostic logs during a power down condition.	3.5V lithium battery and cover Ordered separately: SUP-E01-PPC-R Material number: 288248 It is recommended to replace the battery once a year
---	--

EMC

Noise emission to EN 55022:	Class of an industry environment
Noise immunity to IEC 1000-4-2 (ESD):	Judgement criterion B
Noise immunity to IEC 1000-4-4 (Burst):	Judgement criterion B
Noise immunity to IEC 1000-5-5 (Surge):	Judgement criterion B

Serial and Optional Fieldbus Interfaces for PPC-R

Programming interface PROG (X10):	RS-232 (D-sub, 15pin, female) RS-485 (D-sub, 15pin, female)
General purpose serial interface COM (X16):	RS-232 / RS-422 / RS-485 (D-sub, 15pin, female)
Optional fieldbus interfaces:	Profibus-DP slave (D-sub, 9 pin, female) Interbus slave (Outgoing: D-sub, 9 pin, female) (Incoming: D-sub, 9 pin, male) DeviceNet slave (Phoenix, 5 pin, female) ControlNet slave EtherNet/IP slave

Supply Voltage, Digital I/O and Watchdog

Power is supplied to the PPC-R through the X1 Phoenix connector.

X1 Pin Assignment on PPC-R

Pin	Signal Description
1	Digital Output 1 (Q1)
2	Digital Output 2 (Q2)
3	Digital Input 1 (I1)
4	Digital Input 2 (I2)
5	Digital Input 3 (I3)
6	24 V external
7	0V external
8	BB relay (Watchdog)
9	BB relay (Watchdog)
10	24 V (control supply voltage)
11	0V

Table 4-1: X1 Pin Assignment

Power Supply Voltage for PPC-R

Faultless operation of the PPC-R requires the supply voltage to fulfill the following criteria:

- The supply voltage must never drop below +20VDC. If this occurs, a POWER-FAIL signal will become active and shutdown the motion control.

Note: The power supply unit used with the PPC-R should be a switching power supply with an inrush current as high as 20 A. Do not connect another PPC-R unit to the same supply voltage. The high inrush current may cause the supply voltage to breakdown and activate the POWER-FAIL signal.

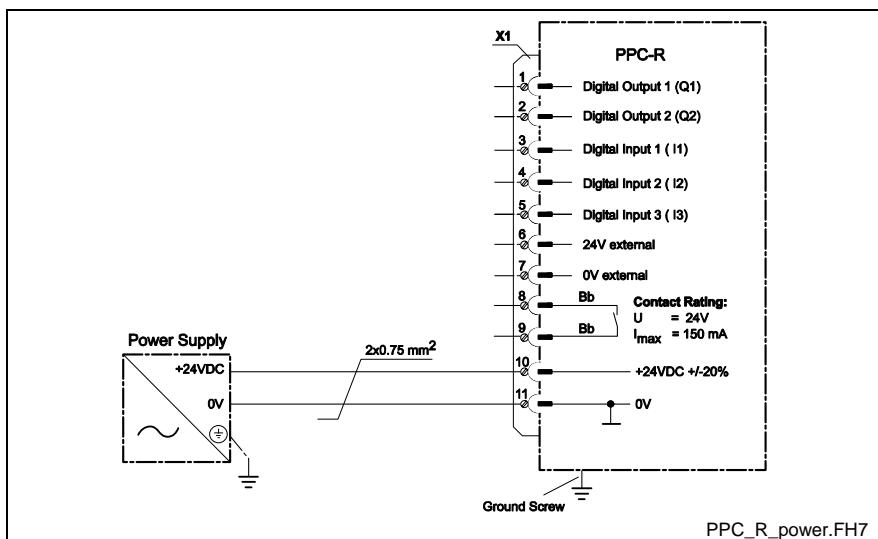


Fig. 4-3: PPC-R Power Supply Voltage

Digital Input / Output Supply Voltage for PPC-R

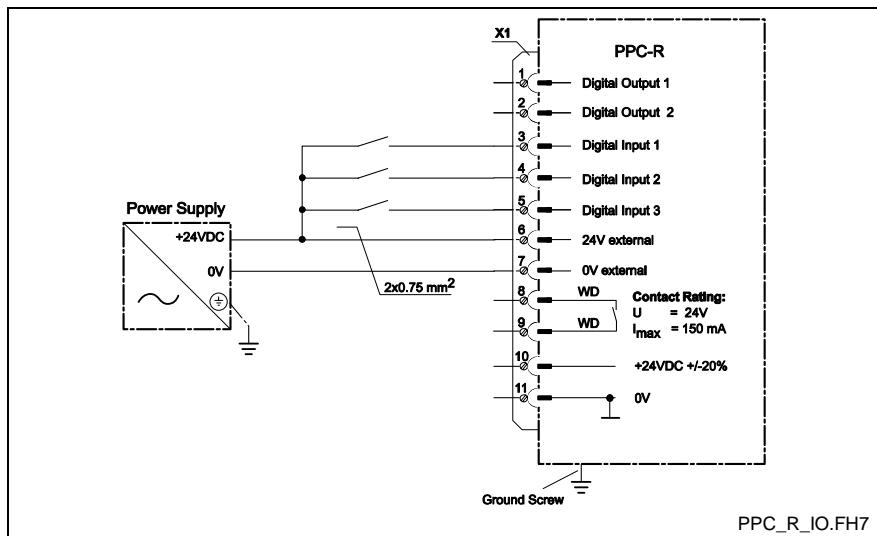


Fig. 4-4: Digital Input / Output Supply Voltage

Note: The digital inputs and outputs found on connector X1 of the PPC-R are not functional unless 24V are supplied to pins 6 and 7.

Digital inputs I1, I2 and I3 are mapped the bits 1, 2, and 3 of register 44. Digital outputs Q1 and Q2 are mapped the bits 1 and 2 of register 45.

SUP-E01-PPC-R Battery Accessory

The SUP-E01-PPC-R battery accessory kit (Mat. No.: 288248) is ordered separately and used to maintain the internal real-time clock for the diagnostic log. The kit includes a 3.5V lithium battery wired to a small 3 pin blue connector and a metal cover. The installation of the SUP battery kit is best accomplished when using the following installation guidelines. The following figure shows an overview of the battery installation.

Note: To order the 3.5V lithium battery as a spare use material number: 226423

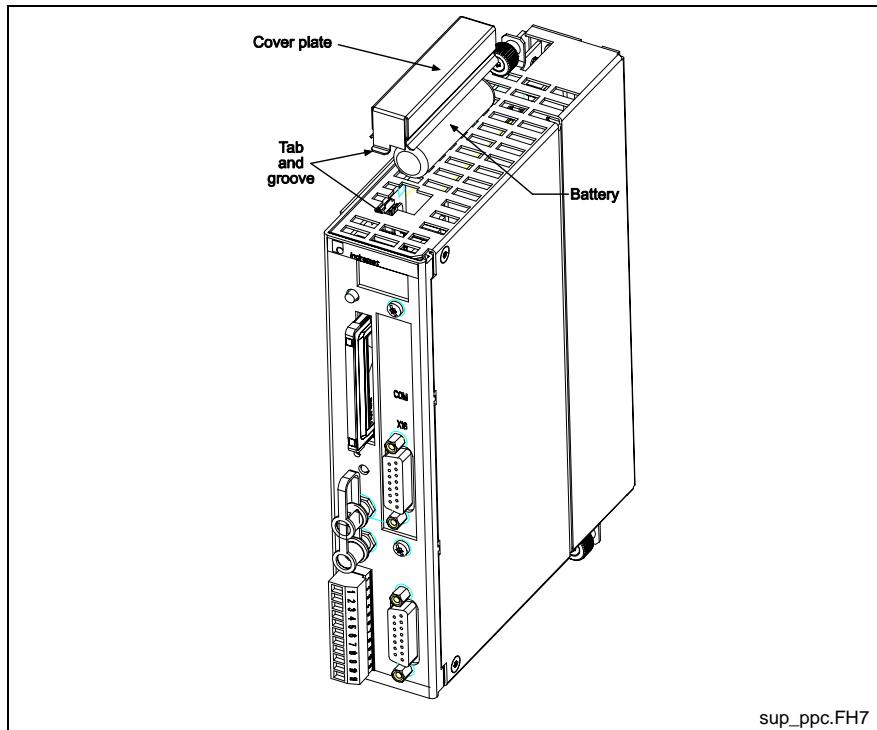


Fig. 4-5: SUP-E01-PPC-RX.2 Battery Kit

Attaching the Battery to the Cover

Before the battery can be connected to the control, it must first be inserted into the metal cover. Refer to Fig. 4-6 for an illustration of the recommended method for installing the battery to the cover.

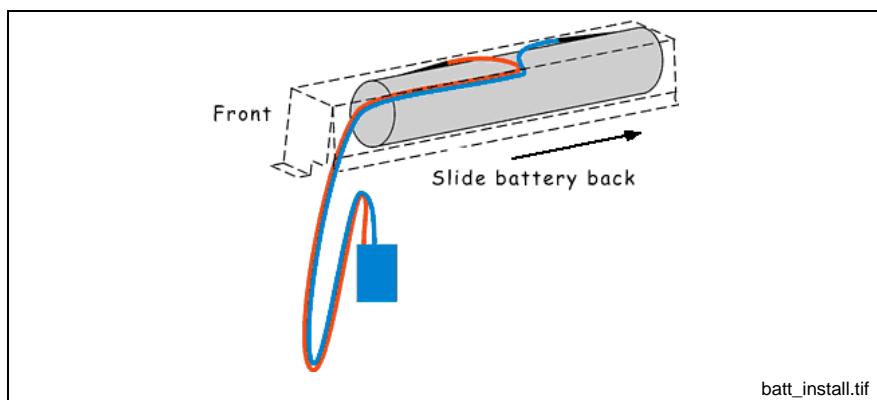


Fig. 4-6: Battery to Cover Installation

Insert the battery into the cover so that the leads are positioned on top of the battery and the remaining wire leads and connector are positioned towards the front of the cover.

Note: Make sure that the wire leads run along the inside edge of the cover. This will allow the battery to sit flush on top of the control.

Install the Battery and Cover onto the Control

With the battery inserted into the cover, connect the blue connector to the mating connector inside the opening on top of the control. The connector on the battery end is designed to connect in only one direction.

Use the following steps to insert the cover onto the top of the control:

1. Insert the rear of the cover into the sixth row from the end of the opening. Refer to the figure below for details.
2. Insert the remaining wire leads into the opening along side the connector.
3. Push in the front face of the cover and lower it until the front notch is inserted into the opening.

Note: A small screwdriver can be used to insert the front notch if the piece is too rigid to insert by hand.

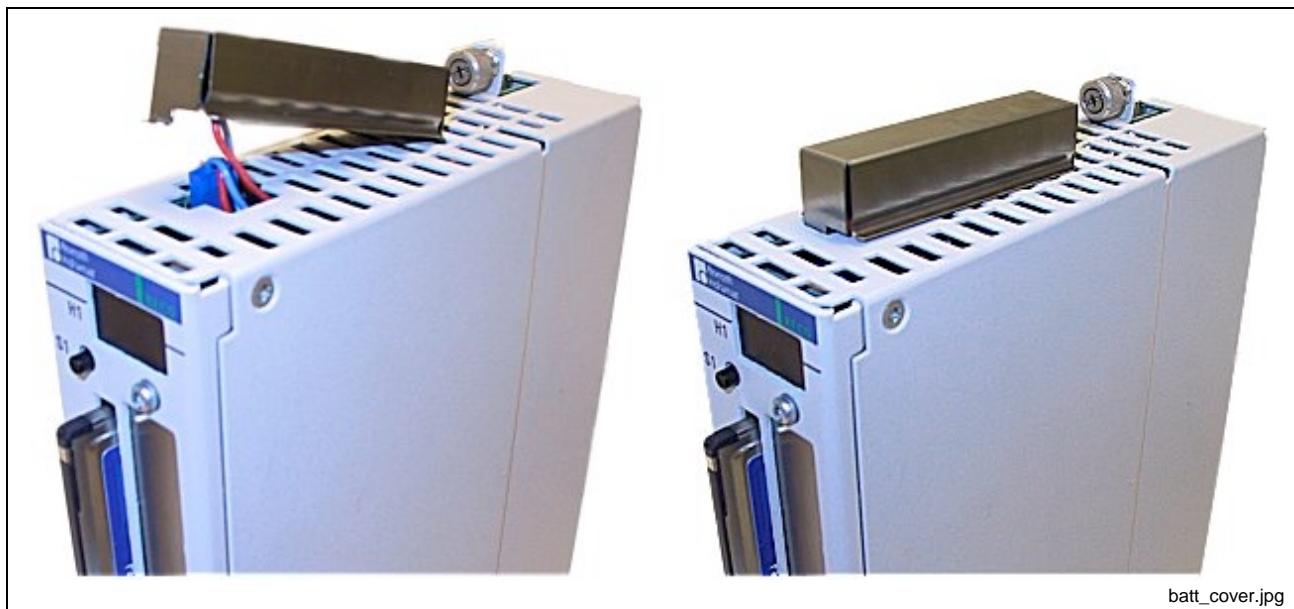


Fig. 4-7: Battery Cover Placement

4.2 PPC-P11.1 (PCI-Version) Overview

The PPC-P11.1 control can be used with VisualMotion's GMP firmware and is designed to plug directly into a PC's PCI slot. The card supports the "plug-and-play" feature, so memory allocation on the host PC is assigned dynamically. No jumper settings are required for memory allocation. A second optional interface card is available containing digital inputs, digital outputs, and a communication port.

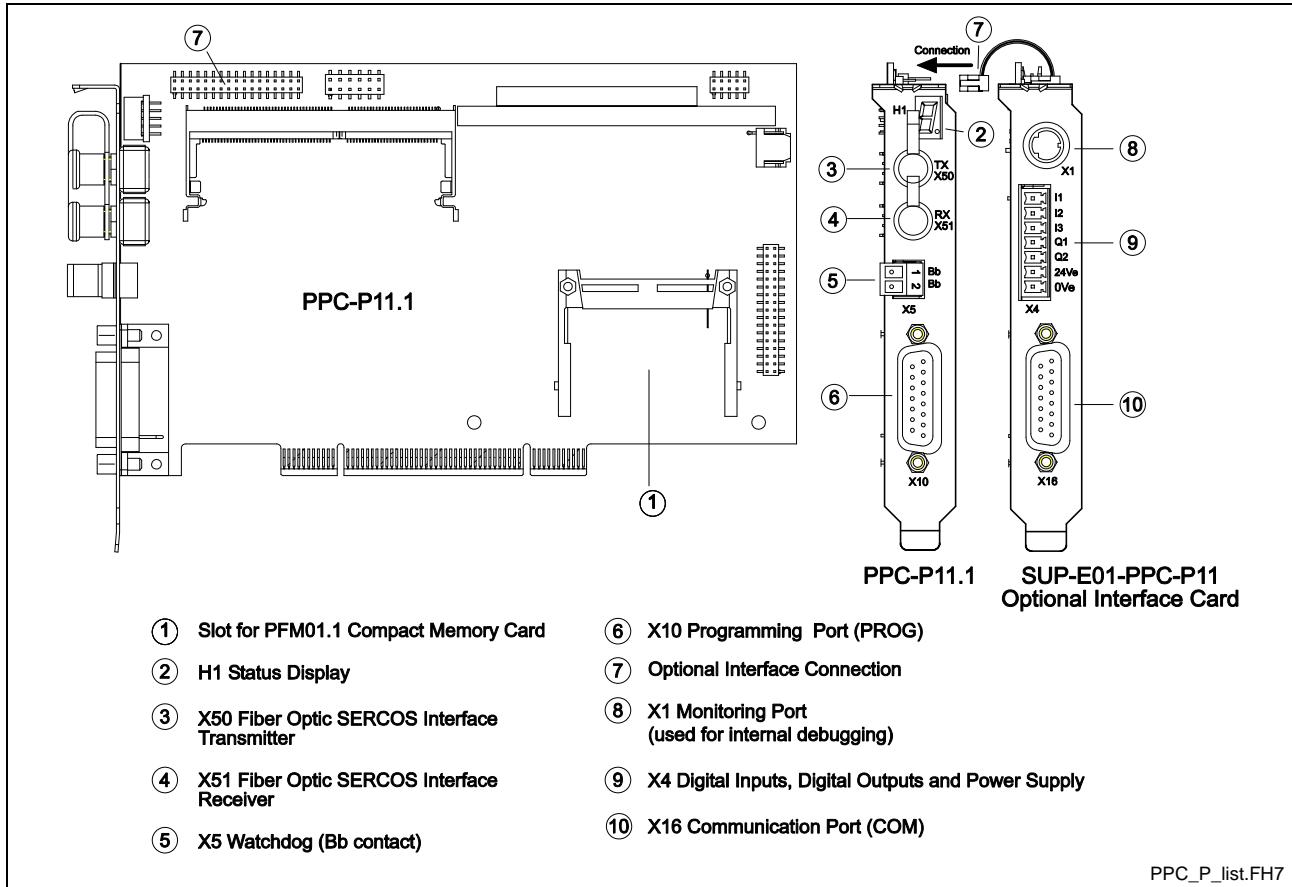


Fig. 4-8: PPC-P11.1 Control

PPC-P11.1 Hardware

Note: Refer to section 10.2 for a complete listing of available configurations for the PPC-P11.1 motion control.

- PC bus connection
 - PCI, 32-bit @ 33Mhz
- Supported interfaces (optional with additional front faceplate)
 - Option Card Programmable Limit Switch (NSW01)
 - Link Ring (DAQ03)
- 1-digit 7-segment display
- I/O Support
 - Drive-based
 - SERCOS RECO02
- 16Mb Compact flash memory card (PFM01.1)

- SERCOS interface for up to 40 drives
- Two serial interface ports available with a software selectable baud rate of 9600 to 115200 (Default: 9600)
 - One serial interface port on main front faceplate
 - 2nd serial interface is only available with the SUP-E01-PPC-P11

Note: The standard RS-232 interface cable used for connecting to VisualMotion Toolkit, via a 9 pin PC COM port, is the IKB0005.

PCI Hardware Requirements

The following requirements should be met to ensure proper operation of the PPC-P11.1 control card.

- PC with PCI Specification 2.2 (PCI Specification 2.1 also works if the PC is capable of providing the proper 1400 mA current for the 3.3V)
- 3.3V and 5V supplies are required to operate the PPC-P11.1. If there are PC104 cards on-board, the 12V supply is also required (provided on the PCI bus)
- Dimensions: Short board with fixed height: Length 6.875 in (175 mm); Height 4.2 in (107 mm)
- In systems with a shared ISA/PCI slot, only one card can be used (either an ISA or the PPC-P11.1 card)
- 1 PC serial port is required for communication using DOLFI and VisualMotion

Soft/Slot PLC Interface to PPC-P11.1

The following hardware and software requirements are used when combining the PPC-P11.1 with a Soft or Slot PLC card.

Hardware Requirements:

- Intel based Pentium Processor with 2 available PCI-Slots
- Bosch Rexroth PPC-P11.1 motion card with GMP09vRS firmware
- Slot PLC and associated hardware / cabling (Not required for soft PLC interface)

Software Requirements:

- Windows NT 4.0; SP6 minimum
- VisualMotion 09vRS
- PLC programming and communications software or Soft PLC programming and tool package
- *Recommended:* VenturCom RTX Version 4.3.2 Run-Time Environment

PPC-P11.1 Specifications

General Specifications for PPC-P11.1

Mounting style:	Standard PC PCI bus "short card"
Humidity:	5 – 78 %, no condensation (operating) 5 – 95 %, no condensation (transport) DIN 40 040 Class F
Atmospheric pressure:	860 ... 1080 hPa, 1500 m
Ambient operating temperature: Storage and transport temperature:	0 ... 45 °C (32 ... 113 °F), DIN 40 040 Class KV -20 ... 70 °C (-4 ... 158 °F)

Supply Voltage for PPC-P11.1

Power requirements:	3.3V @ 1400 mA ** +5V @ 450 mA +12V @ 0 mA *
* 12 V supply is routed to PC104 expansion connector. 0 mA are present when no PC104 boards are connected.	
** If insufficient current is provided to the PPC-P11.1, the H1 (7 segment) LED may either display nothing or a small dot. If this occurs, verify that the PC's motherboard provides the proper voltages and currents.	

Bb Contacts and Digital I/O for PPC-P11.1

Bb contacts:	U = 24V , Imax = 150 mA
Digital Input (Q1, Q2):	Current draw, isolated Vi,Low = 0V ... 5V; Vi,High = 15V ... 30V
Digital Output (Q1, Q2):	Current rating = 0.5 A, isolated Response (delay) time = 400 µs max.

Serial and Optional Interfaces for PPC-P11.1

Programming port (X10):	RS-232 / RS-485 (D-sub, 15 pin, female)
Communication port (X16):	RS-232 / RS-485 (D-sub, 15 pin, female)
Optional interfaces with additional front faceplate:	Link Ring (DAQ03) card Option Card PLS (NSW01)

Supply Voltage, Digital I/O

Power for the PPC-P11.1 is supplied over the PCI bus.

X5 Pin Assignment on PPC-P11.1

Pin	Signal Description
1	Bb relay (Watchdog)
2	Bb relay (Watchdog)

Table 4-2: X5 Pin Assignment

X4 Pin Assignment on SUP-E01-PPC-P11

Pin	Signal Description
1	Digital Input 1 (I1)
2	Digital Input 2 (I2)
3	Digital Input 3 (I3)
4	Digital Output (Q1)
5	Digital Output (Q2)
6	24V external
7	GND external

Table 4-3: X4 Pin Assignment

Digital Input / Output Supply Voltage for PPC-P11.1

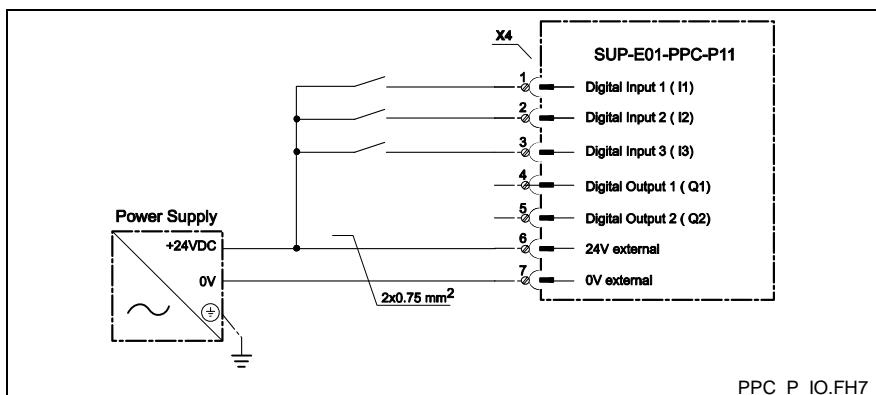


Fig. 4-9: Digital Input / Output Supply Voltage

Note: The digital inputs and outputs found on connector X4 of the SUP-E01-PPC-P11 are not functional unless 24V are supplied to pins 6 and 7.

Digital inputs I1, I2 and I3 are mapped the bits 1, 2, and 3 of register 44. Digital outputs Q1 and Q2 are mapped the bits 1 and 2 of register 45.

Installation Guidelines for PPC-P11.1

The PC board on the PPC-P11.1 is mounted to the right of the front faceplate, when viewed from inside the PC (standard PCI mounting). Optional interface cards from Bosch Rexroth have a small board mounted to the left of the front faceplate (standard ISA mounting). Refer to Fig. 4-10 for details.

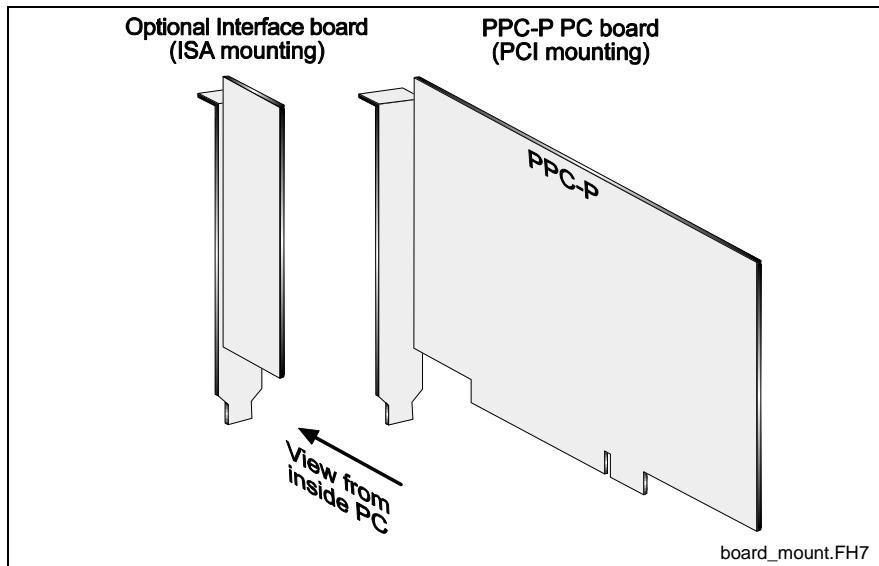


Fig. 4-10: PC Board mounts to Front Faceplate

When installing the PPC-P11.1 with optional interfaces, such as Link Ring and/or Option Card PLS, the optional interfaces are installed to the left of the PPC-P11.1 (viewed from inside PC). The optional interfaces are installed to the left to allow connection of the PC104 card (from each interface) to the PPC-P11.1.

Note: Only one PPC-P11.1 card can be installed in a PC. Only one PCI bus address is supported for the PPC-P11.1.



CAUTION

Improper installation of PCI and ISA cards in the PC can cause unwanted contact between boards!

⇒ Install cards to allow sufficient space between adjacent boards.

Recommended Installation

When installing a PCI card, such as a fieldbus interface card for a soft PLC, in conjunction with the PPC-P11.1 and optional interfaces, the PCI card should be installed to the right of the PPC-P11.1 (refer to Fig. 4-11). This configuration allows sufficient space between the PPC-P11.1 and PCI cards.

Note: If no optional interface cards are installed with the PPC-P11.1, then the PCI card can be installed either to the left or the right of the PPC-P11.1.

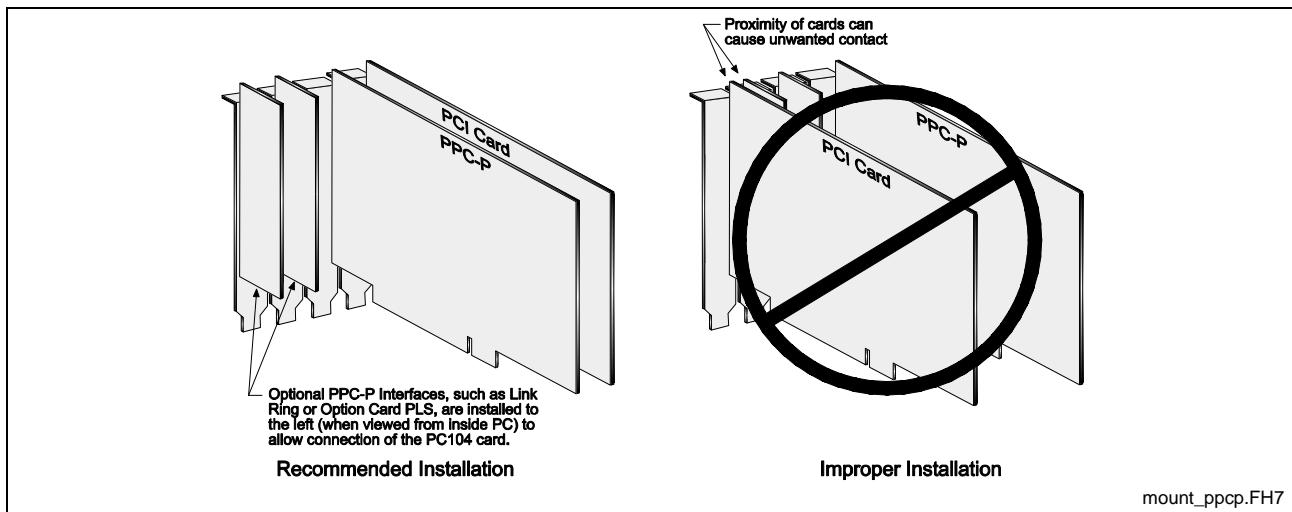


Fig. 4-11: Recommended Installation of PPC-P11.1 Configurations

4.3 Serial Communication

Two serial port interfaces are available on the PPC-R. The PPC-P11.1 card has one serial interface with a second serial interface available on an optional secondary faceplate.

Note: Refer to chapter 10 for a complete listing of available configuration for both the PPC-R and PPC-P11.1 motion controls.

Each serial port can be setup using VisualMotion Toolkit. Both ports always operate with *8 bit, 1 stop bit and no parity*. Select **Tools ⇒ Control Settings**, click on X10 or X16 and configure each port as follows:

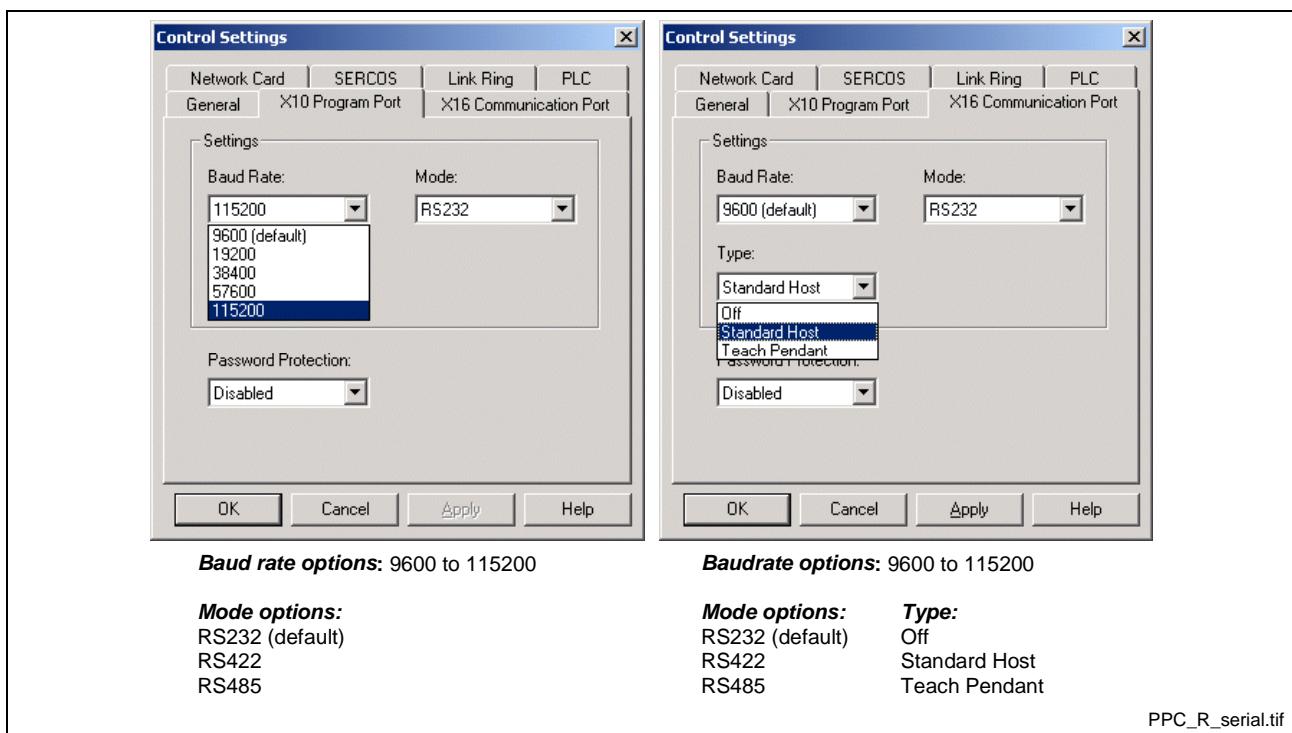


Fig. 4-12: VisualMotion Toolkit communication settings

Serial Interface Pin Assignment

The two interface ports, PROG (X10) and COM (X16) have the following pin assignments.

Pin	Signal	Pin	Signal
1	Protected Ground – not used	9	Transmit Data + for RS422
2	Transmit Data for RS232	10	Ground
3	Receive Data for RS232	11	Transmit Data – for RS422
4	RS485+ / Receive Data + for RS422	12	+5V
5	RS485- / Receive Data – for RS422	13	Request To Send
6	Data Set Ready	14	Clear To Send
7	Signal Ground	15	Data Terminal Ready
8	Data Carrier Detect		

Table 4-4: Pin Assignment for PROG Interface X10 and COM Interface X16.

4.4 PPC Diagnostic Displays

The PPC-R's 4-digit alphanumeric matrix display (H1) scrolls from right to left. The PPC-P11.1's single-digit 7-segment alphanumeric LED displays one digit at a time. Both can display the current mode of operation or any error conditions that may exist.

Normal Operations

During normal operating conditions, the PPC display shows the current mode of operation. The PPC-R display scrolls the 3-digit number along with the description. The PPC-P11.1 only displays the 3-digit number.

PPC-R H1 Scrolling Display	PPC-P11.1 Single-Digit Display
002 Parameter Mode	2
005 Manual Mode	5
006 Automatic Mode: A	6
007 Program Running: A	7

Table 4-5: Normal Operating Conditions

Error Codes

When an error is encountered by the PPC, the display automatically displays an "E", indicating an error, followed by the corresponding 3 digit diagnostic code. The PPC-R will display the error type following the code. The PPC-P11.1 will only display the code.

Code	Error Type
E200 – E399	Warning
E400 – E999	Shutdown Error
PF	Power Failure
..	Probe

Table 4-6: Error Codes

4.5 PPC Memory Cards

The PPC-R uses a special PCMCIA flash memory card. The PPC-P11.1 uses the PFM01.1 compact flash memory card.

These cards contain all data necessary to operate the PPC-R. Items such as...

- GPP firmware in PSM01.1 memory card
- GMP firmware in PFM01.1 memory card
- Control parameters
- VisualMotion user programs
- Cams, points, event and zone tables
- Option Card PLS lists
- Program variables
- I/O configurations (Local, SERCOS RECO and drive-based)

4.6 PPC SERCOS

The SERCOS port is used for loop-through, daisy-chained installation into a SERCOS ring. The output connector **Tx** is connected to the SERCOS input connector, **Rx**, of the next SERCOS device in the ring. Each SERCOS device is interconnected output to input, with the output of the last device returning to the SERCOS input, **Rx**, of the control.

4.7 MTS-R Overview

The MTS-R is a miniature PLC unit compatible with VisualMotion GPP 9 and designed to interface with the PPC-R directly in the RECO02 rack. The MTS-R is connected directly to the PPC-R by means of a local bus board (SUP-E0*-MTC200-R) connected in the back of each unit.

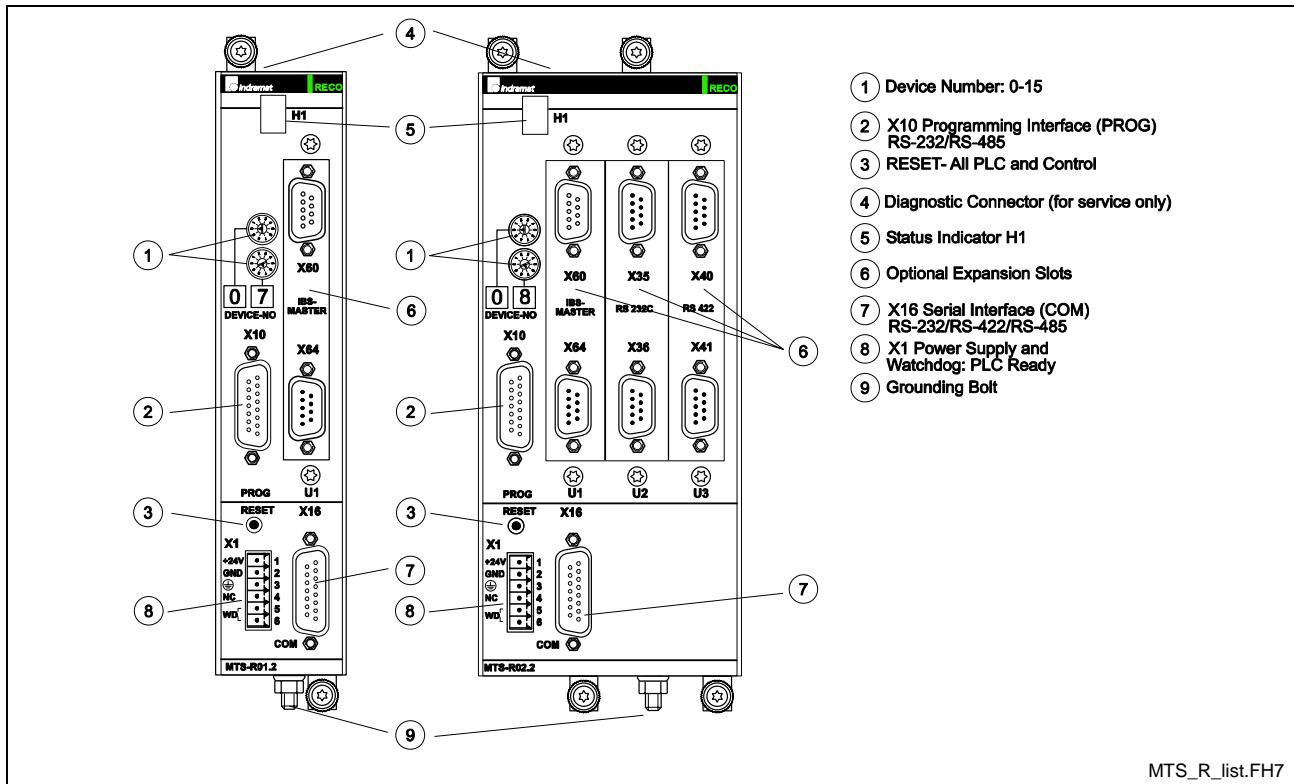


Fig. 4-13: MTS-R01.2 and MTS-R02.2

MTS-R Hardware

- Single or double width versions
 - MTS-R01.2, with one expansion slot, contains two build-in serial ports (X10, X16) and can be preconfigured with a Fieldbus interface card or an additional serial interface in expansion slot U2.
 - MTS-R02.2, with three expansion slots, contains two build-in serial ports (X10, X16) and can be preconfigured with one Fieldbus interface card and/or additional serial interface modules in expansion slots U2, U3, or U4.
- Fieldbus interface cards (configured at time of order)
 - Profibus-DP master interface
 - Profibus-DP slave interface
 - Interbus master interface
- Additional serial interfaces
 - 2xRS-232
 - 2xRS-422
- Single digit 7-segment alphanumeric display (H1)

MTS-R Specifications

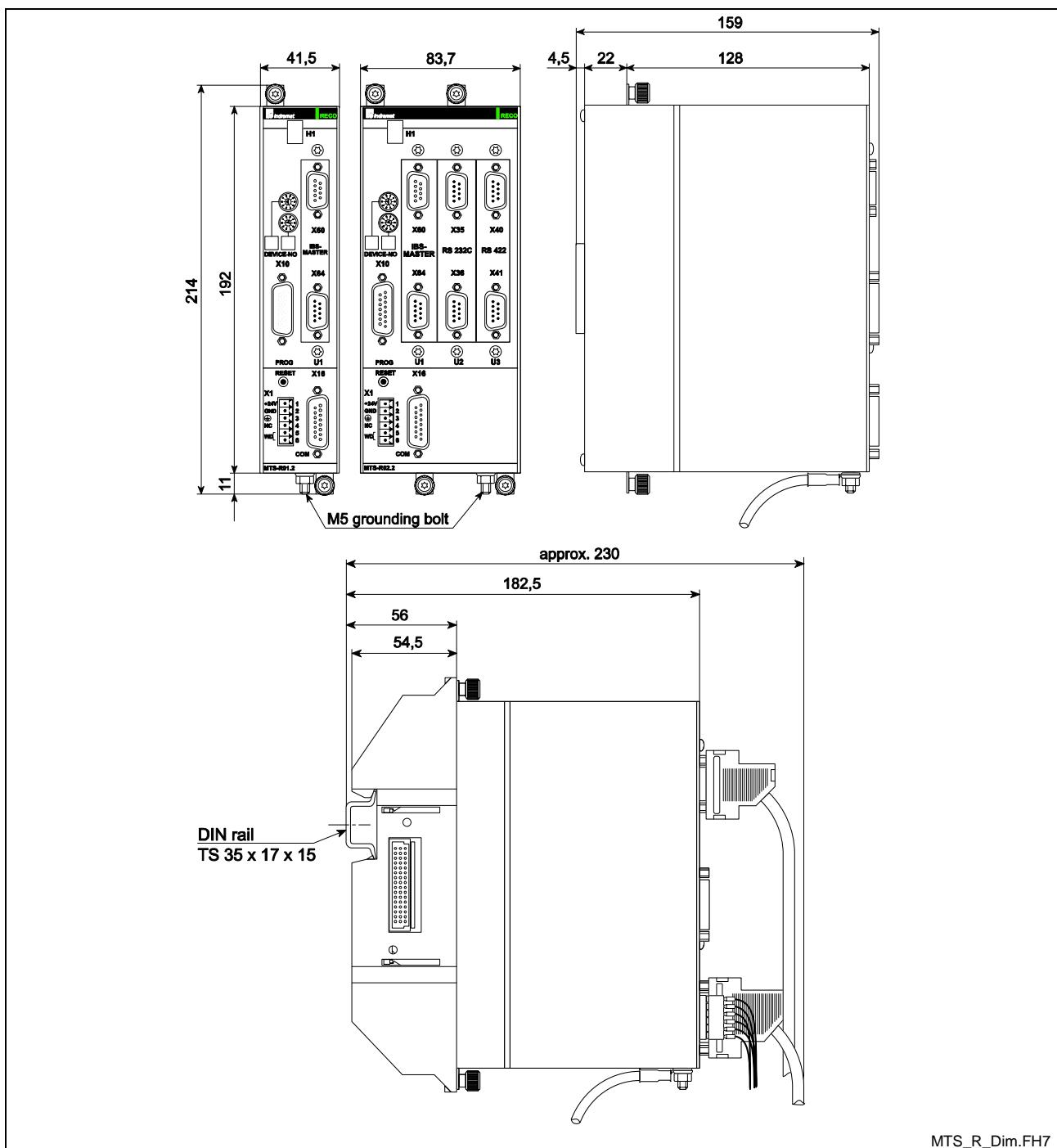


Fig. 4-14: MTS-R01.2 and MTS-R02.2 Dimensions

General Specifications of MTS-R

Permissible cable cross section for incoming power:	Up to 1.5 mm ²
Mounting style:	Using RMB02.2 racks on TS 35x27x15 DIN rails
Protection rating:	IP20, DIN VDE 0470, EN 60529
Humidity:	5 – 78 %, no condensation (operating) 5 – 95 %, no condensation (transport) DIN 40 040 Class F
Atmospheric pressure:	860 ... 1080 hPa, 1500 m (operating) 660 ... 1080 hPa, 3500 m (transport)
Ambient operating temperature: Storage and transport temperature:	0 ... 45 °C (32 ... 113 °F), DIN 40 040 Class KV –25 ... 70 °C (-13 ... 158 °F)
Weight: MTS-R01.2 MTS-R02.2	1.00 kg (2.2 lbs.) 1.65 kg (3.6 lbs.)

Supply Voltages for MTS-R

Nominal value:	24 VDC
Permissible ripples:	4 Vss within the permissible voltage range
Permissible voltage range:	18 ... 28 VDC, including ripples
Maximum heat loss: MTS-R01.2 MTS-R02.2	12.6 W 19.6 W
Maximum current consumption: MTS-R01.2 MTS-R02.2	450 mA (+ supply voltage for I/O modules up to 2.6 A) 700 mA (+ supply voltage for I/O modules up to 2.6 A)

EMC

Noise emission to EN 55022:	Class of an industry environment
Noise immunity to IEC 1000-4-2 (ESD):	Judgement criterion B
Noise immunity to IEC 1000-4-4 (Burst):	Judgement criterion B
Noise immunity to IEC 1000-5-5 (Surge):	Judgement criterion B

Serial and Fieldbus Master Interfaces for MTS-R

Programming interface PROG (X10):	RS-232 / RS-485 (D-sub, 15pin, female)
General purpose serial interface COM (X16):	RS-232 / RS-422 / RS-485 (D-sub, 15pin, female)
Optional interfaces:	Profibus-DP (D-sub, 9 pin, female) Interbus (D-sub, 9 pin, female) 2xRS-232 and 2xRS-422 (D-sub, 9 pin, male)

Supply Voltage and Watchdog

Faultless operation of the MTS-R unit requires the supply voltage to fulfill the following criteria:

- The supply voltage must never drop below +18VDC. If this occurs, a POWER-FAIL signal will become activate and stop the PLC operating program.

Note: The power supply unit used with the MTS-R should be a switching power supply with an inrush current as high as 20 A. Do not connect another MTS-R unit to the same supply voltage. The high inrush current may cause the supply voltage to breakdown and activate the POWER-FAIL signal.

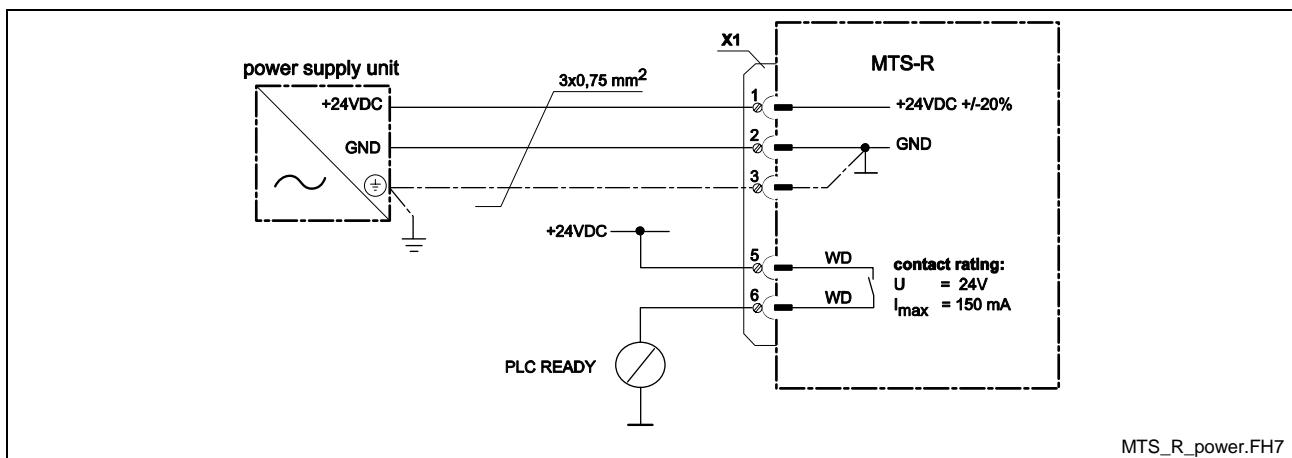


Fig. 4-15: MTS-R X1 Power Supply Voltage

Rechargeable Battery

The MTS-R comes equipped with an internal rechargeable battery used for user-specific PLC data.

Affected data This affects the following data:

- PLC user program
- Retentive data

Recharging the battery

The rechargeable battery is recharged when an MTS-R unit is powered up. A **completely discharged** battery requires the following charging times:

Charging time: 1 hour -> approximately 100 hours backup time

Charging time: 50 hour -> approximately 5000 hours backup time (full battery)

Under normal operating conditions, the service life of the rechargeable battery is between 7 and 10 years. Continuous charging of the rechargeable battery does not have a detrimental effect on the service life.

Setting the Parameters of the PROG Interface

A DIP switch at the top (under the grill) of the unit is used for setting the parameter values for the PROG interface port X10 of the MTS-R unit. Using a pointed tool (small screwdriver), this DIP switch can be reached even if the housing is closed.

If the setting proves difficult, the housing can be opened completely. It consists of two half-shells that can easily be disassembled after the two screws at the rear of the unit have been removed.

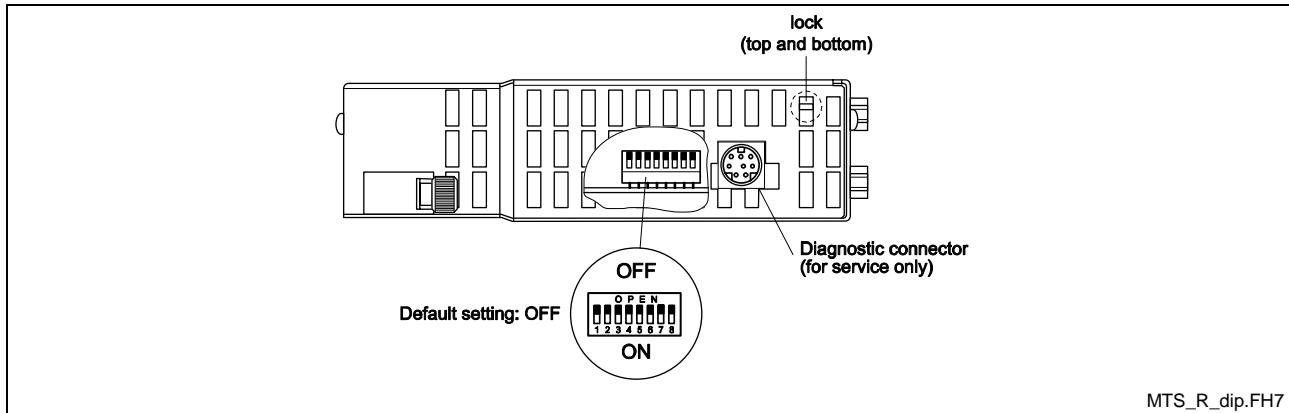


Fig. 4-16: DIP Switch setting for PROG port X10

The table below shows the possible settings and the related DIP switch configurations.

Affected parameter	1	2	3	4	5	6	7	8
Baud rate 9600	ON	ON	ON	X	X	X	X	X
Baud rate 19200	OFF	OFF	OFF	X	X	X	X	X
Baud rate 38400	ON	OFF	OFF	X	X	X	X	X
Baud rate 57600	OFF	ON	OFF	X	X	X	X	X
Baud rate 115200	ON	ON	OFF	X	X	X	X	X
No parity	X	X	X	OFF	X	X	X	X
Even parity	X	X	X	ON	X	X	X	X
RS 232	X	X	X	X	OFF	OFF	X	X
RS 485	X	X	X	X	ON	OFF	X	X
RS 422	X	X	X	X	OFF	ON	X	X
Boot lock OFF	X	X	X	X	X	X	X	OFF
Boot lock ON	X	X	X	X	X	X	X	ON

Table 4-7: Setting the X10 port for MTS-R01.2 and MTS-R02.2

Setting the Parameters of the COM Interface

In contrast to the parameters of the PROG interface X10, the parameter values of the COM interface X16 cannot be set via the hardware. All parameter values are assigned via the PROG interface X10 using the **System Configurator** program for Windows™. Bosch Rexroth's System Configurator program uses a wizard to step the user through all the necessary settings for X16.

Interface Pin Assignments for MTS-R

The two interfaces COM and PROG have the following assignments:

PIN	Signal name	PIN	Signal name
1	Protected Ground	2	Transmit Data (RS232)
3	Receive Data (RS232)	4	RS485+ or RxD+ (RS422)
5	RS485- or RxD- (RS422)	6	Data Set Ready (Modem)
7	Signal Ground	8	Data Carrier Detected (Mod.)
9	TxD+ (RS422)	10	GND
11	TxD- (RS422)	12	+5V
13	Request To Send (Modem)	14	Clear To Send (Modem)
15	Data Terminal Ready (Mod.)		

Table 4-8: Connector pin assignments of PROG interface **X10** and COM interface **X16**

MTS-R H1 Status and Diagnostic Display

Operating state display

The MTS-R's 7-segment H1 display displays the current operating state and error conditions for the MTS-R. The following 1-digit error codes are used for indicating the diagnosis results.

Code	Meaning
b	Operational (PLC is running)
0.	Power-on state (reset test)
F.	Firmware in Flash EPROM invalid
J.	Boot lock for firmware active
P.	Local bus is not connected

Table 4-9: Operating states of the MTS-R unit

Note: Please notify Service **immediately** if any other single digit code with a period is displayed.

Error Display for MTS-R

A 7-segment display that flashes in succession is used for displaying **3-digit** error states. The listed error codes correspond to the system error messages of the user interface.

Code	Meaning
007	Software version error
008	Self-test failed
052	Invalid PLC program
055	Maximum PLC cycle time exceeded
071	PLC operating voltage is low
081	Time-out 2 ms implementation
082	INTERBUS malfunction
083	INTERBUS memory overflow
084	INTERBUS configuration error
085	INTERBUS bus error
086	INTERBUS hardware/firmware error
087	INTERBUS I/O bus module error
088	INTERBUS not ready
089	INTERBUS general generation 4 error
091	PPC not found

Table 4-10: MTS-R error codes

Connecting the PPC-R and MTS-R

Brief Description of the SUP-E0*-MTC200-R Accessories

The electrical connection between the MTS-R and the PPC-R is established via a local bus. This local bus is implemented in the form of a local bus board and is required as an accessory part of the PPC-R.

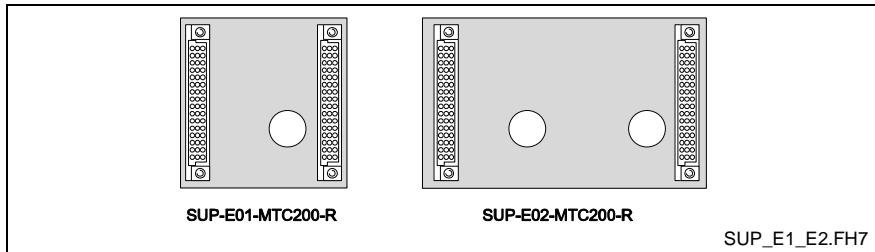


Fig. 4-17: SUP-E01-MTC200 and SUP-E02-MTC200 Local Bus Boards

Versions

There are two versions of the local bus board available:

- As SUP-E01-MTC200-R, 59 mm long Material No.: 281209
- As SUP-E02-MTC200-R, 100 mm long Material No.: 281210

Selection Criterion

The following figure illustrates the possible applications of the local bus boards.

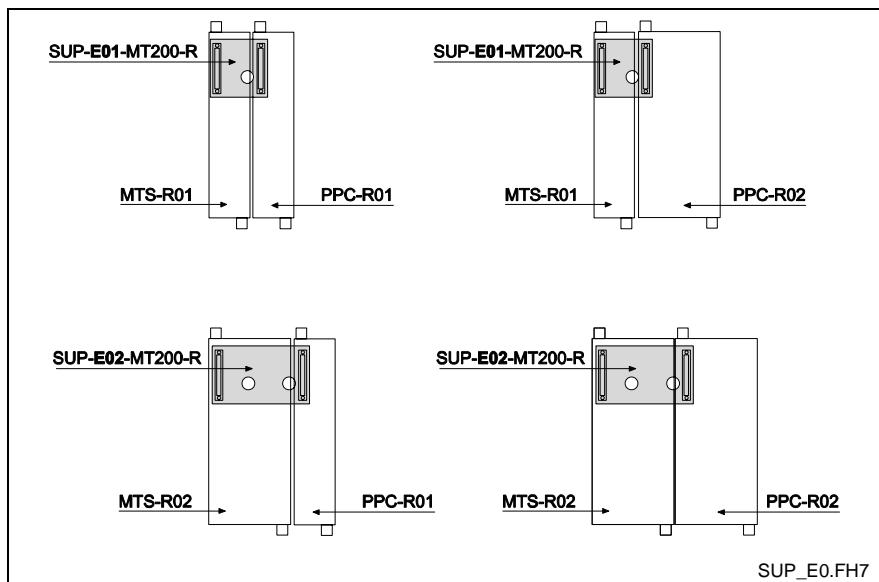


Fig. 4-18: Application of SUP-E0*-MTC200 Local Bus Board

Installation Notes

The SUP-E0*-MTC200-R local bus board must be installed at the rear of the MTS-R and PPC-R. Afterwards, the two modules can be installed in the RMB02.2 rack.

When removing the MTS-R or PPC-R from the RMB02.2 rack, **both** modules (MTS-R and PPC-R) must be removed from the rack **at the same time**.

Note: The local bus board may be damaged if the two modules are not removed simultaneously.

4.8 RECO 02 Hardware

RECO02 defines a form factor for controllers and I/O modules from Bosch Rexroth. RECO I/O modules are installed directly in a RMB four slot rack unit and provide I/O data to the PPC-R controller via the RMB's back-plane.

A maximum of four RMB racks can be connected and mounted side by side. Each rack contains an addressing DIP switch for configuring the order of installation as illustrated in Fig. 4-22.

Note: For complete details, refer to the...

- RECO02.2 Configuration Manual
DOK-CONTRL-RECO02.2***-PRJ1-EN-P
-

A control system is composed of:

- a RECO02 RMB base rack unit
- MTS-R01.2 or 02.2 PLC units
- PPC-R01.2 or 02.2 controls using GPP firmware
- and a combination of RME, RMA I/O and RMC modules

RECO02 I/O Modules

RECO02 I/O modules can be combined in any order beginning with the next available adjacent slot next to the PPC-R.

Description	Type	Details	Material Number
RMB02.2-04	Base rack, 4 slots	accommodates up to 4 modules	278846
RME02.2-16-DC024	Input module	2 x 8 inputs, 24 VDC	280936
RME02.2-32-DC024	Input module	4 x 8 inputs, 24 VDC	280937
RME02.2-32-AC115	Input module	2 x 8 inputs, 115 VAC	280938
RMA02.2-16-DC024-200	Output module	2 x 8 outputs, 24 VDC, 2A	280930
RMA02.2-32-DC024-050	Output module	4 x 8 outputs, 24 VDC, 500mA	280931
RMA02.2-16-AC230-200	Output module	2 x 8 outputs, 230 VDC, 2A	280929
RMA02.2-16-RE230-200	Output module	2 x 8 relay outputs, 230 VAC, 2A	280928
RMC02.2-2E-1A	Analog module	analog module 2 x inputs, 1 x output	280945

Table 4-11: RECO02 I/O Module Overview

Remote SERCOS Coupling Unit

RECO02 I/O modules can be used remotely to the PPC-R. In this case, a SERCOS coupling RMK unit is necessary. The remote RECO02 rack is then connected via the SERCOS ring to the PPC-R.

Description	Type	Details	Material Number
RMK02.2-LWL-SER-FW	SERCOS coupling unit	SERCOS Interface	280946

Table 4-12: Remote SERCOS Coupling Unit

Mounting the RECO RMB Base Rack

The RMB02.2-04 base racks can be mounted onto a TS 35x27x15 DIN rail, and secured with a set screw. If necessary, the RMB racks can be mounted directly onto a mounting panel within the cabinet using the holes provided in the racks.

Rack arrangement

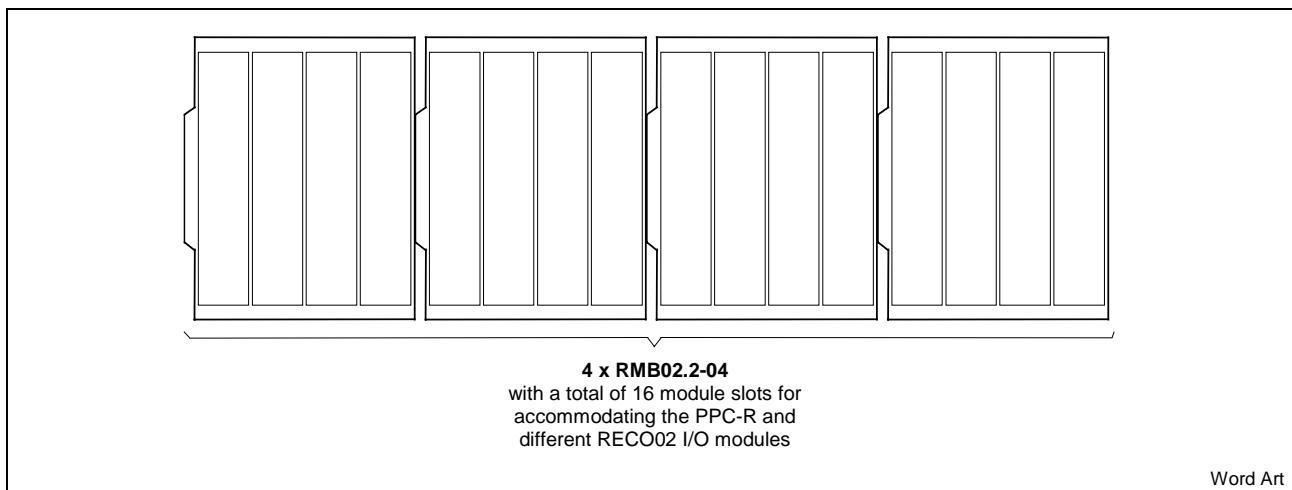


Fig. 4-19: RMB02.2-04 Maximum Configuration

RMB02.2-04 Installation Dimensions

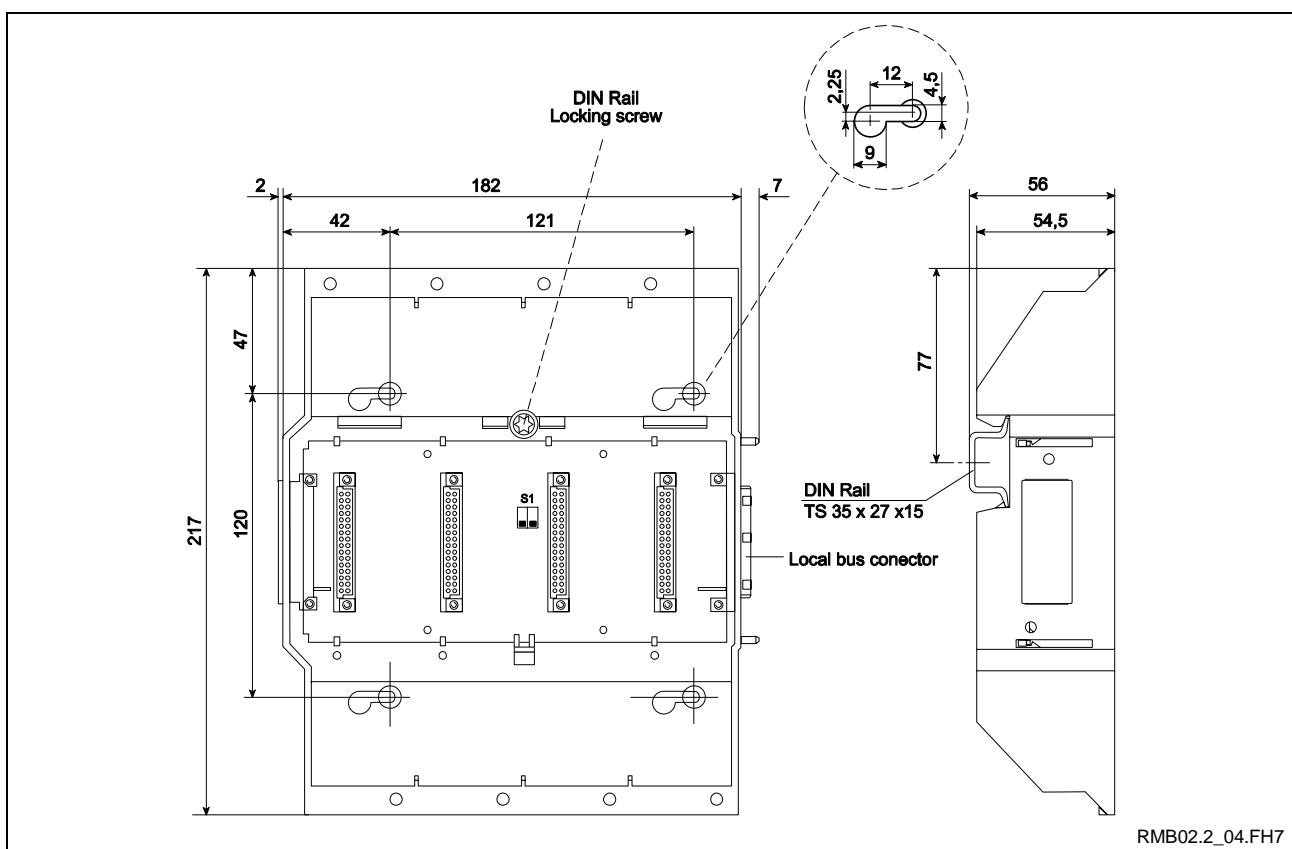


Fig. 4-20: RMB02.2-04 Installation Dimensions

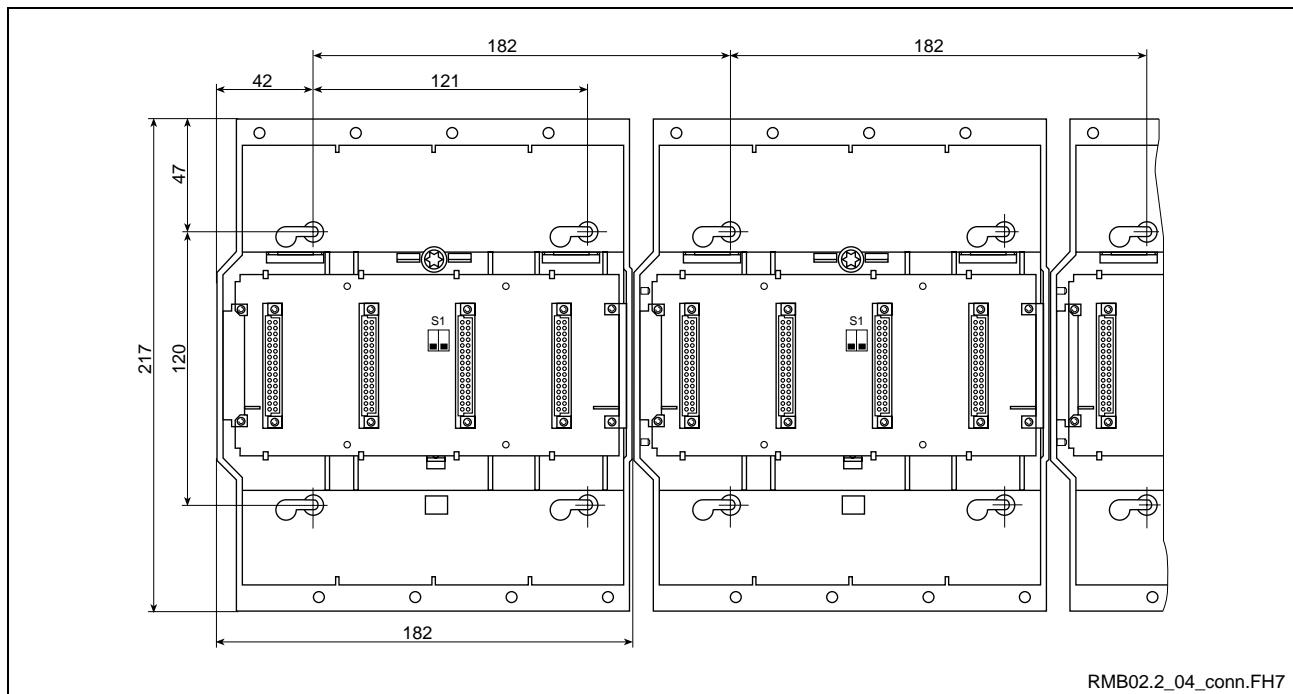


Fig. 4-21: Connecting Multiple RMB02.2-04 Racks

Slot Addressing of the RMB02.2 Racks

A DIP switch on the rack's bus board enables up to four (4) RMB02.2-04 racks to be addressed individually. Each rack must have its own unique address. Number of racks used in a given application should be addressed as shown in Fig. 4-22.

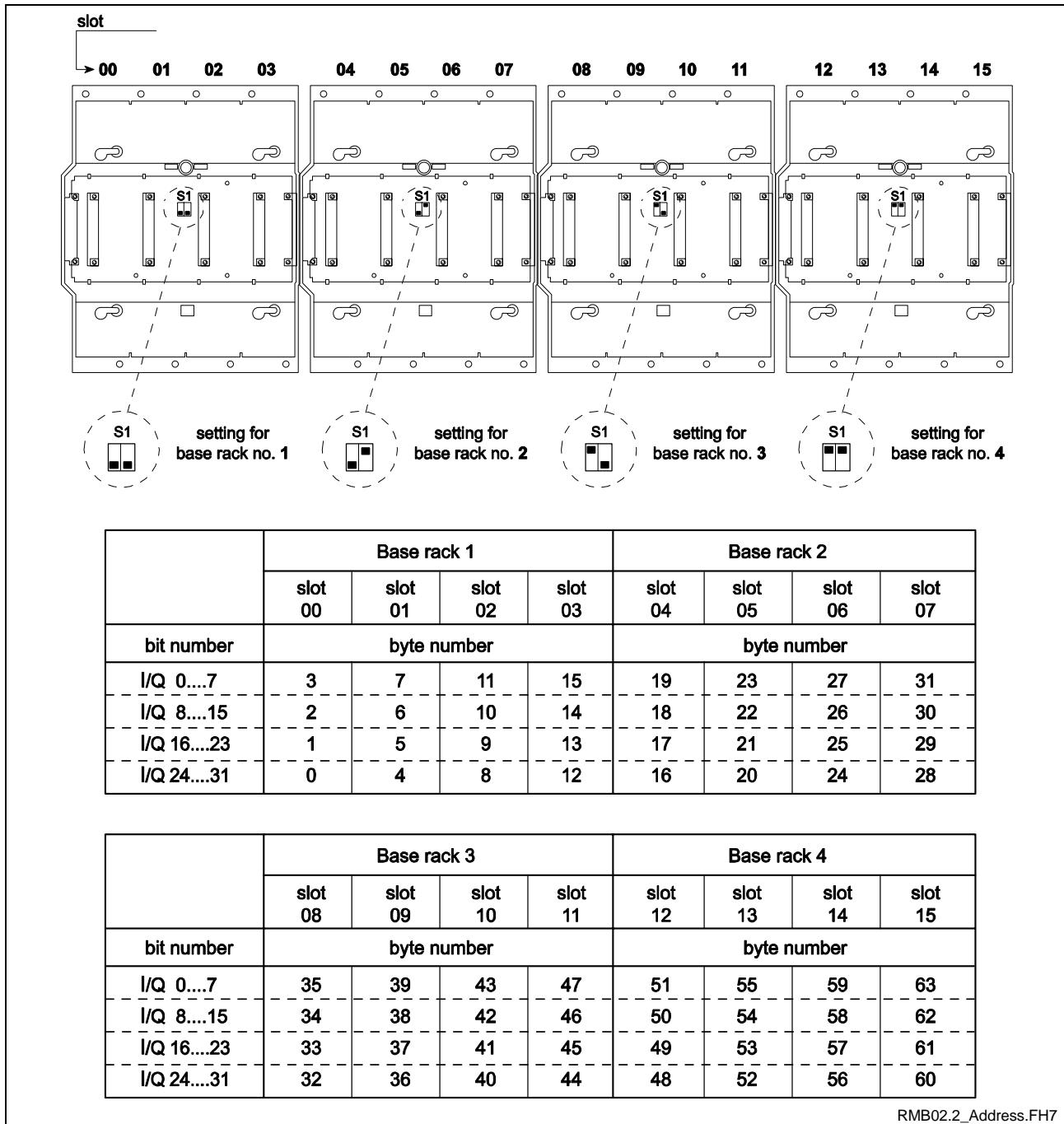


Fig. 4-22: Setting the RECO Rack Addresses

- Note:** The RECO Master must be installed in slot 00 of base rack 1. The following RECO Master configurations are allowed:
- without a PLC, the PPC-R is installed in slot 00
 - with a PLC, the MTS-R is installed in slot 00

4.9 System Grounding

Each electronic component within an enclosure (controls, drives, etc.) should be grounded individually to a central grounding point on the machine as per Fig. 4-23. To ensure proper grounding of control system, use a ground wire of at least 10 mm² (8 American Wire Gauge). Voltage supply grounding should also be performed in the same manner.

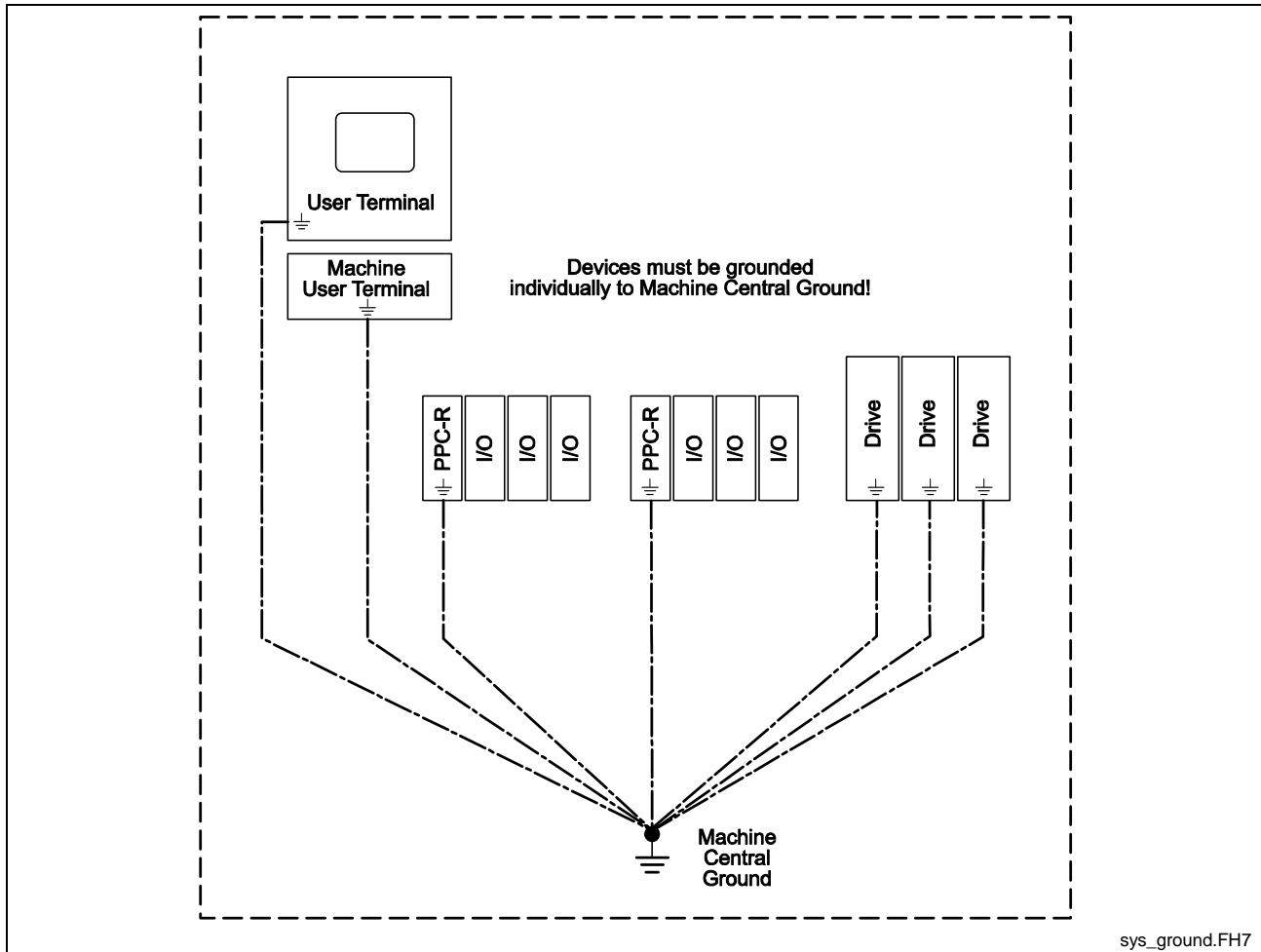


Fig. 4-23: System Grounding

5 System I/O Modules

5.1 PPC-R Motion Control System

When a PPC-R is used as a stand-alone control, it is installed in the left most slot of an RMB rack. This slot is identified as slot 00. The device installed in slot 00, in this case the PPC-R, controls all backplane communication of installed Local RECO02 I/O modules.

Local RECO02 modules are defined as I/O modules that are installed either on the same RMB rack as the control or as I/O modules installed in an adjacent RMB rack. Two adjacent RMB racks communicate via the local bus connection created between two racks, up to a maximum of 4 RMB racks.

In addition to Local RECO I/O modules, the PPC-R can also communicate, via SERCOS, with SERCOS RECO racks and Drive I/O cards. The accessing of I/O modules for RECO and Drive systems is controlled by the PPC-R.

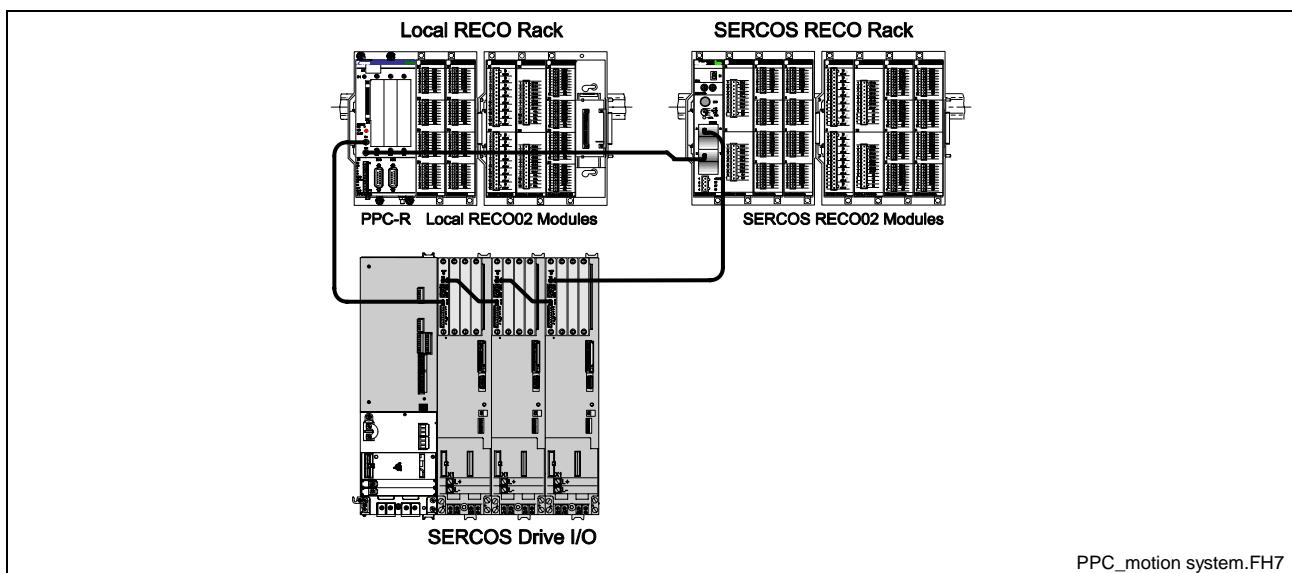


Fig. 5-1: PPC-R Motion Control Configuration

5.2 MTS-R and PPC-R Motion Control System

When an MTS-R is used in conjunction with a PPC-R, both devices are connected via the SUP-E0*-MTC200-R local bus board. Refer to Connecting the PPC-R and MTS-R on page 4-23 for details. The MTS-R is connected to the left of the PPC-R and both devices are installed in the left most position (slot 00) of the first RMB rack, as shown in Fig. 5-2. The device installed in slot 00, in this case the MTS-R, controls all backplane communication of installed Local RECO02 I/O modules.

Local RECO02 modules are defined as I/O modules that are installed either on the same RMB rack as the MTS-R/PPC-R combination or as I/O modules installed in an adjacent RMB rack. Two adjacent RMB racks communicate via the local bus connection created between two racks, up to a maximum of 4 RMB racks.

All SERCOS RECO and drive I/O devices are directly controlled by the PPC-R over the fiber optic ring. The MTS-R can access all SERCOS and drive I/O devices (once mapped in the register channel) across the local bus connection and the PPC-R can access all local RECO I/O modules across the local bus connection.

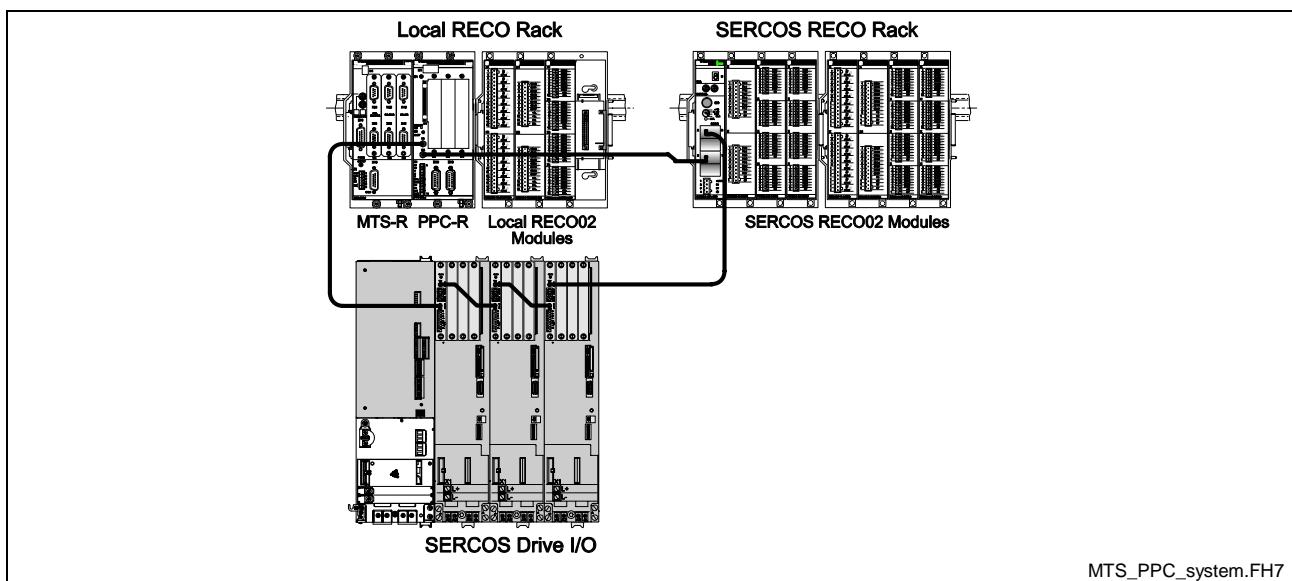


Fig. 5-2: MTS-R and PPC-R Motion Control Configuration

5.3 Supported I/O Devices

Local RECO02 I/O Station

The PPC-R control is physically installed into a RMB02.2 rack designed to hold the control along with RECO02 I/O modules. RMB02.2 racks are a 4 slotted mounting platform that provide power and backplane communication to installed modules. The control can use up to 2 slots (PPC-R02.2) leaving the remaining slots available for I/O modules. The I/O modules that plug into the same rack as that of the control are identified as Local RECO02 I/O modules. Any additional RMB02.2 rack (maximum of 4) containing I/O modules connected directly to the control's rack is also identified as Local RECO02 I/O modules. Local RECO02 I/O modules are automatically detected by the control and identified in control parameter C-0-2013 (I/O Configuration List). Registers can then be assigned to each I/O module by using the I/O Configuration Tool.

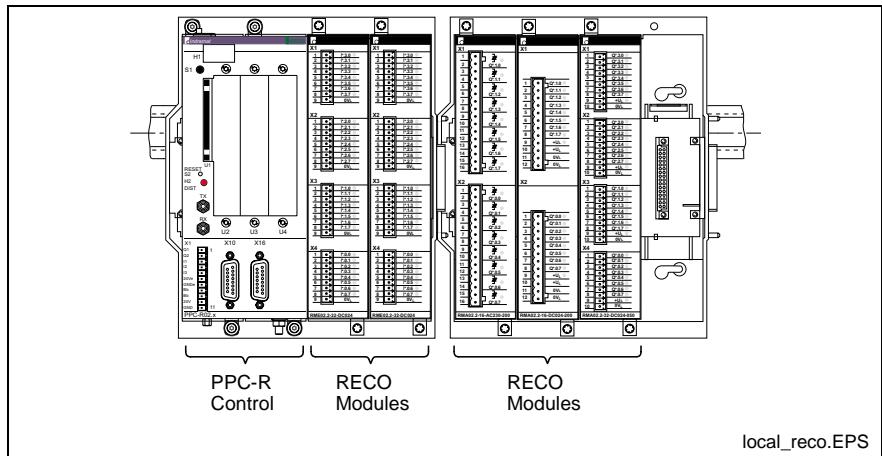


Fig. 5-3: Local RECO02 I/O Station

SERCOS I/O Stations

A SERCOS I/O station is a RMB rack configured with a SERCOS RMK I/O Controller and up to 3 RECO02 I/O modules connected to the control via a SERCOS ring.

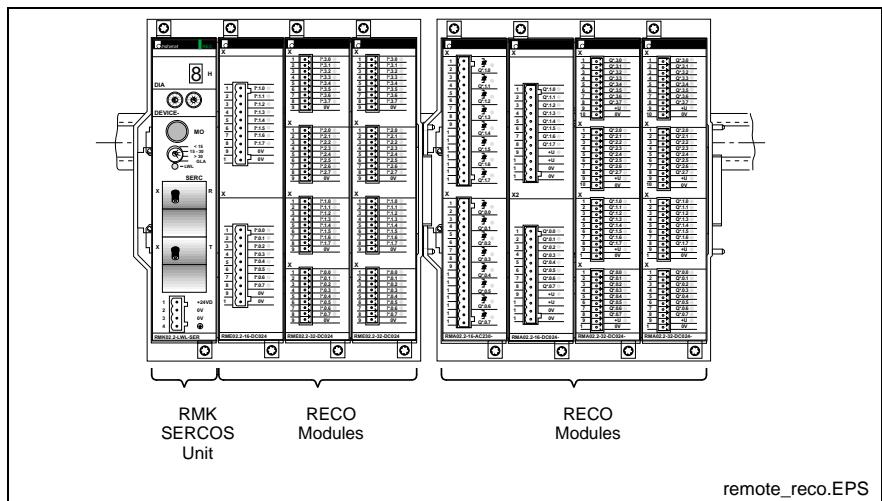


Fig. 5-4: SERCOS I/O Stations

DIAx I/O Module

DIAx03/04 digital drives can hold up to 3 I/O modules. VisualMotion supports both the digital DEA modules and analog DAE and DRF modules.

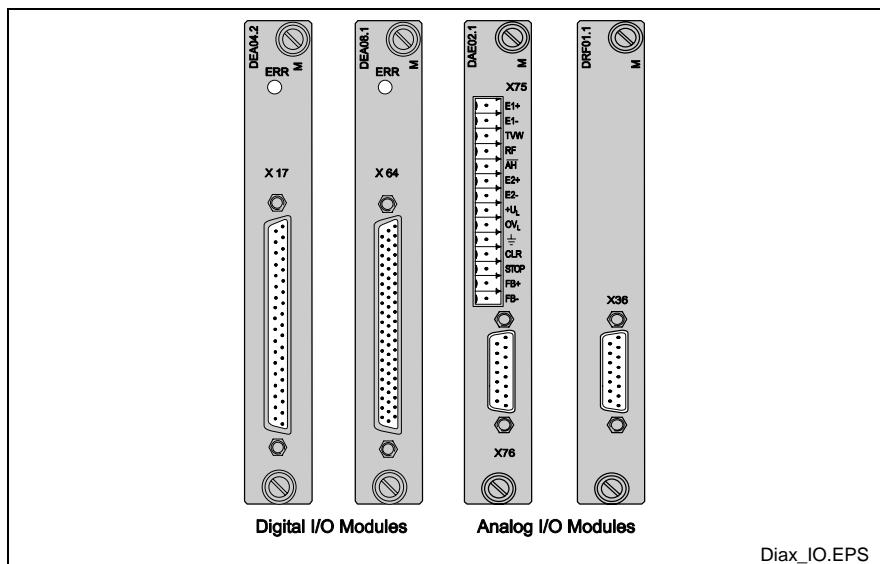


Fig. 5-5: DIAX I/O Modules

ECODRIVE EMD I/O Module

ECODRIVE22.3 digital drives using SGP20 firmware support the EMD I/O module using the Eco-X bus system.

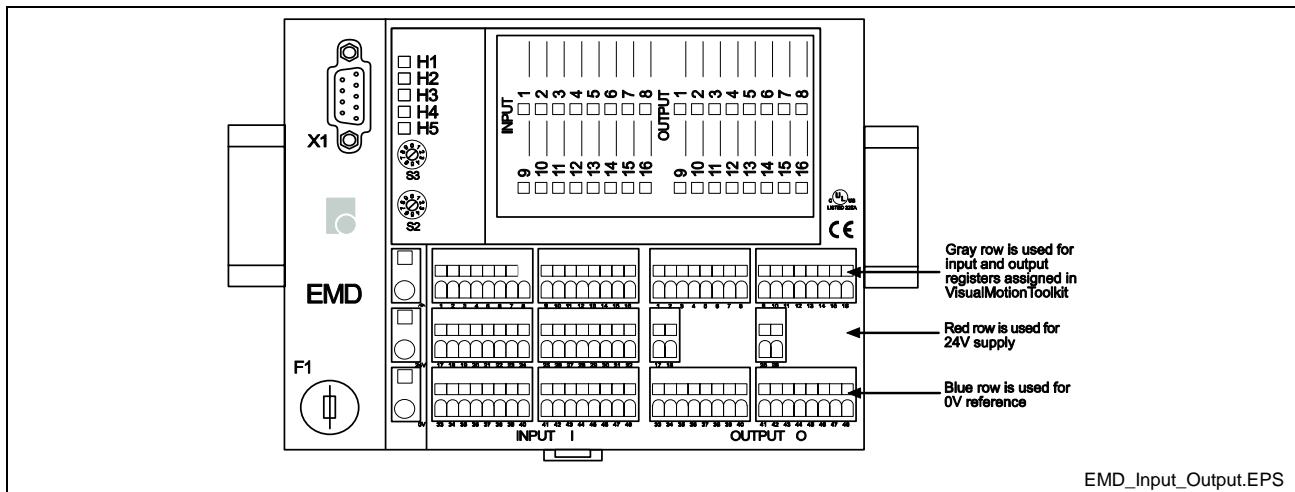


Fig. 5-6: EMD I/O Module

5.4 Configuring I/O Modules

Accessing RECO02 I/O Modules

VisualMotion communicates with RECO02 I/O modules by assigning registers to specific modules. The assignment of registers to I/O devices is performed using VisualMotion's I/O Configuration Tool.

This section describes how RECO02 I/O modules are assigned to VisualMotion registers. The labeling of RECO02 modules is illustrated in Fig. 5-7.

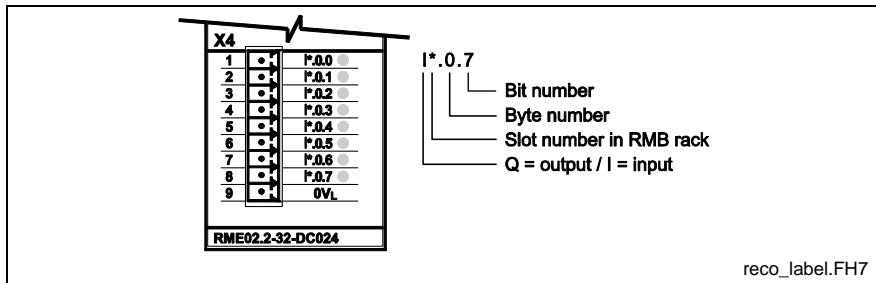


Fig. 5-7: RECO02 Bit Label

RECO02 16-Bit I/O Modules

The RME02.2-16 (Input) and RMA02.2-16 (Output) modules each use 1 VisualMotion register for accessing their respective 16 bits. The lower 8 VisualMotion register bits are assigned to the lower connector X2 (Byte 0) and the upper 8 bits are assigned to the upper connector X1 (Byte 1).

RECO02 32-Bit I/O Modules

The RME02.2-32 (Input) and RMA02.2-32 (Output) modules each use 2 VisualMotion registers for accessing their respective 32 bits. The first VisualMotion register (n) is assigned to the lower two connectors (X3 and X4). The second adjacent VisualMotion register ($n+1$) is assigned to the upper two connectors (X1 and X2). Bit distribution of each register is similar to that of the 16-bit input module.

Note: A VisualMotion register is equivalent to 2 Bytes or 1 Word. Each RECO02 module connector is identified as a Byte. RECO02 module connectors begin at Byte 0 (lowest connector) up to Byte 3 (in the case of a 32-bit module with 4 connectors).

The bits on a RECO02 module are labeled from 0-7 for the lower Byte and 0-7 for the upper Byte. VisualMotion assigns bit numbers 1-8 for the lower Byte and 9-16 for the upper Byte.

Fig. 5-8 illustrates the labeling structure of a RECO02 Input or Output module and the relationship to VisualMotion assigned register bits.

VisualMotion n Register Definition

This section makes mention of a (n) register and a ($n + 1$) register. During the configuration of RECO02 I/O modules, a slot number is used to identify the module as well as the register number that will be assigned to the inputs or outputs, if applicable.

The *Number* assigned to the input or output is considered the (n) register. The ($n + 1$) register is the next adjacent register number assigned to 32-Bit RECO02 modules. 16-Bit modules only use one register (n).

For example,

If register 400 is assigned to the inputs of a RECO02 I/O module, register 401 is the ($n + 1$) register.

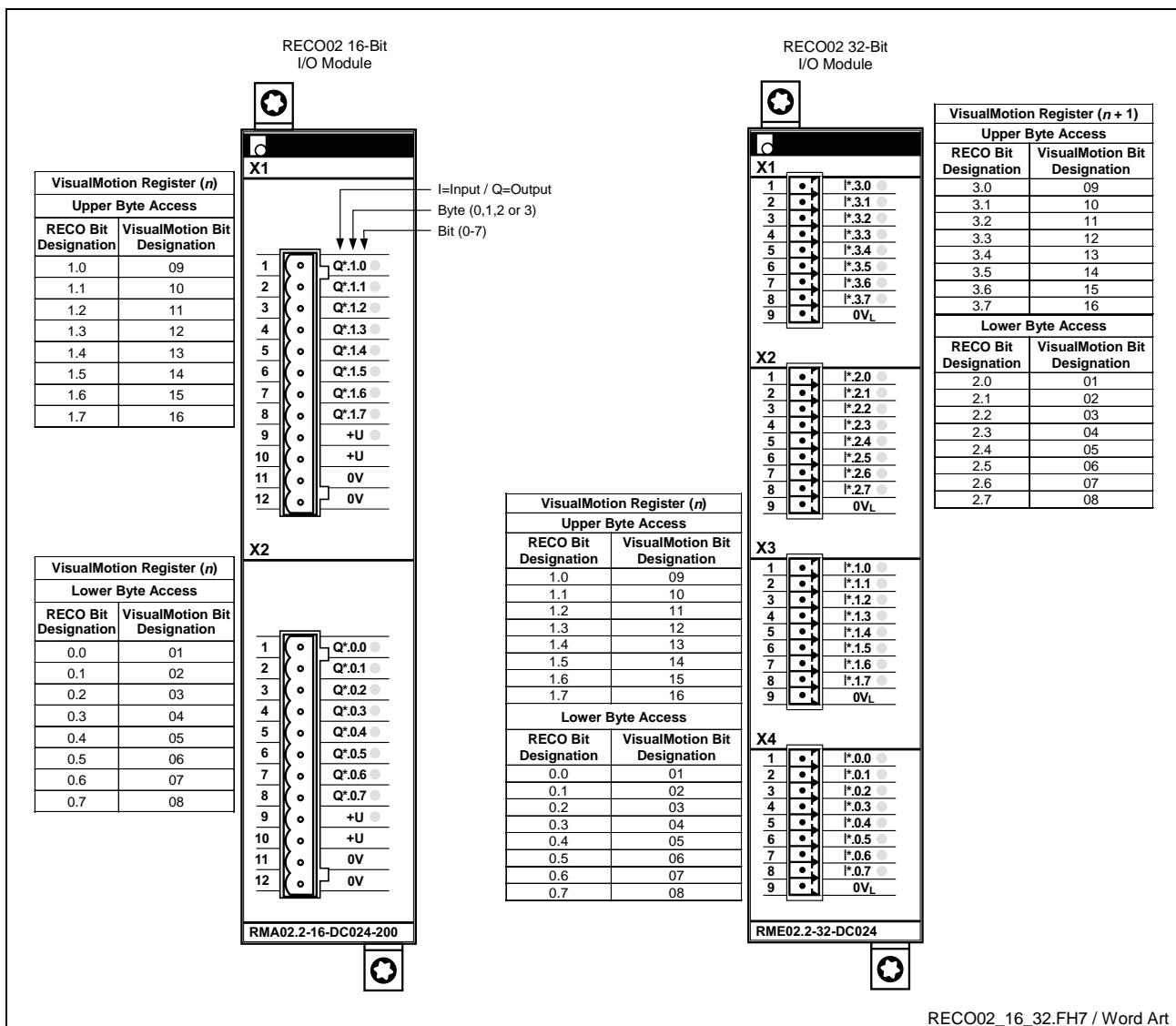


Fig. 5-8: RECO02 Digital Input and Output Module Bit Access

RMC02.2-2E Analog Input and Output Module

The RMC02.2 analog RECO02 module uses 2 VisualMotion registers for accessing the X1 and X2 input connectors and 1 VisualMotion register for accessing the X3 output connector. A second VisualMotion register is used for scaling the output value of X3. The first (n) VisualMotion input register is assigned to the upper X1 connector. The second ($n + 1$) adjacent VisualMotion input register is assigned to the center X2 connector. For output, the lower X3 connector is assigned to the first (n) VisualMotion output register. The second ($n + 1$) adjacent VisualMotion output register is reserved for the output scaling of connector X3. Refer to the *SERCOS I/O Unit RECO02.2* configuration manual for details.

Note: The scaling for the output is done in VisualMotion Toolkit's I/O Configuration Tool when configuring an analog RECO02 module.

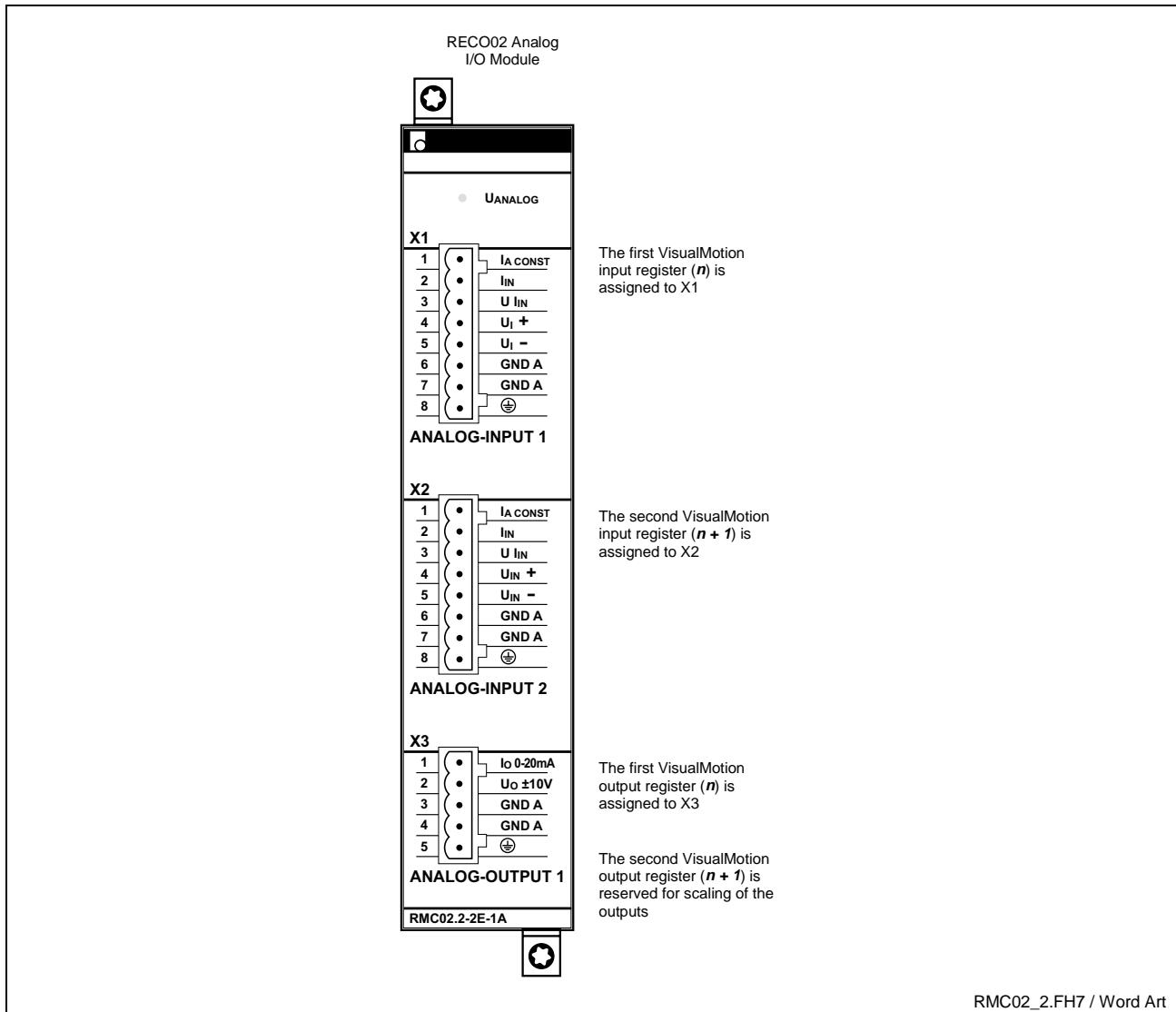


Fig. 5-9: RECO02 Analog Input and Output Module Bit Access

RECO I/O Error Reaction Bits

Bits 6 and 7 of control parameter C-0-0010 (System Options) are used to specify how VisualMotion responds to errors reported by RECO I/O modules. The bit settings are as follows:

Bit 6	Bit 7	Reaction
0	0	Ignore
1	0	Warning
x	1	Fatal Error (default)

Table 5-1: RECO I/O Error Reaction Bits (C-0-0010)

-
- Note:** All power connectors on RECO02 output modules must be connected to a 24V supply or a "24V Missing" error message will be displayed in the I/O Configuration Tool.
- A *Generate Fatal Error* setting will not allow motion to start unless each 24V supply is satisfied.
-

Ignore

The control ignores any errors reported by the RECO I/O modules. This reaction is selected if the user program is to handle RECO I/O errors. In this case, the User I/O Configuration tool would be used to map the RECO I/O modules 32-bit status words to a VisualMotion register, where the user program can monitor them.

-
- Note:** This reaction provides default backwards compatibility to older versions of GPP firmware that are not capable of directly responding to RECO I/O errors.
-

Warning

The control responds to errors reported by the RECO I/O modules by generating a "215 RECO I/O Failure" warning. This reaction is selected if the user is to be notified of any RECO I/O errors, while still allowing the user program to continue executing.

Fatal Error

The control responds to errors reported by the RECO I/O modules by generating a "544 RECO I/O Failure" error, stopping program execution and motion. This is the system's default reaction. This reaction is selected if the application requires program execution and motion to be stopped as soon as a RECO I/O error is detected.

Configuring Local RECO I/O Modules for the MTS-R

The configuration of local RECO I/O modules is done using the WinPCL software program. WinPCL interfaces with the MTS-R using the standard IKB0005 serial cable on X10, as shown in Fig. 5-10.

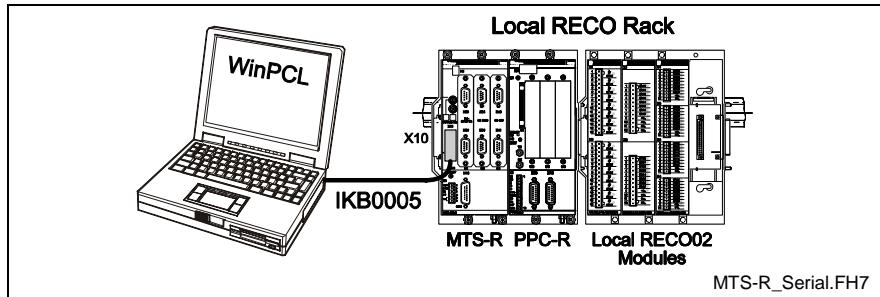


Fig. 5-10: MTS-R Serial Connection to WinPCL

WinPCL configures the dual port RAM, shared by both the MTS-R and PPC-R, with starting memory locations for inputs and outputs. Once configured, the MTS-R can directly access any local I/O bit by writing a program in WinPCL. The PPC-R can access the configured memory locations using any of the following communication methods:

- Cyclic data
(40 words, consistent, 4 ms update rate)
- Non-cyclic (service channel)
- 128 input registers and 128 output registers
(I/O Mapper scan time update rate, no consistency)

Configuring SERCOS I/O Devices

The SERCOS I/O (RECO02 and drive) is configured using the I/O Configuration Tool in VisualMotion. Once all the SERCOS I/O are configured and downloaded to the PPC-R, the MTS-R can access the configured dual-port RAM location for accessing SERCOS I/O.

DIAx Digital I/O Modules

DIAx03/04 digital drives can hold up to 3 DEA I/O modules. The DEA04, 05 and 06 each requires 1 register for 16 inputs and the 1 register for 15 outputs. The DEA08, 09 and 10 each requires 2 registers for 32 inputs and 2 registers for 24 outputs. The pin-out for each module is illustrated in Fig. 5-11.

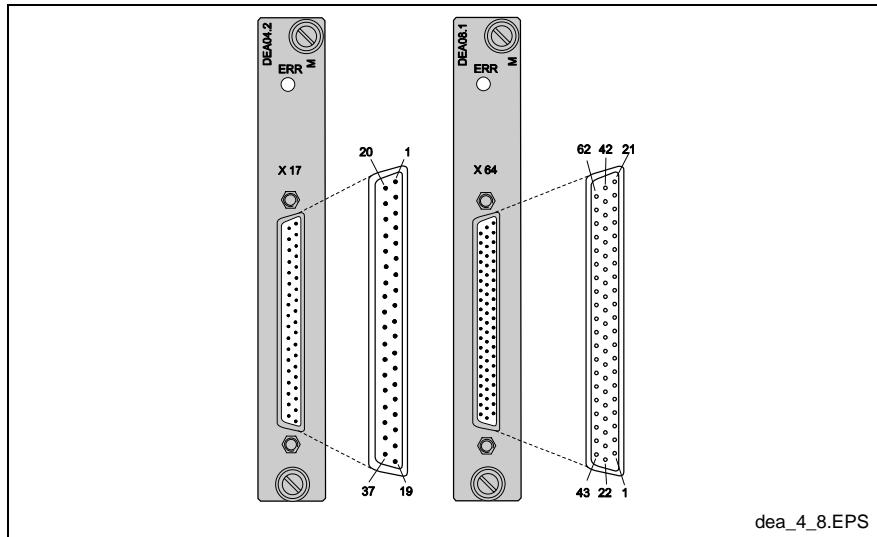


Fig. 5-11: DEA Digital Drive I/O Modules

The following table is an example using registers 405 and 453 as the assigned registers for the DEA04, 05 or 06 inputs and outputs.

Register	Bits	DEA04 Pin-out
405 (Input)	01 - 15	01 - 15
453 (Output)	16 - 31	16 - 31

Table 5-2: DEA04 Digital I/O Pin-out

The following table is an example using registers 406, 407, 454 and 455 as the assigned registers for the DEA08, 09 or 10 inputs and outputs.

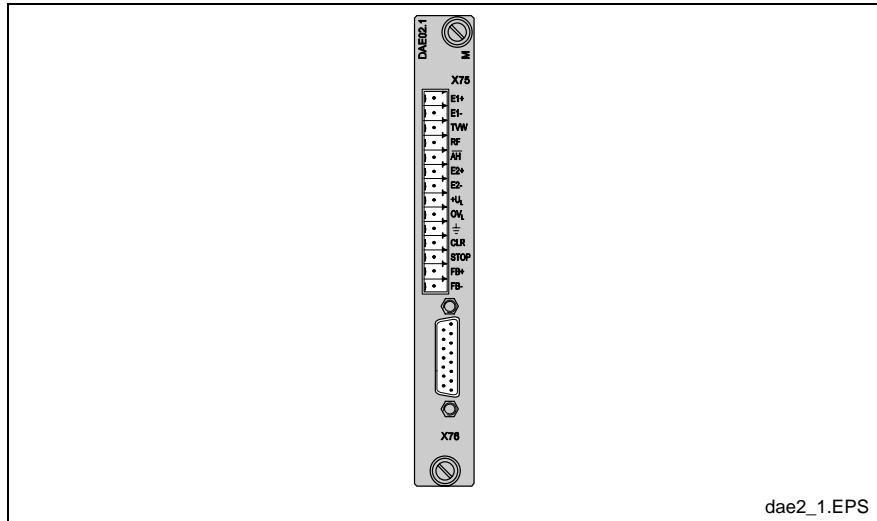
Register	Bits	DEA08 Pin-out
406 (Input)	01 - 11	01 - 11
406 (Input)	12 - 16	22 - 26
407 (Input)	01 - 06	27 - 32
407 (Input)	07 - 16	43 - 52
454 (Output)	01 - 08	12 - 19
454 (Output)	09 - 16	33 - 40
455 (Output)	01 - 08	53 - 60

Table 5-3: DEA08 Digital I/O Pin-out

DIAX Analog Input I/O Module

Bosch Rexroth digital drives of the DIA03/04 families can be configured to hold an analog input module to receive input from a feedback device for use in a VisualMotion user program. Allowable analog input modules are...

- DAE02.1 14-bit analog inputs



dae2_1.EPS

Fig. 5-12: DAE02.1 Analog Input Module

Configuring EMD I/O Modules for DKC22.3

The EMD module is an expansion I/O module that interfaces with the DKC22.3 using the EcoX bus system. EcoX communication can be used by a DKC22.3 drive with an SGP20 module and the appropriate cable.

Within each EcoX bus system, a master drive can have up to two EMD I/O modules with 16 digital inputs and outputs per module. Additional master drives, with up to two EMD I/O modules per drive, can be connected through the SERCOS ring, as shown in Fig. 5-13.

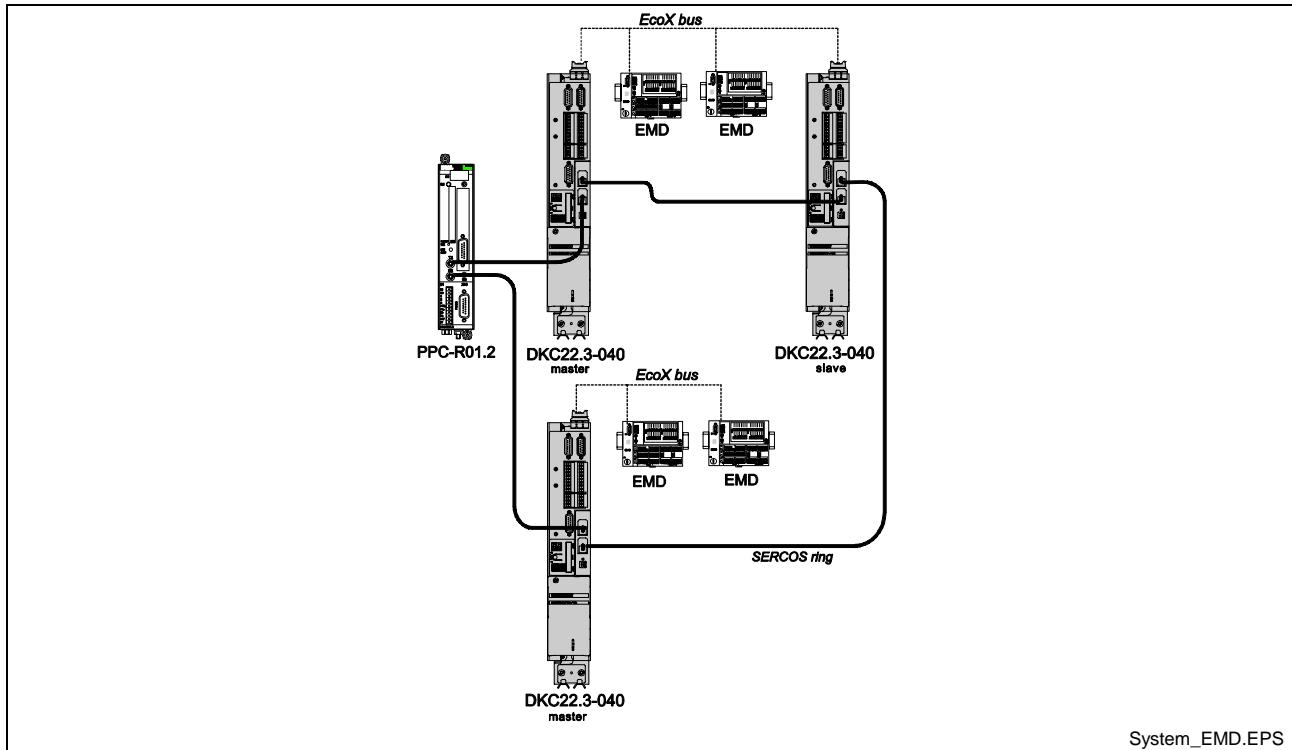


Fig. 5-13: System Configuration with EMD I/O Module

Configuring VisualMotion for EMD I/O Devices with EcoX Communication

To configure VisualMotion Toolkit for EMD modules:

1. Open the **I/O Configuration** window by selecting **I/O Setup...** from the **Commission** menu in VisualMotion Toolkit.
2. Highlight **I/O Configuration** and select **Add SERCOS Device** from the **Edit** menu to open the **Add SERCOS Device** window.
3. Select **ECODRIVE With Eco-X IO Module** device type.
4. Accept the Default device type, **DKC22.3 ECODRIVE03**, and select a SERCOS address for the drive in the **Drive Setup** window.
5. Add an I/O module by highlighting the new drive in the I/O Configuration window and selecting **Add I/O Module** from the **Edit** menu.
6. Select **Digital** for the drive type (**EMD 16 – 16 inputs/16 outputs @ 24 VDC** will appear in the drop-down window) and select **Inputs** or **Outputs**.

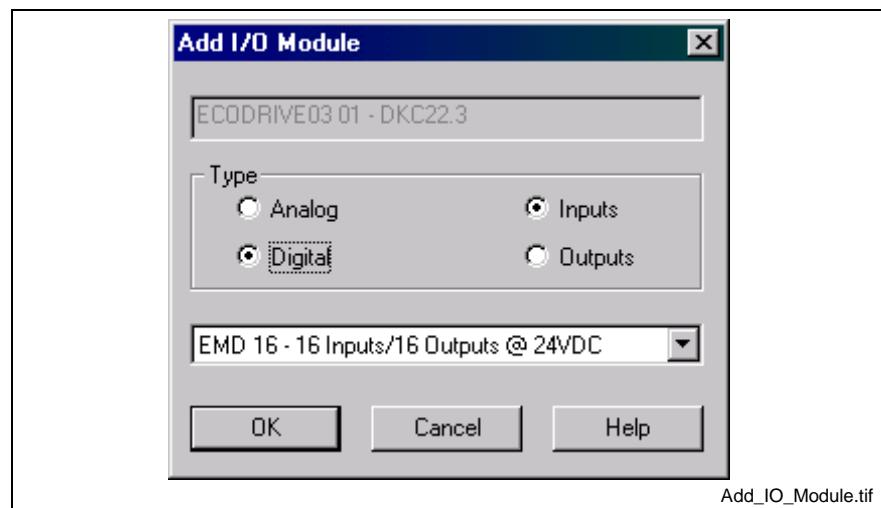


Fig. 5-14: Add I/O Module Window

7. Select the slot number (1 or 2, according to the type of bus connection) for the EMD I/O module.

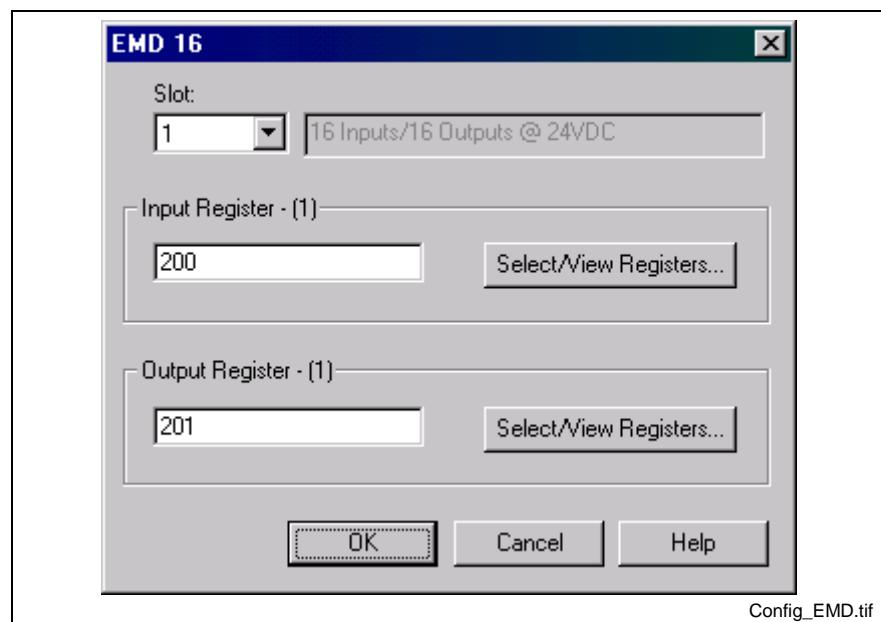


Fig. 5-15: Assigning Registers for EMD Module

8. Assign register numbers to the input and output registers of the EMD I/O module.

The input and output registers assigned by VisualMotion, coincide with the inputs and outputs in the gray row on the EMD I/O module, as shown in Fig. 5-16. The 16 bits of each register are labeled 1 through 16 below each register in the row.

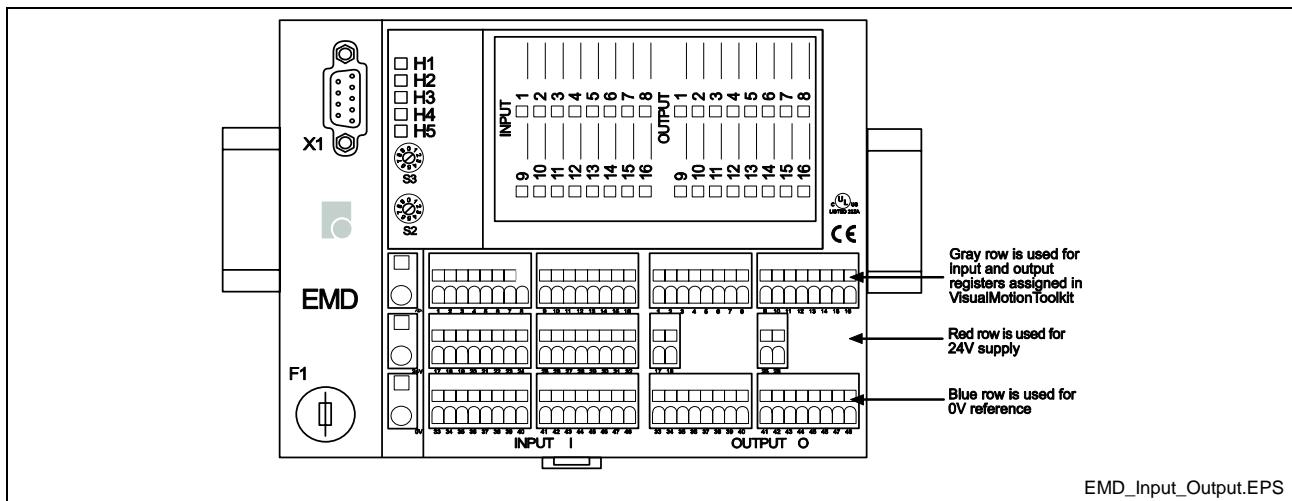


Fig. 5-16: Inputs and outputs on EMD I/O Module

Configuring Drives for Torque Following Mode with EcoX Communication

For drives configured in torque following mode, EcoX bus can be used between the master and slave drives. Previously, an analog connection was used for communication between the master and slave drives.

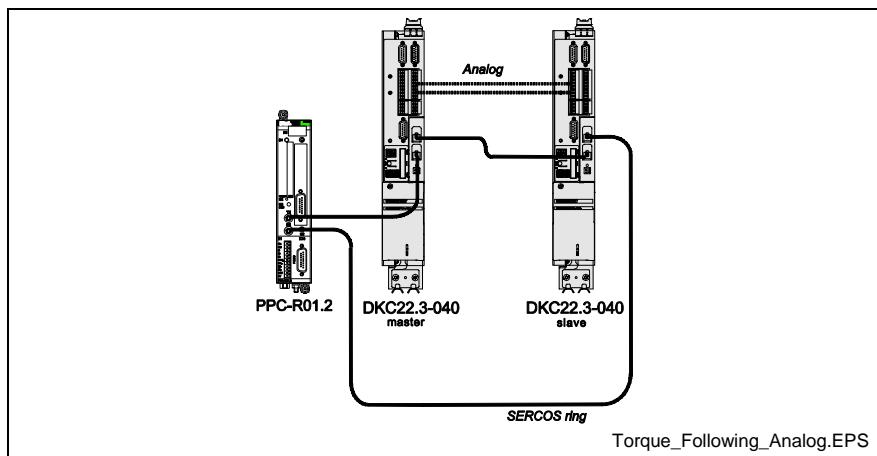


Fig. 5-17: Drives in Torque Following Mode with Analog Connection

A digital connection, the EcoX bus connection, can now be used in place of the analog connection between the master and slave drives for greater following accuracy. With EcoX bus communication, slave drives can only receive signals sent by the master drive while the master drive can send and receive signals from the slave drives. Up to three slave drives can be connected to the master drive through the EcoX bus.

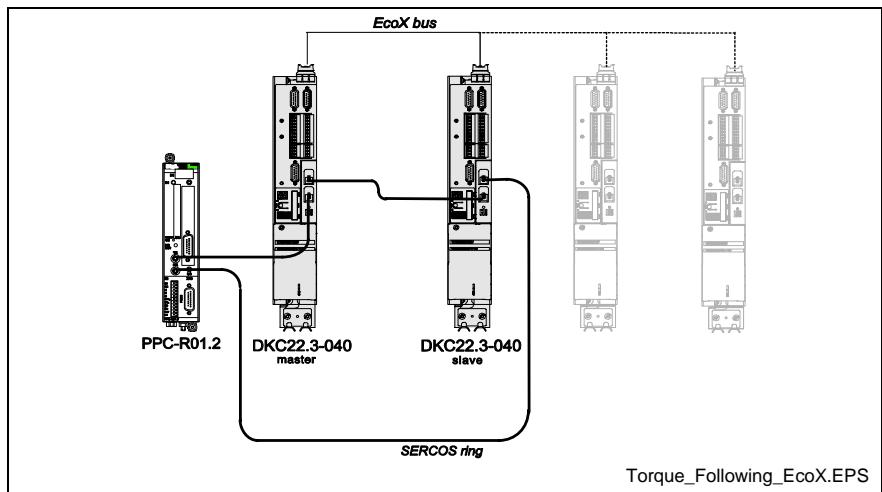


Fig. 5-18: Drives in Torque Following Mode with EcoX Connection

The drives are configured for EcoX communication using DriveTop IE (Integrated Edition), the drive configuration tool in VisualMotion Toolkit. When configuring the drives for torque following mode, the system must be in parameter mode as configuration changes are not possible in runtime. To configure the drives:

1. Launch DriveTop by selecting **Drive Overview** from the **Commission** menu in VisualMotion Toolkit while your project is online.
2. In the **Drives** window, double-click the drive table or click the **Overview** button to launch DriveTop.
3. In the DriveTop window, select **Drive Functions** \Rightarrow **Special/optional drive functions** \Rightarrow **EcoX – Cross communication...**
4. Configure the master drive in the configuration window for the drive by selecting the number of slaves. Maintain the default setting (0) in the **IO-Module** field, VisualMotion will apply the correct settings.
5. Select **Torque/Force command** for the command value and change the drive number to the next drive.

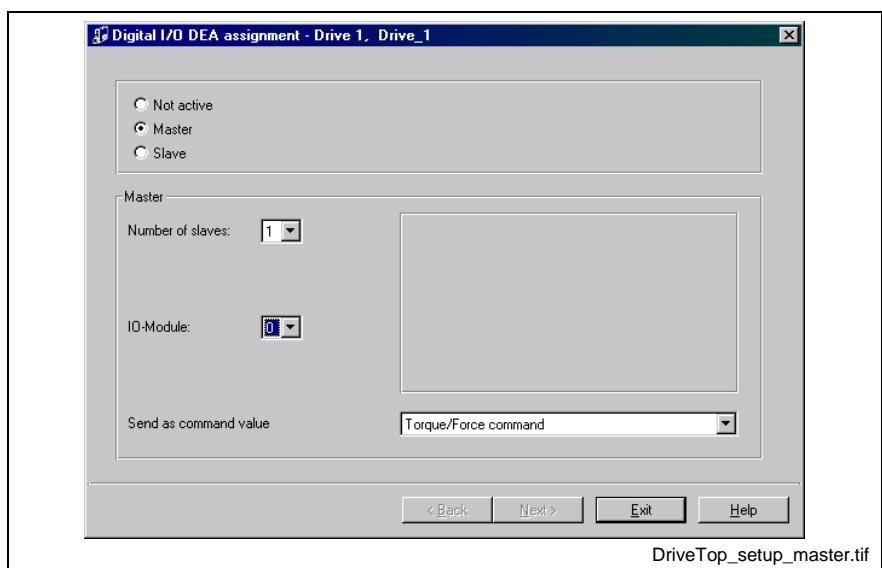


Fig. 5-19: Digital I/O Assignment for Mater Drive

6. Configure the slave drives by selecting **Slave** in the **Assignment** window.

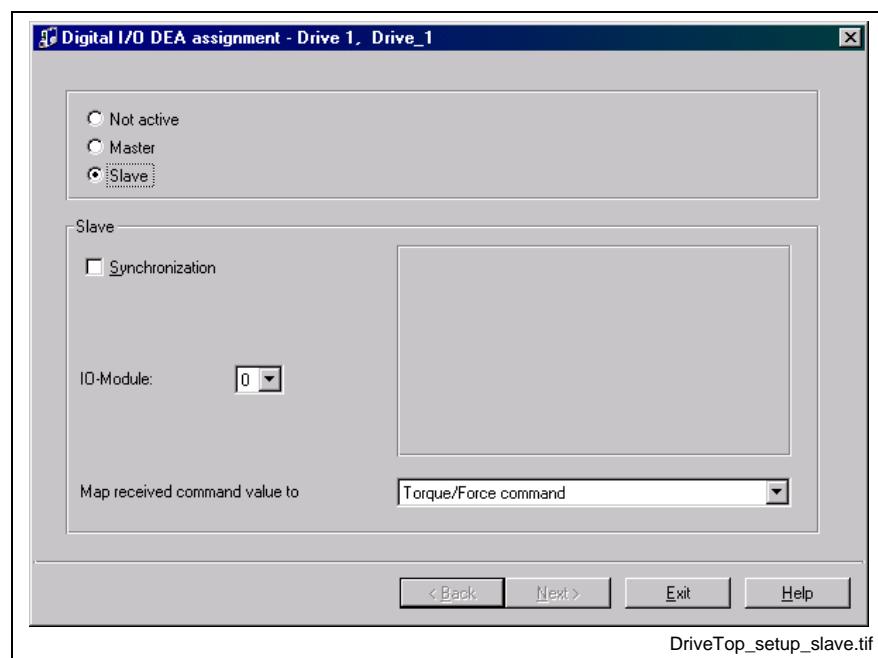


Fig. 5-20: Digital I/O Assignment for Slave Drive

7. Maintain the default settings for **Synchronization** (unchecked) and **IO-Module** (0).
8. Select **Torque/Force command** for the command value.
9. Click **Next>** to apply the settings.

6 Fieldbus Slave Interfaces

The PPC-R can be ordered with one of the following fieldbus slave interfaces:

- Profibus fieldbus slave interface
- DeviceNet fieldbus slave interface
- ControlNet fieldbus slave interface
- EtherNet/IP fieldbus
- Interbus fieldbus slave interface

The fieldbus interface is installed in an expansion slot of the PPC-R.

Note: Only one fieldbus slave interface can be installed in a PPC-R at one time. When using an EtherNet/IP interface, no other fieldbus interface card is allowed.

The PPC-R mapping list is scanned every 4 ms. Data is sent and received via the fieldbus slave board's dual port RAM.

Note: When an MTS-R PLC unit is used in conjunction with a PPC-R, all fieldbus interfaces supported are disabled in the PPC-R. fieldbus support will be handled by the PLC.

6.1 Profibus-DP Fieldbus Slave Interface

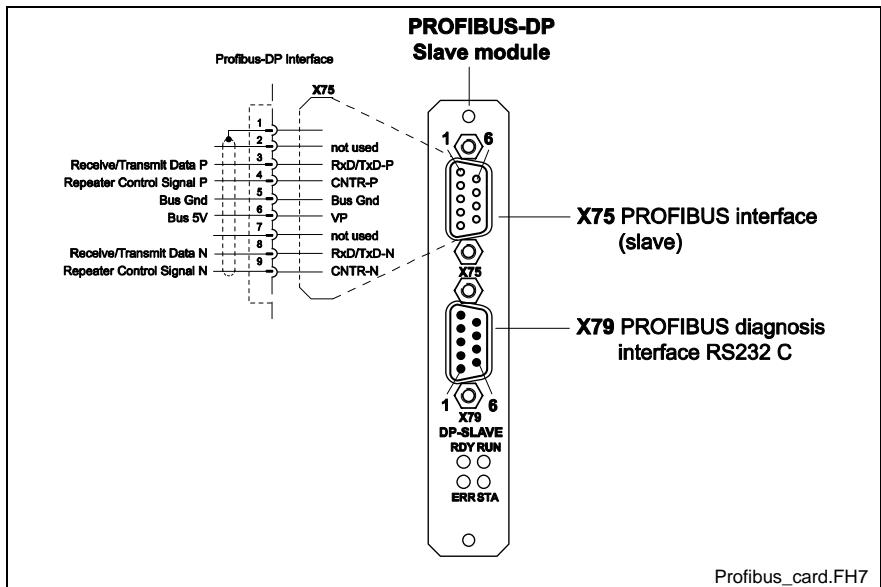


Fig. 6-1: Front Panel of DPS01 Profibus-DP Slave Interface

Pin Assignment of Connector X75

Pin	Signal	Function
1	---	not used
2	---	not used
3	RS485+	Receive / Transmit Data Plus
4	CNTR-P	Repeater Control Signal
5	Ground	0V
6	+5V	Repeater Supply
7	---	not used
8	RS485-	Receive / Transmit Data Minus
9	Ground	0V

Table 6-1: Pin Assignment of Connector X75

Profibus Diagnostics

The Profibus interface has 4 LEDs on the front panel. They allow diagnosis of the bus status and communications between the Profibus slave interface and the PPC-R.

LED	Color code
Ready	Yellow
Run	Green
Status	Yellow
Error	Red

Table 6-2: Designation and Color of LEDs for Profibus Interface

LED	State	Meaning
READY (yellow)	On	Hardware O.K.
	Flashing (continuous)	Initial configuration O.K.
	Flashing (irregular)	Hardware or system O.K.
	Off	Hardware defective
RUN (green)	On	fieldbus communication with master is active
	Flashing (continuous)	Ready for fieldbus communications
	Flashing (irregular)	Parameterization error
	Off	Hardware defective
STATUS (yellow)	On	Bus token active
ERROR (red)	On	Internal slave error

Table 6-3: LED Diagnostics for Profibus Interface

Profibus Specifications

Hardware

Description	Details
Performance – Max. Baudrate	9.6 KBaud- 12 MBaud RS-485 optically isolated
Connector Type	Standard 9 pin Profibus D-sub
Operating Temperature	0 – 55 °C (32 – 131 °F)

Table 6-4: Profibus Hardware

Software

Description	Details
Slave Type	Profibus DP only
I/O Capacity	64 bytes input / 64 bytes output

Table 6-5: Profibus Software

Note: A ControlNet configuration file (*.gsd) is available in the VisualMotion 9 installation CD.

Certifications

Description	Details
Certifications	Profibus NutzerOrganisaton Profibus Trade Organization CE Marked

Table 6-6: Profibus Certifications

6.2 DeviceNet Fieldbus Slave Interface

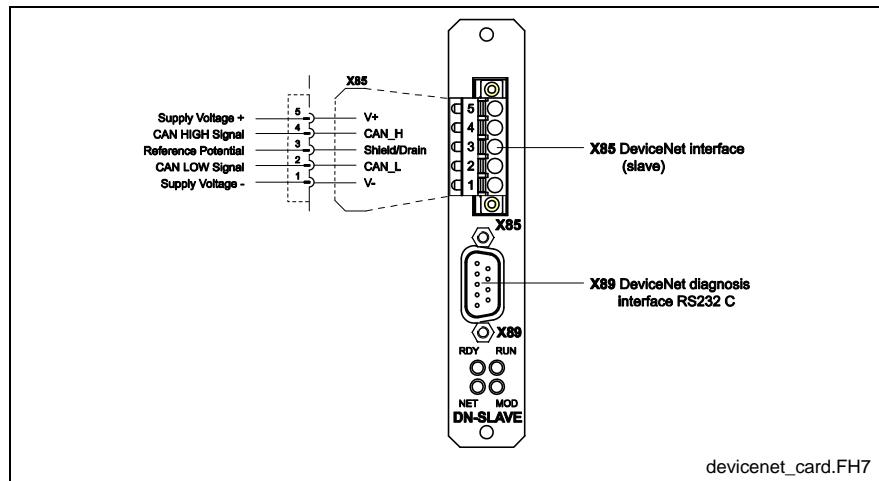


Fig. 6-2: Front Panel of DNS03 DeviceNet Slave Interface

Pin Assignment of Connector X85

Pin	Signal	Function
1	V-	0V
2	CAN_L	Differential low signal
3	Shield/Drain	Shield connection
4	CAN_H	Differential high signal
5	V+	+24 V Interface supply (Maximum 30 V)

Table 6-7: Pin Assignment of Connector X85

DeviceNet Diagnostics

The DeviceNet interface has 4 LEDs on the front panel. They allow diagnosis of the bus status and communications between the DeviceNet slave interface and the PPC-R.

LED	Color code
Ready	Yellow
Run	Green
Network Status	White / Red / Green
Module Status	White / Red / Green

Table 6-8: Designation and Color of LEDs for DeviceNet interface

LED	State	Meaning
READY (yellow)	On	Hardware O.K.
	Flashing (continuous)	Initial configuration O.K.
	Flashing (irregular)	Hardware or system O.K.
	Off	Hardware defective
RUN (green)	On	fieldbus communication with master is active
	Flashing (continuous)	Ready for fieldbus communications
	Flashing (irregular)	Parameterization error
	Off	Hardware defective
NET * (Network Status)	RED on	Critical link failure
	RED flashing	Connection timeout
	GREEN on	On-line, link O.K.
	GREEN flashing	On-line, not connected
	White	Device not power from DeviceNet master, Baudrate error
MODUL * (Module Status)	RED on	Unrecoverable error
	RED flashing	Minor fault
	GREEN on	Normal operation
	GREEN flashing	Configuration failure
	White	Device not power from DeviceNet master, Baudrate error

* NET and MODUL LED's are based on the DeviceNet specification.

Table 6-9: LED Diagnostics for DeviceNet

DeviceNet Specifications

Hardware

Description	Details
Performance – max. baud rate	500 KBaud optically isolated
Transceiver Information	100mA @ 24 V
Connector type	5 pin "Open Style" terminal block
Operating Temperature	0 – 55 °C (32 – 131 °F)

Table 6-10: DeviceNet Hardware

Software

Description	Details
Slave type	Group 2 only server
Message types	Polled I/O, Explicit
Polled I/O Capacity	64 bytes input / 64 bytes output

Table 6-11: DeviceNet Software

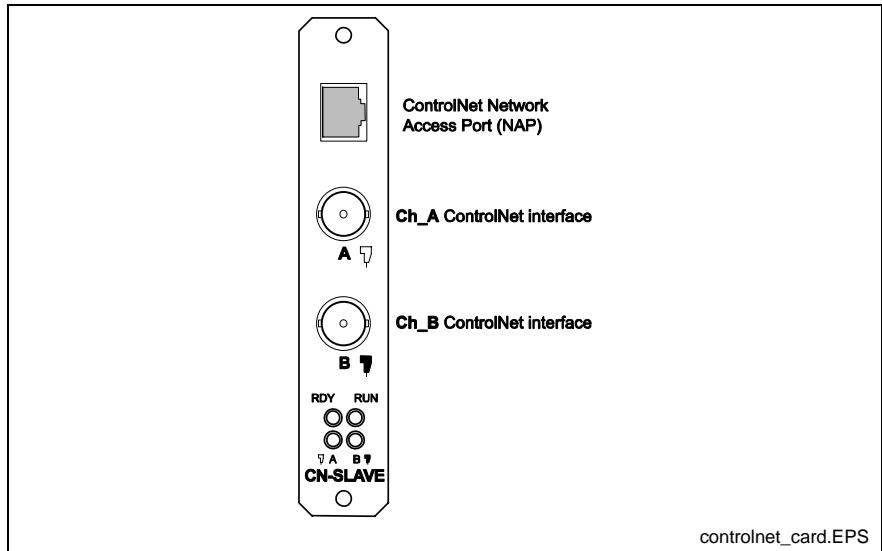
Note: A DeviceNet configuration file (*.eds) is available in the VisualMotion 9 installation CD.

Certification

Description	Details
Certification	Open DeviceNet Vendor Association CE Marked

Table 6-12: DeviceNet Certification

6.3 ControlNet Fieldbus Slave Interface



controlnet_card.EPS

Fig. 6-3: Front Panel of the CNS01 ControlNet Slave Interface

Channel A ControlNet Interface

A standard quad shield coax RG-6 cable, using a BNC coaxial connector, is used to connect the ControlNet slave (Ch_A) to the ControlNet network (Ch_A) via a passive tap.

Channel B ControlNet Interface

A standard quad shield coax RG-6 cable, using a BNC coaxial connector, is used to connect the ControlNet slave (Ch_B) to the ControlNet network (Ch_B) via a passive tap.

Note: Either Ch_A or Ch_B can be used to create the ControlNet network path. To create a Redundant Parallel network path, both Ch_A and Ch_B are connected to the independent network.

ControlNet Network Access Port

The Network Access Port (NAP) can be used to connect to a Laptop (using a PCMCIA ControlNet Interface card) or an equivalent device for configuration and diagnostics on the ControlNet network. A standard 8-pin RJ-45 connector using shield cable is used.

ControlNet Diagnostics

The ControlNet interface has 4 LEDs on the front panel. They allow diagnosis of the bus status and communications between the ControlNet slave interface and the PPC-R.

LED	Color code
RDY	Yellow
RUN	Green
Ch_A	Clear
Ch_B	Clear

Table 6-13: Designation and Color of LEDs for ControlNet

LED	State	Meaning
RDY	On	Hardware O.K.
	Flashing (continuous)	Initial configuration O.K. no firmware loaded
	Flashing (irregular)	Hardware or system error
	Off	Hardware defective
RUN	On	fieldbus communication with master is active
	Flashing (continuous)	Communication stopped
	Flashing (irregular)	Missing or faulty configuration
	Off	No communication
<u>Ch_A *</u> <u>and Ch_B</u> (Redundant Option)	Both off	Reset or no power
	Both red	Failed link interface
	Alternating red / green	Self test
	Alternating red / off	Bad node configuration
	Both green	Normal operation
<u>Ch_A</u> <u>or Ch_B</u>	Both off	Channel disabled
	Flashing red / green	Invalid link configuration
	Flashing red / off	Link fault or no MAC frames received
	Flashing green / off	Temporary channel error or listen only
	On green	Normal operation

* Ch_A and Ch_B LED's are based on the ControlNet Specification.

Table 6-14: LED Diagnostics for ControlNet Interface

ControlNet Specifications

The fieldbus slave card is designed based on the ControlNet specification, Rev. 2.0, March 1998.

Hardware

Description	Details
Performance – max. baud rate	5 MBaud fixed
Connector type	BNC RG-6 connector (Ch_A and Ch_B)
	8-pin RJ-45 connector (NAP)
Redundant configuration supported = yes	According to ControlNet specs.
NAP port supported = yes	According to ControlNet specs.
Operating Temperature	0 – 55 °C (32 – 131 °F)

Table 6-15: ControlNet Hardware

Software

Description	Details
Slave type	Adapter, messaging
Message types	Polled I/O, Explicit
Polled I/O Capacity	64 bytes input / 64 bytes output

Table 6-16: ControlNet Software

Note: A ControlNet configuration file (*.eds) is available in the VisualMotion 9 installation CD.

Certification

Description	Details
Certification	ControlNet International CE Marked

Table 6-17: ControlNet Certification

6.4 EtherNet and EtherNet/IP

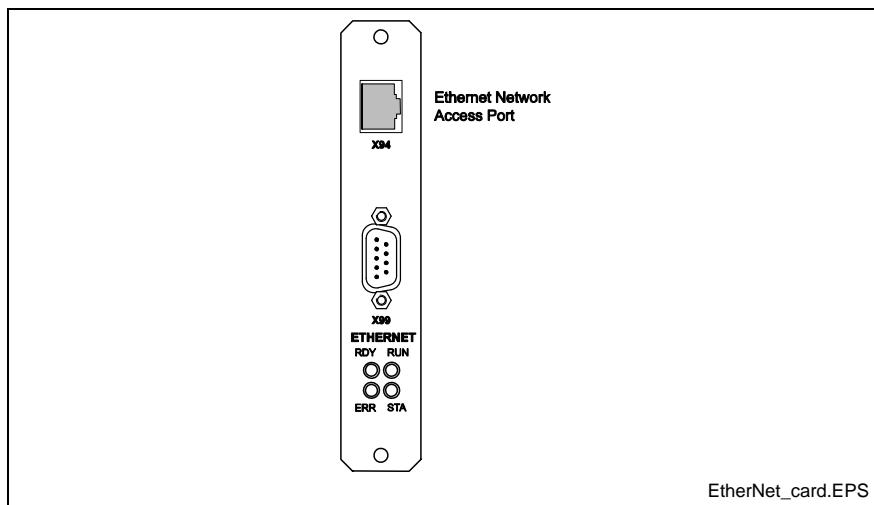
The EtherNet option card resides in the PPC-R control and contains its own TCP/IP (*Transmission Control Protocol/Internet Protocol*) stack. The TCP/IP stack enables the EtherNet interface to transmit data over a network or Internet and communicate with VisualMotion Toolkit via the DDE or OPC servers.

EtherNet/IP is an open network using the standard EtherNet IEEE 802.3, TCP/IP protocol, and CIP (Control and Information Protocol), the same real-time I/O and information protocol that DeviceNet and ControlNet use.

Note: When using EtherNet/IP in a VisualMotion 9 system, no other fieldbus interface card (i.e., Profibus, DeviceNet, ControlNet, Interbus) or the MTS-R PLC interface can be installed.

Note: The same EtherNet hardware is used for both EtherNet/IP fieldbus and standard EtherNet TCP/IP networking communication. When enabled as an EtherNet/IP fieldbus interface in VisualMotion 9 using GPP 9 firmware, standard TCP/IP communication between VisualMotion Toolkit over the same network is possible.

The PPC-R control can be ordered with either a 10 MBaud or 100 MBaud EtherNet card. Refer to chapter 10 for hardware and firmware configurations for both the 10 MBaud and 100 MBaud EtherNet cards.



EtherNet_card.EPS

Fig. 6-4: ETH01 EtherNet Card

EtherNet Network Access Port

The EtherNet network access port is used to connect to a LAN by using a standard RJ-45 cable.

EtherNet Diagnostics

The EtherNet interface has 4 LEDs on the front panel. They allow diagnosis of the communication between the EtherNet interface and the control.

LED	Color code
Ready	Yellow
Run	Green
Error	Red
Status	Yellow

Table 6-18: Designation and Color of LEDs on EtherNet

LED	State	Meaning
READY (yellow)	On	Hardware O.K.
	Flashing (continuous)	Initial configuration O.K.
	Flashing (irregular)	Hardware or system O.K.
	Off	Hardware defective
RUN (green)	Flashing (continuous)	Ready for fieldbus communications
	Flashing (irregular)	Parameterization error
ERROR (red)	Not used	Currently no function assigned
STATUS (yellow)	Flashing	EtherNet-Frame detected on network

Table 6-19: LED Diagnostics for EtherNet

EtherNet and EtherNet/IP Specifications

Hardware

Description	10 MBaud Hardware	100 MBaud Hardware
Performance - max. baud rate	10 MBaud fixed	100 MBaud
Connector types	8-pin RJ-45 connector (NAP) Standard DB9 for diagnostic & firmware upload	
Full Duplex support	Configurable with parameter C-0-0403	YES
Auto negotiation support	NO	YES
Operating Temperature	0 – 55 °C (32 – 131 °F)	

Table 6-20: EtherNet and EtherNet/IP Hardware

EtherNet Firmware

Description	Details
Slave type	TCP/IP Server
Message type	TCP/IP message using SIS or VisualMotion ASCII protocol
Port address	5001

Table 6-21: EtherNet Firmware

EtherNet/IP Firmware

Description	Details
Slave type	Level 2 I/O server
Message types	TCP/IP Msg for VisualMotion (9 sockets), TCP port address 5001
	Polled I/O (1 socket), UDP port address 44818
	Explicit Msg (2 sockets), TCP port address 44818
Polled I/O Capacity	64 bytes input / 64 bytes output
Request Packet Interval minimum	5ms

Table 6-22: EtherNet/IP Firmware

Note: An EtherNet/IP configuration file (*.eds) is available in the VisualMotion 9 installation CD.

Certification

Description	Details
Certification	CE Marked

Table 6-23: EtherNet Certification

6.5 Interbus Fieldbus Slave Interface

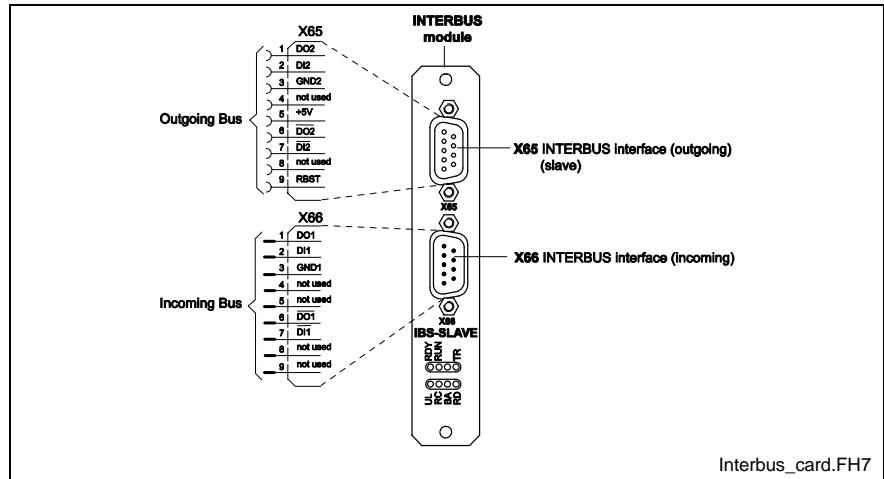


Fig. 6-5: Front Panel of the IBS03 Interbus Slave Interface

Pin Assignment of Connector X65

Pin	Signal	Function
1	DO 2	RS 485 (Out)
2	DI 2	RS 485 (In)
3	GND 2	reference ground
4	---	not used
5	+5V	
6	/DO 2	RS 485 (Out)
7	/DI 2	RS 485 (In)
8	---	not used
9	RBST	remote bus control

Table 6-24: Pin assignment of Connector X65 (outgoing bus)

Pin Assignment of Connector X66

Pin	Signal	Function
1	DO 1	RS 485 (Out)
2	DI 1	RS 485 (In)
3	GND 1	reference ground
4	---	not used
5	---	not used
6	/DO 1	RS 485 (Out)
7	/DI 1	RS 485 (In)
8	---	not used
9	---	not used

Table 6-25: Pin assignment of Connector X66 (incoming bus)

Interbus Diagnostics

The Interbus interface has 8 LEDs on the front panel. They allow diagnosis of the bus status and communications between the Interbus slave interface and the PPC-R.

LED	Color code
RDY	Yellow
RUN	Green
TR	Green
UL	Green
RC	Yellow
BA	Green
RD	Red

Table 6-26: Designation and Color of LEDs for Interbus

LED	State	Meaning
RDY	On	Hardware O.K.
	Flashing (continuous)	Initial configuration O.K. no firmware loaded
	Flashing (irregular)	Hardware or system O.K.
	Off	Hardware defective
RUN	On	fieldbus communication with master is active
	Flashing (continuous)	Communication stopped
	Flashing (irregular)	Missing configuration
	Off	No communication
TR	On	PCP communication O.K.
	Off	No PCP communication
UL	On	Bus power supply O.K.
	Off	Power supply low
RC	On	No error from incoming remote bus
	Off	No connection to device
BA	On	Active data telegram
	Off	No data exchange on Interbus
RD	On	Outgoing remote bus interface switched off
	Off	Outgoing remote bus interface switched on

Table 6-27: LED Diagnostics for Interbus Interface

Interbus Specifications

Hardware

Description	Details
Performance – max. baud rate	500 Kbaud (X65) optically isolated (X66) non-isolated
Connector type	Standard 9 pin D-sub X65 - female connector X66 - male connector
Operating Temperature	0 – 55 °C (32 – 131 °F)

Table 6-28: Interbus Hardware

Software

Description	Details
Card type	Interbus slave with Generation 4 and Loop support
Message types	PD (Process Data) PCP (Peripheral Communication Protocol)
Max. length of PD channel	up to 32 bytes input / 32 bytes output
Length of PCP channel	Configurable via fieldbus Mapper tool (OFF or ON at 2 words)

Table 6-29: Interbus Software

Certification

Description	Details
Certification	CE Marked

Table 6-30: Interbus Certification

7 Option Card PLS and Link Ring Interfaces

VisualMotion 9 supports the following additional interfaces for the PPC-R and the PPC-P11.1:

- Option Card PLS (NSW01)
- Link Ring (DAQ03)

7.1 Option Card PLS for PPC-R and PPC-P11.1

The Option Card PLS (NSW01) is the PPC-R and PPC-P11.1 programmable limit switch interface. Up to two Option Card PLSSs, containing 16 outputs each for a total of 32 outputs, can be ordered for each control.

Each Option Card PLS features the following:

- 16 outputs per card
- 2 mini-phoenix connectors with 8 outputs each (X6 and X7)
- LED indicator for each output
- Current draw per output is 250 mA @ 24V^{Note:}
- PLS outputs updated every 250 µs

Note: The maximum current draw of each output is limited to about 500 mA. However, the sum of all 8 output currents per connector (X6 or X7) should not exceed 2 amps.

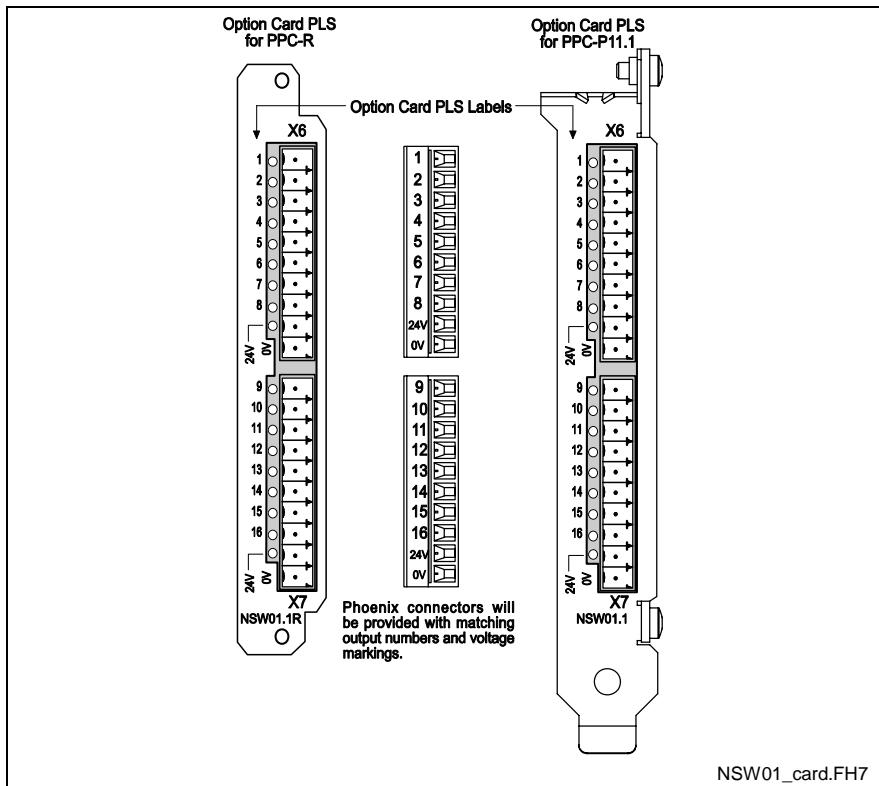


Fig. 7-1: Option Card PLS

Note: Refer to chapter 10, *Hardware and Firmware Configurations* for ordering information.

Connecting Supply Voltage

Each connector on the Option Card PLS (X6 and X7) requires a 24V input for the outputs to function. The label on the Option Card PLC identifies the 24V and 0V connections. Refer to Fig. 7-1 for details. The 24V LED indicator will be lit when power is applied.

X6 and X7 Pin Assignment

Phoenix Connector Numbering for X6 and X7	Label on X6	Label on X7	Signal Description
10	1	9	Digital Output
9	2	10	Digital Output
8	3	11	Digital Output
7	4	12	Digital Output
6	5	13	Digital Output
5	6	14	Digital Output
4	7	15	Digital Output
3	8	16	Digital Output
2	24V	24V	24 V
1	0V	0V	Ground

Table 7-1: X6 and X7 Pin Assignment

Option Card PLS Power Supply Voltage

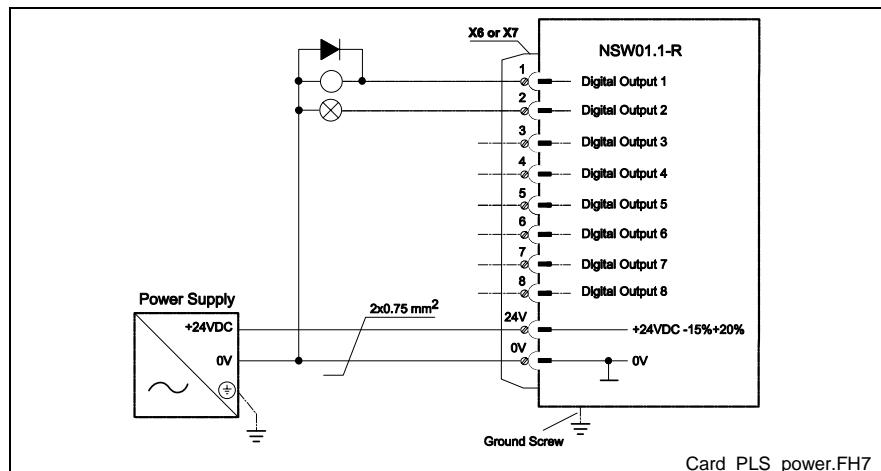


Fig. 7-2: Option Card PLS Power Supply Voltage



Damage due to component overload!

⇒ Exceeding the maximum current draw of the Option Card PLS can cause damage to the internal components.

Option Card PLS Specifications

Hardware

Description	Details
Protection rating	IP 20, EN 60529
Relative humidity	5 - 85 %, no condensation (operating) 5 - 95 %, no condensation (transport)
Atmospheric pressure	860 - 1060 hPa
Ambient operating temperature	0 ... 45 °C (32 ... 113 °F)
Storage and transportation temperature	-25 ... 70 °C (-13 ... 158 °F)

Power Supply

Description	Details
Input voltage	24 VDC, -15%+20%, EN61131-2
Maximum current	The maximum input current per 8 outputs (X6 or X7) should be limited to 2 Amps.

7.2 DAQ03 for PPC-R and PPC-P11.1

The DAQ03 card is the PPC-R and PPC-P11.1 interface to a Link Ring, a fiber optic loop of controls sharing master position data. Each PPC-R and PPC-P11.1 in a Link Ring must be ordered with a DAQ03 card.

The DAQ03 has two pairs of transmit and receive terminals for the fiber optic cables that connect the controls in the Link Ring. Only one pair, the primary ring, is required to form a Link Ring. The second pair forms a secondary ring which provides redundancy.

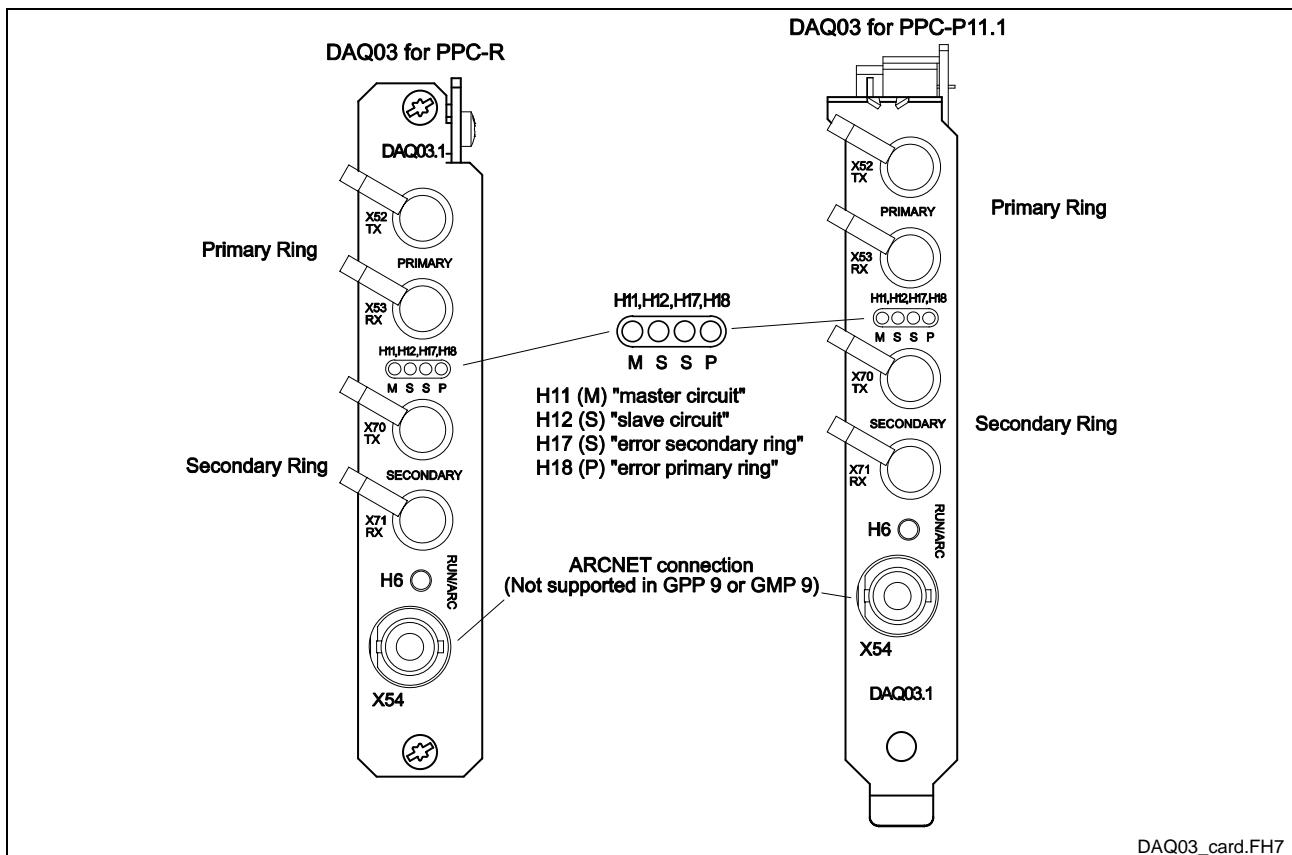


Fig. 7-3: DAQ03 Card

Note: Refer to chapter 10, *Hardware and Firmware Configurations* for ordering information.

When participating in a Link Ring, the jumpers on the control's DAQ03 board should be set according to the type of firmware it has:

- **GPP:** jumpers J1 and J4 (only) should be set.
- **GMP:** jumpers J2 and J4 (only) should be set.

DAQ03 cards are shipped with jumper J4 set to enable operation of the ARCNET connector which is not used by GPP or GMP. Therefore, it is not necessary to change the J4 setting.

DAQ03 Diagnostics

The DAQ03 faceplate has four LEDs that indicate the status of the Link Ring cables.

LED	Indication
H11 (M)	DAQ03 is set as Link Ring master
H12 (S)	DAQ03 is set as Link Ring slave
H17 (S)	An error has occurred in the secondary ring
H18 (P)	An error has occurred in the primary ring

Table 7-2: DAQ03 LEDs

DAQ03 Specifications

Hardware

Condition	Rating
Relative humidity	5-85%, no condensation (operating) 5-95%, no condensation (transport)
Atmospheric pressure	86-106 hPa
Ambient operating temperature	0 - 45 °C
Storage and transportation temperature	-25 - +70 °C

Table 7-3: Hardware Specifications for DAQ03

Power Supply

Type	Rating
Input voltage	5V
Maximum Current	700mA

Table 7-4: Power Supply Specifications for DAQ03

Cable Connections for DAQ03

Single Ring

A single ring uses only the primary receive and transmit connections on the DAQ03 cards, see Fig. 7-5.

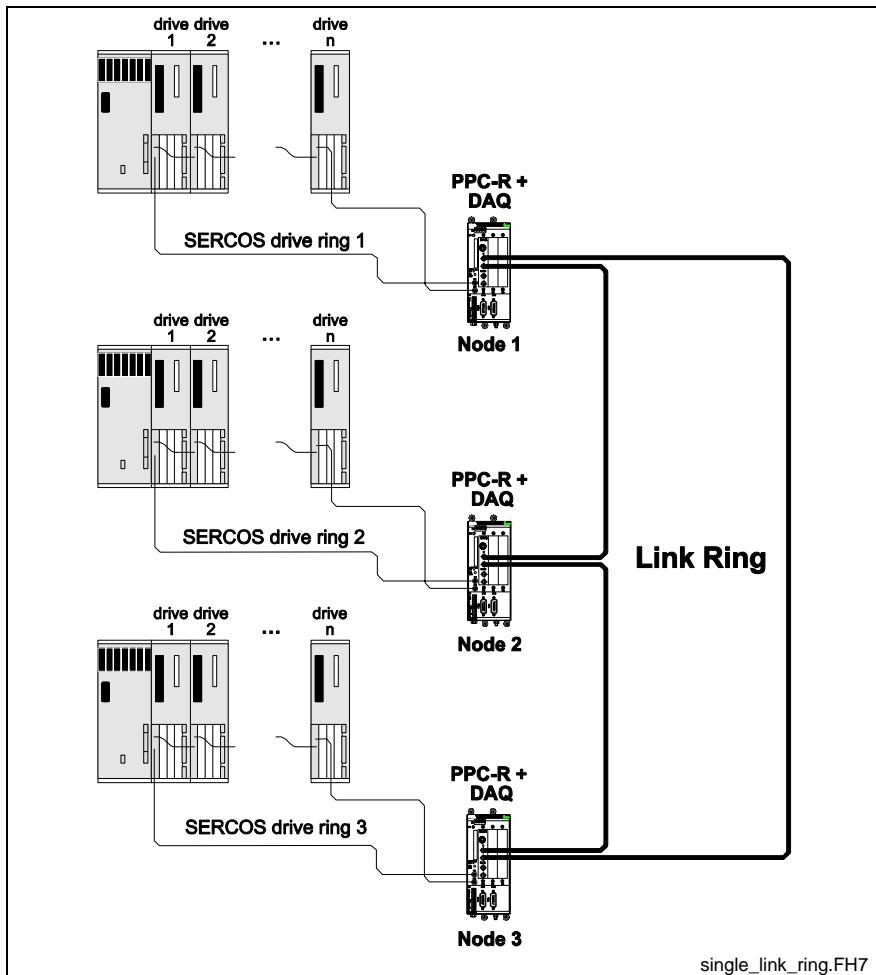


Fig. 7-4: Single Link Ring

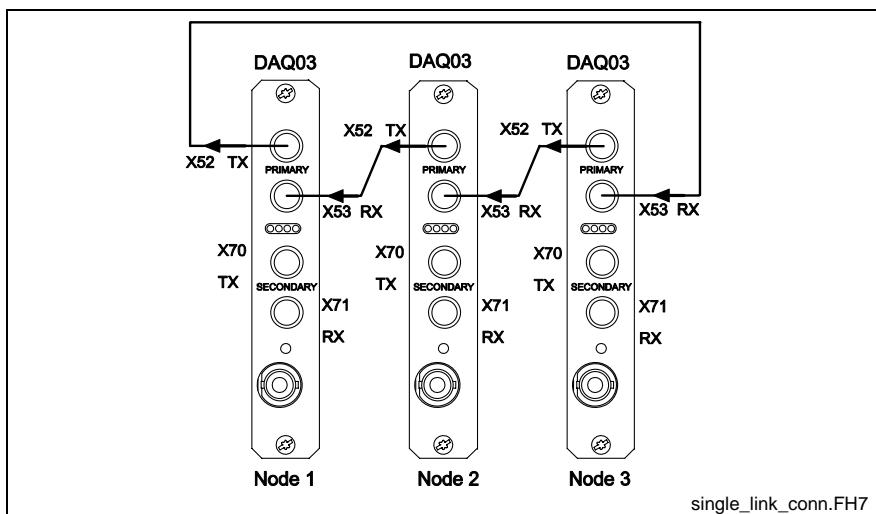


Fig. 7-5: DAQ03 Connection for Single Link Ring

Double Ring

The primary and secondary rings in a double ring are identical except that they transmit signals in opposite directions and the secondary ring transmits only diagnostic signals when the primary ring is active.

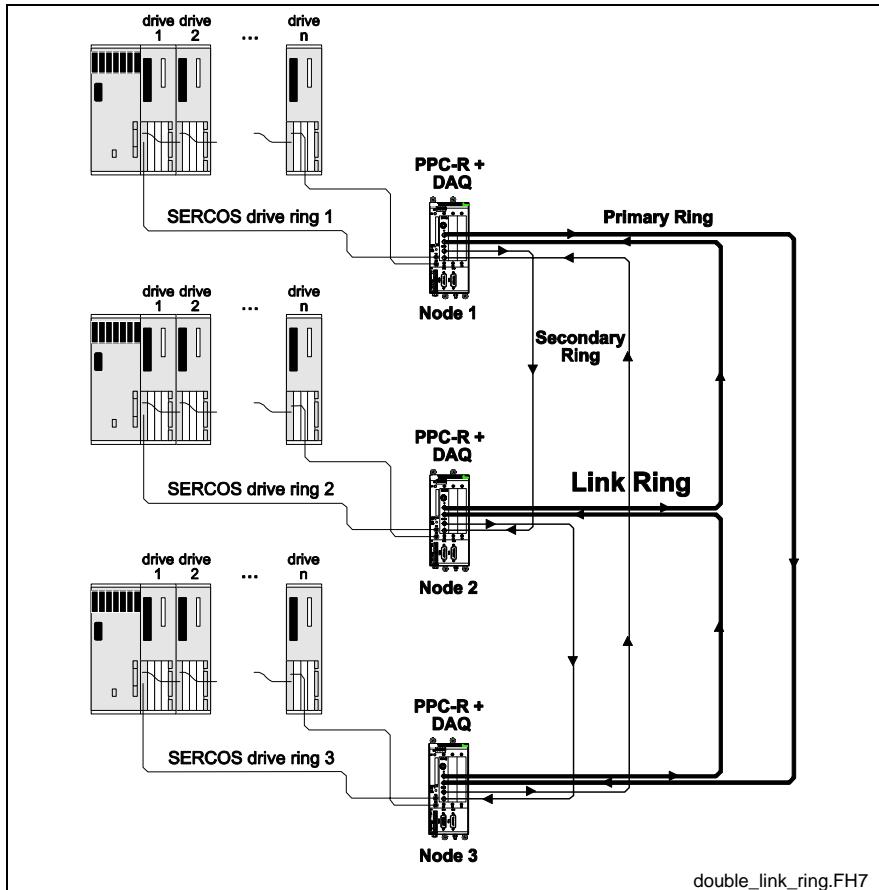


Fig. 7-6: Double Link Ring

The primary and secondary loops are connected in a different order from each other. One transmitting from the Link Ring Master to node 2, the other transmitting from the Link Ring Master to the last node in the series. For example, in Fig. 7-7, the primary Link Ring transmits a signal from the Link Ring Master to node 3 while the secondary ring transmits from the Link Ring Master to node 2.

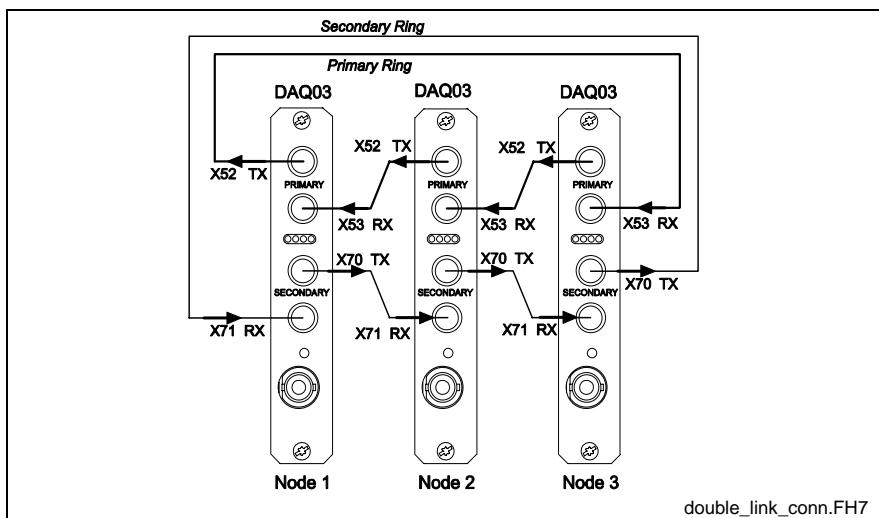


Fig. 7-7: DAQ03 Connection for Double Link Ring

8 VisualMotion Human Machine Interfaces

8.1 Overview

Bosch Rexroth's BTC and BTV Human Machine Interface units are used to interface with the control, providing the operator with a wide variety of functionality. The operator can view and modify parameters, jog axes, and interface with machine operations. Using Screen Manager software, a machine builder can create customized screens that are specific to an application.

8.2 BTC06

The BTC06 is a portable, compact interface that allows a user the flexibility of movement for a better perspective of the function being performed. An RS422/485 combination interface allows connection of the BTC06 to Bosch Rexroth's VisualMotion control (PPC-R).

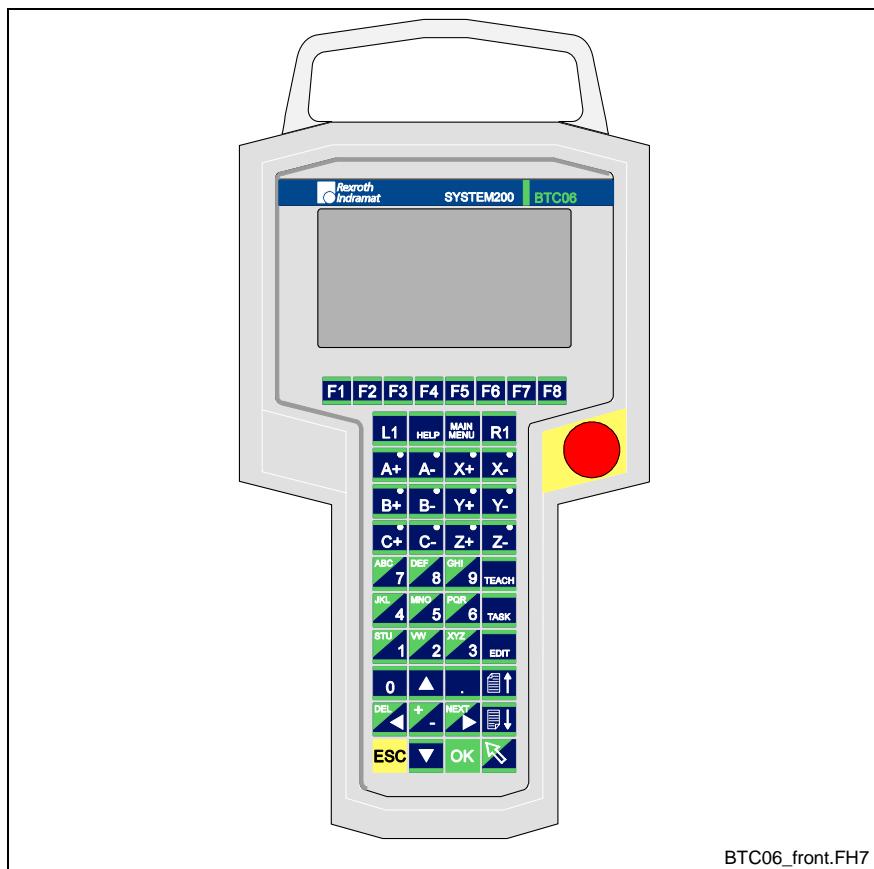


Fig. 8-1: BTC06 Front Face

BTC06 Specifications

Basic BTC06 Unit

Basic BTC06 Unit	
Supply voltage	24 V (20 to 30 V) DC
Power consumption	max. 400 mA
Display	LCD 240 x 128 pixel, b/w, full graphics function LED, backlit visible area 108 x 58 mm (4.25" x 2.25")
Keyboard	Polyester film with 48 keys
Enclosure material	Polycarbonate
Protection	IP 65 (Main connection cable plugged in, RS-232 connector provided with protective cap)
Temperature range	0 to +55°C (<i>Operation</i>) (32 to 131 °F) -20 to +70°C (<i>Storage</i>) (-4 to 158 °F)
Weight	approx. 1.3 Kg (2.9 lbs.)

Table 8-1: Electrical Data

Emergency Stop Switch

Emergency Stop	
Switch elements	Twist release with two floating normally closed contacts, electrically isolated
Rated voltage	24 V DC / 42 V AC
Rated current	2 A DC / 3 A AC
Operating cycles	> 100,000

Table 8-2: Emergency Stop Switch Data

Live-Man Switch

Live-Man switch	
Three position switch	Position 1 – Off Position 2 – Live-Man Position 3 - Panic
Switch elements	Two floating N.O. contacts, electrically isolated
Rated voltage	24 V DC / 42 V AC
Rated current	2 A DC / 3 A AC
Operating cycles	> 200,000 for Live-Man range > 100,000 for Panic position
Control category	4 in accordance with EN954-1

Table 8-3: Live-Man Switch Data

Note: TÜV/BG certified integrated safety circuitry, category 4, according to EN954-1, ensure that the live-man switch will not be activated after a panic event when returning over position 2 to position 1.

Handwheel

The handwheel option has the following characteristics:

- Internal 16 bit absolute counter (in conjunction with Screen Manager software).
- A two-place relative counter from -99 to +99.
- Display reset by pressing the handwheel for an extended period (about two seconds).

Hardware Components

- 1 Mbyte Flash
- 256 Kbytes SRAM
- RS-232 programming interface for downloading firmware and for programming of custom displays
- Communications interface in accordance with Indramat standard, i.e. bus-capable RS485 and RS422

BG Test Certifications

- EN 60204 Part 1: "Safety of Machinery - Electrical Equipment of Industrial Machinery; Part 1: General Requirements"
- EN 775: "Industrial Robots Safety"
- EN 418: "Safety of Machinery - Emergency Shut-Off Equipment, Functional Aspects, Design Guidelines"
- Integrated Safety Circuitry, Category 4, according to EN954-1 for Live-Man Switches

Standard Features

Emergency Shut-Off

The emergency stop button is designed to shut-off the system operation in any mode (stop category 0). For category 1 emergency stop functions, appropriate measures must be taken in addition to the electronic safety equipment (DIN EN 60204-1). The emergency stop button is a dual-circuit switch.

Live-Man Switch

The live-man switch is activated with the holding hand. Enclosure and shape of the live-man switch have been ergonomically optimized for right-hand and left-hand operation.

The live-man switch directly affects the post-connected system (drive amplifier, SPS/PLC, robot). It is designed to allow hazardous machine movement only upon intentional activation of the operator, when the operator has to work within the hazardous zone of the machine.

The BTC06 interface cable includes the power supply line for the device, the connection cable for the emergency stop button, and the live-man switch as well as the data cables for data transfers between the BTC06 and the controller.

When the user disconnects the connector, the emergency stop circuit and the live-man circuit will be interrupted.

Optional Features

The BTC06 may be equipped with an optional 4-bit override switch and a 16-bit handwheel.

Feedrate Override

Used with Screen Manager version of VT-100 software or custom Screen manager screens

Handwheel

Used with custom Screen Manager screens

Safety Concept

If the BTC06 is equipped with the appropriate optional features (emergency stop and live-man switch), it can be used for operation with industrial drive and robot controllers. It includes a dual-circuit 3-position, live-man switch. Both circuits are electrically isolated and operate redundantly. It is important that the subsequent control interprets the switch in accordance with the machine-specific or system-specific standards and rules.

If appropriate interlocks with the safety contacts of the drive or robot control are provided, hazardous movements in certain modes (e.g., manual or test mode) can only be activated if the live-man switch is held in the center (= enabled) position. If this switch is not depressed, or if it is pressed all the way down to the panic position, any movement will be stopped immediately. The return from the panic position is activated electrically, whereby the switch returns to the non-activated position. To start a new movement, enter a command and re-activate the live-man switch.

The live-man switch of the BTC06 provides integrated safety circuitry. A post-connected control must be used to ensure compliance with machine-specific or system-specific standards and rules. It must be linked to the control in a way that meets the safety requirements for the power circuits in accordance with EN775, EN60204, EN954-1, EN1088, VDI2853, and VDI2854.

Enclosure Dimensions

Outer Dimensions

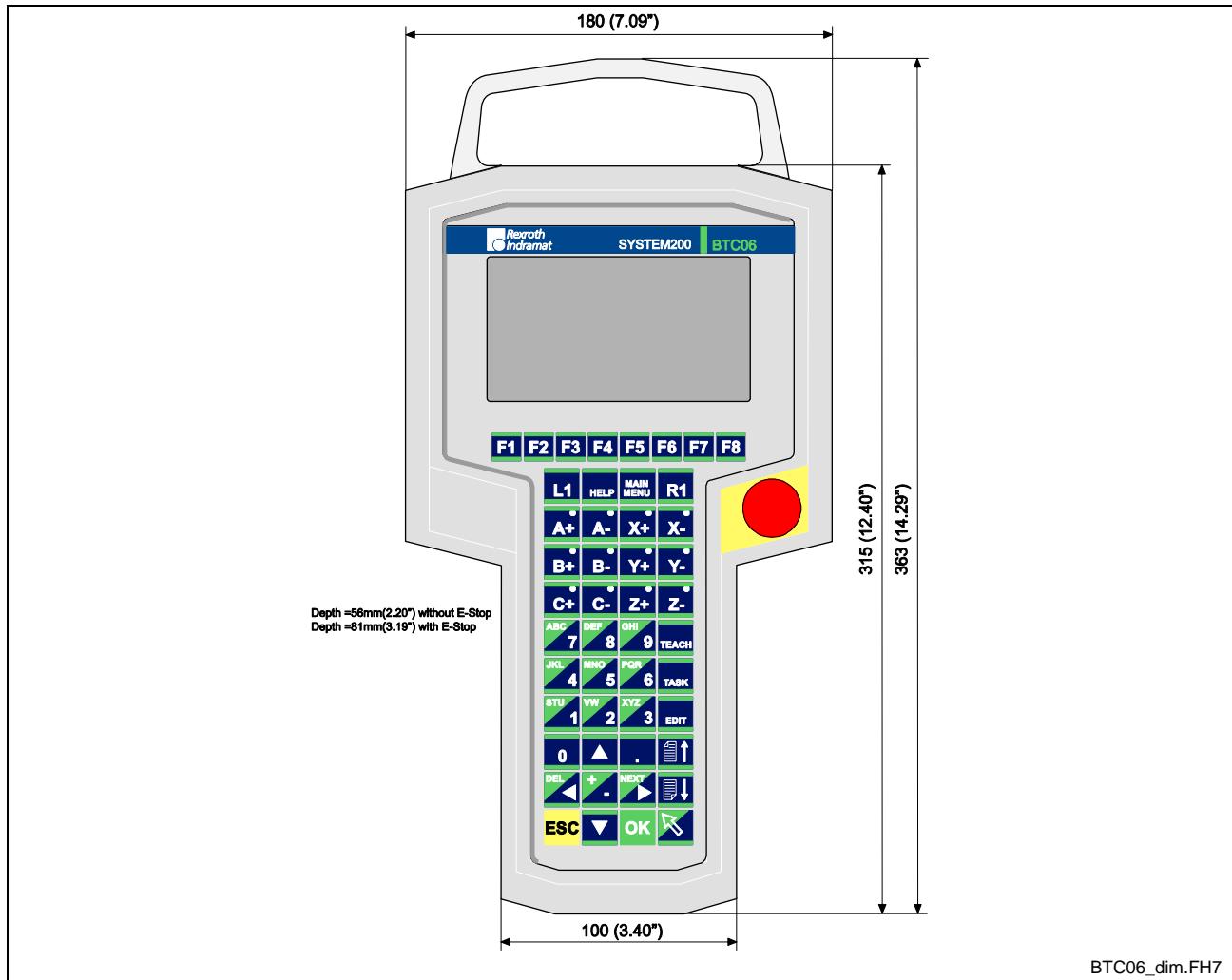


Fig. 8-2: BTC06 Enclosure Dimensions

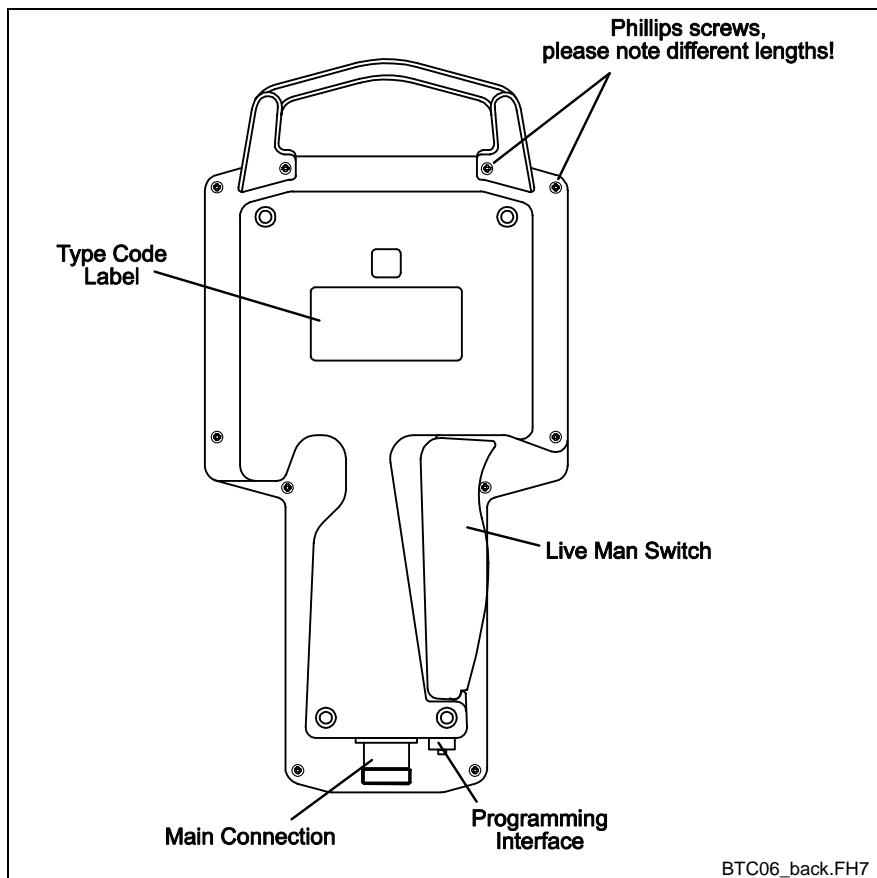
Rear View

Fig. 8-3: Rear View –BTC06

BTC06 Accessories

SUP-M01-BTC06 Wall-Mounting Bracket

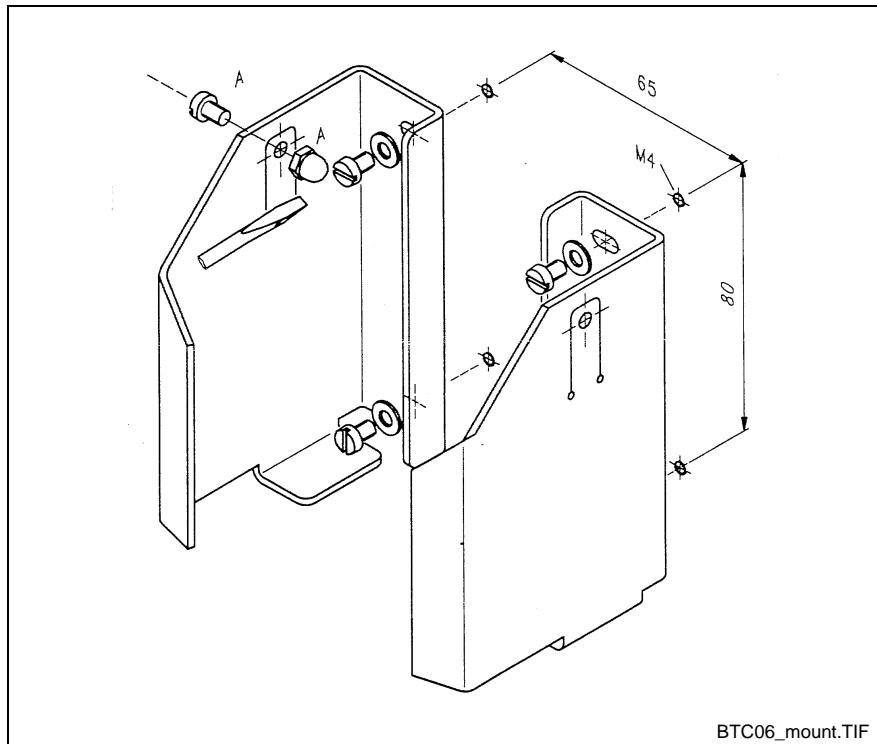


Fig. 8-4: Wall Mounting Bracket

The mounting bracket is provided to attach the BTC06 to a wall or to a machine part. When fastened at the proper height, the display can be read and the device can be operated without removing it from the bracket. The user can mount the two-piece wall bracket so that the live-man switch is enabled when the device is inserted into the bracket. However, this mounting method should be used only if the device is mounted outside of a hazardous zone. In this case, the system must have provisions in accordance with DIN EN 775 to ensure that no persons are present within the room that is equipped with protective safety features.

BTC06 Connections

RS422/485 Main Connection

This 17 pin circular connection is used for RS422/485 communications to the BTC06. Table 8-4 contains a pin-out of the necessary connections to the BTC06 for communications as well as machine interfacing.

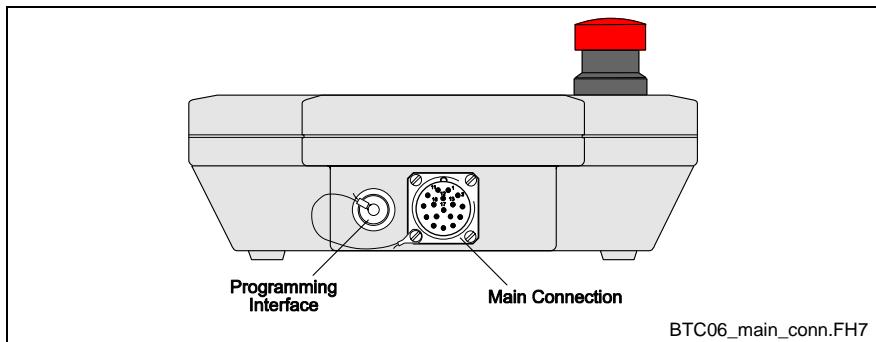


Fig. 8-5: BTC06 Main Connection

Pin	Assignment	
1	0 V	
2	+ 24 V	
3	Live-man switch 1 in	
4	Live-man switch2 in	
5	Live-man switch1 out	
6	Live-man switch2 out	
7	E-STOP 1 in	
8	E-STOP 2 in	
9	E-STOP 1 out	
10	RS422 TxD-	RS485 -
11	RS422 TxD+	RS485 +
12	RS422 RxD-	
13	RS422 RxD+	
14	Signal Ground	
15		
16	E-STOP 2 out	
17	<i>Not used</i>	

Table 8-4: Pin-out of the 17-Pin Connector

RS232 Firmware Download and Projecting Interface

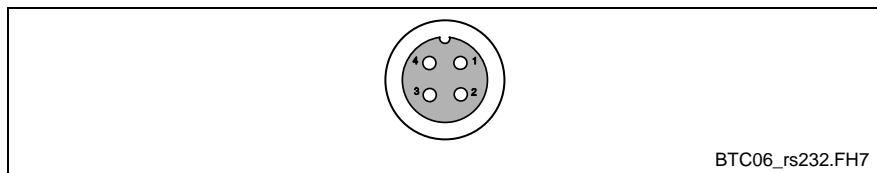


Fig. 8-6: RS232 Interface

Pin	Assignment
1	<i>not used</i>
2	TxD
3	RxD
4	Signal Ground

Table 8-5: Pin-out of the RS232 Interface

IKB0010 PC Connection Cable

The IKB0010 is a RS232 interface connection cable used to download firmware to the BTC06 and for transferring Screen Manager programs. Refer to **Accessories** for ordering information.

Note: The firmware for this device is supplied on diskette. Therefore, an OEM needs this cable to load the firmware.

Enclosure Connection from BTC to Control

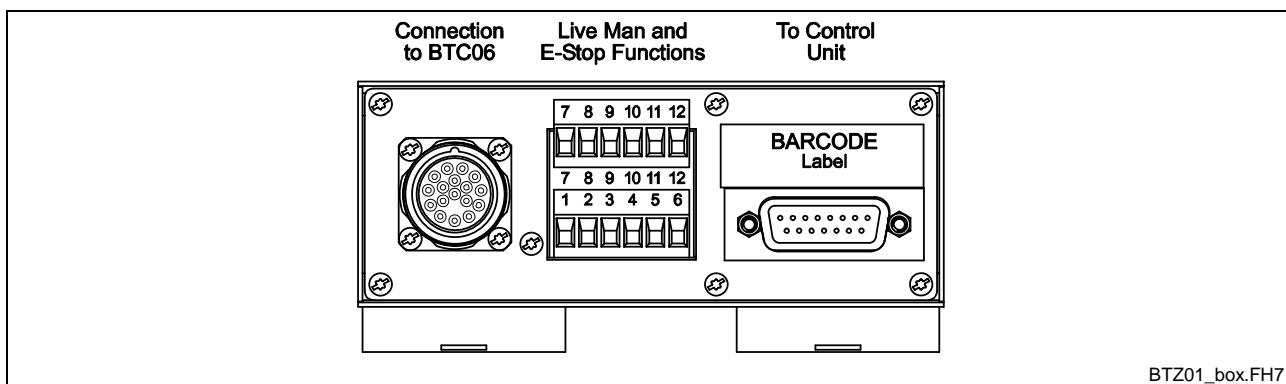
The following components are used for connecting the BTC06 to a VisualMotion control (EMC compliant).

- IKS0188 connection cable
- INS0627 bulkhead connector
- IKB0015 serial cable is used for connecting to a PPC-R

Refer to **Accessories** for ordering information.

The connections for the live-man switch and the emergency stop function inside the control cabinet are wired via the two 6 pin Phoenix connectors on the BTZ01.1 junction box.

BTZ01.1 Junction Box



BTZ01_box.FH7

Fig. 8-7: BTZ01.1 Junction Box

The junction box ensures that the connections for the live-man switch and the emergency stop function can be accessed externally. The IKS0188 connection cable establishes the connection to the INS0627 bulkhead connector. Inside the box, the individual functional units are distributed/wired to the respective connectors on the front panel.

The live-man circuits and the emergency stop function as well as the voltage supply are connected at a 12-pin Phoenix terminal. The connection to the BTC06 is established through a 17-pin female circular connector.

From the BTZ to the PPC-R, the IKB0015 serial communication cable is used. RS485 and RS422 ports are connected to the control in accordance with Indramat standards.

Note: In order to establish communications between the BTC06 and the control, the serial port on the control, to which the BTZ01.1 is connected, must be set to the same settings as that of the BTC06.

BTC06 to PPC-R Connections

Using a BTZ01.1 (EMC Compliant)

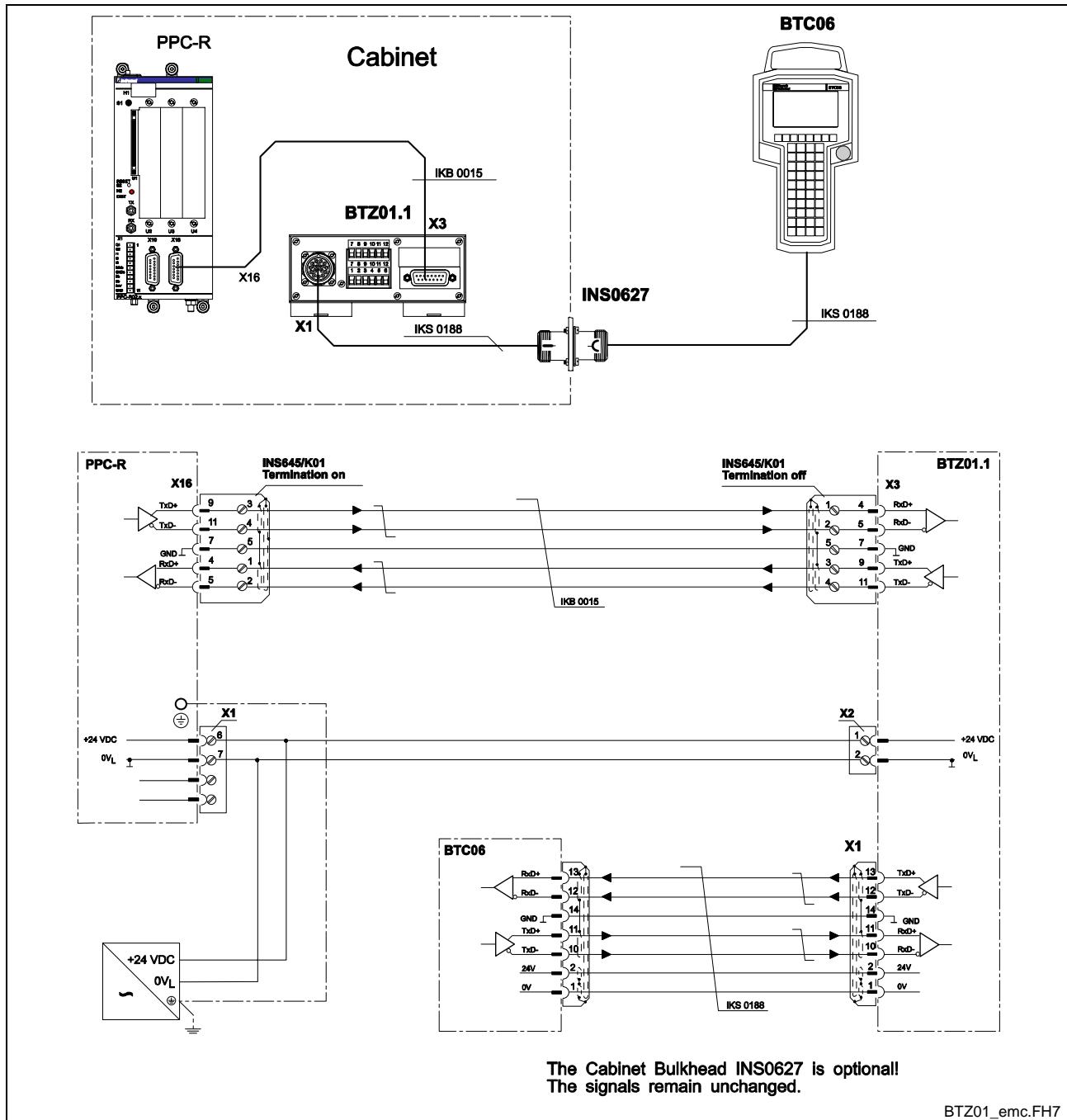
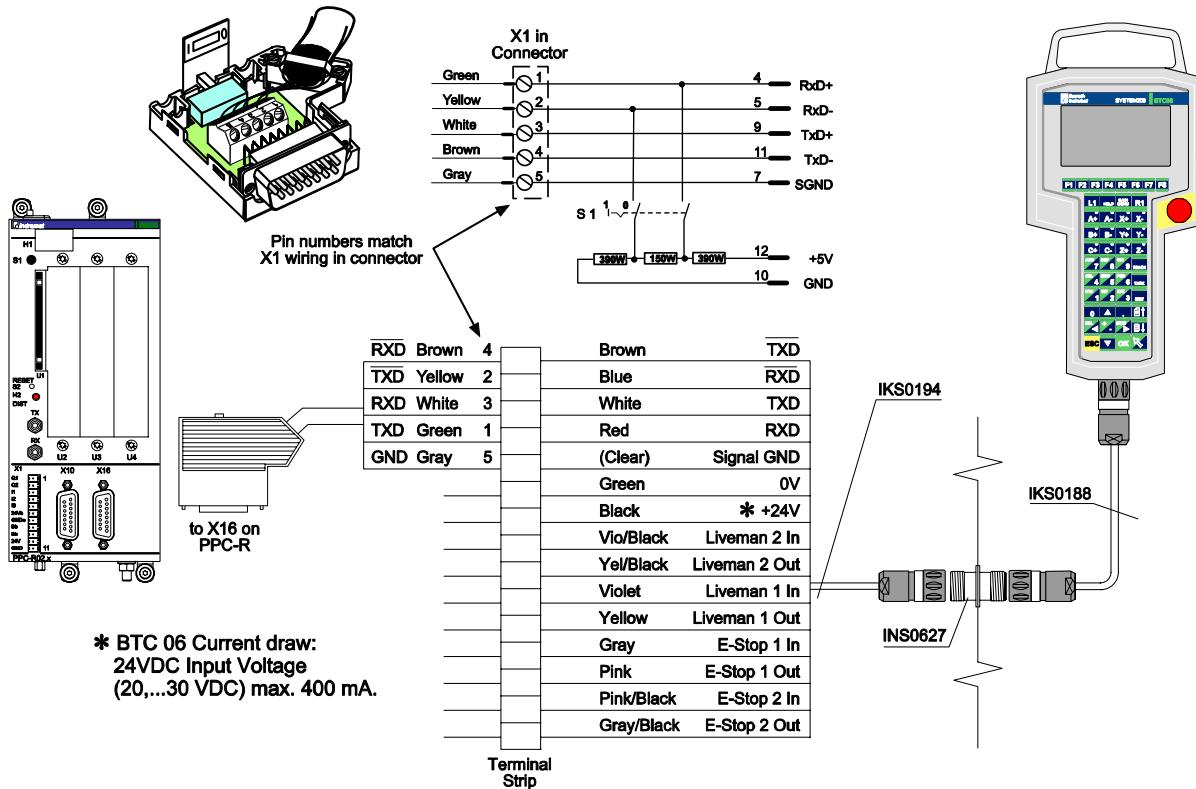


Fig. 8-8: BTC06 to PPC-R through a BTZ01.1

Optional Terminal Strip Connection

Remove housing at one end of cable assembly IKB0015.
 If the color code matches X1 shown below, you have removed the correct housing.
 If not, reassemble housing and remove opposite end.
 Remove conductors from X1 and wire to terminal strip according to wiring scheme shown below.



Notes:

- * MACHINE E-STOP/LIVEMAN CHAIN
- 1) Due to the various I/O schemes available for Visual Motion Control and the ability to map I/O points, refer to the I/O register setup for the correct input points.
- 2) The BTC E-Stop Contacts are rated for 24VDC/2A max. or 42VAC/3A max.
- 3) The BTC Liveman Contacts are rated for 24VDC/2A max. or 42VAC/3A max.
- 4) Due to the various machine configurations available, Hard wiring of E-Stop and Liveman signals other than to Control inputs are considerations to be made by the machine builder.

BTZ01_term_strip.FH7

Fig. 8-9: BTC06 to PPC-R Terminal Strip Connection

8.3 BTV Human Machine Interface

BTV04/05/06 Overview

The BTV04/05/06 control panels provide a graphical user interface to the machine. The BTV control panels provide ease of use and convenience to the user. This is achieved by a clearly structured keypad. The number of keys has been reduced to the most necessary functions.

In order to be able to communicate with other controllers or a PC, the BTV units are equipped with an RS485 and an RS232 serial interface.

The user can program seven keys on the keypad. Insert strips can be used to clearly label key functions as required. Its combined RS232/485 interface makes the BTV units particularly suitable for the connection to any Bosch Rexroth controller.

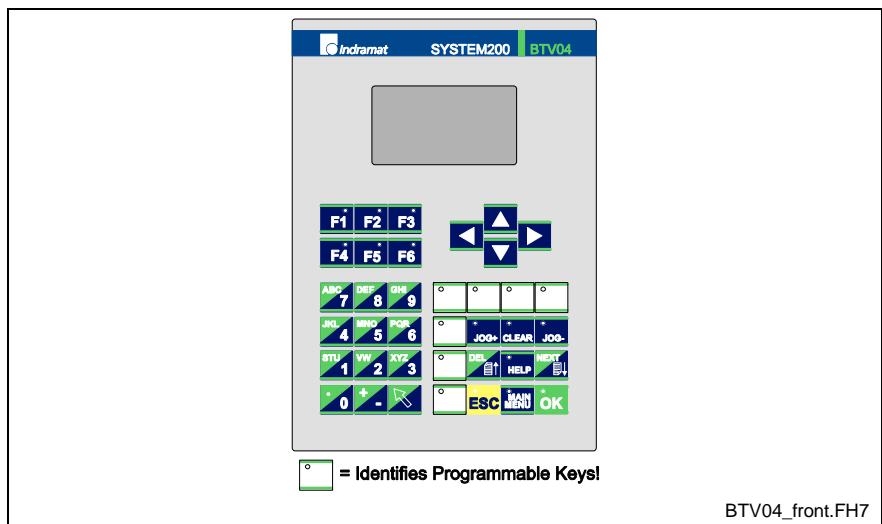


Fig. 8-10: BTV04 Front View

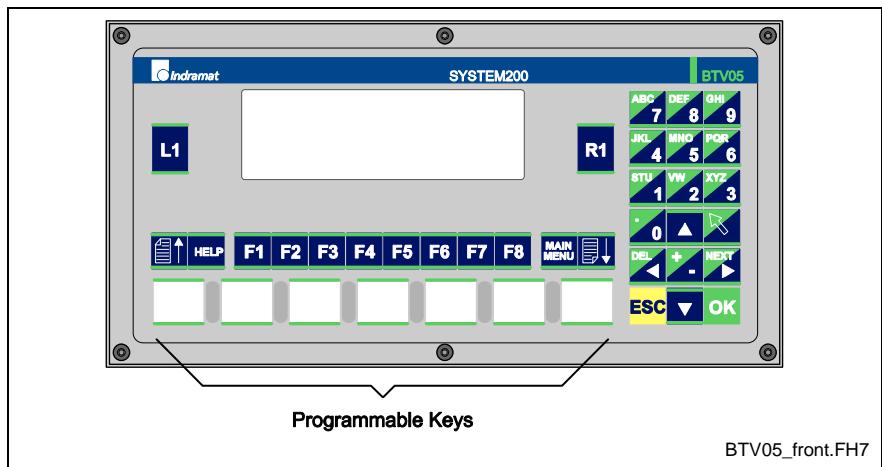


Fig. 8-11: BTV05 Front View

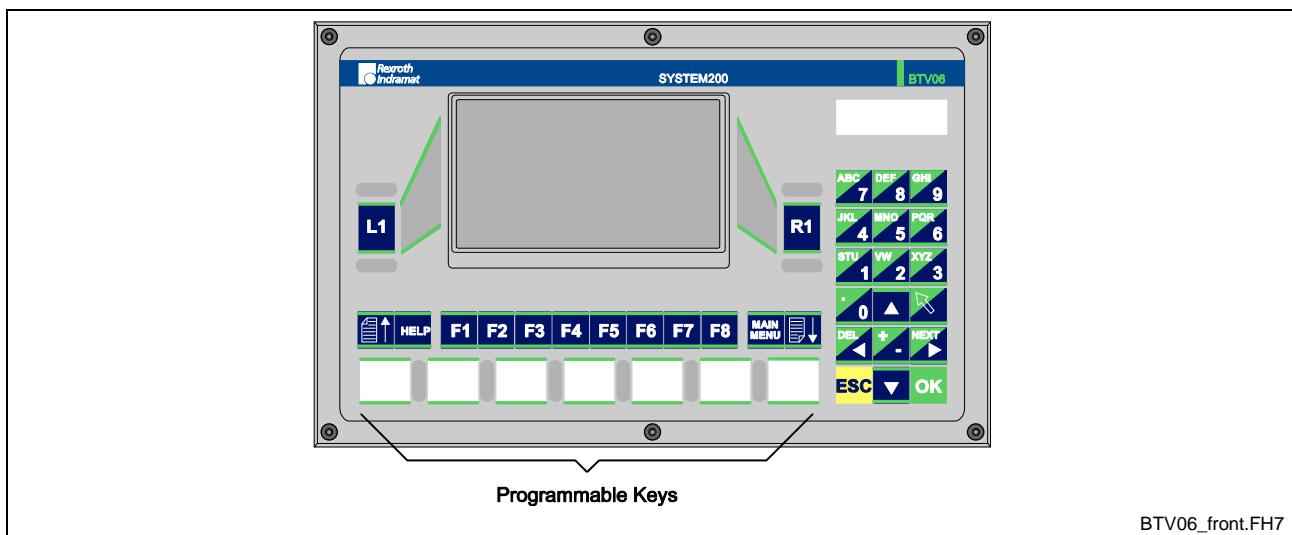


Fig. 8-12: BTV06 Front View

BTV06_front.FH7

BTV Features

Enclosure, Control and Display Element

- Front panel interface with keypad
 - BTV04 has 38 keys
 - BTV05, 06 have 39 keys
- Graphical LC display with LED back lighting
 - BTV04: 128x64 pixel
 - BTV05: 256x64 pixel
 - BTV06: 240x128
- Protection Class
 - BTV04: IP65 aluminum front panel
 - BTV05, 06: impact resistant ergonomic IP65 enclosure
- Plug-in connecting cables
- 7 programmable machine control keys with LEDs, insert strips for customized labeling

Hardware Features

- 1 MB flash memory
- 512 kB RAM
- Standard RS232 and RS422/RS485 Interface
 - BTV04 uses RS232 and RS485
 - BTV05, 06 use RS232 and RS422/RS485
- 10x24V inputs
 - V_{IN} = typical 18 – 30 V potential free
 - I_{IN} = minimum 7 mA
- 11x24V outputs for external wiring
 - V_{OUT} = typical 18 – 30 V potential free
 - I_{OUT} = typical 200 mA

Communications Interfaces

The communication interfaces comply with the Bosch Rexroth standard (i.e., RS485/422 and RS232).

The BTV04 unit features 2 serial interfaces (**not isolated!**):

- COM 1: RS485 interface
- COM 2: RS232 interface

BTM Project Planning Manual

Bosch Rexroth's BTM units are outlined in more detail (dimensions and specifications) in the following documentation.

- System200 BTM04.2
DOK-SUPPL*-BTM04.2****-FK01-EN-P
- System200 BTM05.2
DOK-SUPPL*-BTM05.2****-FK02-EN-P
- System200 BTM06.1
DOK-SUPPL*-BTM06.1****-PR01-EN-P

Typical Applications

RS485 Communication to PPC-R

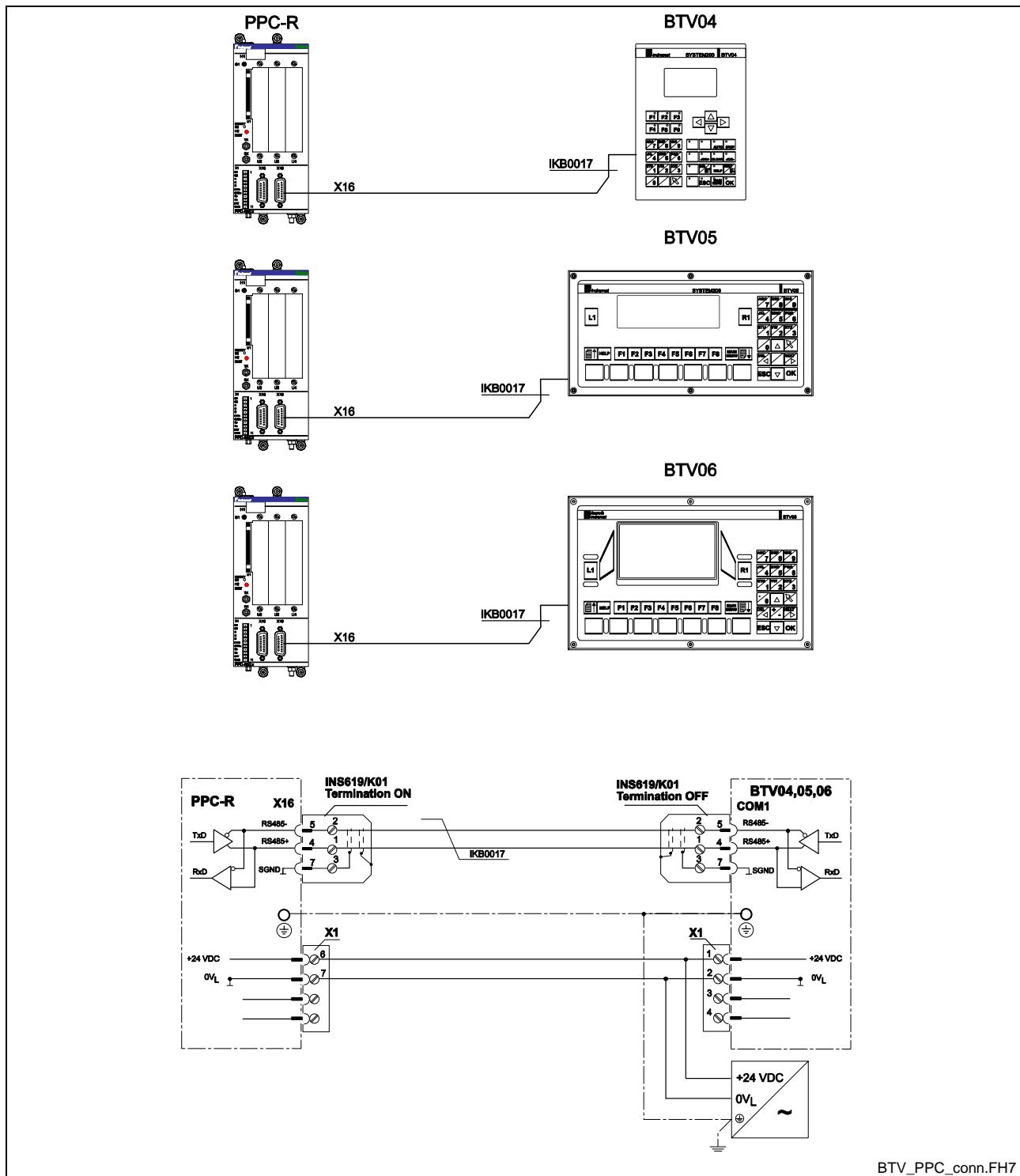


Fig. 8-13: Connecting to a PPC-R Control

9 Fiber Optic Cable(LWL)

9.1 Data Transmission Ring Structure

The communications between the control (PPC) and the digital drives is accomplished using the standard SERCOS interface (IEC 1491) via fiber optic cables (LWL). A SERCOS fiber optic ring structure is illustrated in Fig. 9-1.

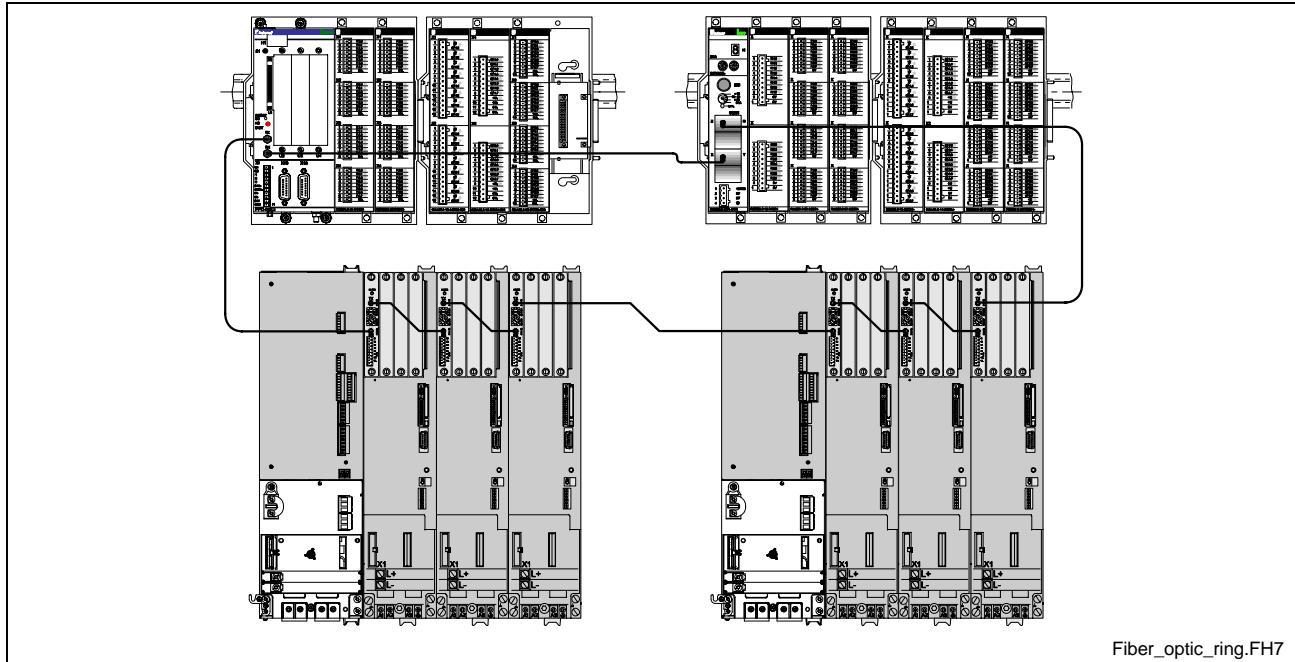


Fig. 9-1: Fiber Optic Ring Structure

The SERCOS ring starts and ends at the control. The optical output (TX) of the control is connected with the optical input (RX) of the first drive. Its output is then connected to the input of the next drive until all drives are connected. The output of the final drive is connected to the input (RX) of the control, thus completing the SERCOS ring.

Fiber Optic Transmission Path Installation

A fiber optic transmission path starts at a transmitter output (TX) and ends at a receiver input (RX).

Fiber Optic Cable Connection Points	The transmission path is made up of fiber optic cables and fiber optic cable bulkhead connectors. Bulkhead connectors are used as coupling units between two fiber optic cables installed through a cabinet wall.
FSMA Connector Standard	The connectors used on Bosch Rexroth fiber optic cable correspond to the FSMA standards (IEC 874-2).

Fiber Optic Cable Types

The fiber used in Bosch Rexroth's fiber optic cable assembling is constructed of either plastic or glass. Plastic fiber optic cables can be used for transmission lengths up to 50 m and glass fiber optic cables for lengths up to 500 m.

Fiber optic cable assemblies are available in three different types:

IKO 0982 Plastic Fiber Optic Cable (2.2 mm)

The IKO 0982 fiber optic cable assembly has an outer diameter of 2.2 mm and is recommended for internal control cabinet connections.

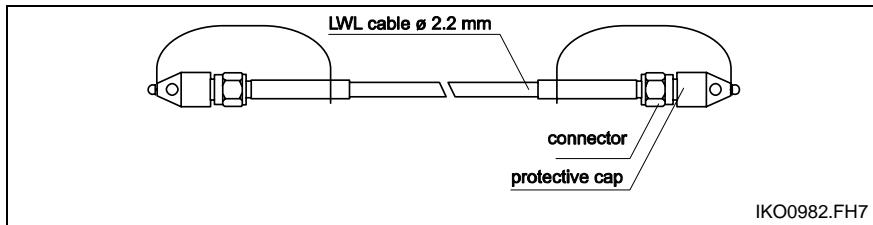


Fig. 9-2: IKO 0982 Fiber Optic Cable Assembly

IKO 0985 Plastic Fiber Optic Cable (6.0 mm)

The IKO 0985 fiber optic cable assembly has an outer diameter of 6.0 mm and is recommended for both internal and external control cabinet connections. This fiber optic cable assembly contains the smaller 2.2 mm fiber optic cable within a red reinforced outer jacketing.

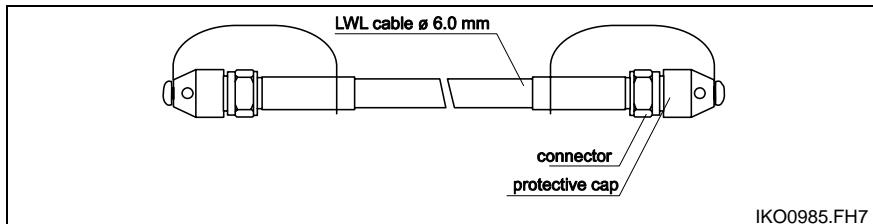


Fig. 9-3: IKO 0985 Fiber Optic Cable Assembly

IKO Glass Fiber Optic Cable

Glass fiber optic cable assemblies are recommended for both internal and external control cabinet connections. Glass fiber optic cable assemblies are available in two types:

- **IKO 0001**

glass fiber optic cable available in 50, 75 and 100 m lengths with an outer diameter of 3 mm.

- **06-0986**

glass fiber optic cable assembled only in the United States in predetermined lengths with an outer diameter of 6 mm. Contact customer service for available lengths.

Fiber Optic Cable Accessories

The following accessories are available for fiber optic cables:

- fiber optic bulkhead connector
- FSMA fiber optic connector wrench

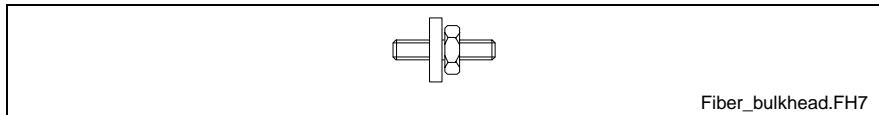


Fig. 9-4: Fiber Optic Bulkhead Connector

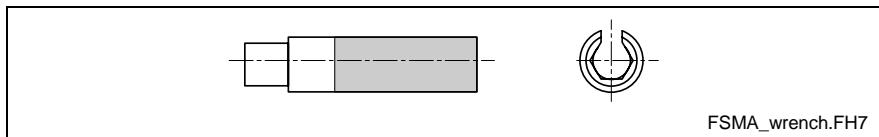


Fig. 9-5: FSMA Fiber Optic Connector Wrench

Note: The fiber optic connector wrench can be helpful when installing fiber optic cable onto the ECODRIVE03 digital controllers.

Description	Material Number
Fiber Optic Bulkhead Connector	252524
Fiber Optic Connector Wrench	260285

Table 9-1: Fiber Optic Cable Accessories

9.2 Project Planning Notes

Before planning a project, make certain that you fully understand the requirements and recommendation of Bosch Rexroth's fiber optic cable assemblies. Note the following details:

Transmission Path Length	The maximum length of fiber optic cables is limited by the amount of attenuation (light loss) in the transmission path between fiber optic transmitters.
Combining Fiber Optic Cable Types	Bosch Rexroth does not recommended the combining of plastic and glass fiber optic cable assemblies through a bulkhead connector.
Mechanical Limits	Observe all mechanical limit values (e.g., bend radii, pulling tensions, cross tension, bending cycles) when installing fiber optic cable assemblies.
Temperature Limits	Never exceed the temperature limit values for fiber optic cable assemblies.

Maximum Transmission Length

Fiber Type	Without Bulkhead	1 Bulkhead Connection	2 Bulkhead Connections
Plastic	50 m	40 m	30 m
Glass	500 m	400 m	300 m

Table 9-2: Maximum Transmission Length

Technical Data

Description	IKO 0982	IKO 0985	IKO 0001	06-0986
Outer jacketing	Polyamide (PA)	Polyurethane (PUR)	Polyurethane (PUR)	Polyurethane (PUR)
Outer diameter	2.2 mm ± 0.07 mm	6.0 mm ± 0.2 mm	3.0 mm ± 0.07 mm	6.0 mm ± 0.2 mm
Bend radius (min.)	50 mm	80 mm	16 mm	47 mm
Bend radius in cable track installations (min.)	Not recommended	100 mm	Not recommended	Not recommended
Pulling tension resistance (one time)	150 N	150 N	330 N	330 N
Pulling tension resistance (continuous)	100 N	100 N	245 N	245 N
Cross tension resistance (crush)	450 N/cm	450 N/cm	1000 N/cm	1000 N/cm
Bending cycle endurance	>8,000 Cycles ± 90°	>100,000 Cycles ± 90°	>10,000 Cycles ± 90°	>10,000 Cycles ± 90°
Temperature (operating/storage)	-40 °C .. +85 °C	-20 °C .. +80 °C	-40 °C .. +85 °C	-40 °C .. +85 °C
Fiber core diameter	1000 µm (Plastic)	1000 µm (Plastic)	200 µm (Glass)	400 µm (Glass)
Specific optic attenuation	< 250 dB/km	< 250 dB/km	< 8 dB/km	< 8 dB/km

Table 9-3: Technical Data for Fiber Optic Cables

General Safety Guidelines



Eye injury due to high-energy light!

⇒ Do not look into the light (transmitter output or fiber optic cable end).



Damage to fiber optic components due to handling and mounting!

⇒ Do not over tighten fiber optic cable connectors.

**Damage to fiber optic cable due to handling and mounting!**

⇒ Mechanical and thermal limit values must be maintained.

Handling

Connecting the Fiber Optic Cables

Note the following transmitter locations when connecting fiber optic cable in a SERCOS ring.

Transmitter End Connections Fiber optic cable assemblies are connected to the transmitting end as follows:

- TX** (PPC-R)
- X10** (DSS in DIAX04)
- X20** (DKC*2.3)
- X2** (RMK02.2-LWL-SER)

Receiver End Connections Fiber optic cable assemblies are connected to the receiver end as follows:

- RX** (PPC-R)
- X11** (DSS in DIAX04)
- X21** (DKC*2.3)
- X1** (RMK02.2-LWL-SER)

Storage

When storage fiber optic cable assemblies, please note that...

- the protective caps must be in place
- the mechanical limits values are not exceeded
- the temperature limit values are not exceeded

Routing and Mounting

When routing and mounting fiber optic cable assemblies, make certain that all mechanical limits are not exceeded.

Bend Radius Do not exceed the minimum bending radius when routing around corners or cable tracks.

Cross Tension Do not exceed the maximum cross tension (e.g., when routing around corners). Do not expose fiber optic cables to excessive weight stress from larger power cables. Avoid routing over sharp edges or pointy uneven surfaces. Any cuts or punctures to the cable's outer jacketing can cause interference.

Cable Twist Remove all the twist out of the fiber optic cables before routing them.

9.3 System Setup

Preparations

Make certain that all fiber optic cables are connected between transmitter output (TX) and receivers (RX) and that the SERCOS fiber optic ring terminates back at the control.

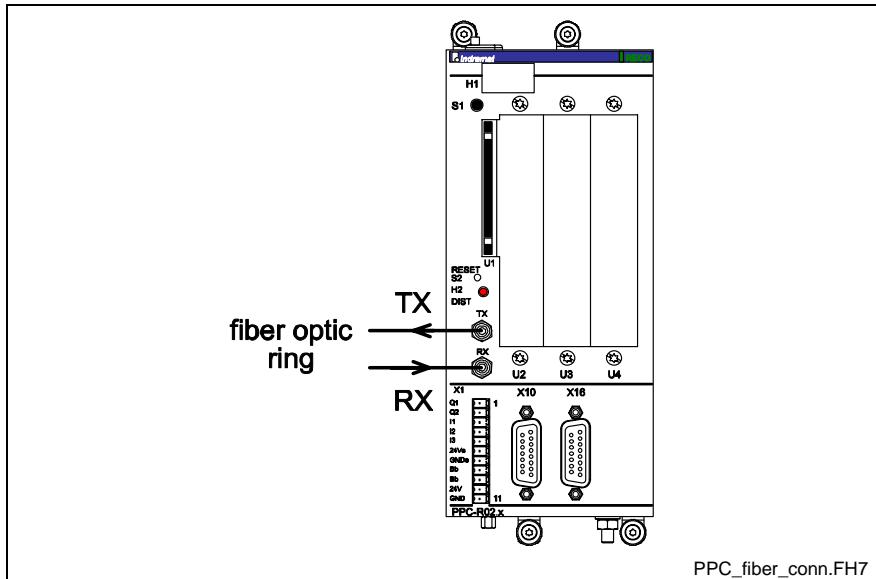


Fig. 9-6: SERCOS Connections for PPC-R

SERCOS Drive Address Settings

In order to achieve proper drive addressing, set the S2 (low) and S3 (high) rotary selector switches on the DSS02.1M and DKC*2.3 firmware module to a unique number for each drive contained in the SERCOS ring. The allowable address range in a VisualMotion system is between 01..40. Refer to Fig. 9-7 and Fig. 9-8.

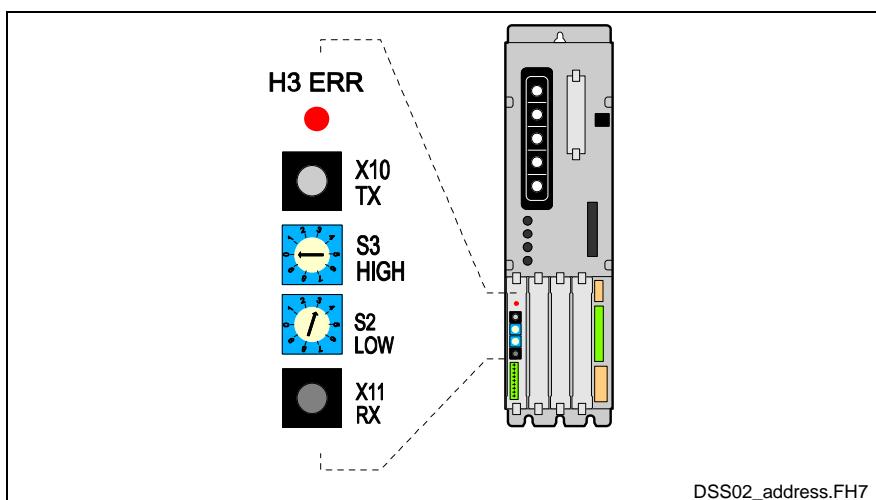


Fig. 9-7: SERCOS Connections for DSS02.1M (DIAX04)

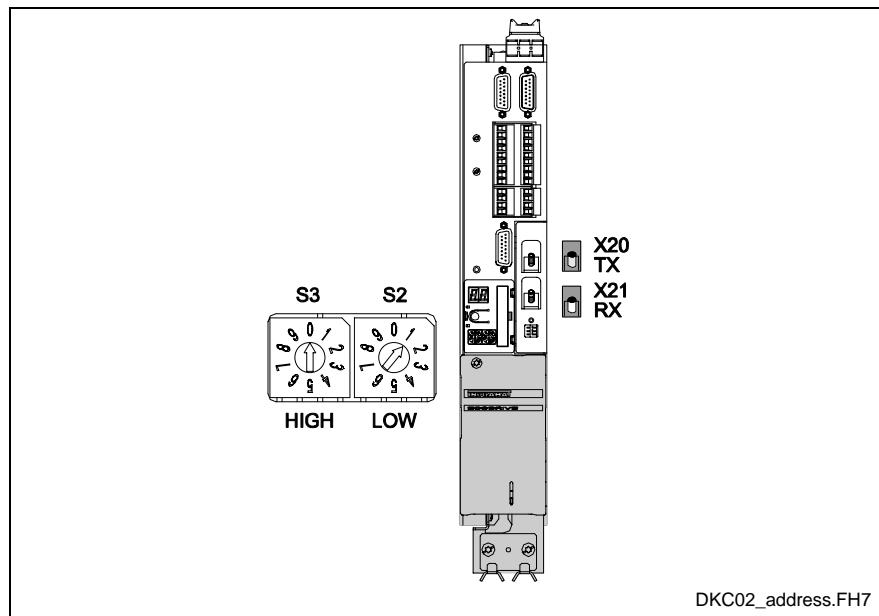


Fig. 9-8: SERCOS Connections for DKC*2.3

Any RMK02.2-LWL-SER (SERCOS RECO02 I/O stations) must also be addressed in the SERCOS ring to a unique number not used by any other device.

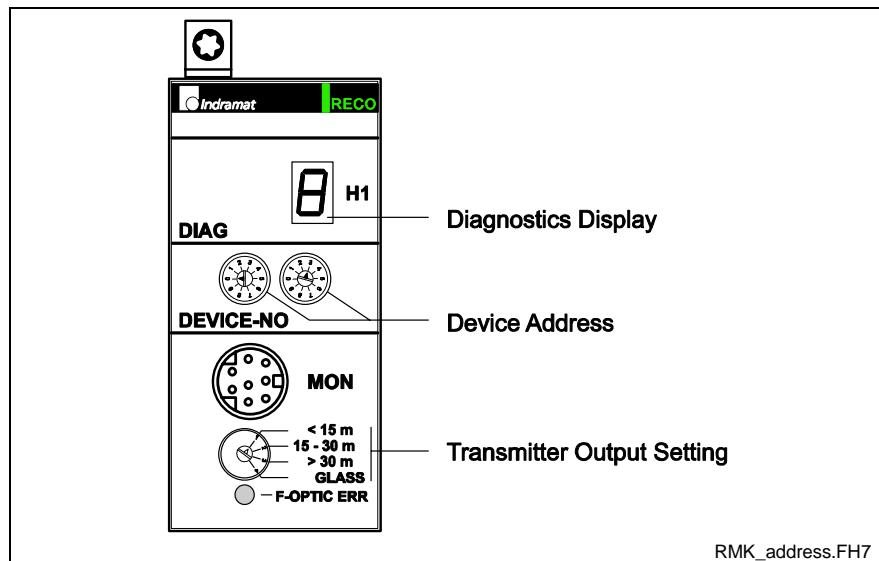


Fig. 9-9: SERCOS Connections for the RMK-LWL-SER

Changing the SERCOS Transmission Baudrate

Bosch Rexroth sets a SERCOS transmission baudrate of 2 Mbits/s at time of production for both the control and drives. This is to ensure that all devices will initially communicate at the same rate.

Note: When changing the SERCOS transmission baudrate, make sure that all the SERCOS devices on the same fiber optic ring have the same 2 or 4 Mbits/s baudrate.

Why Increase the SERCOS Transmission Baudrate?

The SERCOS transmission baudrate for a system can be increased for applications using more than 8 axis. Some benefits for an increased SERCOS transmission baudrate are:

1. A higher number of cyclic SERCOS drive telegrams (more data) can be processed by the control at the same SERCOS cycle time.
2. The same number of cyclic SERCOS drive telegrams can be processed by the control at a reduced SERCOS cycle time.

PPC-R The SERCOS transmission baudrate for GPP is set in control parameter C-0-0010 (System Options) bit 5. Setting bit 5 to 1 increases the baudrate from 2 to 4 Mbits/s. The control must be in parameter mode to modify control parameter C-0-0010.

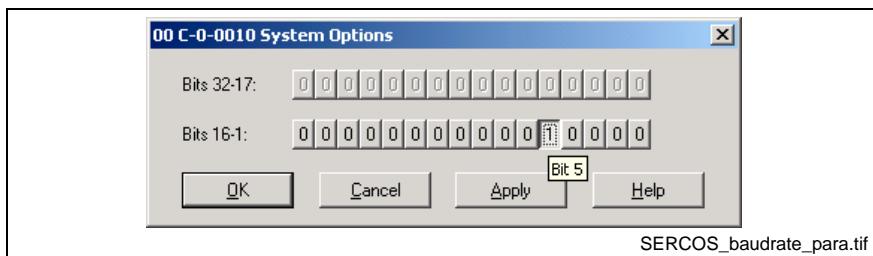


Fig. 9-10: SERCOS Transmission Baudrate parameter

DIAx04 (DSS02.1M)

The SERCOS transmission baudrate for each DIAx04 drive is set on DIP switch S4 on the DSS02.1M. For a SERCOS transmission baudrate of 2 Mbits/s, set S4 to the OFF position.

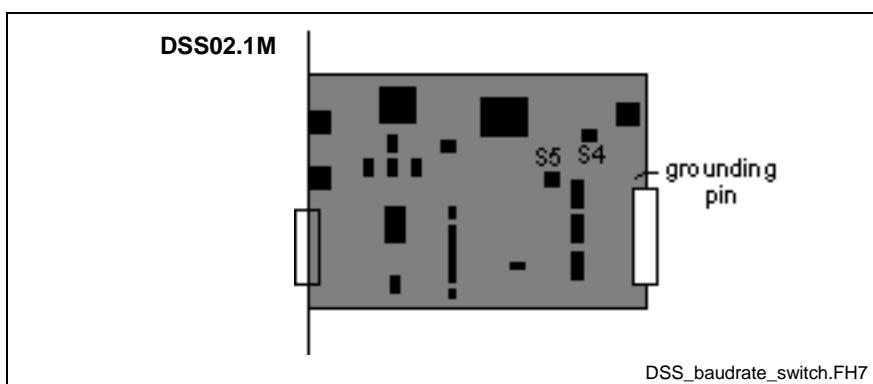


Fig. 9-11: DIP Switches on DSS02.1M

- ECODRIVE03 (DKC02.3)** The SERCOS transmission baudrate for each DKC*2.3 drive is set on DIP switch S20/1 on the SERCOS interface card. For a SERCOS transmission baudrate of 2 Mbit/s, set S20/1 to the OFF position.

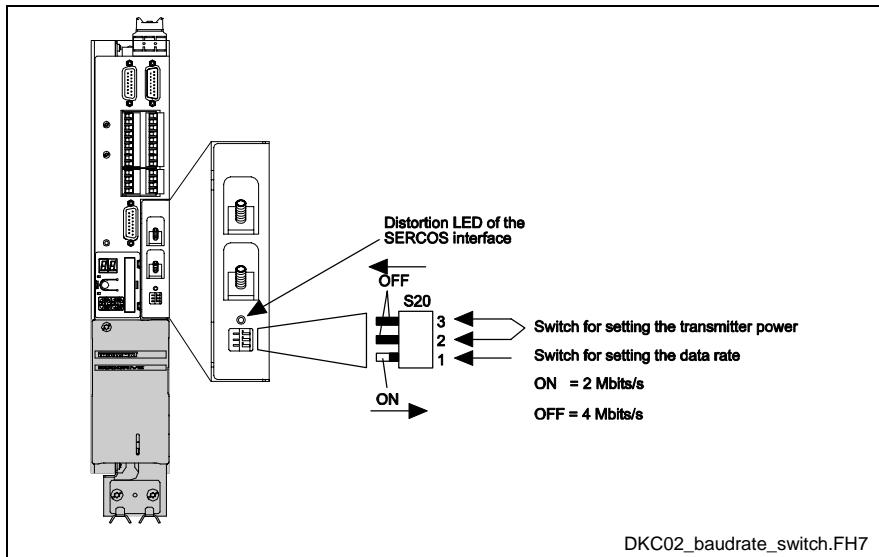


Fig. 9-12: DIP Switches on DKC*2.3 SERCOS Interface

Note: The DKC22.3 using SGP20 firmware automatically detects the proper baudrate.

Setting the Optic Transmitter Output Power

PPC-R The transmitter output power (TX) on the PPC-R is set with control parameter C-0-0020, Transmitter Fiber Optic Length. When using plastic fiber optic cable assemblies, set this parameter to match the length of the cable that is used between the PPC-R and the first drive's receiver (RX). When using glass fiber optic cable assemblies, set this parameter to 50m.

DIAX04 (DSS02.1M) The transmitter output power (TX) on the DSS02.1M is set via DIP switches S5A and S5B. Refer to Fig. 9-11.

ECODRIVE03 (DKC02.3) The transmitter output power (TX) on the DKC02.3 is set via DIP switches S20/2 and S20/3. Refer to Fig. 9-8.

Cable Length	0 .. 15 m	15 m .. 30 m	30 m .. 50 m
DIAX04	S5A = OFF S5B = OFF	S5A = ON S5B = OFF	S5A = ON S5B = ON
DKC02.3	S20/2 = OFF S20/3 = OFF	S20/2 = ON S20/3 = OFF	S20/2 = ON S20/3 = ON

Table 9-4: Setting the Transmitter Output Power for Plastic Fiber Optic Cables

Cable Length	0 .. 500 m
DIAX04	S5A = ON S5B = ON
DKC02.3	S20/2 = ON S20/3 = ON

Table 9-5: Setting the Transmitter Output Power for Glass Fiber Optic Cables

10 Hardware and Firmware Configurations

10.1 PPC-R Hardware and Firmware

The PPC-R control is available as a single slot or double slot unit. Firmware must be ordered separately for each hardware configuration using the appropriate FWA typecode. The FWA typecode includes additional firmware that might be required for interfaces that are part of the configuration, such as fieldbus or EtherNet. Firmware typecodes are listed for all FWA typecodes in the following sections.

Note: A SUP-E01-PPC-R battery kit (Material No.: 288248) is available and ordered separately for the PPC-R control. This battery is used for maintaining the control's real-time clock during a shutdown condition. The real-time clock is used for time stamping of the control's diagnostic log. If the battery backup option is required, contact your representative for ordering information. Refer to chapter 4 for details.

PPC-R01.2 Hardware Configurations

The standard PPC-R01.2 hardware configuration comes equipped with one serial programming port (X10) and a PSM memory card in slot U1.

Note: If a configuration is ordered without an optional interface (i.e., DAQ03 card), the unit will be equipped with a second serial communication port (X16) in slot U2.

PPC-R01.2 using GPP 9 Firmware

The hardware configurations in the following table are ordered with GPP 9 firmware.

Hardware Typecode	U2 (Expansion Slot)	Description	Material Number
PPC-R01.2N-N-S1-FW	Serial card	Second serial com port (X16)	285236
PPC-R01.2N-N-Q1-FW	DAQ03	Link Ring cross communication	287799

Table 10-1: PPC-R01.2 using GPP 9 Firmware

The following table contains the FWA typecode ordered with each hardware configurations in Table 10-1.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-XXXXXX	292884	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card

Table 10-2: FWA-PPCR0*-GP*-09VRS-MS-XXXXXX Firmware

PPC-R01.2 using GPP 9 / Profibus Slave Firmware

The hardware configuration in the following table is ordered with GPP 9 / Profibus slave firmware.

Hardware Typecode	U2 (Expansion Slot)	Description	Material Number
PPC-R01.2N-N-P2-FW	DPS01	Profibus slave interface	288365

Table 10-3: PPC-R01.2 using GPP 9 / Profibus Slave Firmware

The following table contains the FWA typecode ordered with the hardware configuration in Table 10-3.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-P2XXXX	292885	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-DPS01*-PHP-02VRS-NN (Material number: 285672)	Profibus slave firmware	DPS01 Profibus card

Table 10-4: FWA-PPCR0*-GP*-09VRS-MS-P2XXXX Firmware

PPC-R01.2 using GPP 9 / DeviceNet Slave Firmware

The hardware configuration in the following table is ordered with GPP 9 / DeviceNet slave firmware.

Configuration	U2 (Expansion slot)	Description	Material Number
PPC-R01.2N-N-V2-FW	DNS03	DeviceNet slave interface	290049

Table 10-5: PPC-R01.2 using GPP 9 / DeviceNet Slave Firmware

The following table contains the FWA typecode ordered with the hardware configuration in Table 10-5.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-V2XXXX	292886	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-DNS01*-PHV-01VRS-NN (Material number: 286688)	DeviceNet slave firmware	DNS03 DeviceNet card

Table 10-6: FWA-PPCR0*-GP*-09VRS-MS-V2XXXX Firmware

PPC-R01.2 using GPP 9 / Interbus Slave Firmware

The hardware configuration in the following table is ordered with GPP 9 / Interbus slave firmware.

Configuration	U2 (Expansion slot)	Description	Material Number
PPC-R01.2N-N-B2-FW	IBS03	Interbus slave interface	289825

Table 10-7: PPC-R01.2 using GPP 9 / Interbus Slave Firmware

The following table contains the FWA typecode ordered with the hardware configuration in Table 10-7.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-B2XXXX	292887	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-IBS03*-PHB-01VRS-NN (Material number: 286687)	Interbus slave firmware	IBS03 Interbus card

Table 10-8: FWA-PPCR0*-GP*-09VRS-MS-B2XXXX Firmware

PPC-R01.2 using GPP 9 / ControlNet Slave Firmware

The hardware configuration in the following table is ordered with GPP 9 / ControlNet slave firmware.

Configuration	U2 (Expansion slot)	Description	Material Number
PPC-R01.2N-N-L2-FW	CNS01	ControlNet slave interface	289826

Table 10-9: PPC-R01.2 using GPP 9 / ControlNet Slave Firmware

The following table contains the FWA typecode ordered with the hardware configuration in Table 10-9.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-L2XXXX	292888	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-CNS01*-PHL-01VRS-NN (Material number: 288991)	ControlNet slave firmware	CNS01 Interbus card

Table 10-10: FWA-PPCR0*-GP*-09VRS-MS-L2XXXX Firmware

PPC-R01.2 using GPP 9 / EtherNet Firmware

The hardware configuration in the following table is ordered with GPP 9 / EtherNet firmware.

Configuration	U2 (Expansion slot)	Description	Material Number
PPC-R01.2N-N-T2-FW	ETH01	EtherNet interface	290639

Table 10-11: PPC-R01.2 using GPP 9 / EtherNet Firmware

The following table contains the FWA typecode ordered with the hardware configuration in Table 10-11.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-T2XXXX	292889	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-ETH01*-PHT-02VRS-NN (Material number: 295299)	EtherNet firmware	ETH01 EtherNet card

Table 10-12: FWA-PPCR0*-GP*-09VRS-MS-T2XXXX Firmware

PPC-R02.2 Hardware Configurations

The standard PPC-R02.2 hardware configuration comes equipped with two serial ports (X10 and X16) and a PSM memory card in slot U1.

PPC-R02.2 using GPP 9 Firmware

The hardware configurations in the following table are ordered with GPP 9 firmware.

Hardware Typecode	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R02.2N-N-NN-NN-NN-FW	Cover	Cover	Cover	No expansion cards	285402
PPC-R02.2N-N-Q1-NN-NN-FW	DAQ03	Cover	Cover	Link Ring cross communication	287800
PPC-R02.2N-N-N1-NN-NN-FW	NSW01	Cover	Cover	PLS interface with 16 outputs	290004
PPC-R02.2N-N-N1-N2-NN-FW	NSW01	NSW01	Cover	PLS interface with 32 outputs	289012

Table 10-13: PPC-R02.2 using GPP 9 Firmware

The following table contains the FWA typecode ordered with each hardware configurations in Table 10-13.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-XXXXXX	292884	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card

Table 10-14: FWA-PPCR0*-GP*-09VRS-MS-XXXXXX Firmware

PPC-R02.2 using GPP 9 / Profibus Slave Firmware

The hardware configurations in the following table are ordered with GPP 9 / Profibus slave firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R02.2N-N-NN-P2-NN-FW	Cover	DPS01	Cover	Profibus slave interface	286190
PPC-R02.2N-N-Q1-P2-NN-FW	DAQ03	DPS01	Cover	Link Ring cross communication and Profibus slave interface	288408
PPC-R02.2N-N-N1-P2-NN-FW	NSW01	DPS01	Cover	PLS interface with 16 outputs and Profibus slave interface	290005
PPC-R02.2N-N-N1-N2-P2-FW	NSW01	NSW01	DPS01	PLS interface with 32 outputs and Profibus slave interface	289013

Table 10-15: PPC-R02.2 using GPP 9 / Profibus Slave Firmware

The following table contains the FWA typecode ordered with the hardware configurations in Table 10-15.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-P2XXXX	292885	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-DPS01*-PHP-02VRS-NN (Material number: 285672)	Profibus slave firmware	DPS01 Profibus card

Table 10-16: FWA-PPCR0*-GP*-09VRS-MS-P2XXXX Firmware

PPC-R02.2 using GPP 9 / Profibus Slave / EtherNet Firmware

The hardware configurations in the following table are ordered with GPP 9 / Profibus slave / EtherNet firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R02.2N-N-T2-P2-NN-FW	ETH01	DPS01	Cover	EtherNet and Profibus slave interface	291196
PPC-R02.2N-N-Q1-P2-T2-FW	DAQ03	DPS01	ETH01	Link Ring cross communication, Profibus slave interface and EtherNet	291195
PPC-R02.2N-N-N1-P2-T2-FW	NSW01	DPS01	ETH01	PLS interface with 16 outputs, Profibus slave interface and EtherNet	290526

Table 10-17: PPC-R02.2 using GPP 9 / Profibus Slave / EtherNet Firmware

The following table contains the FWA typecode ordered with the hardware configurations in Table 10-17.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-P2T2XX	292890	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-DPS01*-PHP-02VRS-NN (Material number: 285672)	Profibus slave firmware	DPS01 Profibus card
		FWC-ETH01*-PHT-02VRS-NN (Material number: 295299)	EtherNet firmware	ETH01 EtherNet card

Table 10-18: FWA-PPCR0*-GP*-09VRS-MS-P2T2XX Firmware

PPC-R02.2 using GPP 9 / DeviceNet Slave Firmware

The hardware configurations in the following table are ordered with GPP 9 / DeviceNet slave firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R02.2N-N-V2-NN-NN-FW	DNS03	Cover	Cover	DeviceNet slave interface	286218
PPC-R02.2N-N-Q1-V2-NN-FW	DAQ03	DNS03	Cover	Link Ring cross communication and DeviceNet slave interface	289447
PPC-R02.2N-N-N1-V2-NN-FW	NSW01	DNS03	Cover	PLS interface with 16 outputs and DeviceNet slave interface	290006
PPC-R02.2N-N-N1-V2-Q1-FW	NSW01	DNS03	DAQ03	PLS interface with 16 outputs, DeviceNet slave interface and Link Ring cross communication	293286
PPC-R02.2N-N-N1-N2-V2-FW	NSW01	NSW01	DNS03	PLS interface with 32 outputs and DeviceNet slave interface	289014

Table 10-19: PPC-R02.2 using GPP 9 / DeviceNet Slave Firmware

The following table contains the FWA typecode ordered with the hardware configurations in Table 10-19.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-V2XXXX	292886	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-DNS01*-PHV-01VRS-NN (Material number: 286688)	DeviceNet slave firmware	DNS03 DeviceNet card

Table 10-20: FWA-PPCR0*-GP*-09VRS-MS-V2XXXX Firmware

PPC-R02.2 using GPP 9 / DeviceNet Slave / EtherNet Firmware

The hardware configurations in the following table are ordered with GPP 9 / DeviceNet slave / EtherNet firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R02.2N-N-V2-T2-NN-FW	DNS03	ETH01	Cover	EtherNet and DeviceNet slave interface	291198
PPC-R02.2N-N-N1-V2-T2-FW	NSW01	DNS03	ETH01	PLS interface with 16 outputs, DeviceNet slave interface and EtherNet	293285
PPC-R02.2N-N-Q1-T2-V2-FW	DAQ03	ETH01	DNS03	Link Ring cross communication, EtherNet and DeviceNet slave interface	291757

Table 10-21: PPC-R02.2 using GPP 9 / DeviceNet Slave / EtherNet Firmware

The following table contains the FWA typecode ordered with the hardware configurations in Table 10-21.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-V2T2XX	292891	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-DNS01*-PHV-01VRS-NN (Material number: 286688)	DeviceNet slave firmware	DNS03 DeviceNet card
		FWC-ETH01*-PHT-02VRS-NN (Material number: 295299)	EtherNet firmware	ETH01 EtherNet card

Table 10-22: FWA-PPCR0*-GP*-09VRS-MS-V2T2XX Firmware

PPC-R02.2 using GPP 9 / Interbus Slave Firmware

The hardware configuration in the following table is ordered with GPP 9 / Interbus slave firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R02.2N-N-NN-B2-NN-FW	Cover	IBS03	Cover	Interbus slave interface	289020

Table 10-23: PPC-R02.2 using GPP 9 / Interbus Slave Firmware

The following table contains the FWA typecode ordered with the hardware configuration in Table 10-23.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-B2XXXX	292887	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-IBS03*-PHB-01VRS-NN (Material number: 286687)	Interbus slave firmware	IBS03 Interbus card

Table 10-24: FWA-PPCR0*-GP*-09VRS-MS-B2XXXX Firmware

PPC-R02.2 using GPP 9 / Interbus Slave / EtherNet Firmware

The hardware configuration in the following table is ordered with GPP 9 / Interbus slave / EtherNet firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R02.2N-N-T2-B2-NN-FW	ETH01	IBS03	Cover	EtherNet and Interbus slave interface	291197

Table 10-25: PPC-R02.2 using GPP 9 / Interbus Slave / EtherNet Firmware

The following table contains the FWA typecode ordered with the hardware configuration in Table 10-25.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-B2T2XX	292892	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-IBS03*-PHB-01VRS-NN (Material number: 286687)	Interbus slave firmware	IBS03 Interbus card
		FWC-ETH01*-PHT-02VRS-NN (Material number: 295299)	EtherNet firmware	ETH01 EtherNet card

Table 10-26: FWA-PPCR0*-GP*-09VRS-MS-B2T2XX Firmware

PPC-R02.2 using GPP 9 / ControlNet Slave Firmware

The hardware configurations in the following table are ordered with GPP 9 / ControlNet slave firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R02.2N-N-L2-NN-NN-FW	CNS01	Cover	Cover	ControlNet slave interface	289021
PPC-R02.2N-N-N1-L2-NN-FW	NSW01	CNS01	Cover	PLS interface with 16 outputs and ControlNet slave interface	291568
PPC-R02.2N-N-Q1-L2-NN-FW	DAQ03	CNS01	Cover	Ling Ring cross communication and ControlNet slave interface	296290

Table 10-27: PPC-R02.2 using GPP 9 / ControlNet Slave Firmware

The following table contains the FWA typecode ordered with the hardware configurations in Table 10-27.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-L2XXXX	292888	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-CNS01*-PHL-01VRS-NN (Material number: 288991)	ControlNet slave firmware	CNS01 ControlNet card

Table 10-28: FWA-PPCR0*-GP*-09VRS-MS-L2XXXX Firmware

PPC-R02.2 using GPP 9 / ControlNet Slave / EtherNet Firmware

The hardware configuration in the following table is ordered with GPP 9 / ControlNet slave / EtherNet firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R02.2N-N-L2-T2-NN-FW	CNS01	ETH01	Cover	ControlNet slave interface and EtherNet	291193
PPC-R02.2N-N-Q1-L2-T2	DAQ03	CNS01	ETH01	Link Ring cross communication, ControlNet slave interface and EtherNet	293067

Table 10-29: PPC-R02.2 using GPP 9 / ControlNet Slave / EtherNet Firmware

The following table contains the FWA typecode ordered with the hardware configuration in Table 10-29.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-L2T2XX	292893	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-CNS01*-PHL-01VRS-NN (Material number: 288991)	ControlNet slave firmware	CNS01 ControlNet card
		FWC-ETH01*-PHT-02VRS-NN (Material number: 295299)	EtherNet firmware	ETH01 EtherNet card

Table 10-30: FWA-PPCR0*-GP*-09VRS-MS-L2T2XX Firmware

PPC-R02.2 using GPP 9 / EtherNet or EtherNet/IP Firmware

The hardware configurations in the following table are ordered with GPP 9 / EtherNet firmware.

Configurations with a 10 MBaud EtherNet Interface

The 10MBaud EtherNet card does not support auto-negotiation and is not recommended for applications using EtherNet/IP .

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R02.2N-N-T2-NN-NN-FW	ETH01	Cover	Cover	10 MBaud EtherNet interface	290218
PPC-R02.2N-N-Q1-T2-NN-FW	DAQ03	ETH01	Cover	Link Ring cross communication and 10 MBaud EtherNet interface	290640
PPC-R02.2N-N-N1-T2-NN-FW	NSW01	ETH01	Cover	PLS interface with 16 outputs and 10 MBaud EtherNet interface	290007
PPC-R02.2N-N-N1-N2-T2-FW	NSW01	NSW01	ETH01	PLS interface with 32 outputs and 10 MBaud EtherNet interface	290008

Table 10-31: PPC-R02.2 using GPP 9 / EtherNet Firmware (10 MBaud)

The following table contains the FWA typecode ordered with the hardware configurations in Table 10-31.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-T2XXXX	292889	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-ETH01*-PHT-02VRS-NN (Material number: 295299)	10 MBaud EtherNet firmware	ETH01 EtherNet card

Table 10-32: FWA-PPCR0*-GP*-09VRS-MS-T2XXXX Firmware

Configurations with a 100 MBaud EtherNet Interface

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R02.2N-N-T3-NN-NN-FW	ETH02	Cover	Cover	100 MBaud EtherNet interface	297772
PPC-R02.2N-N-Q1-T3-NN-FW	DAQ03	ETH02	Cover	Link Ring cross communication and 100 MBaud EtherNet interface	297775
PPC-R02.2N-N-N1-T3-NN-FW	NSW01	ETH02	Cover	PLS interface with 16 outputs and 100 MBaud EtherNet interface	297773
PPC-R02.2N-N-N1-N2-T3-FW	NSW01	NSW01	ETH02	PLS interface with 32 outputs and 100 MBaud EtherNet interface	297774

Table 10-33: PPC-R02.2 using GPP 9 / EtherNet Firmware (100 MBaud)

The following table contains the FWA typecode ordered with the hardware configurations in Table 10-33.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR0*-GP*-09VRS-MS-T3XXXX	297395	FWB-PSM01*-GP*-09VRS-MS (Material number: 292871)	GPP 9 firmware with boot loader	PSM memory card
		FWC-ETH02*-PHT-02VRS-NN (Material number: 297628)	100 MBaud EtherNet firmware	ETH02 EtherNet card

Table 10-34: FWA-PPCR0*-GP*-09VRS-MS-T3XXXXFirmware

10.2 PPC-P11.1 Hardware and Firmware

The PPC-P11.1 control is available with a 16 MB compact flash memory card and optional interfaces on secondary front faceplates. Firmware must be ordered separately for each hardware configuration using the appropriate FWA typecode. The FWA typecode includes additional firmware that might be required for optional interfaces that are part of the configuration, such as Option Card PLS or Link Ring. Firmware typecodes are listed for all FWA typecodes in the following sections.

PPC-P11.1 Hardware Configurations

The standard PPC-P11.1 hardware configuration comes equipped with one serial programming port (X10) and a PFM compact flash memory card.

A second interface card containing a serial communication port (X16) and digital inputs and outputs can be ordered as follows:

- SUP-E01-PPC-P11 Material Number: 298775

Refer to section 4.2, *PPC-P11.1 Overview* for details.

Hardware Typecode	PC Expansion Slots				Description	Material Number
	1 st	2 nd	3 rd	4 TH		
PPC-P11.1N-N-NN-NN-NN-FW	PPC-P	Cover	Cover	Cover	PPC-P11.1 only	293533
PPC-P11.1N-N-N1-NN-NN-FW	PPC-P	NSW	Cover	Cover	PPC-P11.1 and PLS interface with 16 outputs	296298
PPC-P11.1N-N-N1-N2-NN-FW	PPC-P	NSW	NSW	Cover	PPC-P11.1 and PLS interface with 32 outputs	296299
PPC-P11.1N-N-Q1-NN-NN-FW	PPC-P	DAQ	Cover	Cover	PPC-P11.1 and Link Ring cross communication	296300
PPC-P11.1N-N-N1-Q1-NN-FW	PPC-P	NSW	DAQ	Cover	PPC-P11.1, PLS interface with 16 outputs and Link Ring cross communication	296301

Table 10-35: PPC-P11.1 using GMP 9 Firmware

The following table contains the FWA typecode ordered with each hardware configurations in Table 10-35.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCP11-GM*-09VRS-MS-XXXXXX	292936	FWC-PFM01*-GM*-09VRS-MS (Material number: 292938)	GMP 9 firmware	PFM compact memory card
		FWC-PPCP11-BTL-01VRS-NN * (Material number: 292937)	Dolfi boot loader *	PFM compact memory card

* The Dolfi boot loader firmware is not flashed to the PFM compact flash memory card but resides on-board the PC's flash.

Table 10-36: FWA-PPCP11-GM*-09VRS-MS-XXXXXX Firmware

10.3 Upgrading Control Firmware

The upgrading of control firmware should only be performed by trained personnel to ensure proper installation of the following firmware types:

- GPP 9 firmware (PPC-R)
- GMP 9 firmware (PPC-P11.1)
- Boot loader firmware for PPC-R

Note: The PPC-P11.1 boot loader firmware is retrieved from the PC board's on-board flash. The user never needs to upload boot loader firmware to the PPC-P11.1. If new boot loader firmware is required, contact Bosch Rexroth's Service Department for assistance.

GPP 9 and Boot Loader Firmware

GPP 9 Firmware

GPP 9 firmware can be upgraded on a PSM card containing an older release using the following serial Dolfi software.

- Typecode: SWA-DOL*PC-INB-01VRS-MS
- Material Number: 279804

Boot Loader Firmware for PPC-R

A PSM card containing an older version of GPP firmware, i.e., GPP 7, requires the installation of new boot loader firmware. New boot loader firmware is necessary to communicate with serial Dolfi and can only be installed using a PCMCIA hardware interface on a PC. The upgrading of boot loader firmware can be performed using serial Dolfi software.

Switching to Download Mode (DL)

To switch the PPC-R to download mode, cycle power to the control while holding down the S1 button until the H1 display scrolls the boot loader firmware version. Once released, the H1 display will read "DL".

Note: To switch the control to standard operating mode, cycle power without holding the S1 button.

To view the control's download mode settings, hold the S1 button for 2 seconds then release. Next, push the S1 button to scroll through the following control's download mode settings.

Press S1 # of Times	H1 Display
0	M00: PPC Bootloader
1	M02: PSM01*-BTL01VRS (RS = current release)
2	M03: Device address = " # " (# = control address)
3	M04: X10-Mode = 232
4	M05: X10-Baud = "current download baud rate"
5	M07: X16-Mode = 232
6	M08: X16-Baud = "current download baud rate"

Table 10-37: Boot loader Download Settings



Interrupting boot loader firmware upgrade will render the PSM memory card inoperable.

⇒ When upgrading boot loader firmware of the same version, care must be taken not to turn power off or interrupt the serial Dolfi communication. If this occurs, the boot loader firmware must be reinstalled using a PCMCIA hardware interface.

GPP 9 and Boot Loader Firmwares

The following table contains the FWB typecode containing the GPP 9 and boot loader firmwares.

Firmware Typecode (FWB)	Material Number	Includes	Description	Location
FWB-PSM01*-GP*-09VRS-MS-MS	292871	FWC-PSM01*-GP*-09VRS-MS (Material number: 292870)	GPP 9 firmware	PSM memory card
		FWC-PSM0**-BTL-02VRS-NN (Material number: 295305)	Boot loader firmware	PSM memory card

Table 10-38: FWB-PSM01*-GP*-09VRS-MS-MS Firmware

Note: Fieldbus slave firmware cannot be upgraded using serial Dolfi. Fieldbus slave firmware upgrading should be performed by Bosch Rexroth service personnel.

GMP 9 and Boot Loader Firmware

GMP 9 Firmware

GMP 9 control firmware resides on the PFM01.1 compact flash memory card. The control firmware can be upgraded on the PFM card using serial Dolfi software.

Boot Loader Firmware for PPC-P11.1

Boot loader firmware for the PPC-P11.1 resides on the PC board's on-board flash. On power-up, the boot loader firmware is initialized from the on-board flash. The control firmware on the PFM card is then initialized and the control is ready for operation. If the PFM card does not contain control firmware, the PPC-P11.1 remains in boot loader mode awaiting the installation of GMP control firmware.



Upgrading flash boot loader firmware on PPC-P11.1

⇒ The PPC-P11.1's on-board boot loader firmware can be upgrade using serial Dolfi software. However, care must be taken not to turn power off or interrupt the serial Dolfi communication. If this occurs, the PPC-P11.1 may be rendered inoperable and must then be sent to Bosch Rexroth's service department for reinstallation of firmware.

GMP 9 Firmware with Boot Loader

The following table contains the FWA typecode containing the GMP 9 and boot loader firmwares.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCP11-GM*-09VRS-MS-XXXXXX	292871	FWC-PFM01*-GM*-09VRS-MS (Material number: 292938)	GMP 9 firmware	PFM memory card
		FWC-PPCP11-BTL-01VRS-NN (Material number: 292937)	Boot loader firmware	PFM memory card

Table 10-39: FWA-PPCP11-GM*-09VRS-MS-XXXXXX Firmware

PPC Memory Cards (Blank)

The following blank memory cards are available for the PPC-R and PPC-P11.1.

Typecode	Description	Material Number
PSM01.1-FW	Blank PSM Memory Module used with PPC-R	280669
PFM01.1-016-FW	Blank PFM Compact Flash Memory Card used with PPC-P11.1	295174

Table 10-40: Blank Memory Cards

Note: A blank PSM and PFM memory card requires the installation of the boot loader firmware before loading GPP 9 or GMP 9 firmware.

10.4 BTC06.2 Hardware and Firmware

BTC06.2 Hardware



The BTC06.2 handheld unit comes equipped with a standard E-Stop button and Liveman switch. Optional features can be ordered which include a feedrate override switch and handwheel. The following tables describe the available options along with typecodes and material numbers.

Description	Typecode	Material Number
BTC06 with 40 keys insert, handwheel, E-stop button, override switch and live-man	BTC06.2A-F-EH3-FW	285854
BTC06 with 40 keys insert, E-stop button and live-man switch	BTC06.2A-F-EN3-FW	285855
BTC06 with 40 keys insert, E-stop button, override switch and live-man	BTC06.2A-F-EP3-FW	285856

Table 10-41: BTC06.2 with Liveman and E-Stop

BTC06 Firmware

The BTC06 handheld unit can be ordered with any of the following firmware configurations, depending on the following application.

- Teach Pendant VT100 Terminal
- Screen Manager Teach Pendant Interface
- Screen Manager Runtime

Firmware must be ordered separately for each hardware configuration using the appropriate FWA and/or SWA typecodes.

VT100 Terminal Firmware

VT100 Terminal firmware is used to display screens that are generated by the control firmware. This version uses control resources to provide screens to the BTC06.

Firmware Typecode (FWB)	Material Number	Includes	Description	Location
FWA-BTC06*-DOL-01VRS-EN	280769	FWC-BTC06*-DOL-01VRS-EN (Material number: 280770)	Boot loader firmware	BTC06
SWA-BTC06*-VT-01VRS-MS-C1.44	280785	SWD-BTC06*-VT-01VRS-MS-C1.44 (Material number: 280788)	VT100 terminal software	BTC06
		SWD-DOL*PC-INB-01VRS-MS-C1.44 (Material number: 279806)	Serial Dolfi Software	PC

Table 10-42: VT100 Terminal Firmware

Note: The feedrate override switch and handwheel are not supported with the VT100 terminal firmware.

Screen Manager Teach Pendant Interface Firmware

The Screen Manager Teach Pendant Interface firmware displays the same screens as the VT100 terminal with the following exceptions:

- No sequencer support
- Edit key is not supported
- Handwheel option is not supported.
- Pendant enable bit (reg. 1, bit 14) not supported
- Pendant status register (reg. 95-97) not supported
- Pendant password (C-0-0801, C-0-0802 and C-0-0807) not supported
- Control parameters C-0-0810 through C-0-0814 are not supported

Note: The Screen Manager Teach Pendant Interface firmware does not support the feedrate override switch.

The screens are generated on the BTC06 unit and not by the control. This version frees up control resources. The BTC06 boots up into the main screen. The communication settings on the BTC06 can be set by the user. The baud rate and mode of the BTC06 must match the settings of the PPC-R.

Note: PPC-R control parameter C-0-0012 must be set to ASCII Host.

Firmware Typecode (FWB)	Material Number	Includes	Description	Location
FWA-BTC06*-VM*-02VRS-MS	291480	FWC-BTC06*-DOL-01VRS-EN (Material number: 280770)	Boot loader firmware	BTC06

Table 10-43: Screen Manager Teach Pendant Interface Firmware

Screen Manager Runtime Firmware

The Screen Manager runtime firmware is used to display custom screens created with the following Screen Manager PC software:

- SWA-SCM*PC-INB-03VRS-MS-C1.44 Material Number: 289711

Firmware Typecode (FWB)	Material Number	Includes	Description	Location
FWA-BTC06*-DOL-01VRS-EN	280769	FWC-BTC06*-DOL-01VRS-EN (Material number: 280770)	Boot loader firmware	BTC06
SWA-BTC06*-SCM-02VRS-MS-C1.44	284172	SWD-BTC06*-SCM-02VRS-MS-C1.44 (Material number: 284434)	Screen Manager runtime	BTC06
		SWD-DOL*PC-INB-01VRS-MS-C1.44 (Material number: 279806)	Serial Dolfi Software	PC

Table 10-44: Screen Manager Runtime Firmware

Note: The feedrate override and handwheel options can be programmed for functionality using the Screen Manager PC software and VisualMotion.

10.5 BTV Hardware and Firmware

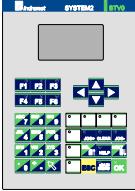
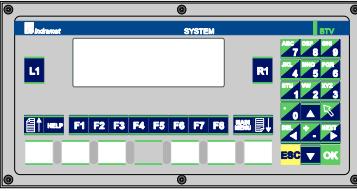
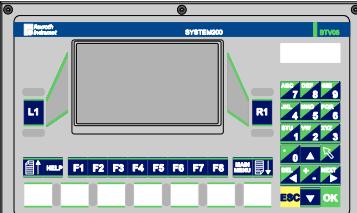
Description	Typecode	Material Number
	BTV04	BTW04.2GN-FW 282182
	BTV05	BTW05.2-HN-RS-FW 282096
	BTV06	BTW06.1HN-RS-FW 285948

Table 10-45: BTV Hardware Configurations

BTV Firmware

Firmware for the BTV units must be ordered separately. The following table indicates firmware requirements.

Description	Typecode	Material Number	Requirement
Boot Loader firmware	FWA-BTV04*-DOL-01VRS-EN	282914	Must be ordered with each BTV04 unit
	FWA-BTV05*-DOL-01VRS-EN	282916	Must be ordered with each BTV05 unit
	FWA-BTV06*-DOL-01VRS-EN	285306	Must be ordered with each BTV06 unit
Screen Manager runtime for BTV units	SWA-BTV04*-SCM-02VRS-MS-C1.44	284173	Order with BTV04
	SWA-BTV05*-SCM-02VRS-MS-C1.44	284174	Order with BTV05
	SWA-BTV06*-SCM-02VRS-MS-C1.44	285303	Order with BTV06

Table 10-46: BTV Firmware Requirements

Note: SWA typecodes for BTV units contain serial Dolfi software.

11 Typecodes

11.1 Typecode Description

PPC-R01.2 Typecode

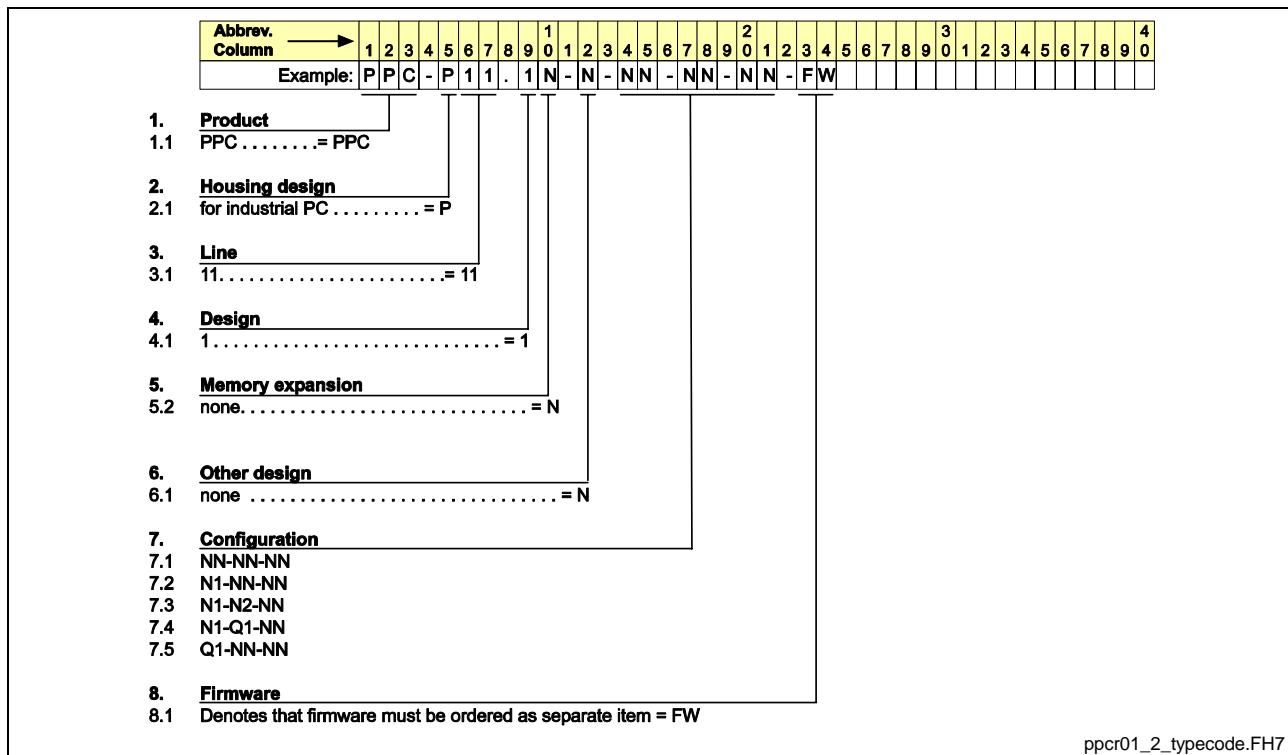


Fig. 11-1: PPC-R01.2 Typecode

PPC-R02.2 Typecode

Abbrev. Column	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	2	0	1	2	3	4	5	6	7	8	9	4
Example:	P	P	C	-	R	0	2	.	2	N	-	N	-	N	-	N	-	N	-	F	W									
1. Product group																														
1.1 PPC	=	PPC																												
2. Housing type																														
2.1 for RECO unit.	=	R																											
3. Line																														
3.1 2	=	02																												
4. Design																														
4.1 2	=	2																												
5. Battery / Memory expansion module																														
5.1 External battery and 4 MB module	=	A																												
5.2 not equipped	=	N																												
6. Programming Module																														
6.1 PSM01.1-FW	=	N																												
7. Configuration ①																														
7.1 L2-NN-NN																														
7.2 L2-T2-NN																														
7.3 N1-L2-NN																														
7.4 N1-L2-T2																														
7.5 N1-N2-NN																														
7.6 N1-N2-P2																														
7.7 N1-N2-T2																														
7.8 N1-N2-T3																														
7.9 N1-N2-V2																														
7.10 N1-NN-NN																														
7.11 N1-P2-NN																														
7.12 N1-P2-Q1																														
7.13 N1-P2-T2																														
7.14 N1-T2-NN																														
7.15 N1-T3-NN																														
7.16 N1-V2-NN																														
7.17 N1-V2-Q1																														
7.18 N1-V2-T2																														
7.19 NN-B2-NN																														
7.20 NN-NN-NN																														
7.21 NN-P2-NN																														
7.22 Q1-B2-NN																														
7.23 Q1-L2-T2																														
7.24 Q1-NN-NN																														
7.25 Q1-P2-NN																														
7.26 Q1-P2-T2																														
7.27 Q1-T2-NN																														
7.28 Q1-T3-NN																														
7.29 Q1-T2-V2																														
7.30 Q1-V2-NN																														
7.31 T2-B2-NN																														
7.32 T2-NN-NN																														
7.33 T3-NN-NN																														
7.34 T2-P2-NN																														
7.35 V2-NN-NN																														
7.36 V2-T2-NN																														
8. Firmware																														
8.1 Denotes that firmware must be ordered as separate subposition.....= FW																														

ppcr02_2_typecode.FH7

Fig. 11-2: PPC-R02.2 Typecode

PPC-P11.1 Typecode

Abbrev. Column	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	
Example:	P	P	C	-	P	1	1	.	N	-	N	-	N	N	-	N	N	-	N	N	-	F	W								
1. Product																															
1.1 PPC	=	PPC																													
2. Housing design																															
2.1 for industrial PC	=	P																													
3. Line																															
3.1 11	=	11																													
4. Design																															
4.1 1	=	1																													
5. Memory expansion																															
5.2 none	=	N																													
6. Other design																															
6.1 none	=	N																													
7. Configuration																															
7.1 NN-NN-NN																															
7.2 N1-NN-NN																															
7.3 N1-N2-NN																															
7.4 N1-Q1-NN																															
7.5 Q1-NN-NN																															
8. Firmware																															
8.1 Denotes that firmware must be ordered as separate item = FW																															

ppcp11_1_typecode.FH7

Fig. 11-3: PPC-P11.1 Typecode

BTC06.2 Typecode

Abbrev. Column	1	2	3	4	5	6	7	8	9	1	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
Example:	B	T	C	0	6	.	2	A	-	E	-	E	H	3	-	F	W														
1. Product group																															
1.1 BTC..... = BTC																															
2. Line																															
2.1 6..... = 06																															
3. Design																															
3.1 2..... = 2																															
4. Interface																															
4.1 RS232C and RS422A / RS485..... = A																															
5. Keyboard																															
5.1 Slide-in strips for 12 axis keys..... = E																															
5.2 Slide-in strips for 40 keys..... = F																															
6. Function design																															
	Code	EH3	EN3	EP3																											
	Function																														
6.1	Handwheel	1	-	-																											
6.2	Emergency-Stop	1	1	1																											
6.3	Override pot.meter	1	-	1																											
6.4	Activate button three stage, dual circuit	1	1	1																											
7.	Firmware																														
7.1	Denotes that firmware must be ordered as separate subposition	=																													

Illustration example: BTC06.2

btc06_typecode.FH7

Fig. 11-4: BTC06.2 Typecode

BTV04.2 Typecode

Abbrev. Column	1	2	3	4	5	6	7	8	9	1	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
Example:	B	T	V	0	4	.	2	G	N	-	F	W																			
1. Product group																															
1.1 BTV..... = BTV																															
2. Line																															
2.1 4..... = 04																															
3. Design																															
3.1 2..... = 2																															
4. Display																															
4.1 graphics capability, 128 X 64 Pixel = G																															
5. Keyboard																															
5.1 Standard																															
6. Firmware																															
6.1 Denotes that firmware must be ordered as separate subposition																															

Illustration example: BTV04.2

btv04_typecode.FH7

Fig. 11-5: BTV04.2 Typecode

BTV05.2 Typecode

Abbrev. Column	1	2	3	4	5	6	7	8	9	1	0	1	2	3	4	5	6	7	8	9	0	2	1	2	3	4	5	6	7	8	9	0	4
Example:	B	T	V	0	5	.	2	H	N	-	R	S	-	F	W																		
1. Product group																																	
1.1 BTV..... = BTV																																	
2. Line																																	
2.1 5..... = 05																																	
3. Design																																	
3.1 2..... = 2																																	
4. Display																																	
4.1 graphics capability, 256 x 64 Pixel .. = H																																	
5. Keyboard																																	
5.1 customized..... = B																																	
5.2 Standard..... = N																																	
6. Communication Bus																																	
6.1 Serial, RS485..... = RS																																	
7. Firmware																																	
7.1 Denotes that firmware must be ordered as separate subposition..... =																																	

Illustration example: BTV05.2

btv05_typecode.FH7

Fig. 11-6: BTV05.2 Typecode

BTV06.1 Typecode

Abbrev. Column	1	2	3	4	5	6	7	8	9	1	0	1	2	3	4	5	6	7	8	9	0	2	1	2	3	4	5	6	7	8	9	0	4
Example:	B	T	V	0	6	.	1	H	N	-	R	S	-	F	W																		
1. Product group																																	
1.1 BTV..... = BTV																																	
2. Line																																	
2.1 6..... = 06																																	
3. Design																																	
3.1 1..... = 1																																	
4. Display																																	
4.1 graphics capability, 240 x 128 Pixel = H																																	
5. Keyboard																																	
5.1 customized..... = B																																	
5.2 Standard..... = N																																	
6. Interface																																	
6.1 2 x SIS (RS232 / RS422 / RS485)..... = RS																																	
7. Firmware																																	
7.1 Denotes that firmware must be ordered as separate subposition =																																	

Illustration example: BTV06.1

btv06_typecode.FH7

Fig. 11-7: BTV06.1 Typecode

BTZ01.1 Typecode

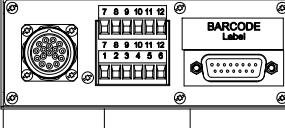
Abbrev. Column	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
Example:	B	T	Z	0	1	.	1																							

1. Product group
1.1 BTZ..... = BTZ

2. Line
2.1 1..... = 01

3. Design
3.1 1..... = 1

Illustration example: BTZ01.1



btz01_1_typecode.FH7

Fig. 11-8: BTZ01.1 Typecode

12 Drawings

12.1 Dimensional Sheets, Wiring Diagrams RECO

Mounting Dimensions Module Carrier RMB02.2-02

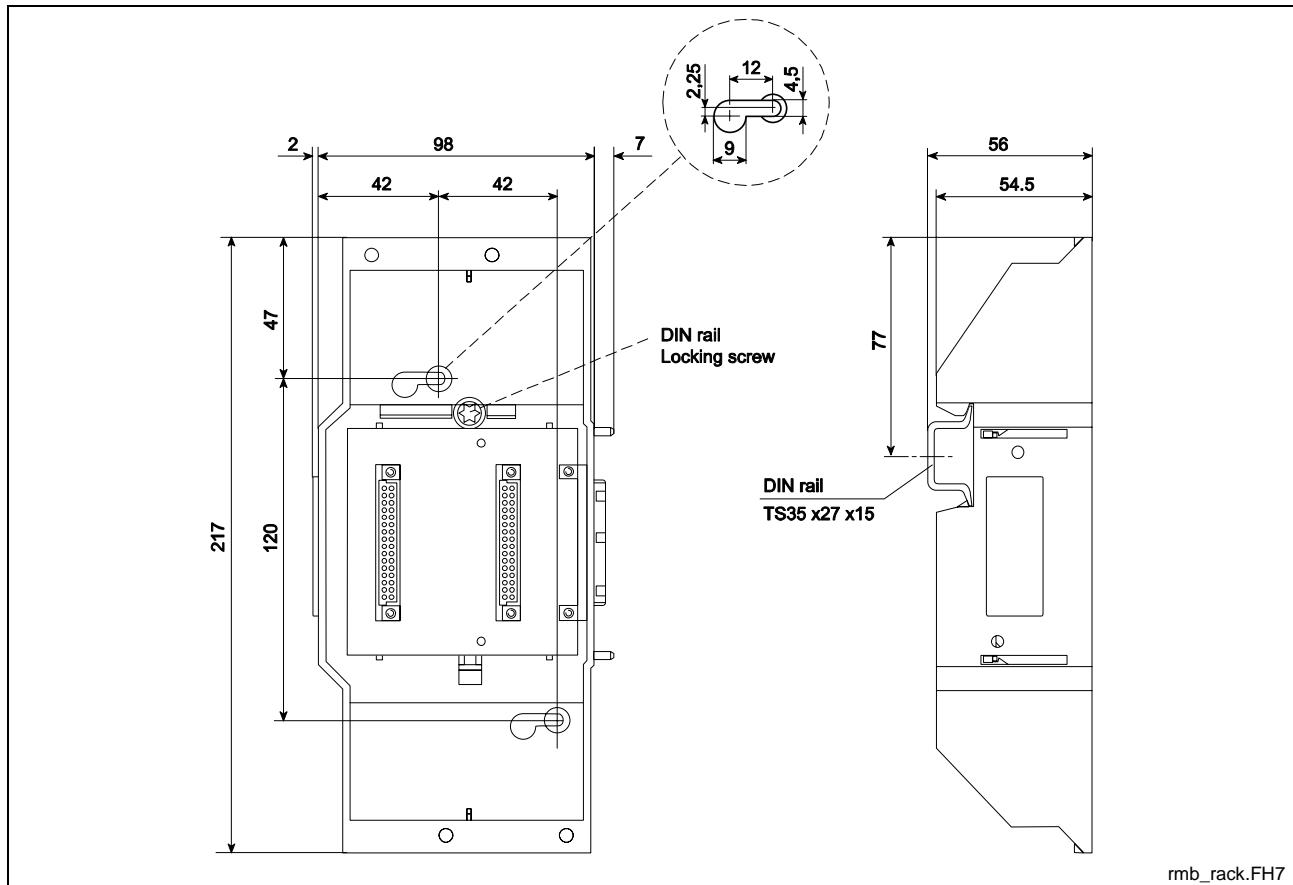


Fig. 12-1: RMB02.2-02 Rack Unit

Mounting Dimensions Module Carrier RMB02.2-04

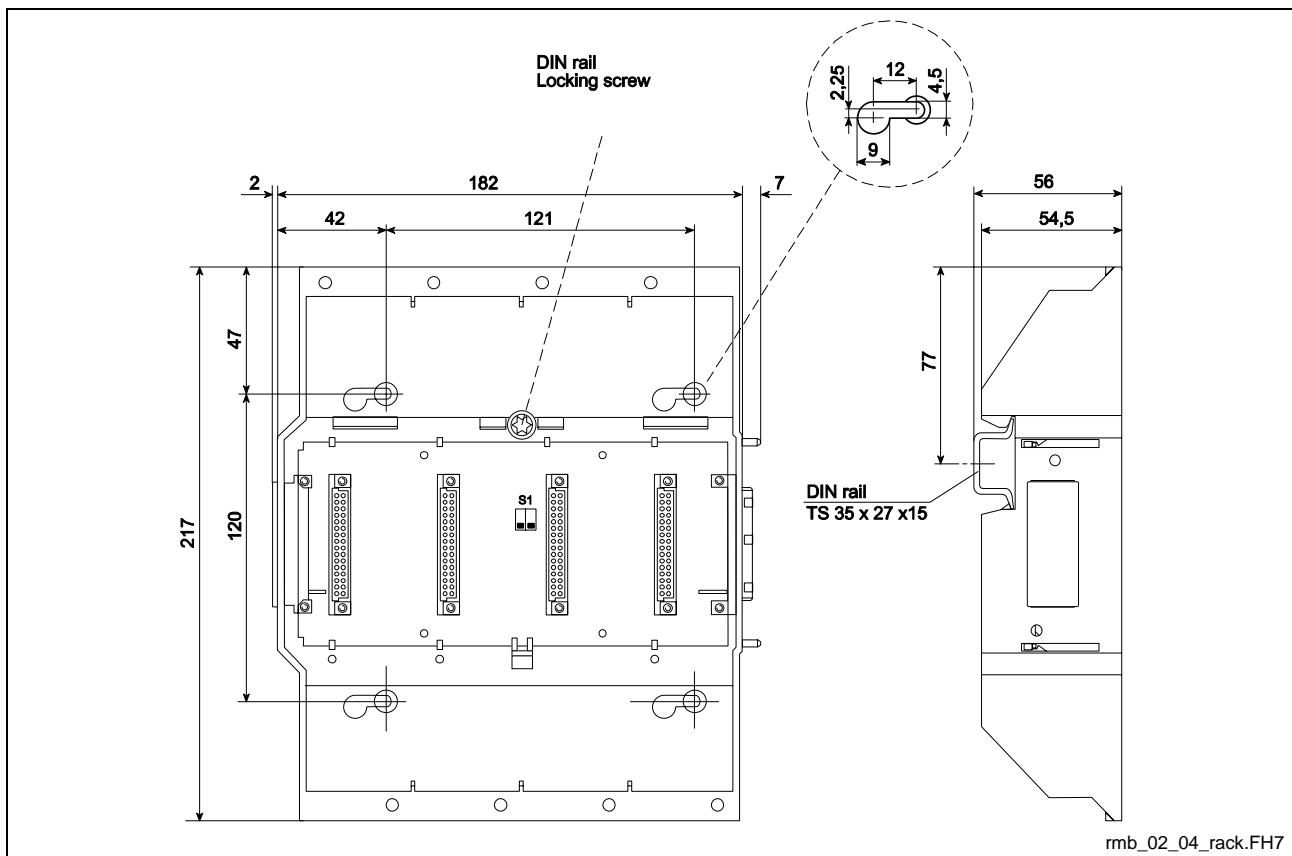


Fig. 12-2: RMB02.2-04 Rack Unit

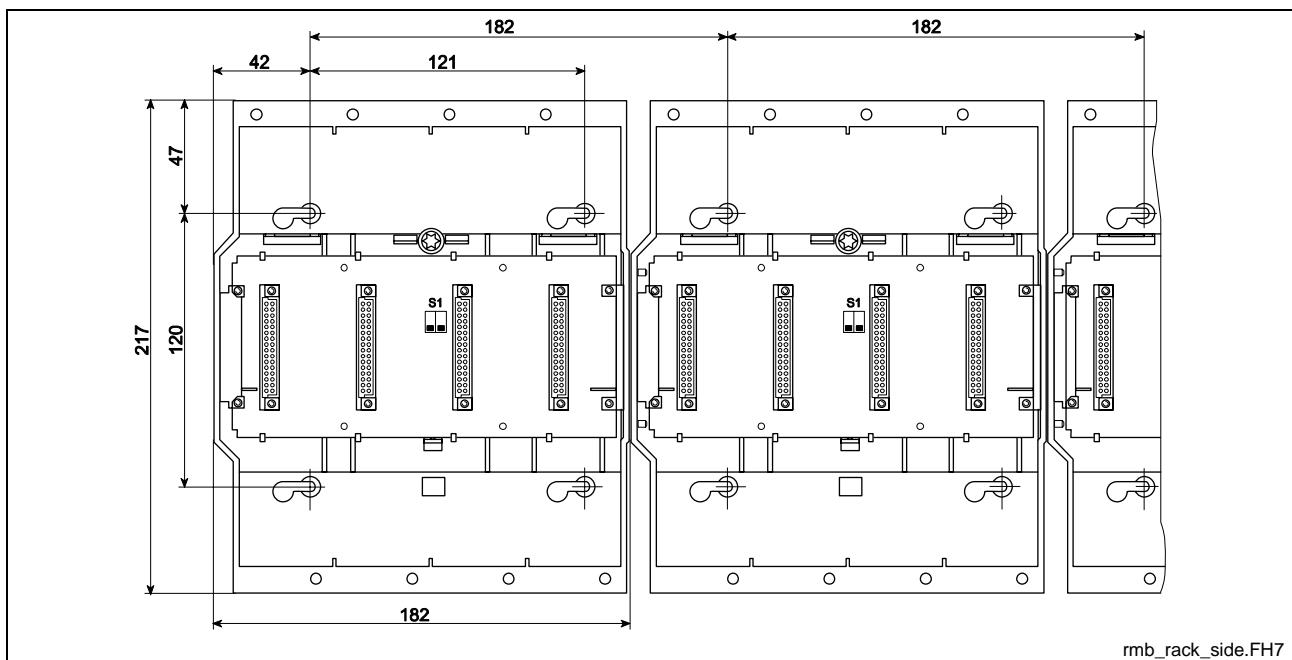


Fig. 12-3: Side-by-Side Installation of Several RMB02.2-04 Rack Units

PPC-R01.2 and PPC-R02.2

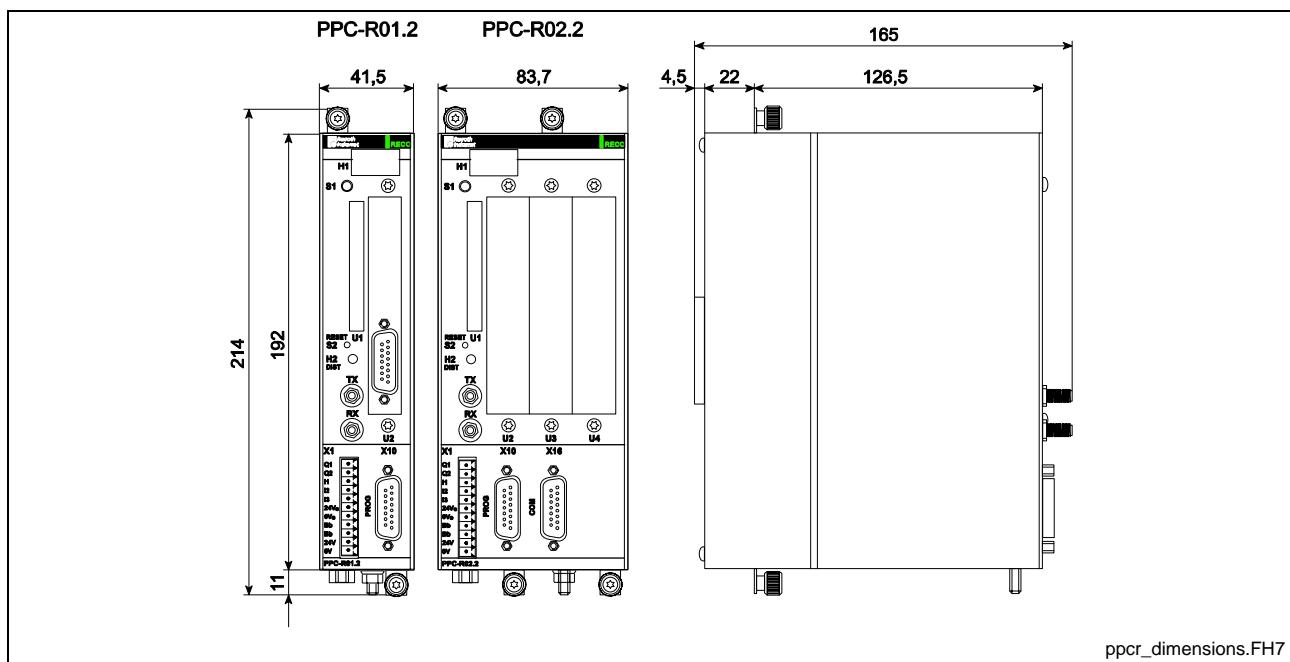


Fig. 12-4: PPC-R01.2 and PPC-R02.2 Dimensions

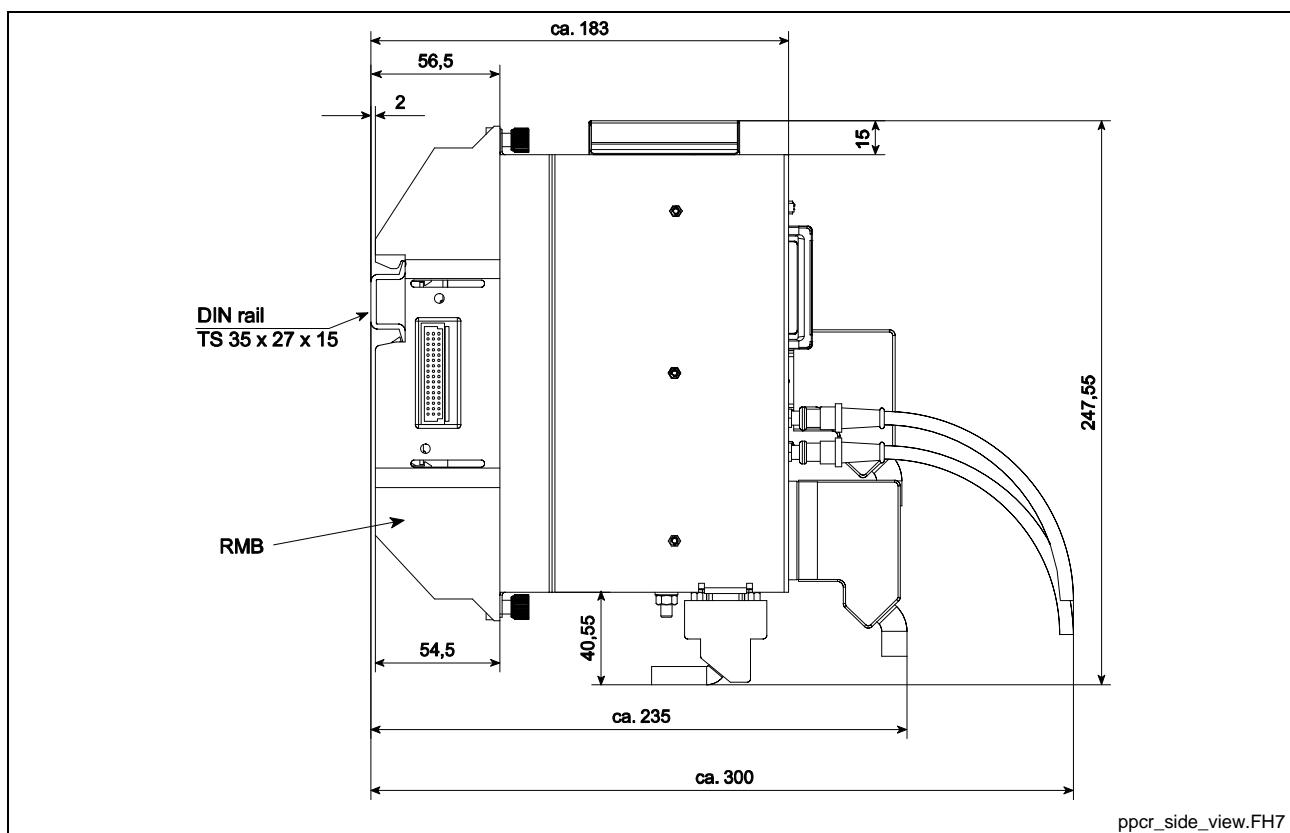


Fig. 12-5: PPC-R01.2 and PPC-R02.2 Mounting Dimensions

DAQ03.1R

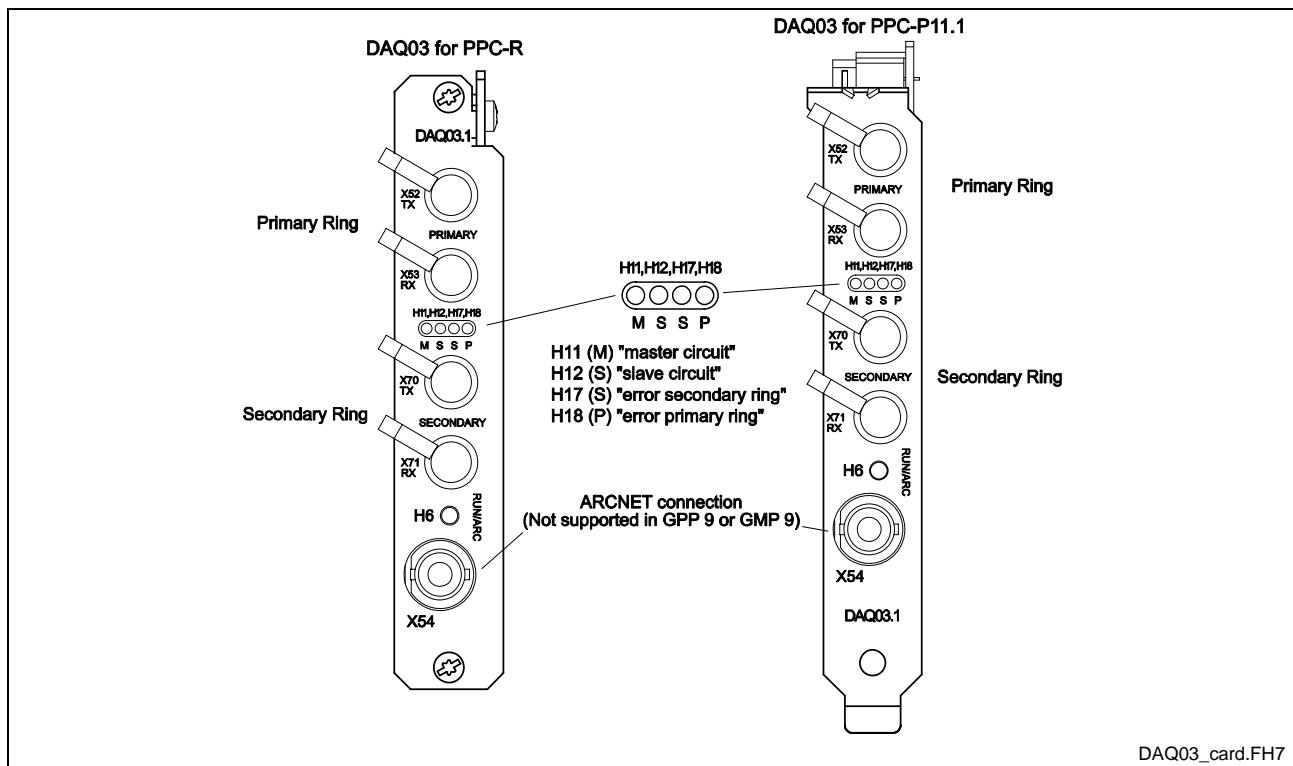


Fig. 12-6: DAQ03.1R Cross Communication Module

Profibus Fieldbus Slave Interface DPS01

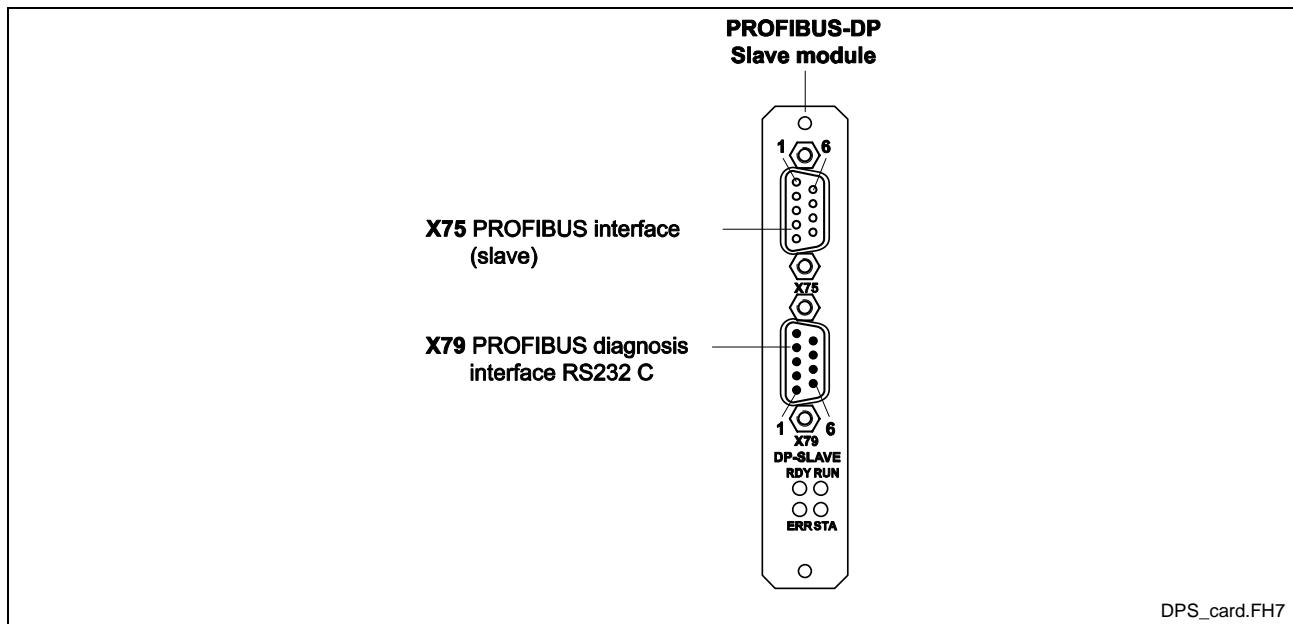


Fig. 12-7: Profibus Fieldbus Slave Interface DPS01

Interbus Fieldbus Slave Interface IBS03

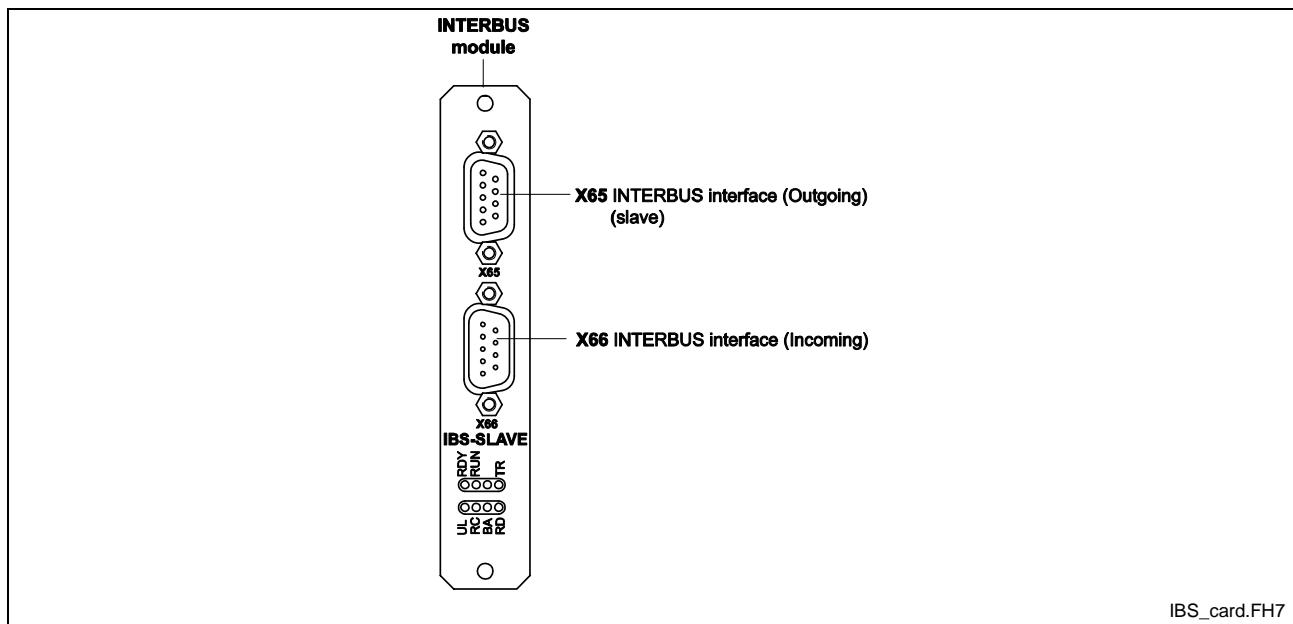


Fig. 12-8: INTERBUS interface IBS03

DeviceNet Fieldbus Slave Interface DNS03

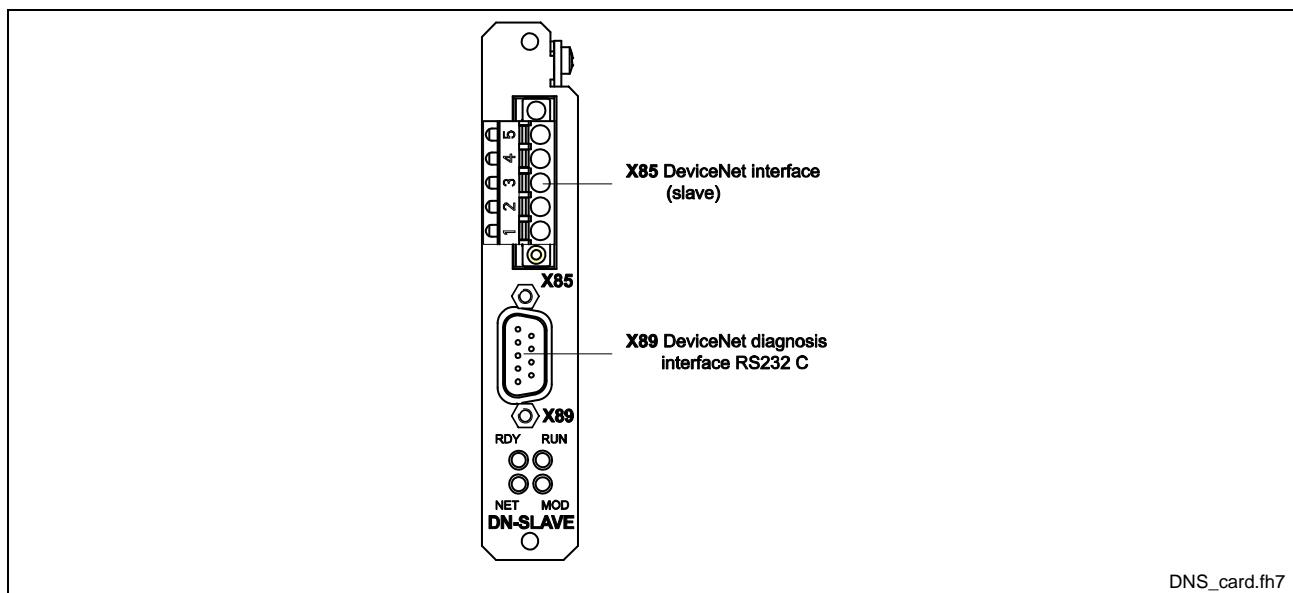


Fig. 12-9: DeviceNet interface DNS03

ControlNet Fieldbus Slave Interface CNS01

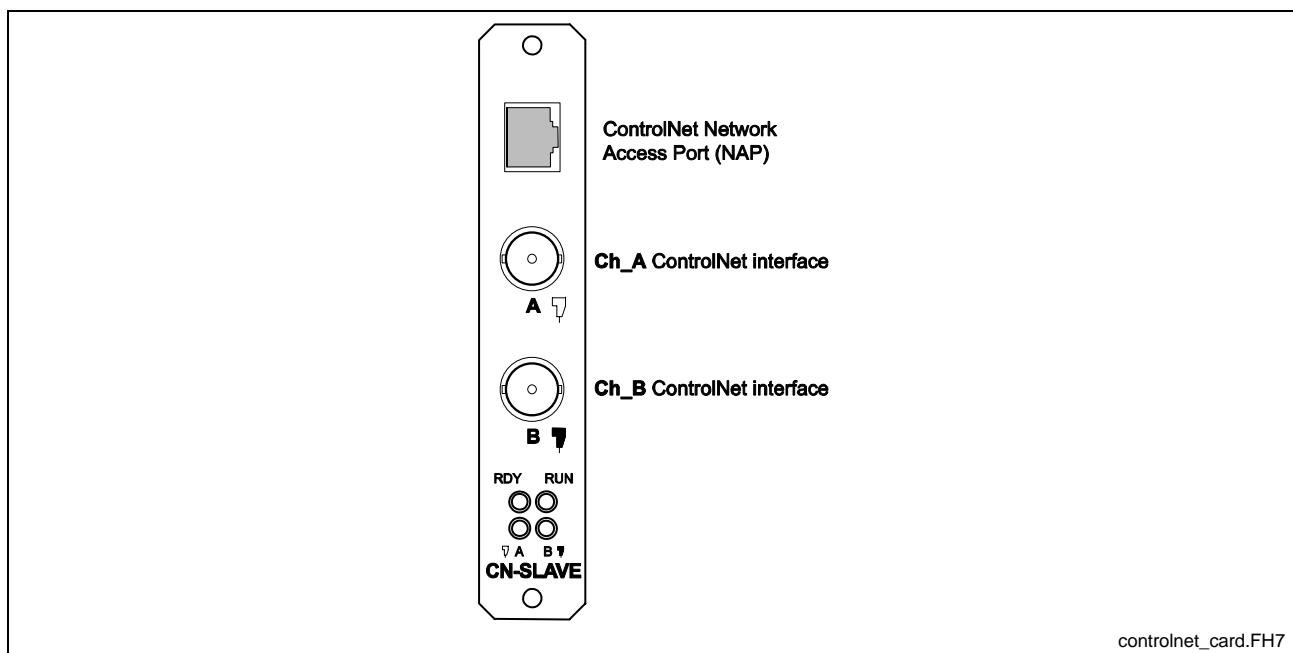


Fig. 12-10: ControlNet Fieldbus Slave Interface CNS01

RME02.2-16-DC024 Input Module

Brief Description

The digital 24 VDC input modules are designed for connecting digital control signals that are produced by pushbuttons, limit switches or electronic proximity switches. The 16 inputs are arranged in 2 isolated potential groups.

Mounting Dimensions

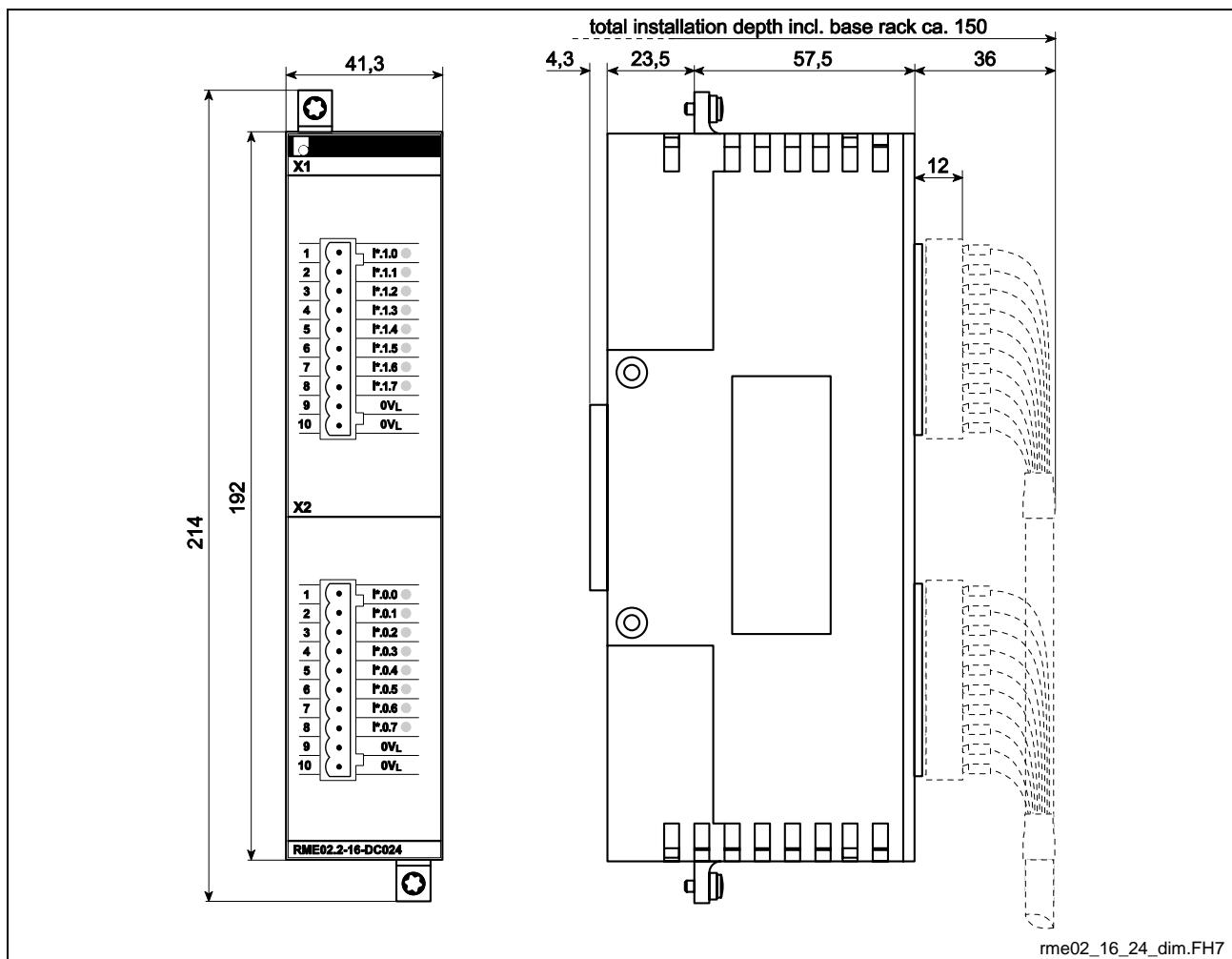


Fig. 12-11: RME02.2-16-DC024 Mounting Dimensions

Pin Assignments

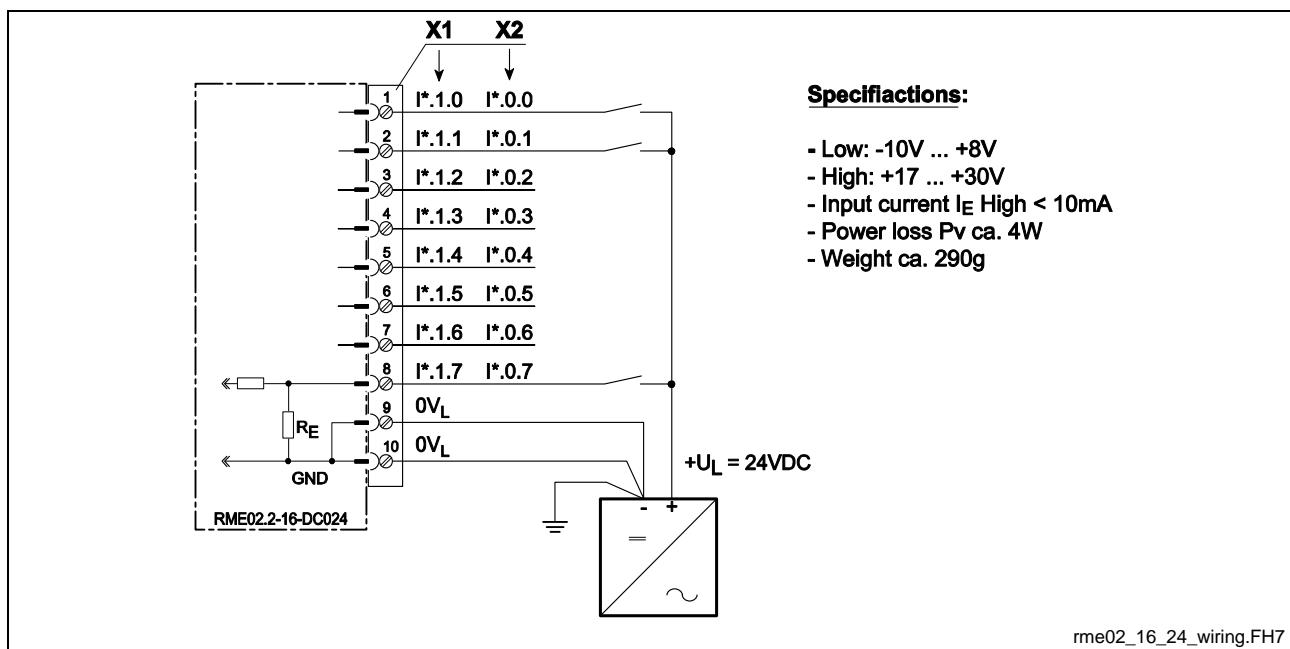


Fig. 12-12: RME02.2-16-DC024 Wiring Diagram

RME02.2-32-DC024 Input Module

Brief Description

The digital 24 VDC input modules are designed for connecting digital control signals that are produced by pushbuttons, limit switches or electronic proximity switches. The 32 inputs are arranged in 4 isolated potential groups.

Mounting Dimensions

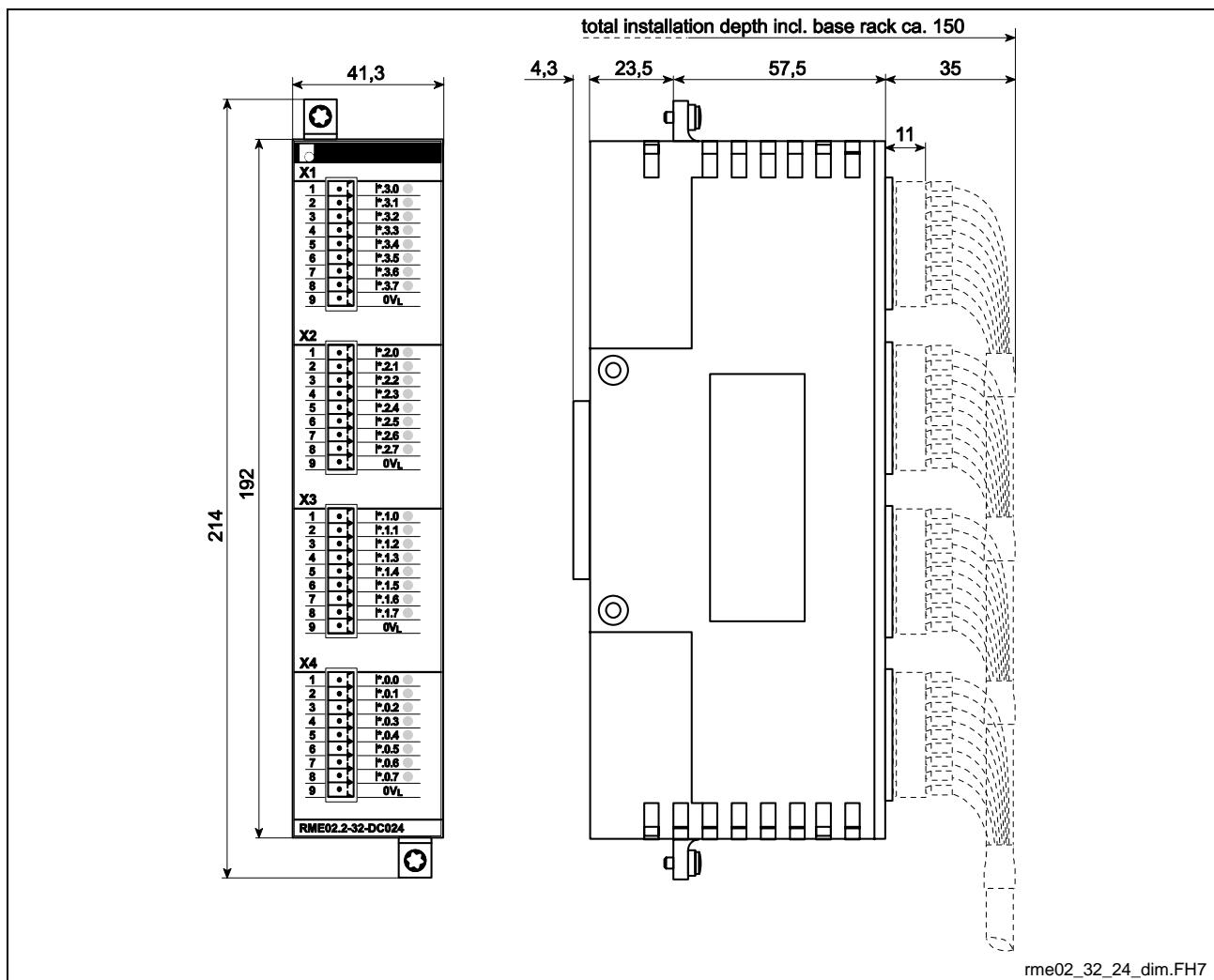


Fig. 12-13: RME02.2-32-DC024 Mounting Dimensions

Pin Assignments

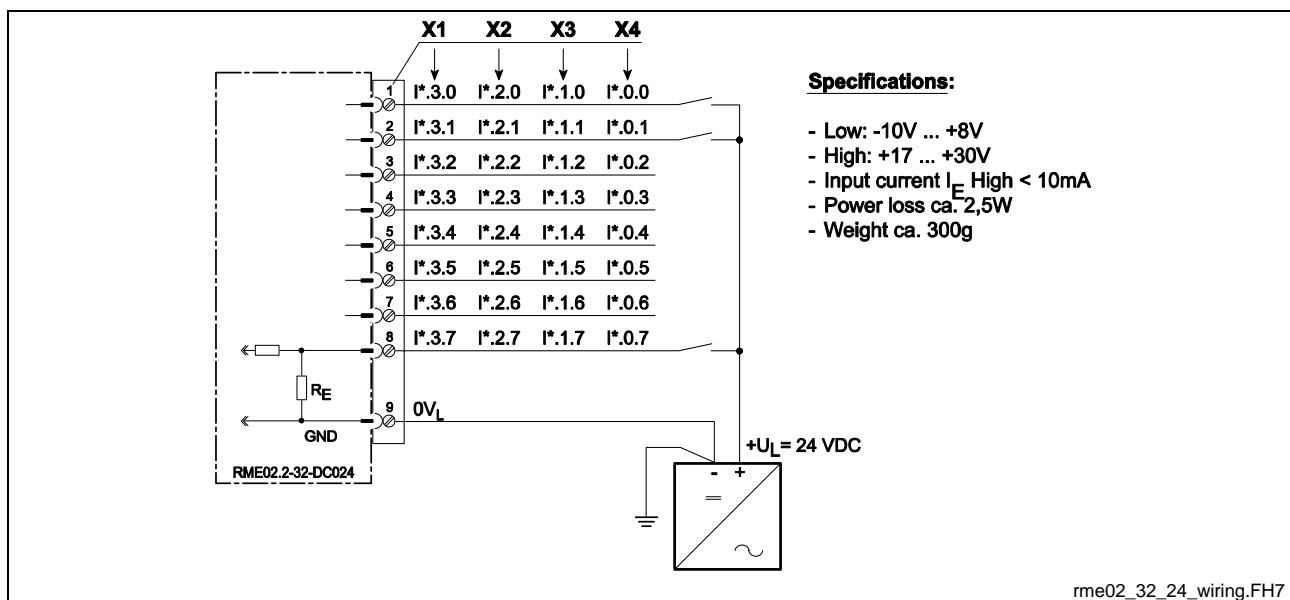


Fig. 12-14: RME02.2-32-DC024 Wiring Diagram

RME02.2-16-AC115 Input Module

Brief Description

AC sources of a maximum rating of 120VAC / 60Hz can directly be connected to the digital 115VAC input modules. The 16 AC inputs are arranged in 2 isolated potential groups.

Mounting Dimensions

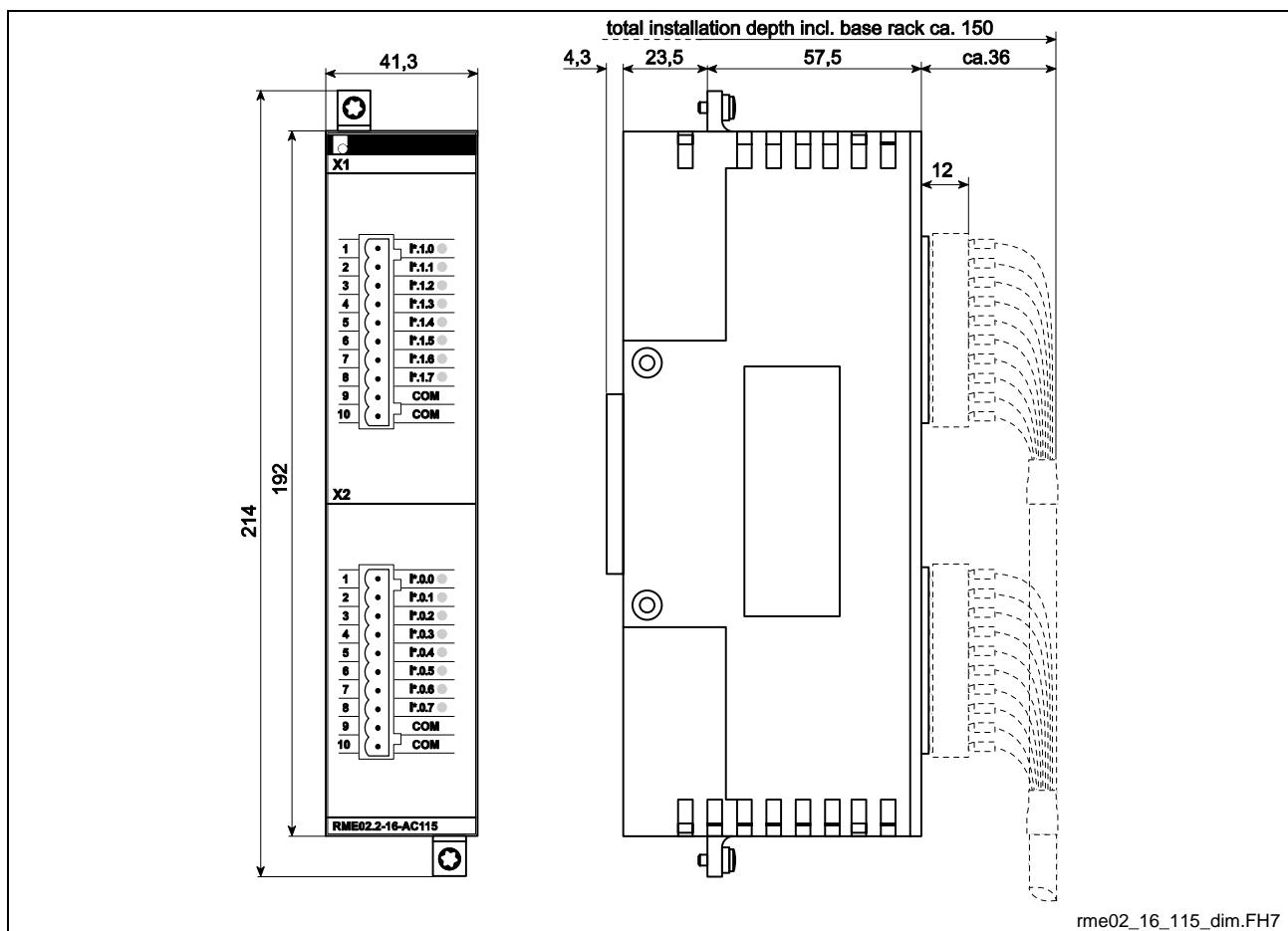


Fig. 12-15: RME02.2-16-AC115 Mounting dimensions

Pin Assignments

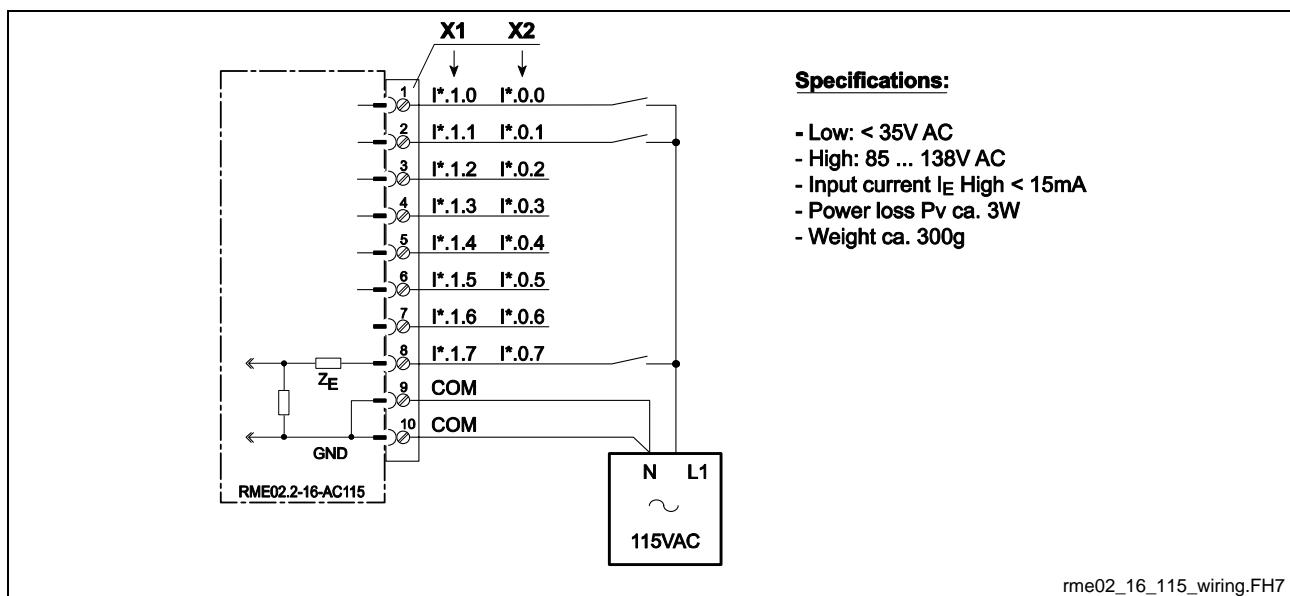


Fig. 12-16: RME02.2-16-AC115 Wiring Diagram

RMA02.2-16-DC024-200 Output Module

Brief Description

The digital 24VDC output modules are designed for the connection of digital actuators, such as solenoid valves, contactors, or indicator lights. The 16 outputs are FET transistor switches (active 1 switching) that are arranged in 2 isolated groups of 8 outputs each. Each 24V output can source loads up to 2 A.

Mounting Dimensions

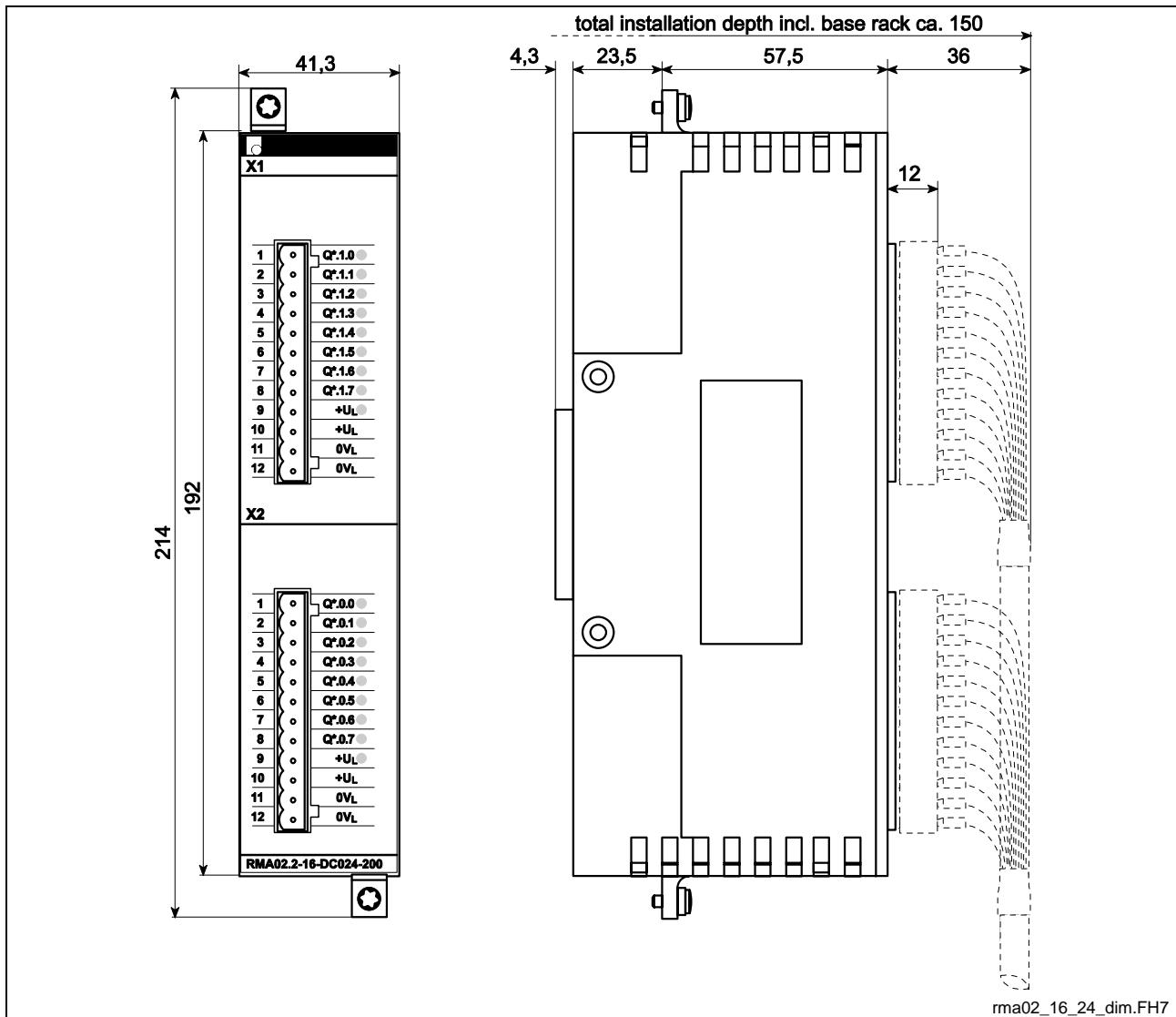


Fig. 12-17: RMA02.2-16-DC024-200 Mounting Dimensions

Pin Assignments

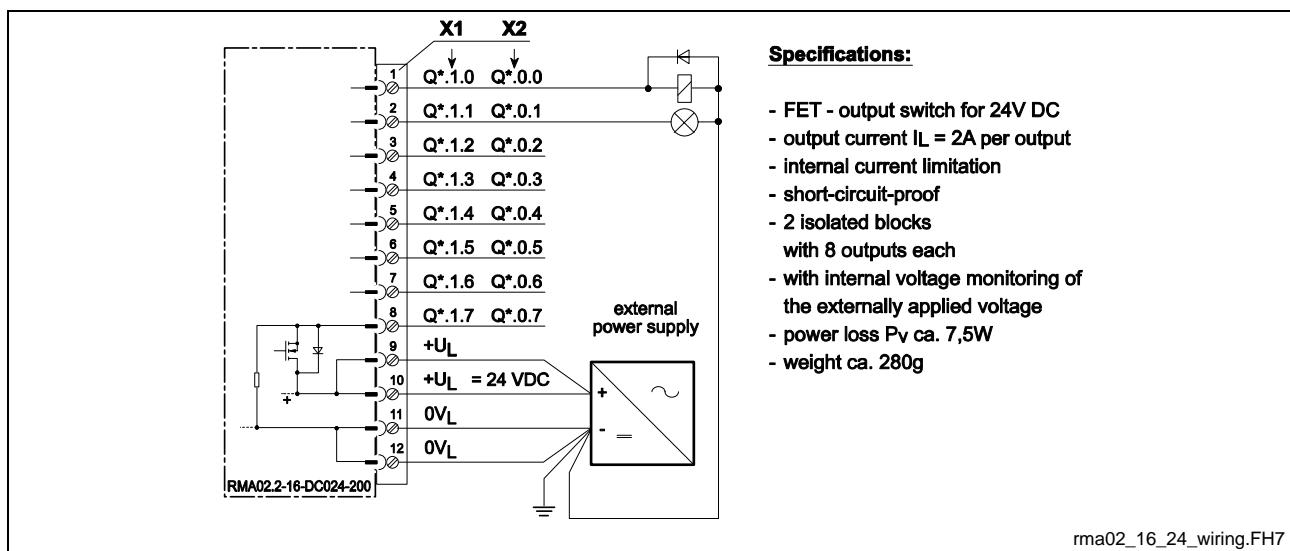


Fig. 12-18: RMA02.2-16-DC024-200 Wiring Diagram

RMA02.2-32-DC024-050 Output Module

Brief Description

The digital 24VDC output modules are designed for the connection of digital actuators, such as solenoid valves, contactors, or indicator lights. The 32 outputs are FET transistor switches (active 1 switching) that are arranged in 4 isolated groups of 8 outputs each. Each 24V output can source loads up to 500 mA.

Mounting Dimensions

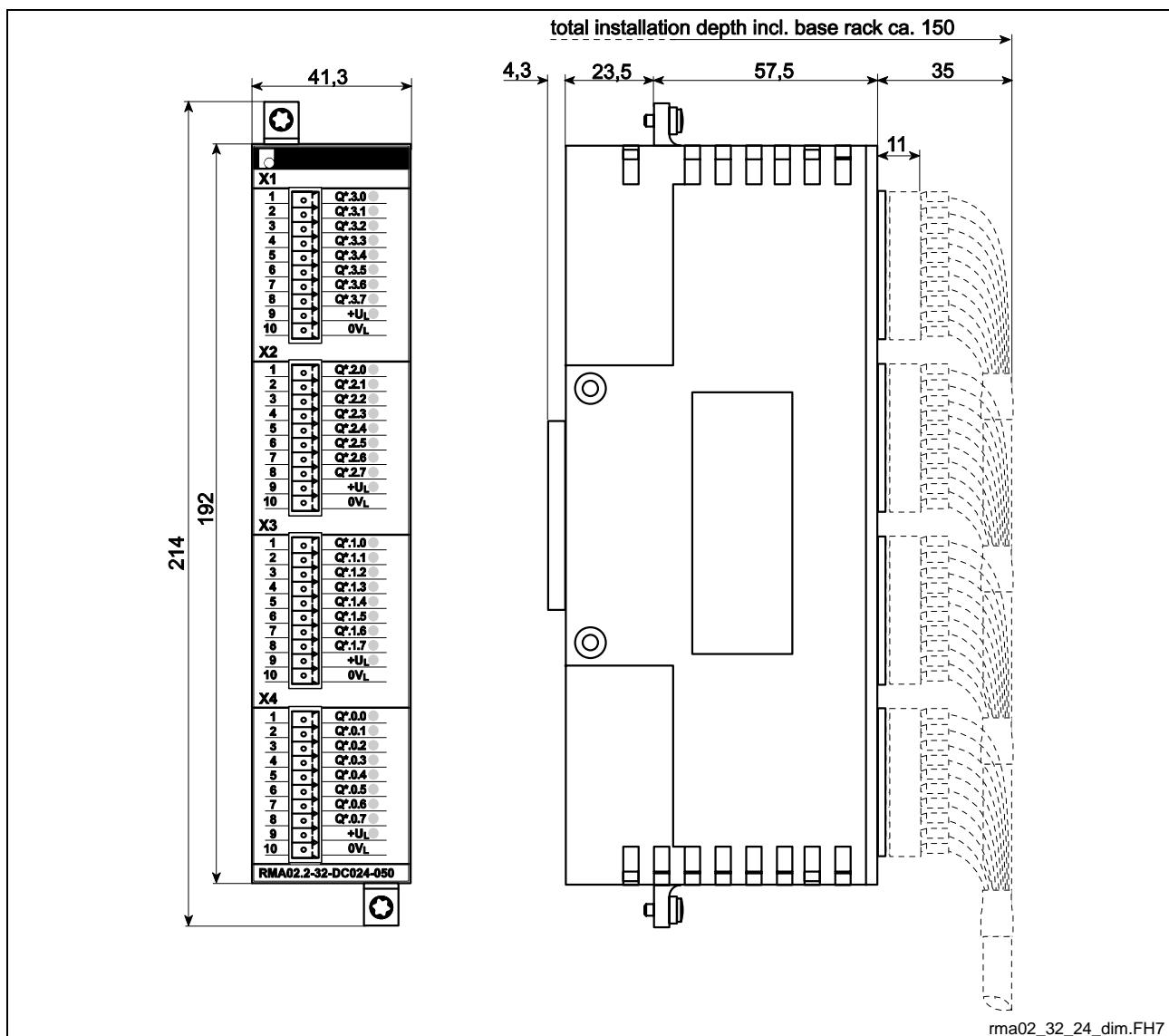


Fig. 12-19: RMA02.2-32-DC024-050 Mounting Dimensions

Pin Assignments

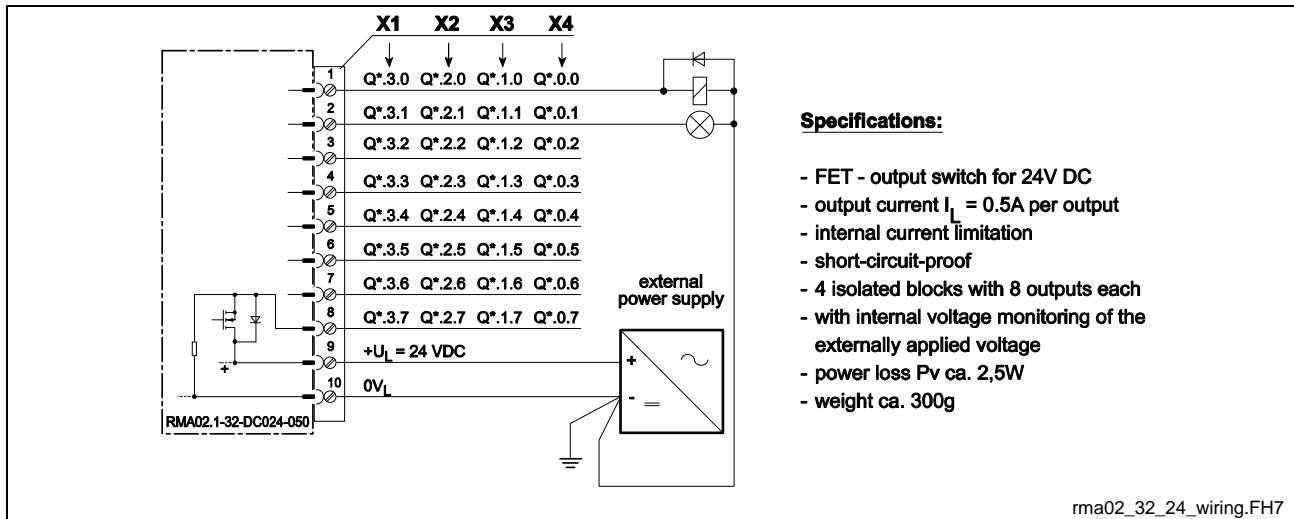


Fig. 12-20: RMA02.2-32-DC024-050 Wiring Diagram

RMA02.2-16-AC230-200 Output Module

Brief Description

The digital AC output modules are designed for the connection of digital actuators that operate on the mains voltage. The 16 active 1 switching outputs are arranged in 2 isolated groups of 8 outputs each. Each 230V AC output is able to source up to 2A.

Mounting Dimensions

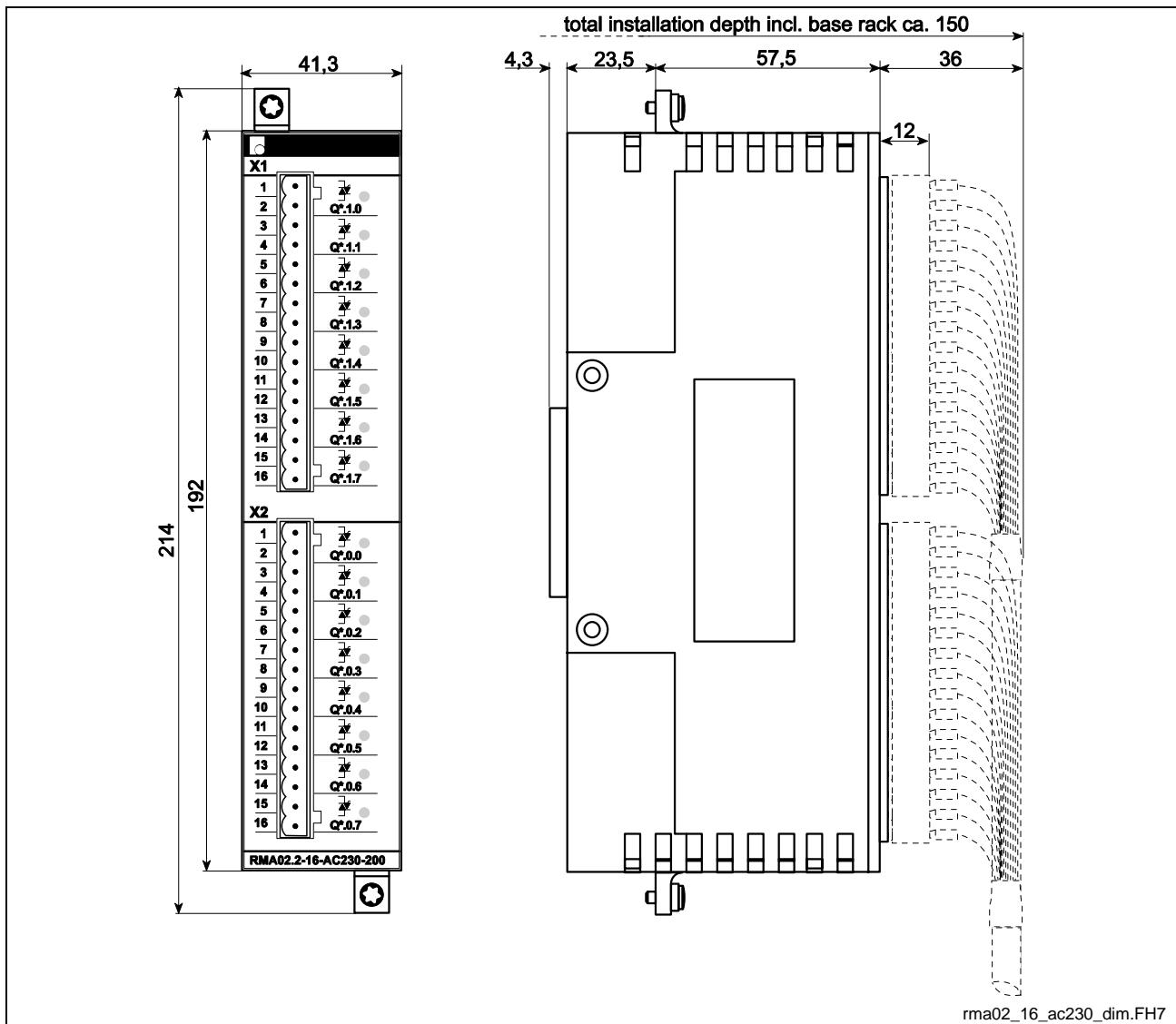


Fig. 12-21: RMA02.2-16-AC230-200 Mounting Dimensions

Pin Assignments

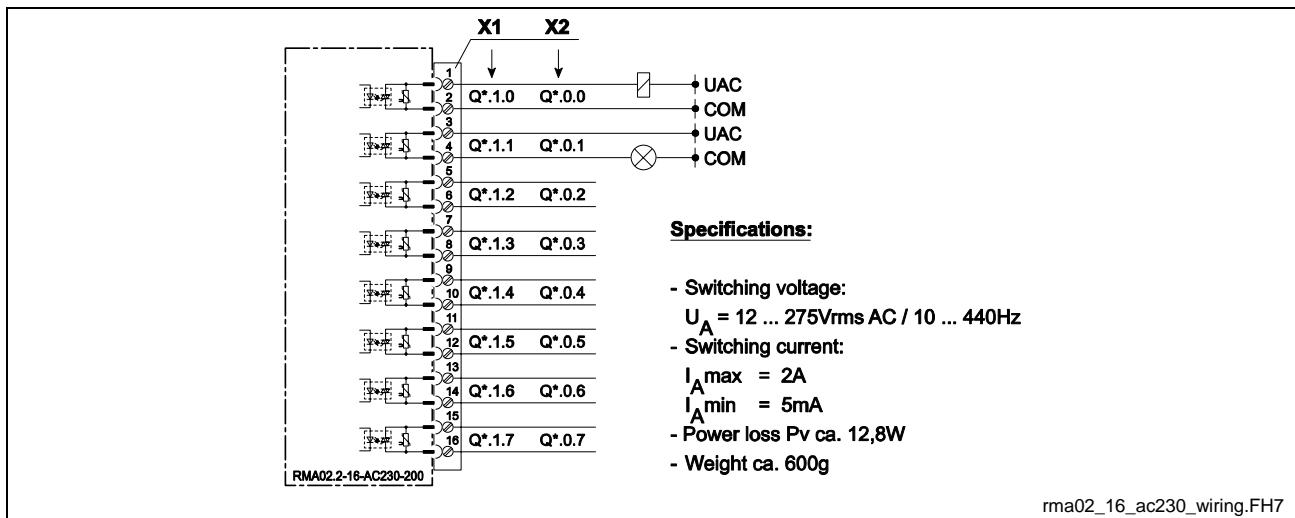


Fig. 12-22: RMA02.2-16-AC230-200 Wiring Diagram

RMA02.2-16-RE230-200 Output Module

Brief description

The digital relay output modules are designed as floating switching contacts for AC and DC. The 16 active 1 switching outputs are arranged in 2 isolated groups of 8 outputs each. Depending on the load, the maximum switching capacity of each output is between 50W and 200W.

Mounting Dimensions

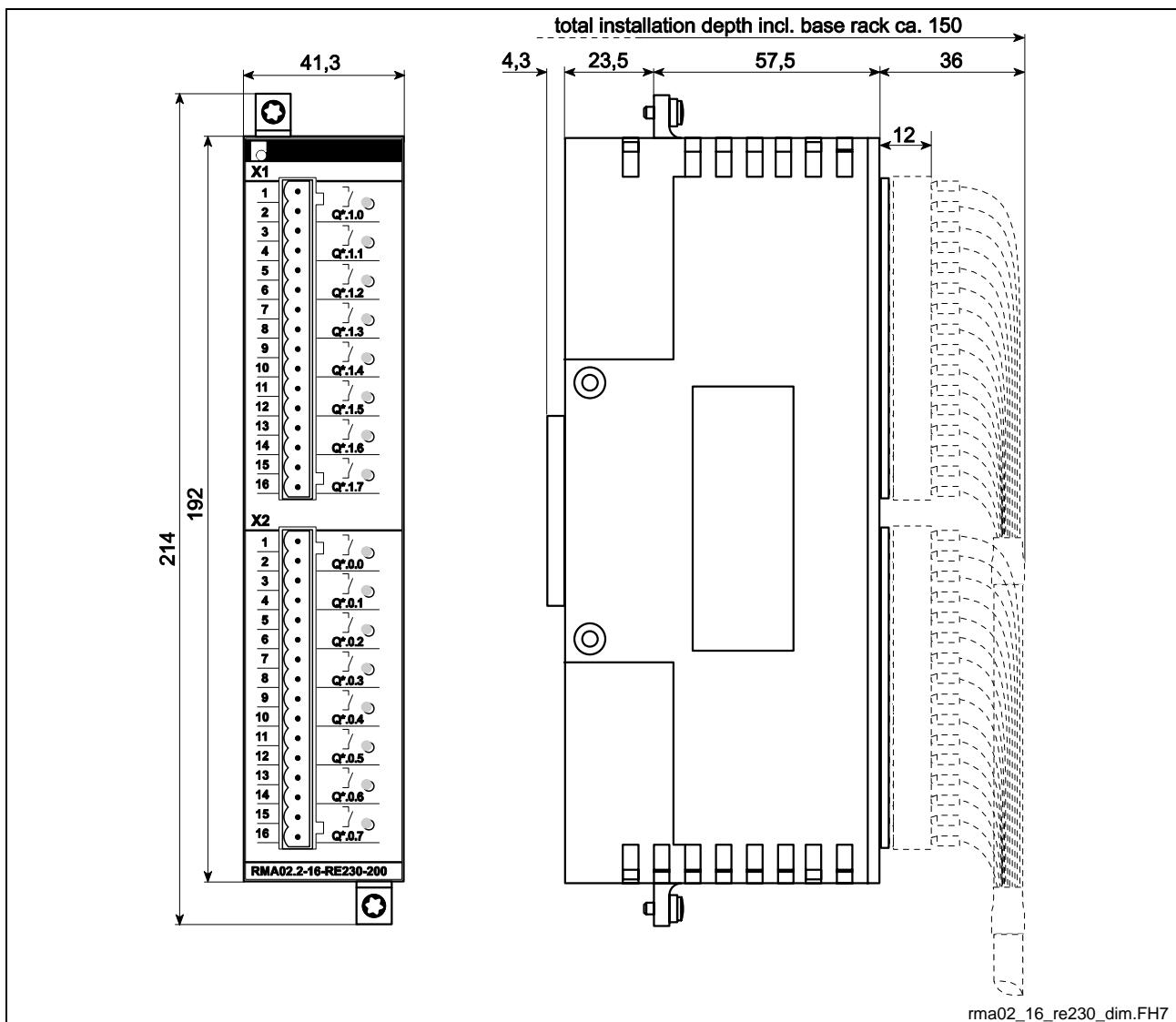


Fig. 12-23: RMA02.2-16-RE230-200 Mounting Dimensions

Pin Assignments

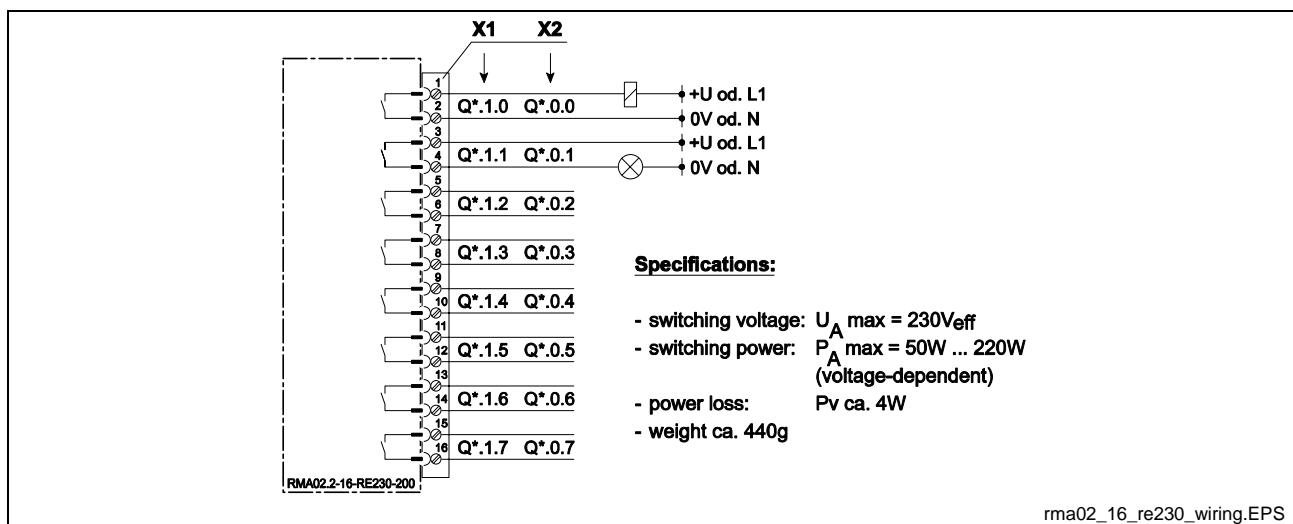


Fig. 12-24: RMA02.2-16-RE230-200 Wiring Diagram

RMC02.2-2E-1A Analog Module

Brief description

The RECO module RMC02.2-2E-1A is an analog I/O module for the SERCOS RECO system. The module is used in conjunction with the SERCOS communication module RMK02.2-LWL-SER in the RMB02.2 racks.

The module possesses 2 isolated input channels and one isolated output channel. 2- and 3-wire actuators and/or 2-/3- and 4-wire sensors can be connected to these outputs. Each input has a separate constant current source (2.5 mA) that eliminates the need for an external power supply for most sensors.

The analog output is available in parallel as a +/- 10V voltage output and a 0 - 20mA current output. Each input and output has its own connector.

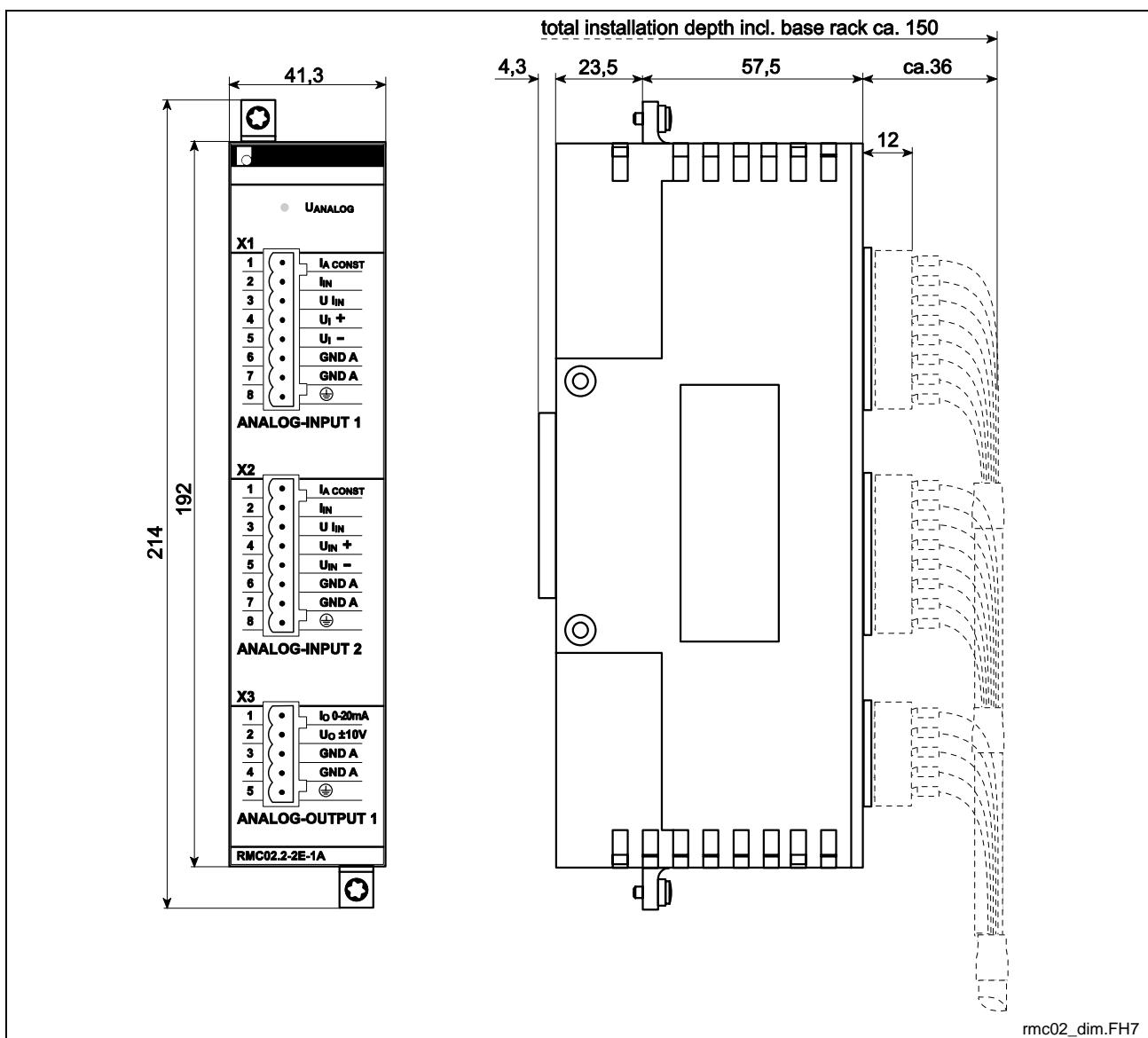


Fig. 12-25 RMC02.2-2E-1A Mounting Dimensions

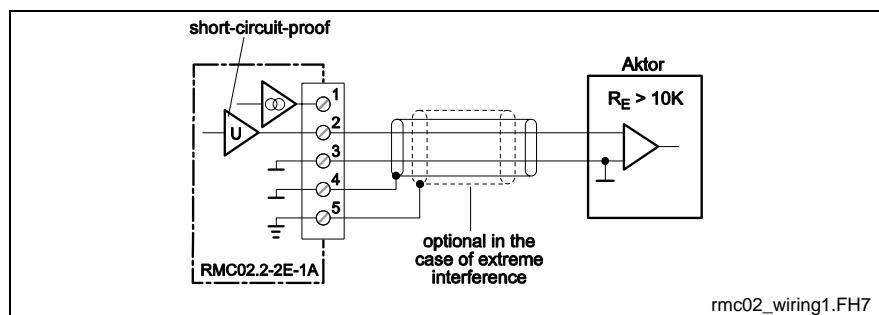
$\pm 10V$ Voltage Output

Fig. 12-26: Typical Wiring of Voltage Output

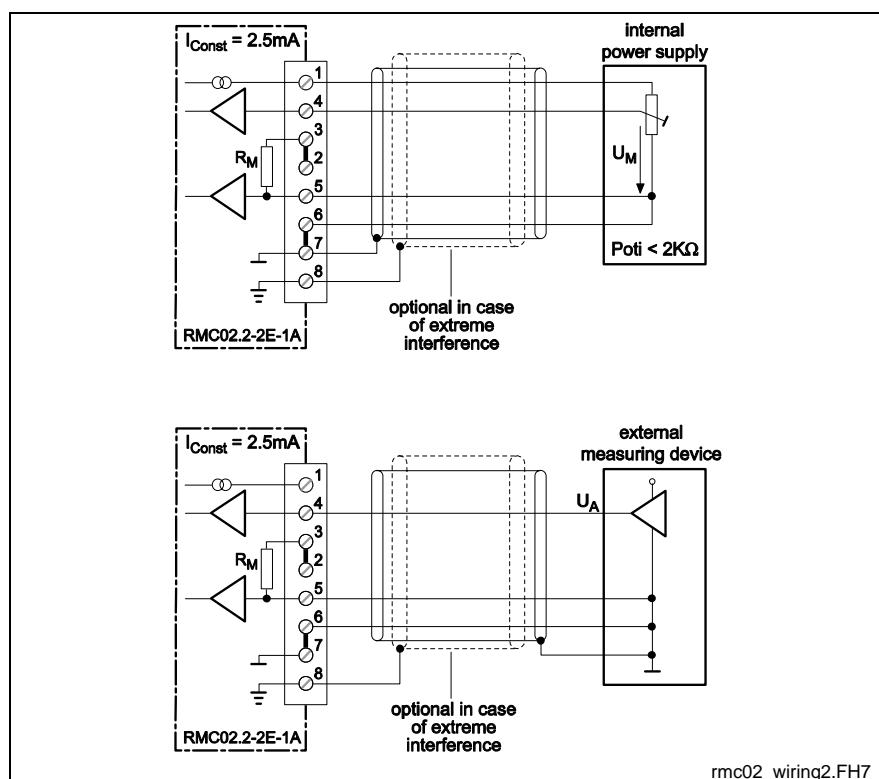
 $\pm 10V$ Voltage Measurement ($R_{in} > 1M\Omega$)

Fig. 12-27: Typical Wiring of Voltage Measurement

0 - 20 mA Current Output

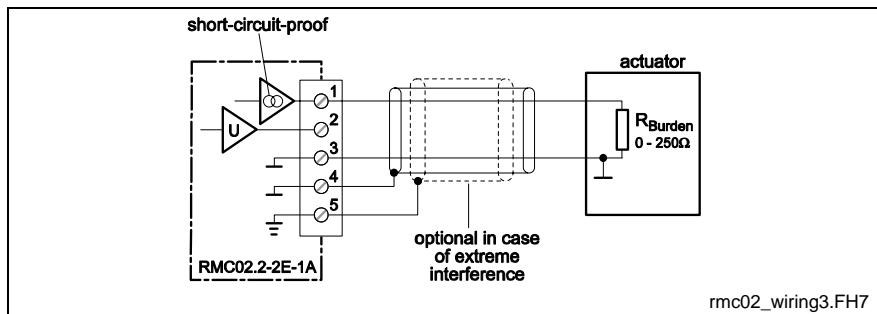


Fig. 12-28: Typical Wiring of Current Output

0 - 20 mA Current Measurement

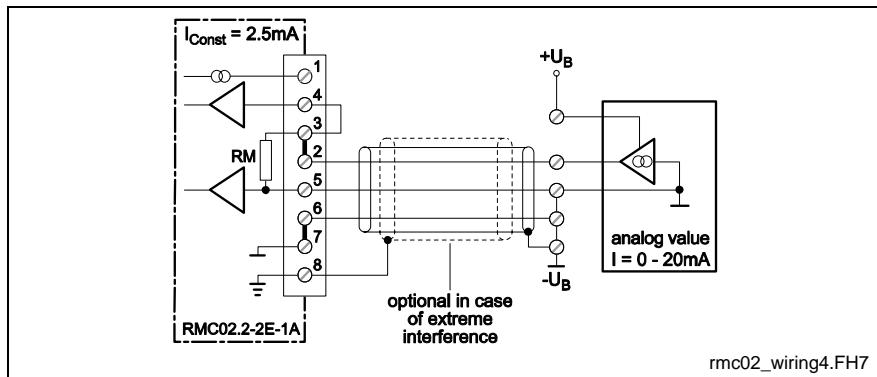


Fig. 12-29: Typical Wiring of Current Measurement

Temperature Measurement using Pt 100 Element

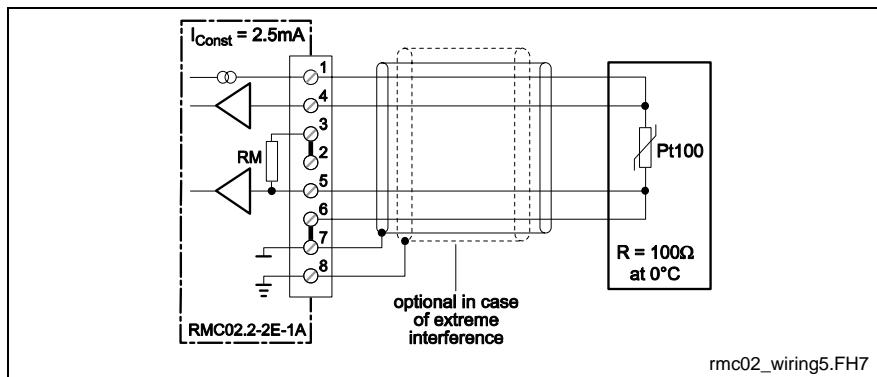


Fig. 12-30: Typical Wiring for Temperature Measurement using Pt 100 Element

12.2 Dimensional Sheet, Terminal Diagrams Drives

SERCOS interface DSS02.1M

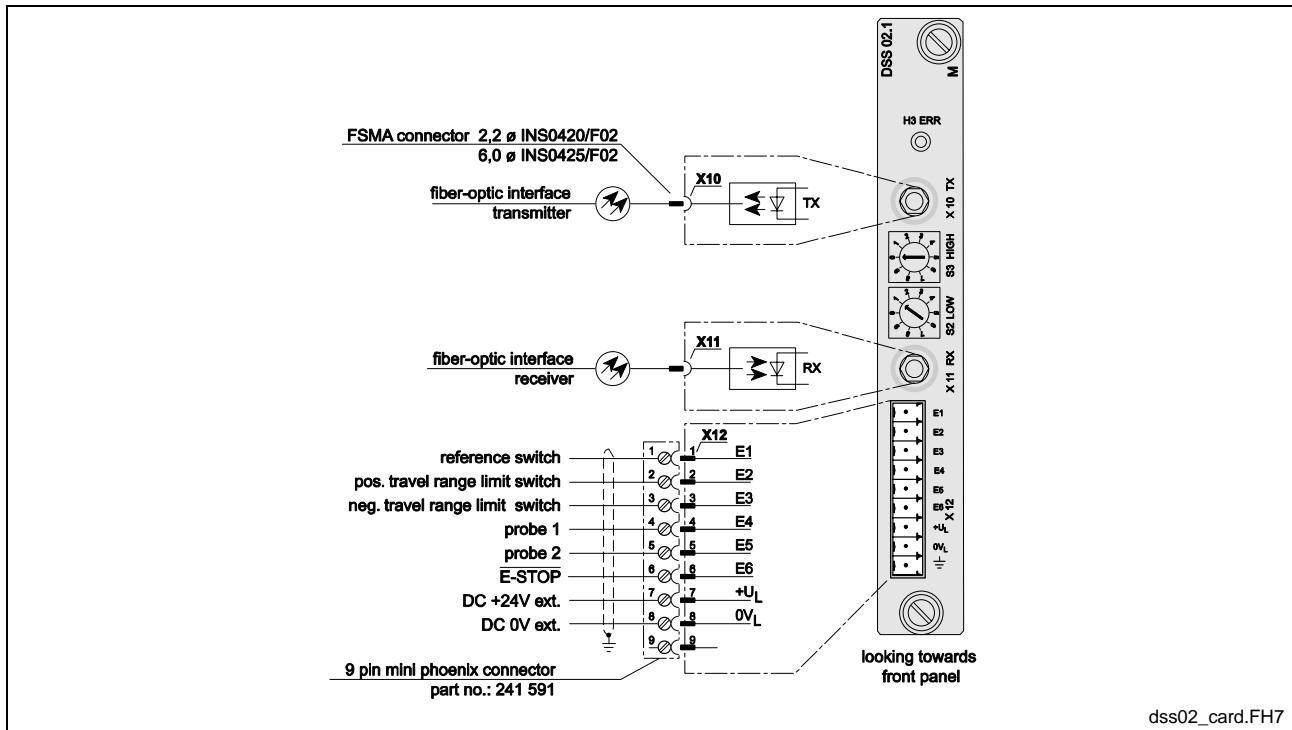


Fig. 12-31: DSS02.1M Connection Diagram

Input / Output interface DEA

DEA04.2M, DEA05.2M, DEA06.2M

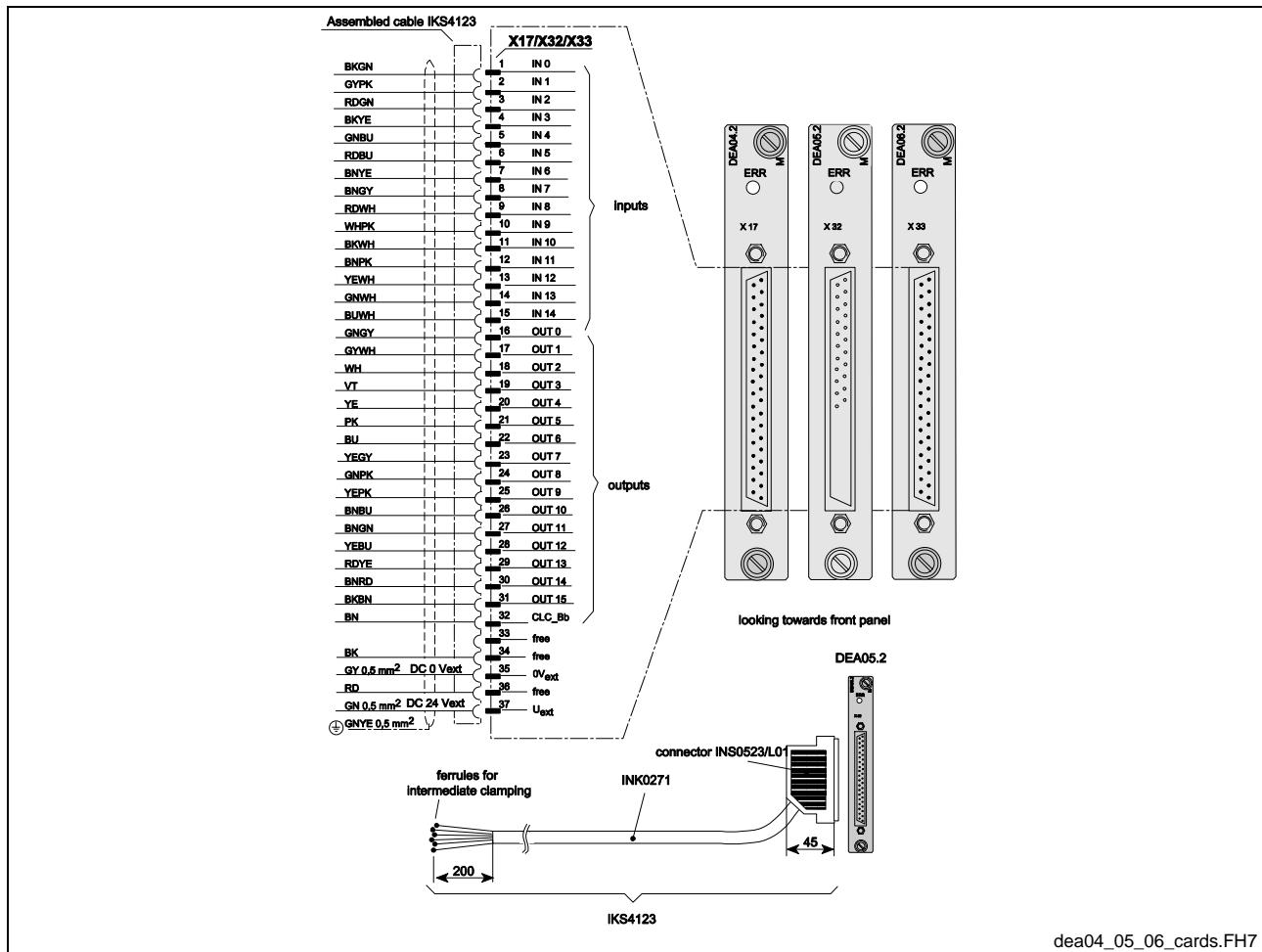


Fig. 12-32: DEA04.2M, DEA05.2M, DEA06.2M Connection Diagram

DEA08.1M, DEA09.1M, DEA10.1M

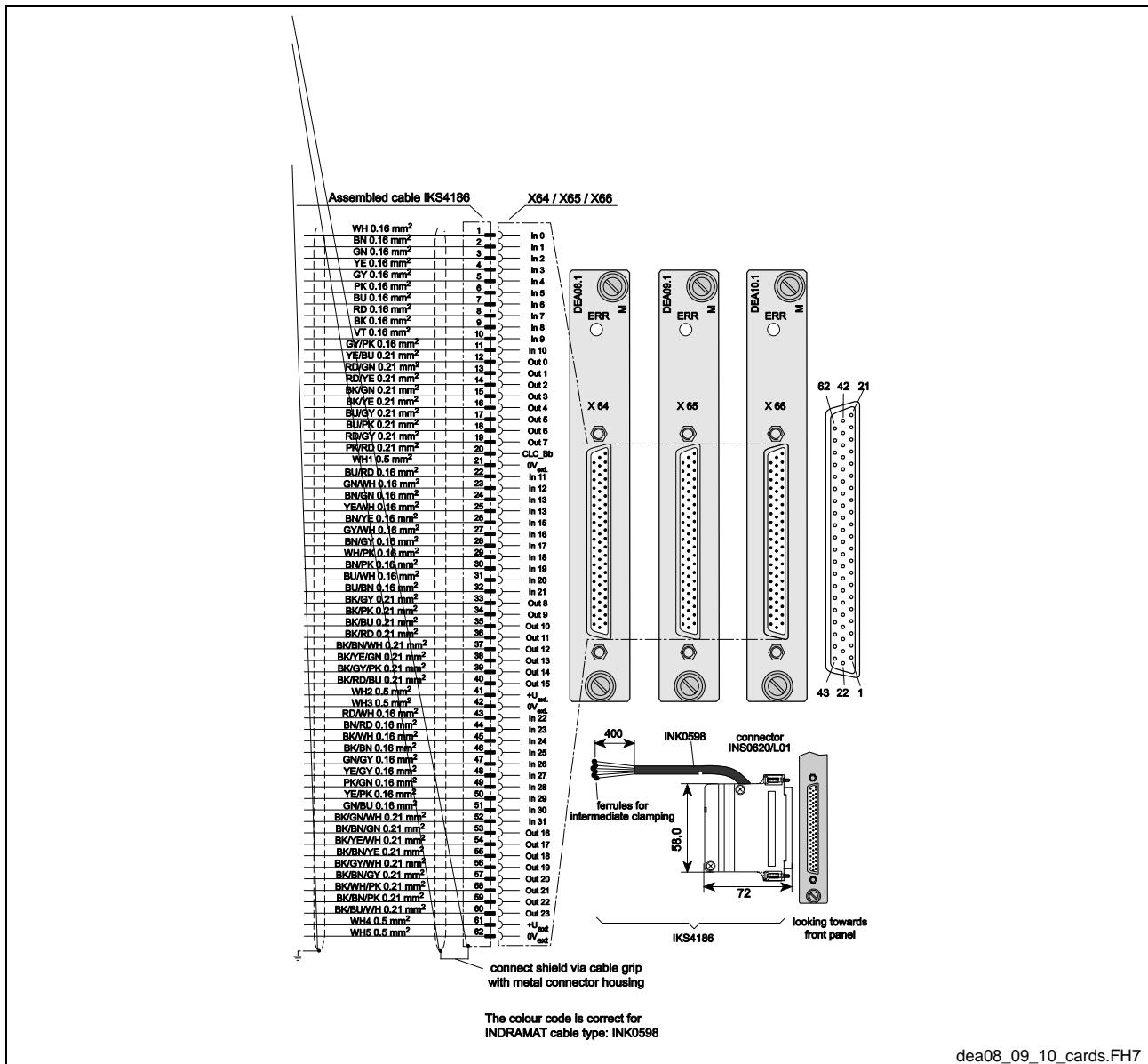


Fig. 12-33: DEA08.1M, DEA09.1M, DEA10.1M Connection Diagram

Analog interface with Actual Position Value Output DAE02.1M

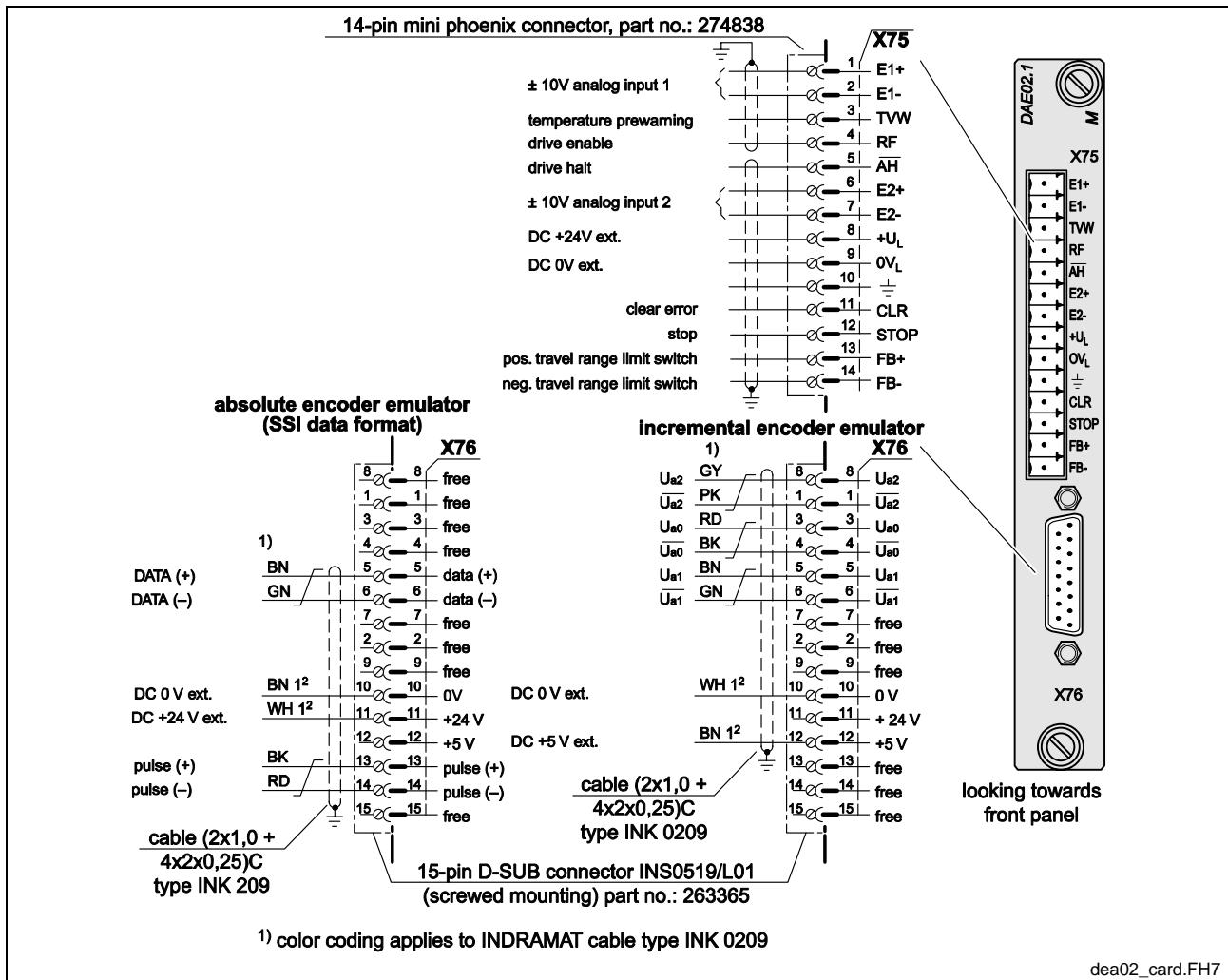


Fig. 12-34: DAE02.1M Connection Diagram

dea02_card.FH7

13 Index

O	DSS02.1M	12-24
06-0986	9-2
B		
battery.....	4-7	
BTC06	8-1	
Display.....	8-2	
Emergency Shut-Off	8-3	
Enclosure Dimensions.....	8-5	
Flash.....	8-3	
Hardware and Firmware	10-13	
Live-Man Switch	8-3	
Main Connection.....	8-8	
Power consumption	8-2	
Protection	8-2	
RS232 Interface.....	8-9	
Supply voltage	8-2	
Temperature range.....	8-2	
Weight	8-2	
BTC06 to PPC-R Connection ...	8-11	
BTC06 to PPC-R Terminal Strip		
Connection	8-12	
BTV		
Features	8-14	
Firmware.....	10-15	
Hardware	10-15	
BTV04.....	8-13	
BTV05.....	8-13	
BTV06.....	8-14	
BTZ01.1 Junction Box	8-10	
C		
CNS01 ControlNet Slave Interface		
.....	6-7	
ControlNet		
Diagnostics	6-8	
Specifications	6-9	
D		
DAE02.1	5-11	
DAE02.1M	12-27	
DAQ03 Expansion Card	7-4	
DAQ03.1R	12-4	
DEA	12-25	
DEA Digital Drive I/O Cards.....	5-10	
DEA04.2M, DEA05.2M, DEA06.2M		
.....	12-25	
DEA08.1M, DEA09.1M, DEA10.1M		
.....	12-26	
DeviceNet	6-4	
Diagnostics	6-5	
Specifications	6-6	
Transceiver Voltage.....	6-6	
DIAX I/O modules	5-4	
DIAX04 digital drive	1-8	
DIAX04 Power Supplies	1-7	
Double Link Ring	7-7	
Double Ring.....	7-7	
DPS01	12-4	
DPS01 Profibus-DP Slave Interface		
.....	6-1	
Drive Address Settings	9-6	
E		
ECODRIVE03 Digital Drive		
Controllers	1-9, 1-11	
EcoX Bus System	5-12	
Torque Following Mode	5-14	
EMD I/O module	5-4	
Emergency Stop button	8-3	
Ethernet Interface	6-10	
Ethernet/IP	6-10	
F		
Fiber Optic		
Technical Data	9-4	
Fiber Optic Bulkhead	9-3	
Fiber Optic Cable.....	9-1	
Fieldbus		
ControlNet.....	6-1	
DeviceNet	6-1	
Ethernet/IP.....	6-1	
Interbus.....	6-1	
Profibus.....	6-1	
Firmware		
Basic GPP	10-10	
Boot Loader	10-10	
G		
Glass fiber optic cable	9-2	
Grounding		
System.....	4-29	
H		
Hardware Configurations		
PPC-R01.2.....	10-1	
PPC-R02.2.....	10-4	
HDD02.2 digital drive controller .	1-8	
HDS digital drive controller	1-8	
HVE power supply	1-7	
HVR power supply	1-7	
I		
I/O modules	4-25, 5-1	
Accessing	5-1	
Configuring	5-5	
EMD	5-12	
Local RECO02	5-1	
SERCOS.....	5-9	
IBS03	12-5	
IBS03 Interbus Slave Interface		6-13
IKB0010	8-9	
IKO 0001	9-2
IKO 0982.....	9-2	
IKO 0985.....	9-2	
Interbus		
Diagnostics	6-14	
Specifications.....	6-15	
L		
Live-Man switch	8-2, 8-3	

Local RECO02.....	5-1
Local RECO02 I/O station	5-3
LWL.....	9-1
M	
MTS-R	4-17
Error codes	4-23
General Specifications.....	4-19
H1 Status and Diagnostic Display	4-22
Interfaces.....	4-19
Maximum current consumption4-19	
Rechargeable Battery.....	4-20
SUP-E0*-MTC200-R.....	4-23
Supply Voltage	4-19
X1 Power Supply Voltage.....	4-20
X10 PROG Settings.....	4-21
X16 COM Settings	4-22
MTS-R Hardware	4-17
N	
NSW01	
Hardware	7-3
Option Card PLS Specifications7-3	
P	
panic position	8-4
PCMCIA flash memory card	4-16
Pin Assignment	
X1 Power supply.....	4-5, 4-12
PPC	
Diagnostic Displays	4-15
PPC-P11.1	
Control.....	4-9
Digital I/O Specs.....	4-11
General Specifications.....	4-11
Hardware	4-9
Interfaces.....	4-11
Supply Voltage	4-11
PPC-R	
Control	4-1
Digital I/O Specs.....	4-4, 4-11
Digital Input / Output Supply	
Voltage	4-6, 4-12
General Specifications.....	4-3
Hardware	4-1
Hardware and Firmware	10-1
Interfaces.....	4-4
Maximum current consumption4-3	
Motion Control System	5-1
Power Supply Voltage	4-5
PSM01.1 memory card	4-16
Supply Voltage	4-3
PPC-R to BTV.....	8-16
PPC-R01.2 and PPC-R02.2	
Dimensions.....	12-3
Primary Ring	7-6, 7-7
Profibus	
Diagnostics	6-2
Specifications	6-3
PSM Memory Module	10-12
PSM01.1 memory card	4-16
R	
RECO 02 Hardware	4-25
RECO02	4-25
RECO02 Bit Access.....	5-5
16-Bit I/O Modules	5-5
32-Bit I/O Modules	5-5
RMC02.2 Analog I/O Module .	5-7
RECO02 I/O modules	4-25
Remote Analog Input Drive Cards5-11	
Remote I/O Stations	5-3
RMA02.2-16-AC230-200 Mounting Dimensions	12-17
RMA02.2-16-DC024-200 Mounting Dimensions	12-13
RMA02.2-16-RE230-200 Mounting Dimensions	12-19
RMA02.2-32-DC024-050 Mounting Dimensions	12-15
RMB02.2-02.....	4-26
RMB02.2-02 Rack Unit	12-1
RMB02.2-04 Rack Unit	12-2
RMC02.2-2E-1A Mounting Dimensions	12-21
RME02.2-16-AC115 Mounting dimensions.....	12-11
RME02.2-16-DC024 Mounting Dimensions	12-7
RME02.2-32-DC024 Mounting Dimensions	12-9
RS485 Communication to PPC-R8-16	
S	
Safety Concept	8-4
Safety Instructions for Electric Drives and Controls	3-1
Secondary Ring	7-7
SERCOS	
Baudrate	9-8
Transmitter Output Power	9-9
Serial Communication.....	4-14
Single Ring	7-6
SUP-E0*-MTC200-R.....	4-23
SUP-E01-PPC-R.....	4-7
SUP-M01-BTC06 Wall-Mounting Bracket.....	8-7
Switch elements.....	8-2
T	
Typecode	
BTC06.2.....	11-4
BTV04.2	11-4
BTV05.2	11-5
BTV06.1	11-5
BTZ01.1	11-6
PPC-R01.2.....	11-1
V	
VisualMotion System Overview .	1-1

14 Service & Support

14.1 Helpdesk

Unser Kundendienst-Helpdesk im Hauptwerk Lohr am Main steht Ihnen mit Rat und Tat zur Seite. Sie erreichen uns

- telefonisch: **+49 (0) 9352 40 50 60**
über Service Call Entry Center Mo-Fr 07:00-18:00
- per Fax: **+49 (0) 9352 40 49 41**
- per e-Mail: **service@boschrexroth.de**

Our service helpdesk at our headquarters in Lohr am Main, Germany can assist you in all kinds of inquiries. Contact us

- by phone: **+49 (0) 9352 40 50 60**
via Service Call Entry Center Mo-Fr 7:00 am - 6:00 pm
- by fax: **+49 (0) 9352 40 49 41**
- by e-mail: **service@boschrexroth.de**

14.2 Service-Hotline

Außerhalb der Helpdesk-Zeiten ist der Service direkt ansprechbar unter

oder **+49 (0) 171 333 88 26**
+49 (0) 172 660 04 06

After helpdesk hours, contact our service department directly at

+49 (0) 171 333 88 26
+49 (0) 172 660 04 06

14.3 Internet

Ergänzende Hinweise zu Service, Reparatur und Training sowie die **aktuellen** Adressen unserer Service- und Vertriebsbüros finden Sie unter **www.boschrexroth.com** – einige Angaben in dieser Dokumentation können inzwischen überholt sein.

Außerhalb Deutschlands nehmen Sie bitte zuerst Kontakt mit Ihrem lokalen Ansprechpartner auf.

- | | |
|--------------------------|----------------------------------|
| <input type="checkbox"/> | Verkaufsniederlassungen |
| <input type="checkbox"/> | Niederlassungen mit Kundendienst |

Additional notes about service, repairs and training as well as the **actual** addresses of our sales- and service facilities are available on the Internet at **www.boschrexroth.com** – some information in this documentation may meanwhile be obsolete.

Please contact the sales & service offices in your area first.

- | | |
|--------------------------|---------------------------|
| <input type="checkbox"/> | sales agencies |
| <input type="checkbox"/> | offices providing service |

14.4 Vor der Kontaktaufnahme... - Before contacting us...

Wir können Ihnen schnell und effizient helfen wenn Sie folgende Informationen bereithalten:

detaillierte Beschreibung der Störung und der Umstände.

Angaben auf dem Typenschild der betreffenden Produkte, insbesondere Typenschlüssel und Seriennummern.

Tel.-/Faxnummern und e-Mail-Adresse, unter denen Sie für Rückfragen zu erreichen sind.

For quick and efficient help, please have the following information ready:

1. Detailed description of the failure and circumstances.
2. Information on the nameplate of the affected products, especially typecodes and serial numbers.
3. Your phone/fax numbers and e-mail address, so we can contact you in case of questions.

14.5 Kundenbetreuungsstellen - Sales & Service Facilities

Deutschland – Germany

vom Ausland: (0) nach Landeskennziffer weglassen!
from abroad: don't dial (0) after country code!

Vertriebsgebiet Mitte Germany Centre	SERVICE CALL ENTRY CENTER MO – FR von 07:00 - 18:00 Uhr from 7 am - 6 pm Tel. +49 (0) 9352 40 50 60 service@boschrexroth.de	SERVICE HOTLINE MO – FR von 17:00 - 07:00 Uhr from 5 pm - 7 am + SA / SO Tel.: +49 (0)172 660 04 06 oder / or Tel.: +49 (0)171 333 88 26	SERVICE ERSATZTEILE / SPARES verlängerte Ansprechzeit - extended office time - ♦ nur an Werktagen - only on working days - ♦ von 07:00 - 18:00 Uhr - from 7 am - 6 pm - Tel. +49 (0) 9352 40 42 22
Vertriebsgebiet Süd Germany South	Gebiet Südwest Germany South-West	Vertriebsgebiet Ost Germany East	Vertriebsgebiet Ost Germany East
Bosch Rexroth AG Landshuter Allee 8-10 80637 München Tel.: +49 (0)89 127 14-0 Fax: +49 (0)89 127 14-490	Bosch Rexroth AG Vertrieb Deutschland – VD-BI Geschäftsbereich Regionalzentrum Südwest Ringstrasse 70 / Postfach 1144 70736 Fellbach / 70701 Fellbach Tel.: +49 (0)711 57 61-100 Fax: +49 (0)711 57 61-125	Bosch Rexroth AG Beckerstraße 31 09120 Chemnitz Tel.: +49 (0)371 35 55-0 Fax: +49 (0)371 35 55-333	Bosch Rexroth AG Regionalzentrum Ost Walter-Köhn-Str. 4d 04356 Leipzig Tel.: +49 (0)341 25 61-0 Fax: +49 (0)341 25 61-111
Vertriebsgebiet West Germany West	Vertriebsgebiet Mitte Germany Centre	Vertriebsgebiet Nord Germany North	Vertriebsgebiet Nord Germany North
Bosch Rexroth AG Vertrieb Deutschland Regionalzentrum West Borsigstrasse 15 40880 Ratingen Tel.: +49 (0)2102 409-0 Fax: +49 (0)2102 409-406	Bosch Rexroth AG Regionalzentrum Mitte Waldecker Straße 13 64546 Mörfelden-Walldorf Tel.: +49 (0) 61 05 702-3 Fax: +49 (0) 61 05 702-444	Bosch Rexroth AG Walsroder Str. 93 30853 Langenhagen Tel.: +49 (0) 511 72 66 57-0 Fax: +49 (0) 511 72 66 57-95	Bosch Rexroth AG Kieler Straße 212 22525 Hamburg Tel.: +49 (0) 40 81 955 966 Fax: +49 (0) 40 85 418 978

Europa (West) - Europe (West)

vom Ausland: (0) nach Landeskennziffer weglassen,
from abroad: don't dial (0) after country code,
Italien: 0 nach Landeskennziffer mitwählen
Italy: dial 0 after country code

Austria - Österreich	Austria – Österreich	Belgium - Belgien	Denmark - Dänemark
Bosch Rexroth AG Stachegasse 13 1120 Wien Tel.: +43 (0) 985 25 40 Fax: +43 (0) 985 25 40-93	Bosch Rexroth AG Industriepark 18 4061 Pasching Tel.: +43 (0)7221 605-0 Fax: +43 (0)7221 605-21	Bosch Rexroth AG Electric Drives & Controls Industrielaan 8 1740 Ternat Tel.: +32 (0)2 5830719 Service: +32 (0)2 5830717 Fax: +32 (0)2 5830731 indramat@boschrexroth.be	Bosch Rexroth A/S Zinkvej 6 8900 Randers Tel.: +45 (0)87 11 90 60 Fax: +45 (0)87 11 90 61
Great Britain – Großbritannien	Finland - Finnland	France - Frankreich	France - Frankreich
Bosch Rexroth Ltd. Broadway Lane, South Cerney Cirencester, Glos GL7 5UH Tel.: +44 (0)1285 863000 Fax: +44 (0)1285 863030 sales@boschrexroth.co.uk service@boschrexroth.co.uk	Rexroth Mecman Oy Ansatie 6 017 40 Vantaa Tel.: +358 (0)9 84 91-11 Fax: +358 (0)9 84 91-13 60	Bosch Rexroth S.A. Avenue de la Trentaine BP. 74 77503 CHELLES CEDEX Tel.: +33 (0)164 72-70 00 Fax: +33 (0)164 72-63 00 Hotline: +33 (0)608 33 43 28	Bosch Rexroth S.A. 1270, Avenue de Lardenne 31100 Toulouse Tel.: +33 (0)5 61 49 95 19 Fax: +33 (0)5 61 31 00 41
France - Frankreich	Italy - Italien	Italy - Italien	Italy - Italien
Bosch Rexroth S.A. 91, Bd. Irène Joliot-Curie 69634 Vénissieux – Cedex Tel.: +33 (0)4 78 78 53 65 Fax: +33 (0)4 78 78 53 62	Bosch Rexroth S.p.A. Via G. Di Vittoria, 1 20063 Cernusco S/N.MI Tel.: +39 02 2 365 270 Fax: +39 02 700 408 252378	Bosch Rexroth S.p.A. Via Paolo Veronesi, 250 10148 Torino Tel.: +39 011 224 88 11 Fax: +39 011 220 48 04	Bosch Rexroth S.p.A. Via del Progresso, 16 (Zona Ind.) 35020 Padova Tel.: +39 049 8 70 13 70 Fax: +39 049 8 70 13 77
Italy - Italien	Italy - Italien	Netherlands - Niederlande/Holland	Netherlands - Niederlande/Holland
Bosch Rexroth S.p.A. Via Mascia, 1 80053 Castellammare di Stabia NA Tel.: +39 081 8 71 57 00 Fax: +39 081 8 71 68 85	Bosch Rexroth S.p.A. Viale Oriani, 38/A 40137 Bologna Tel.: +39 051 34 14 14 Fax: +39 051 34 14 22	Bosch Rexroth B.V. Kruisbroeksestraat 1 (P.O. Box 32) 5281 RV Boxtel Tel.: +31 (0)411 65 19 51 Fax: +31 (0)411 65 14 83 indramat@hydraudyne.nl	Bosch Rexroth Services B.V. Kruisbroeksestraat 1 (P.O. Box 32) 5281 RV Boxtel Tel.: +31 (0)411 65 19 51 Fax: +31 (0)411 67 78 14
Norway - Norwegen	Spain - Spanien	Spain - Spanien	Sweden - Schweden
Bosch Rexroth AS Berghagan 1 or: Box 3007 1405 Ski-Langhus 1402 Ski Tel.: +47 (0)64 86 41 00 Fax: +47 (0)64 86 90 62 jul.ruud@rexroth.no	Bosch Rexroth S.A. Centro Industrial Santiga Obradors s/n 08130 Santa Perpetua de Mogoda Barcelona Tel.: +34 9 37 47 94 00 Fax: +34 9 37 47 94 01	Bosch Rexroth S.A. Goimendi S.A. Parque Empresarial Zuatzu C/ Francisco Grandmontagne no.2 20018 San Sebastian Tel.: +34 9 43 31 84 21 - service: +34 9 43 31 84 56 Fax: +34 9 43 31 84 27 - service: +34 9 43 31 84 60 satindramat-goimendi@adeqi.es	Rexroth Mecman Svenska AB Varuvägen 7 125 81 Stockholm Tel.: +46 (0)8 727 92 00 Fax: +46 (0)8 647 32 77
Sweden - Schweden	Switzerland West - Schweiz West	Switzerland East - Schweiz Ost	
Rexroth Mecman Svenska AB Ekvändan 7 254 67 Helsingborg Tel.: +46 (0) 42 38 88 -50 Fax: +46 (0) 42 38 88 -74	Bosch Rexroth Suisse SA Rue du village 1 1020 Renens Tel.: +41 (0)21 632 84 20 Fax: +41 (0)21 632 84 21	Bosch Rexroth Schweiz AG Hemrietstrasse 2 8863 Buttikon Tel.: +41 (0) 55 46 46 205 Fax: +41 (0) 55 46 46 222	

Europa (Ost) - Europe (East)

vom Ausland: (0) nach Landeskennziffer weglassen
from abroad: don't dial (0) after country code

Czech Republic - Tschechien	Czech Republic - Tschechien	Hungary - Ungarn	Poland – Polen
Bosch -Rexroth, spol.s.r.o. Hviezdoslavova 5 627 00 Brno Tel.: +420 (0)5 48 126 358 Fax: +420 (0)5 48 126 112	DEL a.s. Strojírenská 38 Zdar nad Sázavou 591 01 Czech republic Tel.: +420 616 64 3144 Fax: +420 616 216 57	Bosch Rexroth Kft. Angol utca 34 1149 Budapest Tel.: +36 (1) 364 00 02 Fax: +36 (1) 383 19 80	Bosch Rexroth Sp.zo.o. Biuro Poznan ul. Dabrowskiego 81/85 60-529 Poznan Tel.: +48 061 847 64 62 /-63 Fax: +48 061 847 64 02
Rumania - Rumänien	Russia - Russland	Russia - Russland	Turkey - Türkei
Bosch Rexroth Sp.zo.o. Str. Drobet nr. 4-10, app. 14 70258 Bucuresti, Sector 2 Tel.: +40 (0)1 210 48 25 +40 (0)1 210 29 50 Fax: +40 (0)1 210 29 52	Bosch Rexroth Wolokolamskoje Chaussee 73 Zimmer 406, 408 RUS – 123424 Moskau Tel.: +7 095/ 232 08 34 +7 095/ 232 08 35 Fax: +7 095/ 232 08 36 info.rex@rexroth.ru	ELMIS 10, Internationalnaya Str. 246640 Gomel, Belarus Tel.: +375/ 232 53 42 70 Fax: +375/ 232 53 37 69 elmis_ltd@yahoo.com	Bosch Rexroth Otomasyon San & Tic. A.S. Fevzi Cakmak Cad No. 3 34630 Sefaköy İstanbul Tel.: +90 212 541 60 70 Fax: +90 212 599 34 07
Slowenia - Slowenien			
DOMEI Otoki 21 64 228 Zelezniki Tel.: +386 5 5117 152 Fax: +386 5 5117 225 brane.ozbek@domei.si			

Africa, Asia, Australia – incl. Pacific Rim

vom Ausland: (0) nach Landeskennziffer weglassen!
from abroad: don't dial (0) after country code!

Australia - Australien	Australia - Australien	China	China
AIMS - Australian Industrial Machinery Services Pty. Ltd. Unit 3/45 Horne ST Campbellfield , VIC 3061 Melbourne Tel.: +61 (0) 393 590 228 Fax: +61 (0) 393 590 286 Hotline: +61 (0) 419 369 195 terryobrien@aimservices.com.au	Bosch Rexroth Pty. Ltd. No. 7, Endeavour Way Braeside Victoria, 31 95 Melbourne Tel.: +61 (0)3 95 80 39 33 Fax: +61 (0)3 95 80 17 33 mel@rexroth.com.au	Bosch Rexroth Ltd. Wai Gaoqiao Free Trade Zone No.122, Fu Te Dong Yi Road Shanghai 200131 - P.R.China Tel.: +86 21 58 66 30 30 Fax: +86 21 58 66 55 23 roger.shi_sh@boschrexroth.com.cn	Bosch Rexroth (China) Ltd. 15/F China World Trade Center 1, Jianguomenwai Avenue Beijing 100004, P.R.China Tel.: +86 10 65 05 03 80 Fax: +86 10 65 05 03 79
China	China	Hongkong	India - Indien
Bosch Rexroth (China) Ltd. A-5F., 123 Lian Shan Street Sha He Kou District Dalian 116 023, P.R.China Tel.: +86 411 46 78 930 Fax: +86 411 46 78 932	Bosch Rexroth (Changzhou) Co.Ltd. Guangzhou Repres. Office Room 1014-1016, Metro Plaza, Tian He District, 183 Tian He Bei Rd Guangzhou 510075, P.R.China Tel.: +86 20 8755-0030 +86 20 8755-0011 Fax: +86 20 8755-2387	Bosch Rexroth (China) Ltd. 6 th Floor, Yeung Yiu Chung No.6 Ind Bldg. 19 Cheung Shun Street Cheung Sha Wan, Kowloon, Hongkong Tel.: +852 22 62 51 00 Fax: +852 27 41 33 44 alexis.siu@boschrexroth.com.hk	Bosch Rexroth (India) Ltd. Plot. A-58, TTC Industrial Area Thane Turbhe Midc Road Mahape Village Navi Mumbai - 400 701 Tel.: +91 (0)22 7 61 46 22 Fax: +91 (0)22 7 68 15 31
India - Indien	Indonesia - Indonesien	Japan	Japan
Bosch Rexroth (India) Ltd. Plot. 96, Phase III Peenya Industrial Area Bangalore - 560058 Tel.: +91 (0)80 8 39 73 74 Fax: +91 (0)80 8 39 43 45	PT. Rexroth Wijayakusuma Building # 202, Cilandak Commercial Estate Jl. Cilandak KKO, Jakarta 12560 Tel.: +62 21 7891169 (5 lines) Fax: +62 21 7891170 - 71	Bosch Rexroth Automation Corp. Service Center Japan Yutakagaoka 1810, Meito-ku, NAGOYA 465-0035, Japan Tel.: +81 (0)52 777 88 41 +81 (0)52 777 88 53 +81 (0)52 777 88 79 Fax: +81 (0)52 777 89 01	Bosch Rexroth Automation Corp. 1F, I.R. Building Nakamachidai 4-26-44, Tsuzuki-ku YOKOHAMA 224-0041, Japan Tel.: +81 (0)45 942 72 10 Fax: +81 (0)45 942 03 41
Korea	Malaysia	Singapore - Singapur	South Africa - Südafrika
Bosch Rexroth-Korea Ltd. 1515-14 Dadae-Dong, Saha-Ku Pusan Metropolitan City, 604-050 Republic of South Korea Tel.: +82 (0)51 26 00 741 Fax: +82 (0)51 26 00 747 gyhan@rexrothkorea.co.kr	Bosch Rexroth Sdn.Bhd. Head Office No. 3, Block B, Jalan SS 13/5 Subang Jaya Industrial Estate 47500 Petaling Jaya - Selangor Tel.: +60 (0) 3 73 44 870 Fax: +60 (0) 3 73 44 864 hockhwa@hotmail.com	Robert Bosch (SEA) Pte Ltd. Dept. RBSI-R/SAT 38-C Jalan Pemimpin Singapore 577180 Tel.: +65 35 05 470 Fax: +65 35 05 313 kenton.peh@sg.bosch.com	TECTRA Automation (Pty) Ltd. 28 Banfield Road, Industria North RSA - Maraiburg 1700 Tel.: +27 (0)11 673 20 80 Fax: +27 (0)11 673 72 69 Hotline: +27 (0)82 903 29 23 georgv@tectra.co.za
Taiwan	Thailand		
Rexroth Uchida Co., Ltd. No.17, Lane 136, Cheng Bei 1 Rd., Yungkang, Tainan Hsien Taiwan, R.O.C. Tel.: +886 (0)6 25 36 565 Fax: +886 (0)6 25 34 754 indramat@mail.net.tw	NC Advance Technology Co. Ltd. 59/76 Moo 9 Ramintrra road 34 Tharang, Bangkhen, Bangkok 10230 Tel.: +66 2 943 70 62 +66 2 943 71 21 Fax: +66 2 509 23 62 sonkawin@hotmail.com		

Nordamerika – North America

USA Hauptniederlassung - Headquarters	USA Central Region - Mitte	USA Southeast Region - Südwest	USA SERVICE-HOTLINE
<p>Bosch Rexroth Corporation Electric Drives and Controls 5150 Prairie Stone Parkway Hoffman Estates, IL 60192-3707</p> <p>Tel.: +1 847 6 45 36 00 Fax: +1 847 6 45 62 01 service@boschrexroth.com</p>	<p>Bosch Rexroth Corporation Electric Drives and Controls 1701 Harmon Road Central Region Technical Center Auburn Hills, MI 48326</p> <p>Tel.: +1 248 3 93 33 30 Fax: +1 248 3 93 29 06</p>	<p>Bosch Rexroth Corporation Electric Drives and Controls Southeastern Technical Center 3625 Swiftwater Park Drive Suwanee, Georgia 30124</p> <p>Tel.: +1 770 9 32 32 00 Fax: +1 770 9 32 19 03</p>	<p>- 7 days x 24hrs -</p> <p>+1-800-860-1055</p>
<p>USA East Region –Ost</p> <p>Bosch Rexroth Corporation Electric Drives and Controls Charlotte Regional Sales Office 14001 South Lakes Drive Charlotte, North Carolina 28273</p> <p>Tel.: +1 704 5 83 97 62 +1 704 5 83 14 86</p>	<p>USA Northeast Region – Nordost</p> <p>Bosch Rexroth Corporation Electric Drives and Controls Northeastern Technical Center 99 Rainbow Road East Granby, Connecticut 06026</p> <p>Tel.: +1 860 8 44 83 77 Fax: +1 860 8 44 85 95</p>	<p>USA West Region – West</p> <p>Bosch Rexroth Corporation 7901 Stoneridge Drive, Suite 220 Pleasant Hill, California 94588</p> <p>Tel.: +1 925 227 10 84 Fax: +1 925 227 10 81</p>	
<p>Canada East - Kanada Ost</p> <p>Bosch Rexroth Canada Corporation Burlington Division 3426 Mainway Drive Burlington, Ontario Canada L7M 1A8</p> <p>Tel.: +1 905 335 55 11 Fax: +1 905 335-41 84 michael.moro@boschrexroth.ca</p>	<p>Canada West - Kanada West</p> <p>Bosch Rexroth Canada Corporation 5345 Goring St. Burnaby, British Columbia Canada V7J 1R1</p> <p>Tel. +1 604 205-5777 Fax +1 604 205-6944 david.gunby@boschrexroth.ca</p>	<p>Mexico</p> <p>Bosch Rexroth S.A. de C.V. Calle Neptuno 72 Unidad Ind. Vallejo MEX - 07700 Mexico, D.F.</p> <p>Tel.: +52 5 754 17 11 +52 5 754 36 84 +52 5 754 12 60 Fax: +52 5 754 50 73 +52 5 752 59 43</p>	

Südamerika – South America

Argentina - Argentinien	Argentina - Argentinien	Brazil - Brasilien	Brazil - Brasilien
<p>Bosch Rexroth S.A.I.C. "The Drive & Control Company" Acassuso 48 41/47 1605 Munro Prov. Buenos Aires</p> <p>Tel.: +54 (0)11 4756 01 40 Fax: +54 (0)11 4756 01 36 mannesmann@mannesmannsaic.com.ar</p>	<p>NAKASE Servicio Tecnico CNC Calle 49, No. 5764/66 1653 Villa Balester Prov. - Buenos Aires</p> <p>Tel.: +54 (0) 11 4768 36 43 Fax: +54 (0) 11 4768 24 13 nakase@usa.net nakase@nakase.com</p>	<p>Bosch Rexroth Ltda. Av. Tégula, 888 Ponte Alta, Atibaia SP CEP 12942-440</p> <p>Tel.: +55 (0)11 4414 56 92 +55 (0)11 4414 56 84 Fax sales: +55 (0)11 4414 57 07 Fax serv.: +55 (0)11 4414 56 86 alexandre.wittwer@rexroth.com.br</p>	<p>Bosch Rexroth Ltda. R. Dr.Humberto Pinheiro Vieira, 100 Distrito Industrial [Caixa Postal 1273] BR - 89220-390 Joinville - SC</p> <p>Tel./Fax: +55 (0)47 473 58 33 Mobil: +55 (0)47 9974 6645 prochnow@zaz.com.br</p>
<p>Columbia - Kolumbien</p> <p>Reflutec de Colombia Ltda. Calle 37 No. 22-31 Santafé de Bogotá, D.C. Colombia</p> <p>Tel.: +57 1 368 82 67 +57 1 368 02 59 Fax: +57 1 268 97 37 reflutecc@inter.net.co</p>			

Bosch Rexroth AG
Electric Drives and Controls
P.O. Box 13 57
97803 Lohr, Germany
Bgm.-Dr.-Nebel-Str. 2
97816 Lohr, Germany
Phone +49 93 52-40-50 60
Fax +49 93 52-40-49 41
service.svc@boschrexroth.de
www.boschrexroth.com



R911292836

Printed in Germany
DOK-VISMOT-VM*-09VRS**-PR03-EN-P