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Rexroth VisualMotion 11
Multi-Axis Machine Control

R911309165
Edition 02

Project Planning Manual

Title

Rexroth VisualMotion 11
Multi-Axis Machine Control

Type of Documentation

Project Planning Manual

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Purpose of Documentation

This documentation describes …

- the controls and components used with the VisualMotion 11 multi-axis machine control system with Integrated PLC functionality (IndraLogic) and optional interfaces, such as Master Encoder Card, Ethernet, Fieldbus, Option Card PLS, Link Ring.

Record of Revisions

Description	Release Date	Notes
DOK-VISMOT-VM*-11VRS**-PR02-EN-P	02/2006	Final release
DOK-VISMOT-VM*-11VRS**-PR01-EN-P	05/2005	Initial release

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Note

This document has been printed on chlorine-free bleached paper.

Table of Contents

1 Rexroth VisualMotion 11 Overview

1.1 System Overview

VisualMotion is a programmable multi-axis motion and logic control system capable of controlling up to 64 intelligent digital drives from Bosch Rexroth. The PC software used for programming and commissioning motion is VisualMotion Toolkit. The programming and commissioning of PLC logic is performed using IndraLogic. The IndraLogic PLC software is integrated into VisualMotion Toolkit. IndraLogic is an IEC 61131-3 programming software tool used for programming the PLC logic portion of the motion / logic system. Refer to section 7.1, IndraLogic, in volume 1 of the VisualMotion Functional Description manual for details.

VisualMotion 11 supports the following control hardware and firmware versions:

- PPC-R22.1 using GPP 11 firmware
- PPC-P11.1 using GMP 11 firmware

1.2 PPC-R Control Overview

The PPC-R22 is a stand-alone multi-axis motion and logic control. It has the Reco 02 form factor, a form factor used by Bosch Rexroth for motion controls, PLCs and I/O modules. These devices share the LocalReco 02 back-plane bus for data exchange.

It is recommended to use the VisualMotion motion/logic control with Rexroth IndraDrive, Diax 04, and EcoDrive 03 intelligent digital drives. The communication between control and digital drives is performed using the Sercos interface, the international standard for real-time communication for digital servo drives.

VisualMotion GPP 11 firmware can provide multi-axis coordinated or non-coordinated motion control with tightly integrated logic control functions. It supports a variety of applications, from general motion control to sophisticated multiple master electronic line shafting (ELS) and robotics.

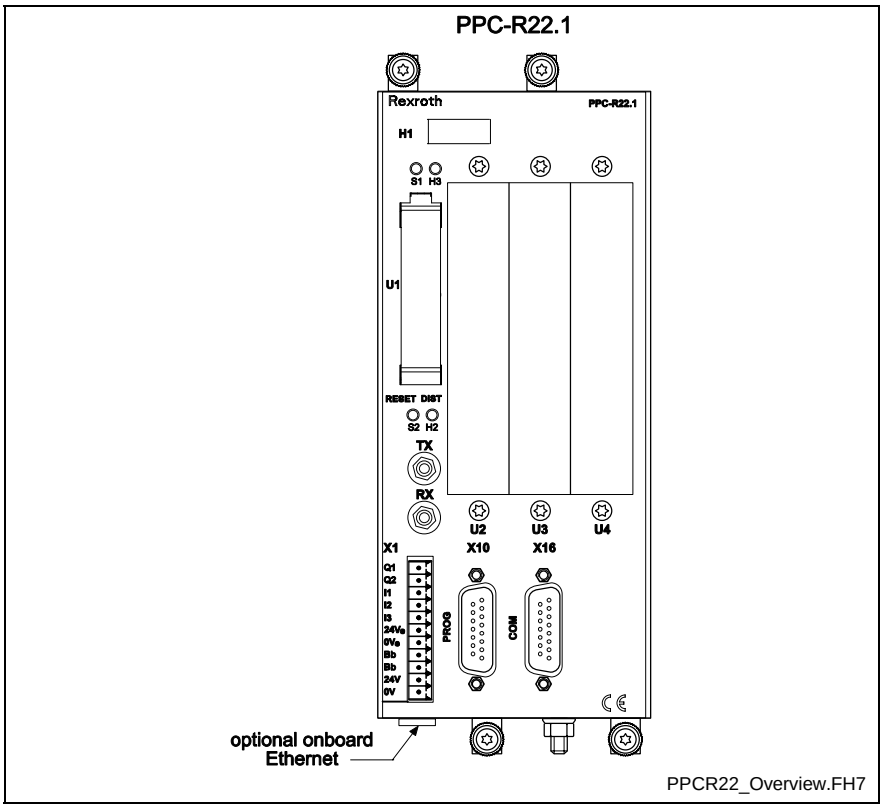


Fig. 1-1: PPC-R Motion Control

PPC-R22 Components

The VisualMotion PPC-R22 control system is comprised of the following components:

Control Hardware Support:

- Rexroth PPC-R22.1 (three expansion slots)

I/O Module Support:

- Rexroth Reco 02 I/O modules (Local and Sercos)
- Rexroth Inline I/O modules
- IndraDrive MD1 I/O module
- Diax 04 and EcoDrive 03 I/O modules

Digital Drive and HMI Support:

- Up to 64 intelligent digital drives can be connected to one control over Sercos
  - Rexroth IndraDrive (using MPx02, MPx03, and MPx04 firmware with ELS05 support) drives and motors
  - Rexroth Diax 04 (using SSE03 or ELS05 firmware) drives and motors
  - Rexroth EcoDrive 03 (using SMT02, SGP01, SGP03 or SGP20 firmware) drives and motors
  - Rexroth EcoDrive Cs (using MPG01 firmware) drives and motors
  - Refu (using release level 05V20 or later) drives
  - HNC100-SER-5s hydraulic drive
- HMI interfaces
  - Rexroth IndraControl VCP (02, 05, 08, 20, 25) terminals

- Rexroth IndraControl VEP (30, 40, 50) embedded terminals
- Rexroth IndraControl VEH 30 embedded terminal
- BTC06 teach pendent

Server Communication Support:

- VisualMotion Dde server using ASCII protocol
- DDE and OPC servers communicating via the SCP using the SIS protocol

Communication Interface Support:

- Sercos fiber optic real-time communication
- RS232, RS422, and RS485 serial interfaces
- Ethernet TCP/IP and EtherNet/IP interfaces
  - Optional onboard Ethernet connection (underneath control)
  - Ethernet option card for expansion slot (only for PPC-R22)

Note: The onboard Ethernet is a passive interface that consumes the resources of PPC-R's processor when communicating. The Ethernet option card has a built-in processor that is used to support all Ethernet communication. Refer to Dual Ethernet Support in chapter 4 for details.

PPC-R22 Fieldbus and Additional Interface Support

The PPC-R22 control supports the following fieldbus and additional interfaces:

Fieldbus Slave Interfaces

- Profibus-DP (64 words max.)
- Interbus (16 words max.)
- DeviceNet (64 words max.)
- ControlNet (64 words max.)
- EtherNet/IP (64 words max.)

Fieldbus Master Interfaces

- Profibus-DP (7 Kbytes max.)
- DeviceNet (7 Kbytes max.)

Additional Interfaces

- Option Card **P**rogrammable **L**imit **S**witch (16 or 32 outputs)
- Link Ring for master/slave interfacing of VisualMotion controls
- Encoder Interface Card (LAG)

Drive I/O Support

Rexroth digital drives support the following I/O devices:

- MD1 I/O module for IndraDrive using MPH02 or greater firmware
- Dea x.1M (x = 4, 5, 6, 8, 9, and 10) I/O cards for Diax 04 digital drives
- EMD I/O module using the EcoX interface for DKC22.3 digital drives using SGP20 firmware

1.3 PPC-P11.1 Control Overview

The PPC-P11.1 (PCI-version) is a PC-based stand-alone multi-axis motion and logic control. The GMP 11 firmware is used with the PPC-P11.1 and is designed to work as a complete motion and logic control solution.

Just like the PPC-R22, the PPC-P11.1 supports Rexroth IndraDrive, Diax 04 and EcoDrive 03 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 11 Firmware Features

All firmware functionality supported in GPP 11 will also be supported in GMP 11 with the following restriction:

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

PPC-P11.1 Components

The VisualMotion PPC-P11.1 control system is composed of the following components:

Control Hardware Support:

- Rexroth PPC-P11.1 control using GMP 11 firmware

I/O Module Support:

- Rexroth SercosReco 02 I/O modules
- Rexroth Inline I/O modules
- IndraDrive MD1 I/O module
- Diax 04 and EcoDrive 03 I/O modules

Digital Drive and HMI Support:

- Up to 64 intelligent digital drives can be connected to one control over Sercos
  - Rexroth IndraDrive (using MPx02, MPx03, and MPx04 firmware with ELS05 support) drives and motors
  - Rexroth Diax 04 (using SSE03 or ELS05 firmware) drives and motors
  - Rexroth EcoDrive 03 (using SMT02, SGP01, SGP03 or SGP20 firmware) drives and motors
  - Rexroth EcoDrive Cs (using MPG01 firmware) drives and motors
  - Refu (using release level 05V20 or later) drives
  - HNC100-SER-5s hydraulic drive
- HMI interfaces
  - Rexroth IndraControl VCP (02, 05, 08, 20, 25) terminals
  - Rexroth IndraControl VEP (30, 40, 50) embedded terminals
  - Rexroth IndraControl VEH 30 embedded terminal
  - BTC06 teach pendent

Server Communication Support:

- VisualMotion Dde server using ASCII protocol
- DDE and OPC servers communicating via the SCP using the SIS protocol

Communication Interface Support:

- Sercos fiber optic real-time communication
- RS232, RS422, and RS485 serial interfaces

PPC-P11.1 Fieldbus and Additional Interface Support

The PPC-P11.1 control supports the following PC versions of the fieldbus master and additional interfaces:

Fieldbus Master Interfaces

- Profibus-DP (7 KBytes max.)
- DeviceNet (7 KBytes max.)

Additional Interfaces

- optional second Serial interface card
- Option Card **P**rogrammable **L**imit **S**witch (16 or 32 outputs)
- Link Ring for master/slave interfacing of VisualMotion controls
- Encoder Interface Card (LAG)

Drive I/O Support

Rexroth digital drives support the following I/O devices:

- MD1 I/O module for IndraDrive using MPH02 or greater firmware
- Dea x.1M (x = 4, 5, 6, 8, 9, and 10) I/O cards for Diax 04 digital drives
- EMD I/O module using the EcoX interface for DKC22.3 digital drives using SGP20 firmware

1.4 Rexroth Digital Drive Families

Rexroth digital drive families are comprised of power supplies, drive controllers and their associated motors. The IndraDrive, Diax 04, and EcoDrive 03 digital drive families are fully capable of using the functions available in the VisualMotion.

Rexroth IndraDrive Digital Drives

Rexroth IndraDrive provides integrated safety technology conforming to EN 954-1, category 3. They offer a wide range of power from 1 kW to 110 kW. They are available as IndraDrive C (compact converters) and IndraDrive M (modular inverters).

VisualMotion GPP 11 and GMP 11 firmware support the following IndraDrive firmware configurations:

IndraDrive Firmware Configurations						Description
FWA-INDRV*-	MPB-					Basic single-axis
	MPD-					Basic double-axis
	MPH-					Advanced single-axis
		02VRS-D5-				Version MPx02
		03VRS-D5-				Version MPx03
		04VRS-D5-				Version MPx04
			0-			Open-Loop (without encoder)
			1-			Closed-Loop (with encoder)
				NNN		Base package
				SNC		Base package + synchronization
				SRV		Base package + servo function
				ALL		All functions **Note**
					-NN	Base package
					-ML	Base package + IndraMotion MLD-S
Note: The IndraLogic main spindle firmware MSP is not supported by VisualMotion.						

Table 1-1: VisualMotion 11 Supported IndraDrive Firmware Configurations

Refer to the relevant *Rexroth IndraDrive* documentation for safety technology, ratings, output power details, and drive firmware configuration.

IndraDrive C Compact Converters

The IndraDrive C digital drive family incorporates a power supply section with a drive controller in one package. The following compact converters are available:

- HCS02.1-W0012
- HCS02.1-W0028
- HCS02.1-W0054
- HCS02.1-W0070
- HCS03.1-W0070
- HCS03.1-W0100
- HCS03.1-W0150

- HCS03.1-W0210

IndraDrive M Modular Power Supplies

IndraDrive power supply units of the HMV line support the power and control voltage of the HMD line. IndraDrive power supplies requires a mains voltage of 3 x 380 … 480 V.

The HMV01.1E power supply uses a bleeder resistor to absorb regenerative power that is fed back from the attached digital drive controllers. The following HMV01.1E power supplies are available:

- HMV01.1E-W0030
- HMV01.1E-W0075
- HMV01.1E-W0120

The HMV01.1R power supply uses current regeneration to regenerate power that is fed back from the attached digital drive controllers. The following HMV01.1R power supplies are available:

- HMV01.1R-W0018
- HMV01.1R-W0045
- HMV01.1R-W0065

IndraDrive M Modular Inverters

IndraDrive modular inverters using MPx02 or MPx03 firmware are supported by GPP 11 and GMP 11 firmware.

- HMD01.1N-W0020
- HMD01.1N-W0036
- HMS01.1N-W0020
- HMS01.1N-W0036
- HMS01.1N-W0054
- HMS01.1N-W0070
- HMS01.1N-W0150
- HMS01.1N-W0210

Motors used with IndraDrive

IndraDrive digital drive controllers are capable of operating all rotating and linear motors of the MSK, MLF, MBT, MAD, and LSF.

IndraDrive.jpg

Fig. 1-3: Motors used with IndraDrive

Rexroth Diax 04 Digital Drives

The modular concept in the Rexroth Diax 04 digital drive family enables a flexible combination of digital drive controllers to one power supply unit. Power supplies and digital drive controllers are combined based on their power requirements. Refer to the relevant *Rexroth Digital Drive* documentation.

Diax 04 Power Supplies

Power supply units of the HV* line support the power and control voltage of Rexroth digital drive controllers of the HD* line. Diax 04 power supplies require a mains voltage of 3 x AC 380 ... 480 V.

HVE Power Supply

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
- HVE03.2
- HVE04.2

HVR Power Supply

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
- HVR03.2

Diax 04 Digital Drive Controllers

The following digital drive controllers are part of the Diax 04 drive family.

HDD Controllers

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 Controllers

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
- HDS03.2
- HDS04.2
- HDS05.2

Rexroth EcoDrive Digital Drive Family

The EcoDrive digital drive family incorporates a power supply section with a drive controller in one package. The DKC digital drive controller requires additional components to output the mechanical power listed above. Refer to the relevant *Rexroth EcoDrive 03* documentation.

EcoDrive 03 Digital Drive Controllers

The following DKC digital drive controllers using SGP or SMT firmware are supported by GPP 11 and GMP 11 firmware.

- DKC02.3-016
- DKC02.3-040 or DKC22.3-040
- DKC02.3-100 or DKC22.3-100
- DKC02.3-200 or DKC22.3-200

Motors used with Diax 04 and EcoDrive 03

All Diax 04 and EcoDrive 03 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.

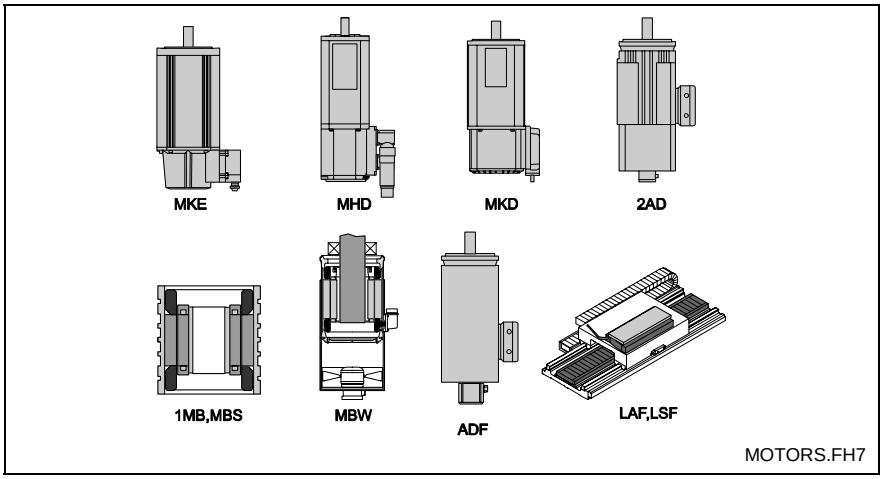


Fig. 1-4: Motors used with Diax 04 and EcoDrive 03

EcoDrive Cs Digital Drive Controllers

The following DKC digital drive controllers using MGP firmware are supported by GPP 11 and GMP 11 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.

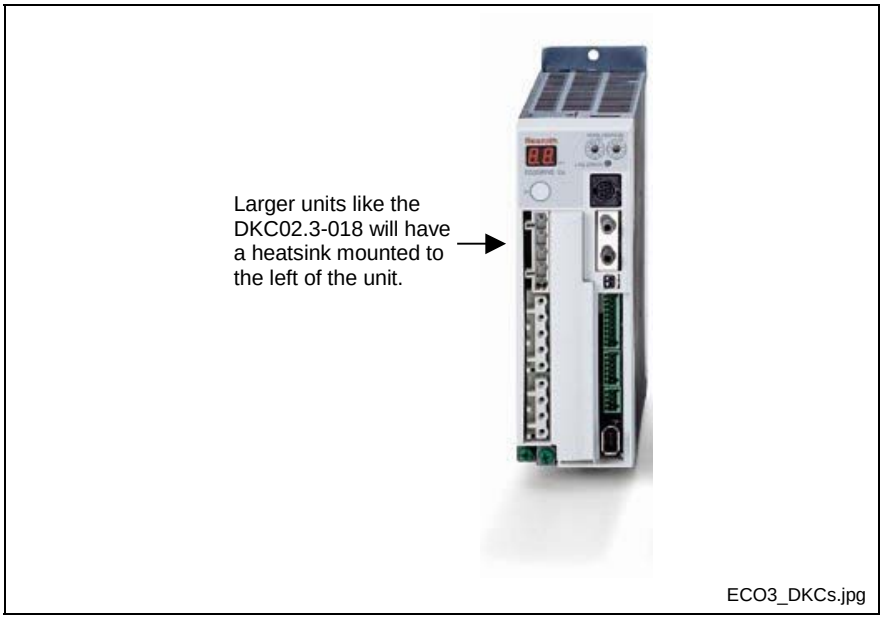


Fig. 1-5: EcoDrive Cs Digital Drive Controllers

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. 1-6: Motor used with EcoDrive Cs

1.5 Supporting Documentation

The information in this manual is intended for users and programmers of the Rexroth VisualMotion control.

Note: The latest release of Rexroth documents are always available over the Internet @ http://www.boschrexroth.com/BrcDoku.

In addition to this manual, the following supporting documentation is available:

Additional VisualMotion Documentation for GPP/GMP 11 Firmware

Type of Manual	Typecode	Material Number
Functional Description (2 volume set)	DOK-VISMOT-VM*-11VRS**-FK01-EN-P	R911309162
Troubleshooting Guide	DOK-VISMOT-VM*-11VRS**-WA02-EN-P	R911309167
Box Set 20-10V-EN	DOK-VISMOT-VM*-11VRS**-2001-EN-P	R911309160

Table 1-2: Additional VisualMotion Documentation

IndraLogic Documentation

Type of Manual	Typecode	Material Number
PLC Programming with Rexroth IndraLogic 1.0	DOK-CONTRL-IL**PRO*V01-AW01-EN-P	R911305036

Table 1-3: IndraLogic Documentation

Rexroth Inline I/O Modules

Type of Manual	Typecode	Material Number
Rexroth Inline Overall View	DOK-CONTRL-R-IL*INLINE-KB02-EN-P	R911292649
Digital I/O Terminals	DOK-CONTRL-R-IL*DIO***-FK03-EN-P	R911289589
Analog I/O Terminals	DOK-CONTRL-R-IL*AIO***-FK02-EN-P	R911289591
Counter Terminal	DOK-CONTRL-R-IL-CNT***-AW02-EN-P	R911289593
INTERBUS (Functional Description)	DOK-CONTRL-R-IL*IBSSYS-AW02-EN-P	R911289595
IBS Terminals and Module Supply	DOK-CONTRL-R-IL*IBS-BK-FK02-EN-P	R911289585
PROFIBUS DP (Functional Description)	DOK-CONTRL-R-IL*PBSSYS-AW02-EN-P	R911289597
PROFIBUS DP - Terminal and Module Supply	DOK-CONTRL-R-IL*PB*-BK-FK02-EN-P	R911289587
SERCOS Bus Coupler	DOK-CONTRL-R-IL-SEBK**-AW01-EN-P	R911307632

Table 1-4: RECO02.2 Module Documentation

RECO02.2 Sercos I/O Modules

Type of Manual	Typecode	Material Number
Project Planning	DOK-CONTRL-RECO02.2**-PR01-EN-P	R911283915
RECO02 (Functional Description)	DOK-CONTRL-RECO02.2***-FK01-EN-P	R911283668

Table 1-5: RECO02.2 Module Documentation

IndraDrive Digital Drive Documentation

Type of Manual	Typecode	Material Number
Functional Description	DOK-INDRV*-MP*-02VRS**-FK01-EN-P	R911299225
Parameter Description	DOK-INDRV*-GEN-**VRS**-PA01-EN-P	R911297317
Troubleshooting	DOK-INDRV*-GEN-**VRS**-WA01-EN-P	R911297319
Integrated Safety Technology	DOK-INDRV*-SI*-**VRS**-FK02-EN-P	R911297838
IndraDrive Functional Description	DOK-INDRV*-MP*-03VRS**-FK01-EN-P	R911308329
IndraDrive Functional Description	DOK-INDRV*-MP*-04VRS**-FK01-EN-P	R911315485

Table 1-6: IndraDrive MP*02 and MP*03 Documentation

Diax 04 Digital Drive Documentation for SSE Firmware

Type of Manual	Typecode	Material Number
Functional Description	DOK-DIAX04-SSE-03VRS**-FK01-EN-P	R911284050
Parameter Description	DOK-DIAX04-SSE-03VRS**-PA01-EN-P	R911284051
Troubleshooting	DOK-DIAX04-SSE-03VRS**-WA01-EN-P	R911284052
Drive Configurations	DOK-DIAX04-SSE-03VRS**-IF02-EN-P	R911284045
Firmware Version Notes	DOK-DIAX04-SSE-03VRS**-FV01-EN-P	R911284044

Table 1-7: Diax 04 SSE03 Documentation

Diax 04 Digital Drive Documentation for ELS Firmware

Type of Manual	Typecode	Material Number
Functional Description	DOK-DIAX04-ELS-05VRS**-FKB1-EN-P	R911276260
Troubleshooting	DOK-DIAX04-ELS-05VRS**-WAR1-EN-P	R911276258
Drive Configurations	DOK-DIAX04-ELS-05VRS**-IF02-EN-P	R911276256
Firmware Version Notes	DOK-DIAX04-ELS-05VRS**-FVN1-EN-P	R911276254

Table 1-8: Diax 04 ELS05 Documentation

EcoDrive 03 Digital Drive Documentation for SMT02 Firmware

Type of Manual	Typecode	Material Number
Project Planning	DOK-ECODR3-DKC**.3****-PR05-EN-P	R911280107
Functional Description	DOK-ECODR3-SMT-02VRS**-FK01-EN-P	R911285846
Parameter Description	DOK-ECODR3-SMT-02VRS**-PA01-EN-P	R911285850
Troubleshooting	DOK-ECODR3-SMT-02VRS**-WA01-EN-P	R911285852
Firmware Version Notes	DOK-ECODR3-SMT-02VRS**-FV01-EN-P	R911285851

Table 1-9: EcoDrive 03 SMT01 Documentation

EcoDrive 03 Digital Drive Documentation for SGP01 Firmware

Type of Manual	Typecode	Material Number
Project Planning	DOK-ECODR3-DKC**.3****-PR05-EN-P	R911280107
Functional Description	DOK-ECODR3-SGP-01VRS**-FKB1-EN-P	R911279095
Parameter Description	DOK-ECODR3-SGP-01VRS**-PAR1-EN-P	R911283218
Troubleshooting	DOK-ECODR3-SGP-01VRS**-WAR1-EN-P	R911279096
Firmware Version Notes	DOK-ECODR3-SGP-01VRS**-FVN1-EN-P	R911280282

Table 1-10: EcoDrive 03 SGP01 Documentation

EcoDrive 03 Digital Drive Documentation for SGP03 Firmware

Type of Manual	Typecode	Material Number
Project Planning	DOK-ECODR3-DKC**.3****-PR05-EN-P	R911280107
Functional Description	DOK-ECODR3-SGP-03VRS**-FKB1-EN-P	R911295671
Parameter Description	DOK-ECODR3-SGP-03VRS**-PAR1-EN-P	R911295673
Troubleshooting	DOK-ECODR3-SGP-03VRS**-WAR1-EN-P	R911295675
Firmware Version Notes	DOK-ECODR3-SGP-03VRS**-FVN1-EN-P	R911295677

Table 1-11: EcoDrive 03 SGP03 Documentation

EcoDrive 03 Digital Drive Documentation for SGP20 Firmware

Type of Manual	Typecode	Material Number
Project Planning	DOK-ECODR3-DKC**.3****-PR05-EN-P	R911280107
Functional Description	DOK-DRIVE*-SGP-20VRS**-FK01-EN-P	R911289469
Parameter Description	DOK-DRIVE*-SGP-20VRS**-PA01-EN-P	R911289471
Troubleshooting	DOK-DRIVE*-SGP-20VRS**-WA01-EN-P	R911289472
Firmware Version Notes	DOK-DRIVE*-SGP-20VRS**-FV02-EN-P	R911289470

Table 1-12: EcoDrive 03 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	R911295758
Functional Description	DOK-DRIVE*-MGP-01VRS**-FK01-EN-P	R911296549
Parameter Description	DOK-DRIVE*-MGP-01VRS**-PA01-EN-P	R911296551
Troubleshooting	DOK-DRIVE*-MGP-01VRS**-WA01-EN-P	R911296553
Firmware Version Notes	DOK-DRIVE*-MGP-01VRS**-FV01-EN-P	R911296555

Table 1-13: EcoDrive 03 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	R911282411

Table 1-14: DRIVEHELP CD-ROM

Note: Drive help can also be installed from the VisualMotion CD.

Control and Drive Systems Electronic Documentation

The documents referred in this manual are available on the most current Bosch Rexroth's documentation DVD. This DVD 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-DRIVE*CONTR-GNXX-DO-V04G7	R911306531

Table 1-15: Documentation DVD

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 pre-requisites 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 in order to 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 or transferred or passed on to others, then these safety instructions must be delivered with the equipment.

WARNING

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 provided in this documentation.
- Read the operating, maintenance and safety instructions in your language before starting up the machine. If you find that you cannot 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 and 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. If this is not the case, they are excluded.
  The following areas of use and application, for example, include safety features and applications: 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 in which electrical devices with vital functions can be electromagnetically disturbed, mining, food processing, control of protection equipment (also in a machine).
- The information given in the documentation of the product 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.

DANGER

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 thirty (30) 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:

DANGER

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 at 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 can 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 Rexroth products are protective low voltages designed in accordance with international standards on electrical safety.

WARNING

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 devices
- 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.

DANGER

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

- ⇨ Ensure personal safety by means of qualified and tested higher-level monitoring devices or measures integrated in the installation. Unintended machine motion is possible if monitoring devices are disabled, bypassed or not activated.
- ⇨ Pay attention to unintended machine motion or other malfunction in any mode 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 motion:
  - 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 there is a possibility of loose parts flying off.
- ⇨ 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 axes
- ⇨ The standard equipment motor brake or an external brake controlled directly by the drive controller are 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.

WARNING

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

⇨ Persons with heart pacemakers, hearing aids and metal implants are not permitted to enter the 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

CAUTION

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.

CAUTION

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.

CAUTION

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: Be aware of 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.

CAUTION

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.

3.13 Protection Against Unwanted Network Access

The VisualMotion PPC-R22.1 control can be equipped with an optional onboard EtherNet interface and/or an optional Ethernet card interface that allows the control to be accessed over a network. The PPC-P11.1 control can also be accessed over a network via DCOM.

The assignment of an IP address and Internet security against unwanted access is the sole responsibility of the customer's Information Technology department.

Control data is not encrypted, nor do we have access or security levels for it. It is recommended to isolate the control's network by using a router as well as a hardware firewall for any portion of the network accessible to an Internet connection.

Notes:

4 VisualMotion Machine Control System

4.1 PPC-R22.1 Overview

The PPC-R22.1 control can be used with VisualMotion's GPP 11 firmware and is designed to plug directly into the Reco 02 rack from Bosch Rexroth. The Reco 02 rack can hold the PPC-R22.1 along with Reco 02 I/O modules, allowing communication along the Reco 02 back-plane bus.

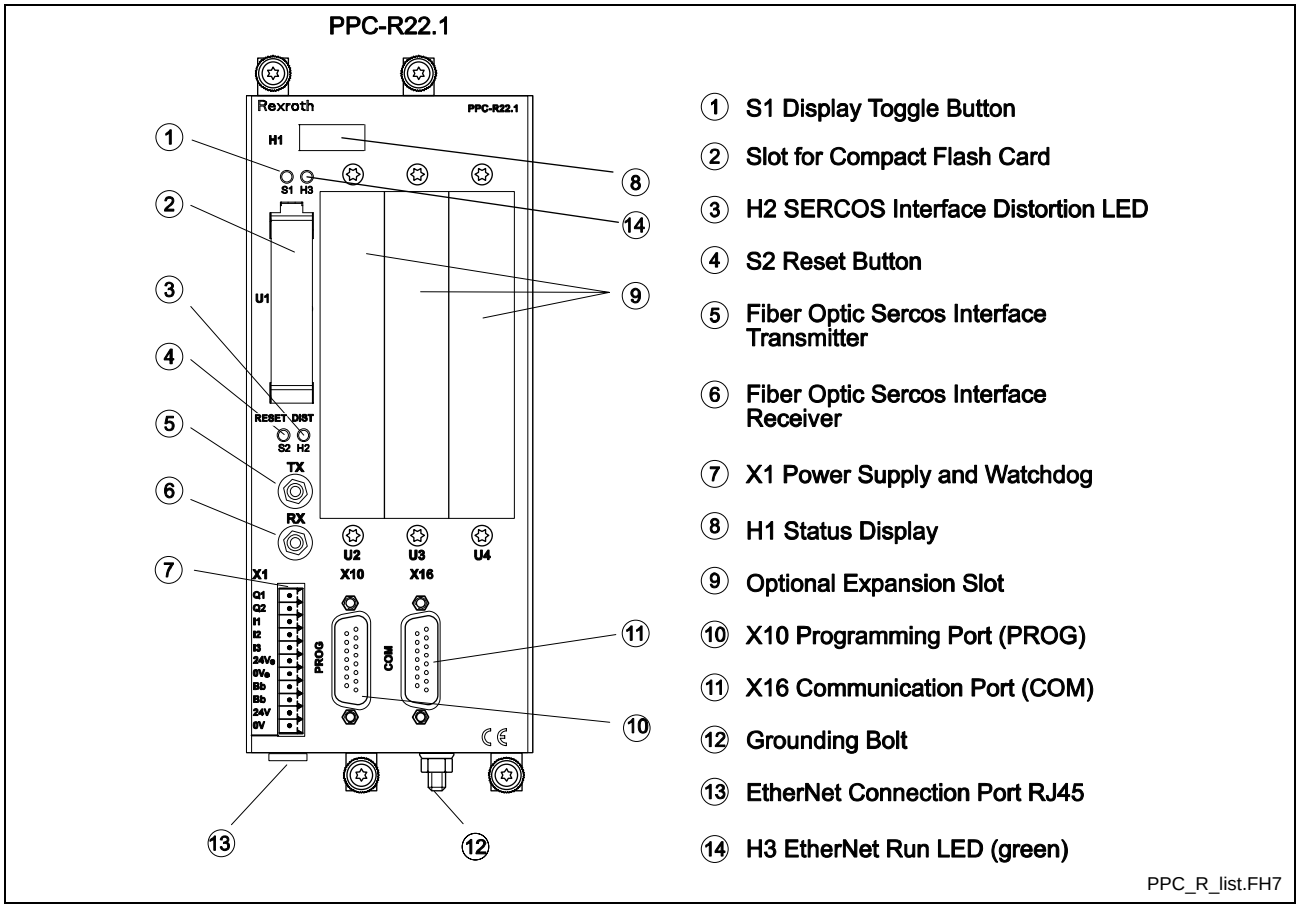


Fig. 4-1: PPC-R22.1

Note: VisualMotion GPP 11 firmware will only support the PPC-R22.1 double width control hardware.

Installing the PPC-R22.1 and Reco 02 I/O Modules

The PPC-R22.1 control should be mounted in a vertical upright position as shown in the figure below. Allow adequate clearance above and below the control to prove sufficient room for heat dissipation. The control must be installed in slot 00 of the first RMB rack for proper communication between Local Reco 02 I/O modules. Afterwards Reco 02 I/O modules should be installed in the next available slot to the right of the PPC-R22.1.

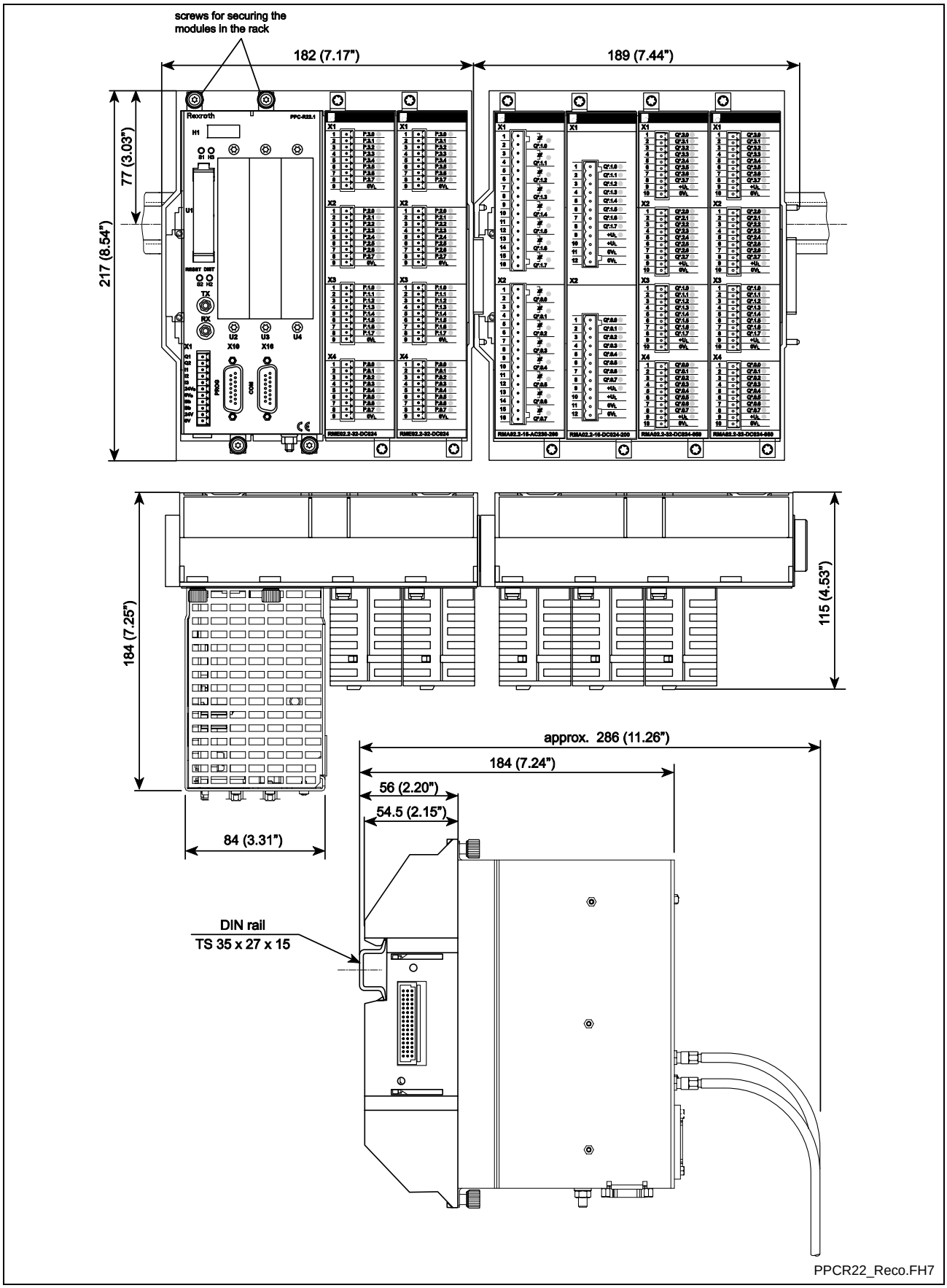


Fig. 4-2: PPC-R and Reco Rack Dimensions

PPC-R22.1 Hardware

Note: Refer to chapter 10 for a complete listing of available configurations for the PPC-R22.1 motion/logic control.

- Double slot width versions with onboard Ethernet support
  - PPC-R22.1, with three expansion slots

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 slave fieldbus interface in VisualMotion 11 using GPP 11 firmware, standard TCP/IP communication between VisualMotion Toolkit over the same network is possible.

- Fieldbus slave interface cards
  (only one slave interface card can be used at one time)
  - Profibus fieldbus slave interface
  - Interbus fieldbus slave interface
  - DeviceNet fieldbus slave interface
  - ControlNet fieldbus slave interface
  - EtherNet/IP fieldbus slave interface
- Fieldbus master interface cards
  (only one master interface card can be used at one time)
  - Profibus fieldbus master interface
  - DeviceNet fieldbus master interface
- Additional interfaces
  - Ethernet Card (in addition to onboard Ethernet interface)
  - Option Card **P**rogrammable **L**imit **S**witch
  - Link Ring (DAQ03)
  - Master Encoder Card (LAG)
- 4-digit alphanumeric display (H1)
- I/O Support
  - Drive-based
  - Reco 02 (Local and Sercos)
  - Rexroth Inline I/O
- Compact flash memory card (U1)
- Sercos Interface (2, 4, 8 or 16 MBaud) for up to 64 drives
- Two serial interface ports available with a software selectable baud rate of 9600 to 115200 (Default: 9600)
  - PPC-R22.1: X10 (Default baud rate: 9600)
  - PPC-R22.1: X16 (Default baud rate: 115k)

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

PPC-R22.1 Specifications

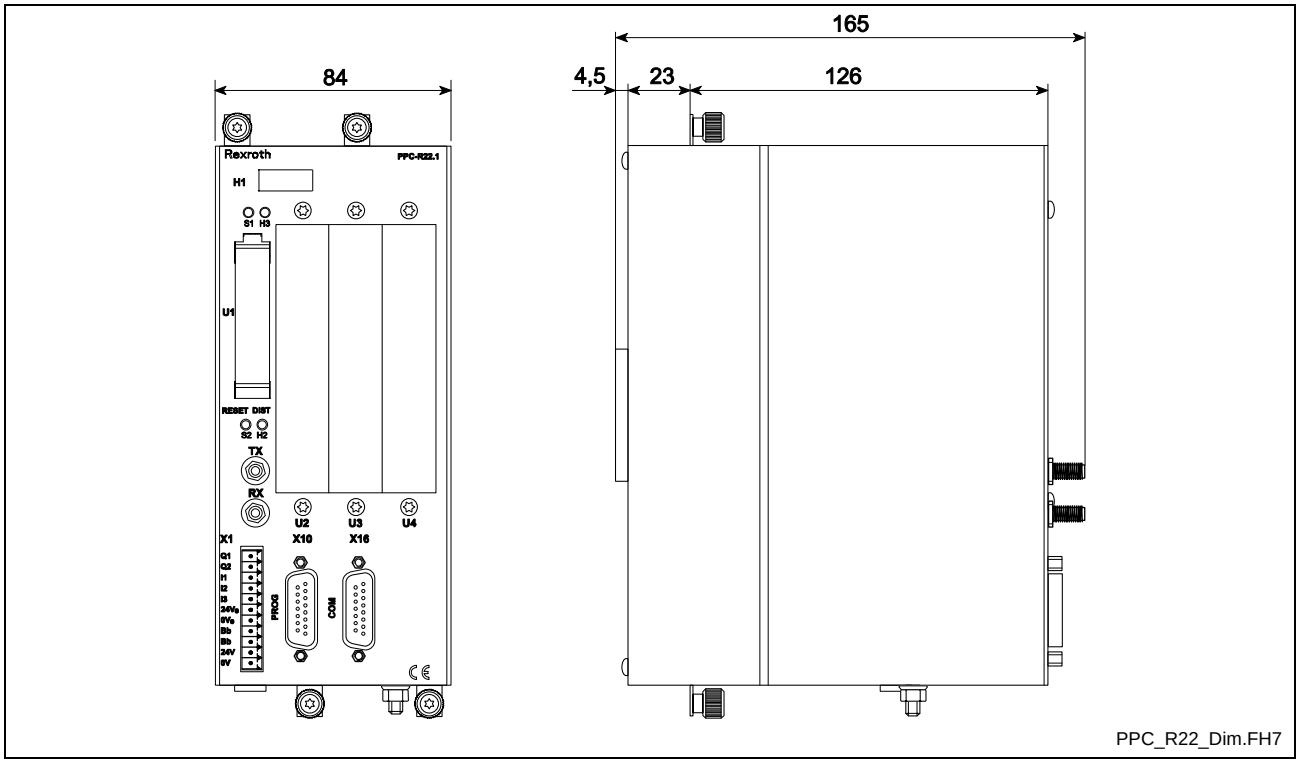


Fig. 4-3: PPC-R22.1 Dimensions [mm]

General Specifications for PPC-R22.1

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:	1.3 kg (2.87 lbs.)

Supply Voltages for PPC-R22.1

Nominal value:	24 VDC
Permissible ripples:	4 Vpp within the permissible voltage range
Permissible voltage range:	19.2 … 30 VDC, including ripples
Maximum current consumption: PPC-R22.1	1.2 A (+ supply voltage for I/O modules up to 2.6 A)

Digital Input and Output Rating for PPC-R22.1

Digital Input:	Current draw, isolated $V_{i,Low}$ = 0V …5V: $V_{i,High}$ = 15V …30V Delay time: 50 µs
Digital Output:	Current rating = 0.5 A, isolated Response (delay) time = 500 µs max.

Internal Clock for PPC-R22.1

Internal clock: A Real-time clock that maintains accurate time of diagnostic logs during a power down condition.	No battery backup. A capacitor provides power for up to 3 days

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 Interfaces for PPC-R22.1

Programming port (X10):	RS-232 (D-sub, 15pin, female) RS-485 (D-sub, 15pin, female)
Communication port (X16):	RS-232 / RS-422 / RS-485 (D-sub, 15pin, female)

Supply Voltage, Digital I/O and Watchdog

Power is supplied to the PPC-R22.1 through the X1 Phoenix connector.

X1 Pin Assignment on PPC-R22.1

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	GND external
8	BB relay (Watchdog)
9	BB relay (Watchdog)
10	24 V (control supply voltage)
11	GND

Table 4-1: X1 Pin Assignment

Power Supply Voltage for PPC-R22.1

Faultless operation of the PPC-R22.1 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/logic.

Note: The power supply unit used with the PPC-R22.1 should be a switching power supply with an inrush current as high as 20 A. Do not connect another PPC-R22.1 unit to the same supply voltage. The high inrush current may cause the supply voltage to breakdown and activate the POWER-FAIL signal.

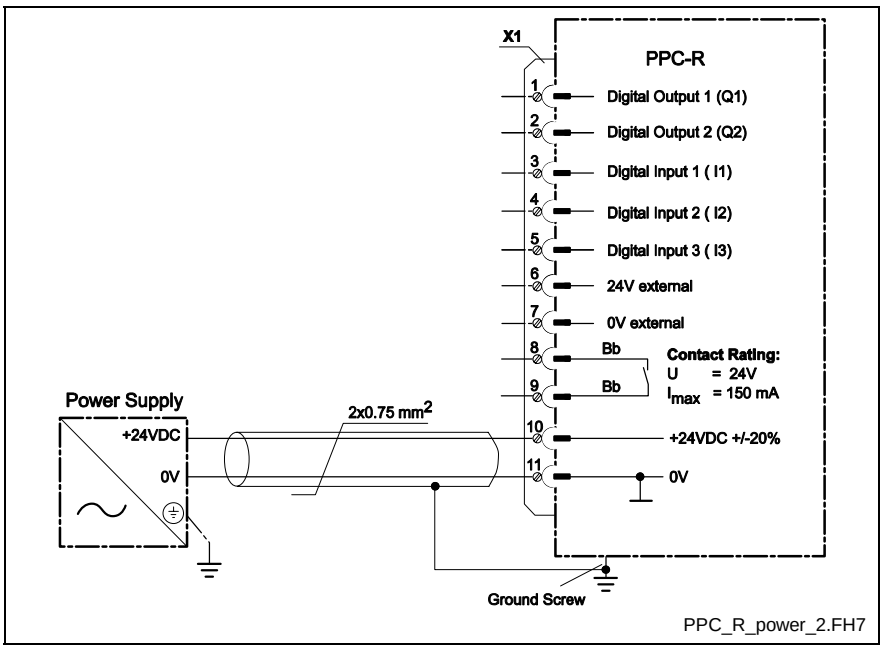


Fig. 4-4: PPC-R22.1 Power Supply Voltage

Note: CE compliance: To observe the standard strength limits (EN 61000-6-4), connect the 24 V supply via a shielded cable (e.g. Belden 8762) and connect the cable shield with the ground screw of the control using a cable as short as possible.

Digital Input / Output Supply Voltage for PPC-R22.1

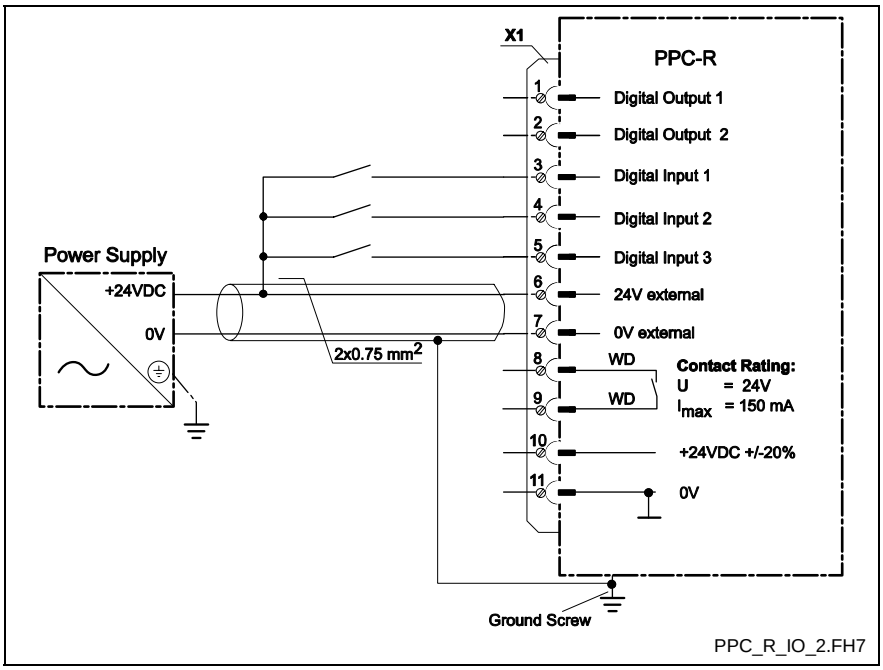


Fig. 4-5: Digital Input / Output Supply Voltage

Note: The digital inputs and outputs found on connector X1 of the PPC-R22.1 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.

Bb Watchdog Contact

The Bb contact on connector X1 is provided as a signal to an external device or circuitry that the control is no longer in operating mode (Sercos phase 4). The Bb contact opens and closes under the following conditions:

Bb Contact Opens:

- Reboot of control from either bootloader, downloading a project, or from a runtime system reboot command.
- Control has an exception in operating system (pROBE)
- Clear flash memory command C-0-0996
- Switch from Sercos phase 4 to Sercos phase 2
- Task watchdog (internal) error

Bb Contact Closes:

- Successful initialization into Sercos phase 4

Dual Ethernet Support

The PPC-R22.1 can be ordered with an optional onboard Ethernet interface and/or a 10/100 MBaud Ethernet card. The onboard Ethernet connection is located on the underside of the control. The onboard Ethernet and Ethernet option card both support standard TCP/IP and EtherNet/IP communication. When both Ethernet interfaces are installed, only the option card will support EtherNet/IP, in addition to TCP/IP. Otherwise, a single Ethernet interface will support both TCP/IP and EtherNet/IP communication.

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 used by DeviceNet and ControlNet.

Note: When using EtherNet/IP in a VisualMotion 11 system, no other fieldbus slave interface card (i.e., Profibus, DeviceNet, ControlNet, and Interbus) can be installed.

IndraLogic Ethernet Support

Direct Ethernet connection (TCP/IP Level 2 Route) to IndraLogic can only be performed via the onboard Ethernet interface. Both Ethernet interfaces support IndraLogic communication via the SCP_VM.

Ethernet Network Access Port

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

Ethernet Network Security

The assignment of an IP address and Internet security against unwanted access is the sole responsibility of the customer's Information Technology department. Control data is not encrypted, nor do we have access or security levels for it. It is recommended to isolate the control's network by using a router as well as a hardware firewall for any portion of the network accessible to an Internet connection.

Ethernet Diagnostics

The Ethernet interface has a green LED (H3) located above the compact flash memory card. It allows diagnosis of the communication between the Ethernet interface and the control.

Ethernet and EtherNet/IP Specifications

Hardware

Description	Description
Performance - max. baud rate	10/100 MBaud
Full Duplex support	YES
Auto negotiation support	YES
Operating Temperature	0 – 55 °C (32 – 131 °F)

Table 4-2: Ethernet and EtherNet/IP Hardware

Ethernet Option Card Firmware Support

Description	Details
Slave type	TCP/IP Server
Message type	TCP/IP message using SIS
Port address	5001

Table 4-3: Ethernet Option Card Firmware Support

Onboard Ethernet Firmware Support

Description	Details
Slave type	TCP/IP Server
Message type	TCP/IP message using SIS
	IL serial protocol via TCP/IP
Port address	5001 for VisualMotion communication
	1200 for IndraLogic communication

Table 4-4: Onboard Ethernet Firmware Support

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 **P**acket **I**nterval minimum	5ms

Table 4-5: EtherNet/IP Firmware

Note: EtherNet/IP configuration files (*.eds) for both the onboard and card interfaces are available in the VisualMotion 11 CD.

Certification

Description	Details
Certification	CE Marked

Table 4-6: Ethernet Certification

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

The PPC-P11.1 control can be used with VisualMotion's GMP 11 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.

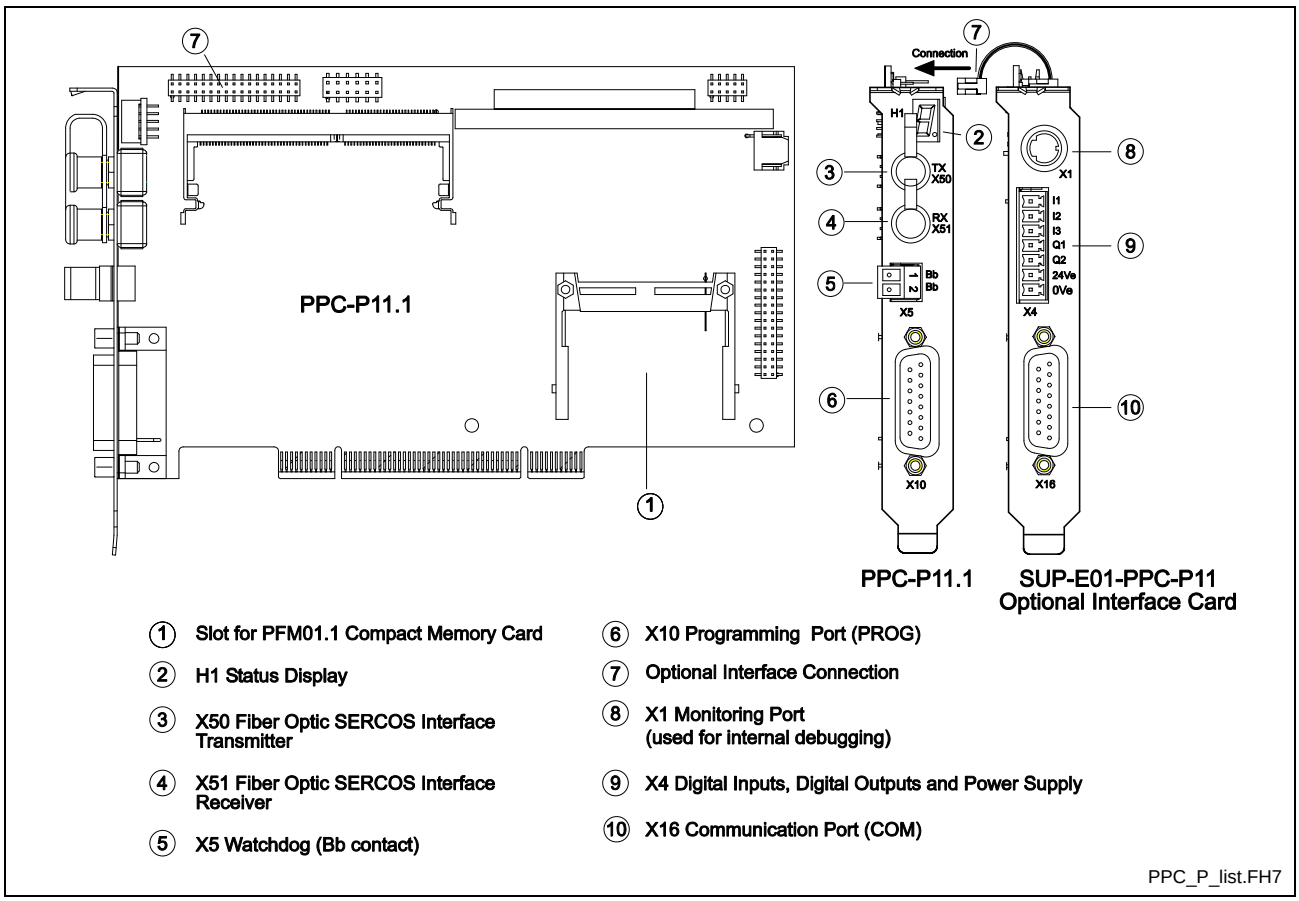


Fig. 4-6: PPC-P11.1 Control

PPC-P11.1 Hardware

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

- PC bus connection
  - PCI, 32-bit @ 33Mhz
- Fieldbus master interface cards
  (only one master interface card can be used at one time)
  - Profibus fieldbus master interface
  - DeviceNet fieldbus master interface
- Additional interfaces
  - Option Card **P**rogrammable **L**imit **S**witch
  - Link Ring (DAQ03)
  - Master Encoder Card (LAG)

- 1-digit 7-segment display
- I/O Support
  - Drive-based
  - Sercos Reco 02
  - Rexroth Inline I/O
- Compact flash memory card (U1)
- Sercos Interface (2, 4, 8 or 16 MBaud) for up to 40 drives
- Two serial interface ports available with a software selectable baud rate of 9600 to 115200:
  - One serial interface port on control card (X10 Default: 9600)
  - 2nd serial interface with SUP-E01-PPC-P11 (X16 Default: 115k)

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 GMP11vRS 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 for real-time access via the PCI Bus interface

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 $V_{i,Low}$ = 0V …5V: $V_{i,High}$ = 15V …30V
Digital Output (I1, I2, I3):	Current rating = 0.5 A, isolated Response (delay) time = 400 µs max.

Serial 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)

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 4-7: 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 4-8: X4 Pin Assignment

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

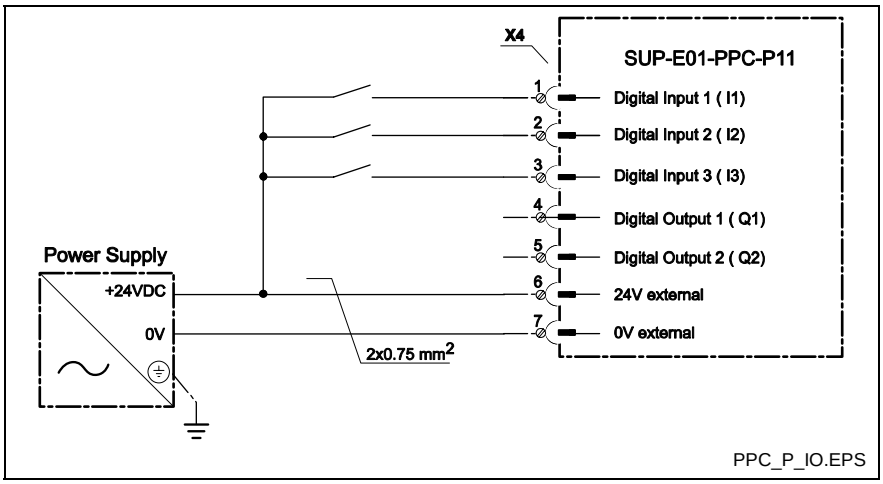


Fig. 4-7: Digital Input / Output Supply Voltage

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. 4-9 for details.

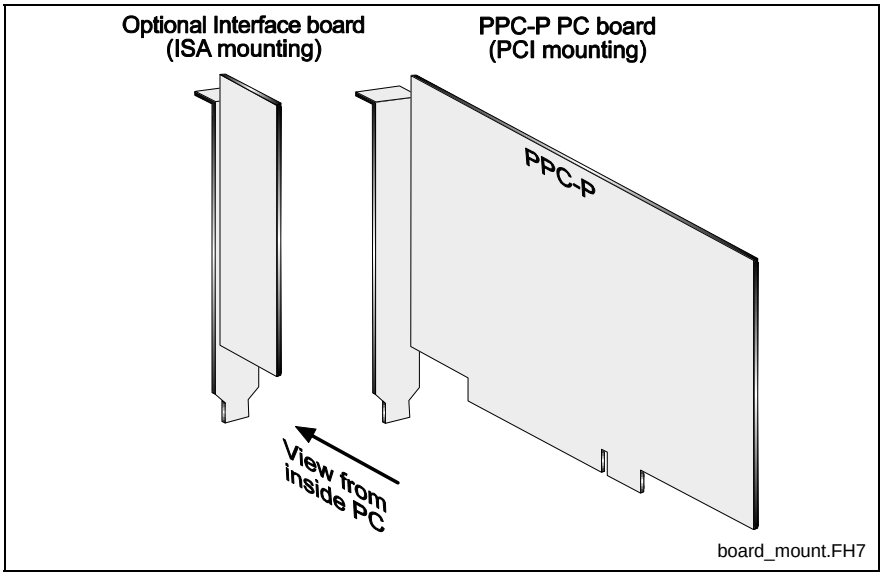


Fig. 4-9: PC Board mounts to Front Faceplate

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. 4-10). 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.

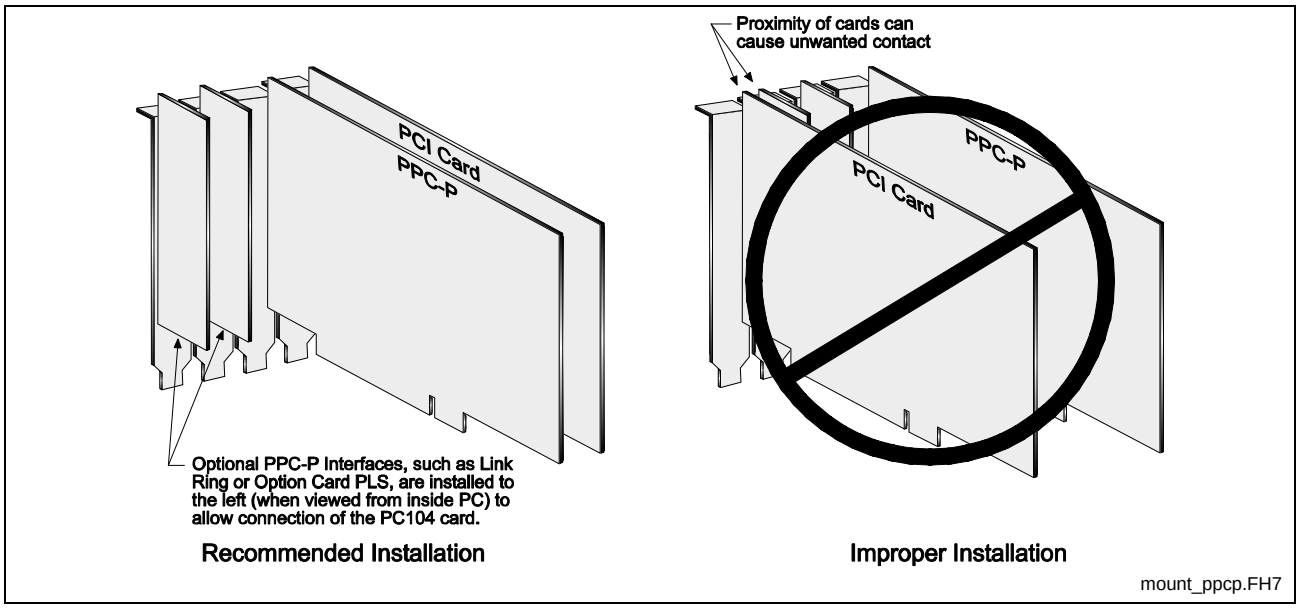


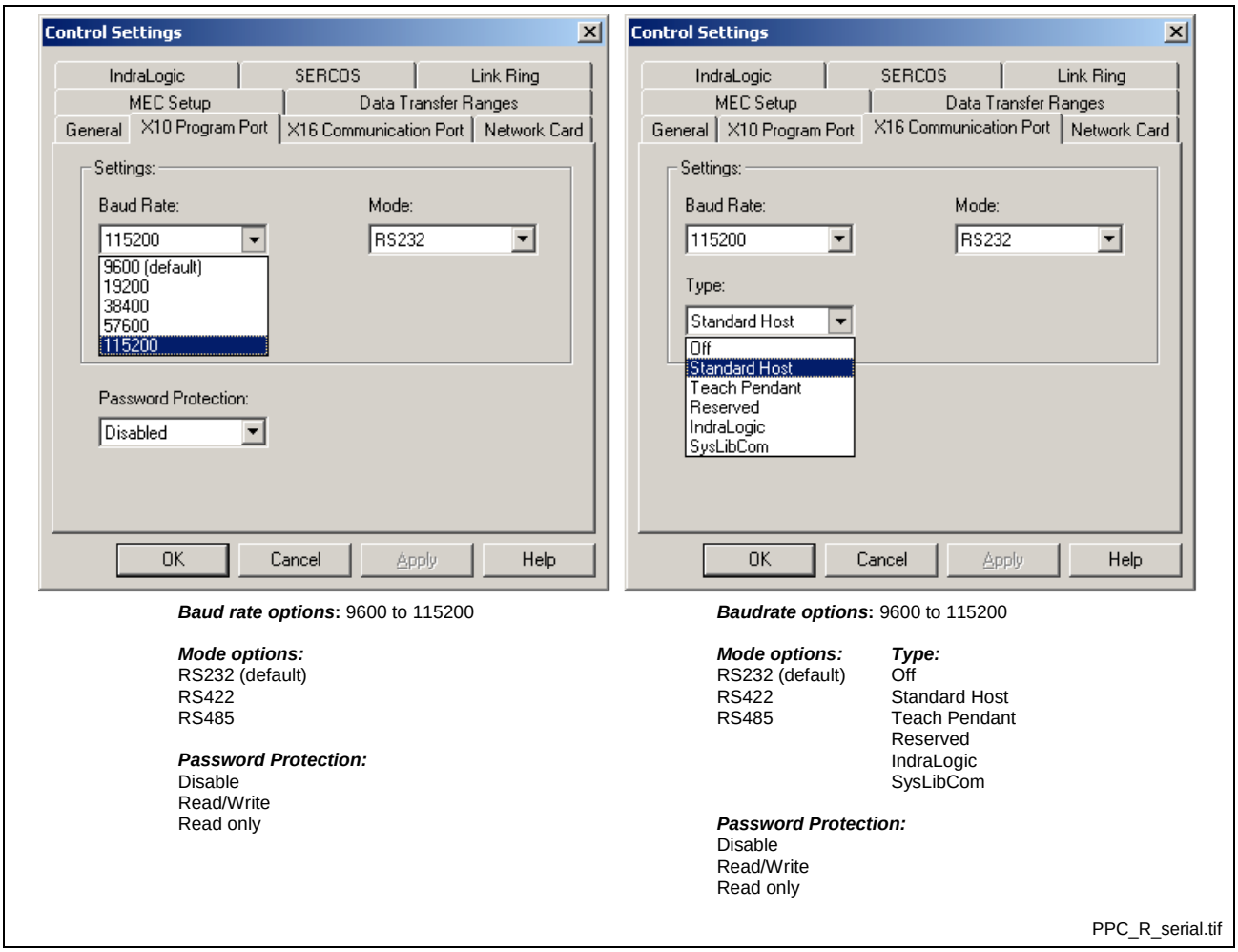
Fig. 4-10: Recommended Installation of PPC-P11.1 Configurations

4.3 Serial Communication

Two serial port interfaces are available on the PPC-R22.1. 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-R22.1 and PPC-P11.1.

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:



***Baud rate options*:** 9600 to 115200

Mode options:
RS232 (default)
RS422
RS485

Password Protection:
Disable
Read/Write
Read only

***Baudrate options*:** 9600 to 115200

Mode options:
RS232 (default)
RS422
RS485

Type:
Off
Standard Host
Teach Pendant
Reserved
IndraLogic
SysLibCom

Password Protection:
Disable
Read/Write
Read only

PPC_R_serial.tif

Fig. 4-11: VisualMotion Toolkit Serial 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	**T**ransmit **D**ata **+** for RS422
2	**T**ransmit **D**ata for RS232	10	Ground
3	**R**eceive **D**ata for RS232	11	**T**ransmit **D**ata **–** for RS422
4	RS485+ / **R**eceive **D**ata **+** for RS422	12	+5V
5	RS485- / **R**eceive **D**ata **–** for RS422	13	**R**equest **T**o **S**end
6	**D**ata **S**et **R**eady	14	**C**lear **T**o **S**end
7	Signal Ground	15	**D**ata **T**erminal **R**eady
8	**D**ata **C**arrier **D**etect		

Table 4-9: Pin Assignment for PROG Interface X10 and COM Interface X16.

4.4 PPC Diagnostic Displays

The PPC-R22.1's 4-digit alphanumeric matrix display (H1) alternates between motion and Integrated PLC diagnostic messages. Motion related diagnostic messages are stored in control parameters C-0-0122, while Integrated PLC diagnostic message are stored in C-0-1612.

The PPC-P11.1's single-digit 7-segment alphanumeric LED displays one digit at a time. The display will flash the diagnostic code for motion, flash a "P", and then flash the Integrated PLC diagnostic code.

Control Status and Settings on H1 Display

The PPC-R H1 display provides additional control status and settings that can be retrieved by pressing the S1 push button on the control. The following table lists all of the available displays:

# of Times pressing S1	Description	Parameter
0	Motion and Integrated PLC status messages	C-0-0122 & C-0-1612
1	Firmware version	C-0-0100
2	NVRam backup status (valid or NOT valid)	Register 21, bit 16
3	X10 programming port mode (RS232, RS422, RS485)	C-0-0013
4	X10 programming port baud rate (9600, 19.2K, 38.4K, 57.6K, 115.2K)	C-0-0003
5	X16 programming port mode (RS232, RS422, RS485)	C-0-0014
6	X16 programming port baud rate (9600, 19.2K, 38.4K, 57.6K, 115.2K)	C-0-0004
7	IP Address 1	C-0-0400
8	IP Address 2	C-0-0411
9	Control Address	C-0-0002

Table 4-10: Control Status and Settings on H1 Display

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-R22.1 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 4-11: Error Codes

Refer to the *VisualMotion 11 Troubleshooting Guide* for a complete listing of error codes and messages.

4.5 Compact Flash Memory Cards

All data necessary to operate the control is stored on the PFM01.1 compact flash memory card and on the onboard NVRam memory. The NVRam is a non-volatile memory chip mounted on the hardware.

Control Data on Compact Flash

The following control data is stored on the compact flash memory card:

Firmware:

- GPP 11 firmware for the PPC-R22.1, or
- GMP 11 firmware for the PPC-P11.1

File system:

- VisualMotion user programs
- Cams, points, event and zone tables
- Option Card PLS parameter lists
- Program variables
- I/O configurations (Local, Sercos RECO and drive-based)

Control Data on NVRam

The following control data is stored on the NVRam memory:

File System Allocation Table:

- logical mapping of file system data

Currently Active Program Data:

- program variables

System Parameters:

- control, task, and axis

NVRam and Compact Flash Backup Commands

In the event that control hardware must be replaced, the contents of NVRam (non-volatile data) and compact flash must be valid in order to ensure portability of control data to the new hardware. VisualMotion provides backup commands for both the NVRam and compact flash. These backup commands can be preformed by writing directly to the parameters listed in the following sections or from VisualMotion Toolkit under menu selection ***Commission ⇒ Archive ⇒ Other…***

NVRam Backup

The following parameters are used to backup the contents of the NVRam to the compact flash:

Parameter	Description
C-0-0170	NVRam backup command
C-0-0171	NVRam backup status

Table 4-12: NVRam Backup Parameters

Note: NVRam restore functionality is not required. During power up, the NVRam is restored automatically from flash if a difference is detected between the current NVRam content and the backup copy in flash.

Compact Flash Backup

For controls using a 32 MB or greater compact flash card, the following parameters divide the compact flash memory into two equal parts and create a complete backup of the compact flash including the NVRam and GxP 11 firmware.

Parameter	Description
C-0-0172	Compact flash backup command
C-0-0173	Compact flash backup status

Table 4-13: Compact Flash Backup Parameters

Compact Flash Restore

The following parameters are used to restore the contents of a compact flash backup:

Parameter	Description
C-0-0174	Compact flash restore command
C-0-0175	Compact flash restore status

Table 4-14: Compact Flash Restore Parameters

4.6 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. 4-12. To ensure proper grounding of control system, use a ground wire of at least 10 mm² (8 **A**merican **W**ire **G**auge). Voltage supply grounding should also be performed in the same manner.

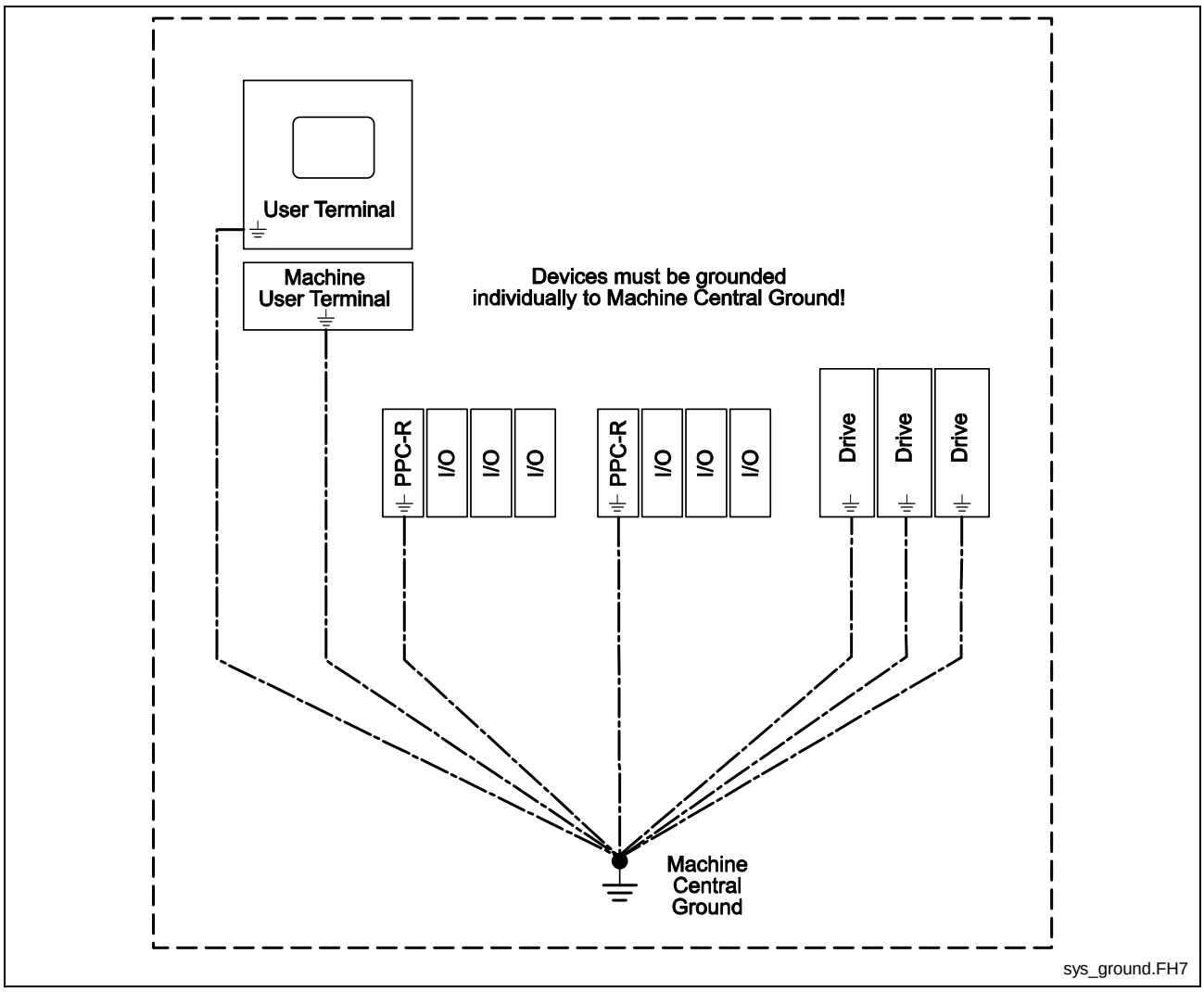


Fig. 4-12: System Grounding

5 System I/O Modules

5.1 PPC-R22.1 Machine Control System

When a PPC-R22.1 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-R22.1, controls all backplane communication of installed LocalReco 02 I/O modules.

LocalReco 02 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 LocalReco I/O modules, the PPC-R22.1 can also communicate, via Sercos, with Rexroth Inline, SercosReco racks, and drive I/O cards.

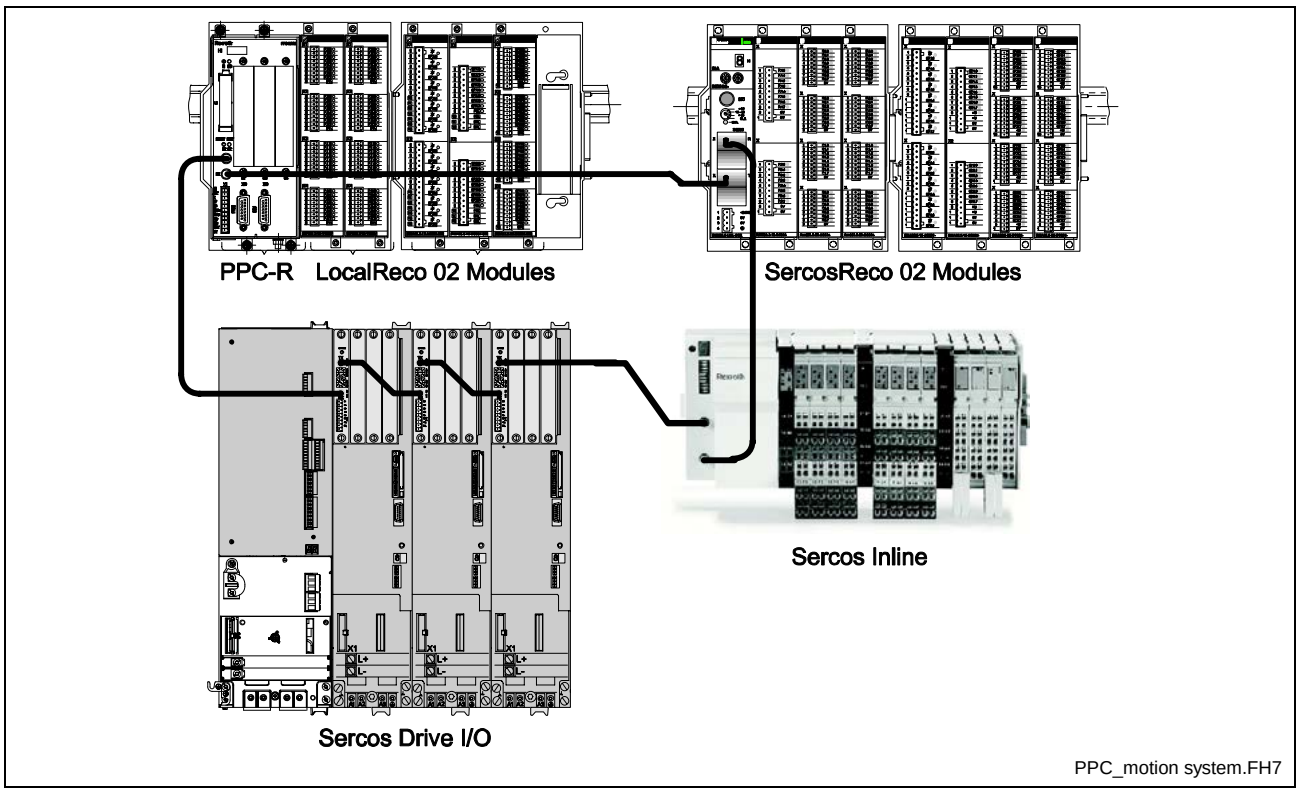


Fig. 5-1: PPC-R22.1 Motion Control Configuration

5.2 Supported I/O Devices

Sercos Inline I/O Hardware

Sercos Inline is a Sercos based I/O module system that provides the user with greater flexibility in I/O configurations. Rexroth Inline modules are stacked on to a Sercos coupler (R-IL-SE-BK). A maximum of six (6) Sercos couplers can be on the Sercos ring. Each Sercos coupler can hold a maximum of 40 Rexroth Inline modules as long as the total number of bytes per Sercos coupler does not exceed 32 bytes for input data and 32 bytes for output data.

Refer to Sercos I/O Configuration Limits on page 5-11 for details.

The following arrangements are strongly recommended for optimal performance:

- I/O module blocks should be attached to the Inline Sercos coupler sequentially from left to right in the following order: Analog Outputs, Digital Outputs, Analog Inputs, and Digital Inputs.
- I/O modules should be arranged depending on the data length, i.e. modules with the larger data length should be placed in the first slot position, modules with the lowest data length in last slot position.

Refer to the *Rexroth Inline Overall View* manual DOK-CONTRL-R-IL*INLINE-KB02-EN-P (MN R911292649) and the *Sercos Terminal and Module Supply* project planning manual, DOK-CONTRL-R-IL-SEBK**-PR01-EN-P for details.

Rexroth Inline I/O Update Calculation

The I/O update rate for Rexroth Inline I/O configurations is slower than it is for SercosReco I/O modules. As a general rule, the update time for Rexroth Inline I/O configurations can be calculated using the following formula:

Update Time = (2 * ***Sercos Update Rate***) + Max[(***Total Bytes*** / 2), 6]

If the calculation (Total Bytes / 2) is less than 6, then use 6 bytes as a Max value.

Fig. 5-2: Rexroth Inline I/O Update Calculation

Update Time **=** time (in ms) for a signal change of a given Inline IO update module to reach the actual VisualMotion register for which it is defined.
Sercos Update Rate **=** value (in ms) of the Sercos Update as defined in C-0-0099.
Total Bytes **=** total number of data bytes (for both input and output direction) used within the Sercos Inline module.

Note: Additional time could also be considered for individual module behavior (A->D conversion for analog modules, latency delays, etc.). However, in most cases the bulk of the Update Time calculation is taken in to account in the formula mentioned above.

For example:

With an Inline I/O configuration using 2 bytes of input and 2 bytes of output and a Sercos update rate of 2 ms, an *Update Rate* of 10 ms or more can be expected. With additional I/O, inclusion of analog modules, etc. this time will increase.

In contrast, the Sercos Reco IO (RMK) has a considerably faster update time. In the same scenario, the update time would be 4ms for the RMK system.

Refer to the relevant Rexroth Inline Terminal functional description for details.

Rexroth Inline Digital I/O Modules

The following table lists the available digital modules supported in VisualMotion 11:

Digital Module	Description	Material Number
R-IL-SE-BK	Sercos coupler - use with supply connector R-IB IL SCN-PWR IN-CP (MN R911289328)	R911296696
R-IB IL 24 DI 2	2 bit - 24V digital input	R911289286
R-IB IL 24 DI 4	4 bit - 24V digital input	R911289287
R-IB IL 24 DI 8	8 bit - 24V digital input	R911289288
R-IB IL 24 DI 16	16 bit - 24V digital input	R911289290
R-IB IL 24 DI 32/HD	32 bit - 24V digital input	R911297188
R-IB IL 24 DO 2-2A	2 bit - 24V digital output	R911289294
R-IB IL 24 DO 4	4 bit - 24V digital output	R911289295
R-IB IL 24 DO 8	8 bit - 24V digital output	R911289297
R-IB IL 24 DO 16	16 bit - 24V digital output	R911289299
R-IB IL 24/230 DOR1/W	1 digital output / 230 VAC / relay	R911289301
R-IB IL 24/230 DOR4/W	4 digital outputs / 230 VAC / relay	R911289302
R-IB IL 24 EDI 2-DES	2 digital inputs / 2 monitoring inputs / 24 VDC	R911289292

Table 5-1: Rexroth Inline Digital Modules

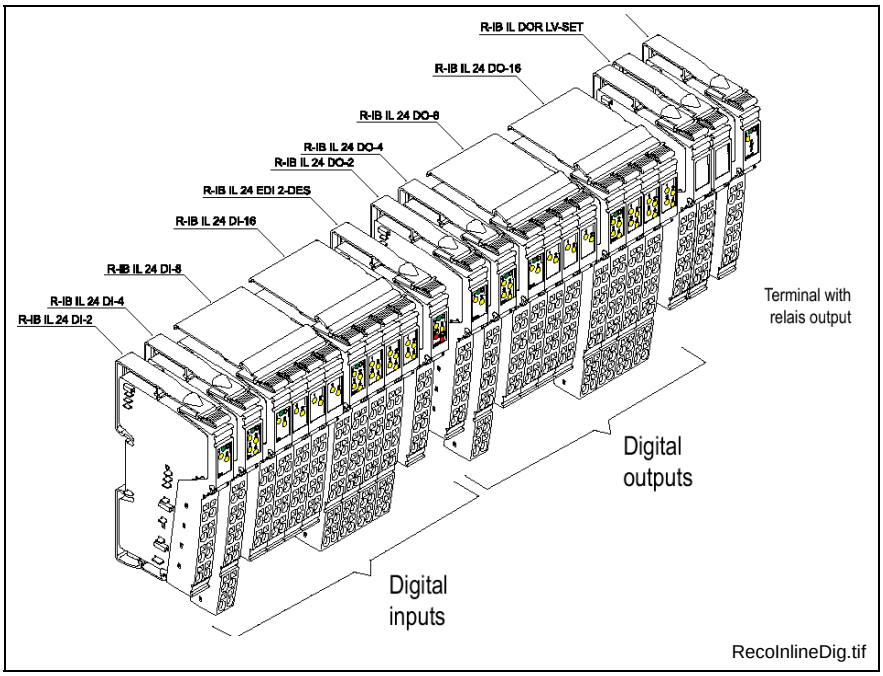


Fig. 5-3: Rexroth Inline Digital Modules

Refer to the *Rexroth Inline Digital I/O Terminal* functional description, DOK-CONTRL-R-IL*DIO***-FK03-EN-P (MN R911289589) for details.

Rexroth Inline Analog I/O Modules

The following table lists the available analog modules supported in VisualMotion 11:

Analog Module	Description	Material Number
R-IB IL 24 AI 2/SF	4 byte input / 4 byte output 24V analog input	R911289306
R-IB IL TEMP 2 RTD	4 byte input / 4 byte output analog input	R911289305
R-IB IL 24 AO 1/SF	2 byte input 24V analog output	R911289303
R-IB IL 24 AO 2/U/BP	4 byte input / 4 byte output 24V	R911289381
R-IB IL TEMP 2UTH-PAC	4 byte input / 4 byte output analog input	in preparation

Table 5-2: Rexroth Inline Analog Modules

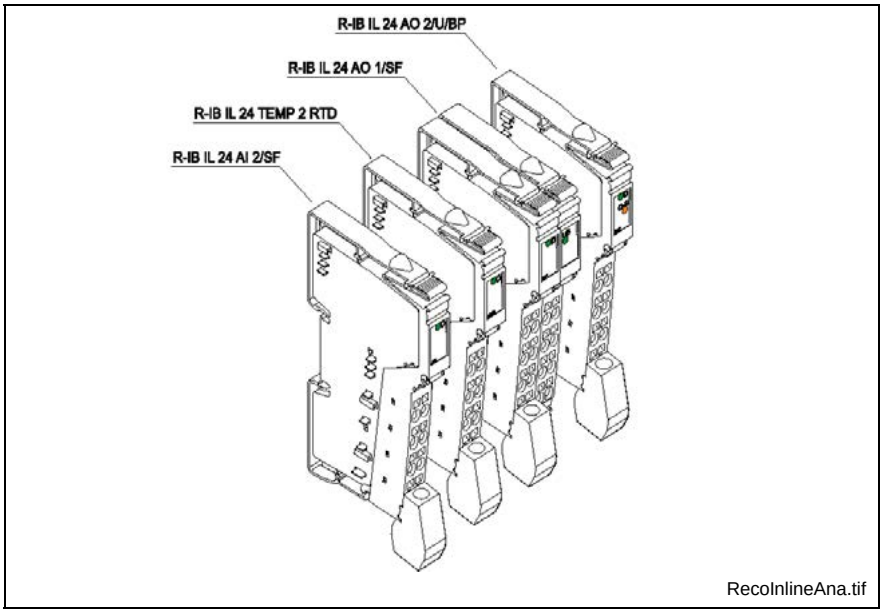


Fig. 5-4: Rexroth Inline Analog Modules

Refer to the *Rexroth Inline Analog Terminals* functional description, DOK-CONTRL-R-IL*AIO***-FK02-EN-P (MN 911289591) for details.

Rexroth Inline Controllers

The following table lists the available temperature and positioning controllers supported in VisualMotion 11:

Inline Controller	Description	Material Number
R-IB IL TEMPCON UTH	4 byte input / 4 byte output temperature controller	in preparation
R-IB IL TEMPCON RTD	4 byte input / 4 byte output temperature controller	in preparation
R-IB IL SSI	4 byte input / 4 byte output positioning controller	in preparation
R-IB IL INC	4 byte input / 4 byte output positioning controller	in preparation

Table 5-3: Rexroth Inline Controllers

Rexroth Inline Fieldbus Couplers

The following table lists the available fieldbus couplers supported in VisualMotion 11:

Fieldbus Coupler	Description	Material Number
R-IL PB BK DP/V1	Profibus coupler use with supply connector R-IB IL SCN-PWR IN-CP (MN R911289328)	R911308486
R-IL DN BK	DeviceNet coupler use with supply connector R-IB IL SCN-PWR IN-CP (MN R911289328)	R911289284

Table 5-4: Rexroth Inline Fieldbus Couplers

Refer to the *Design and Installation of Reco Inline Module family in Profibus DP* manual, DOK-CONTRL-R-IL*PBSSYS-AW02-EN-P (MN R911289597) for details.

Rexroth Reco 02 I/O Modules

Reco 02 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-R22.1 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. 5-8.

Refer to the *Rexroth Reco 02 Configuration* manual for details.

A control system is composed of:

- a Reco 02 RMB base rack unit
- PPC-R22.1 controls using GPP firmware
- and a combination of RME, RMA I/O and RMC modules

LocalReco 02 I/O Station

The PPC-R22.1 control is physically installed into a RMB02.2 rack designed to hold the control along with Reco 02 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-R22.1) leaving the remaining slots available for I/O modules. The I/O modules that plug into the same rack as the control are identified as LocalReco 02 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 LocalReco 02 I/O modules. LocalReco 02 I/O modules are automatically detected by the control and identified in control parameter C-0-2013 (I/O Configuration List). The assignment of registers for LocalReco I/O modules is done using the I/O Setup Tool.

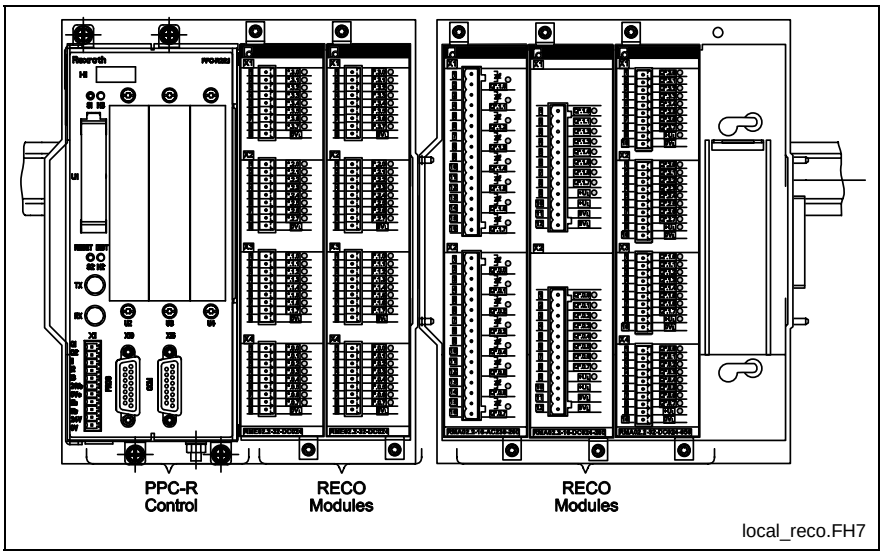


Fig. 5-5: LocalReco 02 I/O Station

SercosReco I/O Station

A SercosReco I/O station is a RMB rack configured with a Sercos RMK I/O Controller and up to 3 Reco 02 I/O modules connected to the control via a Sercos ring. Up to 3 additional RMB racks can be configured and connected to the RMB containing the RMK Sercos coupler. A maximum of 6 Sercos couplers can be on the Sercos ring. Each Sercos coupler can hold a maximum of 15 Reco 02 I/O modules.

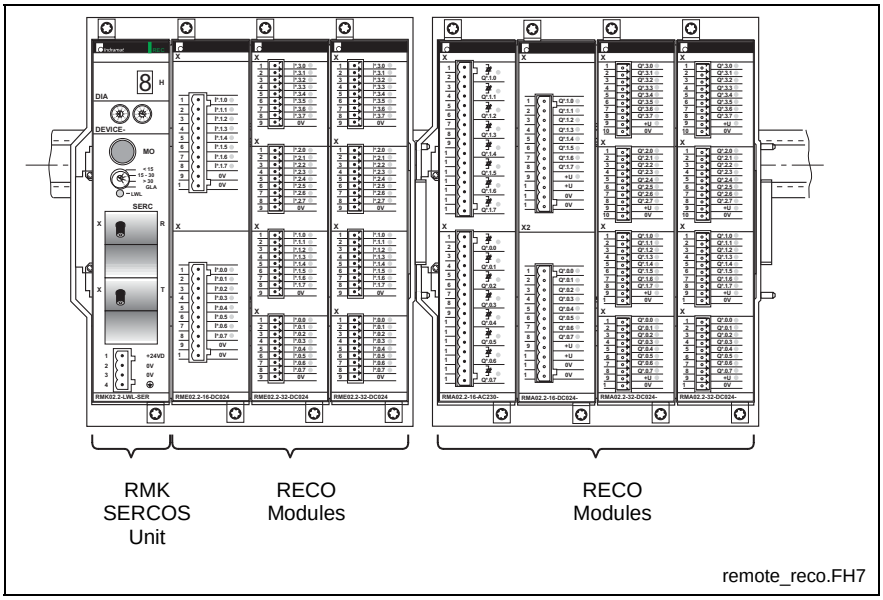


Fig. 5-6: Sercos I/O Stations

Reco 02 I/O Hardware

Reco 02 I/O modules can be combined in any order beginning with the next available adjacent slot next to the PPC-R22.1.

Description	Type	Details	Material Number
RMB02.2-04	Base rack, 4 slots	accommodates up to 4 modules	R911278846
RME02.2-16-DC024	Input module	2 x 8 inputs, 24 VDC	R911280936
RME02.2-32-DC024	Input module	4 x 8 inputs, 24 VDC	R911280937
RME02.2-32-AC115	Input module	2 x 8 inputs, 115 VAC	R911280938
RMA02.2-16-DC024-200	Output module	2 x 8 outputs, 24 VDC, 2A	R911280930
RMA02.2-32-DC024-050	Output module	4 x 8 outputs, 24 VDC, 500mA	R911280931
RMA02.2-16-AC230-200	Output module	2 x 8 outputs, 230 VDC, 2A	R911280929
RMA02.2-16-RE230-200	Output module	2 x 8 relay outputs, 230 VAC, 2A	R911280928
RMC02.2-2E-1A	Analog module	analog module 2 x inputs, 1 x output	R911280945

Table 5-5: Reco 02 I/O Module Overview

Reco Sercos Coupling Unit

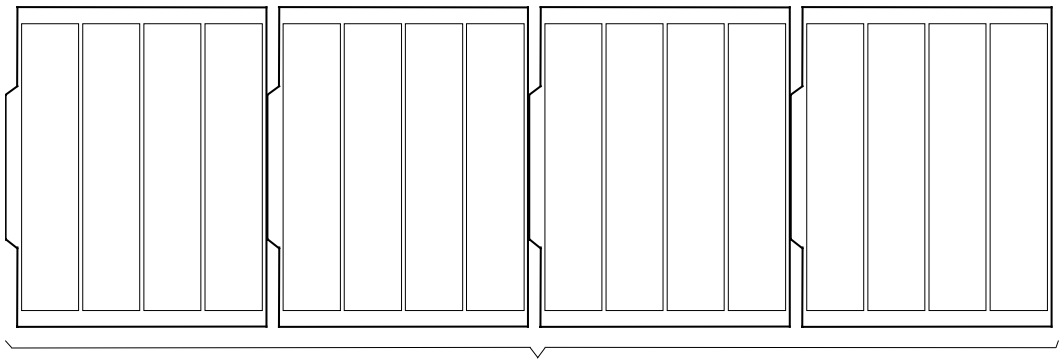
Reco 02 I/O modules can be used remotely to the PPC-R22.1. In this case, a Sercos coupling RMK unit is necessary. The remote Reco 02 rack is then connected via the Sercos ring to the PPC-R22.1.

Description	Type	Details	Material Number
RMK02.2-LWL-SER-FW	Sercos coupling unit	Sercos Interface	R911280946

Table 5-6: 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.



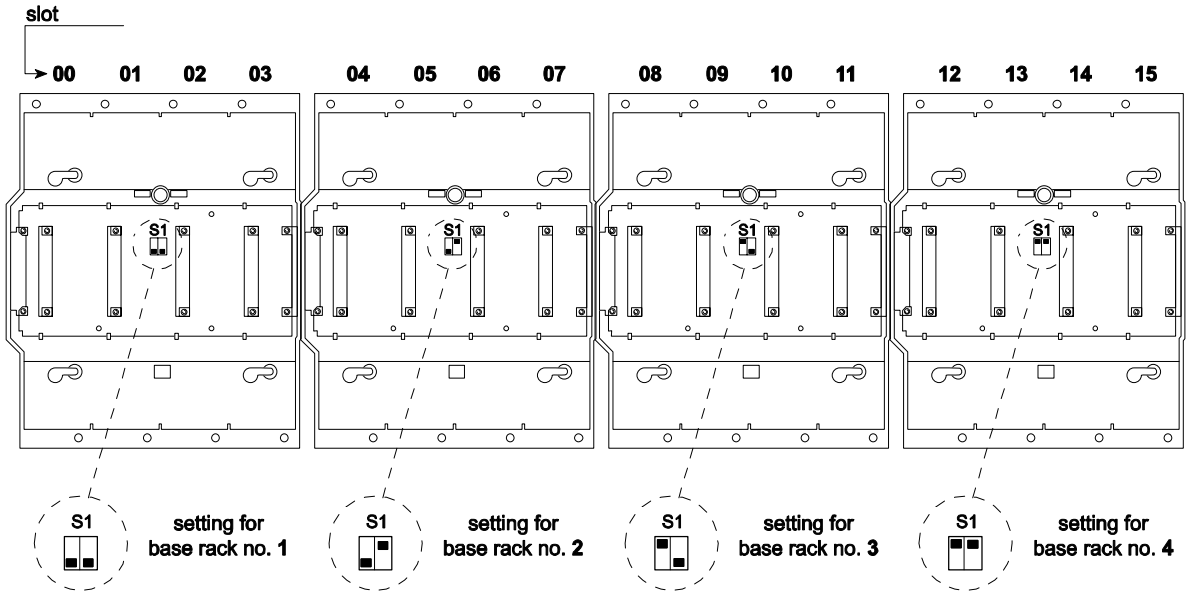
4 x RMB02.2-04
with a total of 16 module slots for accommodating the PPC-R and different RECO02 I/O modules

Word Art

Fig. 5-7: RMB02.2-04 Maximum Configuration

RMB02.2 Rack Slot Addressing

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. 5-8.



	Base rack 1				Base rack 2			
	slot 00	slot 01	slot 02	slot 03	slot 04	slot 05	slot 06	slot 07
bit number	byte number				byte number			
I/Q 0....7	3	7	11	15	19	23	27	31
I/Q 8....15	2	6	10	14	18	22	26	30
I/Q 16....23	1	5	9	13	17	21	25	29
I/Q 24....31	0	4	8	12	16	20	24	28

	Base rack 3				Base rack 4			
	slot 08	slot 09	slot 10	slot 11	slot 12	slot 13	slot 14	slot 15
bit number	byte number				byte number			
I/Q 0....7	35	39	43	47	51	55	59	63
I/Q 8....15	34	38	42	46	50	54	58	62
I/Q 16....23	33	37	41	45	49	53	57	61
I/Q 24....31	32	36	40	44	48	52	56	60

RMB02.2_Address.FH7

Fig. 5-8: Setting the Reco Rack Addresses

Note: The PPC-R22.1 must be installed in slot 00 of base rack 1.

IndraDrive MD1 I/O Module

IndraDrive digital drives using MPH 02 firmware or greater support the MD1 digital I/O module. This optional I/O module is installed in the X10 slot of the CSH advanced control section. It provides 8 digital 24V outputs and 12 digital 24V inputs according to IEC61131.

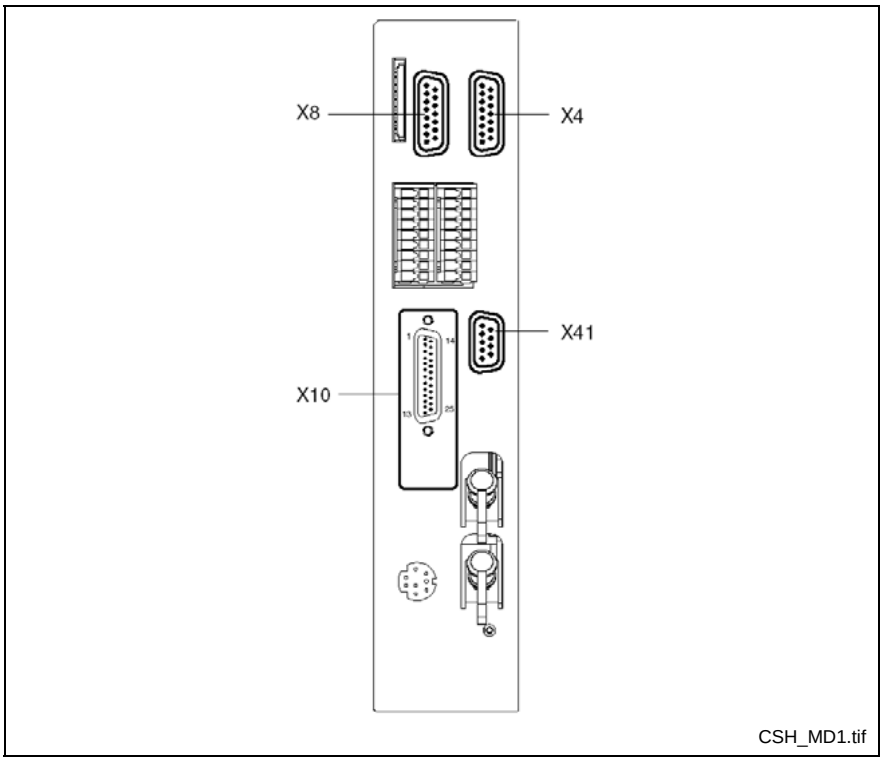


Fig. 5-9: CSH Control Section with MD1 I/O Module (X10)

MD1 X10 Connector Assignment

The following table lists the X10 connector pin assignment for the MD1 I/O module:

Pin	I/O	Function	Pin	I/O	Function
1	O	Output 0.0	14	I	Input 2.0
2	O	Output 0.1	15	I	Input 2.1
3	PWR	$U_{ext\ 0}$	16	I	Input 2.2
4	O	Output 0.2	17	I	Input 2.3
5	O	Output 0.3	18	I	Input 2.4
6	PWR	GND_{ext}	19	I	Input 2.5
7	PWR	$U_{ext\ 2}$	20	I	Input 2.6
8	PWR	GND_{ext}	21	I	Input 2.7
9	O	Output 1.0	22	I	Input 2.8
10	O	Output 1.1	23	I	Input 2.9
11	PWR	$U_{ext\ 1}$	24	I	Input 2.10
12	O	Output 1.2	25	I	Input 2.11
13	O	Output 1.3			

Table 5-7: MD1: X10 Signal Assignment

Diax I/O Module

Diax 03/04 digital drives can hold up to 3 I/O modules. VisualMotion supports both the digital Dea modules and analog Dae and Drf modules.

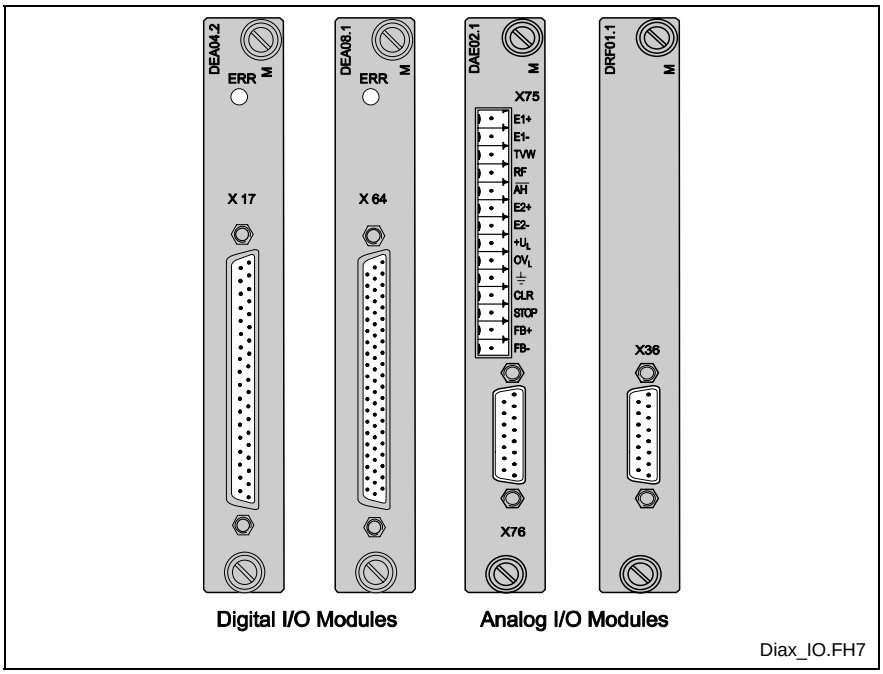


Fig. 5-10: Diax I/O Modules

EcoDrive EMD I/O Module

EcoDrive 03 digital drives using SGP20 firmware support the EMD I/O module using the Eco-X bus system.

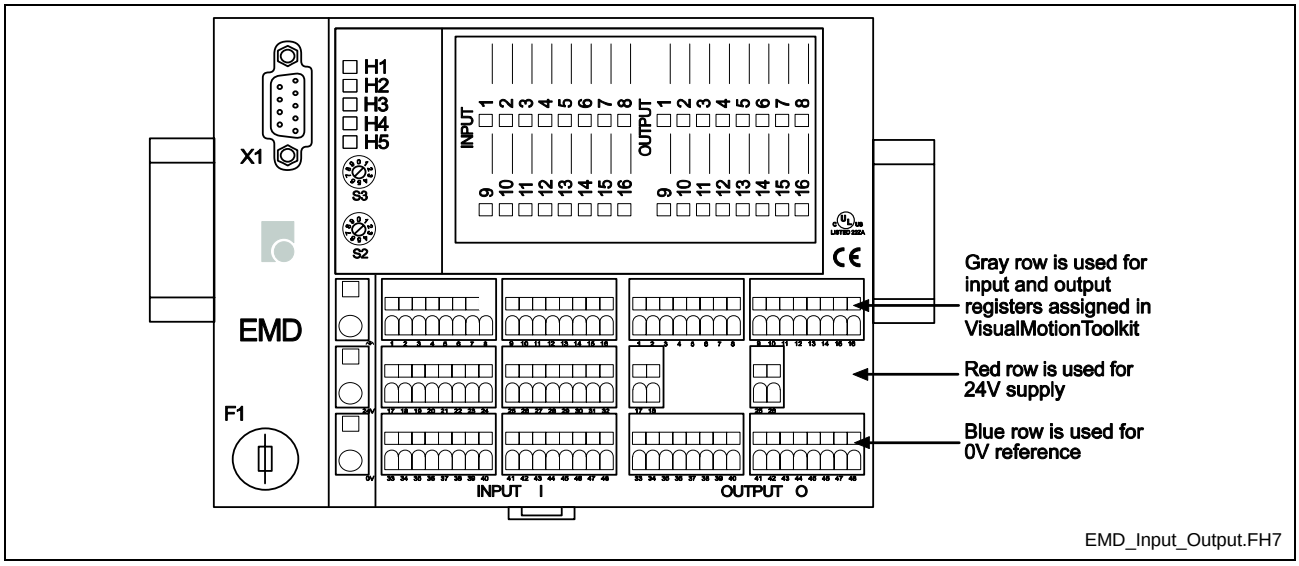


Fig. 5-11: EMD I/O Module

5.3 Configuring I/O Modules

VisualMotion 11 separates the configuring of I/O modules depending on the level of communication. LocalReco I/O modules are installed in the same RMB rack as the control and communicate via the rack's backplane. For this reason, the configuration of such modules is performed using IndraLogic. On the other hand, SercosReco I/O, Rexroth Inline, and drive I/O modules all communicate via the Sercos ring and are configured using VisualMotion Toolkits I/O Setup tool.

Sercos I/O Configuration Limits

The VisualMotion system supports a maximum of 40 Sercos devices, including both drives and I/O devices. The use of Sercos I/O devices reduces the number of drives allowed on the Sercos ring.

The maximum number of Sercos and Drive I/O that can be configured for one control is 240 inputs and 240 outputs.

SercosReco and Inline Limits

A total of 6 Sercos I/O devices of type RMK and/or R-IL-SE-BK can be configured for a VisualMotion control. The following table lists the maximum number of modules that can be configured for each Sercos I/O device:

Sercos I/O Device	I/O Type	Max. Number per Device
RMK	Reco 02	15 Modules
R-IL-SE-BK	Rexroth Inline	40 Modules *

* 40 modules are possible if the total I/O length is not greater than 32 bytes in each direction.

Table 5-8: Sercos I/O Limits

Drive I/O Limits

The following table lists the maximum number of Sercos I/O cards that can be configured for a Rexroth digital drive:

Drive Type	I/O Type	Max. Number of I/O Modules
IndraDrive	MD1	1 interface per drive (CSH section: X10)
Diax 04	Dea I/O Cards	Up to 3 I/O cards per drive
EcoDrive 03	EcoX I/O	Up to 2 Inputs and 2 Outputs per drive

Table 5-9: Drive I/O Limits

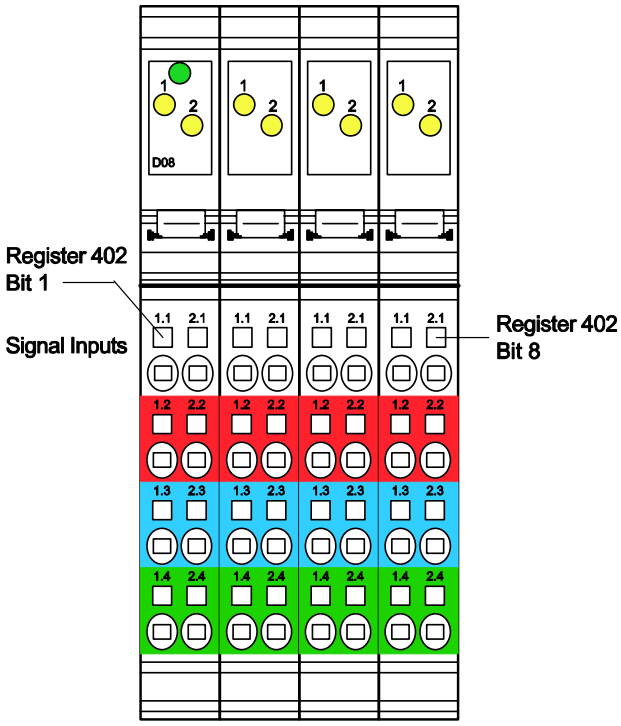
Accessing Rexroth Inline I/O Modules

Rexroth Inline I/O modules are accessed via user defined VisualMotion registers. The assignment of registers is performed using the I/O Setup tool. Rexroth Inline modules should only be assembled while the Rexroth Inline Sercos coupler is powered down.

Note: A valid Rexroth Inline configuration can only be detected and displayed in the I/O Setup tool when the Sercos coupler, attached to the Rexroth Inline modules, is connected to the Sercos ring and VisualMotion Toolkit is in online mode.

VisualMotion register bits are assigned to the Rexroth Inline signal input row (non-colored row), from left to right. The following figure shows an example of the register bit order for an 8 bit digital module.

Example Register Assignment to Rexroth Inline Module



D08.FH7

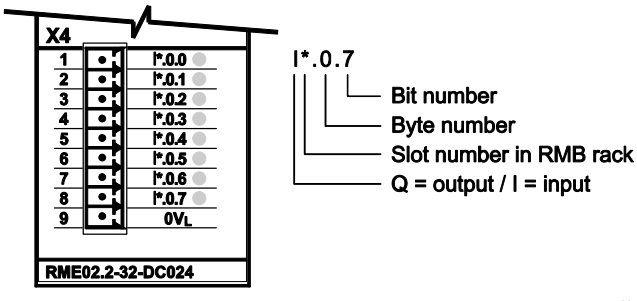
Fig. 5-12: Rexroth Inline Bit Order

Refer to the *I/O Setup Tool* in chapter 7 of the *VisualMotion 11 Functional Description* manual for details.

Accessing Reco 02 I/O Modules

Local Reco 02 I/O modules are addressed in the I/O image of IndraLogic. SercosReco 02 I/O modules are assigned to VisualMotion registers. The labeling of Reco 02 modules is illustrated in Fig. 5-13.

Note: This section only covers the accessing of SercosReco 02 I/O modules. For accessing Local Reco, refer to *Configuring Local Reco 02 I/O modules with IndraLogic* in chapter 7 of the *VisualMotion 11 Functional Description*.



reco_label.FH7

Fig. 5-13: Reco 02 Bit Label

Reco 02 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).

Reco 02 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 Reco 02 module connector is identified as a Byte. Reco 02 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 Reco 02 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. 5-14 illustrates the labeling structure of a Reco 02 Input or Output module and the relationship to VisualMotion assigned register bits.

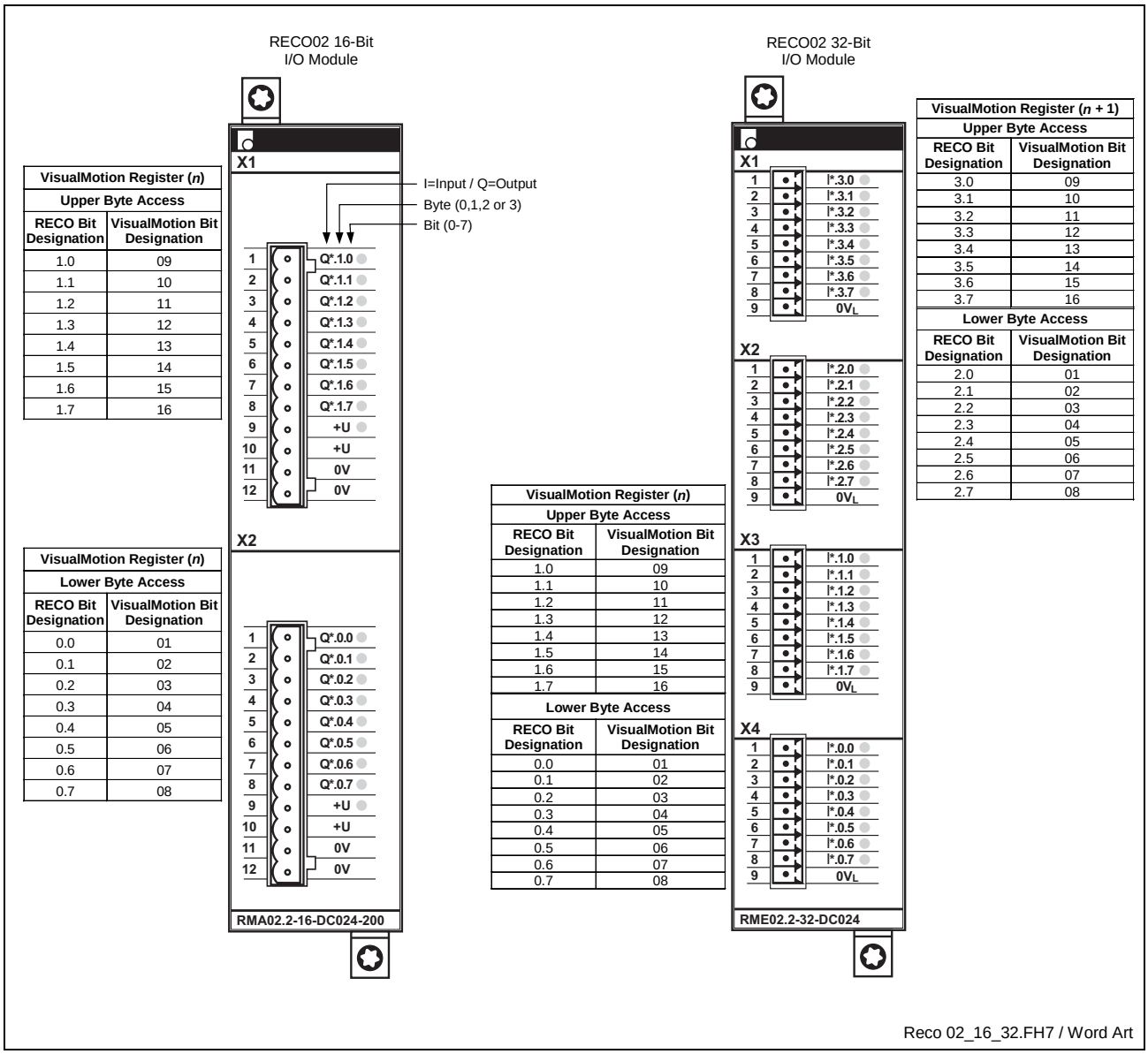
VisualMotion n Register Definition

This section makes mention of a (***n***) register and a (***n + 1***) register. During the configuration of Reco 02 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 Reco 02 modules. 16-Bit modules only use one register (***n***).

For example,

If register 400 is assigned to the inputs of a Reco 02 I/O module, register 401 is the (*n* + *1*) register.



VisualMotion Register (*n*)	
Upper Byte Access	
RECO Bit Designation	VisualMotion Bit Designation
1.0	09
1.1	10
1.2	11
1.3	12
1.4	13
1.5	14
1.6	15
1.7	16

VisualMotion Register (*n*)	
Lower Byte Access	
RECO Bit Designation	VisualMotion Bit Designation
0.0	01
0.1	02
0.2	03
0.3	04
0.4	05
0.5	06
0.6	07
0.7	08

VisualMotion Register (*n*)	
Upper Byte Access	
RECO Bit Designation	VisualMotion Bit Designation
1.0	09
1.1	10
1.2	11
1.3	12
1.4	13
1.5	14
1.6	15
1.7	16
Lower Byte Access	
RECO Bit Designation	VisualMotion Bit Designation
0.0	01
0.1	02
0.2	03
0.3	04
0.4	05
0.5	06
0.6	07
0.7	08

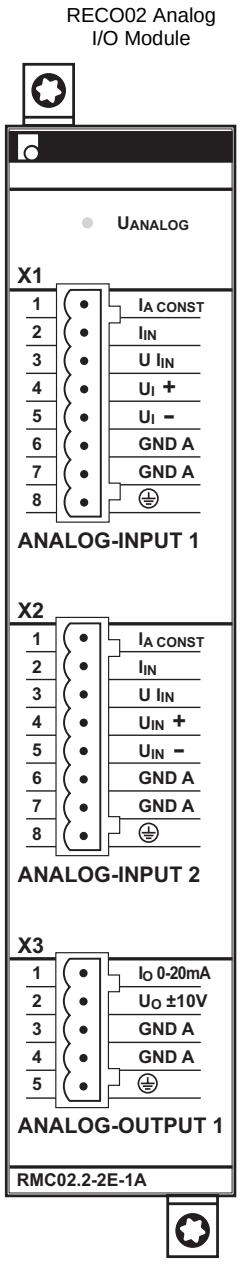
VisualMotion Register (*n* + 1)	
Upper Byte Access	
RECO Bit Designation	VisualMotion Bit Designation
3.0	09
3.1	10
3.2	11
3.3	12
3.4	13
3.5	14
3.6	15
3.7	16
Lower Byte Access	
RECO Bit Designation	VisualMotion Bit Designation
2.0	01
2.1	02
2.2	03
2.3	04
2.4	05
2.5	06
2.6	07
2.7	08

Fig. 5-14: Reco 02 Digital Input and Output Module Bit Access

RMC02.2-2E Analog Input and Output Module

The RMC02.2 analog Reco 02 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 Reco 02.2* configuration manual for details.

Note: The scaling for the output is done in VisualMotion Toolkit's I/O Setup Tool when configuring an analog Reco 02 module.



The first VisualMotion input register (***n***) is assigned to X1

The second VisualMotion input register (***n + 1***) is assigned to X2

The first VisualMotion output register (***n***) is assigned to X3

The second VisualMotion output register (***n + 1***) is reserved for scaling of the outputs

RMC02_2.FH7 / Word Art

Fig. 5-15: Reco 02 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 5-10: Reco I/O Error Reaction Bits (C-0-0010)

Note: All power connectors on Reco 02 output modules must be connected to a 24V supply or a "*24V Missing*" error message will be displayed in the I/O Setup 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 MD1 I/O Module for IndraDrive

The MD1 digital I/O module is configured using VisualMotion's I/O Setup tool in online or offline mode. This module can only be used with the IndraDrive CSH advanced control section using MPH 02 or greater firmware.

Configure the MD1 Module in Online Mode

1. Switch VisualMotion Toolkit to online mode and select ***I/O Setup…*** from the ***Commission*** menu.
2. Once the IndraDrive is found on the Sercos ring, right click over the relevant drive and select **Add I/O Module…**
3. By default, only an MD1 will be available for selection. Click the **OK** button to continue.

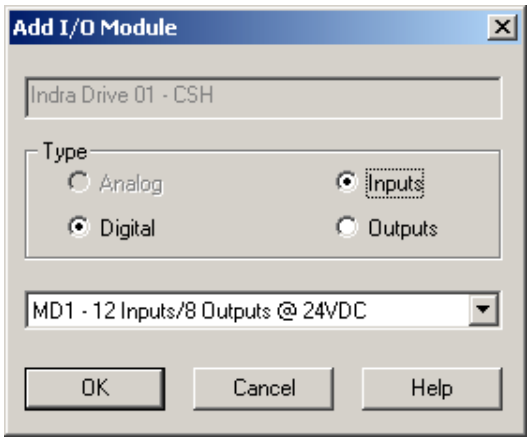


Fig. 5-16: IndraDrive – Add an I/O Module Window

4. Assign register numbers to the input and output registers of the MD1 I/O module (Only slot 1 is available).

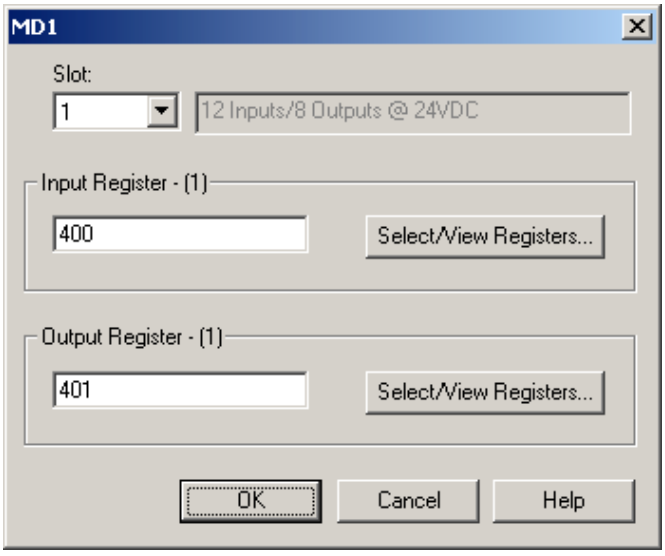


Fig. 5-17: Assigning Registers for MD1 Module

Note: Refer to Table 5-7: MD1: X10 Signal Assignment for a description of the I/O assignments.

Configure the MD1 Module in Offline Mode

1. Open the *I/O Setup* window by selecting ***I/O Setup…*** from the ***Commission*** menu in VisualMotion Toolkit.
2. Right click **I/O Configuration** and select **Add Sercos Device** to open the *Add Sercos Device* window.
3. Select **IndraDrive with MD1 I/O Module** device type.
4. Accept the default device type, **CSH - IndraDrive**, and select a Sercos address for the drive in the *Drive Setup* window.
5. Add an I/O module by right clicking the new drive in the I/O Configuration window and selecting ***Add I/O Module***.
6. Accept the default I/O type in the *Add I/O Module* window.
7. Assign register numbers to the input and output registers of the MD1 I/O module (Only slot 1 is available).
8. Save the I/O configuration to the offline project.

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. 5-18.

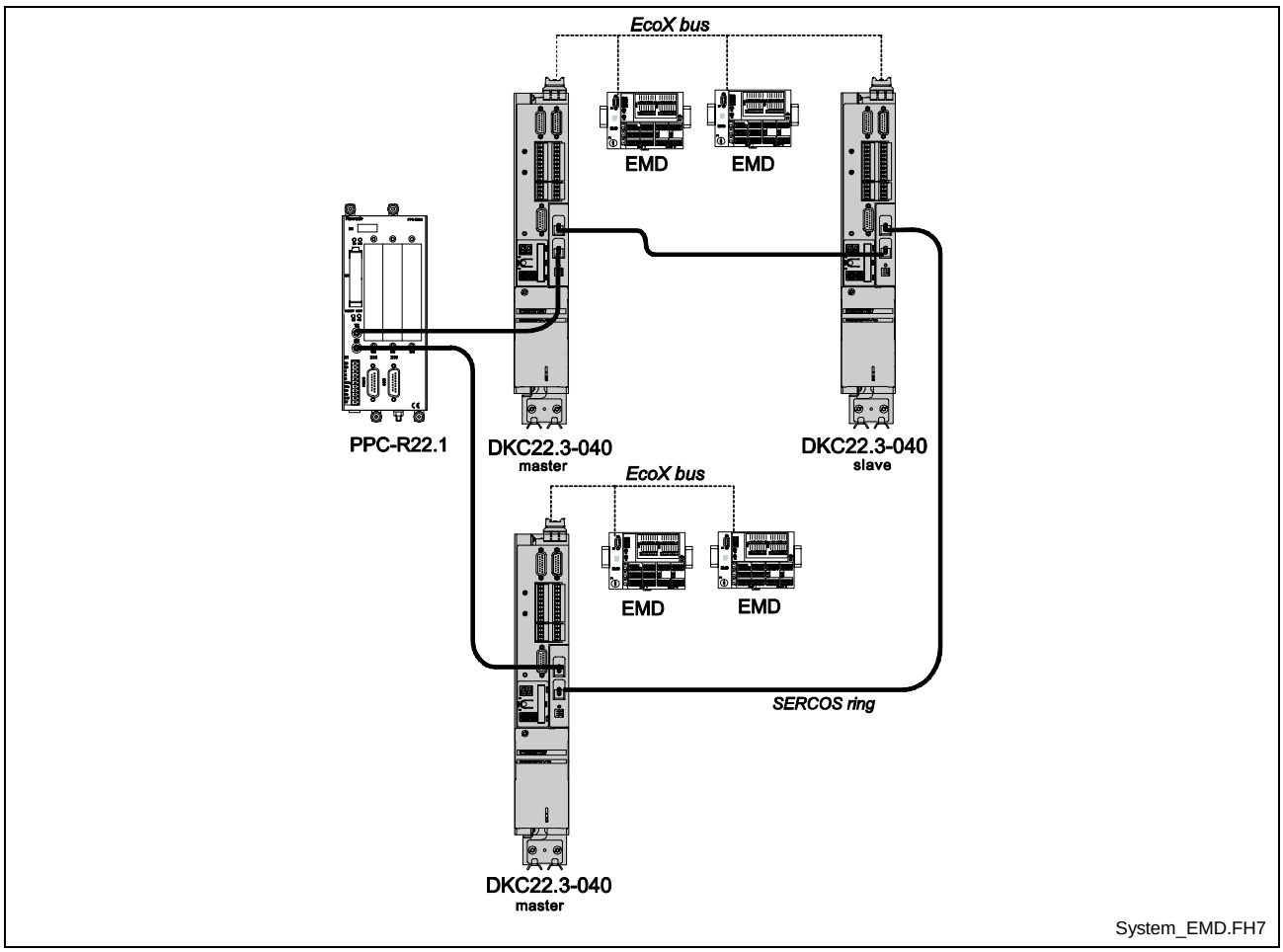


Fig. 5-18: System Configuration with EMD I/O Module

Configuring VisualMotion for EMD I/O Devices with EcoX Communication

To configure the EMD modules:

1. Open the *I/O Setup* 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, **DKC 22.3 EcoDrive 03**, 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**.

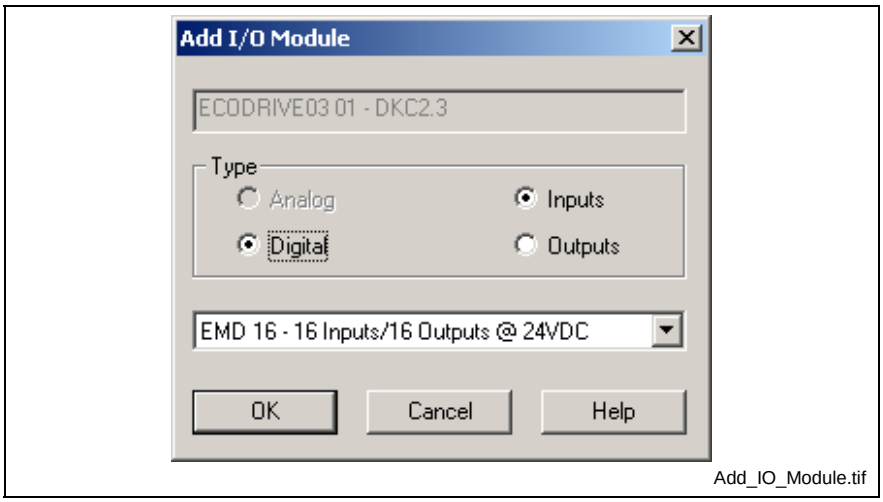


Fig. 5-19: Add I/O Module Window

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

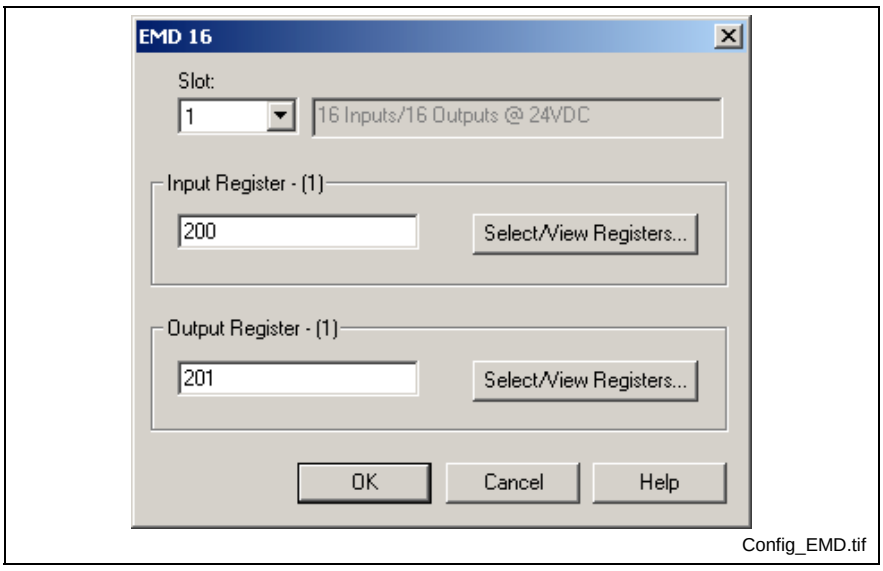


Fig. 5-20: Assigning Registers for EMD Module

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. 5-21. The 16 bits of each register are labeled 1 through 16 below each register in the row.

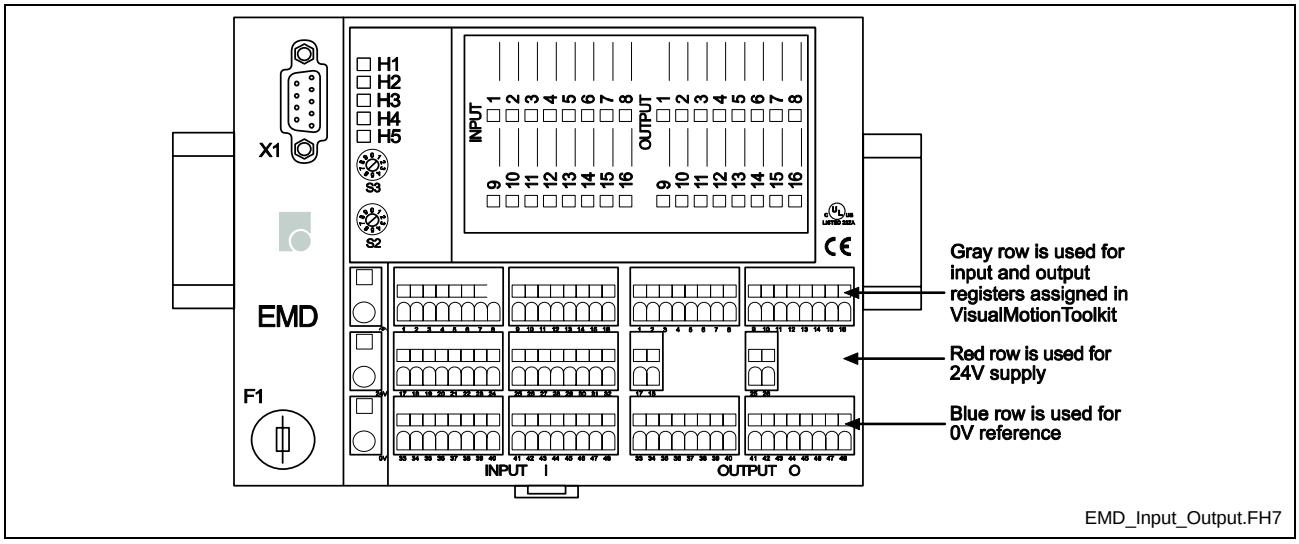


Fig. 5-21: Inputs and outputs on EMD I/O Module

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.

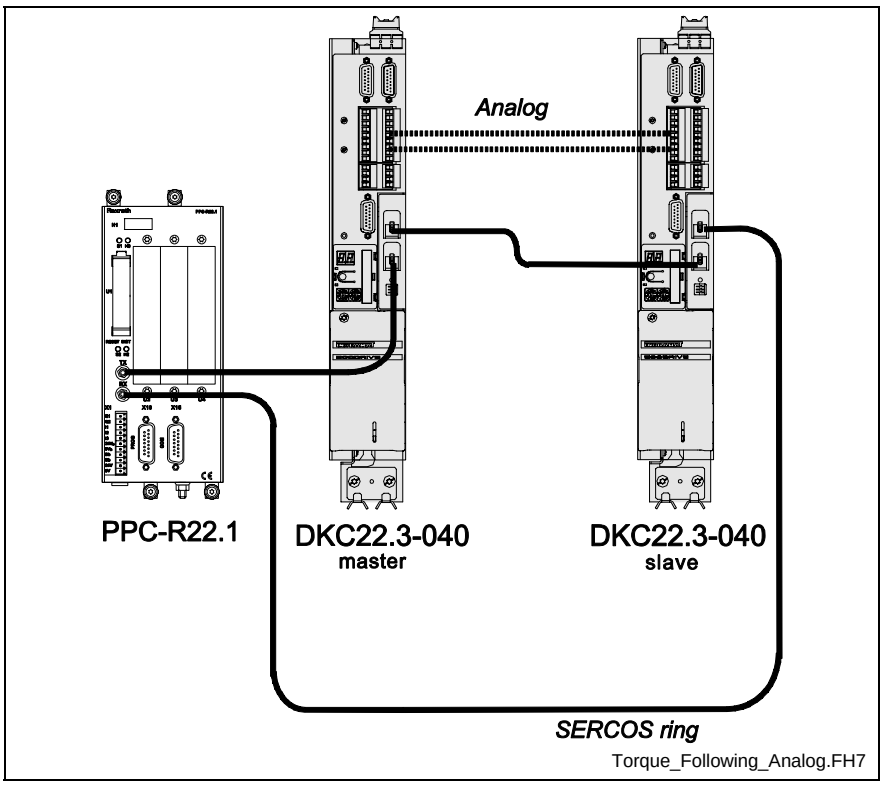


Fig. 5-22: Drives in Torque Following Mode with Analog Connection

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.

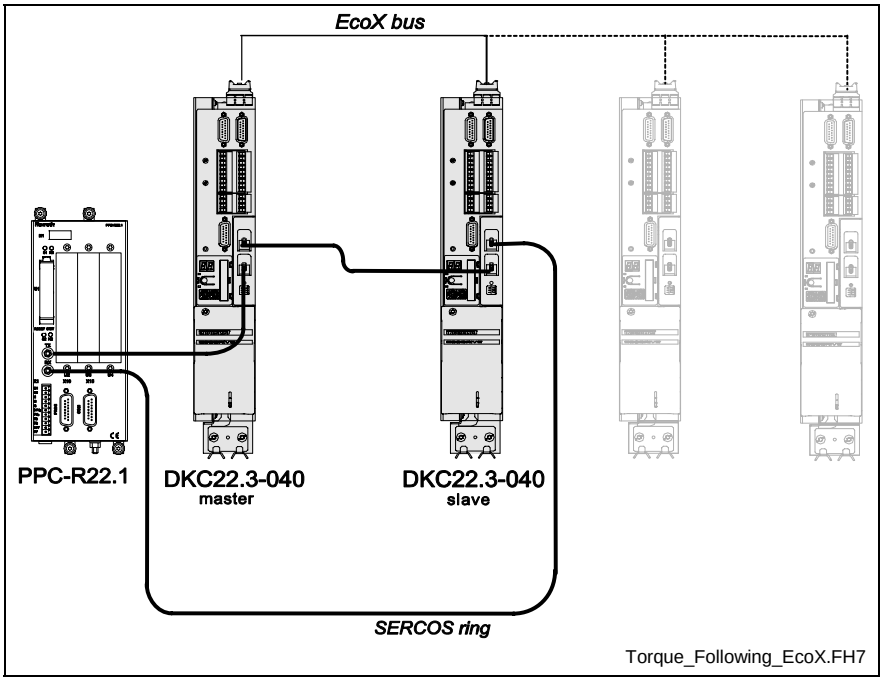
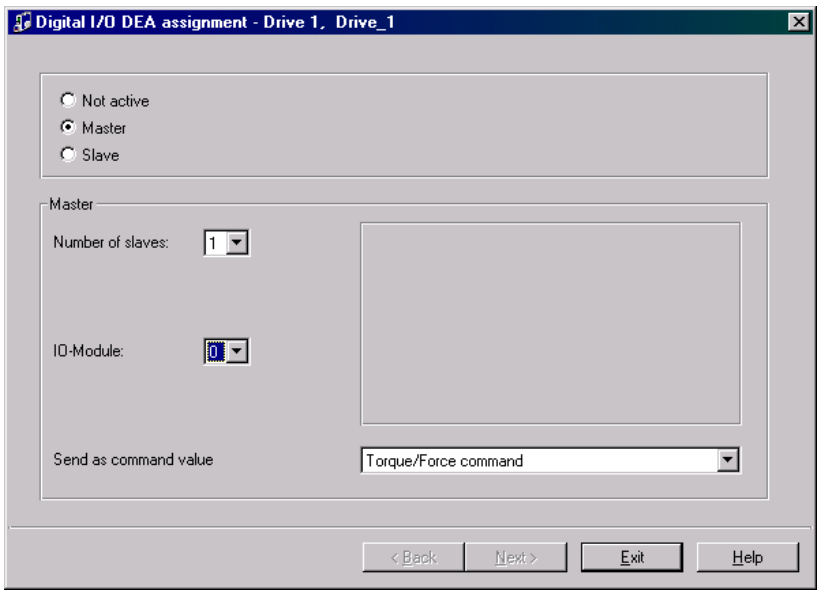


Fig. 5-23: Drives in Torque Following Mode with EcoX Connection

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:

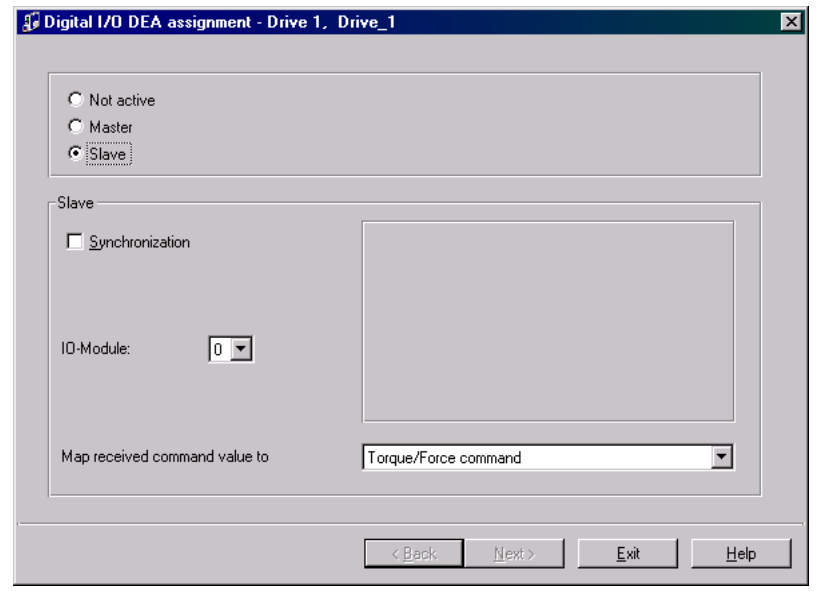
1. Launch DriveTop by selecting ***Drive Overview*** from the ***Commission*** menu in VisualMotion Toolkit while your project is online.
2. In the *Drives* window, double-click the drive table or click the ***Overview*** button to launch DriveTop.
3. In the DriveTop window, select ***Drive Functions ⇒ Special/optional drive functions ⇒ 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.



DriveTop_setup_master.tif

Fig. 5-24: Digital I/O Assignment for Mater Drive

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



DriveTop_setup_slave.tif

Fig. 5-25: 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.

Diax Digital I/O Modules

Diax 03/04 digital drives can hold up to 3 Dea I/O modules. The Dea 4.1, 5.1 and 6.1 each requires 1 register for 16 inputs and the 1 register for 15 outputs. The Dea 8.1, 9.1 and 10.1 each requires 2 registers for 32 inputs and 2 registers for 24 outputs. The pin-out for each module is illustrated in Fig. 5-26.

Note: VisualMotion does not support the I/O functionality in Rexroth IndraDrive digital drives.

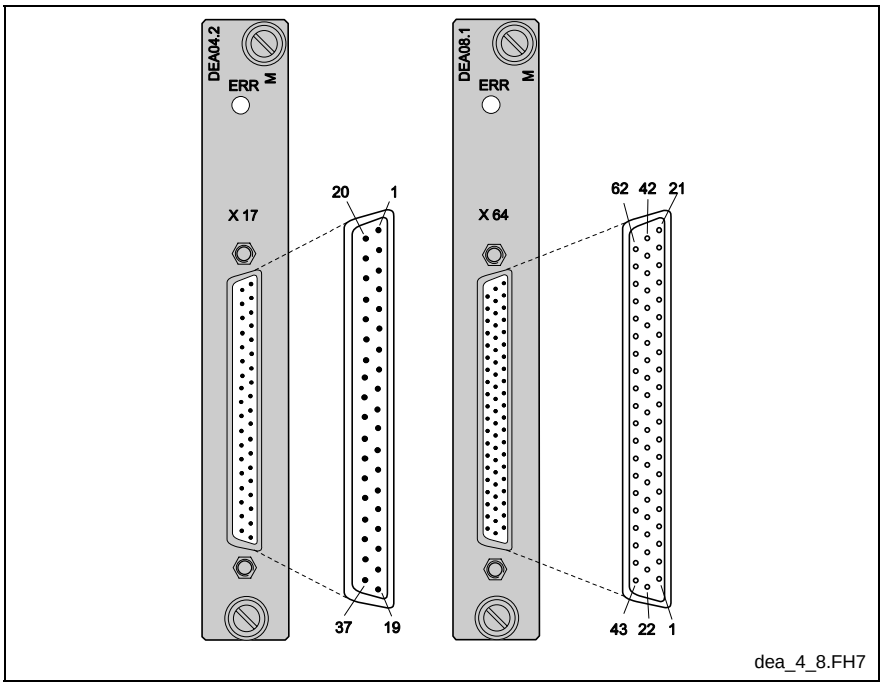


Fig. 5-26: Dea Digital Drive I/O Modules

The following table is an example using registers 405 and 453 as the assigned registers for the Dea 4.1, 5.1 or 6.1 inputs and outputs.

Register	Bits	Dea04 Pin-out
405 (Input)	01 - 15	01 - 15
453 (Output)	16 - 31	16 -31

Table 5-11: Dea 04 Digital I/O Pin-out

The following table is an example using registers 406, 407, 454 and 455 as the assigned registers for the Dea 8.1, 9.1 or 10.1 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 5-12: Dea 08 Digital I/O Pin-out

Diax Analog Input I/O Module

Bosch Rexroth digital drives of the Diax 03/04 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…

- Dae 02.1 14-bit analog inputs

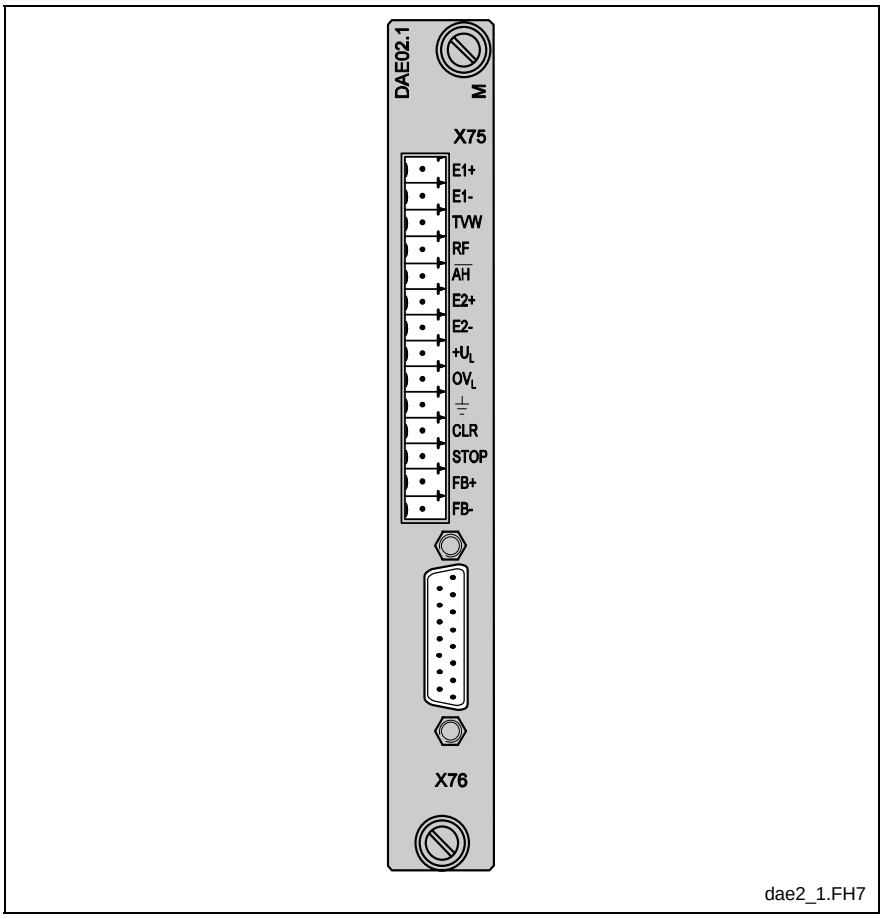


Fig. 5-27: Dae 02.1 Analog Input Module

6 Fieldbus Interfaces

The PPC-R22.1 and PPC-P11.1 can be ordered with a fieldbus slave interface, or a fieldbus master interface, or both. Only one fieldbus interface of each type can be installed in a control at one time. The mapping list for the slave interface is scanned every 4 ms. The fieldbus master interface is scanned at the current Integrated PLC I/O image update rate. Data is sent and received via the fieldbus board's dual port RAM.

The following fieldbus slave interfaces are available:

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

Note: EtherNet/IP fieldbus slave interface is available using either the Ethernet card or the onboard EtherNet connection. Refer to the *PPC-R Overview* in *section 4.1* for details.

The following fieldbus master interfaces are available:

- Profibus master interface
- DeviceNet master interface

The fieldbus interface are installed in an expansion slot of the PPC-R22.1 or mounted next to the PPC-P11.1 via the PC104 interface.

Note: Fieldbus slave interface is controlled via the motion portion of the control firmware. Fieldbus master interface is controlled via the Integrated PLC.

6.1 Profibus-DP Fieldbus Master and Slave Interfaces

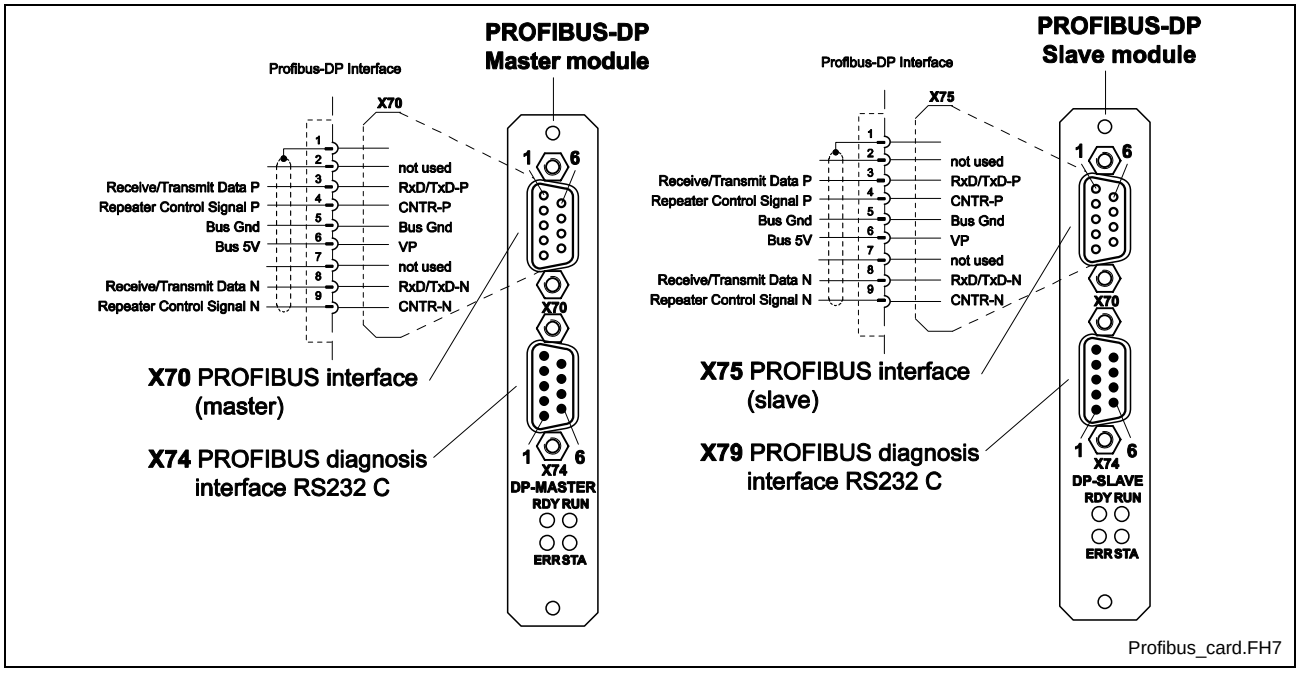


Fig. 6-1: Front Panel of DPM01 and DPS01 Profibus-DP Interface

Pin Assignment of Connector X70 and 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 X70 and 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 interface and the PPC-R22.1.

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 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 error

Table 6-3: LED Diagnostics for Profibus Interface

Profibus Specifications

Hardware

Description	Details
Performance – Max. Baud rate	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
Master or Slave Type	Profibus DP only
I/O Capacity	Master: 7 Kbytes total Slave: 128 bytes input / 128 bytes output

Table 6-5: Profibus Software

Note: A Profibus slave configuration file (*.gsd) and master file (*.gmd) are available in the VisualMotion 11 installation CD.

Certifications

Description	Details
Certifications	***P***rofibus ***N***utzer***O***rganisaton ***P***rofibus ***T***rade ***O***rganization CE Marked

Table 6-6: Profibus Certifications

6.2 DeviceNet Fieldbus Master and Slave Interfaces

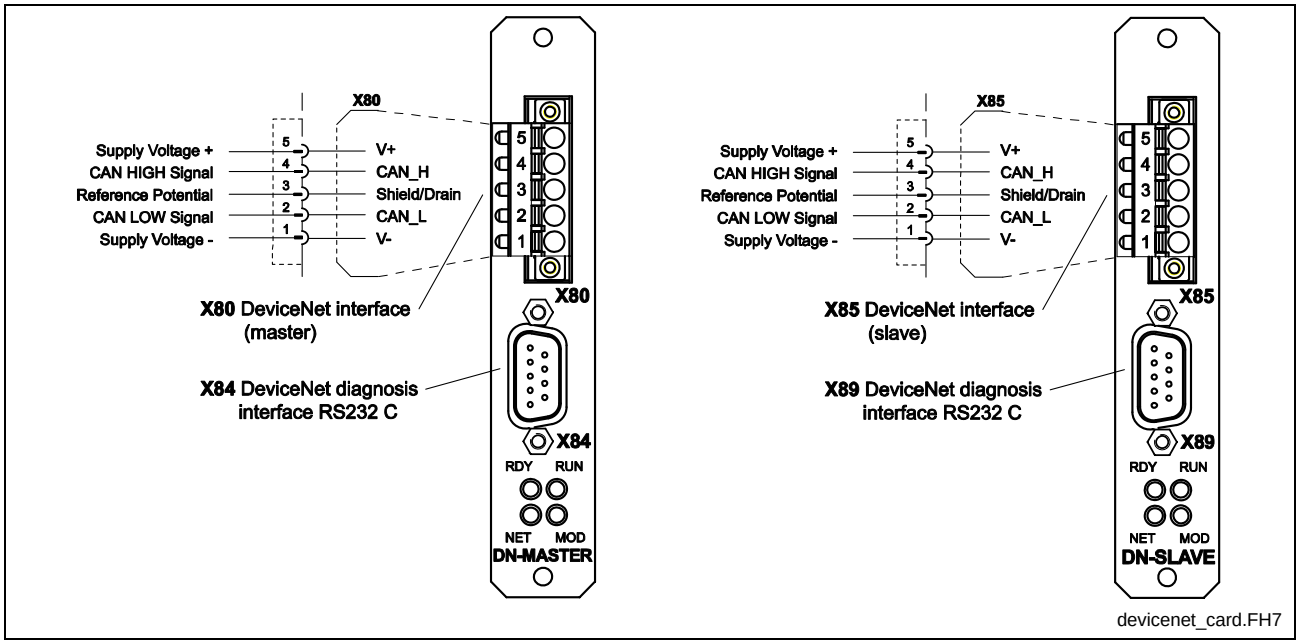


Fig. 6-2: Front Panel of DNS03 DeviceNet Slave Interface

Pin Assignment of Connector X80 and 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 interface and the PPC-R22.1.

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 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, Baud rate 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, Baud rate 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 Slave Software

Description	Details
Message types	Polled I/O, Cos, Cyclic, Explicit and Bit Strobe
Polled I/O Capacity	7 KBytes total

Table 6-12: DeviceNet Master Software

Note: DeviceNet configuration files (*.eds) are available in the VisualMotion 11 installation CD.

Certification

Description	Details
Certification	***O***pen ***D***eviceNet ***V***endor ***A***ssociation CE Marked

Table 6-13: DeviceNet Certification

6.3 ControlNet Fieldbus Slave Interface

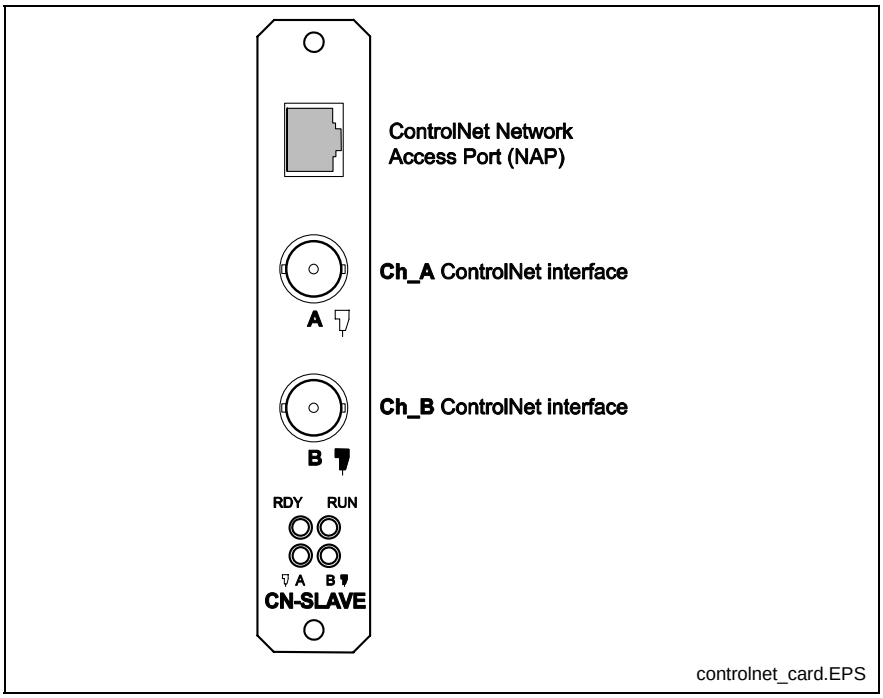


Fig. 6-3: Front Panel of the CNS01 ControlNet Slave Interface

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-R22.1.

LED	Color code
RDY	Yellow
RUN	Green
Ch_A	Clear
Ch_B	Clear

Table 6-14: 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
Ch_A * and Ch_B (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
Ch_A or Ch_B	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
* C_A and Ch_B LED's are based on the ControlNet Specification.		

Table 6-15: 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 6-16: ControlNet Hardware

Software

Description	Details
Slave type	Adapter, messaging
Message types	Polled I/O, Explicit
Polled I/O Capacity	128 bytes input / 128 bytes output

Table 6-17: ControlNet Software

Note: A ControlNet configuration file (*.eds) is available in the VisualMotion 11 installation CD.

Certification

Description	Details
Certification	***C**ontrolNet **I**nternational* CE Marked

Table 6-18: ControlNet Certification

6.4 EtherNet/IP Fieldbus Slave Interface

The PPC-R22.1 can be ordered with an optional onboard Ethernet interface and/or a 10/100 MBaud EtherNet card. The onboard EtherNet and EtherNet option card both support standard TCP/IP and EtherNet/IP communication. When both EtherNet interfaces are installed, only the option card will support EtherNet/IP, in addition to TCP/IP. Otherwise, a single EtherNet interface will support both TCP/IP and EtherNet/IP communication.

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 used by DeviceNet and ControlNet.

Note: When using EtherNet/IP in a VisualMotion 11 system, no other fieldbus interface card (i.e., Profibus, DeviceNet, ControlNet, and Interbus) 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 11 using GPP 11 firmware, standard TCP/IP communication between VisualMotion Toolkit over the same network is possible.

Refer to chapter 10 for hardware and firmware configurations.

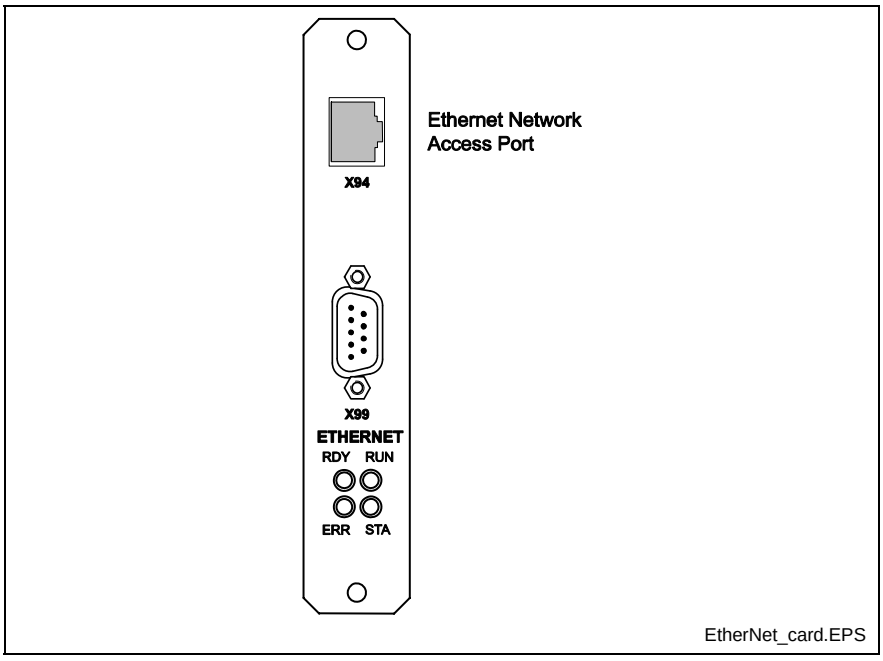


Fig. 6-4: ETH02 EtherNet Card

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 6-19: 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 6-20: LED Diagnostics for EtherNet

EtherNet and EtherNet/IP Specifications

Hardware

Description	ETH02 Hardware
Performance - baud rate	10/100 MBaud
Connector types	8-pin RJ-45 connector (NAP) Standard DB9 for diagnostic & firmware upload
Full Duplex support	YES
Auto negotiation support	YES
Operating Temperature	0 – 55 °C (32 – 131 °F)

Table 6-21: 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 6-22: 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	128 bytes input / 128 bytes output
Request **P**acket **I**nterval minimum	5ms

Table 6-23: EtherNet/IP Firmware

Note: An EtherNet/IP configuration file (*.eds) is available in the VisualMotion 11 installation CD.

Certification

Description	Details
Certification	CE Marked

Table 6-24: EtherNet Certification

6.5 Interbus Fieldbus Slave Interface

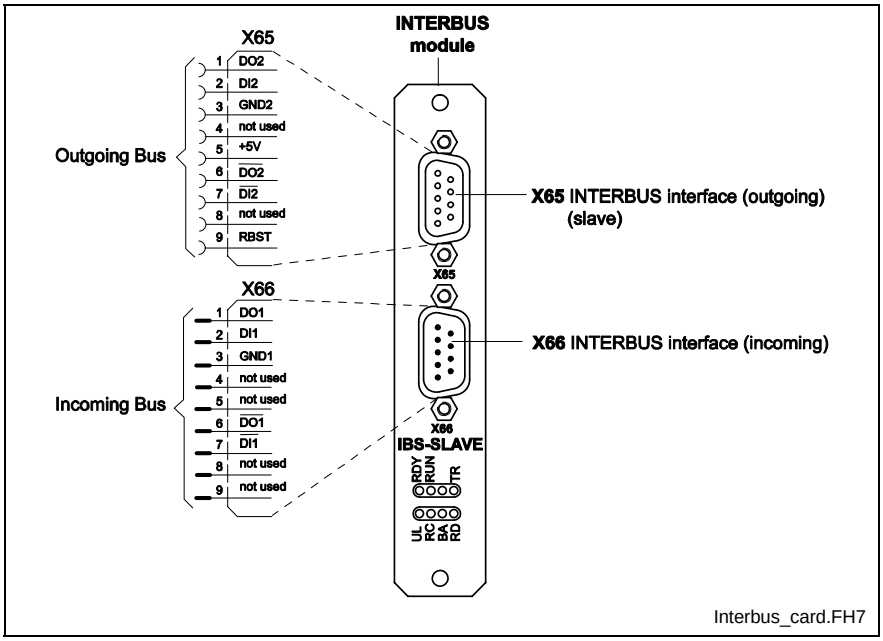


Fig. 6-5: Front Panel of the IBS03 Interbus Slave Interface

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 6-25: 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 6-26: 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-R22.1.

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

Table 6-27: 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 6-28: 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 6-29: 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 6-30: Interbus Software

Certification

Description	Details
Certification	CE Marked

Table 6-31: Interbus Certification

7 Master Enc. Card, Option Card PLS, & Link Ring

VisualMotion 11 supports the following optional interfaces for the PPC-R22.1 and the PPC-P11.1:

- Master Encoder Card (LAG)
- Option Card PLS (NSW01)
- Link Ring (DAQ03)

7.1 Master Encoder Card (LAG)

The Master Encoder Card (LAG) is used to provide a real master input to an ELS System. It is not intended to provide a secondary feedback device for a drive that supports only one primary feedback.

The following two cards are available for the PPC-R22.1 and PPC-P11.1:

- 2 encoder input interface
  - EnDat encoders
  - 1 V peak-to-peak Sinusoidal encoders only

Note: GPP 11 and GMP 11 firmware only support the interface of one encoder interface card.

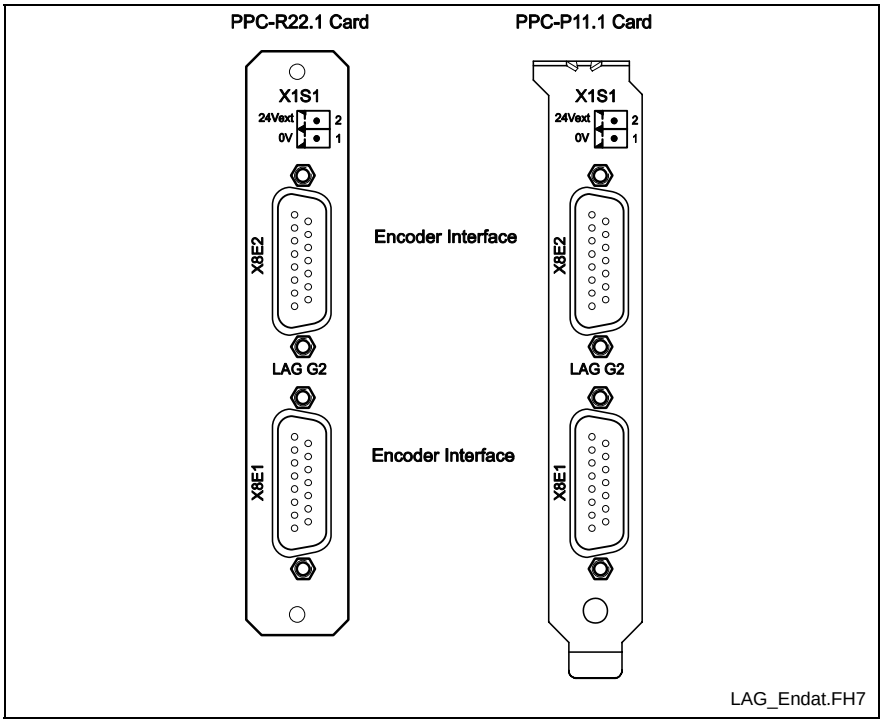


Fig. 7-1: Master Encoder Card (LAG)

The following VisualMotion features support the Master Encoder Card as a source of data:

- ELS System
- Position Monitoring Group
- Slip Monitoring
- Rotary Events
- Programmable Limit Switch

The Master Encoder Card uses standard Rexroth cable assemblies for EnDat and 1 Vpp encoders. The following table lists some example of Bosch Rexroth encoders and the cable assemblies used:

Encoder	Cable Assembly
ROC413 (EnDat)	IKS4001 *
ROD486 (1 Vpp)	IKS4002 *

Table 7-1: Encoder Types

* Cable assembly may vary based on drive type. Refer to the relevant digital drive documentation for details.

Master Encoder Card Specifications

Supply Voltage X10

Description	Details
Input voltage	24 VDC, -15%+20% , EN61131-2
Current range:	0.15 A to 0.3 A

Table 7-2: X10 Power Supply

1 Vpp (SinCos) Encoder Signals

Amplitude	Typical: 1Vpp Min: 0,6Vpp Max: 1,2Vpp with 120 Ohm termination resistance
Reference Voltage	2.7 V
Maximum Input Frequency	200 kHz
Output Voltage	+5 V_{DC} ± 0.1 V
Maximum Output Current	300 mA_{DC}
Sensing	Yes

Table 7-3: 1 Volt Peal-to-Peak Encoder Signals

EnDat Encoder Signals

Level	RS485
Differential Output Voltage	Min: 1.5 V Max: 5 V
Differential Input Voltage	Threshold: Min: -0.2 V Max: +0.2 V
Input Hysteresis	70 mV
Clock Frequency	Min: 100 kHz Max: 2 MHz
Termination Resistance	120 Ohm
Output Voltage	+5 V_{DC} ± 0.1 V
Maximum Output Current	300 mA_{DC}
Sensing	Yes

Table 7-4: EnDat Encoder Signals

X81 and X82 Pin Assignment

Pin	Signal Type	Signal Description
1	Voltage	5 V Sense
2	Voltage	0 V Sense
3	IN (analog)	Not used
4	IN (analog)	Not used
5	IN (analog)	Cosine -
6	IN (analog)	Cosine +
7	IN (analog)	Sine +
8	IN (analog)	Sine -
9	BIDIR (485)	EnDatD +
10		0 V
11	OUT (485)	EnDatClk +
12		5 V
13	OUT (485)	EnDatClk -
14		0 V
15	BIDIR (485)	EnDatD -

Table 7-5: X81 and X82 Pin Assignment (15-pin female D-sub)

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

7.2 Option Card PLS for PPC-R22.1 and PPC-P11.1

The Option Card PLS (NSW01) is the PPC-R22.1 and PPC-P11.1 programmable limit switch interface. Up to two Option Card PLSs, 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.

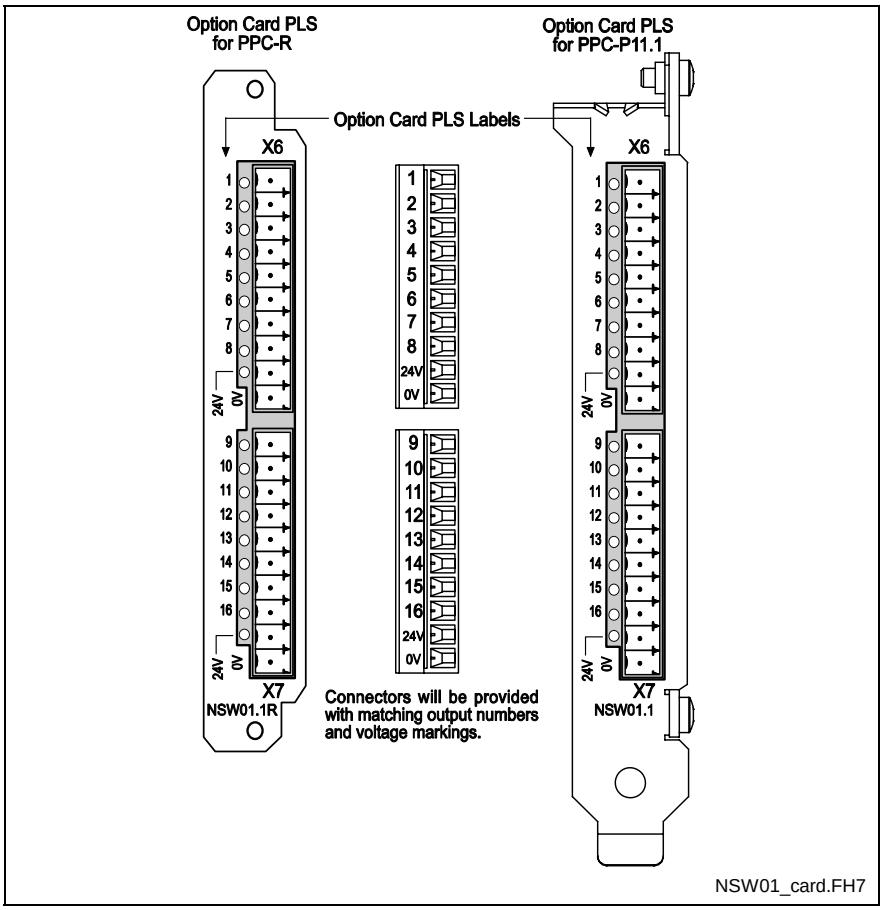


Fig. 7-2: Option Card PLS (NSW01)

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. 7-2 for details. The 24V LED indicator will be lit when power is applied.

X6 and X7 Pin Assignment

Standard Numbers on X6 and X7	Label on Card for X6	Label on Card for 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 7-6: X6 and X7 Pin Assignment

Option Card PLS Power Supply Voltage

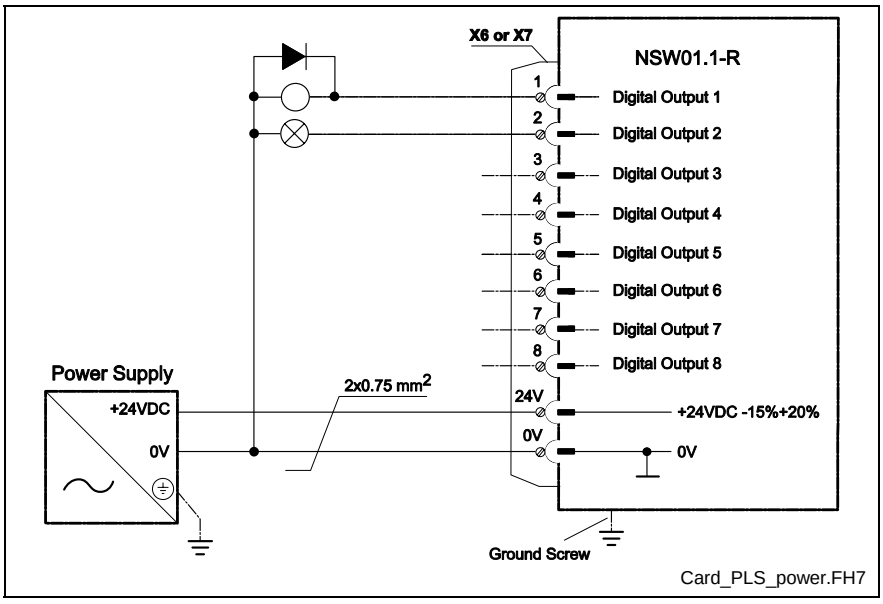


Fig. 7-3: Option Card PLS Power Supply Voltage

CAUTION

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.

7.3 Link Ring for PPC-R22.1 and PPC-P11.1

The DAQ03 card is the PPC-R22.1 and PPC-P11.1 interface to a Link Ring, a fiber optic loop of controls sharing master position data. Each PPC-R22.1 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 that provides redundancy.

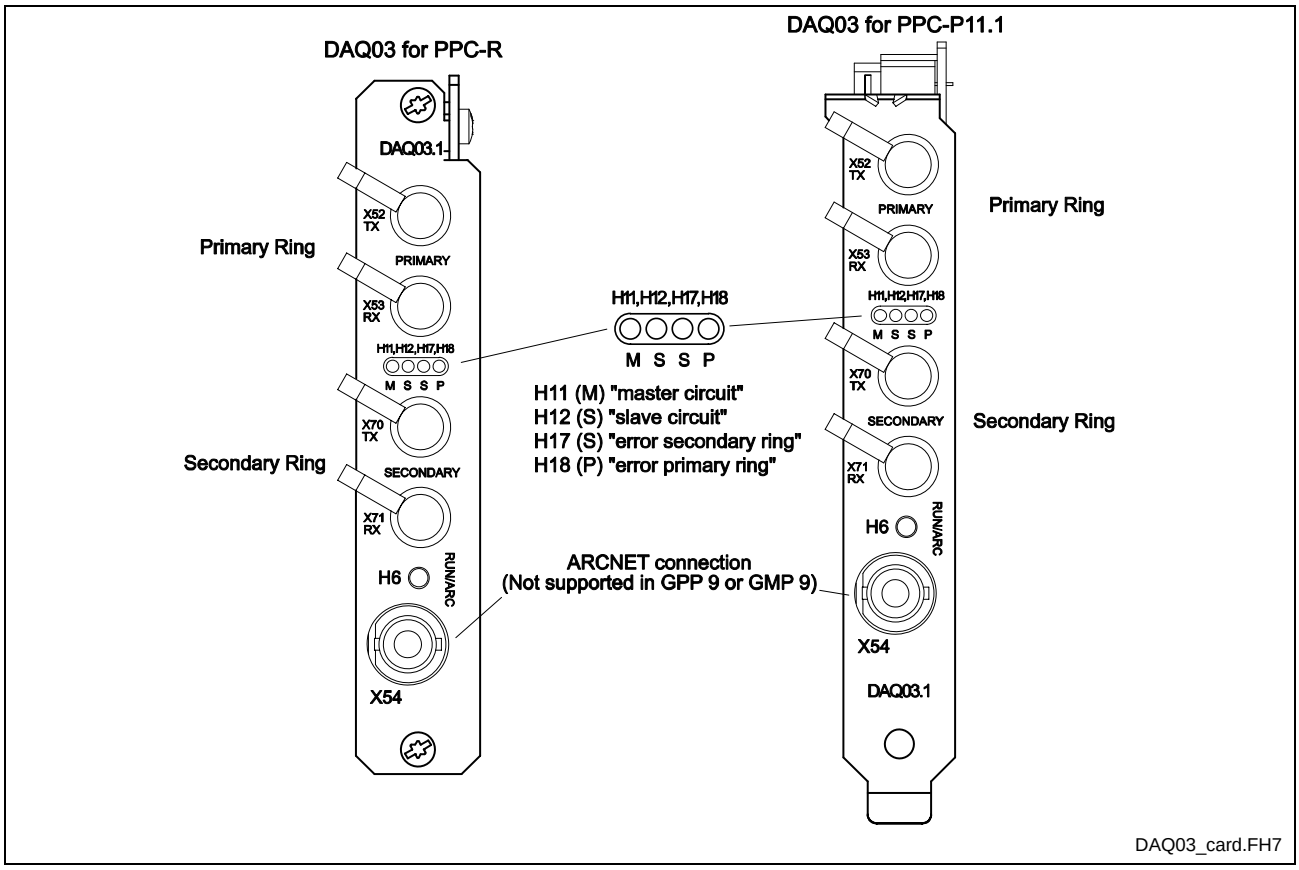


Fig. 7-4: Link Ring Card (DAQ03)

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 as follows (regardless of VisualMotion 11 firmware type):

- Jumpers J2 and J4 (only) should be set.

DAQ03 cards are shipped with jumper J4 set to enable operation. Therefore, it is not necessary to change the J4 setting.

Link Ring Card 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 7-7: DAQ03 LEDs

Link Ring Card 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 7-8: Hardware Specifications for DAQ03

Power Supply

Type	Rating
Input voltage	5V
Maximum Current	700mA

Table 7-9: Power Supply Specifications for DAQ03

Cable Connections for Link Ring

Single Ring

A single ring uses only the primary receive and transmit connections on the DAQ03 cards, see Fig. 7-6.

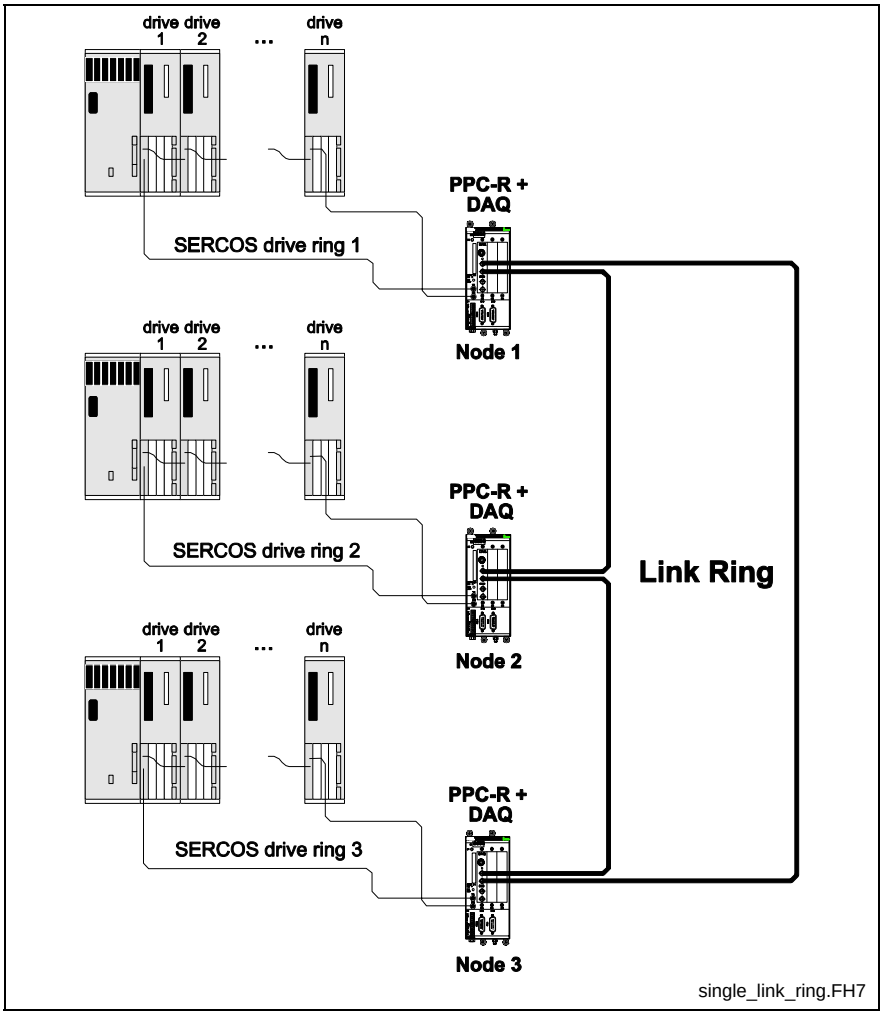


Fig. 7-5: Single Link Ring

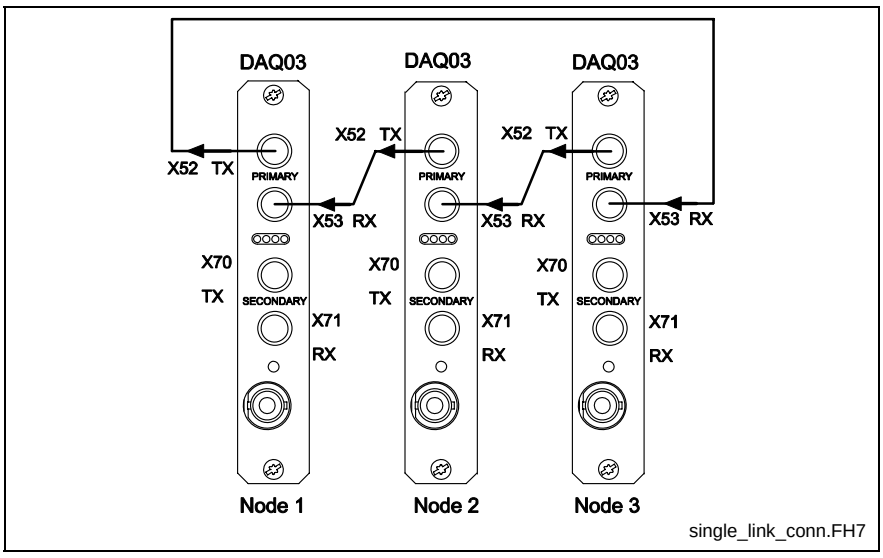


Fig. 7-6: DAQ03 Connection for Single Link Ring

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.

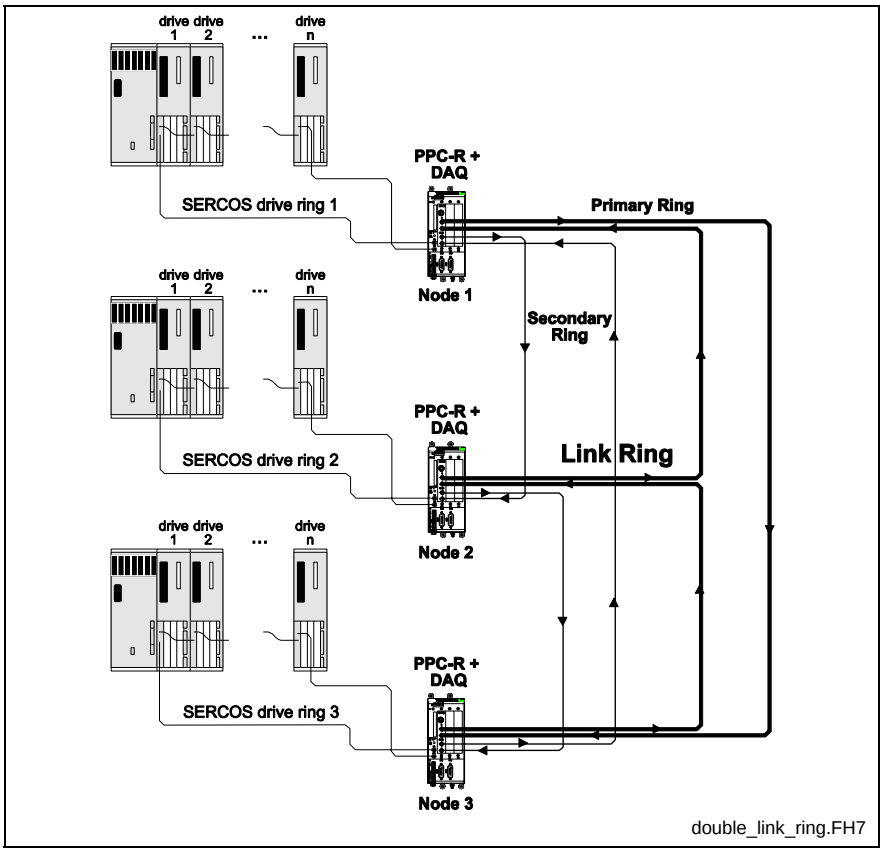


Fig. 7-7: Double Link Ring

The primary and secondary loops are connected in a different order from each other. One is 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. 7-8, 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.

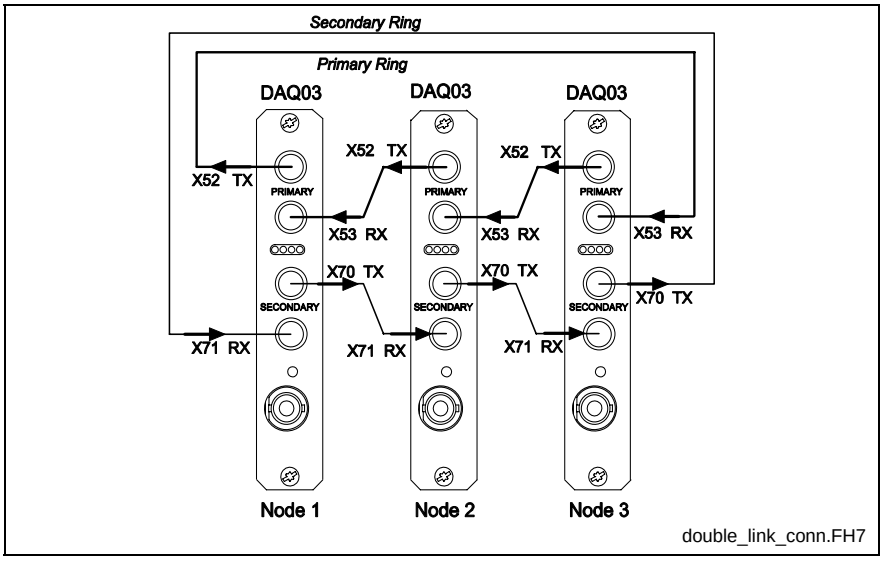


Fig. 7-8: DAQ03 Connection for Double Link Ring

8 VisualMotion Human Machine Interfaces

8.1 Overview

Rexroth IndraControl VCP, VEP, VEH and BTC **H**uman **M**achine **I**nterface 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.

8.2 Rexroth IndraControl VCP Terminals

The VCP small operator terminals provide textual and/or graphical user interface to the machine. They provide ease of use and convenience to the user. The parametrization and visualization of the VCP small operator terminals is done using the VI-Composer software.

They are available in the following types:

Operator Terminal	Display Type	Application Memory
VCP 02	Text-based - 4 x 20 character display	256 kB flash
VCP 05	Text-based - 4 x 20 character display	256 kB flash
VCP 08	Graphic-based - 4 x 20 character display	256 kB flash
VCP 20	Graphic-based - 16 x 40 character display	768 kB flash
VCP 25	Graphical Touch-screen 320 x 240 pixel resolution, 256 color	3 MB compact flash

Table 8-1: VCP Small Operator Terminals

Fig. 8-1: VCP Series Front View

VCP Features

Enclosure, Control and Display Elements

- Front panel interface with keys
  - VCP 02 has 4 function keys and 7 system keys
  - VCP 05 has 8 function keys and 22 system keys
  - VCP 08 has 14 function keys and 22 system keys
  - VCP 20 has 12 function keys and 22 system keys
- Front panel touch-screen interface without keys
  - VCP 25
- Protection Class
  - VCP 02, 25: IP65 aluminum front panel
  - VCP 05, 08, 20: IP54 aluminum front panel

Communication Interface

All VCP terminals support RS232 and RS485 serial interfaces or Profibus DP fieldbus.

VCP Documentation

Rexroth IndraControl VCP terminals are outlined in more detail (dimensions and specifications) in the following documents:

- Rexroth IndraControl VCP 02
  DOK-SUPPL*-VCP02******-PR01-EN-P
- Rexroth IndraControl VCP 05
  DOK-SUPPL*-VCP05******-PR01-EN-P
- Rexroth IndraControl VCP 08
  DOK-SUPPL*-VCP08******-PR01-EN-P
- Rexroth IndraControl VCP 20
  DOK-SUPPL*-VCP20******-PR01-EN-P
- Rexroth IndraControl VCP 25
  DOK-SUPPL*-VCP25******-PR01-EN-P

8.3 Rexroth IndraControl VEH/VEP Embedded Terminals

The VEH/VEP embedded terminals provide graphical user interface to the machine. These terminals are configured with WinStudio runtime and the IndraLogic (CoDeSys) Windows CE OPC server. The OPC server is configured via an *.ini file. VEH/VEP terminals are not programming terminals. They are intended for supporting the runtime of an HMI system (mainly WinStudio).

VEH 30 Embedded Terminal

The following VEH terminal is supported by VisualMotion:

Operator Terminal	Display Type	Application Memory
VEH 30	Graphic-based – 8.4" Touch-screen 800 x 600 pixel, 262, 144 colors	128 MB Compact Flash

Table 8-2: VEH 30.1 Embedded Terminal

Veh30.jpg

Fig. 8-2: VEH 30 Front View

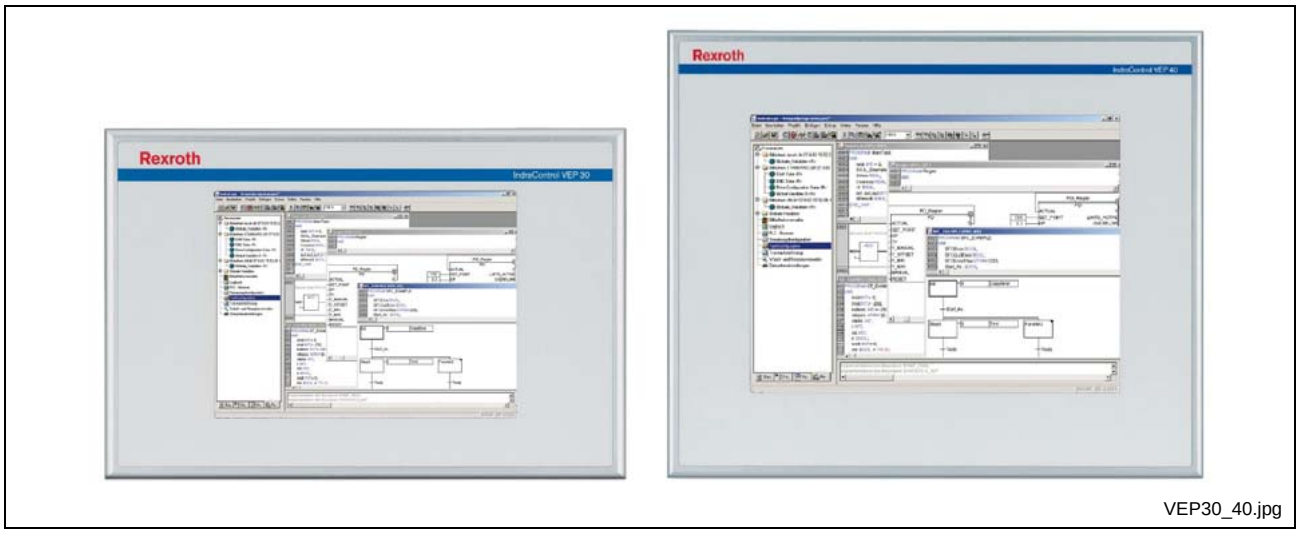
Note: The IndraControl VAC 30 is required to connect and power the VEH 30 embedded terminal.

VEP Embedded Terminals

They are available in the following types:

Operator Terminal	Display Type	Application Memory
VEP 30	Graphic-based – 8.4" Touch-screen 800 x 600 pixel, SVGA	64 MB/ 128 MB Compact Flash
VEP 40	Graphic-based – 12.1" Touch-screen 800 x 600 pixel, SVGA	64 MB/ 128 MB Compact Flash
VEP 50	Graphic-based – 15.0" Touch-screen 1024 x 768 pixel, SVGA	64 MB/ 128 MB Compact Flash

Table 8-3: VEP Embedded Terminals



VEP30_40.jpg

Fig. 8-3: VEP Front View

VEH/VEP Features

Enclosure, Control and Display Elements

- Front panel touch-screen interface with virtual keyboard
  - VEP 30
  - VEP 40
  - VEP 50
  - VEH 30
- Protection Class
  - VEP 30, 40, 50 and VEH 30: IP65 aluminum front panel, IP20 back panel

Communication Interface

- All VEP terminals support RS232 serial interface or EtherNet
- All VEP terminals have 2 PC104 plug-in slots
- The VEH 30 supports one Ethernet connect via the VAC 30

VEH/VEP Documentation

Rexroth IndraControl VEH/VEP terminals are outlined in more detail (dimensions and specifications) in the following document:

- Rexroth IndraControl VEP/VEH
  DOK-SUPPL*-VEH/VEP****-PR02-EN-P

8.4 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 the Rexroth VisualMotion control (PPC-R22.1).

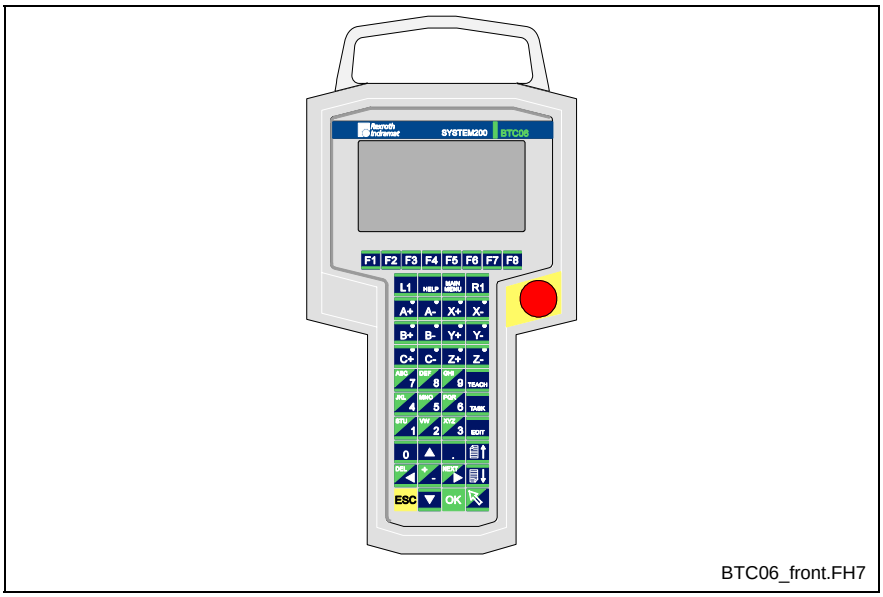


Fig. 8-4: BTC06 Front Face

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 (*Operation*) (32 to 131 °F) -20 to +70°C (*Storage*) (-4 to 158 °F)
Weight	approx. 1.3 Kg (2.9 lbs.)

Table 8-4: 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 8-5: 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 8-6: 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 MB Flash
- 256 KB SRAM
- RS-232 programming interface for downloading firmware and for programming of custom displays
- Communications interface in accordance with Rexroth 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

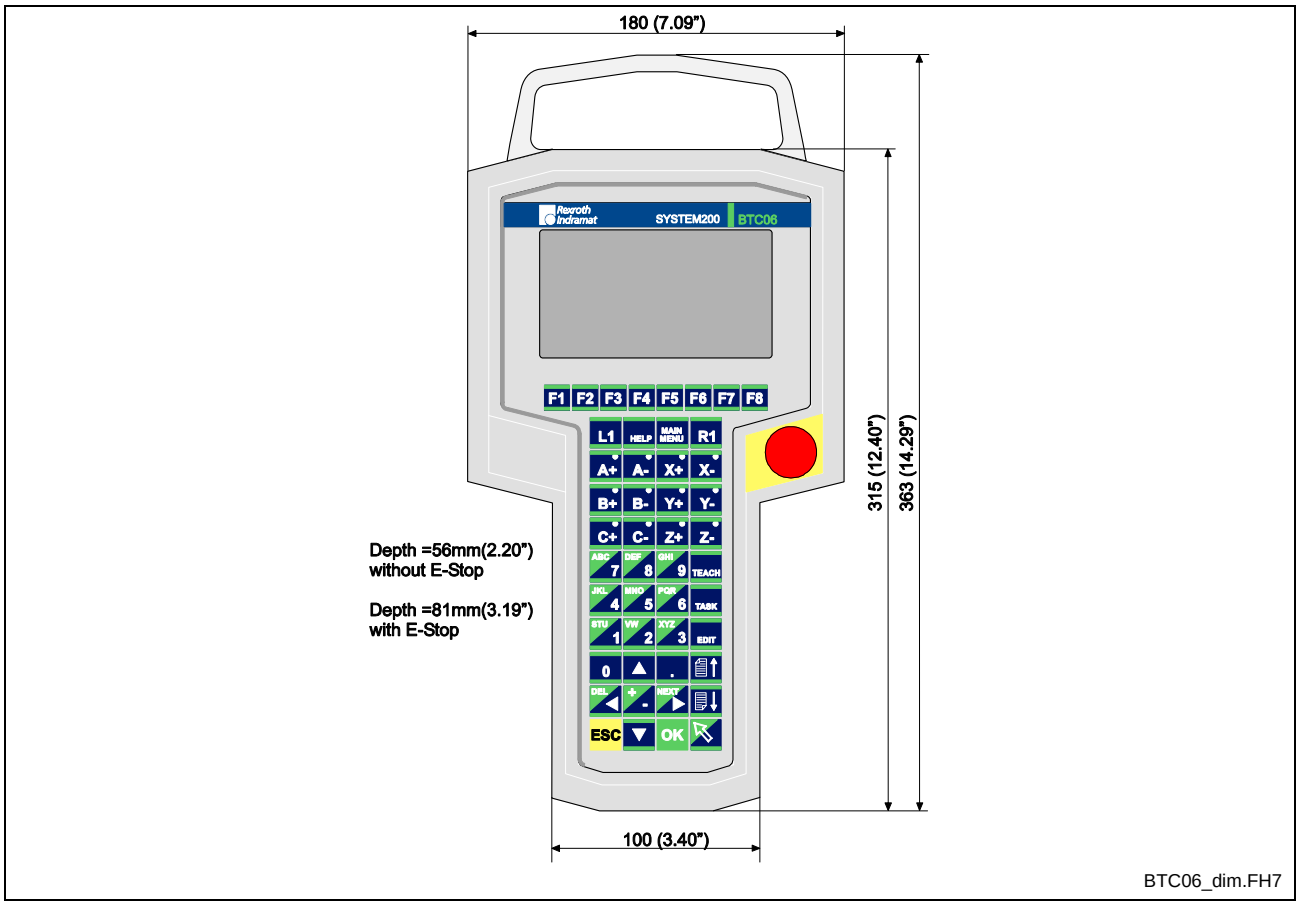


Fig. 8-5: BTC06 Enclosure Dimensions

Rear View

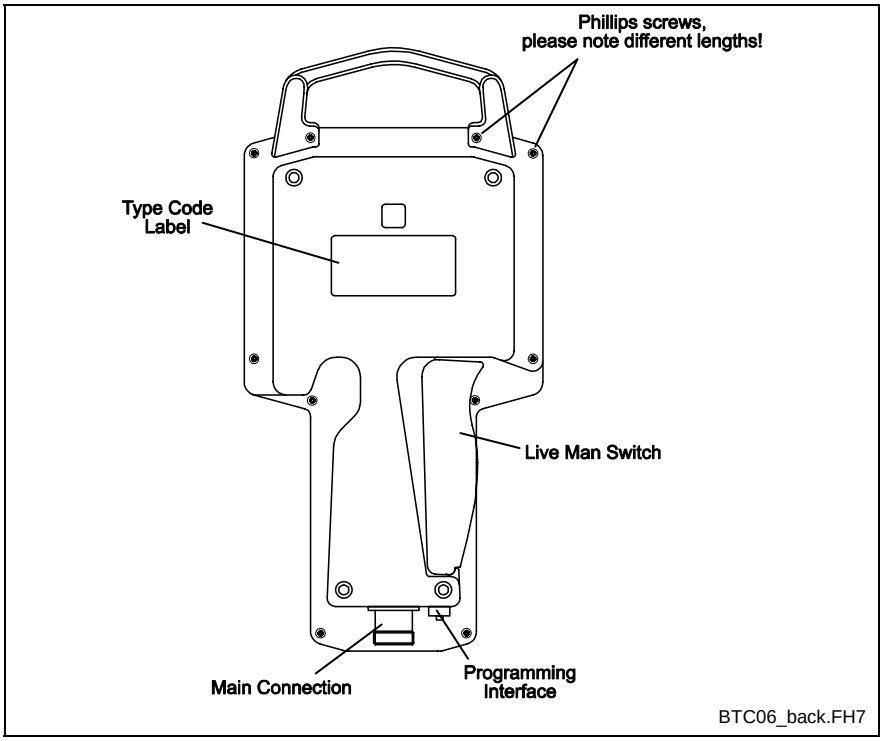


Fig. 8-6: Rear View –BTC06

BTC06 Accessories

SUP-M01-BTC06 Wall-Mounting Bracket

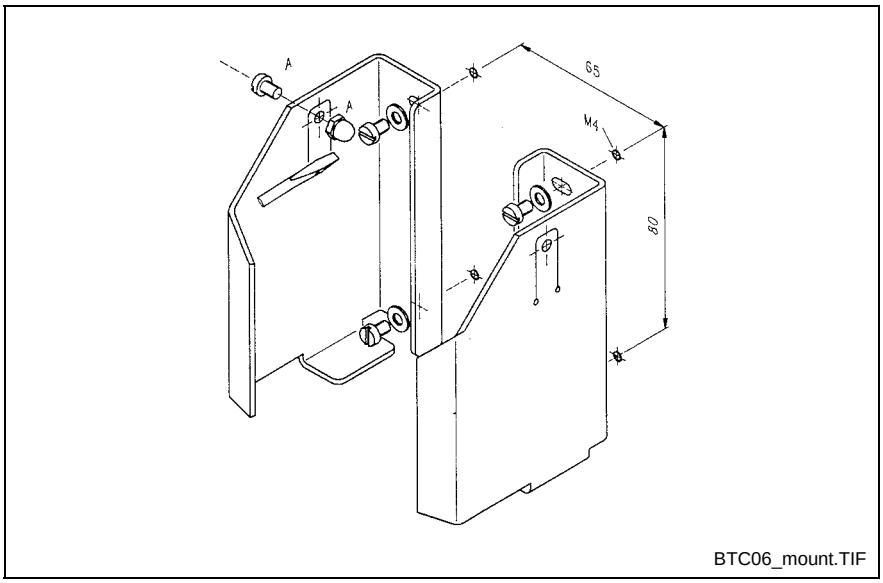


Fig. 8-7: Wall Mounting Bracket

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 8-7 contains a pin-out of the necessary connections to the BTC06 for communications as well as machine interfacing.

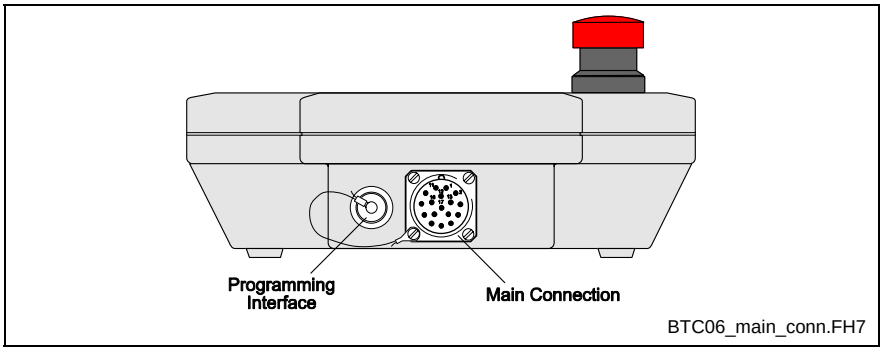


Fig. 8-8: BTC06 Main Connection

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	*Not used*	

Table 8-7: Pin-out of the 17-Pin Connector

RS232 Firmware Download and Projecting Interface

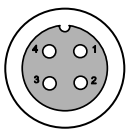


Fig. 8-9: RS232 Interface

Pin	Assignment
1	*not used*
2	TxD
3	RxD
4	Signal Ground

Table 8-8: 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-R22.1

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

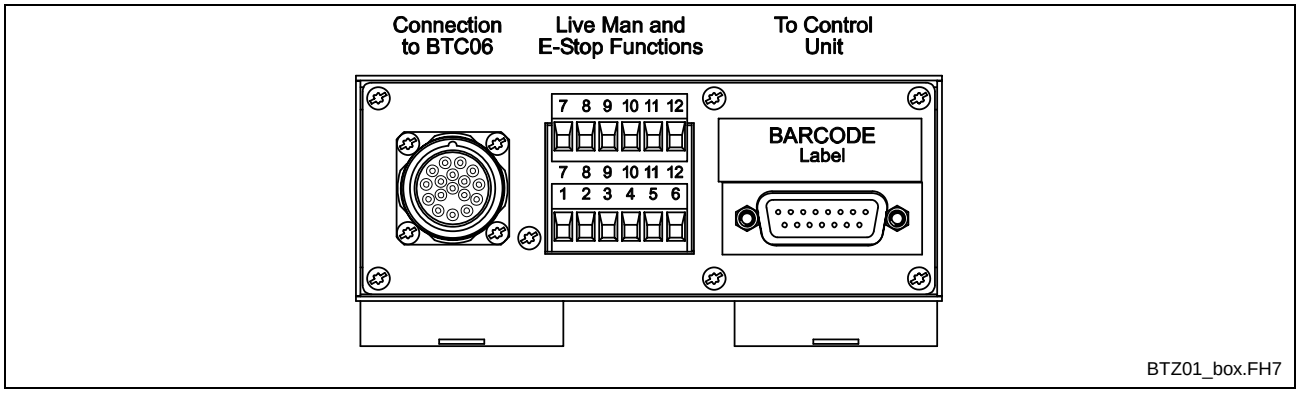


Fig. 8-10: BTZ01.1 Junction Box

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-R22.1, the IKB0015 serial communication cable is used. RS485 and RS422 ports are connected to the control in accordance with Rexroth 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-R22.1 Connections

Using a BTZ01.1 (EMC Compliant)

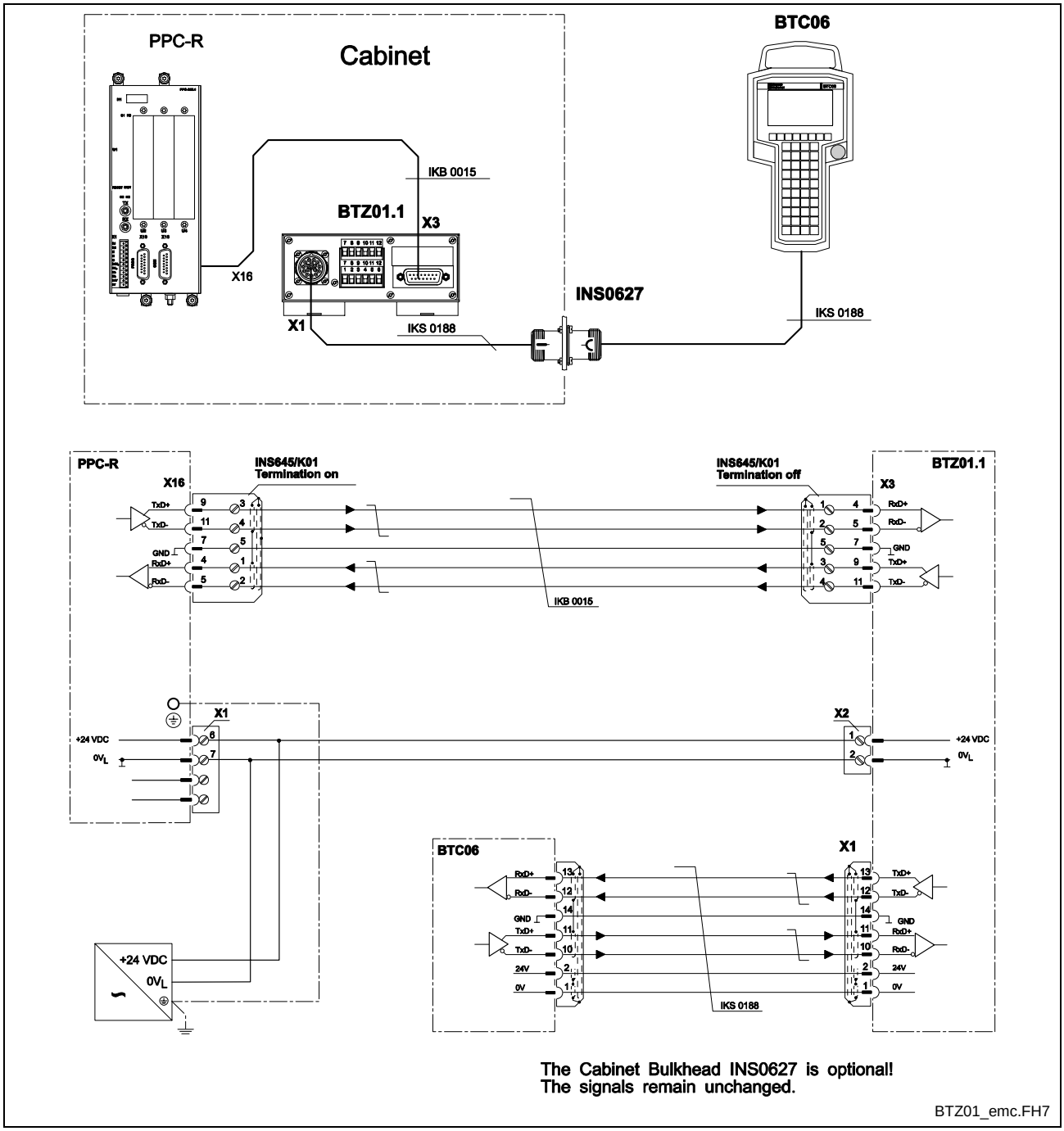


Fig. 8-11: BTC06 to PPC-R22.1 through a BTZ01.1

Optional Terminal Strip Connection

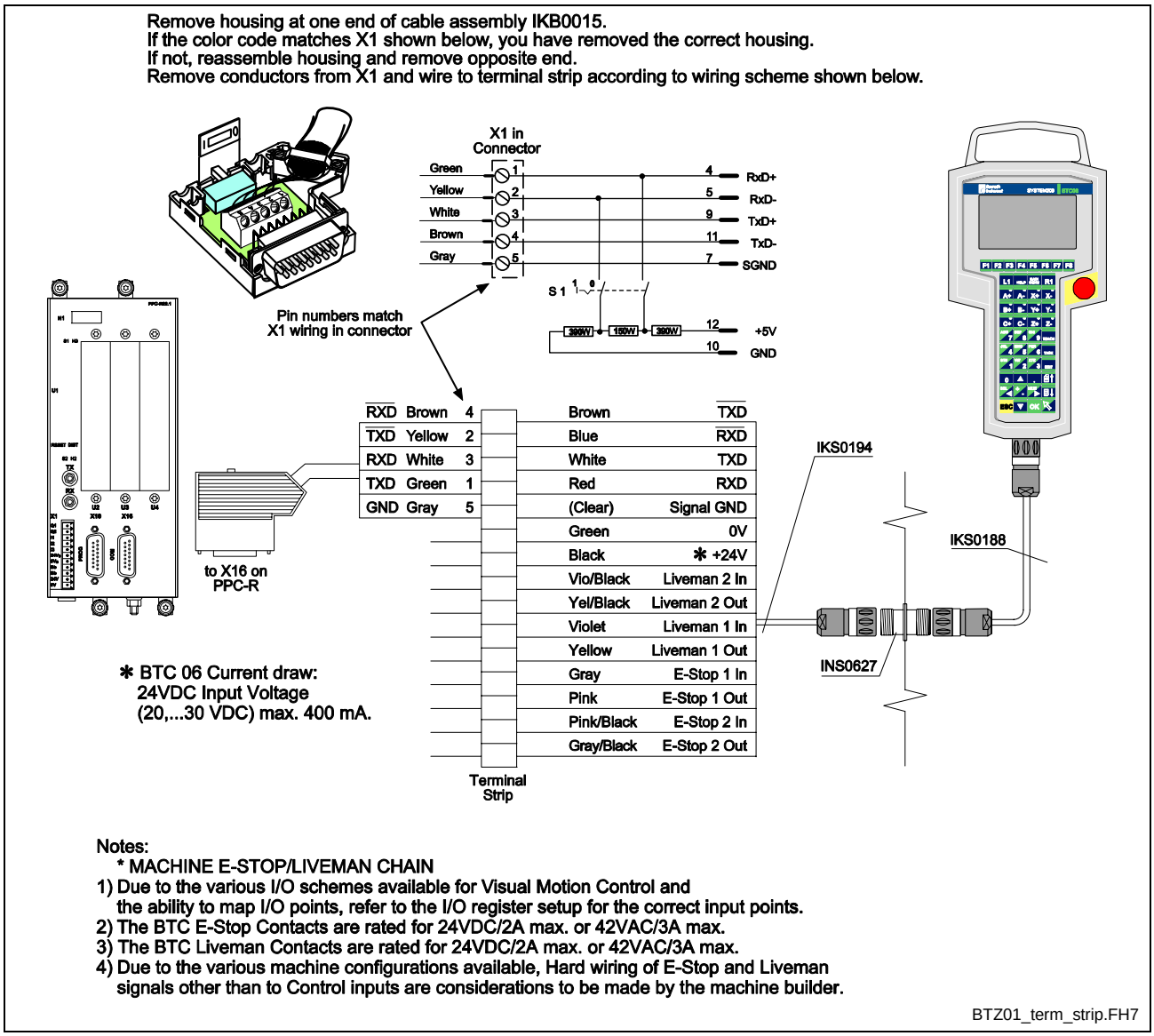


Fig. 8-12: BTC06 to PPC-R22.1 Terminal Strip Connection

9 Fiber Optic Cable(LWL)

9.1 Data Transmission Ring Structure

The communications between the all Sercos devices (control, Sercos I/O, 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.

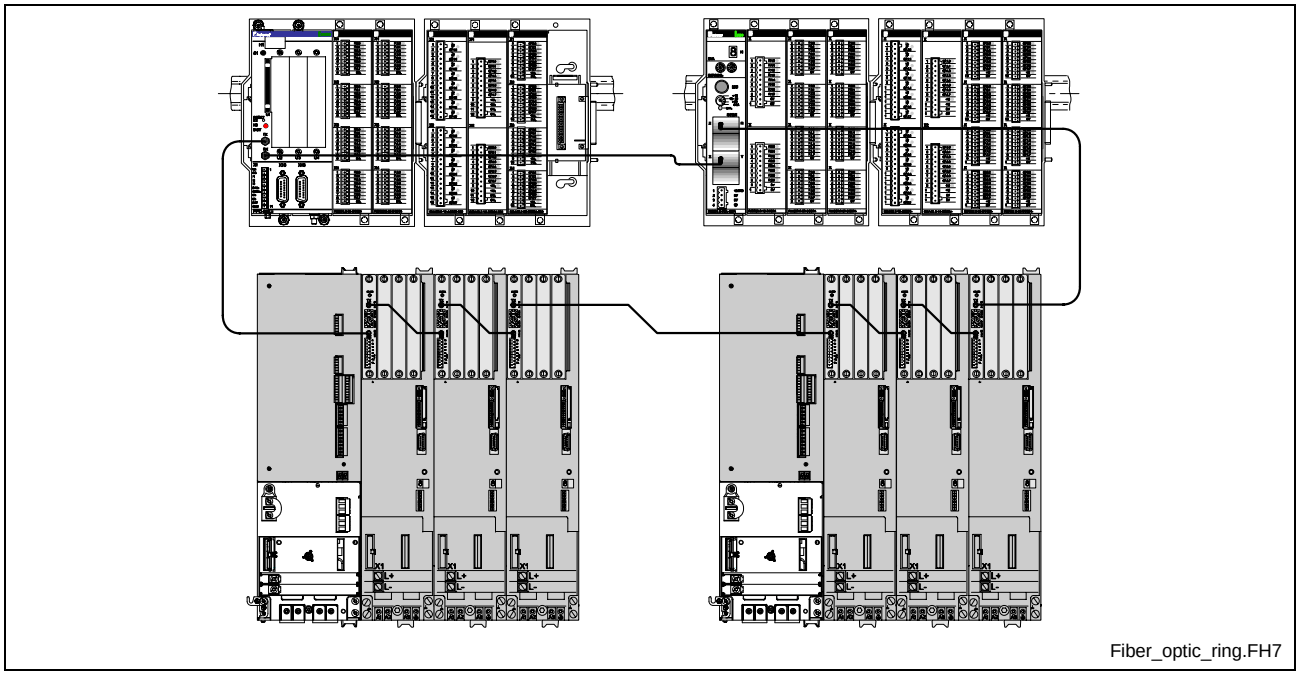


Fig. 9-1: Fiber Optic Ring Structure

The Sercos ring starts and end at the control. The optical output (TX) of the control is connected with the optical input (RX) of the first drive. The output is then connected to the input of the next Sercos I/O device or drive until all Sercos devices are connected. The output of the final Sercos device 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 the fiber optic cable correspond to the FSMA standards (IEC 874-2).

Fiber Optic Cable Types

The fiber used in the fiber optic cable assemblies are 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.

RKO 0100 Plastic Fiber Optic Cable (2.2 mm)

The RKO 0100 fiber optic cable assembly has an outer diameter of 2.2 mm and is recommend for internal control cabinet connections.

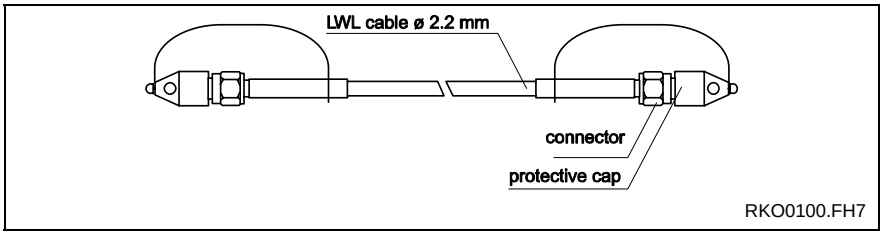


Fig. 9-2: RKO 0100 Fiber Optic Cable Assembly

RKO 0101 Plastic Fiber Optic Cable (6.0 mm)

The RKO 0101 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.

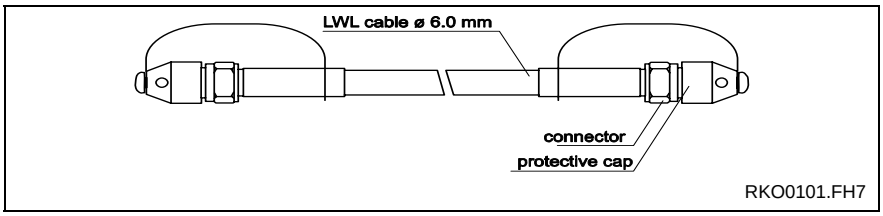


Fig. 9-3: RKO 0101 Fiber Optic Cable Assembly

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.

Fiber Optic Cable Accessories

The following accessories are available for fiber optic cables:

- fiber optic bulkhead connector
- FSMA fiber optic connector wrench

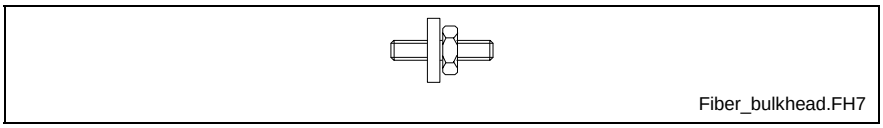


Fig. 9-4: Fiber Optic Bulkhead Connector

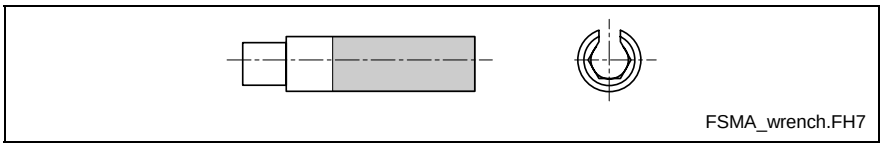


Fig. 9-5: FSMA Fiber Optic Connector Wrench

Note: The fiber optic connector wrench can be helpful when installing fiber optic cable onto the EcoDrive 03 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 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 recommend 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	RKO 0100	RKO 0101	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

DANGER

Eye injury due to high-energy light!

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

CAUTION

Damage to fiber optic components due to handling and mounting!

⇒ Do not over tighten fiber optic cable connectors.

CAUTION

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-R22.1)
X10 (DSS in Diax 04)
X20 (IndraDrive, DKC*2.3)
X2 (RMK02.2-LWL-SER)
X82 (R-IL SE BK)

Receiver End Connections

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

RX (PPC-R22.1)
X11 (DSS in Diax 04)
X21 (IndraDrive, DKC*2.3)
X1 (RMK02.2-LWL-SER)
X81 (R-IL SE BK)

Storage

When storage fiber optic cable assemblies, please not 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.

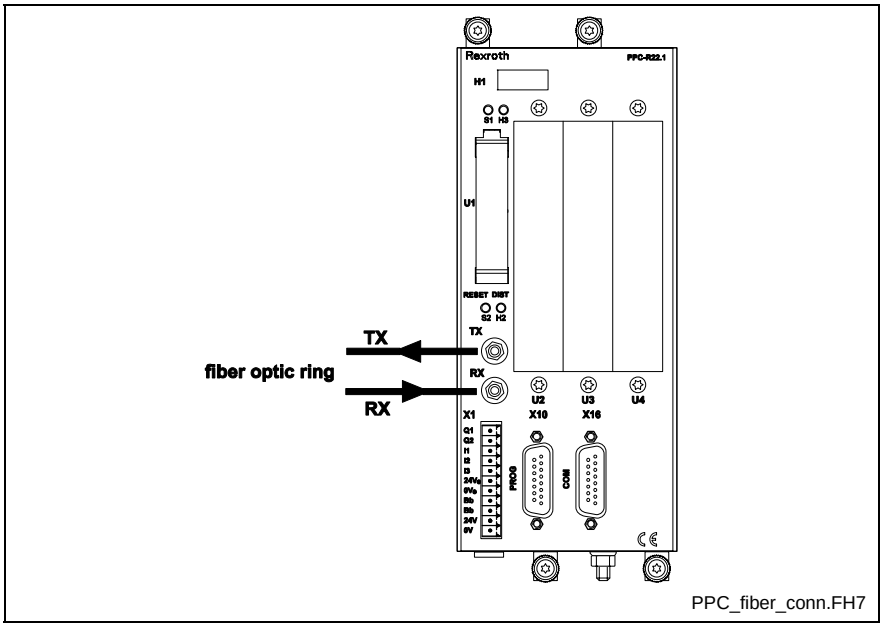


Fig. 9-6: Sercos Connections for PPC-R22.1

Sercos Drive Address Settings

In order to achieve proper Sercos device addressing, a unique number must be assigned to each device that will be connected in the Sercos ring. Diax 04, EcoDrive 03, and Reco 02 RMK Sercos device have rotary selector switches S2 (low) and S3(high). The Reco Inline Sercos coupler uses a DIP switch to set the Sercos device address. IndraDrive Sercos device address are set via the control panel. The allowable address range in a VisualMotion system is between 01..64. Refer to the following figure for the location to set the address.

Diax 04 Sercos Address Setting

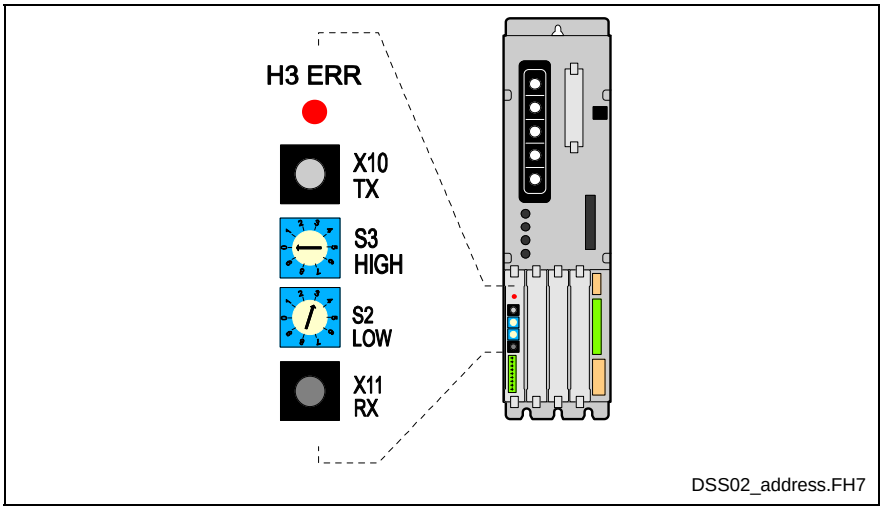


Fig. 9-7: Sercos Connections for DSS02.1M (Diax 04)

EcoDrive 03 Sercos Address Setting

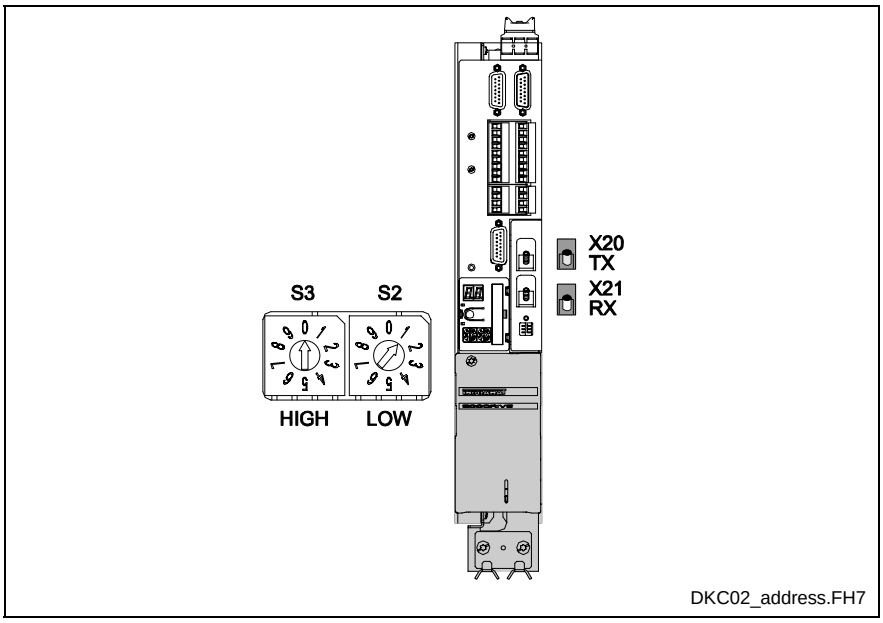


Fig. 9-8: Sercos Connections for DKC*2.3

Sercos Reco 02 Addess Setting

Any RMK02.2-LWL-SER (Sercos Reco 02 I/O stations) must also be addressed in the Sercos ring to a unique number not used by any other device.

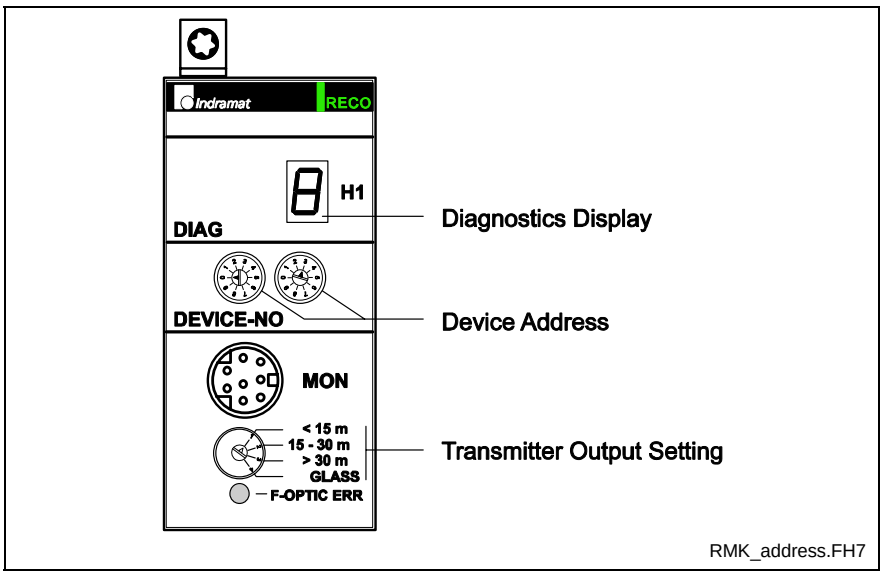


Fig. 9-9: Sercos Connections for the RMK-LWL-SER

Sercos Inline Address Setting

The Sercos device address number for the Reco Inline Sercos coupler is set using a combination of DIP switches. The allowable range is 1-127. Address 0 is not valid. The following table shows the value for each individual switch when set to the "ON" position.

For example, switching SW7 and SW8 to ON will set the Sercos device address to 3. If all the switches are ON, the address is set to 127.

Position	SW2	SW3	SW4	SW5	SW6	SW7	SW8
ON	64	32	16	8	4	2	1
OFF	0	0	0	0	0	0	0

Table 9-4: Reco Inline Sercos coupler Sercos Address Setting

IndraDrive Sercos Address Setting

The Sercos address for IndraDrive controllers can be set via the standard control panel on the front of the device or by writing to drive parameter P-0-4025.

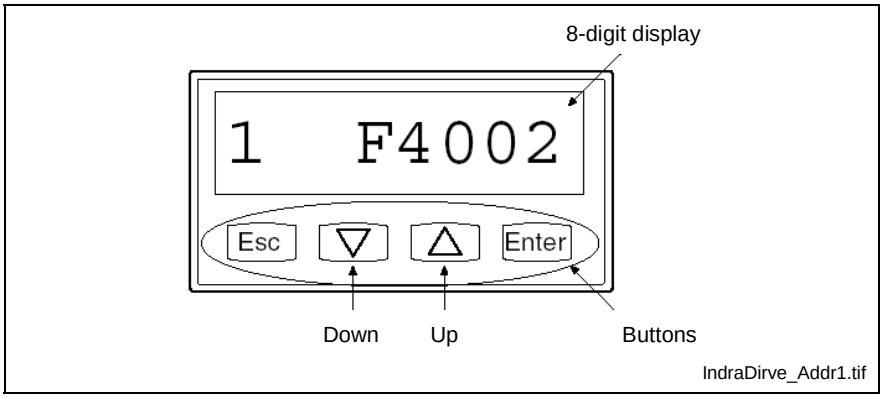


Fig. 9-10: IndraDrive Standard Control Panel

To set the Sercos address via the control panel:

1. Change to "command/settings" mode by holding down the **Esc** and **Enter** buttons for about 8 seconds.
2. With the display showing **1.Er.Anz**, press the **Up** button once.

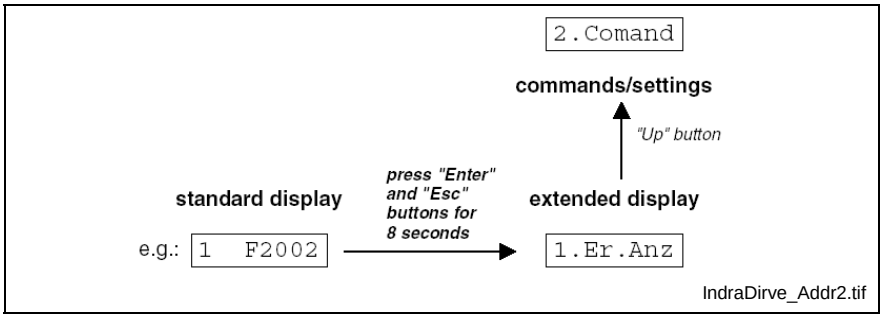


Fig. 9-11: Changing to command/settings mode

3. From the **2.Command** display, press the **Enter** button twice to set the tens place of the Sercos address.
4. Press the **Enter** button one more time to set the ones place of the Sercos address.

Note: The Enter button confirms settings and the Esc button returns.

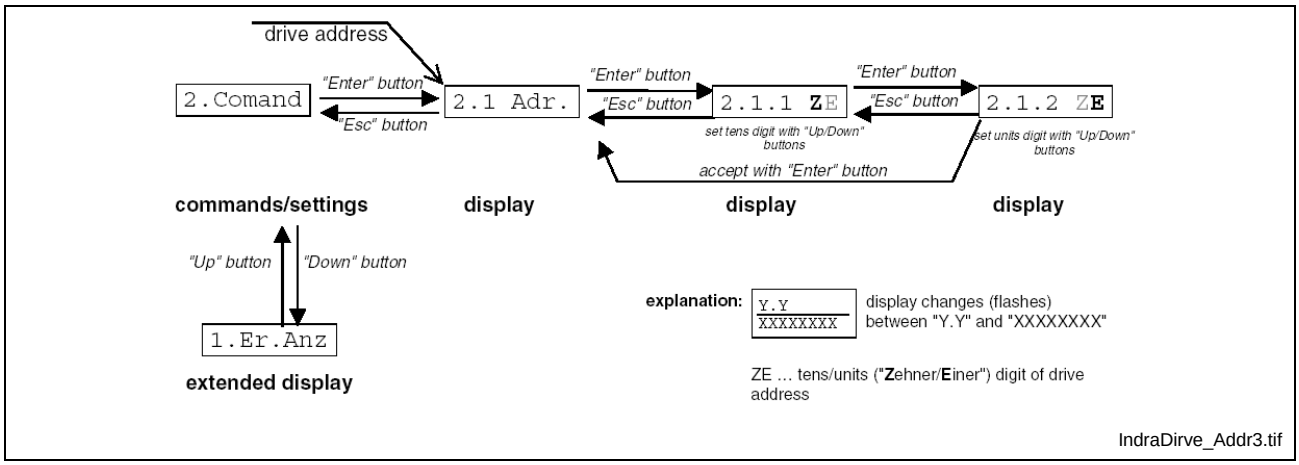


Fig. 9-12: Selecting and Setting the Drive Address

Changing the Sercos Baud Rate

Bosch Rexroth sets a Sercos baud rate 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.

Why Increase the Sercos Transmission Baud Rate?

The Sercos transmission baud rate for a system can be increased for applications using more than 8 axis. Some benefits for an increased Sercos transmission baud rate 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.

Changing Sercos Baud Rate on VisualMotion Controls

The Sercos baud rate can be changed on VisualMotion controls by setting control parameter C-0-0010, bits 4 and 5 as follows:

Bit 5	Bit 4	Sercos Baud Rate
0	0	2 MBaud (default)
1	0	4 MBaud
0	1	8 MBaud
1	1	16 MBaud

Table 9-5: Sercos Baud Rate Bit Settings

The control must be in parameter mode to modify C-0-0010.

Note: When changing the Sercos baud rate, make sure that all the Sercos devices on the same fiber optic ring have the same Sercos baud rate.

Changing Sercos Baud Rate on Rexroth Digital Drives

IndraDrive, EcoDrive Cs, and Sercos Reco Inline

Rexroth IndraDrive, EcoDrive Cs digital drives, and Reco Inline Sercos couplers automatically detect the Sercos baud rate from VisualMotion controls and set their own Sercos baud rate to match. These drives support a 2, 4, 8, or 16 MBaud Sercos baud rate.

Diax 04 (DSS02.1M)

The Sercos baud rate for Diax 04 drives is set via DIP switch S4 on the DSS02.1M. For a Sercos baud rate of 2 MBaud, set S4 to the OFF position. Diax 04 digital drives only support a 2 or 4 MBaud Sercos baud rate.

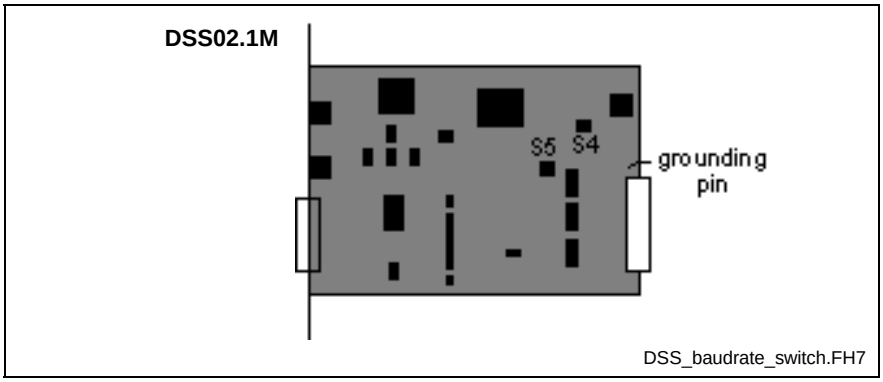


Fig. 9-13: DIP Switches on DSS02.1M

EcoDrive 03 (DKC02.3) The Sercos baud rate for EcoDrive 03 digital drives is set on DIP switch S20/1 on the SERCOS interface card. For a Sercos baud rate of 2 MBaud, set S20/1 to the OFF position. EcoDrive 03 digital drives only support a 2 or 4 MBaud Sercos baud rate.

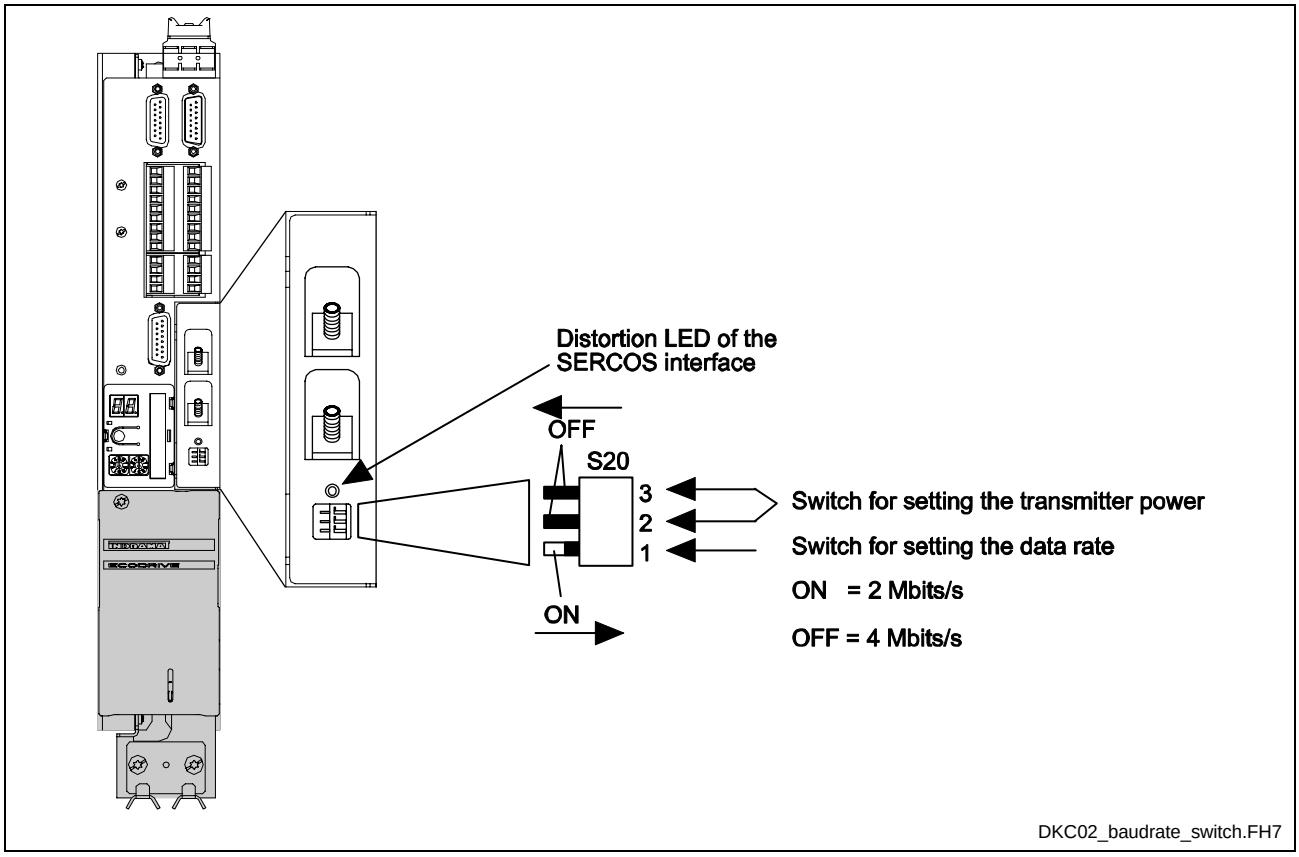


Fig. 9-14: DIP Switches on DKC*2.3 SERCOS Interface

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

Setting the Optic Transmitter Output Power

VisualMotion Controls The transmitter output power (TX) on the VisualMotion controls 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 control and the first drive's receiver (RX). When using glass fiber optic cable assemblies, set this parameter to 50m.

Diax 04 (DSS02.1M) The transmitter output power (TX) on the DSS02.1M is set via DIP switches S5A and S5B.

EcoDrive 03 (DKC02.3) The transmitter output power (TX) on the DKC02.3 is set via DIP switches S20/2 and S20/3.

SercosReco Inline The transmitter output power (TX) on the Rexroth SercosReco Inline is set via the DIP switch settings on the Sercos coupler R-IL-SE-BK.

Plastic Fiber Optic Settings

Sercos Device	0 .. 15 m	15 m .. 30 m	30 m .. 50 m
Diax 04	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
R-IL-SE-BK	SW9 = OFF SW10 = OFF	SW9 = OFF SW10 = ON	SW9 = ON SW10 = OFF

Table 9-6: Setting the Transmitter Output Power for Plastic Fiber Optic Cables

Glass Fiber Optic Settings

Sercos Device	0 .. 500 m
Diax 04	S5A = ON S5B = ON
DKC02.3	S20/2 = ON S20/3 = ON
R-IL-SE-BK	SW9 = ON SW10 = ON

Table 9-7: Setting the Transmitter Output Power for Glass Fiber Optic Cables

10 Hardware and Firmware Configurations

10.1 PPC-R Hardware and Firmware

The PPC-R22.1 control is available as a 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. Firmware typecodes are listed for all FWA typecodes in the following sections.

PPC-R22.1 Hardware Configurations

The standard PPC-R22.1 hardware configuration, using GPP 11 firmware, comes equipped with two serial ports (X10 and X16) and PFM flash memory card. The bootloader firmware (FWC-PPCPR*-BTL-02VRS-NN) resides on-board the hardware flash.

Dual Ethernet Support

The PPC-R22.1 can be ordered with an optional onboard Ethernet interface and/or a 10/100 MBaud EtherNet card. The available hardware configuration containing single or dual Ethernet interfaces are listed in the following sections. Refer to the hardware typecode for details.

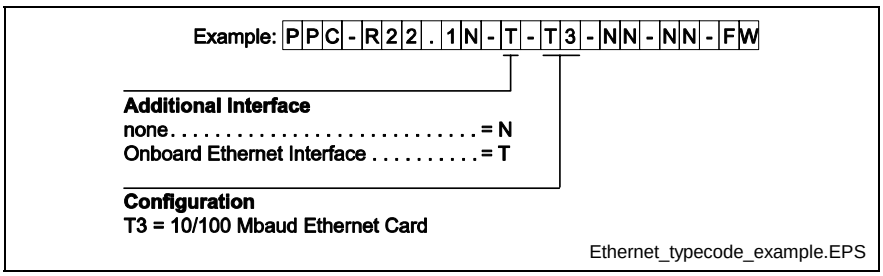


Fig. 10-1: PPC-R22.1 Ethernet Configuration Example

PPC-R22.1 without Onboard Ethernet

The hardware configurations in the following table are ordered with GPP 11 firmware.

Hardware Typecode	Expansion Slots U2	U3	U4	Description	Material Number
PPC-R22.1N-N-NN-NN-NN-FW	Cover	Cover	Cover	No expansion cards	1070170148
PPC-R22.1N-N-Q1-NN-NN-FW	DAQ03	Cover	Cover	Link Ring cross communication	1070170281
PPC-R22.1N-N-G2-NN-NN-FW	LAG	Cover	Cover	Master Encoder Card	R911311476
PPC-R22.1N-N-T3-NN-NN-FW	ETH02	Cover	Cover	10/100 Ethernet Card	R911170307

Table 10-1: PPC-R22.1 without Onboard EtherNet

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-XXXXXX	R911309188	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash

Table 10-2: FWA-PPCR2*-GP*-11VRS-DO-XXXXXX Firmware

PPC-R22.1 with Onboard Ethernet

The hardware configurations in the following table are ordered with GPP 11 and EtherNet firmware.

Hardware Typecode	Expansion Slots U2	U3	U4	Description	Material Number
PPC-R22.1N-T-NN-NN-NN-FW	Cover	Cover	Cover	No expansion cards	1070170191
PPC-R22.1N-T-Q1-NN-NN-FW	DAQ03	Cover	Cover	Link Ring cross communication	1070170287
PPC-R22.1N-T-G2-NN-NN-FW	LAG	Cover	Cover	Master Encoder Card	R911311477
PPC-R22.1N-T-N-N1-N2-NN-FW	NSW01	NSW01	Cover	PLS interface with 32 outputs	1070170290
PPC-R22.1N-T-N-N1-NN-NN-FW	NSW01	Cover	Cover	PLS interface with 16 outputs	R911307609

Table 10-3: PPC-R22.1 with Onboard EtherNet

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-XXXXXX	R911309188	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash

Table 10-4: FWA-PPCR2*-GP*-11VRS-DO-XXXXXX Firmware

PPC-R22.1 Profibus Slave (without Ethernet)

The hardware configurations in the following table are ordered with GPP 11 / Profibus slave firmware.

Hardware Typecode	Expansion Slots U2	U3	U4	Description	Material Number
PPC-R22.1N-N-NN-P2-NN-FW	Cover	DPS01	Cover	Profibus slave interface	1070170149
PPC-R22.1N-N-Q1-P2-NN-FW	DAQ03	DPS01	Cover	Link Ring cross communication and Profibus slave interface	1070170151
PPC-R22.1N-N-N1-P2-NN-FW	NSW01	DPS01	Cover	PLS interface with 16 outputs and Profibus slave interface	1070170283
PPC-R22.1N-N-N1-N2-P2-FW	NSW01	NSW01	DPS01	PLS interface with 32 outputs and Profibus slave interface	1070170280

Table 10-5: PPC-R22.1 Profibus Slave (without Ethernet)

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-P2XXXX	R911309189	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DPS01*-PHP-02VRS-NN (Material number: R911285672)	Profibus slave firmware	DPS01 card

Table 10-6: FWA-PPCR2*-GP*-11VRS-DO-P2XXXX Firmware

PPC-R22.1 Profibus Slave (with Onboard Ethernet)

The hardware configurations in the following table are ordered with GPP 11 / Profibus slave firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R22.1N-T-NN-P2-NN-FW	Cover	DPS01	Cover	Profibus slave interface	1070170285
PPC-R22.1N-T-Q1-P2-NN-FW	DAQ03	DPS01	Cover	Link Ring cross communication and Profibus slave interface	1070170288
PPC-R22.1N-T-N1-N2-P2-FW	NSW01	NSW01	DPS01	PLS interface with 32 outputs and Profibus slave interface	1070170293
PPC-R22.1N-T-Q1-P2-G2-FW	DAQ03	DPS01	LAG	Ling Ring cross communication, Profibus slave interface and Master Encoder Card	R911307434
PPC-R22.1N-T-G2-P2-NN-FW	LAG	DPS01	Cover	Master Encoder Interface and Profibus slave interface	R911309030

Table 10-7: PPC-R22.1 Profibus Slave (with Onboard Ethernet)

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-P2XXXX	R911309189	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DPS01*-PHP-02VRS-NN (Material number: R911285672)	Profibus slave firmware	DPS01 card

Table 10-8: FWA-PPCR2*-GP*-11VRS-DO-P2XXXX Firmware

PPC-R22.1 Profibus Master (without Onboard Ethernet)

The hardware configurations in the following table are ordered with GPP 11 / Profibus master firmware.

Hardware Typecode	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R22.1N-N-NN-P1-NN-FW	Cover	DPM01	Cover	Profibus master interface	1070170307
PPC-R22.1N-N-Q1-P1-NN-FW	DAQ03	DPM01	Cover	Link Ring cross communication and Profibus master interface	In Preparation
PPC-R22.1N-N-Q1-P1-N1-FW	DAQ03	DPM01	NSW01	Link Ring cross communication, Profibus master interface and PLS interface with 16 outputs	In Preparation
PPC-R22.1N-N-N1-N2-P1-FW	NSW01	NSW01	DPM01	PLS interface with 32 outputs and Profibus master interface	In Preparation
PPC-R22.1N-N-T3-P1-NN-FW	ETH02	DPM01	Cover	10/100 Ethernet card and Profibus master interface	R911170308

Table 10-9: PPC-R22.1 Profibus Master (without Onboard Ethernet)

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-P1XXXX	R911309193	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DPM01*-PHP-02VRS-NN (Material number: R911285671)	Profibus master firmware	DPM01 card

Table 10-10: FWA-PPCR2*-GP*-11VRS-DO-P1XXXX Firmware

PPC-R22.1 Profibus Master (with Onboard Ethernet)

The hardware configurations in the following table are ordered with GPP 11 / Profibus master firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R22.1N-T-NN-P1-NN-FW	Cover	DPM01	Cover	Profibus master interface	1070170294
PPC-R22.1N-T-Q1-P1-NN-FW	DAQ03	DPM01	Cover	Link Ring cross communication and Profibus master interface	1070170296
PPC-R22.1N-T-N1-N2-P1-FW	NSW01	NSW01	DPM01	PLS interface with 32 outputs and Profibus master interface	1070170298
PPC-R22.1N-T-G2-P1-NN-FW	LAG	DPM01	Cover	Master Encoder Interface and Profibus master interface	R911309926
PPC-R22.1N-T-T3-P1-NN-FW	ETH02	DPM01	Cover	10/100 Ethernet card and Profibus master interface	R911170310

Table 10-11: PPC-R22.1 Profibus Master (with Onboard Ethernet)

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-P1XXXX	R911309193	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DPM01*-PHP-02VRS-NN (Material number: R911285671)	Profibus master firmware	DPM01 card

Table 10-12: FWA-PPCR2*-GP*-11VRS-DO-P1XXXX Firmware

PPC-R22.1 Profibus Master and Slave (with Onboard Ethernet)

The hardware configurations in the following table are ordered with GPP 11 / Profibus master and slave firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R22.1N-T-Q1-P1-P2-FW	DAQ03	DPM01	DPS01	Link Ring cross communication with Profibus master and slave interfaces	R911310248

Table 10-13: PPC-R22.1 Profibus Master and Slave (with Onboard Ethernet)

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-D0-P1P2XX	R911311211	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DPM01*-PHP-02VRS-NN (Material number: R911285671)	Profibus master firmware	DPM01 card
		FWC-DPS01*-PHP-02VRS-NN (Material number: R911285672)	Profibus slave firmware	DPS01 card

Table 10-14: FWA-PPCR2*-GP*-11VRS-DO-P1P2XX Firmware

PPC-R22.1 Profibus Master and DeviceNet Slave (without Onboard Ethernet)

The hardware configurations in the following table are ordered with GPP 11 / Profibus master and slave firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R22.1N-N-V2-P1-NN-FW	DNS03	DPM01	Cover	DeviceNet slave interface and Profibus master interface	R911170307

Table 10-15: PPC-R22.1 Profibus Master and Slave (without Onboard Ethernet)

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-D0-P1V2XX	R911170313	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DPM01*-PHP-02VRS-NN (Material number: R911285671)	Profibus master firmware	DPM01 card
		FWC-DNS01*-PHV-01VRS-NN (Material number: R911286688)	DeviceNet slave firmware	DNS03 DeviceNet card

Table 10-16: FWA-PPCR2*-GP*-11VRS-DO-P1V2XX Firmware

PPC-R22.1 DeviceNet Slave (without Onboard Ethernet)

The hardware configurations in the following table are ordered with GPP 11 / DeviceNet slave firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R22.1N-N-V2-NN-NN-FW	DNS03	Cover	Cover	DeviceNet slave interface	1070170150
PPC-R22.1N-N-Q1-V2-NN-FW	DAQ03	DNS03	Cover	Link Ring cross communication and DeviceNet slave interface	1070170282
PPC-R22.1N-N-N1-N2-V2-FW	NSW01	NSW01	DNS03	PLS interface with 32 outputs and DeviceNet slave interface	1070170284
PPC-R22.1N-N-G2-V2-NN-FW	LAG	DNS03	Cover	Master Encoder interface and DeviceNet slave interface	R911309031

Table 10-17: PPC-R22.1 DeviceNet Slave (without Onboard Ethernet)

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-V2XXXX	R911309190	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DNS01*-PHV-01VRS-NN (Material number: R911286688)	DeviceNet slave firmware	DNS03 DeviceNet card

Table 10-18: FWA-PPCR2*-GP*-11VRS-DO-V2XXXX Firmware

PPC-R22.1 DeviceNet Slave (with Onboard Ethernet)

The hardware configurations in the following table are ordered with GPP 11 / DeviceNet slave firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R22.1N-T-V2-NN-NN-FW	DNS03	Cover	Cover	DeviceNet slave interface	1070170286
PPC-R22.1N-T-Q1-V2-NN-FW	DAQ03	DNS03	Cover	Link Ring cross communication and DeviceNet slave interface	1070170289

Table 10-19: PPC-R22.1 DeviceNet Slave (with Onboard Ethernet)

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-V2XXXX	R911309190	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DNS01*-PHV-01VRS-NN (Material number: R911286688)	DeviceNet slave firmware	DNS03 DeviceNet card

Table 10-20: FWA-PPCR2*-GP*-11VRS-DO-V2XXXX Firmware

PPC-R22.1 DeviceNet Master (without Onboard Ethernet)

The hardware configurations in the following table are ordered with GPP 11 / DeviceNet master firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R22.1N-N-V1-NN-NN-FW	DNM03	Cover	Cover	DeviceNet master interface	In Preparation
PPC-R22.1N-N-Q1-V1-NN-FW	DAQ03	DNM03	Cover	Link Ring cross communication and DeviceNet master interface	In Preparation
PPC-R22.1N-N-Q1-V1-N1-FW	DAQ03	DNM03	NSW01	Link Ring cross communication, DeviceNet master interface and PLS interface with 16 outputs	In Preparation
PPC-R22.1N-N-V1-N1-N2-FW	DNM03	NSW01	NSW01	DeviceNet master interface and PLS interface with 32 outputs	In Preparation
PPC-R22.1N-N-V1-T3-NN-FW	DNM03	ETH02	Cover	DeviceNet master and 10/100 Ethernet card	R911170309

Table 10-21: PPC-R22.1 DeviceNet Master (without Onboard Ethernet)

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-V1XXXX	R911309194	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DNM03*-PHV-01VRS-NN (Material number: R911291424)	DeviceNet master firmware	DNM03 card

Table 10-22: FWA-PPCR2*-GP*-11VRS-DO-V1XXXX Firmware

PPC-R22.1 DeviceNet Master (with Onboard Ethernet)

The hardware configurations in the following table are ordered with GPP 11 / DeviceNet master firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R22.1N-T-V1-NN-NN-FW	DNM03	Cover	Cover	DeviceNet master interface	1070170295
PPC-R22.1N-T-Q1-V1-NN-FW	DAQ03	DNM03	Cover	Link Ring cross communication and DeviceNet master interface	1070170297
PPC-R22.1N-T-N1-N2-V1-FW	NSW01	NSW01	DNM03	PLS interface with 32 outputs, and DeviceNet master interface	1070170299
PPC-R22.1N-T-G2-V1-NN-FW	LAG	DNM03	Cover	Master Encoder interface and DeviceNet master interface	R911310658
PPC-R22.1N-T-V1-T3-NN-FW	DNM03	ETH02	Cover	DeviceNet master interface and 10/100 Ethernet card	R911170311

Table 10-23: PPC-R22.1 DeviceNet Master (with Onboard Ethernet)

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-V1XXXX	R911309194	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DNM03*-PHV-01VRS-NN (Material number: R911291424)	DeviceNet master firmware	DNM03 card

Table 10-24: FWA-PPCR2*-GP*-11VRS-DO-V1XXXX Firmware

PPC-R22.1 DeviceNet Master and Slave (with Onboard Ethernet)

The hardware configurations in the following table are ordered with GPP 11 / DeviceNet master and slave firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R22.1N-T-V1-V2-NN-FW	DNM03	DNS03	Cover	DeviceNet master and slave interface	R911311755
PPC-R22.1N-T-Q1-V1-V2-FW	DAQ03	DNM03	DNS03	Link Ring cross communication with DeviceNet master and slave interface	R911311756

Table 10-25: PPC-R22.1 DeviceNet Slave (with Onboard Ethernet)

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-V1V2XX	R911311212	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DNM03*-PHV-01VRS-NN (Material number: R911291424)	DeviceNet master firmware	DNM03 card
		FWC-DNS01*-PHV-01VRS-NN (Material number: R911286688)	DeviceNet slave firmware	DNS03 DeviceNet card

Table 10-26: FWA-PPCR2*-GP*-11VRS-DO-V1V2XX Firmware

PPC-R22.1 Interbus Slave (with Onboard Ethernet)

The hardware configuration in the following table is ordered with GPP 11 / Interbus slave firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R22.1N-T-NN-B2-NN-FW	Cover	IBS03	Cover	Interbus slave interface	1070170291

Table 10-27: PPC-R22.1 Interbus Slave (with Onboard Ethernet)

The following table contains the FWA typecode ordered with the hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-B2XXXX	R911309191	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-IBS03*-PHB-01VRS-NN (Material number: R911286687)	Interbus slave firmware	IBS03 card

Table 10-28: FWA-PPCR2*-GP*-11VRS-DO-B2XXXX Firmware

PPC-R22.1 ControlNet Slave (with Onboard Ethernet)

The hardware configuration in the following table is ordered with GPP 11 / ControlNet slave firmware.

Configuration	Expansion Slots			Description	Material Number
	U2	U3	U4		
PPC-R22.1N-T-L2-NN-NN-FW	CNS01	Cover	Cover	ControlNet slave interface and	1070170292
PPC-R22.1N-T-N1-L2-NN-FW	NSW01	CNS01	Cover	PLS interface with 16 outputs and ControlNet slave interface	R911311143
PPC-R22.1N-T-Q1-L2-NN-FW	DAQ03	CNS01	Cover	Link Ring cross communication and ControlNet slave interface	R911314861

Table 10-29: PPC-R22.1 ControlNet Slave (with Onboard Ethernet)

The following table contains the FWA typecode ordered with the hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCR2*-GP*-11VRS-DO-L2XXXX	R911309192	FWC-PFM01*-GP*-11VRS-DO (Material number: R911309187)	GPP 11 firmware	PFM memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-CNS01*-PHL-01VRS-NN (Material number: R911288991)	ControlNet slave firmware	CNS01 ControlNet

Table 10-30: FWA-PPCR2*-GP*-11VRS-DO-L2XXXX Firmware

10.2 PPC-P11.1 Hardware and Firmware

The PPC-P11.1 control is available with a 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. The bootloader firmware (FWC-PPCPR*-BTL-02VRS-NN) resides on-board the hardware flash.

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

- SUP-E01-PPC-P11 Material Number: R911298775

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

Note: Ethernet support is not available for the PPC-P11.1 control.

PPC-P11.1 using GMP 11 Base Firmware

The hardware configurations in the following table are ordered with GMP 11 firmware.

Hardware Typecode	PC Expansion Slots 1st	2nd	3rd	4TH	Description	Material Number
PPC-P11.1N-N-NN-NN-NN-FW	PPC-P	Cover	Cover	Cover	PPC-P11.1 only	R911293533
PPC-P11.1N-N-N1-NN-NN-FW	PPC-P	NSW	Cover	Cover	PPC-P11.1 and PLS interface with 16 outputs	R911296298
PPC-P11.1N-N-N1-N2-NN-FW	PPC-P	NSW	NSW	Cover	PPC-P11.1 and PLS interface with 32 outputs	R911296299
PPC-P11.1N-N-Q1-NN-NN-FW	PPC-P	DAQ	Cover	Cover	PPC-P11.1 and Link Ring cross communication	R911296300
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	R911296301

Table 10-31: PPC-P11.1 using GMP 11 Base Firmware

The following table contains the FWA typecode ordered with each hardware configurations listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCP11-GM*-11VRS-DO-XXXXXX	R911309184	FWC-PFM01*-GM*-11VRS-DO (Material number: R911306342)	GMP 11 firmware	PFM compact memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash

Table 10-32: FWA-PPCP11-GM*-11VRS-DO-XXXXXX Firmware

PPC-P11.1 Profibus Master Firmware

The hardware configurations in the following table are ordered with GMP 11 / Profibus master firmware.

Hardware Typecode	Expansion Slots U2	U3	U4	Description	Material Number
PPC-P11.1N-N-P1-NN-NN-FW	DPM01	Cover	Cover	Profibus master interface	R911296365
PPC-P11.1N-N-P1-N1-NN-FW	DPM01	NSW	Cover	Profibus master interface and PLS interface with 16 outputs	R911308551

Table 10-33: PPC-P11.1 Profibus Master Firmware

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCP11-GM*-11VRS-DO-P1XXXX	R911309185	FWC-PFM01*-GM*-11VRS-DO (Material number: R911306342)	GMP 11 firmware	PFM compact memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DPM01*-PHP-02VRS-NN (Material number: R911285671)	Profibus master firmware	DPM01 card

Table 10-34: FWA-PPCP11-GM*-11VRS-DO-P1XXXX Firmware

PPC-P11.1 DeviceNet Master Firmware

The hardware configurations in the following table are ordered with GMP 11 / DeviceNet master firmware.

Hardware Typecode	Expansion Slots U2	U3	U4	Description	Material Number
PPC-P11.1N-N-V1-NN-NN-FW	DNM01	Cover	Cover	DeviceNet master interface	R911296363

Table 10-35: PPC-P11.1 DeviceNet Master Firmware

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Material Number	Includes	Description	Location
FWA-PPCP11-GM*-11VRS-DO-V1XXXX	R911309186	FWC-PFM01*-GM*-11VRS-DO (Material number: R911306342)	GMP 11 firmware	PFM compact memory card
		FWC-PPCPR*-BTL-02VRS-NN (Material number: R911299771)	Bootloader firmware	Onboard Flash
		FWC-DNM03*-PHV-01VRS-NN (Material number: R911291424)	DeviceNet master firmware	DNM01 card

Table 10-36: FWA-PPCP11-GM*-11VRS-DO-V1XXXX 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 11 firmware (PPC-R22.1)
- GMP 11 firmware (PPC-P11.1)
- Bootloader firmware for PPC-R

Bootloader Firmware on Controls

Bootloader firmware for the PPC-R22.1 and PPC-P11.1 resides on the control's on-board flash. On power-up, the bootloader firmware is initialized from the on-board flash. The control firmware on the PFM card is than initialized and the control is ready for operation. If the PFM card does not contain control firmware, the PPC-P11.1 remains in bootloader mode awaiting the installation of GMP control firmware.

CAUTION

Upgrading flash bootloader firmware

⇒ The control's on-board bootloader 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 control may be rendered inoperable and must then be sent to Bosch Rexroth's service department for reinstallation of bootloader firmware.

Dolfi Software

Control firmware can be upgraded on a PFM card using the serial Dolfi software. Dolfi is an optional software installation that is part of the VisualMotion 11 installation CD.

To install Dolfi:

1. Insert the VisualMotion 11 CD and select the **Modify** radio button from the *Welcome* window.
2. From the *Select Component* window, deselect all components and select only **Dolfi**.

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 bootloader firmware version. Once released, the H1 display will read "DL". The PPC-P11.1 does not have a S1 button and requires the use of control parameter C-0-0994 to switch the control to download mode.

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*-BTL02VRS (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: Bootloader Download Settings

CAUTION

Interrupting bootloader firmware upgrade will render the PFM memory card inoperable.

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

10.4 HMI Hardware and Firmware

VCP Small Operator Terminals

The VCP small operator terminal hardware is available in 5 different models. Firmware must be ordered separately for each hardware configuration using the appropriate FWA typecode.

VCP02 Serial or Profibus

The following VCP02 hardware configurations are available:

Hardware Typecode	Description	Material Number
VCP02.1BRN-RS-NN-FW	Serial interface	R911305253
VCP02.1BRN-PB-NN-FW	Profibus interface	R911305255

Table 10-38: VCP02 Hardware Configurations

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Description	Material Number
FWA-VCP02*-SUE-01VRS-EN	VCP02 firmware	R911305254

Table 10-39: VCP02 Firmware Configuration

VCP05 Serial or Profibus

The following VCP05 hardware configurations are available:

Hardware Typecode	Description	Material Number
VCP05.1BSN-RS-NN-FW	Serial interface	R911305256
VCP05.1BSN-PB-NN-FW	Profibus interface	R911305257

Table 10-40: VCP05 Hardware Configurations

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Description	Material Number
FWA-VCP05*-SUE-01VRS-EN	VCP05 firmware	R911305258

Table 10-41: VCP05 Firmware Configuration

VCP08 Serial or Profibus

The following VCP08 hardware configurations are available:

Hardware Typecode	Description	Material Number
VCP08.1BTN-RS-NN-FW	Serial interface	R911305259
VCP08.1BTN-PB-NN-FW	Profibus interface	R911305260

Table 10-42: VCP08 Hardware Configurations

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Description	Material Number
FWA-VCP08*-SUE-01VRS-EN	VCP08 firmware	R911305262

Table 10-43: VCP08 Firmware Configuration

VCP20 Serial or Profibus

The following VCP20 hardware configurations are available:

Hardware Typecode	Description	Material Number
VCP20.1BUN-256RS-NN-FW	Serial interface (256kB)	R911305261
VCP20.1BUN-256PB-NN-FW	Profibus interface (256kB)	R911305263
VCP20.1BUN-768RS-NN-FW	Serial interface (768kB)	R911305265
VCP20.1BUN-768PB-NN-FW	Profibus interface (768kB)	R911305267

Table 10-44: VCP20 Hardware Configurations

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Description	Material Number
FWA-VCP20*-SUE-01VRS-EN	VCP20 firmware	R911305264

Table 10-45: VCP20 Firmware Configuration

VCP25 Serial or Profibus

The following VCP25 hardware configurations are available:

Hardware Typecode	Description	Material Number
VCP25.1BVN-003RS-NN-FW	Serial interface (3 MB)	R911305268
VCP25.1BVN-003PB-NN-FW	Profibus interface (3 MB)	R911305269

Table 10-46: VCP25 Hardware Configurations

The following table contains the FWA typecode ordered with each hardware configuration listed above.

Firmware Typecode (FWA)	Description	Material Number
FWA-VCP25*-SUE-01VRS-EN	VCP25 firmware	R911305266

Table 10-47: VCP25 Firmware Configuration

VI Composer Software

The parametrization and visualization of the VCP small operator terminals is done using the following VI-Composer software.

Software Typecode	Material Number
SWA-VIC*PC-INB-01VRS-DO-CD0650-EN	R911305266

Table 10-48: VI Composer Software

VEH/VEP Embedded Terminals

The VEH 30 is available in one model. The VEP operator terminal hardware is available in 3 different models. Firmware must be ordered separately using the appropriate FWA typecode.

VEP 30 Hardware Configurations

The following VEP 30 hardware configurations are available:

Hardware- Typecode	Description	Material Number
VEP30.1CCU-064NA-G3D-064-EC-FW	With Profibus master interface	R911306313
VEP30.1CCU-064NN-G3D-064-EC-FW	No fieldbus interface	R911306312
VEP30.1CCU-128NA-G3D-064-EC-FW	With Profibus master interface	R911309657

Table 10-1: VEP 30 Hardware Configurations

VEP 40 Hardware Configurations

The following VEP 40 hardware configurations are available:

Hardware- Typecode	Description	Material Number
VEP40.1CEU-064NA-G3D-064-EC-FW	With Profibus master interface	R911306315
VEP40.1CEU-064NN-G3D-064-EC-FW	No fieldbus interface	R911306314

Table 10-2: VEP 40 Hardware Configurations

VEP 50 Hardware Configurations

The following VEP 50 hardware configurations are available:

Hardware- Typecode	Description	Material Number
VEP50.1CHU-064NA-G3D-064-EC-FW	With Profibus master interface	R911308408
VEP50.1CHU-064NN-G3D-064-EC-FW	No fieldbus interface	R911308409

Table 10-3: VEP 50 Hardware Configurations

VEH 30 Hardware and Firmware Configuration

The following VEH 30 hardware configuration is available:

Hardware- Typecode	Description	Material Number
VEH30.1BJN-128ET-G3D-128-BS-NN-FW	No fieldbus interface	1070170223

Table 10-4: VEH 30 Hardware Configuration

The following firmware must be ordered with the VEH 30:

Firmware - Typecode	Description	Material Number
FWA-VEH*01-CWN-01VRS-EN	Standard firmware	R911310833

Table 10-5: VEH 30 Firmware

VAC 30 Hardware Configuration

The following VAC 30 hardware configuration must be order with the VEH 30 hardware configuration:

Hardware- Typecode	Description	Material Number
VAC30.1-N-NN	VEH 30 power and communication interface	R911307876

Table 10-6: VAC 30 Hardware Configuration

Firmware for VEP Embedded Terminals

IndraControl VEP devices are shipped with the Microsoft Windows CE .NET 4.2 operation system installed. The operation system is part of the firmware that has to be ordered separately for the corresponding hardware. Additional components of the firmware are the soft PLC "IndraLogicWinCE" and the visualization software “WinStudio lite". The utilization of "IndraLogicWinCE" requires a separate license. “WinStudio lite" only offers a limited functional range. The utilization of an extended range requires an additional license. The following tables provide an overview of the available licenses.

Hardware- Typecode	Description	Material Number
FWA-VE**01-CWL-01VRS-D0	Windows CE 4.2 .NET pre-installed with IndraLogicWinCE and WinStudio "lite".	R911307883

Table 10-49: VEP Firmware

Hardware- Typecode	Description	Material Number
SWL-VE**01-ILC-01VRS-NN	IndraLogicWinCE license	R911308258
SWS-WINSTU-RUN-06VRS-D0-WCE1K5	WinStudio runtime license for up to 1,500 variables, 256 array elements and 32 class elements	R911306954
SWS-WINSTU-RUN-06VRS-D0-WCE4K	WinStudio runtime license for up to 4,000 variables, 512 array elements and 32 class elements	R911306951

Table 10-50: Software Options

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	R911285854
BTC06 with 40 keys insert, E-stop button and live-man switch	BTC06.2A-F-EN3-FW	R911285855
BTC06 with 40 keys insert, E-stop button, override switch and live-man	BTC06.2A-F-EP3-FW	R911285856

Table 10-51: 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	R911280769	FWC-BTC06*-DOL-01VRS-EN (Material number: R911280770)	Bootloader firmware	BTC06
SWA-BTC06*-VT-01VRS-MS-C1.44	R911280785	SWD-BTC06*-VT-01VRS-MS-C1.44 (Material number: R911280788)	VT100 terminal software	BTC06
		SWD-DOL*PC-INB-01VRS-MS-C1.44 (Material number: R911279806)	Serial Dolfi Software	PC

Table 10-52: 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 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	R911291480	FWC-BTC06*-DOL-01VRS-EN (Material number: R911280770)	Bootloader firmware	BTC06

Table 10-53: 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: R911289711

Firmware Typecode (FWB)	Material Number	Includes	Description	Location
FWA-BTC06*-DOL-01VRS-EN	R911280769	FWC-BTC06*-DOL-01VRS-EN (Material number: R911280770)	Bootloader firmware	BTC06
SWA-BTC06*-SCM-02VRS-MS-C1.44	R911284172	SWD-BTC06*-SCM-02VRS-MS-C1.44 (Material number: R911284434)	Screen Manager runtime	BTC06
		SWD-DOL*PC-INB-01VRS-MS-C1.44 (Material number: R911279806)	Serial Dolfi Software	PC

Table 10-54: Screen Manager Runtime Firmware

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

11 Typecodes

11.1 Typecode Description

PPC-R22.1 Typecode

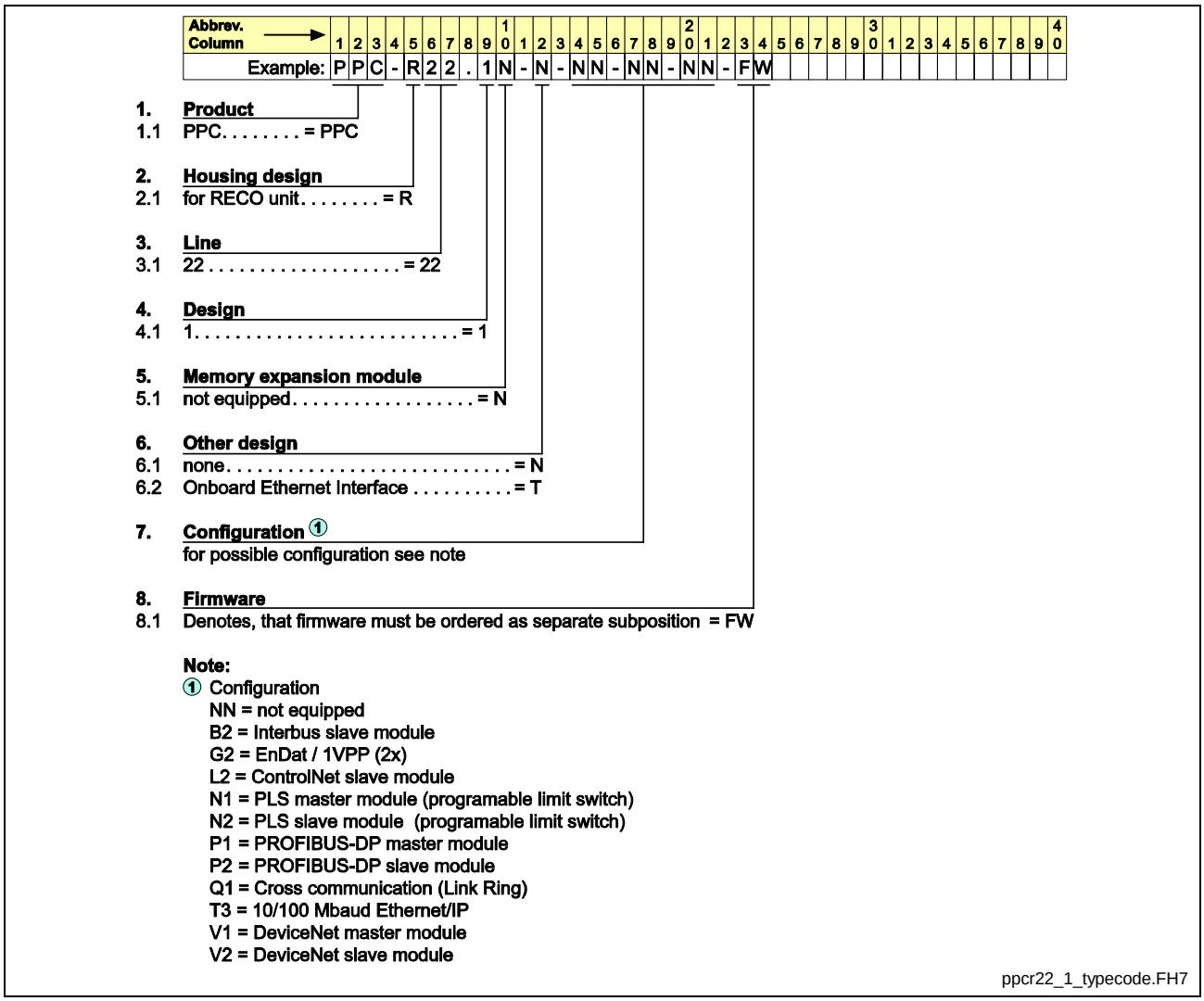


Fig. 11-1: PPC-R22.1 Typecode

PPC-P11.1 Typecode

Abbrev. Column →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Example:	P	P	C	-	P	1	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
5.1 none . . . . . = N

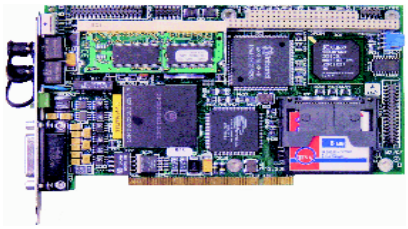
6. Other design
6.1 none . . . . . = N

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
7.6 P1-NN-NN
7.7 P1-N1-NN
7.8 V1-NN-NN

8. Firmware
8.1 Denotes, that firmware must be ordered as separate subposition = FW

Illustration example: PPC-P11.1

- no other design -



ppcp11_1_typecode.FH7

Fig. 11-2: PPC-P11.1 Typecode

VCP02 Typecode

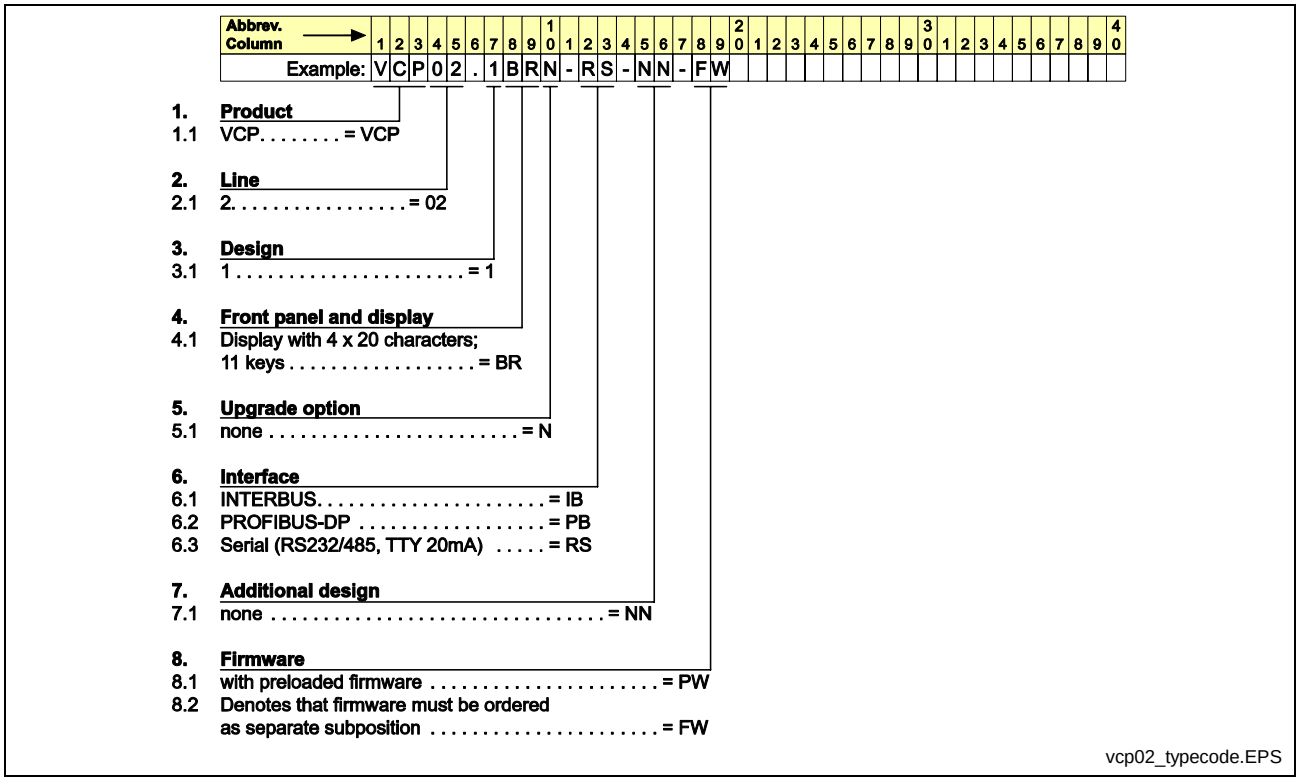


Fig. 11-3: VCP02 Typecode

VCP05 Typecode

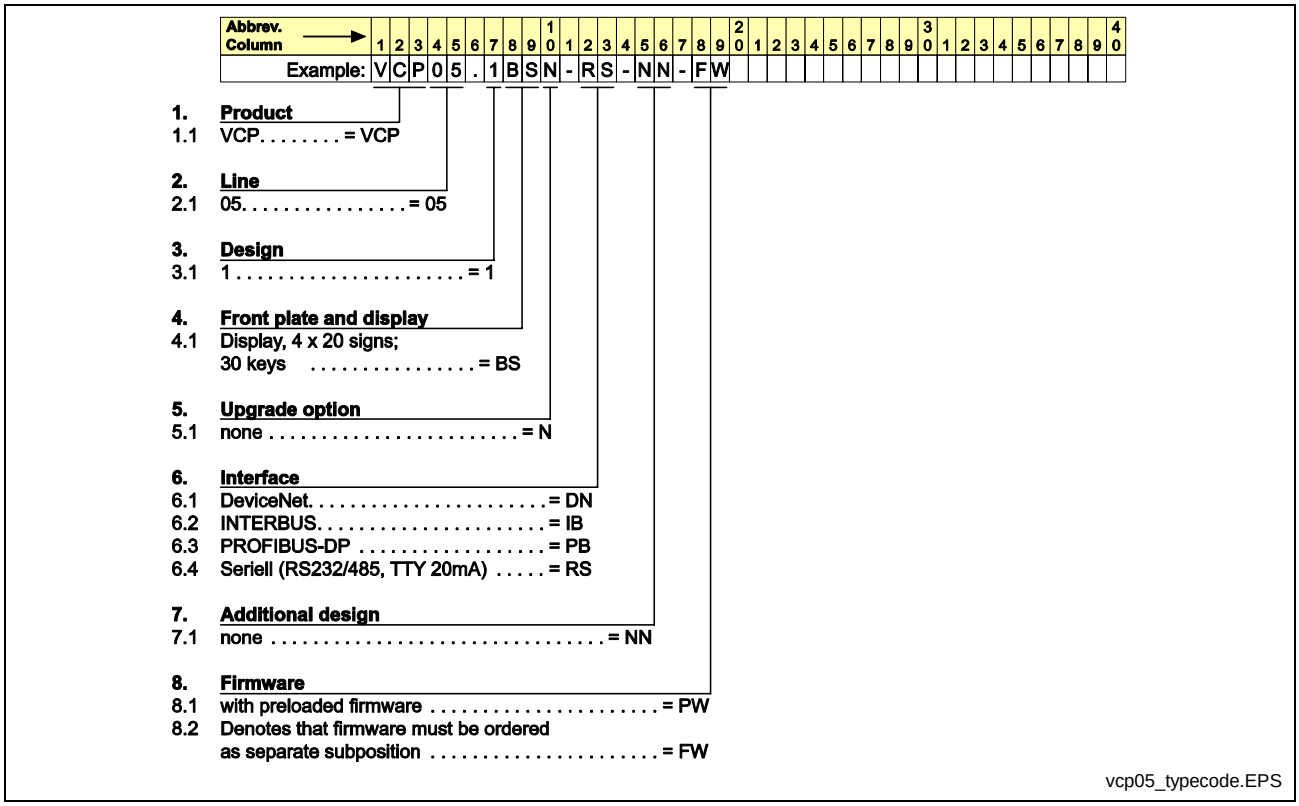


Fig. 11-4: VCP05 Typecode

VCP08 Typecode

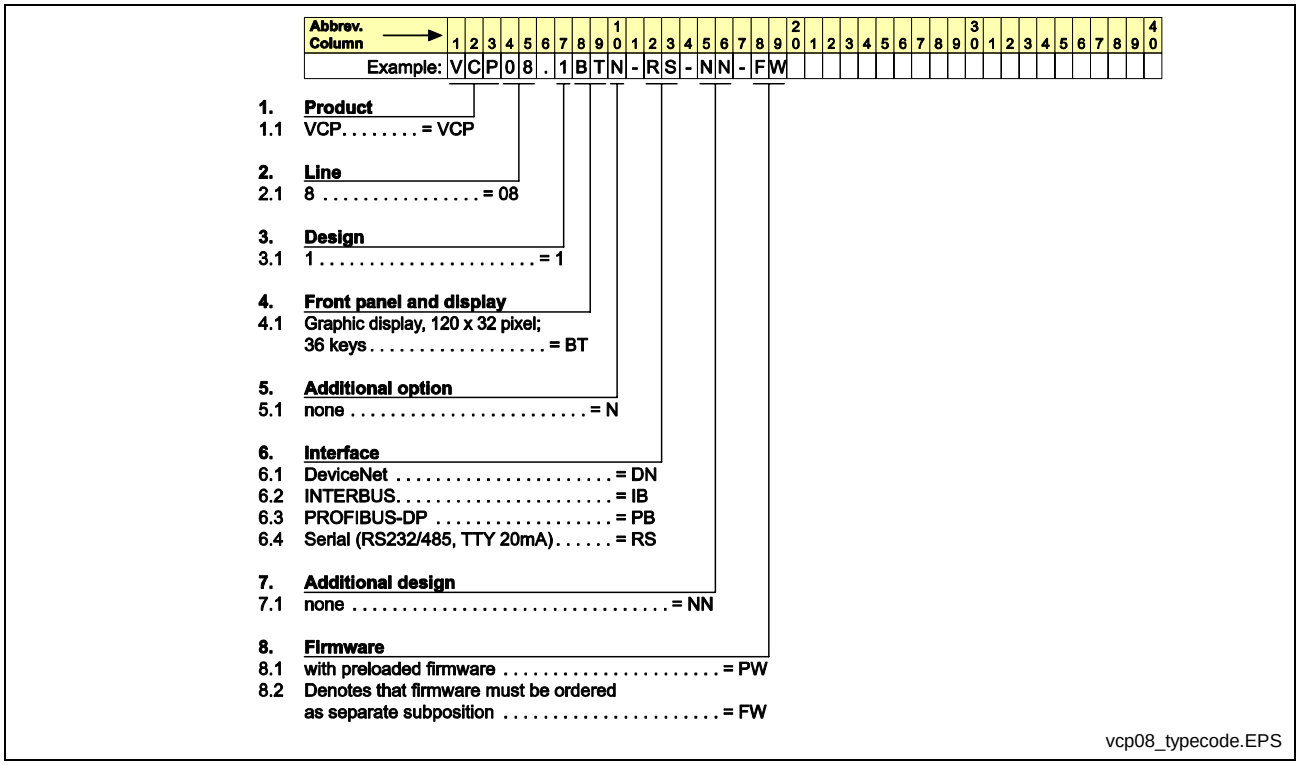


Fig. 11-5: VCP08 Typecode

VCP20 Typecode

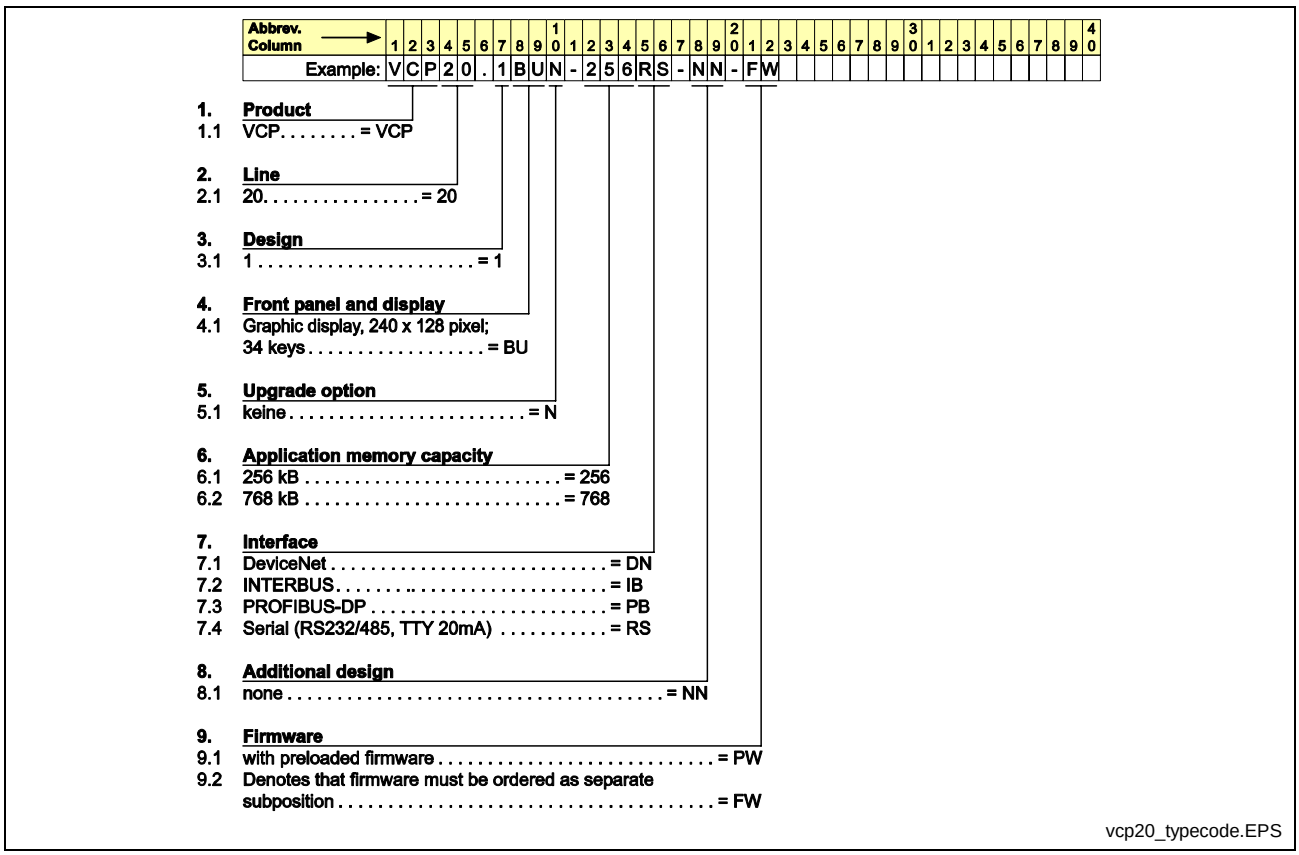


Fig. 11-6: VCP20 Typecode

VCP25 Typecode

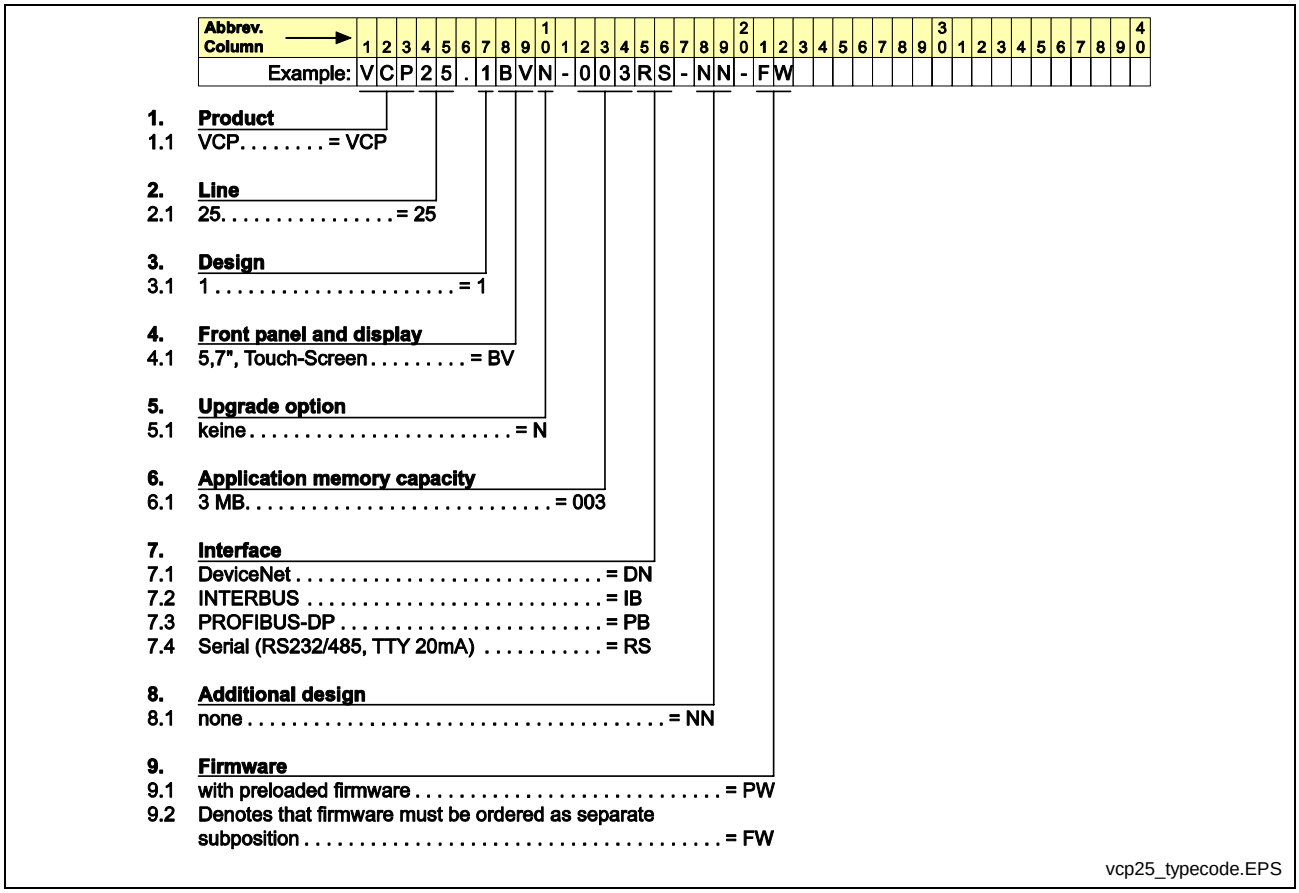


Fig. 11-7: VCP25 Typecode

VEP30 Typecode

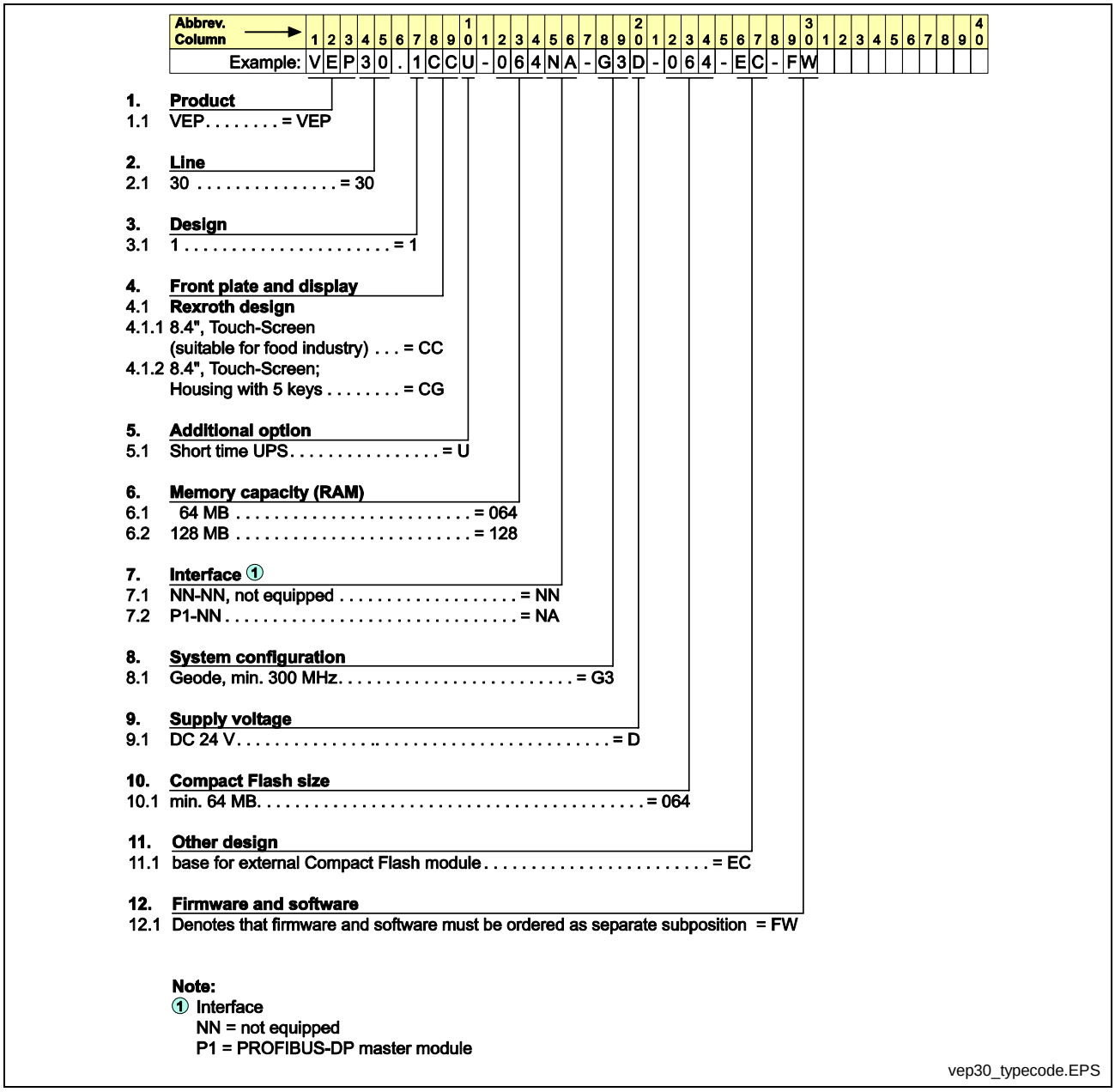


Fig. 11-8: VEP30 Typecode

VEP40 Typecode

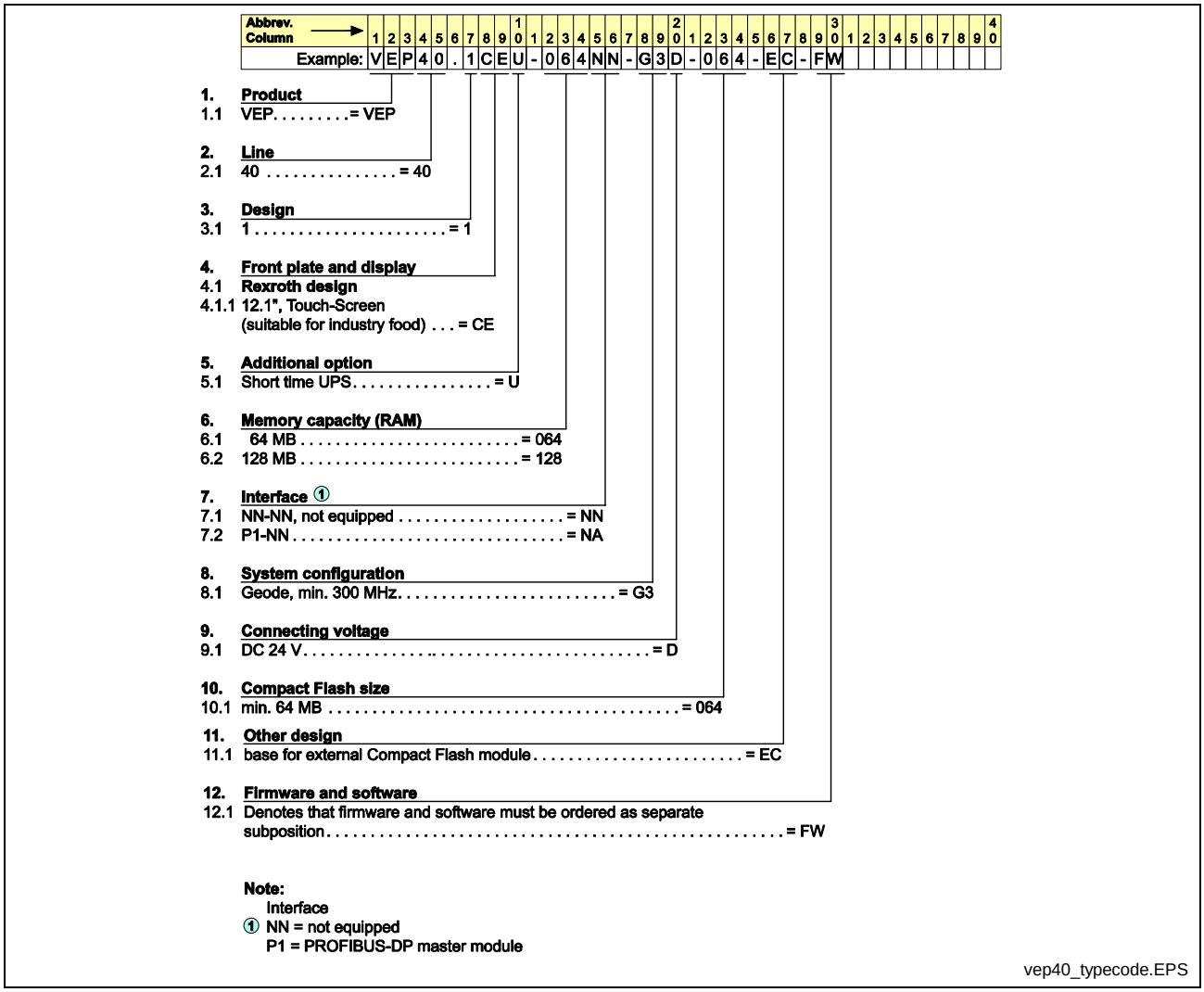


Fig. 11-9: VEP40 Typecode

VEP50 Typecode

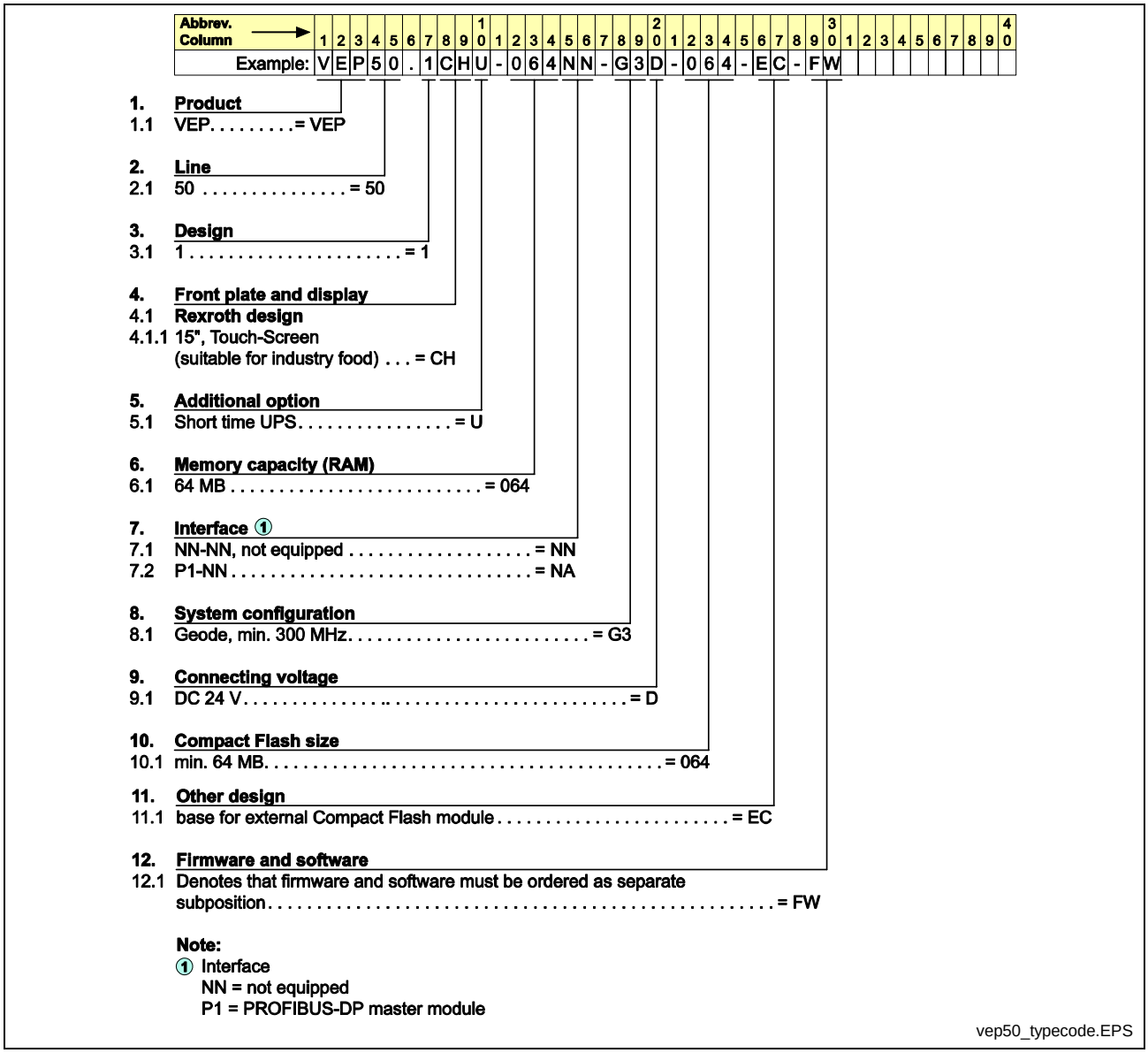


Fig. 11-10: VEP50 Typecode

VEH30 Typecode

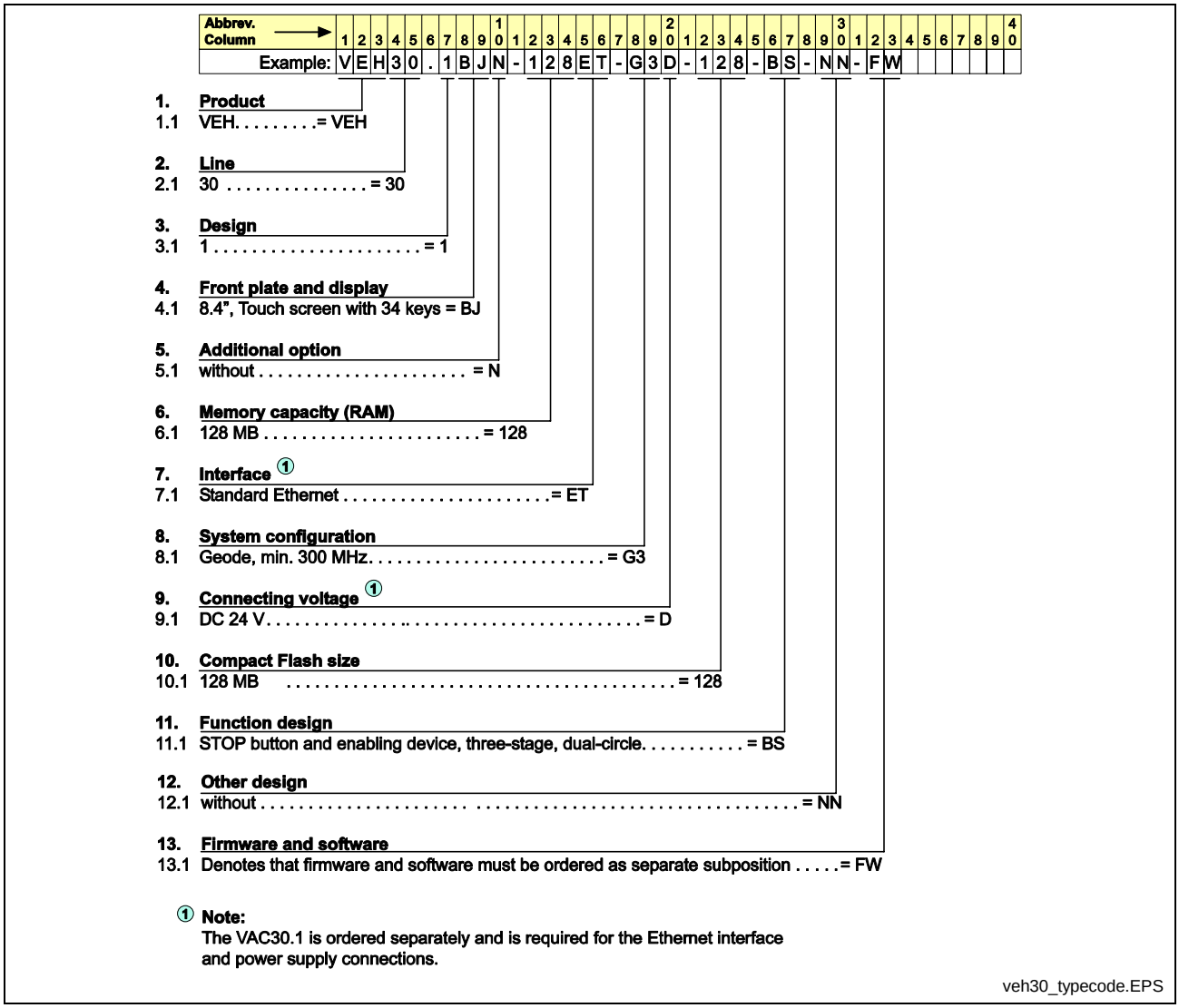


Fig. 11-11: VEH30 Typecode

VAC30 Typecode

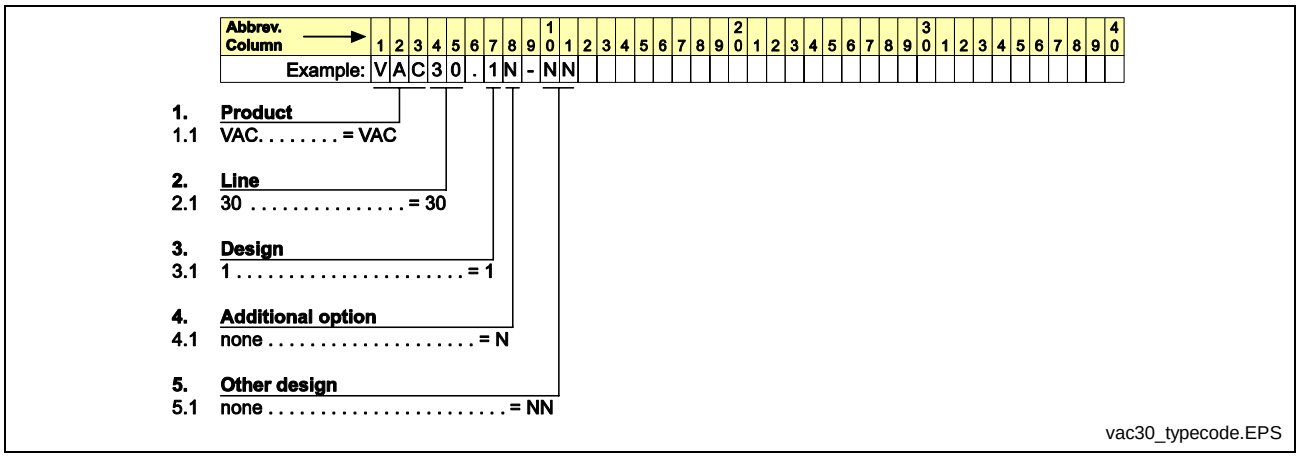


Fig. 11-12: VAC30 Typecode

BTC06.2 Typecode

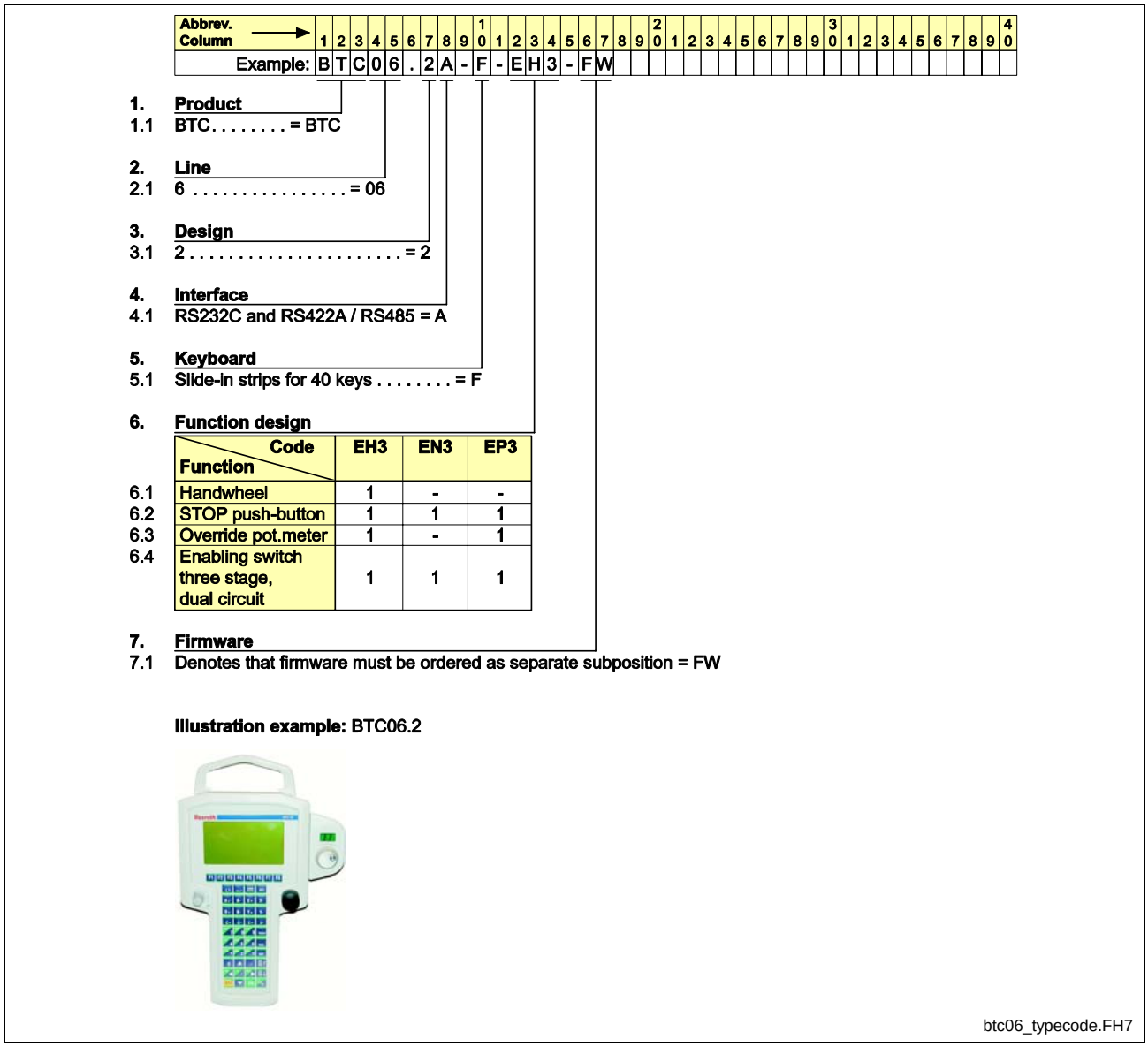


Fig. 11-13: BTC06.2 Typecode

BTZ01.1 Typecode

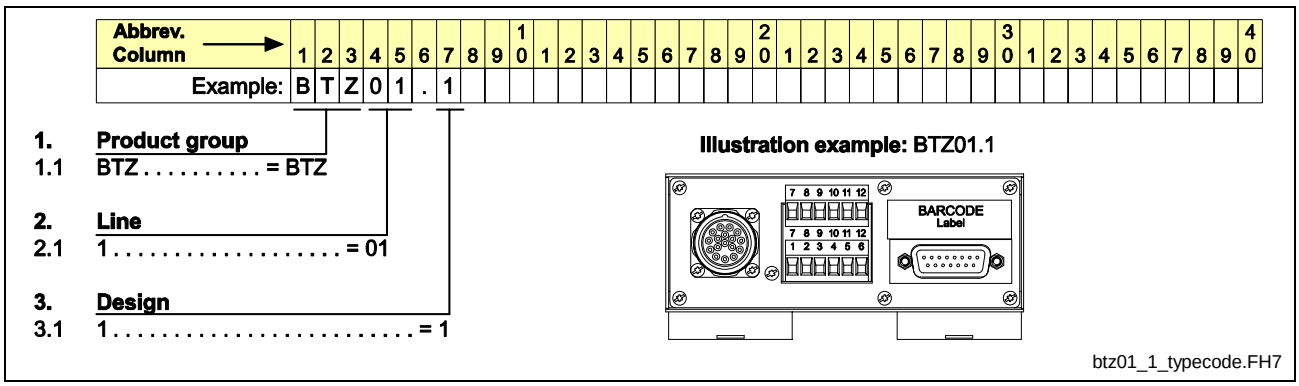


Fig. 11-14: BTZ01.1 Typecode

12 Index

R

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13 Service & Support

13.1 Helpdesk

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

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

- telefonisch - by phone: **+49 (0) 9352 40 50 60**
  über Service Call Entry Center Mo-Fr 07:00-18:00 Central European Time
  - via Service Call Entry Center Mo-Fr 7:00 am - 6:00 pm CET
- per Fax - by fax: **+49 (0) 9352 40 49 41**
- per e-Mail - by e-mail: **service.svc@boschrexroth.de**

13.2 Service-Hotline

Außerhalb der Helpdesk-Zeiten ist der Service Deutschland direkt ansprechbar unter

After helpdesk hours, contact the German service experts directly at

+49 (0) 171 333 88 26

oder - or **+49 (0) 172 660 04 06**

Hotline-Rufnummern anderer Länder entnehmen Sie bitte den Adressen in den jeweiligen Regionen.

Hotline numbers of other countries to be seen in the addresses of each region.

13.3 Internet

Unter **www.boschrexroth.com** finden Sie ergänzende Hinweise zu Service, Reparatur und Training sowie die **aktuellen** Adressen *) unserer auf den folgenden Seiten aufgeführten Vertriebs- und Servicebüros.

Verkaufsniederlassungen
Niederlassungen mit Kundendienst

Außerhalb Deutschlands nehmen Sie bitte zuerst Kontakt mit unserem für Sie nächstgelegenen Ansprechpartner auf.

*) Die Angaben in der vorliegenden Dokumentation können seit Drucklegung überholt sein.

At **www.boschrexroth.com** you can find additional notes about service, repairs and training. The current addresses *) for our sales and service locations around the world are on the following pages.

Sales agencies
Sales agencies providing service

Please contact our sales / service office in your area first.

*) Data in the present documentation may have become obsolete since printing.

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

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

1. Detaillierte Beschreibung der Störung und der Umstände.
2. Angaben auf dem Typenschild der betreffenden Produkte, insbesondere Typenschlüssel und Seriennummern.
3. 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.

13.5 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 AUTOMATION	SERVICE AUTOMATION	SERVICE AUTOMATION
Bosch Rexroth Electrice Drives and Controls GmbH Bgm.-Dr.-Nebel-Str. 2 / Postf. 1357 97816 Lohr am Main / 97803 Lohr **Kompetenz-Zentrum Europa** Tel.: +49 (0)9352 40-0 Fax: +49 (0)9352 40-4885	CALL ENTRY CENTER Helpdesk MO – FR von 07:00 - 18:00 Uhr from 7 am – 6 pm **Tel. +49 (0) 9352 40 50 60** **Fax +49 (0) 9352 40 49 41** service.svc@boschrexroth.de	HOTLINE 24 / 7 / 365 außerhalb der Helpdesk-Zeit out of helpdesk hours **Tel.: +49 (0)172 660 04 06** oder / or **Tel.: +49 (0)171 333 88 26**	**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	Vertriebsgebiet West Germany West	Gebiet Südwest Germany South-West	
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 Regionalzentrum West Borsigstrasse 15 40880 Ratingen Tel.: +49 (0)2102 409-0 Fax: +49 (0)2102 409-406 +49 (0)2102 409-430	Bosch Rexroth AG Service-Regionalzentrum Süd-West Siemensstr. 1 70736 Fellbach Tel.: +49 (0)711 51046–0 Fax: +49 (0)711 51046–248	
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from abroad: don't dial (0) after country code, Italy: dial 0 after country code

Austria - Österreich Bosch Rexroth GmbH Electric Drives & Controls Stachegasse 13 1120 Wien Tel.: +43 (0) 1 985 25 40 Fax: +43 (0) 1 985 25 40-1459	Austria – Österreich Bosch Rexroth GmbH Electric Drives & Controls Industriepark 18 4061 Pasching Tel.: +43 (0)7221 605-0 Fax: +43 (0)7221 605-1220	Belgium - Belgien Bosch Rexroth NV/SA Henri Genessestraat 1 1070 Bruxelles Tel: +32 (0) 2 451 26 08 Fax: +32 (0) 2 451 27 90 info@boschrexroth.be service@boschrexroth.be	Denmark - Dänemark BEC A/S Zinkvej 6 8900 Randers Tel.: +45 87 11 90 60 Fax: +45 87 11 90 61
Denmark - Dänemark Bosch Rexroth A/S Engelsholmvej 26 8900 Randers Tel.: +45 36 77 44 66 Fax: +45 70 10 03 20 tj@boschrexroth.dk	Great Britain – Großbritannien Bosch Rexroth Ltd. Electric Drives & Controls Broadway Lane, South Cerney Cirencester, Glos GL7 5UH Tel.: +44 (0)1285 863-000 Fax: +44 (0)1285 863-030 sales@boschrexroth.co.uk service@boschrexroth.co.uk	Finland - Finnland Bosch Rexroth Oy Electric Drives & Controls Ansatie 6 017 40 Vantaa Tel.: +358 (0)9 84 91-11 Fax: +358 (0)9 84 91-13 60	France - Frankreich Bosch Rexroth SAS Electric Drives & Controls Avenue de la Trentaine (BP. 74) 77503 Chelles Cedex Tel.: +33 (0)164 72-63 22 Fax: +33 (0)164 72-63 20 **Hotline: +33 (0)608 33 43 28**
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AIMS - Australian Industrial Machinery Services Pty. Ltd. 28 Westside Drive Laverton North Vic 3026 Melbourne Tel.: +61 3 93 14 3321 Fax: +61 3 93 14 3329 **Hotlines: +61 3 93 14 3321** **+61 4 19 369 195** enquires@aimservices.com.au	Bosch Rexroth Pty. Ltd. No. 7, Endeavour Way Braeside Victoria, 31 95 Melbourne Tel.: +61 3 95 80 39 33 Fax: +61 3 95 80 17 33 mel@rexroth.com.au	TECTRA Automation (Pty) Ltd. 100 Newton Road, Meadowdale Edenvale 1609 Tel.: +27 11 971 94 00 Fax: +27 11 971 94 40 **Hotline: +27 82 903 29 23** georgv@tectra.co.za	**Tightening & Press-fit:** Jendamark Automation 76A York Road, North End 6000 Port Elizabeth Tel.: +27 41 391 4735

Asien - Asia (incl. Pacific Rim)

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