engineering
mannesmann
Rexroth

SYNAX200
Decentralized System for the Synchronization of Machine Axes

Project Planning Manual: Version 07

DOK-SYNAX*-SY*-07VRS**-PR01-EN-P

Rexroth
Indramat

Title
SYNAX200
Decentralized System for the
Synchronization of Machine Axes

Type of Documentation
Project Planning Manual: Version 07

Document Typecode
DOK-SYNAX*-SY*-07VRS**-PR01-EN-P

Internal File Reference
- Sy107E_O.doc
- Document Number 120-2200-B311-01/EN

Purpose of Documentation
This documentation assists
- in the selection of units and hardware components and
- in the basic control cabinet construction

Record of Revisions

Description	Release Date	Notes
DOK-SYNAX*-SY*-07VRS**-PR01-EN-P	05.00	Version 07VRS

Published by
Rexroth Indramat GmbH
Bgm.-Dr.-Nebel-Str. 2 • D-97816 Lohr a. Main
Telephone 09352/40-0 • Tx 689421 • Fax 09352/40-4885
http://www.rexroth.com/indramat
Dept. ESP (STS/TI)

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

Contents

1 Determing Drive and System Configurations

1.1 General

SYNAX200 systems are built of up to 40 digital intelligent drives of the DIAX03 (DKR), DIAX04 and ECODRIVE03 drive family, a motion control PPC-R, one LWL connection between these components meeting SERCOS interface standards (IEC 61491 or EN 61491) as well as a number of optional plug-in cards for the digital intelligent drives and option modules for the PPC.

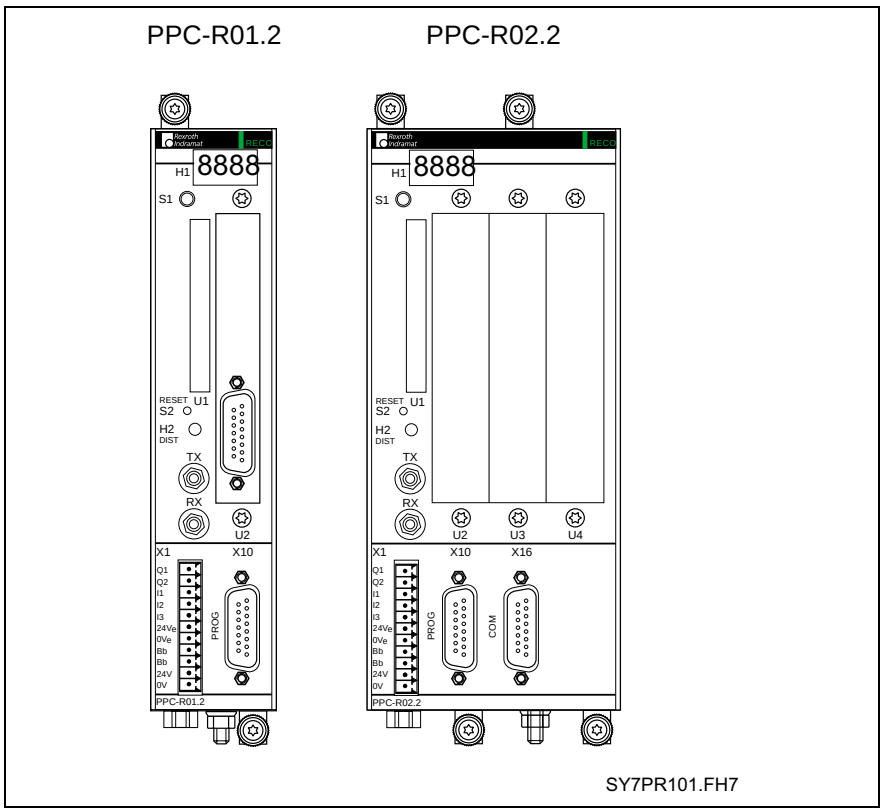


Fig. 1-1: Motion control PPC-R

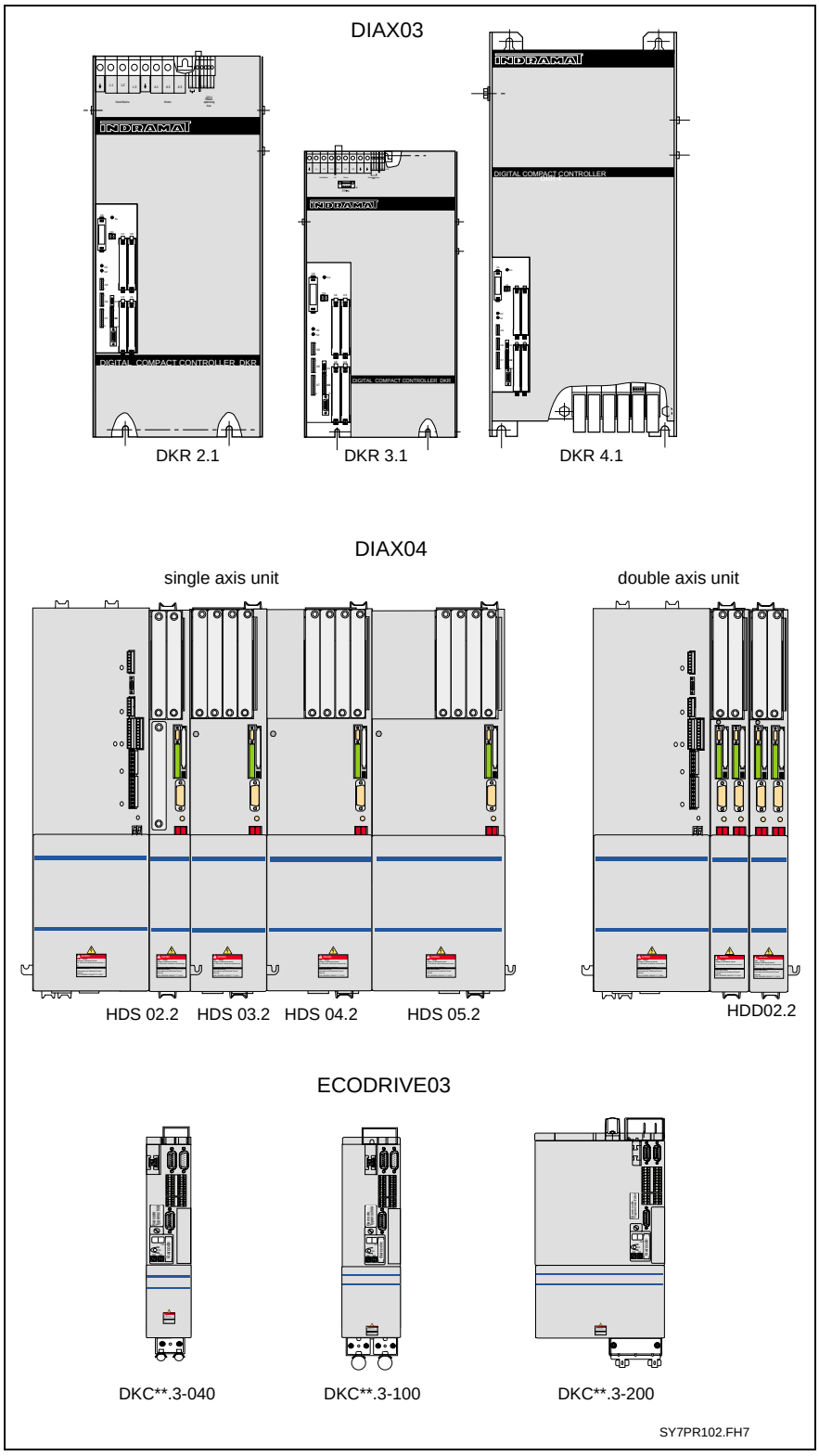


Fig. 1-2: Drive controller

Fig. 1-3: Rotary motors

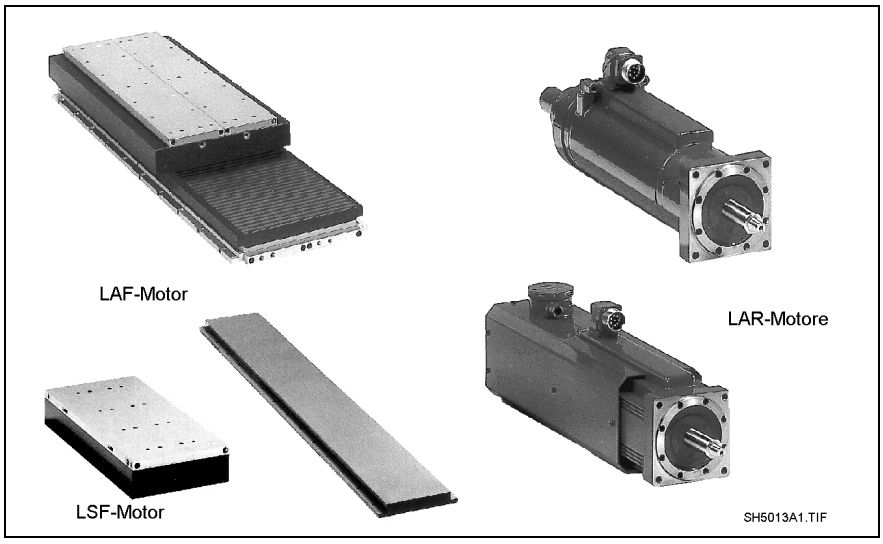


Fig. 1-4: Linear motors

PPC Motion Control

The motion control PPC can be adapted to meet numerous application requirements by using various option modules.

The motion control itself is mounted on a module carrier. Module carrier can also be fitted with I/O modules.

Basic devices

PPCs not fitted with option modules are basic devices.

Option modules

The following option modules are available:

- ARCNET-/PPC link assembly.
- Fieldbus modules.

ARCNET-/PPC link assembly

This option module with designation DAQ serves for coupling of PPCs and serves for communication with higher automation level (e.g., SPS) via ARCNET interface.

Fieldbus module

Fieldbus slave interfaces are available for the fieldbusses Profibus (DPS), Interbus (IBS) and DeviceNet (DNS).

Note: The SYNAX200 system is adapted to the hardware on the machine in two steps:

- First the drive concept in terms of the motor is determined. This includes drive amplifiers and linear scale (as part of the basic drive configuration).
- Then PPC motion control function and plug-in card assignment to the PPC motion controls is determined.

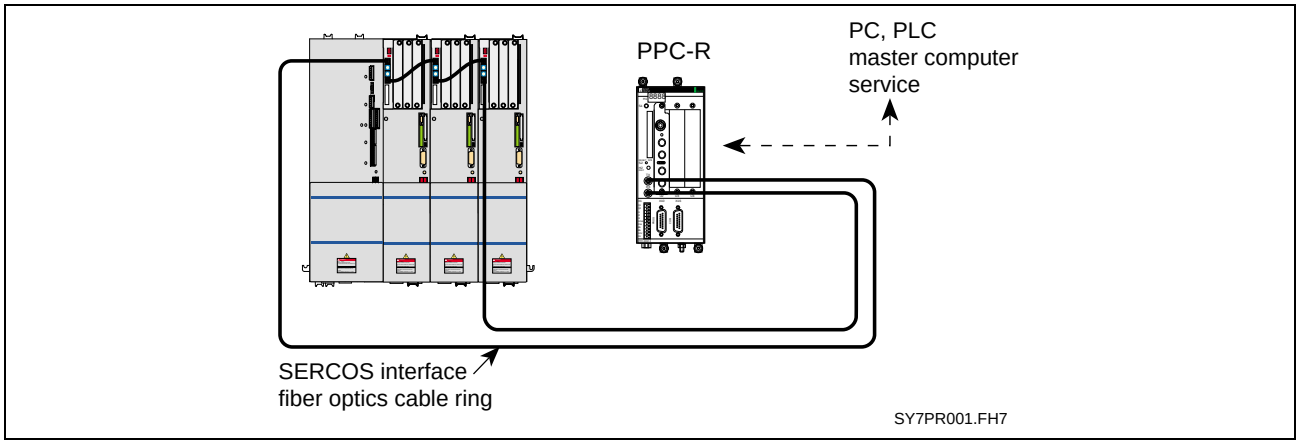


Fig. 1-5: PPC configurations

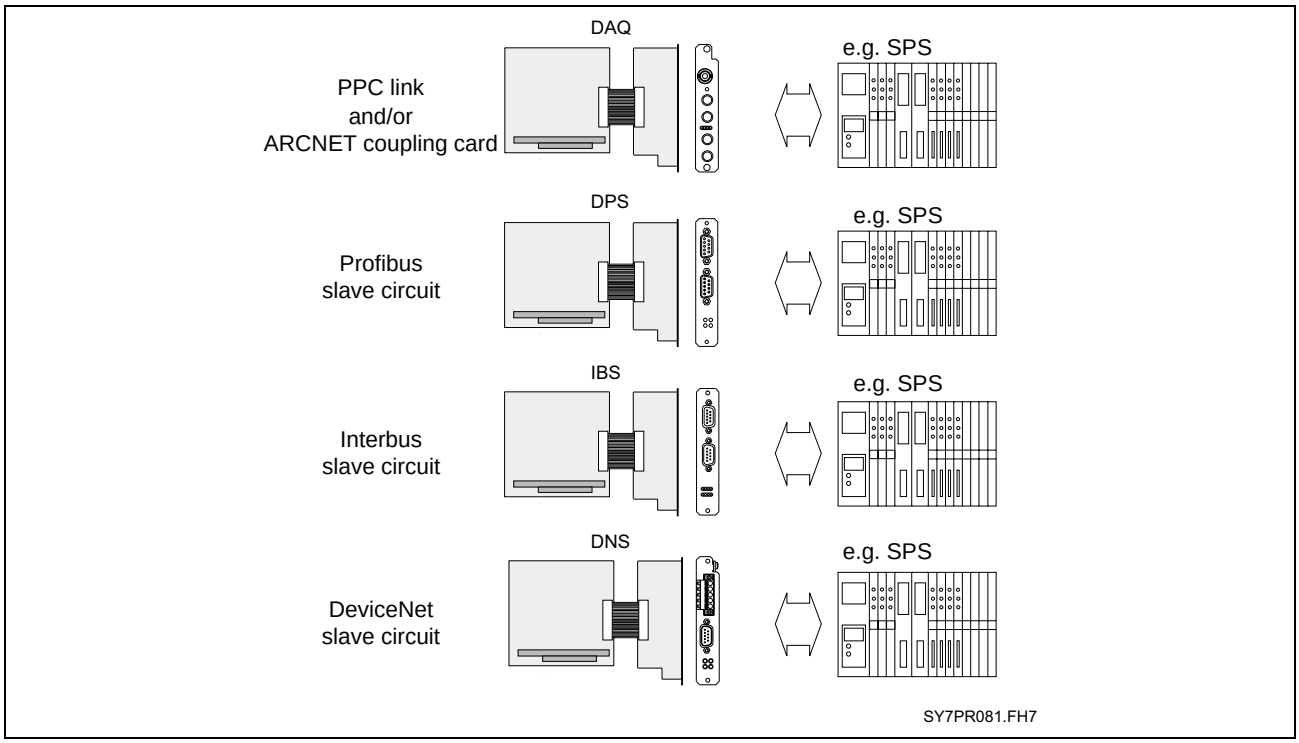


Fig. 1-6: Functional assignment of the PPC option modules with SYNAX200-system configuration

Motors

All rotary and linear motors which belong to the product line MKD, MKE, MHD, 2AD, 1MB, MBW, MBS, LAF and LSF can always be used.

Drive Controller

Digital drive controllers of the type DIAX03 (DKR) and DIAX04 can be adapted to meet numerous application requirements by using various plug-in modules. For this reason, drive controllers are equipped with ports for plug-in modules.

Digital drive controller of the type ECODRIVE03 are compact controller with integrated command interface card and evaluation interfaces. The DIAX04 drive configuration described in this project planning are also possible with ECODRIVE03, but ECODRIVE03 has a reduced range of capacity.

Basic devices

Drive controllers not fitted with plug-in modules are basic devices.

Plug-in modules

The following plug-in modules are available:

- Command interface card module
- Modules for evaluating position measurement systems
- Input/output modules to evaluate SPS signals or to export signals to the SPS
- Software modules
- Module for evaluating analog inputs
- Encoder emulation modules

Command interface card module

The DSS plug-in module is used as a command interface card module. This module occupies in most cases slot U1 in the drive controller.

Configured drive controller

A basic device fitted with additional plug-in modules is called a configured drive controller.

Hardware configuration

Every hardware configuration is designated by a letter/number sequence, e.g., HS04-01-FW. Digital drive controllers are delivered as configured drive controllers which may be equipped with various components, according to the selected configuration.

The plug-in cards functionally assigned to the PPC motion control are addressed directly via the SERCOS interface. The digital intelligent drives thus fill a two-fold purpose. In addition to their intelligent drive functions, they also serve as a decentralized unit rack for the control-related plug-in cards (see Fig. 1-6).

Only configured drive controllers are delivered for logistical reasons. In other words, basic units or individual cards are only available for service.

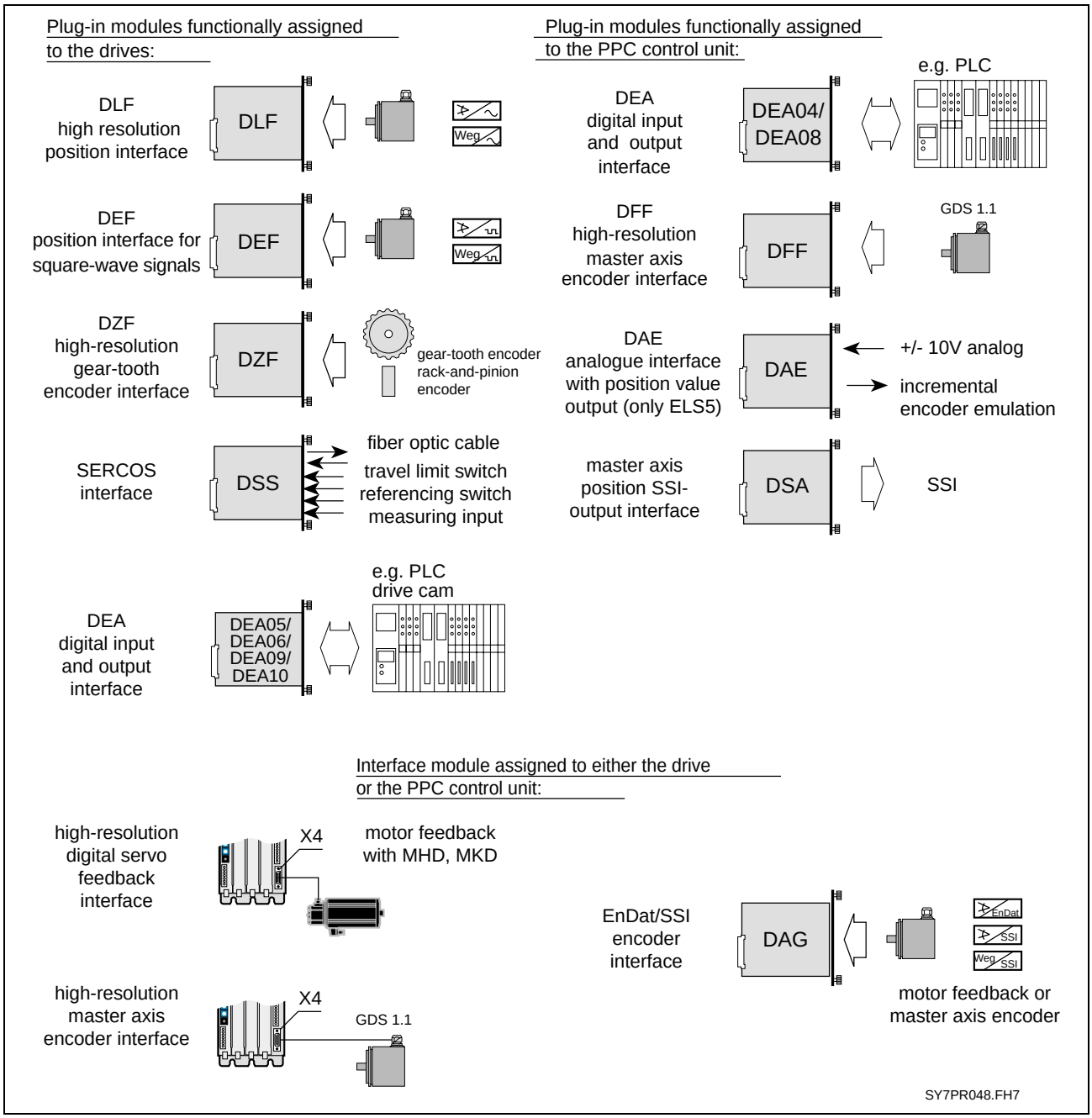


Fig. 1-7: Functional assignment of the drive plug-in modules with SYNAX200 system configuration

2 Important Directions for Use

2.1 Appropriate Use

Introduction

Rexroth Indramat 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: Rexroth Indramat, 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 Rexroth Indramat 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

SYNAX200 made by Rexroth Indramat is designed for the synchronization of machine axes (shaftless machines).

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 parametrized/ programmed before starting it up, making it possible for the motor to execute the specific functions of an application.

The motion control solution SYNAX200 has been developed for use in single or multiple-axis drives and control tasks.

Typical applications of SYNAX200 are:

- printing and paper converting machines,
- textile machines,
- handling and assembly systems and
- packaging and foodstuff machines.

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

2.2 Inappropriate Use

Using the SYNAX200 components outside of the above-referenced areas of application or under operating conditions other than described in the document and the technical data specified is defined as “inappropriate use".

The SYNAX200 components may not be used if

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

3 Safety Instructions for Electric Servo Drives and Controls

3.1 Introduction

Read these instructions before the equipment is used and eliminate the risk of personal injury or property damage. Follow these safety instructions at all times.

Do not attempt to install, use or service 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 Rexroth Indramat representative to send this documentation immediately to the person or persons responsible for the safe operation of this equipment.

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

WARNING

Inappropriate 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 product damage, personal injury, severe electrical shock or death!

3.2 Explanations

The safety warnings in this documentation describe individual degrees of hazard seriousness in compliance with ANSI:

Warning symbol with signal word	Degree of hazard seriousness The degree of hazard seriousness describes the consequences resulting from non-compliance with the safety guidelines.
 **DANGER**	Bodily harm or product damage will occur.
 **WARNING**	Death or severe bodily harm may occur.
 **CAUTION**	Death or severe bodily harm may occur.

Fig. 3-1: Classes of danger with ANSI

3.3 Hazards by Inappropriate Use

DANGER

High voltage and high discharge current! Danger to life, risk of severe electrical shock and risk of injury!

DANGER

Dangerous movements! Danger to life and risk of injury or equipment damage by unintentional motor movements!

WARNING

High electrical voltage due to wrong connections! Danger to life, severe electrical shock and severe bodily injury!

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 inappropriate handling! Bodily injury caused by crushing, shearing, cutting and mechanical shock or improper handling of pressurized systems!

CAUTION

Risk of injury due to inappropriate handling of batteries!

3.4 General Information

- Rexroth Indramat GmbH is not liable for damages resulting from failure to observe the warnings given in these documentation.
- Order operating, maintenance and safety instructions in your language before starting up the machine. If you find that due to a translation error you can not completely understand the documentation for your product, please ask your supplier to clarify.
- Proper and correct transport, storage, assembly and installation as well as care in operation and maintenance are prerequisites for optimal and safe operation of this equipment.
- Trained and qualified personnel in electrical equipment:
  Only trained and qualified personnel may work on this equipment or within its proximity. Personnel are qualified if they have sufficient knowledge of the assembly, installation and operation of the product as well as an understanding of all warnings and precautionary measures noted in these instructions.
  Furthermore, they should be trained, instructed and qualified to switch electrical circuits and equipment on and off, to ground them and to mark them according to the requirements of safe work practices and common sense. 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 on commercial machinery.

European countries: see directive 89/392/EEC (machine guideline).

- The ambient conditions given in the product documentation must be observed.
- Use only safety features that are clearly and explicitly approved in the Project Planning manual.
  For example, the following areas of use are not allowed: Construction cranes, Elevators used for people or freight, Devices and vehicles to transport people, Medical applications, Refinery plants, the transport of hazardous goods, Radioactive or nuclear applications, Applications sensitive to high frequency, mining, food processing, Control of protection equipment (also in a machine).
- Start-up is only permitted once it is sure that the machine, in which the product is installed, complies with the requirements of national safety regulations and safety specifications 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 INDRAMAT document "EMC in Drive and Control Systems”.
  The machine builder is responsible for compliance with the limiting values as prescribed in the national regulations and specific EMC regulations for the application.

European countries: see Directive 89/336/EEC (EMC Guideline).

U.S.A.: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.

- 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 with voltages above 50 Volts.

Making contact with parts conducting voltages above 50 Volts could be dangerous to personnel and cause an electrical shock. When operating electrical equipment, it is unavoidable that some parts of the unit conduct dangerous voltages.

DANGER

High electrical voltage! Danger to life, severe electrical shock and severe bodily injury!

⇒ 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 electrical 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 if the ground wire is not permanently connected, even for brief measurements or tests.

⇒ Before working with electrical parts with voltage potentials higher than 50 V, the equipment must be disconnected from the mains voltage or power supply.

⇒ The following should be observed with electrical drives, power supplies, and filter components:

Wait five (5) minutes after switching off power to allow capacitors to discharge before beginning work. Measure the voltage on the capacitors before beginning 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 (r.c.d.) must not be used on an electric drive! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.

⇒ Equipment that is built into machines must be secured against direct contact. Use appropriate housings, for example a control cabinet.

European countries: according to EN 50178/1998, section 5.3.2.3.

U.S.A: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA) and local building codes. The user of this equipment must observe the above noted instructions at all times.

To be observed with electrical drives, power supplies, and filter components:

DANGER

High electrical voltage! High leakage current! Danger to life, danger of injury and bodily harm from electrical shock!

⇒ Before switching on power for electrical units, all housings and motors must be permanently grounded according to the connection diagram. This applies even for brief tests.

⇒ Leakage current exceeds 3.5 mA. Therefore the electrical equipment and units must always be firmly connected to the supply network.

⇒ Use a copper conductor with at least 10 mm² cross section over its entire course for this protective connection!

⇒ Prior to startups, even for brief tests, always connect the protective conductor or connect with ground wire. High voltage levels can occur on the housing that could lead to severe electrical shock and personal injury.

European countries: EN 50178/1998, section 5.3.2.1.

USA: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must maintain the above noted instructions at all times.

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

All connections and terminals with voltages between 5 and 50 Volts on INDRAMAT products are protective low voltages designed in accordance with the following standards on contact safety:

- International: IEC 364-4-411.1.5
- EU countries: see EN 50178/1998, section 5.2.8.1.

WARNING

High electrical voltage due to wrong connections! Danger to life, severe electrical shock and severe bodily injury!

⇒ Only equipment, electrical components and cables of the protective low voltage type (PELV = Protective Extra Low Voltage) may be connected to all terminals and clamps with 0 to 50 Volts.

⇒ Only safely isolated voltages and electrical circuits may be connected. 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 or the connected motors. These causes are be various such as:

- unclean or wrong wiring of cable connections
- inappropriate or wrong operation of equipment
- malfunction of sensors, encoders and monitoring circuits
- defective components
- software errors

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

The monitors in the drive components make faulty operation almost impossible. Regarding personnel safety, especially the danger of bodily harm and property damage, this alone should not be relied upon to ensure complete safety. Until the built-in monitors become active and effective, it must be assumed in any case that some faulty drive movements will occur. The extent of these faulty drive movements depends upon the type of control and the state of operation.

DANGER

Dangerous movements! Danger to life and risk of injury or equipment damage!

⇒ Personnel protection must be secured for the above listed reason by means of superordinate monitors or measures.

These are instituted in accordance with the specific situation of the facility and a danger and fault analysis conducted by the manufacturer of the facility. All the safety regulations that apply to this facility are included therein. By switching off, circumventing or if safety devices have simply not been activated, then random machine movements or other types of faults can occur.

Avoiding accidents, injury or property damage:

⇒ Keep free and clear of the machine's range of motion and moving parts. Prevent people from accidentally entering the machine's range of movement:

- use protective fences
- use protective railings
- install protective coverings
- install light curtains or light barriers

⇒ Fences must be strong enough to withstand maximum possible momentum.

⇒ Mount the emergency stop switch (E-stop) 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 start-inhibit system to prevent unintentional start-up.

⇒ Make sure that the drives are brought to standstill before accessing or entering the danger zone.

⇒ Secure vertical axes against falling or slipping after switching off the motor power by, for example:

- Mechanically securing the vertical axes
- Adding an external brake / clamping mechanism
- Balancing and thus compensating for the vertical axes mass and the gravitational force

The standard equipment motor brake or an external brake controlled directly by the servo drive are not sufficient to guarantee the safety of personnel!

⇒ 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

⇒ Avoid operating high-frequency, remote control and radio equipment near electronics circuits and supply leads. If use of such equipment cannot be avoided, verify the system and the plant for possible malfunctions at all possible positions of normal use before the first start-up. If necessary, perform a special electromagnetic compatibility (EMC) test on the plant.

3.8 Protection Against Magnetic and Electromagnetic Fields During Operations and Mounting

Magnetic and electromagnetic fields generated by 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 pacemakers, metal implants and hearing aids are not permitted to enter following areas:

- Areas in which electrical equipment and parts are mounted, being operated or started up.
- Areas in which parts of motors with permanent magnets are being stored, operated, repaired or mounted.

⇒ If it is necessary for a person with a pacemaker to enter such an area, then a physician must be consulted prior to doing so. Pacemaker, that are already implanted or will be implanted in the future, have a considerable deviation in their resistance to interference. Due to the unpredictable behavior 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 surfaces near the source of heat! Danger of burns!

⇒ Wait ten (10) minutes before you access any hot unit. Allow the unit to cool down.

⇒ Do not touch hot parts of the equipment, such as housings, heatsinks or resistors. Danger of burns!

3.10 Protection During Handling and Installation

Under certain conditions unappropriate handling and installation of parts and components may cause injuries.

CAUTION

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

⇒ Observe general instructions and safety regulations during handling installation.

⇒ Use only appropriate lifting or moving 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.

⇒ Wear appropriate protective clothing, e.g. safety glasses, safety shoes and safety gloves.

⇒ Never stay under suspended loads.

⇒ Clean up liquids from the floor immediately to prevent personnel from slipping.

3.11 Battery Safety

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

CAUTION

Risk of injury through incorrect handling!

⇒ Do not attempt to reactivate discharged batteries by heating or other methods (danger of explosion and corrosion).

⇒ Never charge batteries (danger from leakage and explosion).

⇒ Never throw batteries into a fire.

⇒ Do not dismantle batteries.

⇒ Handle with care. Incorrect extraction or installation of a battery can damage equipment.

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

3.12 Protection Against Pressurized Systems

Certain Motors (ADS, ADM, 1MB etc.) and drives, corresponding to the information in the Project Planning manual, must be provided with and remain under a forced load such as compressed air, hydraulic oil, cooling fluid or coolant. In these cases, improper handling of the supply of the pressurized systems or connections of the fluid or air under pressure can lead to injuries or accidents.

CAUTION

Danger of injury when pressurized systems are handled by untrained personnel!

⇒ Do not attempt to disassemble, to open or to cut a pressurized system.

⇒ Observe the operation restrictions of the respective manufacturer.

⇒ Before the disassembly of pressurized systems, lower pressure and drain off the fluid or gas.

⇒ Use suitable protective clothing (for example protective eyewear, safety shoes and gloves)

⇒ Remove any fluid that has leaked out onto the floor immediately.

Note: Environmental protection and disposal! The fluids used in the operation of the pressurized system equipment is not environmentally compatible. Fluid that is damaging to the environment must be disposed of separate from normal waste. Observe the national specifications of the country of installation.

4 PPC Motion Control Configuration

4.1 Brief Description

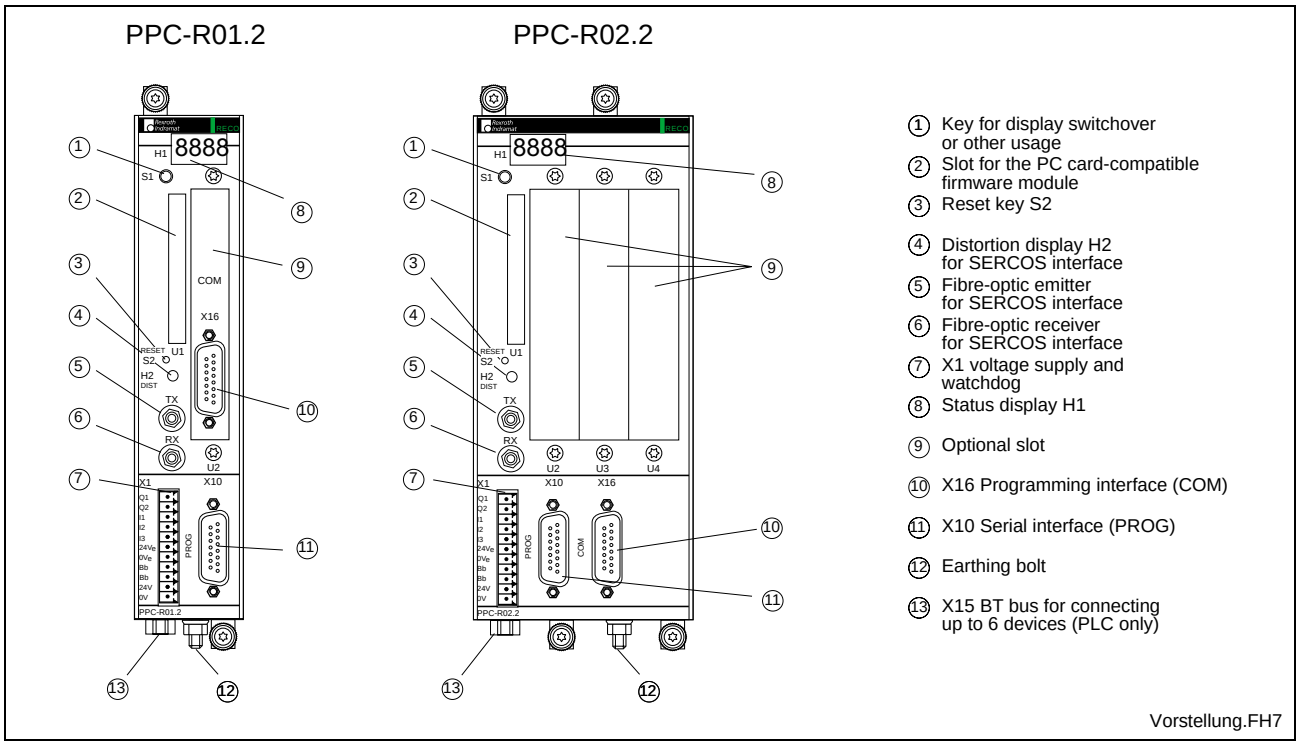


Fig. 4-1: PPC-R01.2 and PPC-R02.2

The PPC-R unit is a powerful controller in a small size in IP 20 rating. It is a general-purpose platform that works as a PLC or as an NC controller, depending on the application and the loaded software.

The PPC-R unit exists with two enclosure versions of different width. A single-width version and a double-width version.

The two interfaces that are available on the controller are fully connected according to the Indramat standard (SIS = Serial Indramat Interface). The data transfer type (function) is only selected by the related application (RS232/RS422/RS485). With **PPC-R01**, the COM interface is brought out via a separate slot plate if this has not yet been assigned for a different purpose (by the PC/104 Field bus, for example).

Furthermore, the PPC-R unit has a BT bus (operator input terminal bus) that permits application-related operator input terminals (BTM15/16, BTA20, etc.) to be used. This is possible with a cable length of up to 50 m.

To install the PPC-R unit, a module carrier system is used that consists of one or more RMB02.2-04 units. The double carrier RMB02.2-02 can only be used as an installation carrier. It is merely used for fixing the PPC-R units; RECO modules cannot be controlled. Interconnecting several PPC-R units via a backplane is not possible either.

The PPC-R01.2 unit occupies one slot in the module carrier; the PPC-R02.2 occupies two units. In this carrier system, the PPC-R unit can handle up to 15 further I/O modules (RME02.2..., RMA02.2... or RMC02.2...).

Depending on the application, the PPC-R has PC/104 modules fitted that, for example, can be used for open field bus interfaces, such as Interbus, Profibus, etc.

4.2 Installation Dimensions

PPC-R01.2 and PPC-R02.2

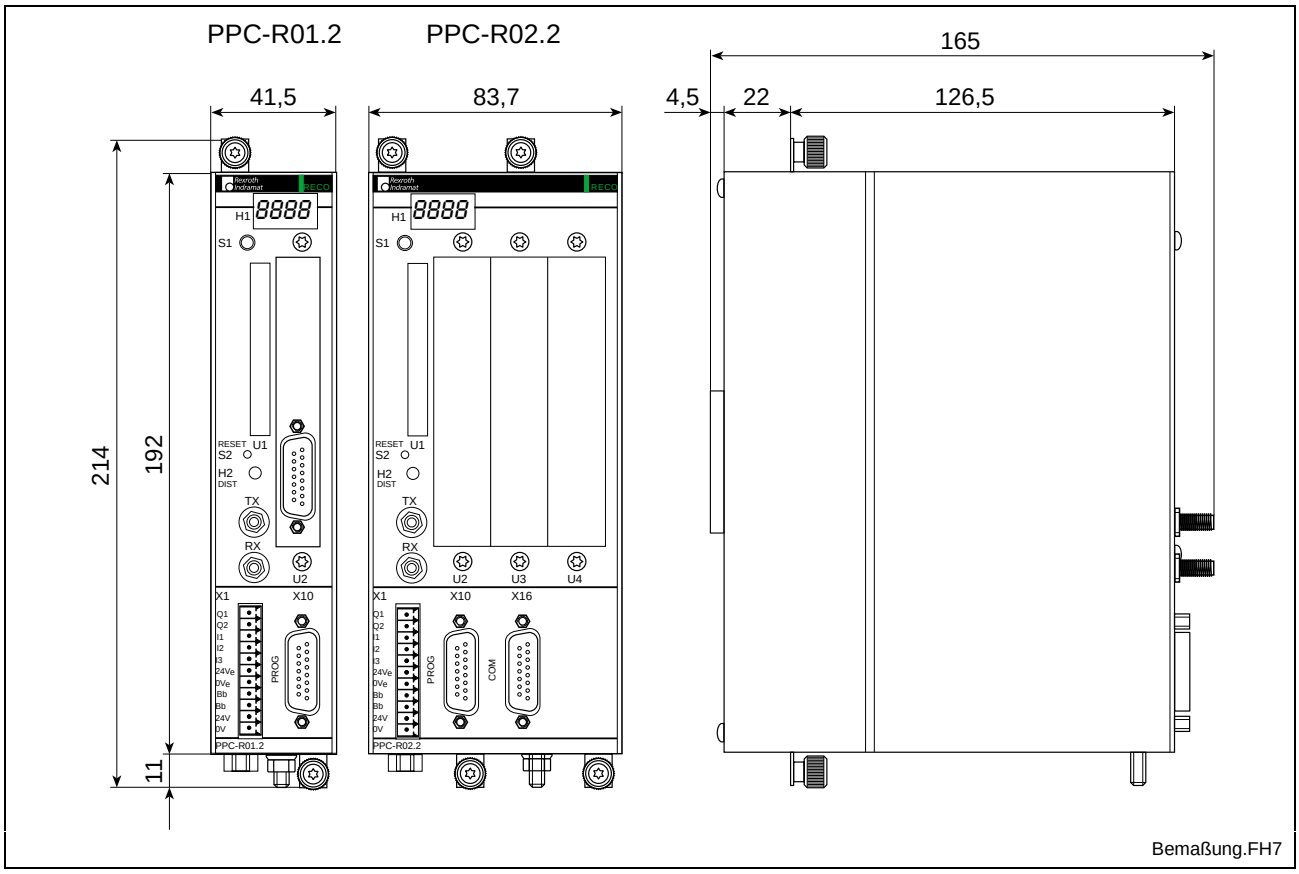


Fig. 4-2: Dimensioned drawing PPC-R01.2 and PPC-R02.2

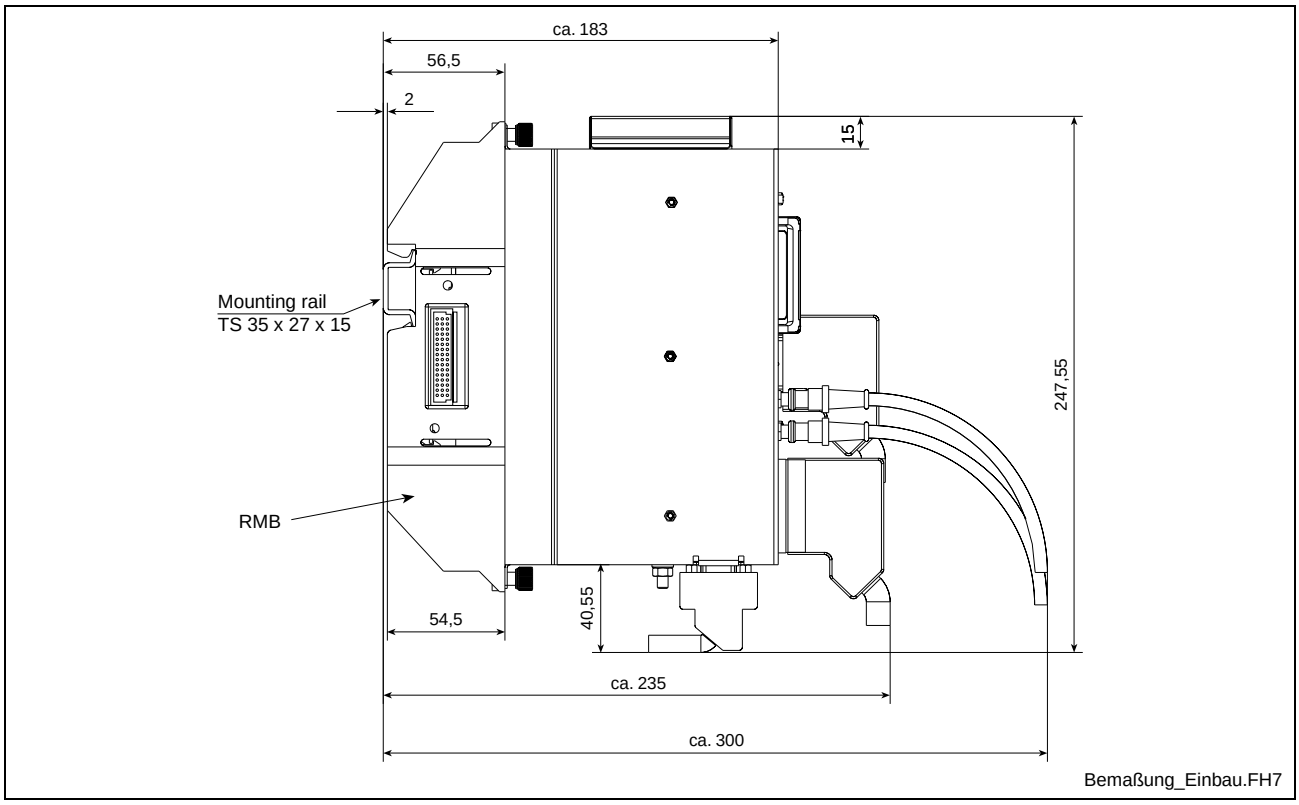


Fig. 4-3: Installation dimensions of PPC-R01.2 and PPC-R02.2

Installation dimensions of module carrier RMB02.2-02

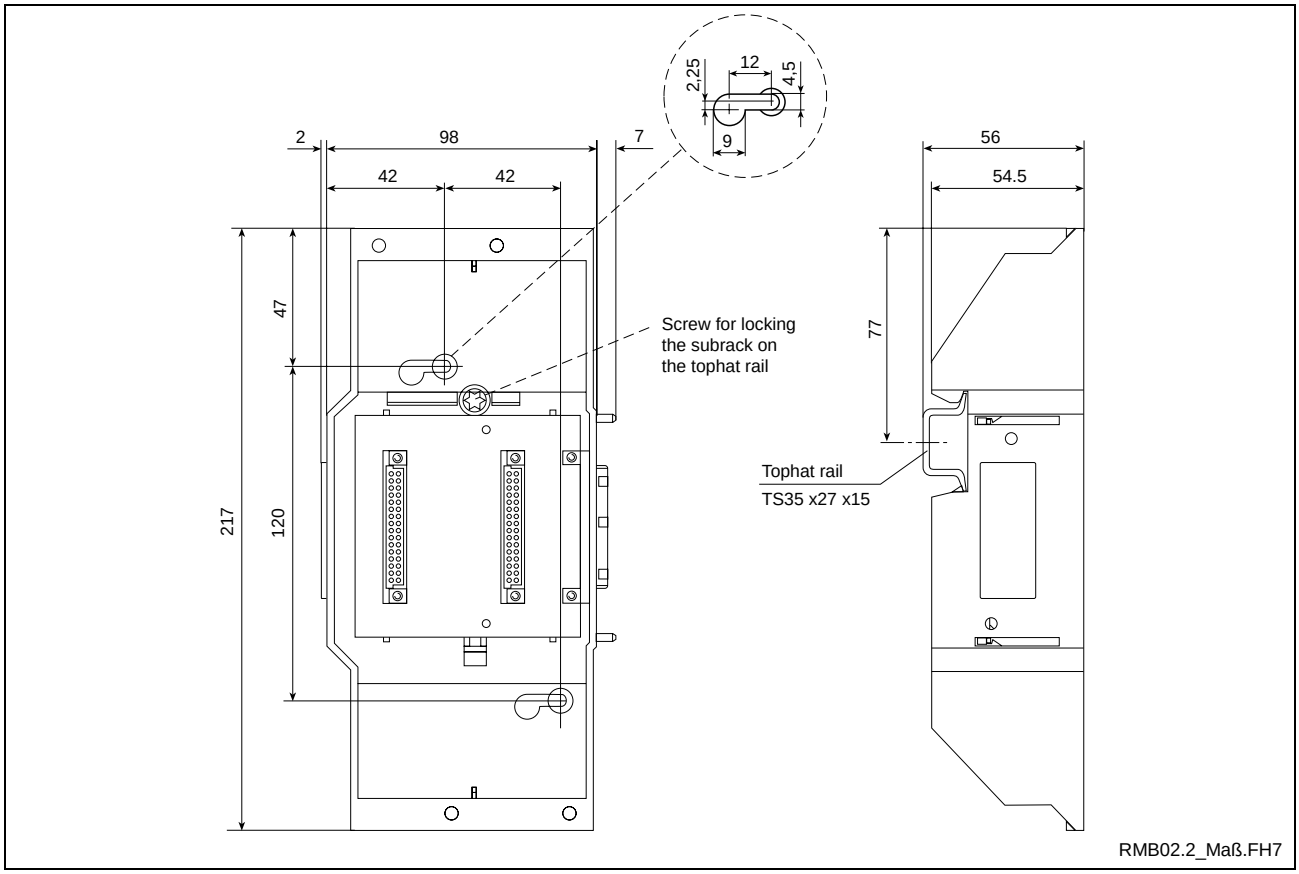


Fig. 4-4: Module carrier RMB02.2-02

Installation dimensions of module carrier RMB02.2-04

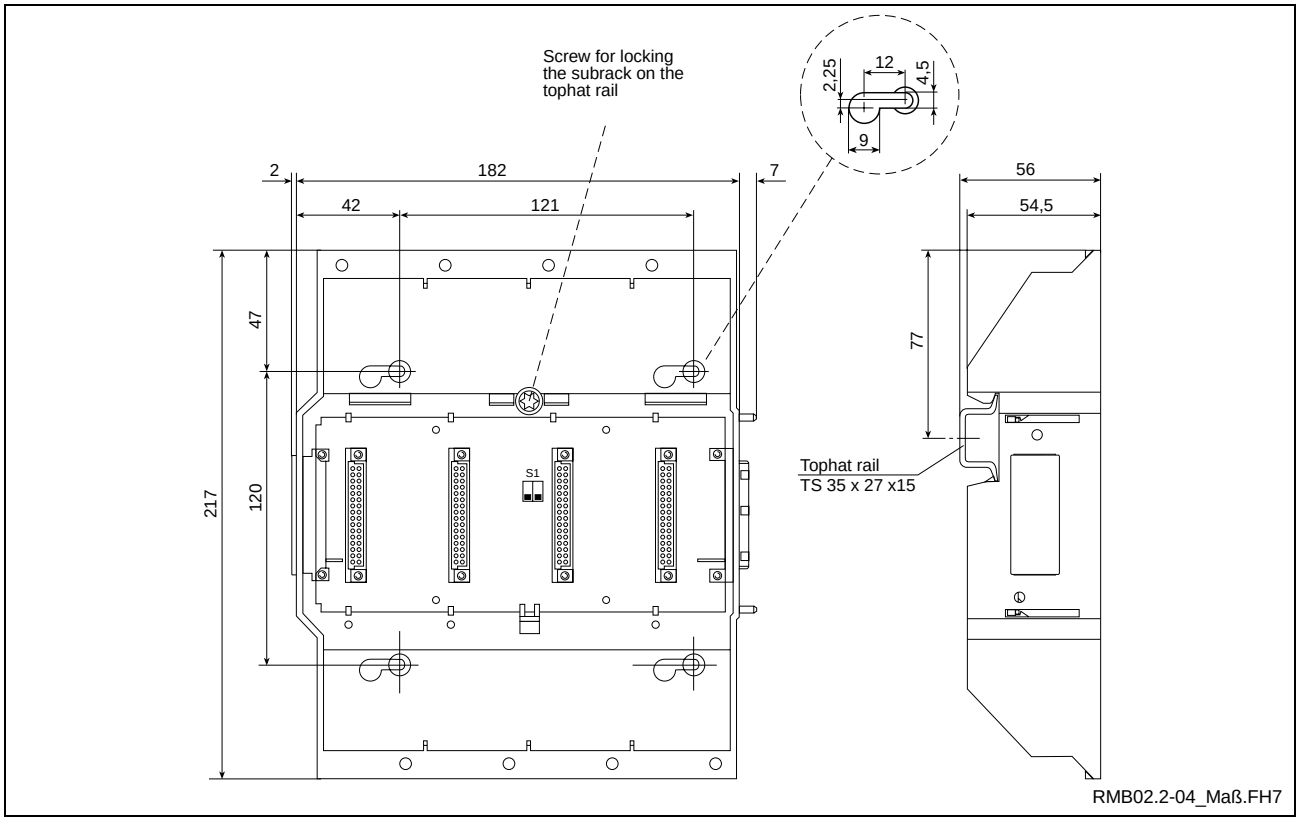


Fig. 4-5: Module carrier RMB02.2-04

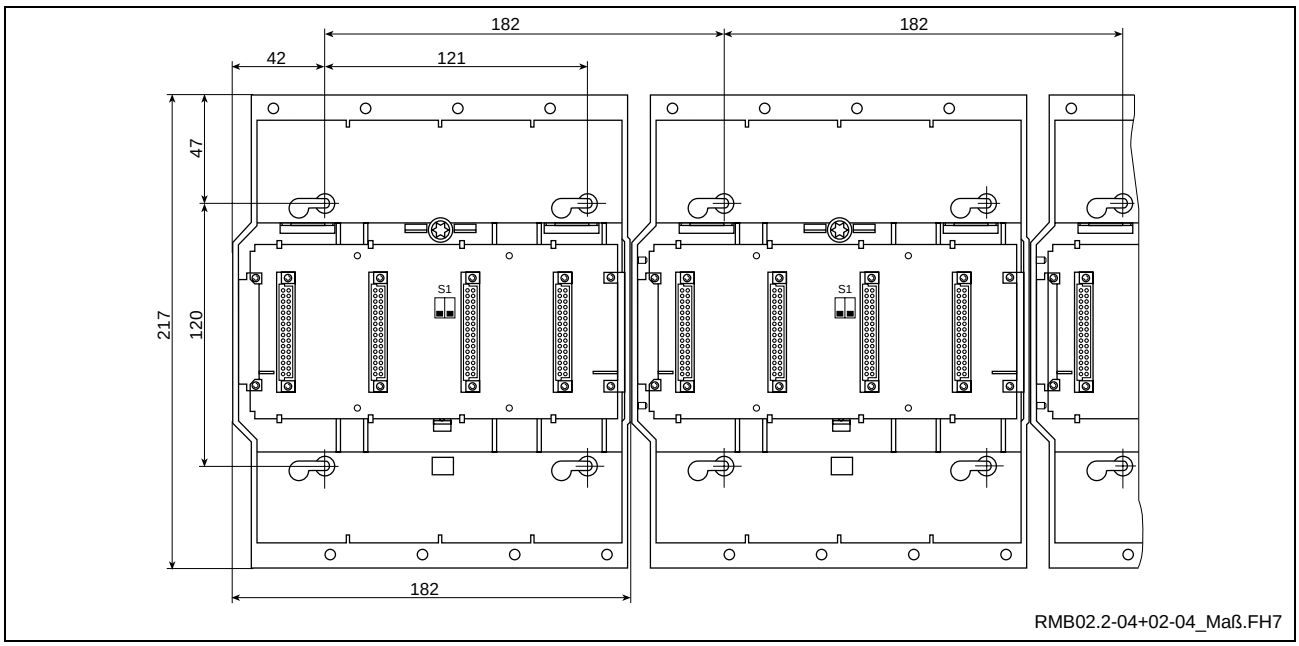


Fig. 4-6: Side-by-side installation of several RMB02.2-04 module carriers

4.3 Installation Instructions

The module carriers must first be installed before the PPC-R units can be installed. These module carriers are equipped with the PPC-R unit and, according to the requirements, with the related I/O modules (RECO02 modules).

Installing the module carriers

To install the RMB02.2-04 module carrier, you must latch it onto a DIN rail TS 35x27x15 and secure it with a retaining screw. The module carrier may also be installed directly on the installation plate in the control cabinet. This is done through boreholes provided in the module carrier (Fig. 4-5).

Up to four RMB02.2-04 module carriers can be installed side by side. The PPC-R must be in slot 0 if it shall be able to control the RECO bus. Slot addressing requires the DIP switches on the bus boards of the RMB02.2-04 module carriers to be configured (Fig. 4-9). The dual carrier RMB02.2-02 is used if the PCR-R shall be used on its own without RECO bus.

Arrangement of the module carriers

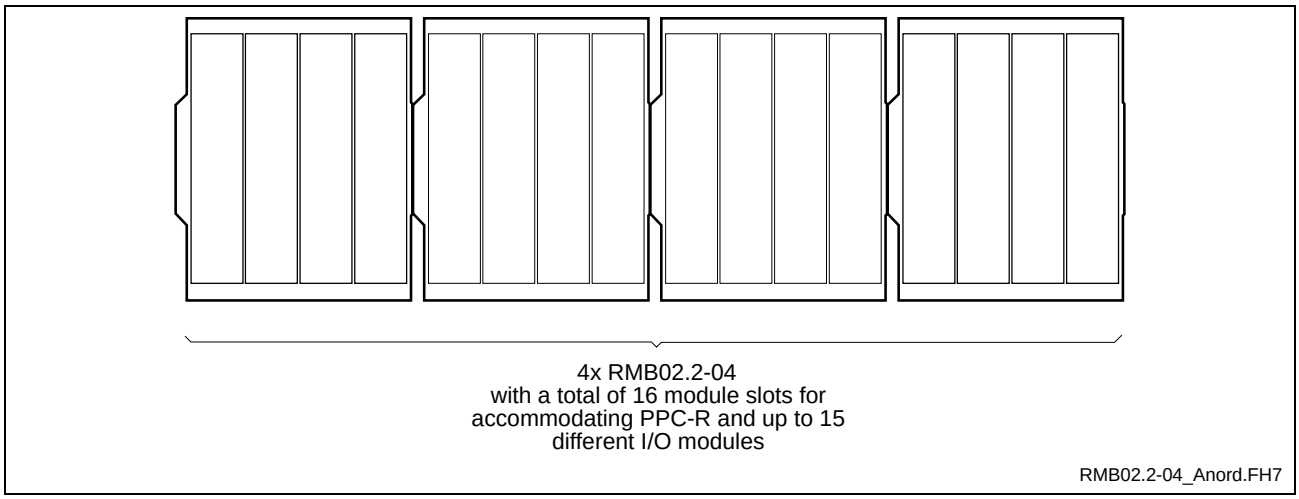


Fig. 4-7: Maximum configuration RMB02.2-04

Installing the modules

Starting with a PPC-R in slot 0 (left-hand side), the modules are plugged into the RMB02.2-04 module carrier. Each module is secured with two fixing screws. The I/O modules (RECO02.2) are added in the slots 1-15 or 2-15 (with PPC-R02.2) to the right-hand side of the PPC-R. You may leave gaps to be able to install additional modules later.

Note: Prior to commissioning, you must tighten the fixing screws of the module carriers in order to avoid lateral movements that may lead to a disconnection of the connectors. (The location of the screws is shown in Fig. 4-5). The modules must be screwed to the module carrier.

Grounding

Grounding the controller and screening the electronic components requires a grounding cable of at least 6mm² to be laid between the grounding stud of the controller to the central grounding point of the machine. The other devices of the machine must be grounded in a star-shaped configuration (see Fig. 4-8). The power supply must be grounded in the same way.

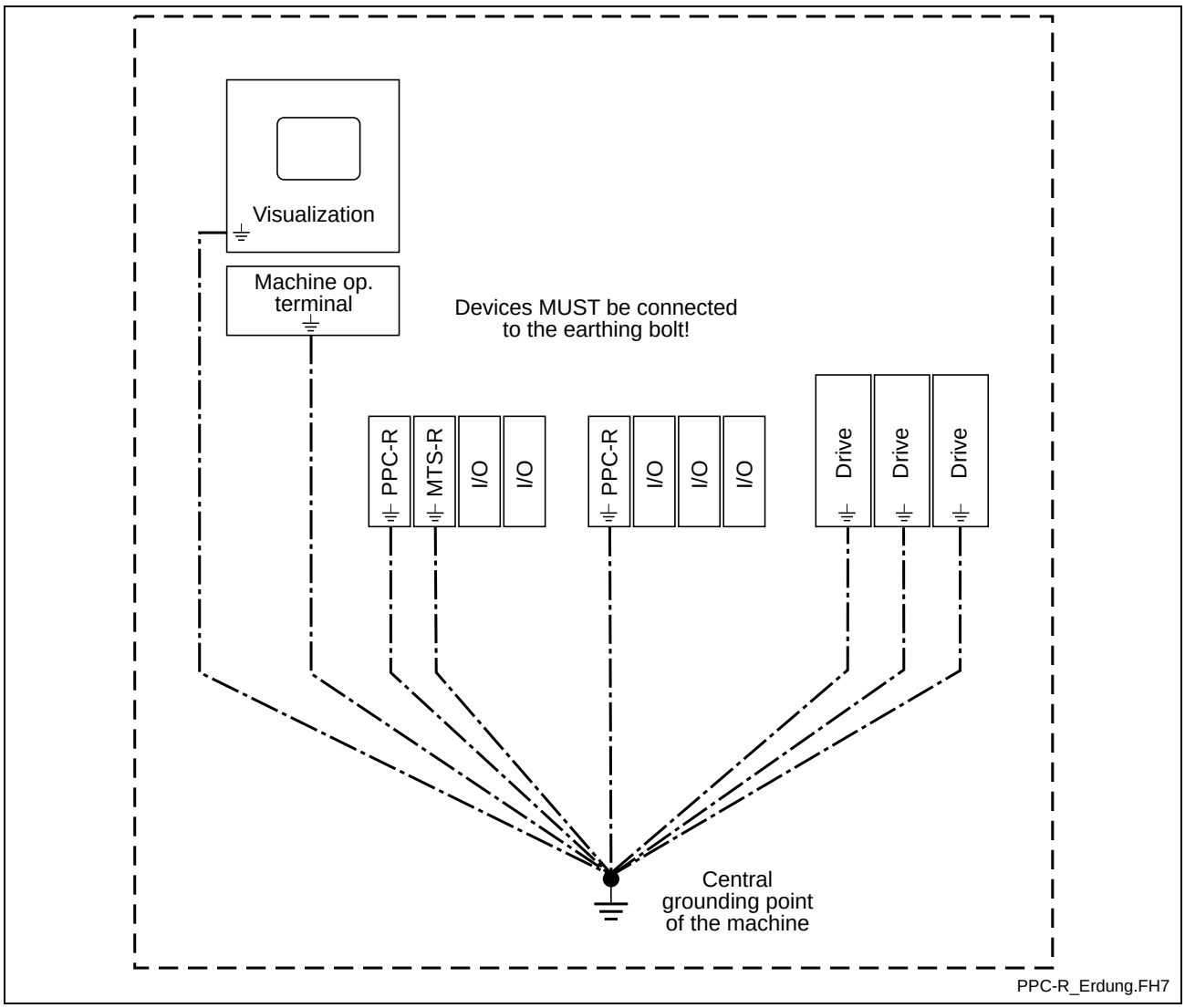


Fig. 4-8: System grounding with PPC-R

4.4 Slot Addressing of the Module Carriers

A maximum of 4 module carriers RMB02.2-04 can be installed side by side. To be able to address the module carriers, there is a DIP switch on the bus board of the module carriers. Depending on the module carrier, the switch must be set to the corresponding module carrier number (module carrier address 00-03, see diagram below). Each module carrier number may only be set once.

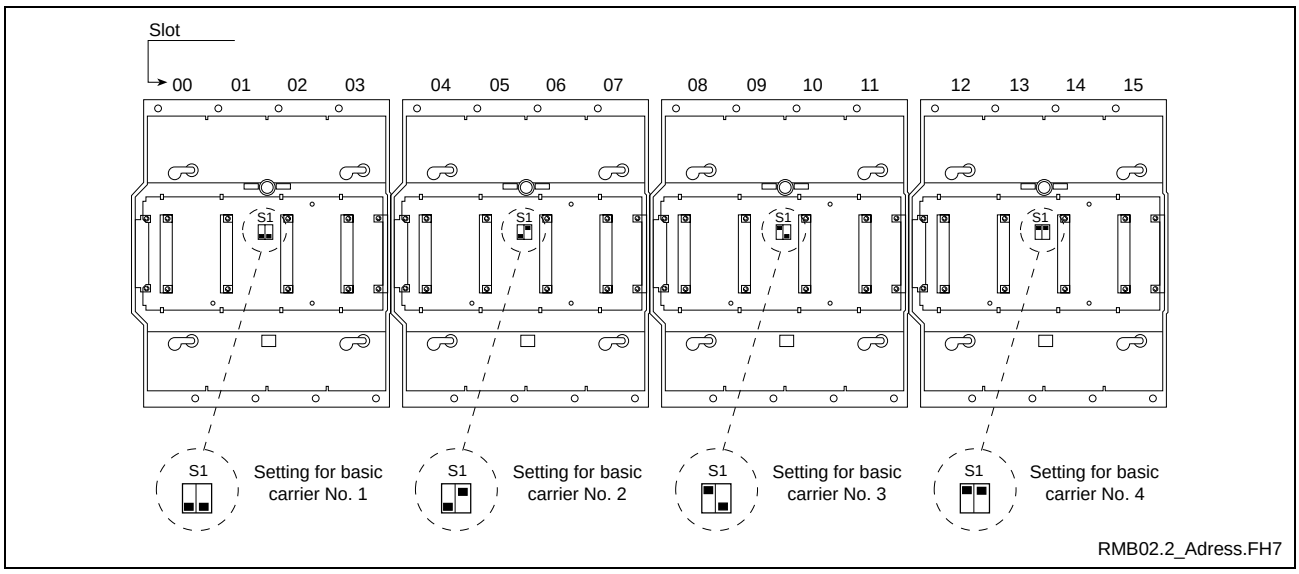


Fig. 4-9: Setting the slot address

4.5 Combination Options Module Carrier - PPC - I/O Module

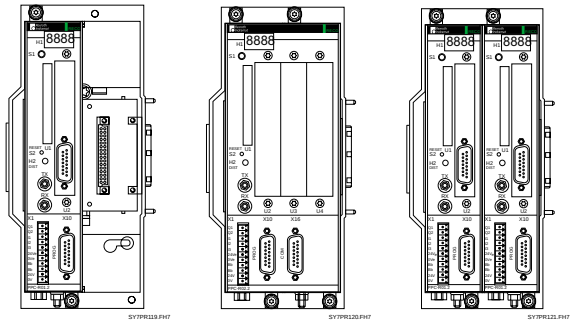
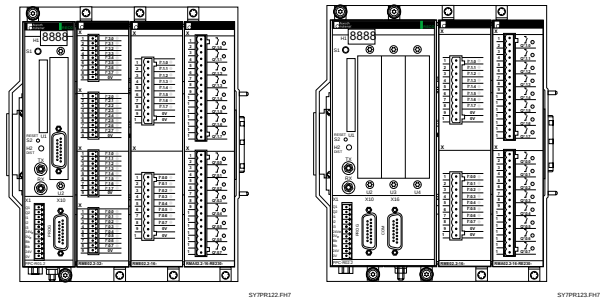
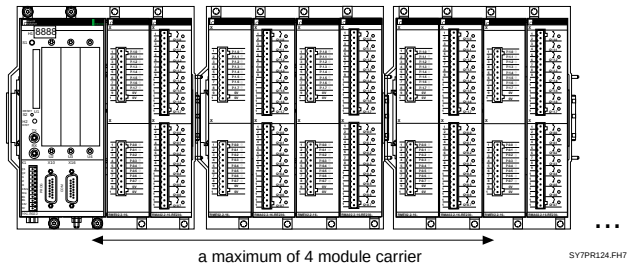
Structure	PPC	I/O	Remark
one module carrier RMB02.2-02 	1 x PPC-R01.2	without I/O	
	1 x PPC-R02.2	without I/O	
	2 x PPC-R01.2	without I/O	
one module carrier RMB02.2-04 	1 x PPC-R01.2	with I/O	PPC must be at slot 0 (see Fig. 4-9, module carrier no. 1 left slot).
	1 x PPC-R02.2	with I/O	
several module carrier side-by-side 	1 x PPC-R01.2	with I/O	PPC at slot 0 operates I/O, the remaining PPC-R have **no** access on I/O! (slot 0: see Fig. 4-9, module carrier no. 1 left slot)
	1 x PPC-R02.2	with I/O	
	several PPC-R	without I/O	
	sveral PPC-R	with I/O	

Fig. 4-10: Combination options module carrier - PPC - I/O module

4.6 Specifications

General Information

Cable cross section of Power supply feeder:	0.75 mm² to 1.5 mm²
Attachment in the control cabinet:	with RMB02.2 module carrier on DIN rail TS 35 x 27 x 15
Protection rating:	IP 20, EN 60529
Relative humidity:	5-85%, no condensation (operation) 5-95%, no condensation (transport)
Atmospheric pressure:	86-106 kPa
Operating temperature - environment:	0 to 45°C
Storage and transport temperature:	-25°C to 70°C
Enclosure dimensions (B x H x T) PPC-R01.1: PPC-R02.1:	 41,5 x 192 x 150 83.7 x 192 x 150
Weight: (PPC-R01/PPC-R02)	1.1kg / 1.3kg
Battery backup (only included if the optional PPM memory module and the real-time clock are used)	To be replaced every year
Battery type	Order name: Battery Lithium 3.5 V, preassembled

Fig. 4-11: General specifications

Power supply

Supply / rated voltage:	24 V_{DC} -15% +20% to EN61131-2: 1994
AC voltage component:	5% of the rated voltage
Absolute limits:	19.2 to 30 V_{DC}, ripples included
Max. current consumption: (PPC-R01) (PPC-R02)	0,7 A (+supply voltage for I/O modules up to 2.6 A) 1.2 A (+supply voltage for I/O modules up to 2.6 A)

Fig. 4-12: Power supply

Digital inputs and outputs

Digital inputs (X1)	Current-sinking (to ground), floating $V_{i,Low}$ = 0V...5V; $V_{i,High}$ = 15V...30V
Digital outputs (X1)	Rated current 0.5 A, floating, $V_{OH,min} = U_{ext}$ -3V delay = 400µs max.
Watchdog relay	NO contact V_n=24 V, I_{max} = 150mA

Fig. 4-13: Inputs and outputs

EMC

Emitted interference to EN 55022	Class A (industrial environment)
Noise immunity to EN 61000-4-2 (ESD)	Rating criterion B
Noise immunity to EN 61000-4-4 (burst)	Rating criterion B
Noise immunity to EN 61000-5-5 (surge)	Rating criterion B

Fig. 4-14: EMC data

Interfaces

Programming interface (PROG)	RS232/RS422/RS485 (D-SUB, 15-way female connector), isolated
General serial interface (COM)	RS232/RS422/RS485 (D-SUB, 15-way female connector)
BT bus	Indramat BT bus (D-SUB, 9-way female connector)

Fig. 4-15: Interface specifications

4.7 Connecting the Power Supply

Note: Connector and modules may only be inserted or removed when the power is switched off.

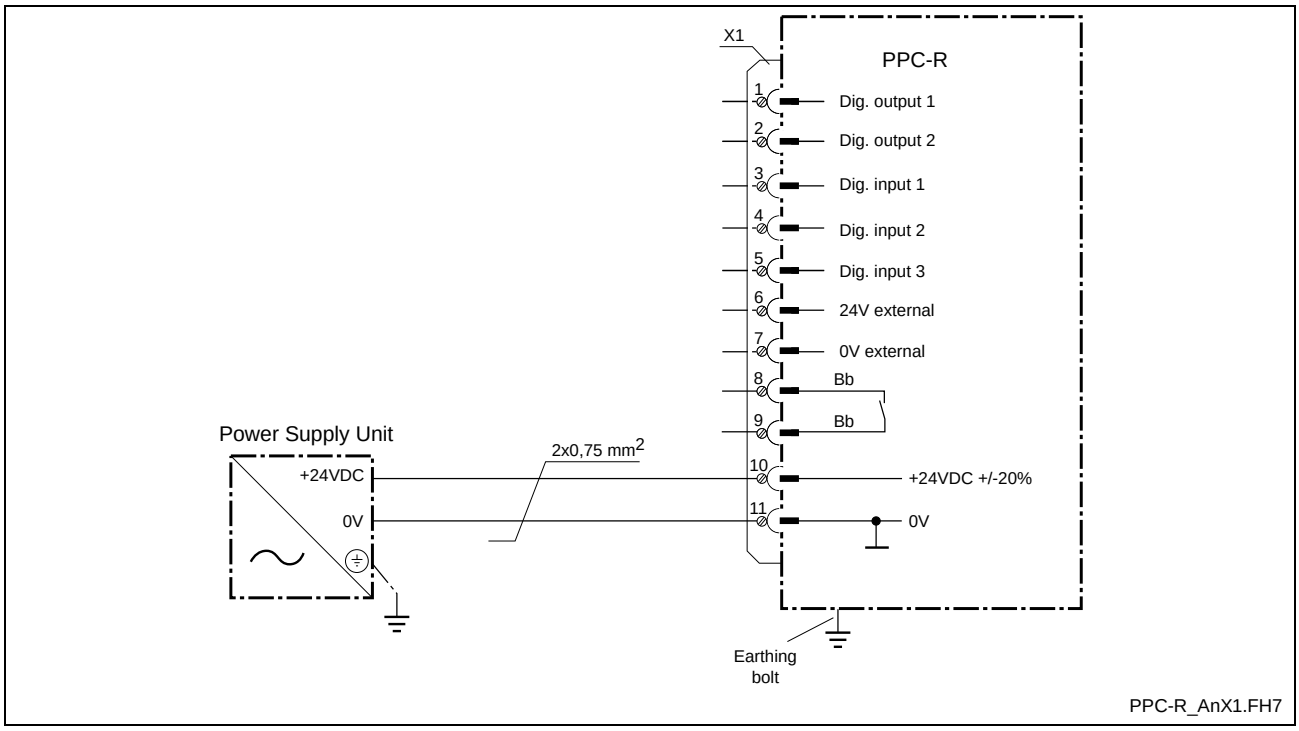


Fig. 4-16: Connecting the power supply

4.8 Connecting Inputs and Outputs

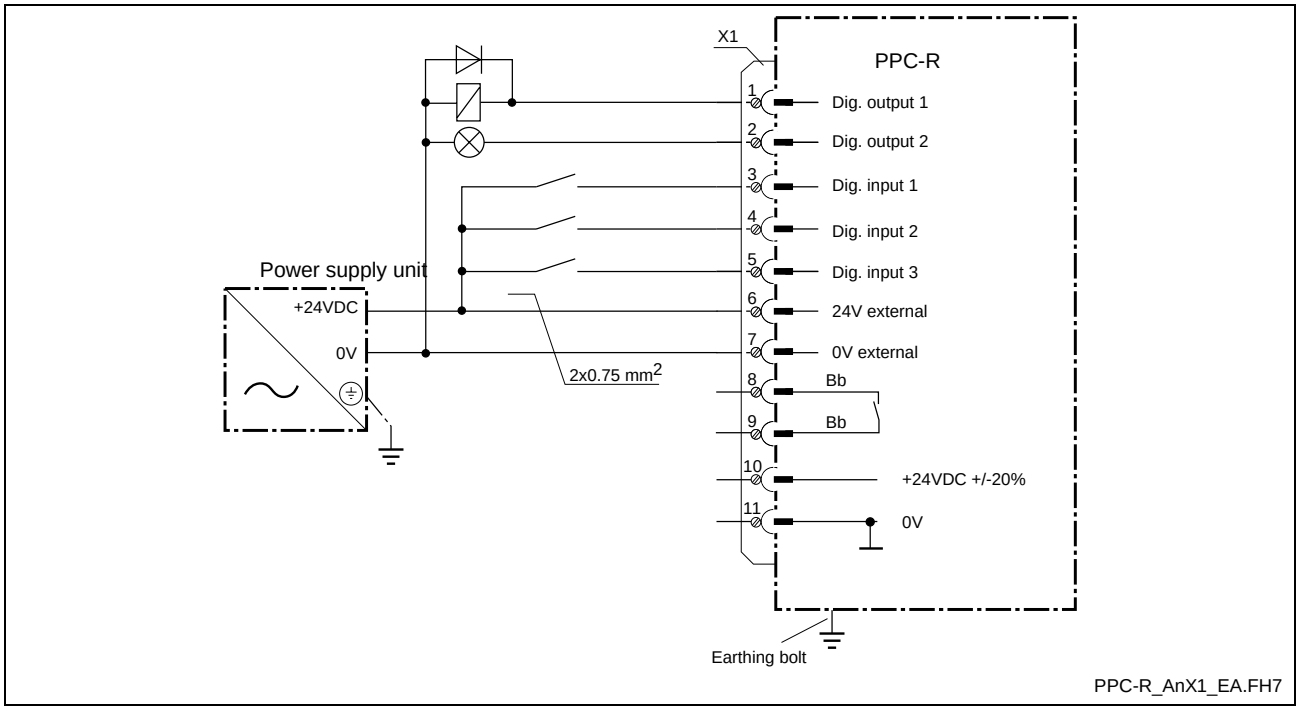


Fig. 4-17: Connecting inputs and outputs

4.9 Connector Pin Assignments

X1 (11-way Phoenix female connector)

Pin	Signal name
1	Digital output 1 (Q1)
2	Digital output 2 (Q2)
3	Digital input 1 (I1)
4	Digital input 2 (I1)
5	Digital input 3 (I1)
6	24V external voltage
7	External GND
8	Bb relay
9	Bb relay
10	24V
11	GND

Fig. 4-18: Connector pin assignments X1

PROG / COM interface (X10, X16)

Serial interface to Indramat standard (SIS – 15-way DSUB female connectors).

Both interfaces have full modem capability. The PROG interface is isolated.

Pin	Signal name
1	(Protected ground) NC
2	RS232 TxD
3	RS232 RxD
4	RS422 RxD+ or RS485+
5	RS422 RxD+ or RS485+
6	DSR
7	Signal ground
8	DCD
9	RS232 TxD
10	GND
11	RS232 TxD
12	+5V
13	RTS
14	CTS
15	DTR

Fig. 4-19: Interface pin assignments of X10 and X16

BT bus (X15)

PIN	Signal name	PIN	Signal name
1	TxD+	2	RxD+
3	GND	4	NC
5	+5V	6	TxD-
7	RxD-	8	NC
9	NC		

Fig. 4-20: Connector pin assignments BT-BUS X15

4.10 Motion Control Configuration when Using the PPC-R

Configuration designation	DPS	IBS	DNS	DAQ03	2nd serial on slot plate
PPC-R01.2N-P1N-NN-FW					
PPC-R01.2N-P1N-S1-FW					X
PPC-R01.2N-P1N-P2-FW	X				
PPC-R01.2N-P1N-B4-FW		X			
PPC-R01.2N-P1N-V2-FW			X		
PPC-R01.2N-P1N-Q1-FW				X	
PPC-R02.2N-P1N-NN-NN-NN-FW					
PPC-R02.2N-P1N-NN-P2-NN-FW	X				
PPC-R02.2N-P1N-Q1-P2-NN-FW	X			X	
PPC-R02.2N-P1N-B2-NN-NN-FW		X			
PPC-R02.2N-P1N-Q1-B2-NN-FW		X		X	
PPC-R02.2N-P1N-V2-NN-NN-FW			X		
PPC-R02.2N-P1N-Q1-V2-NN-FW			X	X	
PPC-R02.2N-P1N-Q1-NN-NN-FW				X	

Fig. 4-21: Coonfiguration selection when using the PPC-R

DPS: PROFIBUS-DP Slave interface
IBS: INTERBUS-S Slave interface
DNS: DeviceNet Slave interface
DAQ: ARCNET Slave interface and PPC link interface card
2. ser:: Second serial interface on plug-in slot plate (only PPC-R01)

5 Determining Basic Drive Configuration

5.1 Procedure

The drive configuration choices (motor, drive amplifier, drive-related plug-in cards) conform to the power requirements and the precision requirements of the respective drive task.

To determine the drive configuration or to specify the hardware configuration labelling of a drive controller for the corresponding machine, we recommend the following procedure:

1. Determine the precision requirements:
   - Select the required gearbox and linear scales.

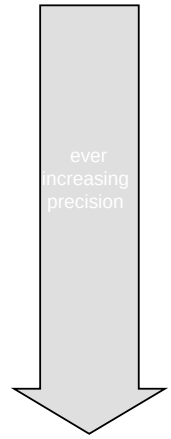
2. Determine the motor/controller combination:
   - Determine rpm/torque requirements for your purpose.
   - Select motor/controller combination from the list.

3. Determine the drive configuration labelling:
   - Select motor - motor feedback combination.
   - Select desired features.
   - Determine configuration labelling based on the plug-in modules required for the desired features.

a) Definition of Precision Requirements

A differentiation is made between absolute and relative precision (repetitive precision) as well as scale resolution. It depends primarily on the mechanical transmission elements and the quality of the mounting location of the linear scale.

Motor type	Motor type
Motor with gearbox and resolver as motor feedback	MKD
Motor with gearbox and DSF as motor feedback	MKE 2AD MHD ADF
Motor with gearbox and external encoder mounted loadside (direct position detection)	MKD MKE 2AD MHD ADF
Conventional motor as direct drive and encoder loadside	MKD MKE 2AD MHD ADF
Mounted motor and loadside encoder	1MB MBW MBS



SY7PR002.FH7

Fig. 5-1: Selection table for precision

b) Selecting the Suitable Motor/Controller Combinations

The selection lists must be used. The following figure offers a rough orientation.

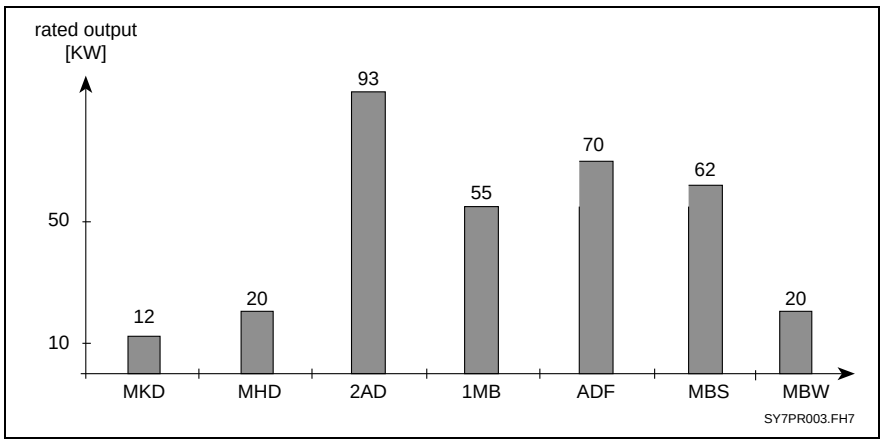


Fig. 5-2: Power range of different lines of motors

Once motor type and encoder arrangement are fixed, a suitable basic drive configuration is selected using the subsections below.

c) Determining the Drive Configuration Labelling

The following illustrations offer an idea on how to determine the configuration labelling.

Illustration: Determining the Motor/Controller Combination

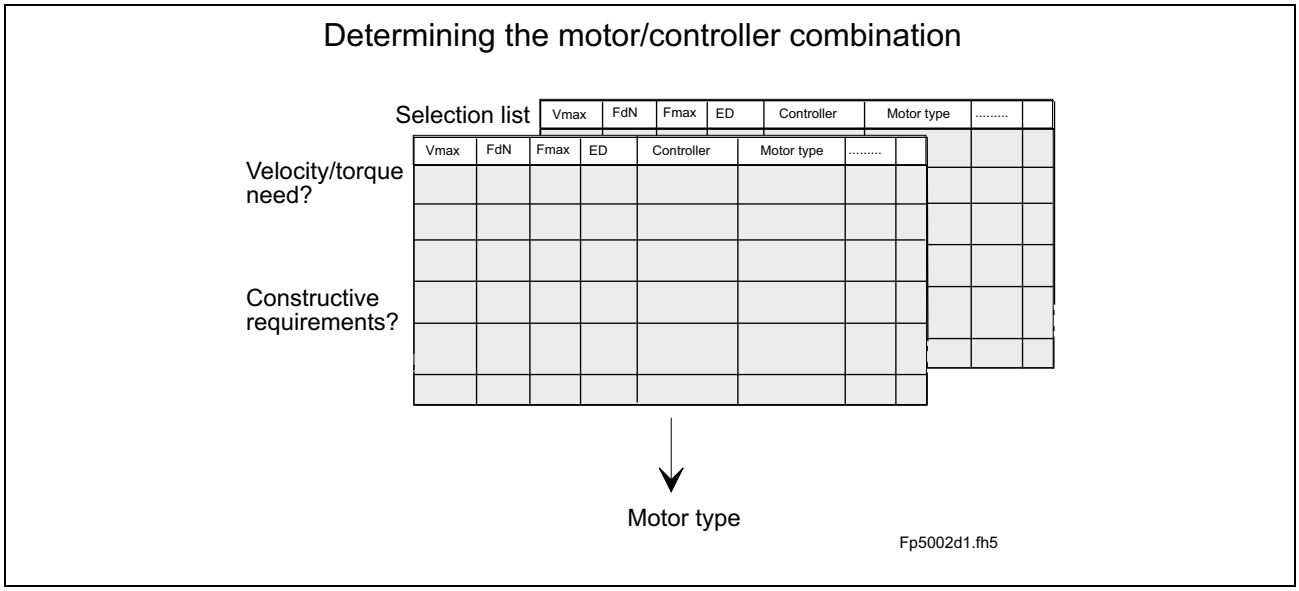


Fig. 5-3: Illustration for working with selection lists

Illustration: Determining the Hardware Configuration Labelling

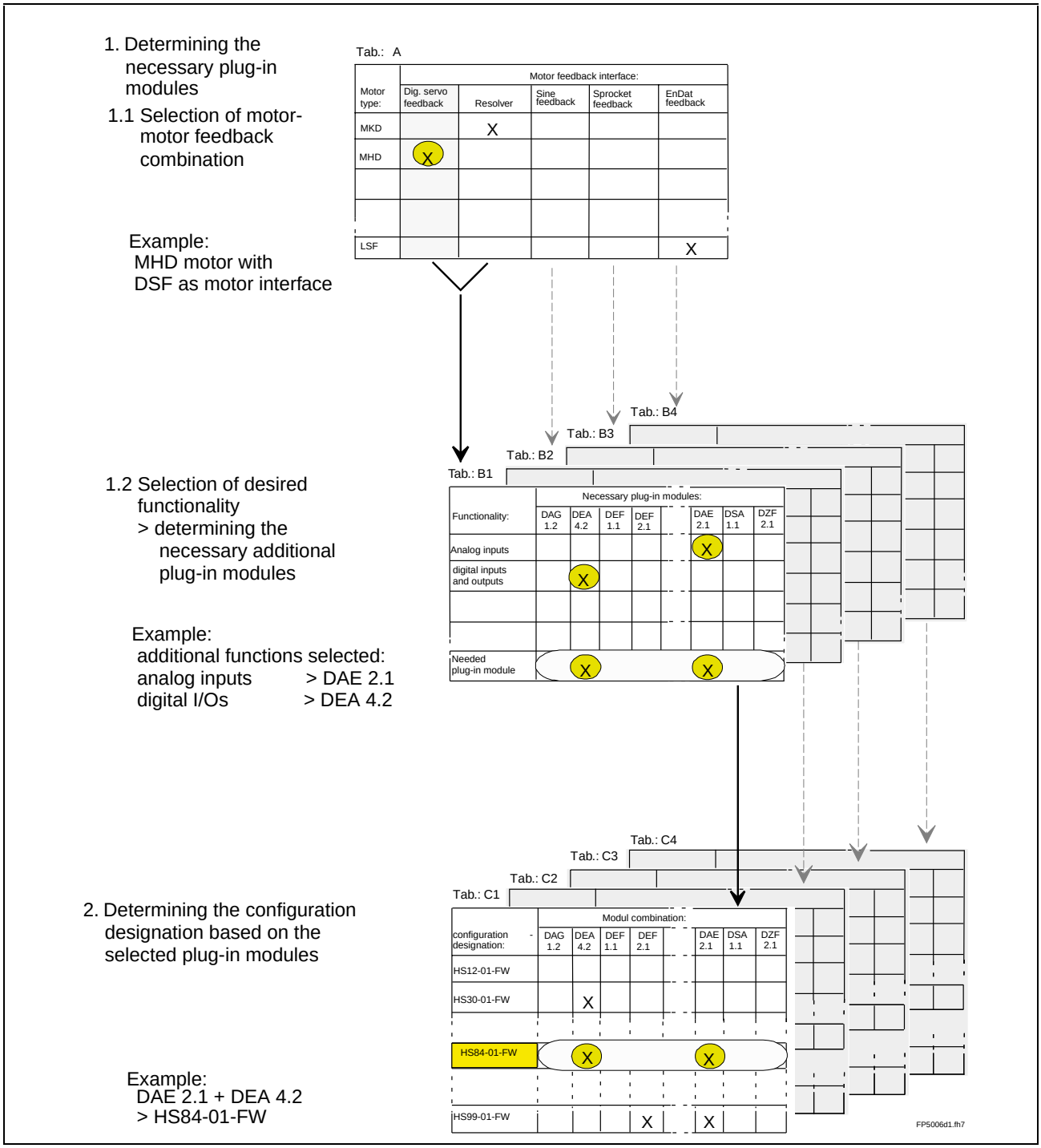


Fig. 5-4: Illustration for determining configuration labelling

5.2 Rotary Axes

Drive with Step-Down Gear and Indirect Position Detection

Features:

- Precision is determined with gear error (generally four angle minutes)
- encoder is integrated into motor
- motor encoder with singleturn or multiturn absolute encoder

Usable Motors DKR:

- 2AD with HSF (HSF: digital servo feedback)
- ADF with HSF

Basic Drive Configuration BE12 (DKR):

2AD with HSF, ADF with HSF

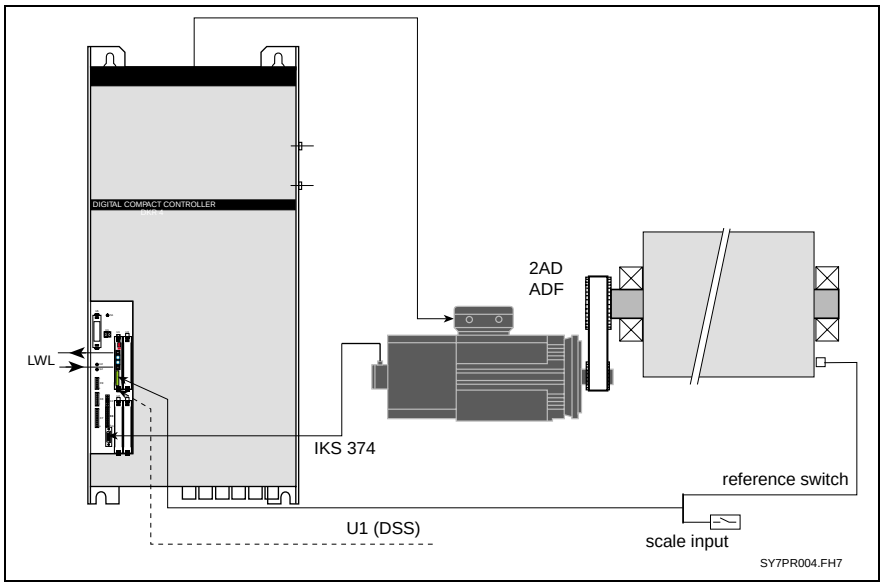


Fig. 5-5: Drive with step-down gears and indirect position detection

Usable Motors DIAX04:

- MHD
- MKD
- MKE
- 2AD with HSF
- ADF with HSF
- MBW
- 1MB

Basic Drive Configuration HS12 (DIAX04):

MHD, MKE, MKD, 2AD with HSF, ADF with HSF, MBW, 1MB:

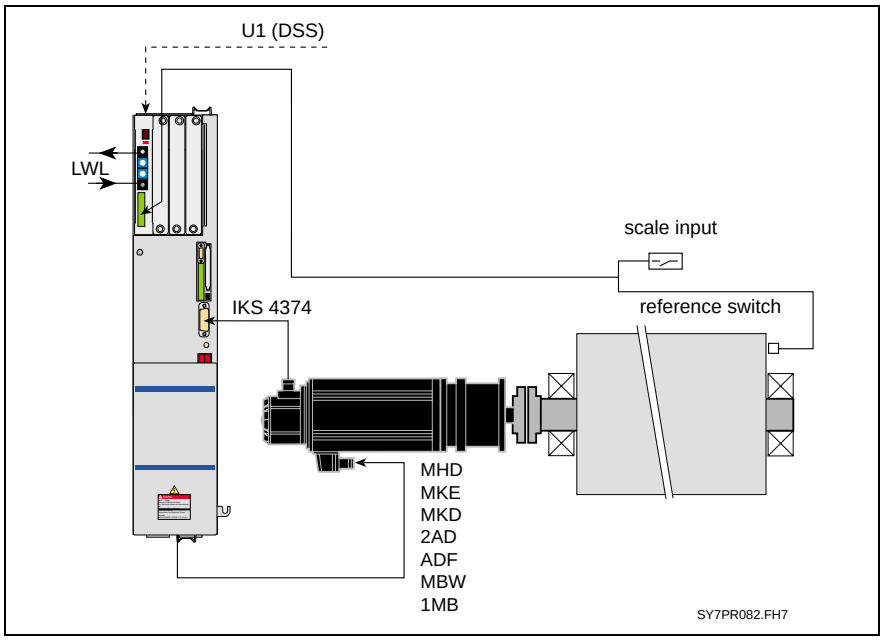


Fig. 5-6: Drive with step-down gears and indirect position detection

Drive with Step-Down Gears and Direct Incremental Position Detection

Feature:

- Precision determined by gear error (generally four angle minutes)
- encoder is integrated into motor
- motor encoder single-turn encoder
- load angle directly detected via incremental external encoder
- gear error is statically compensated

Usable Motors DKR:

- 2AD with HSF
- ADF with HSF

Basic Drive Configuration BE32 (DKR):

2AD with HSF, ADF with HSF:

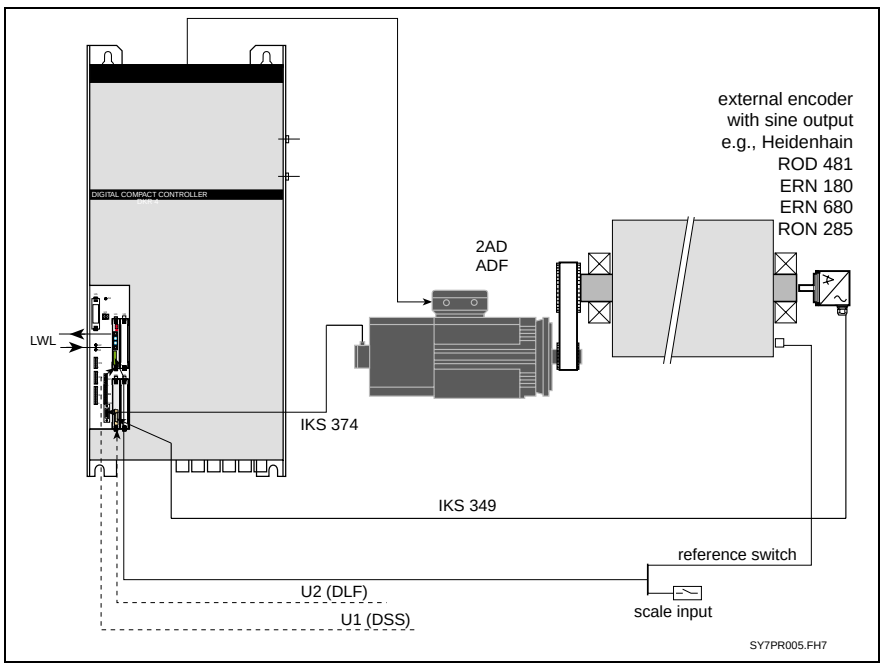


Fig. 5-7: Drive with step-down gear and direct incremental position detection

Usable Motors DIAX04:

- MHD
- MKD
- MKE
- 2AD with HSF
- ADF with HSF

Basic Drive Configuration HS32 (DIAX04):

MHD, MKD, MKE,
2AD with HSF, ADF with HSF:

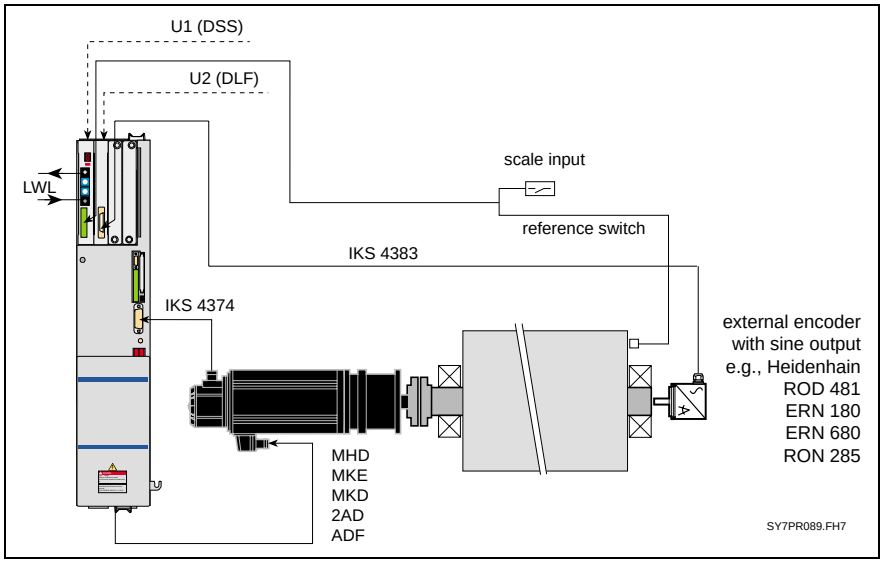


Fig. 5-8: Drive with step-down gear and direct incremental position detection

Drive with Step-Down Gear and Direct Absolute Position Detection

Feature:

- Precision is determined by gear error (generally four angle minutes)
- encoder is integrated into motor
- motor encoder multiturn absolute encoder
- load angle directly detected via absolute external encoder
- gear error statically compensated

Usable Motors DKR:

- 2AD with HSF
- ADF with HSF

Basic Drive Configuration BE45 (DKR):

2AD with HSF, ADF with HSF:

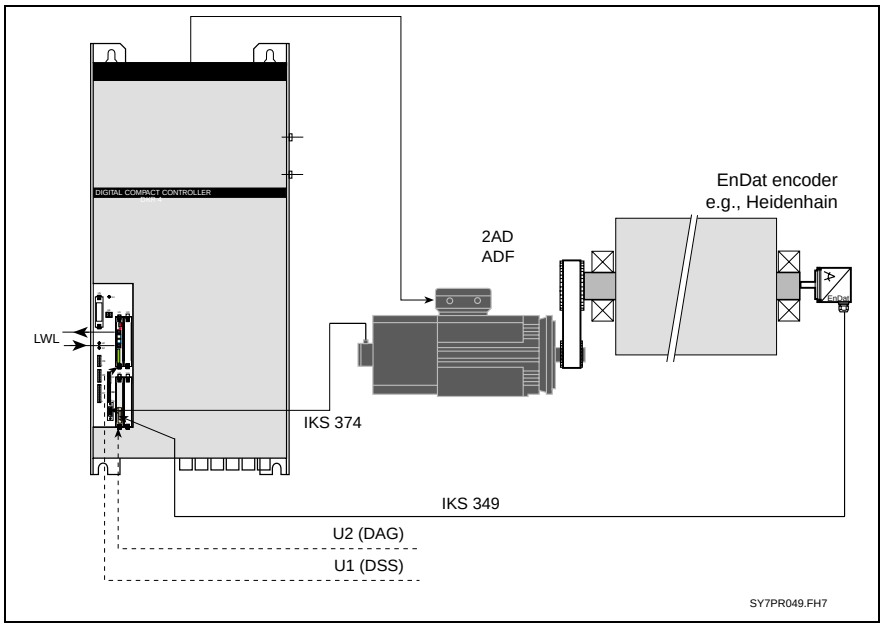


Fig. 5-9: Drive with step-down gear and direct absolute position detection

Usable Motors DIAX04:

- MHD
- MKD
- MKE
- 2AD with HSF
- ADF with HSF

Basic Drive Configuration HS45 (DIAX04):

MHD, MKD, MKE
2AD with HSF, ADF with HSF:

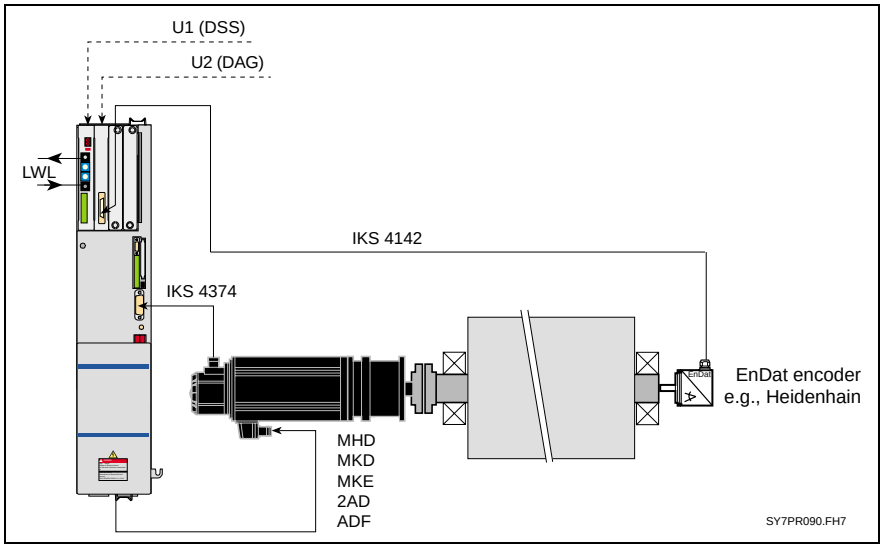


Fig. 5-10: Drive with step-down gear and direct absolute position detection

Drive with Indirect Position Detection

Features:

- no gear between motor and cylinder
- high level of precision can be achieved
- encoder is integrated into motor

Usable Motors DKR:

- 1MB

Basic Drive Configuration BE37 (DKR):

1MB:

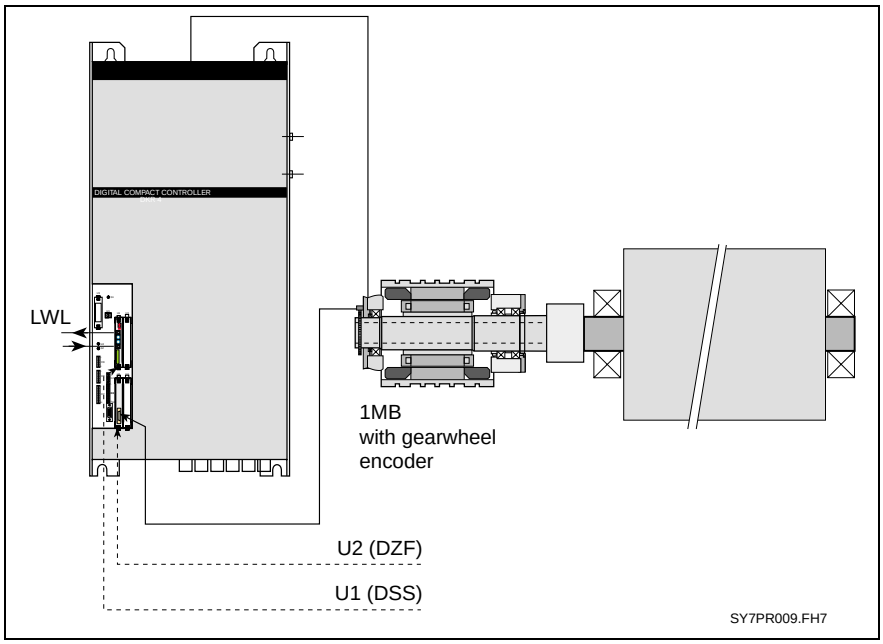


Fig. 5-11: Drive with 1MB motor with indirect position detection

Usable Motors DIAX04:

- 1MB

Basic Drive Configuration HS37 (DIAX04):

1MB:

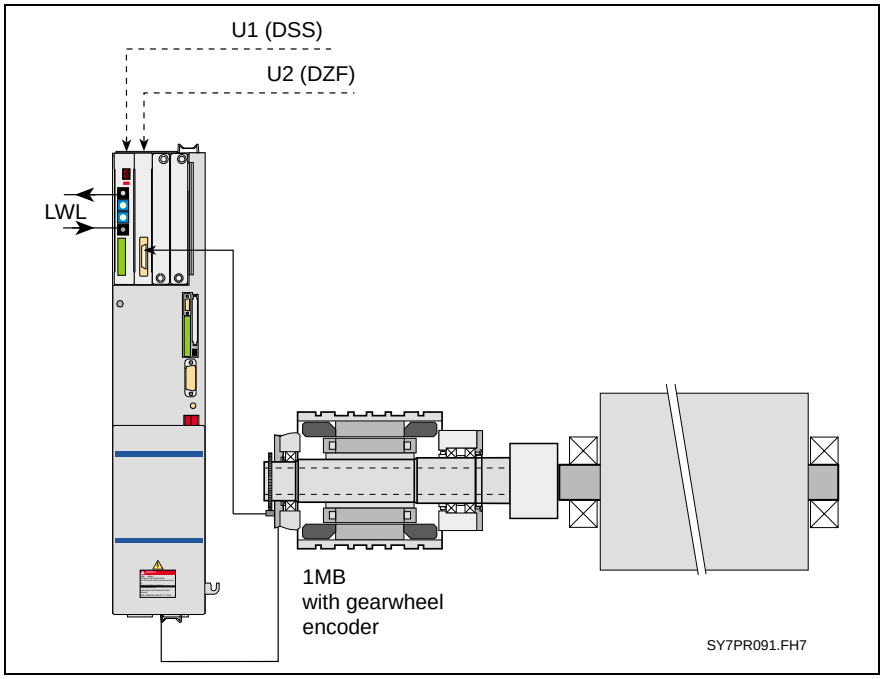


Fig. 5-12: Drive with 1MB motor with indirect position detection

Drive with Direct Incremental Position Detection

Features:

- no gear between motor and cylinder
- high level of precision can be achieved
- load angle directly determined via incremental external encoder
- gear error statically compensated
- **With MHD, MKE, MKD and MBS motors:**
  - motor encoder for commutation is needed
  - absolute position detection via motor encoder
- **With MBW, 1MB, 2AD and ADF motors:**
  - no separate motor encoder
  - no absolute position detection
- **With MBW and 1MB motors:**
  - rigid coupling between motor and cylinder, resulting in highest level of static and dynamic stiffness

Usable Motors DKR:

- MBW (without motor encoder)
- 1MB (without motor encoder)
- 2AD (without motor encoder)
- ADF (without motor encoder)
- MBS (only in connection with motor encoder)

Basic Drive Configuration BE32 (DKR)

MBW, 2AD, ADF, 1MB:

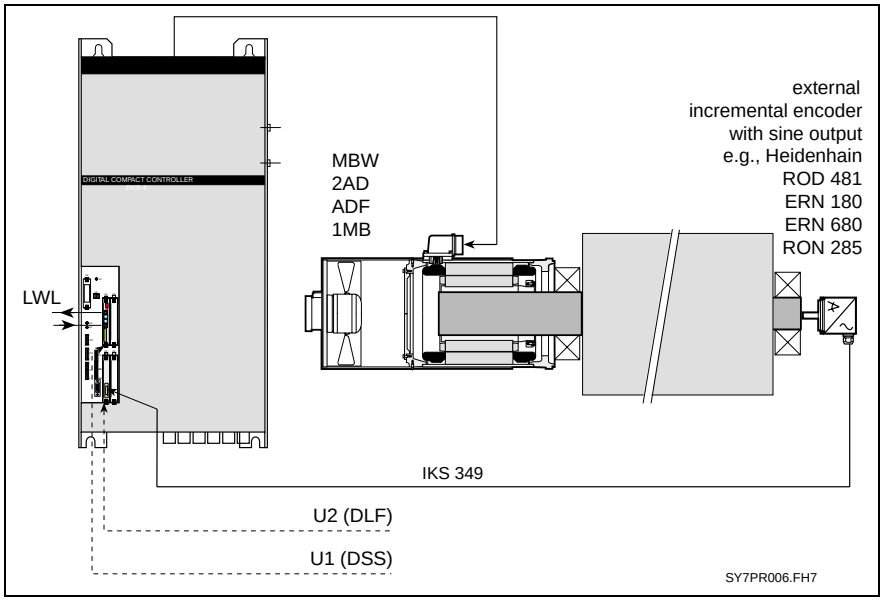


Fig. 5-13: Drive with MBW, 2AD or 1MB motor with direct incremental position detection

Basic Drive Configuration BE32 (DKR):

MBS:

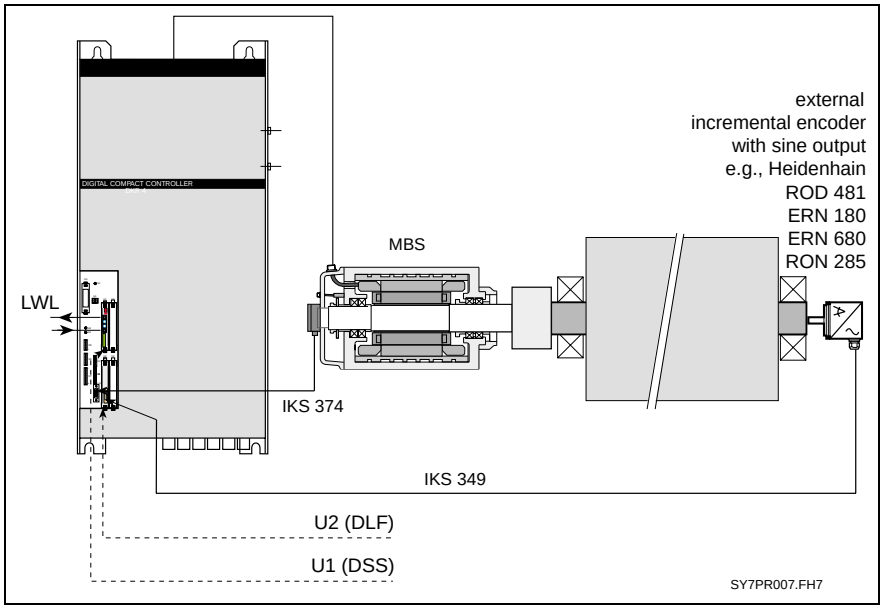


Fig. 5-14: Drive with MBS motor with direct incremental position detection

Usable Motors DIAX04:

- MBW (without motor encoder)
- 1MB (without motor encoder)
- 2AD (without motor encoder)
- ADF (without motor encoder)
- MHD (only in connection with motor encoder)
- MKD (only in connection with motor encoder)
- MKE (only in connection with motor encoder)
- MBS (only in connection with motor encoder)

Basic Drive Configuration HS32 (DIAX04)

MBW, 2AD, ADF, 1MB:

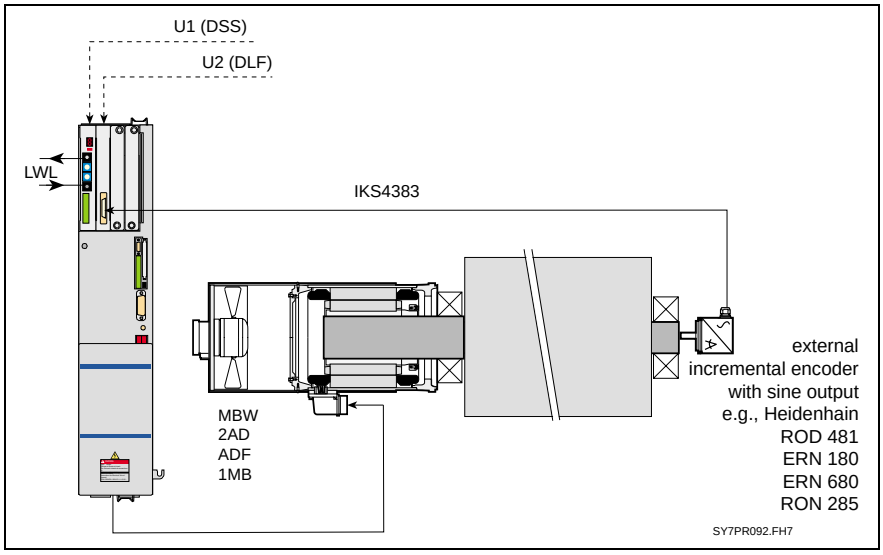


Fig. 5-15: Drive with MBW, 2AD, ADF or 1MB motor with direct incremental position detection

Basic Drive Configuration HS32 (DIAX04):

MHD, MKD, MKE, MBS:

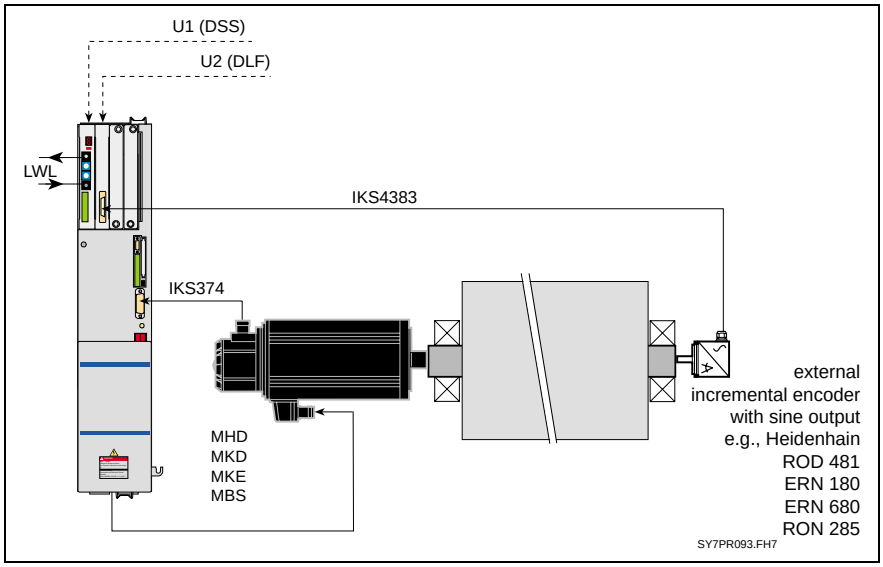


Fig. 5-16: Drive with MHD, MKD, MKE or MBS motor with direct incremental position detection

Drive with Direct Absolute Position Detection

Features:

- no gear between motor and cylinder
- high level of precision an be achieved
- load angle directly detected via absolute external encoder
- gear error statically compensated
- **With MHD, MKD, MKE and MBS motors:**
  - motor encoder for commutation is needed
  - absolute position detection via external encoder
- **With MBW, 1MB, 2AD and ADF motors:**
  - no separate motor encoder
  - absolute position detection
- **With MBW, MBS and 1MB motors:**
  - rigid coupling between motor and cylinder, meaning highest level of static and dynamic stiffness

Usable Motors DKR:

- MBW (without motor encoder)
- 1MB (without motor encoder)
- 2AD (without motor encoder)
- ADF (without motor encoder)
- MBS (only in connection with motor encoder)

Basic Drive Configuration BE45 (DKR):

MBW, 2AD, ADF, 1MB:

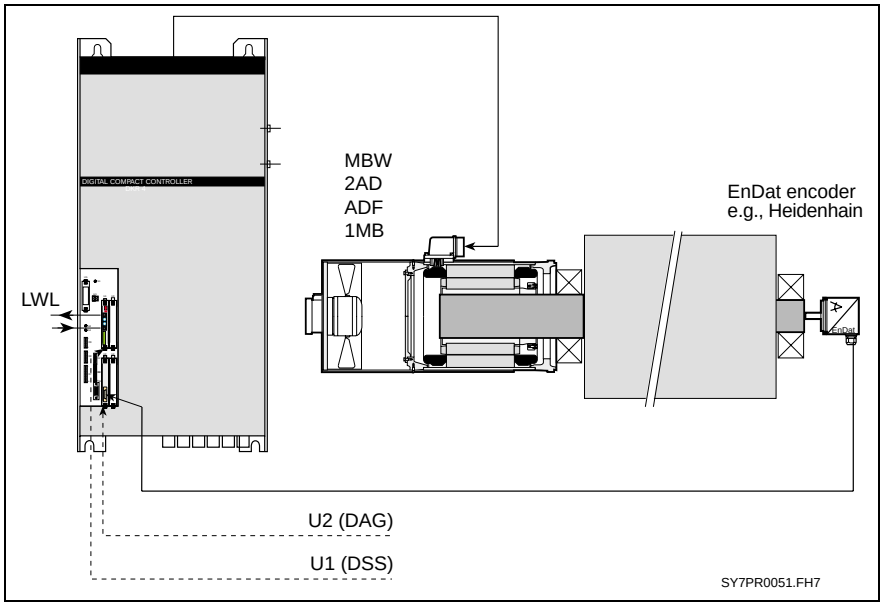


Fig. 5-17: Drive with MBW, 2AD, ADF or 1MB motor with direct absolute position detection

Basic Drive Configuration BE32 (DKR):

MBS:

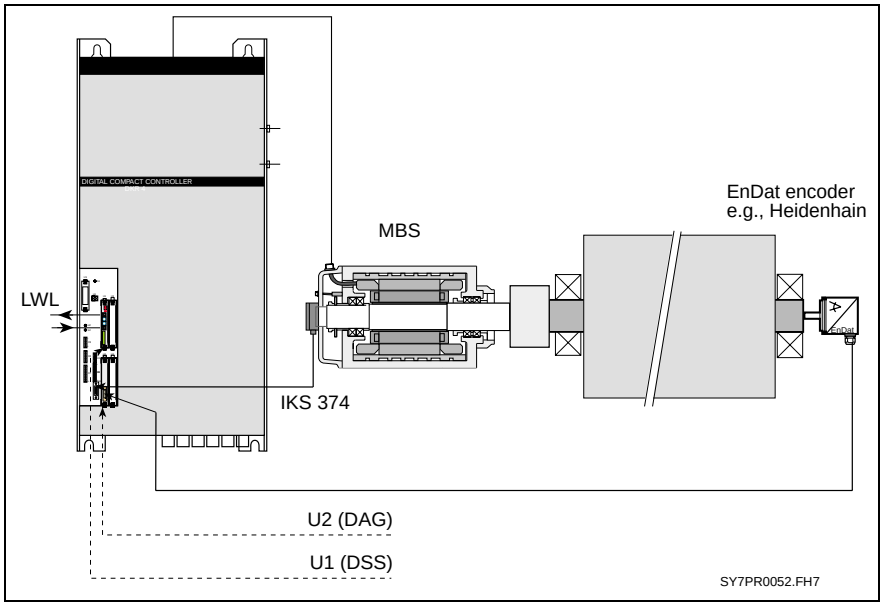


Fig. 5-18: Drive with MBS motor with direct absolute position detection

Usable Motors DIAX04:

- MBW (without motor encoder)
- 1MB (without motor encoder)
- 2AD (without motor encoder)
- ADF (without motor encoder)
- MHD (only in connection with motor encoder)
- MKD (only in connection with motor encoder)
- MKE (only in connection with motor encoder)
- MBS (only in connection with motor encoder)

Basic Drive Configuration HS45 (DIAX04):

MBW, 2AD, ADF, 1MB:

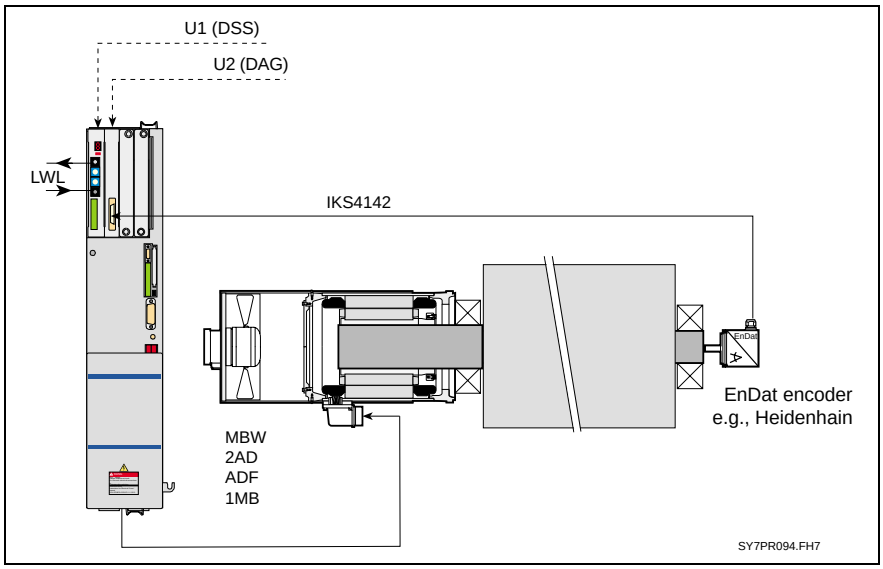


Fig. 5-19: Drive with MBW, 2AD, ADF or 1MB motor with direct absolute position detection

Basic Drive Configuration HS32 (DIAX04):

MHD, MKD, MKE, MBS:

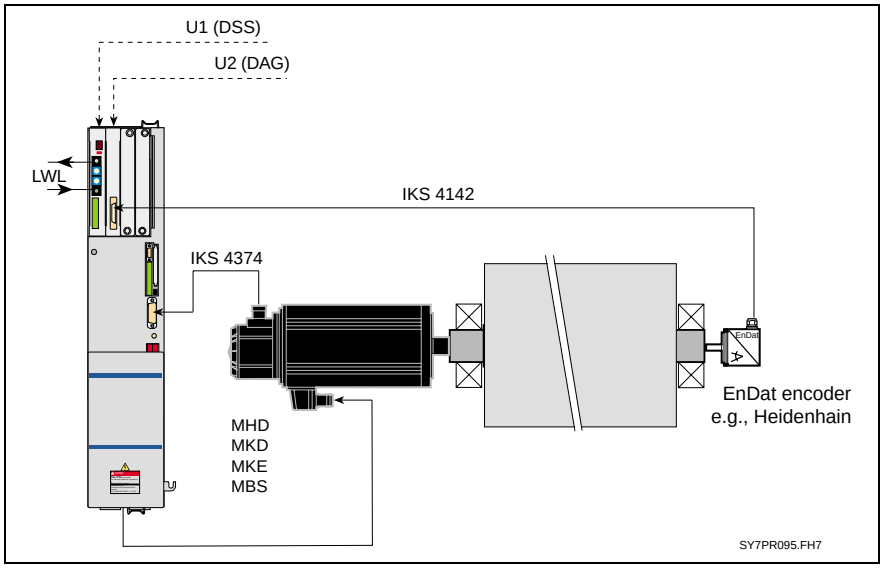


Fig. 5-20: Drive with MHD, MKD, MKE or MBS motor with direct absolute position detection

5.3 Linear Axes

Drive with Indirect Position Detection

Features:

- accuracy determined by spindle and gear errors
- encoder is integrated into motor
- motor encoder either with singleturn or multiturn absolute encoder

Usable Motors DKR:

- 2AD with HSF
- ADF with HSF

Basic Drive Configuration BE12 (DKR):

2AD with HSF, ADF with HSF

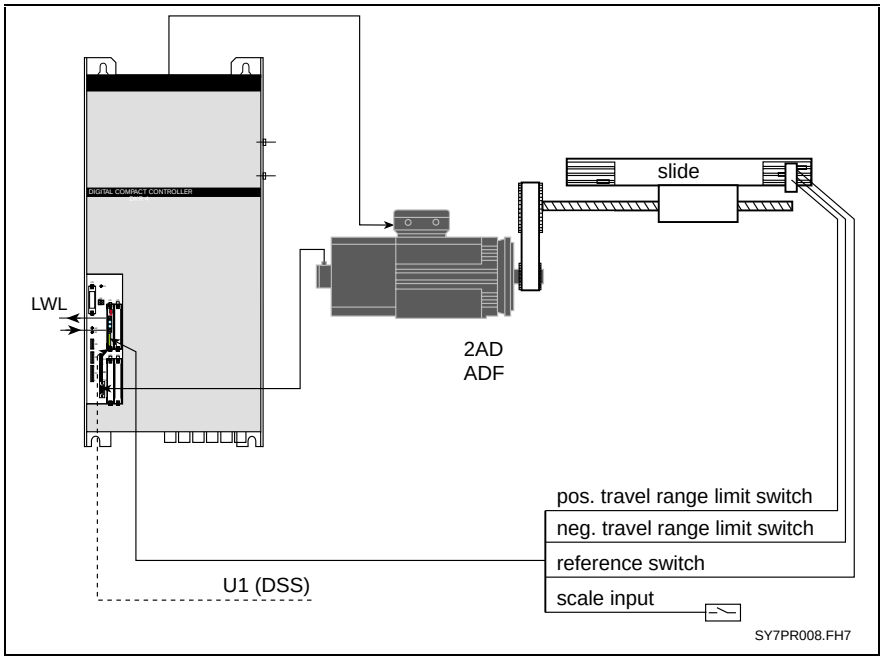


Fig. 5-21: Drive with 2AD or ADF motor with DSF and indirect position detection

Usable Motors DIAX04:

- MHD
- MKD
- MKE
- 2AD with HSF
- ADF with HSF

Basic Drive Configuration HS12 (DIAX04):

MHD, MKD, MKE, 2AD with HSF, ADF with HSF

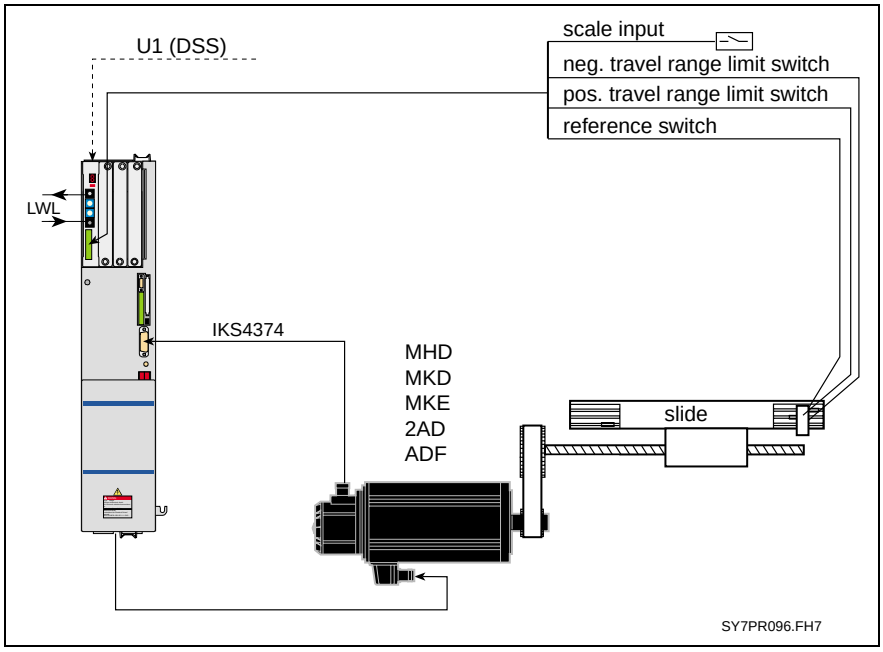


Fig. 5-22: Drive with MHD, MKD, MKE, 2AD or ADF motor with DSF and indirect position detection

Drive with Direct Incremental Position Detection

Features:

- motor encoder with either singleturn or multiturn absolute encoder
- load position directly detected via incremental external encoder
- gear error statically compensated

Usable Motors DKR:

- 2AD with HSF
- ADF with HSF

Basic Drive Configuration BE32 (DKR):

2AD with HSF, ADF with HSF

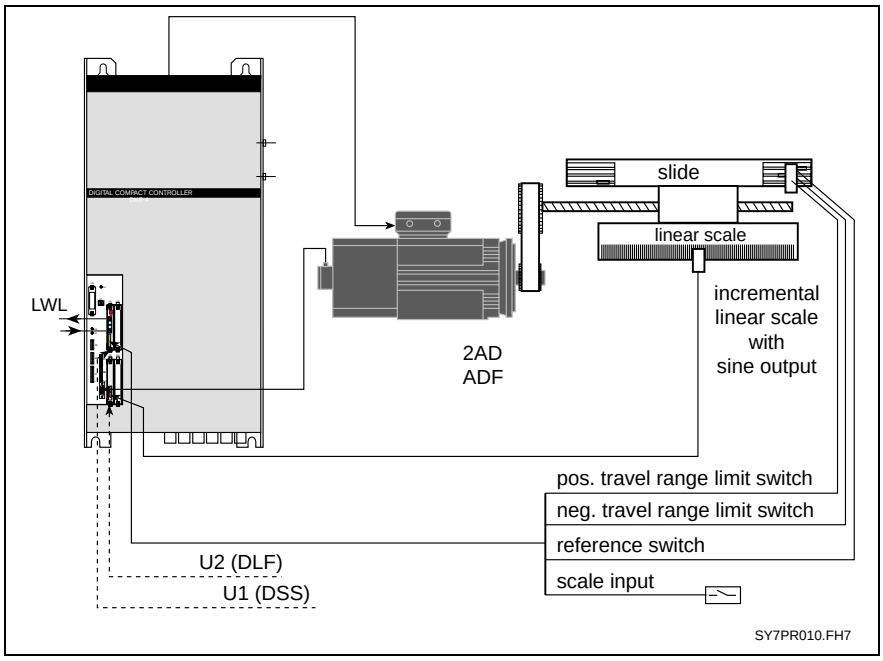


Fig. 5-23: Drive with 2AD or ADFmotor with DSF with direct incremental position detection

Usable Motors DIAX04:

- MHD
- MKD
- MKE
- 2AD with HSF
- ADF with HSF

Basic Drive Configuration BE32 (DIAX04):

MHD, MKD, MKE, 2AD with HSF, ADF with HSF

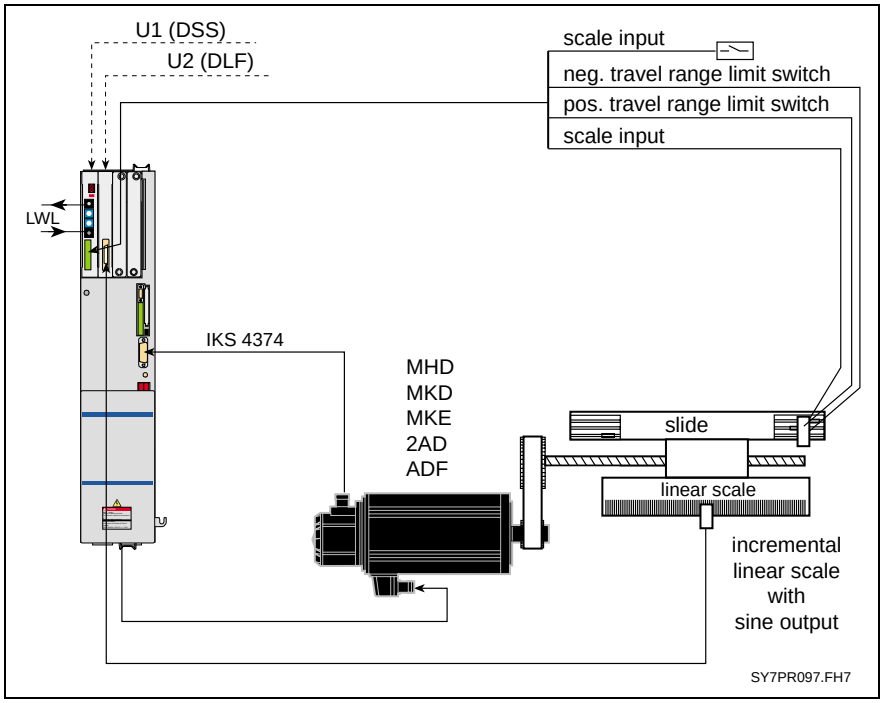


Fig. 5-24: Drive with MHD, MKD, MKE, 2AD or ADF motor withDSF with direct incremental position detection

Drive with Direct Absolute Position Detection

Features:

- gearwheel encoder as motor encoder
- load position directly detected via absolute external encoder
- gear error statically compensated

Usable Motors DKR:

- 2AD with gearwheel encoder
- 1MB with gearwheel encoder

Basic Drive Configuration BE45 (DKR):

1MB, 2AD:

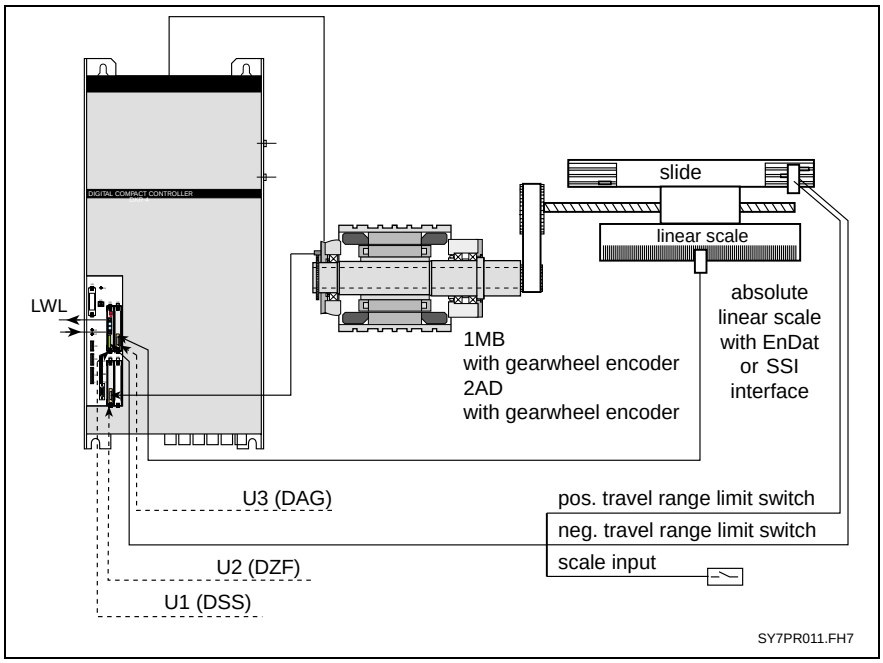


Fig. 5-25: Drive with 1MB or 2AD motor with gearwheel encoder with direct absolute position detection

Usable Motors DIAX04:

- 2AD with gearwheel encoder
- 1MB with gearwheel encoder

Basic Drive Configuration HS45 (DIAX04):

1MB, 2AD:

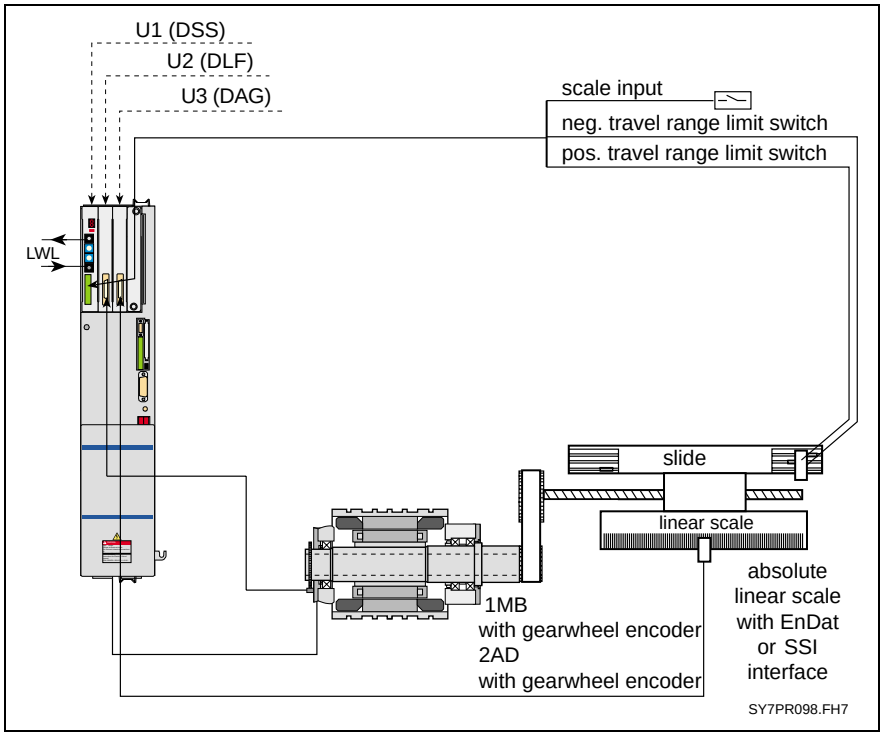


Fig. 5-26: Drive with 1MB or 2AD motor with gearwheel encoder with direct absolute position detection

Drive with Linear Motor and Incremental Position Detection

Features:

- incremental position detection via external linear scale with sinusoidal output
- Direct Drive
- highest possible degree of static and dynamic precision
- high achievable acceleration of up to 100 m/s²

Usable Motors DKR:

- LAF
- LAR
- LSF

Basic Drive Configuration BE32 (DKR):

LAR, LAF, LSF:

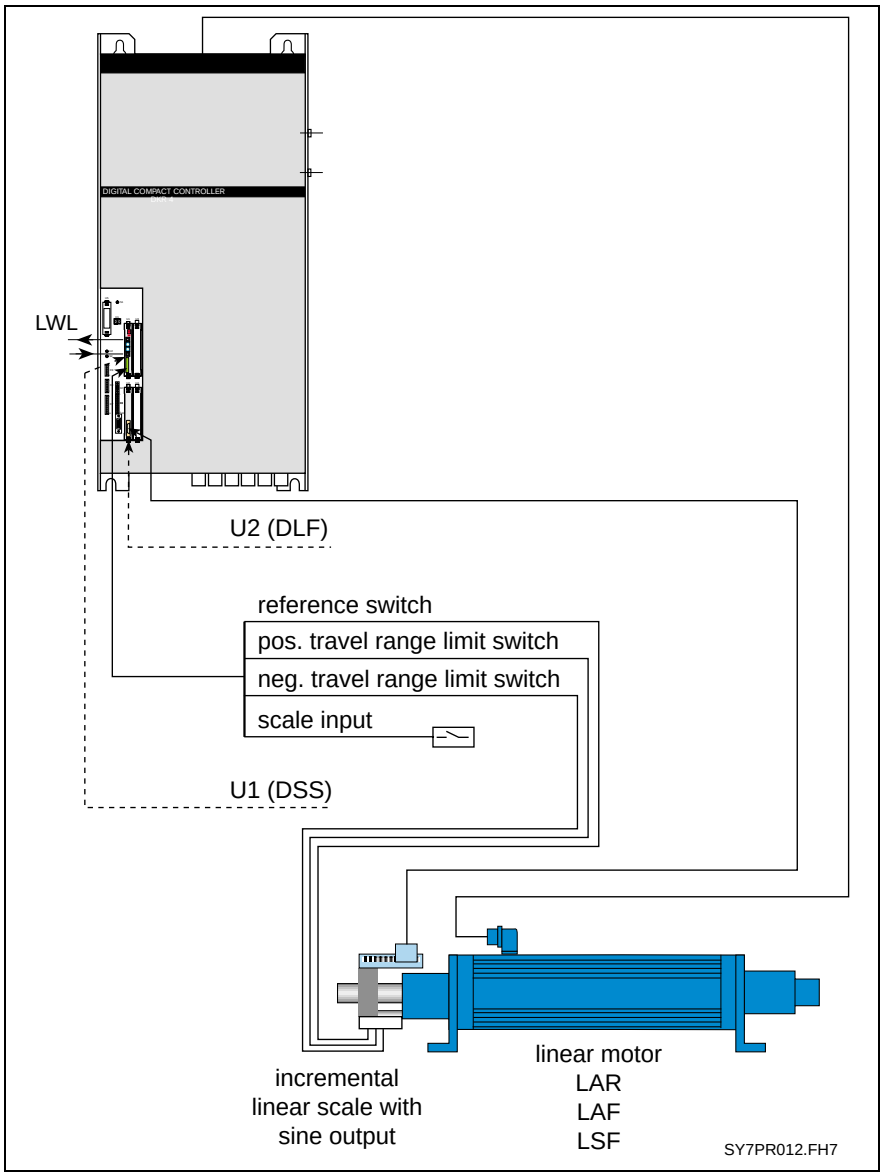


Fig. 5-27: Drive with linear motor LAR, LAF or LSF and incremental position detection

Usable Motors DIAX04:

- LAF
- LAR
- LSF

Basic Drive Configuration HS32 (DIAX04):

LAR, LAF, LSF:

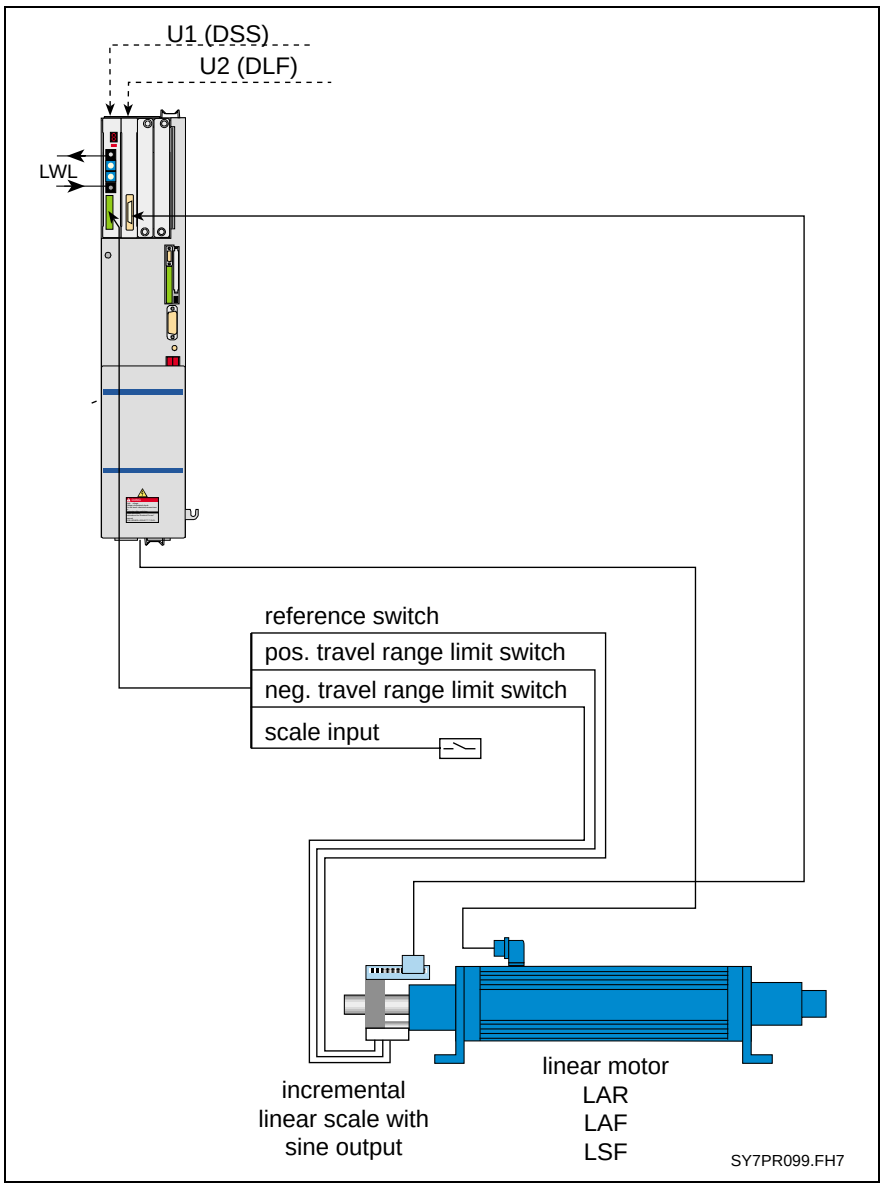


Fig. 5-28: Drive with linear motor LAR, LAF or LSF and incremental position detection

Drive with Linear Motor and Absolute Position Detection

Features:

- absolute position detection via external linear scale with EnDat interface
- DirectDrive
- highest possible degree of static and dynamic precision
- high achievable acceleration of up to 100 m/s²

Usable Motors DKR:

- LAF
- LAR
- LSF

Basic Drive Configuration BE45 (DKR):

LAR, LAF, LSF:

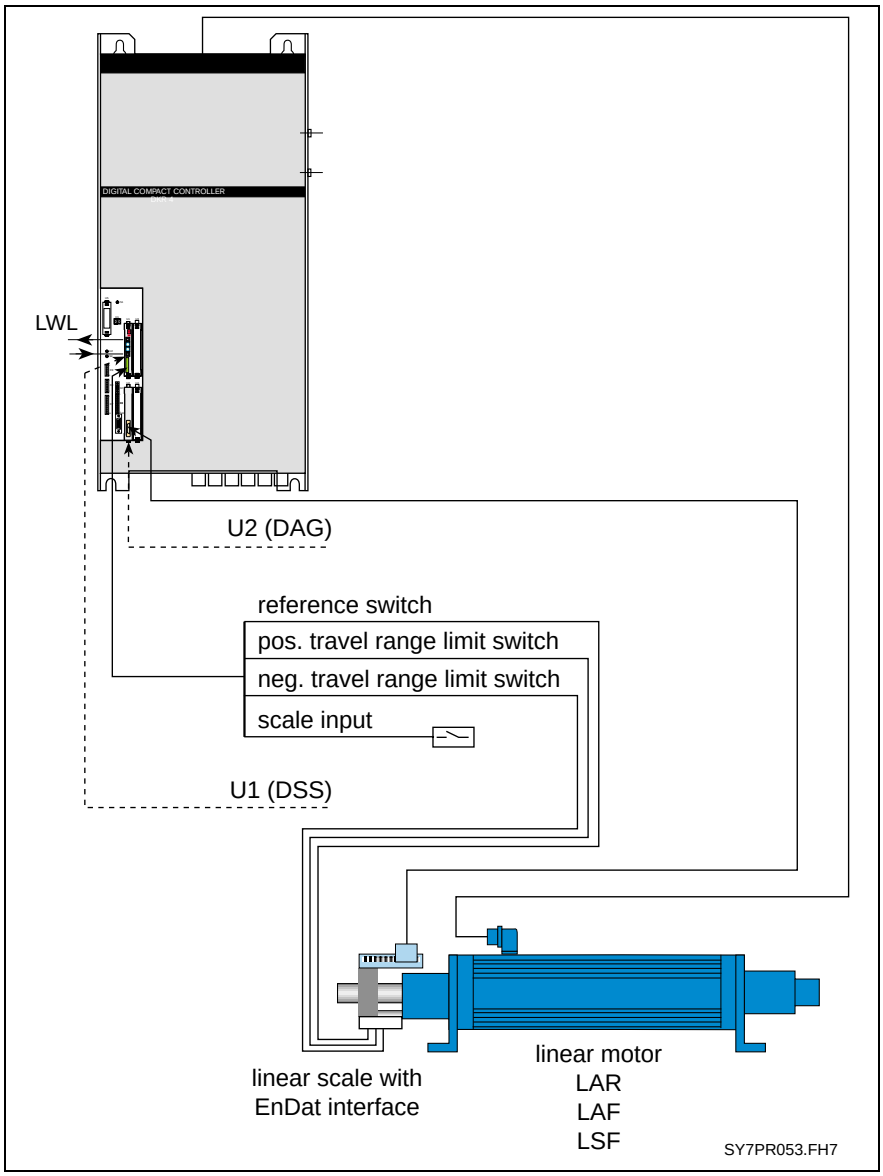


Fig. 5-29: Drive with linear motor LAR, LAF or LSF and absolute position detection

Usable Motors DIAX04:

- LAF
- LAR
- LSF

Basic Drive Configuration HS45 (DIAX04):

LAR, LAF, LSF:

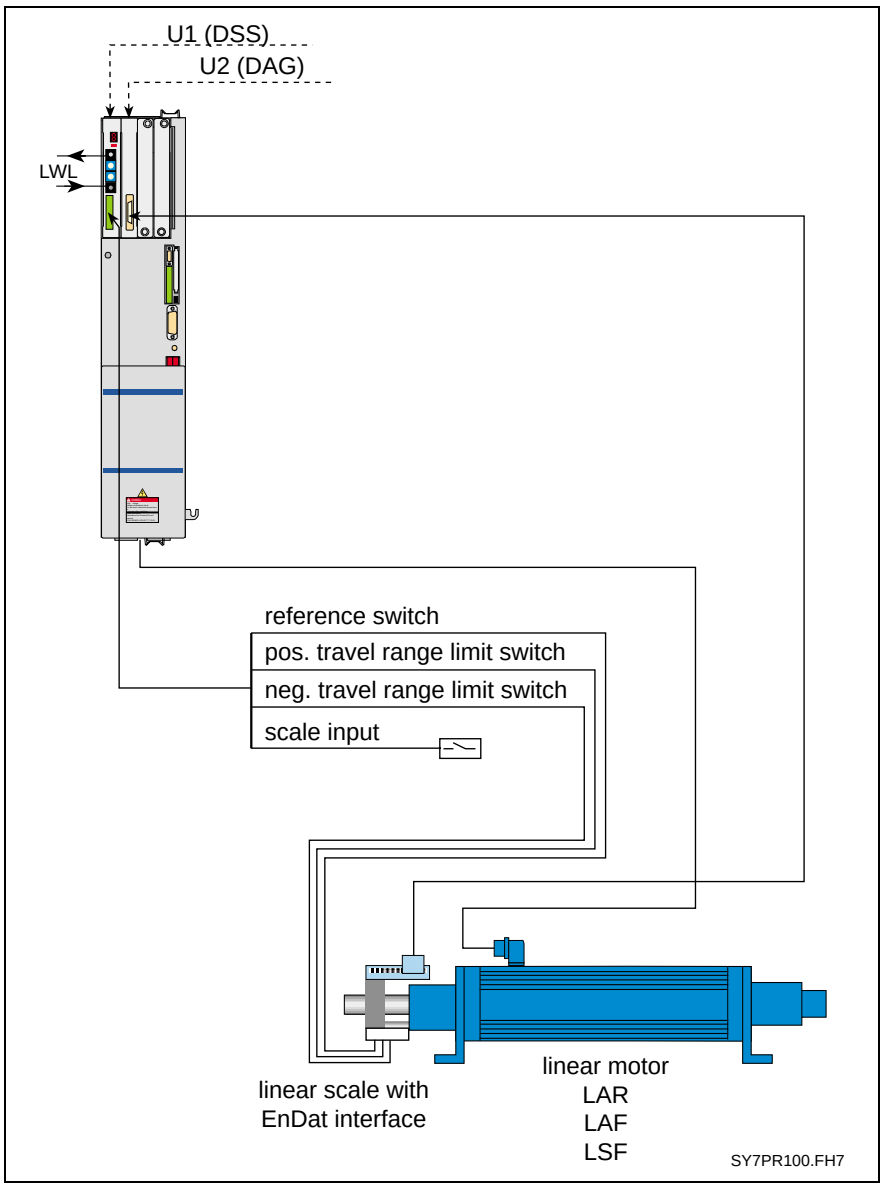


Fig. 5-30: Drive with linear motor LAR, LAF or LSF and absolute position detection

6 Determining the Control-Related Plug-In Cards

6.1 Determining Parallel I/Os

DEA04 or DEA08 parallel I/O cards can be inserted into DKR and HDS controllers.

Binary signals can be exchanged with this card between the PPC and a PLC. The voltage level equals 24 volts. The inputs and outputs are opto-decoupled.

DEA04 Fifteen inputs (the 16th input monitors the 24 V power source) and 16 outputs are available. The 16th input can be used as a watchdog or a regular output.

DEA08 32 inputs, 24 outputs and a watchdog ouput are available.

The signals applied to this I/O are transmitted via the SERCOS fibre-optics cable link to the PPC.

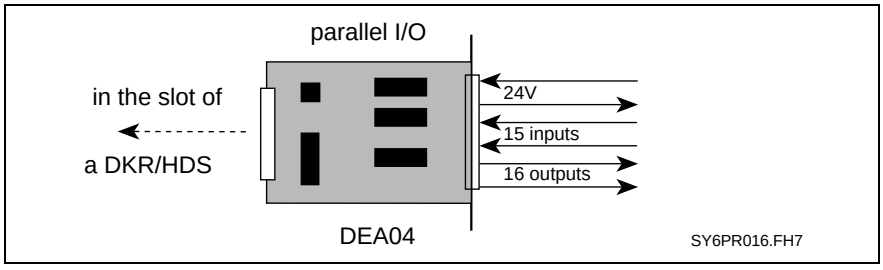


Fig. 6-1: Parallel I/O card DEA04

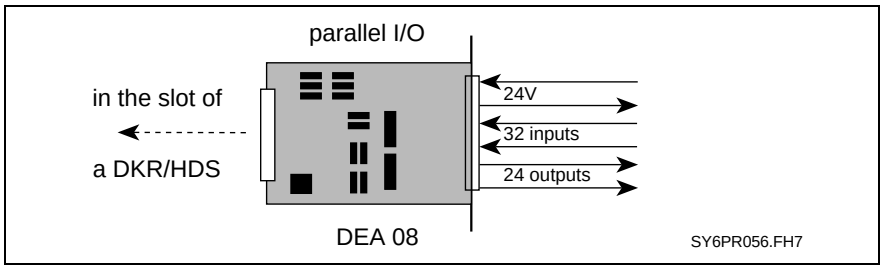


Fig. 6-2: Parallel I/O card DEA08

6.2 Combination Options of the External I/O (Drive Internal)

In addition to the RECO I/O modules the following I/O variants are available drive internal:

- drive plug-in card DEA04
- drive plug-in card DEA08

These can be used for the following functions:

- I/O logic (VKL)
- High-speed cam switch group (HS cams)

The drive plug-in cards can also be used to output the binary value of a parameter or to read it in.

Note: For parameter output or reading one in, it is also possible to use the drive plug-in cards DEA05/DEA06 or DEA09/DEA10.

	DEA04	**DEA08**
Example A	inputs VKL, outputs 16 HS cams (32 HS cams with 2 * DEA04)	inputs VKL, outputs VKL
Example B	inputs VKL, outputs VKL	inpputs VKL, outputs 24 HS cams
Example C	inputs VKL, parameter output	inputs VKL, outputs VKL
Example D	parameter input, outputs VKL	inputs VKL, parameter output

Fig. 6-3: Example configuration

The following combinations are not possible:

- High-speed cams configured on a DEA card while simultaneously using the outputs of this card in the I/O logic or for parameter output.
- Parameter output via P-0-0124 (e.g., drive cams P-0-0135) on a DEA04 or DEA08 activated and the outputs used in the VKL or for HS cams.
- Parameter read in via P-0-0125 activated by DEA04 or DEA08 and the inputs used in the VKL.

6.3 Determining the Master Axis

If it is necessary that the slave drive of the electronic gears has reference to a real master axis, then a master axis encoder must be mounted to this master axis.

Note: The master axis encoder must be mounted so that one master axis revolution equals *one* machine cycle (1 product ejection). This can be reached when parametrize a electronic measuring gear if necessary (see DOK-SYNAX*-SY*-07VRS**-FK01-EN-P, section 2.2 Real master axis - electronic measuring gear)

The master axis encoder is mounted to an encoder interface in the drive amplifier. The master axis position is generated from the encoder signals and transmitted via SERCOS interface to the PPC motion control.

High-Resolution Singleturn Encoder GDS or Multiturn Encoder GDM Made by Indramat

DIAX03, DIAX04

The singleturn encoder GDS or the multiturn encoder GDM is connected via encoder interface DFF or DSF interface (connector X4) to a drive amplifier.

The singleturn encoder GDS delivers an absolute encoder information within one revolution, the multiturn encoder within 4096 revolutions.

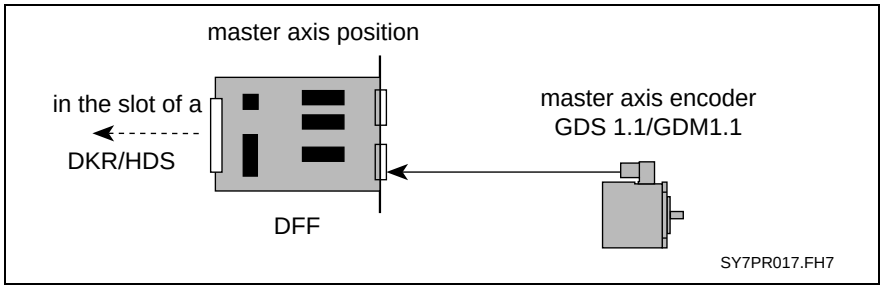


Fig. 6-4: GDS or GDM master axis encoder with encoder interface DFF

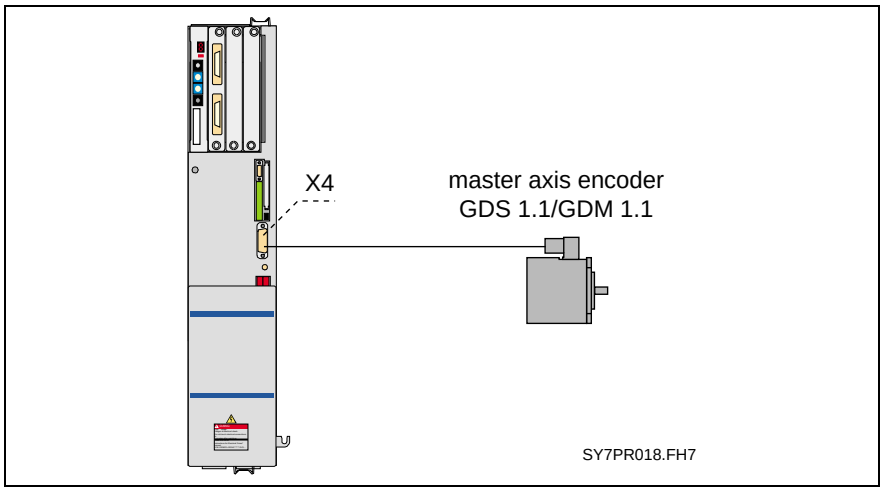


Fig. 6-5: GDS or GDM master axis encoder with DSF interface X4 (DIAX04)

EnDat/SSI Encoder

It is also possible to connect a real master axis using an EnDat/SSI encoder.

DIAX03, DIAX04 In this case use encoder interface DAG.

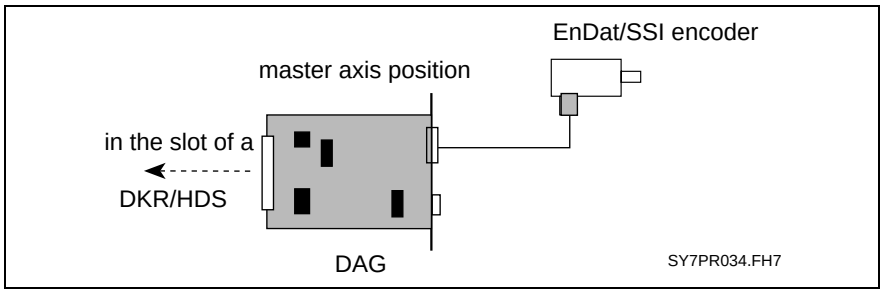


Fig. 6-6: EnDat and SSI encoder interface DAG

ECODRIVE03 The EnDat encoder is connected to the second interface X8. SSI encoders are not supported.

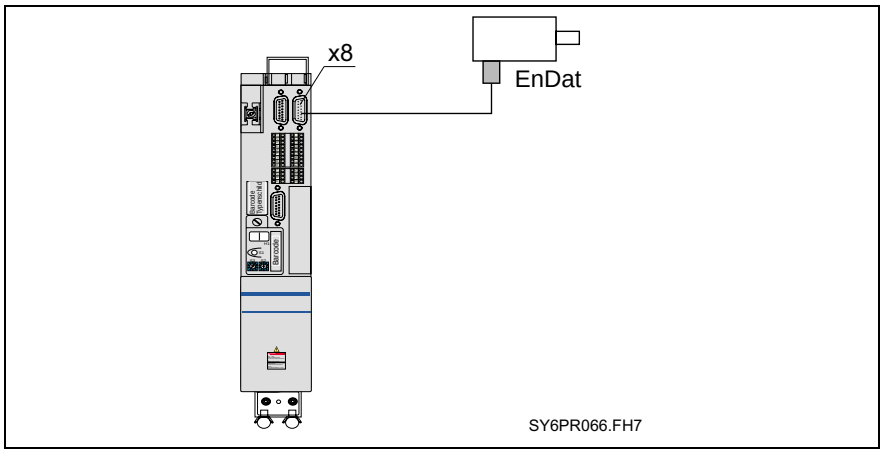


Fig. 6-7: EnDat encoder interface DKC

Note: Use only encoders with binary line numbers (2^n). Recommended type: encoder with 2048 number of lines.

Incremental Encoder with Sinusoidal Signals 1Vss

It is also possible to connect a real master axis using an incremental encoder with sinousoidal signals 1Vss.

Note: Use only encoders with binary line numbers (2^n).

DIAX03, DIAX04 In this case use encoder interface DLF.

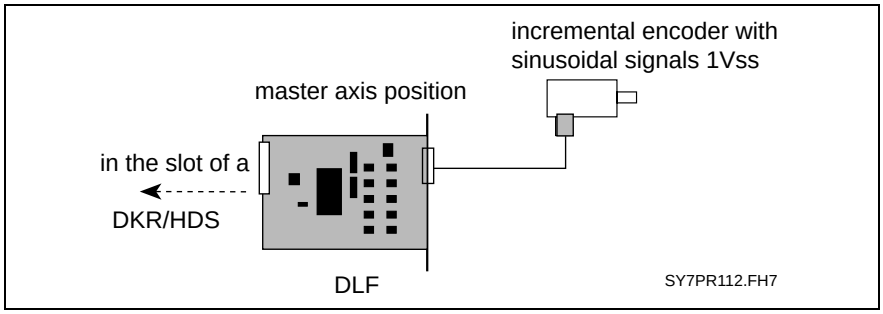


Fig. 6-8: Incremental encoder with sinousoidal signals 1Vss

Note: There is no zero impulse evaluation, that means that the master axis position has no absolute reference

ECODRIVE03 The incremental encoder with sinousoidal signals 1Vss is connected to the second interface X8.

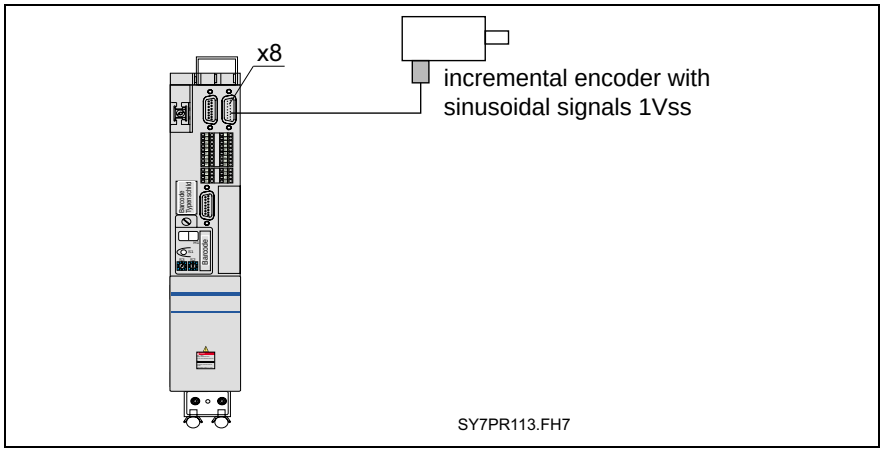


Fig. 6-9: incremental encoder with sinousoidal signals 1Vss

Note: The evaluation of the zero impulse of ECODRIVE03 is parameterizable. If the zero impulse is evaluated, the master axis position changes immediately when registrating the zero impulse. This must be considered for application.

6.4 Determining Analog Inputs

Two analog signals per drive can be detected via the analog interface DAE.

Analog signals are read by the drive and transmitted via the SERCOS LWL ring to the PPC. The PPC processes and allocates the analog signals (e.g., actual values of the tension control).

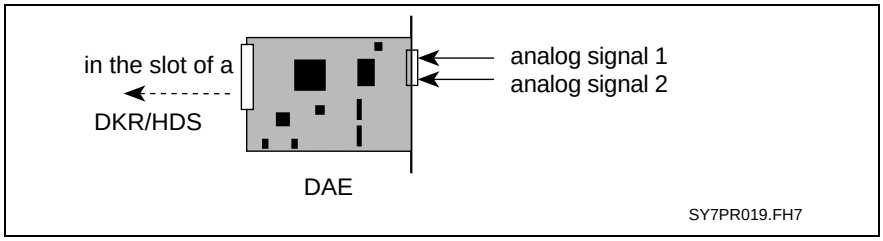


Fig. 6-10: Analog interface DAE

6.5 Master Axis Position Output

SSI Emulation

DIAX03, DIAX04

The master axis position in SSI format can be generated via the SSI output interface DSA.

The DSA card can be placed in any drive in the fibre-optics ring for this purpose.

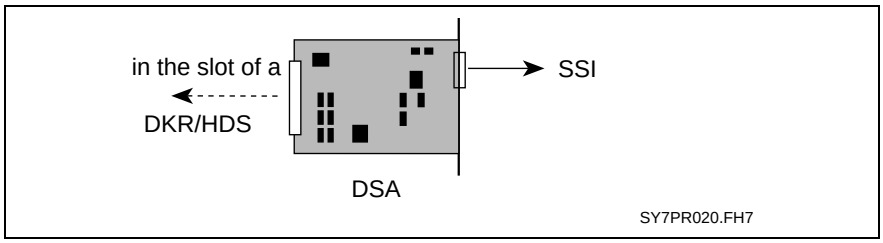


Fig. 6-11: Master axis position - SSI output interface DSA

ECODRIVE03

The master axis position in SSI format can be generated via the SSI output interface X9 in any drive in the fibre-optics ring.

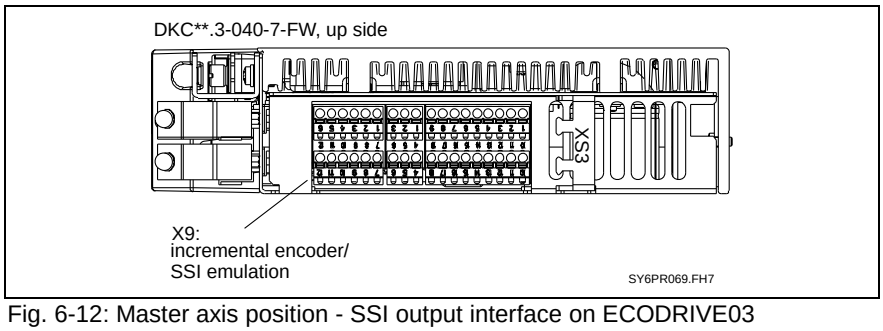


Fig. 6-12: Master axis position - SSI output interface on ECODRIVE03

Incremental Encoder Emulation

DIAX03, DIAX04

The master axis position can be generated as an incremental signal via the incremental encoder emulation interface DAE.

The DAE card can be placed in any drive in the fibre-optics ring for this purpose.

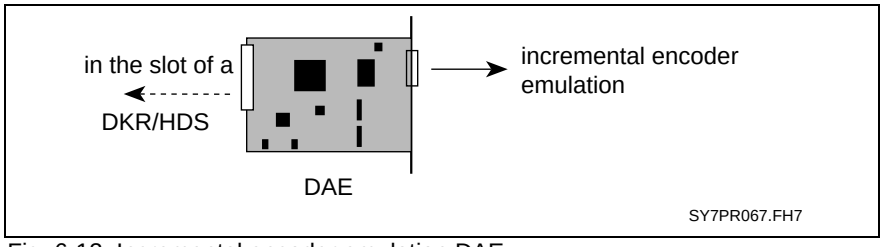


Fig. 6-13: Incremental encoder emulation DAE

ECODRIVE03

The master axis position can be generated as an incremental signal via the incremental encoder emulation interface X9 in any drive in the fibre-optics ring.

See Fig. 6-12: Master axis position - SSI output interface on

6.6 Encoder Branching DGA 01.2 for Encoders with Sinusoidal Voltage Signals 1Vss

General

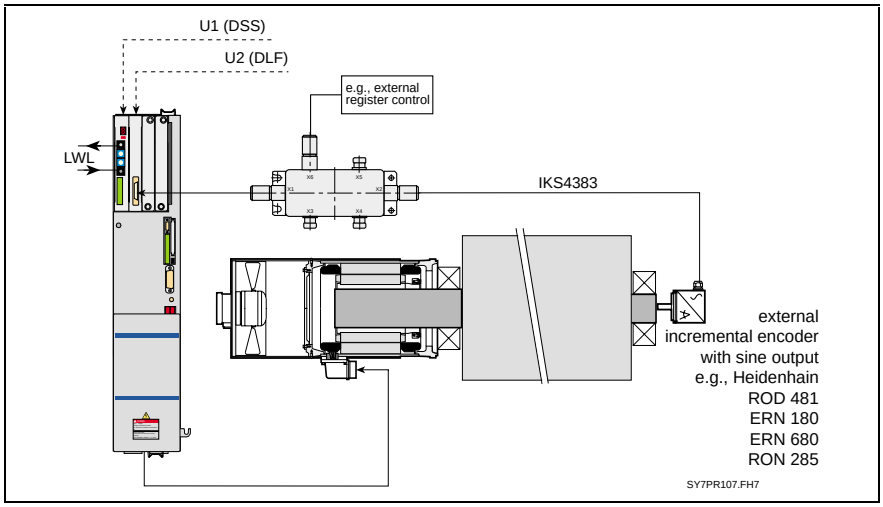


Fig. 6-14: Encoder branching DGA 01.2 example

The DGA makes it possible to distribute the signals of a measuring system to up to four measuring system inputs of different drive controllers. Possible applications of the DGA are:

- Parallel connection of linear motors using a measuring system
- Diverting position signals to external controls for the purpose of monitoring or as master axis positions

All measuring systems with sinusoidal output signals and a signal level of 1 V_{SS} can be used (Heidenhain voltage interface).

The DGA makes it possible to connect up to four drive controllers. There is also an output with square-wave signals.

Connection schematics DGA01.2

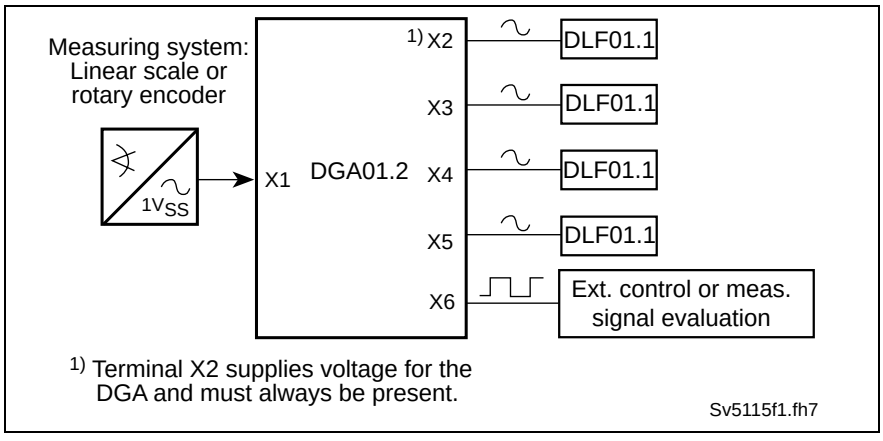


Fig. 6-15: Connection schematics - DGA01.2

Ready-made cable

Connection	Ready-made cable
from DGA01.2 (X2, X3, X4, X5) to DLF01.1	IKS0131
from DGA01.2 (X6) to DEF01.1	IKS0331

Fig. 6-16: Ready-made cable

Terminal Diagram

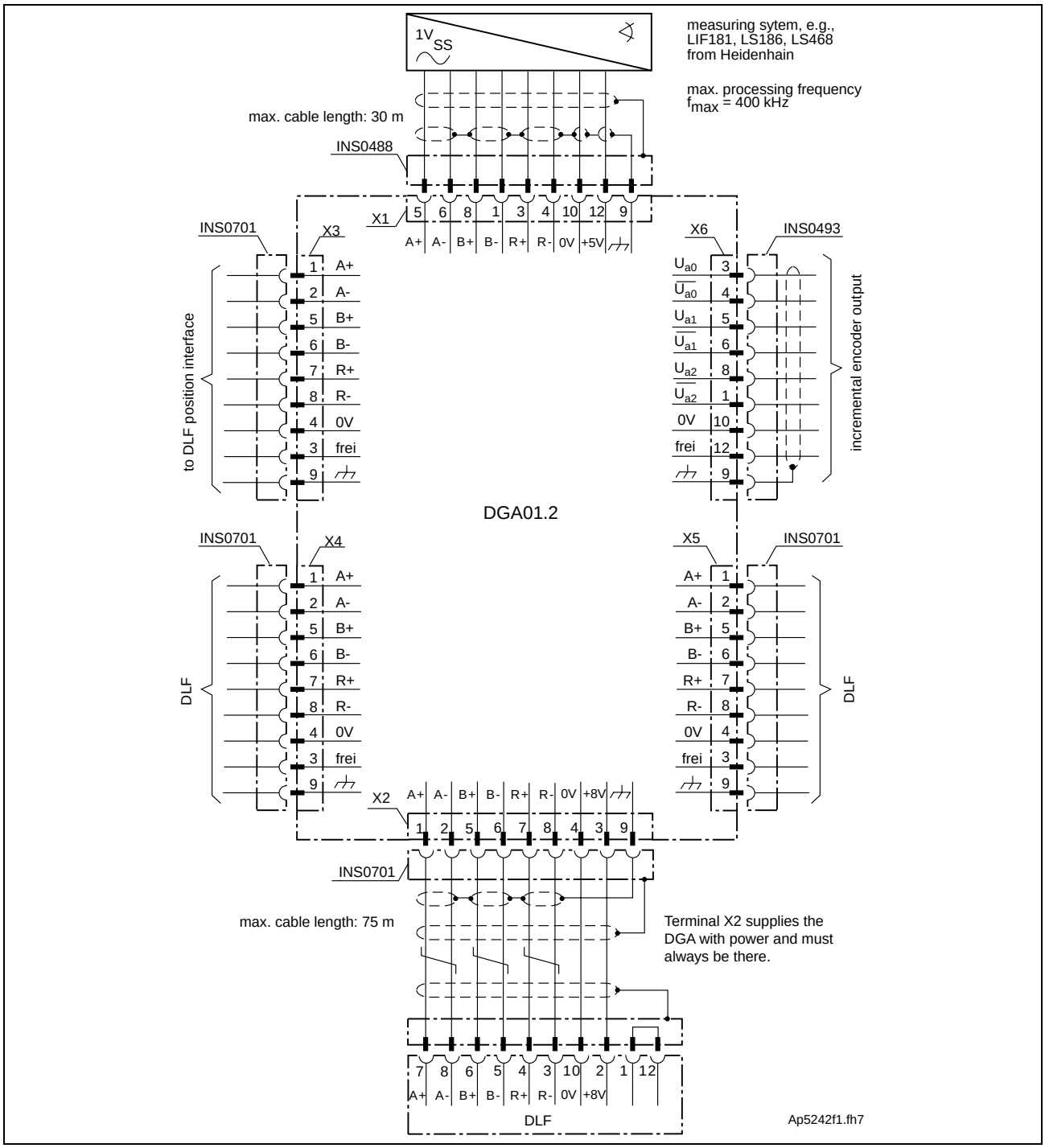


Fig. 6-17: Terminal diagram DGA01.2

Technical Data

External Measuring System

Supply voltage for external measuring system

Output voltage X1/12:	DC +5 V (±5%)		
max. output load X1/12:	150 mA		

Signal form

Approximately sinusoidal signals

Voltage signals

Signal voltage:	A, B, R	1	V_{SS}
max. frequency for measuring system signals:	A, B	400	kHz
max. frequency for reference signal:	R	15	kHz

Signal-input circuit

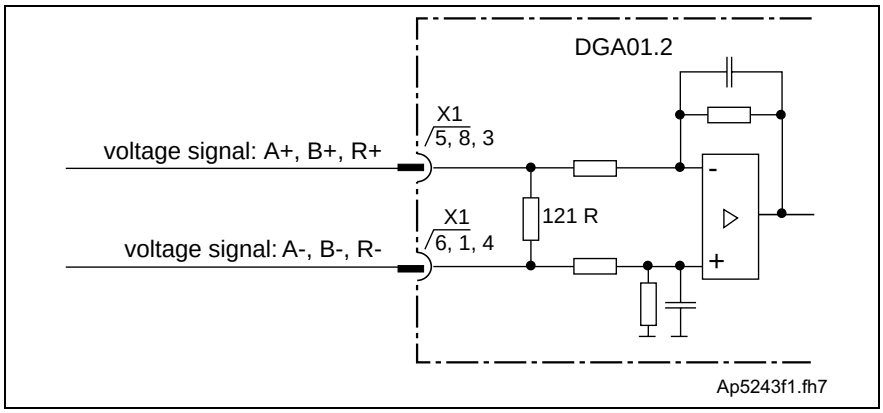


Fig. 6-18: Signal input circuit

Block diagram of the signal paths

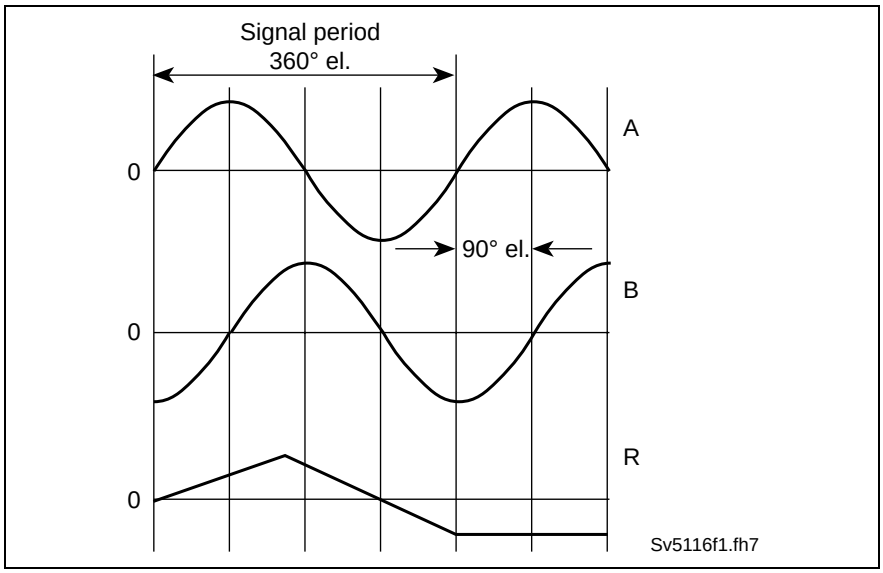


Fig. 6-19: Block diagram of the signal paths

Diverting Measuring System Signals to Four Connection

The signals from the measuring system are diverted to connections X2, X3, X4 and X5.

DGA01.2 supply

The DGA01.2 receives ist power via terminal X2.

Connecting voltage X2/3:	DC +8 V (±5%)
Maximum current consumption:	300 mA

Recommended signal input circuit

see Fig. 6-18: Signal input circuit

Outputting Measuring System Signals as Square-Wave Signals

Sinusoidal signals of the measuring system are generated via terminal X6 as square-wave incremental signals.

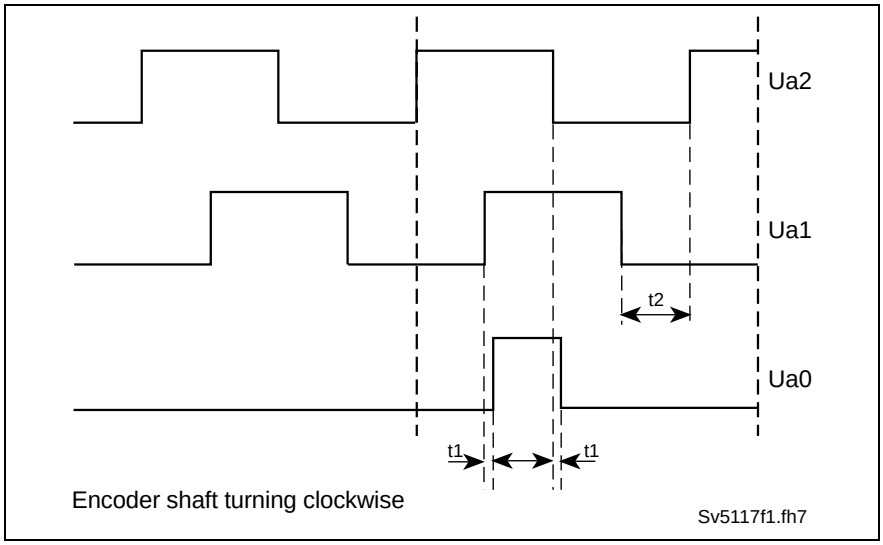


Fig. 6-20: Voltage level and phase position of incremental signals

Designation	Unit	min.	type / value	max.
Phase position Ua1	degree		0	
Phase position Ua2	degree		90	
Signal amplitude Ua-(/Ua)	V_{SS}		7	
Reference point delay t1	ns			50
Edge distance t2	ns	500		

Fig. 6-21: Incremental signal data

7 Drive Configurations

7.1 General Informations

The control related plug-in cards are now distributed to the free slots in the basic configuration.

Possible configurations are listed below.

The HDS02.1 controller is limited in its configuration to a DSS card plus two additional cards.

There is no card available for use with an HDD.

7.2 Drive Configurations DIAX03 Based on the Basic Configuration BE12

Features	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
analog input Incremental feedback emulation								X			
digital input/output		X									
ext. measurement system with Heidenhain sine encoder							X				
ext. measurement system with Heidenhain square-wave encoder				X	X						
ext,. measurement system with DSF encoder						X					
ext. measurement system with SSI interface	X										
ext. measurement system with EnDat encoder	X										
ext. measurement system with gear wheel encoder (Indramat)										X	
master axis encoder measure-ment with DSF encoder						X					
master axis encoder measure-ment with EnDat encoder	X										
master axis encoder measure-ment with SSI interface	X										
master axis position output									X		
plug-in modules determined:											

Fig. 7-1: Additional features based on basic configuration BE12

Configuration designation:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
BE09-01-FW						X					
BE10-01-FW		X							X		
BE12-01-FW											
BE23-01-FW		X									
BE25-01-FW		X				X			X		
BE30-01-FW		X				X					
BE47-01-FW						X			X		
BE54-01-FW									X		
BE56-01-FW								X			
BE59-01-FW						X		X			
BE60-01-FW				X				X			
BE73-01-FW		X				X		X			
BE76-01-FW				X							
BE78-00-FW		X		X							
BE79-01-FW											X
BE80-01-FW		X									X
BE84-01-FW		X						X			
BE86-01-FW		X		X				X			
BE91-01-FW									X		X
BE92-01-FW						X					X
BE94-01-FW						X			X		X
BE99-01-FW					X			X			X
BT08-01-FW		X						X			X
BT10-01-FW		X				X					X
BT13-01-FW		X							X		X
BT15-01-FW						X		X			X
BT20-01-FW			X								
BT52-01-FW			X	X							
BT53-01-FW			X			X					
BT56-01-FW			X								X
BT67-01-FW					X						X
BT68-01-FW			X		X						X
BT69-01-FW		X			X						X

Fig. 7-2: Drive configurations based on basic configuration BE12

7.3 Drive Configurations DIAX03 Based on Basic Configuration BE32

Features:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
analog inputs							X	X			
digitla input/output		X					X				
ext. measurement system with Heidenhain square-wave encoder					X		X				
ext. measurement system with DSF encoder (1)						X	X				
ext. measurement system with SSI interface	X						X				
ext. measurement system with EnDat encoder	X						X				
master axis encoder measure-ment with DSF encoder (1)						X	X				
master axis encoder measure-ment with EnDat encoder	X						X				
master axis encoder measure-ment with SSI interface	X						X				
master axis position output							X		X		
plug-in modules determined:							X				

Fig. 7-3: Additional features based on basic configuration BE32

(1) If the standard interface X4 is not used, then there is no need for the DFF module.

Configuration designation:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
BE08-01-FW						X	X				
BE28-01-FW		X				X	X				
BE32-01-FW							X				
BE33-01-FW		X					X				
BE55-01-FW		X					X		X		
BE57-01-FW						X	X		X		
BE58-01-FW							X	X			
BE62-01-FW							X		X		
BE68-01-FW		X					X	X			
BT01-01-FW	X						X				
BT02-01-FW	X	X					X				
BT03-01-FW	X						X	X			
BT04-01-FW					X		X				
BT05-01-FW		X			X		X				
BT06-01-FW					X		X	X			
BT07-01-FW						X	X	X			
BT54-01-FW			X				X				
BT57-01-FW			X		X		X				
BT58-01-FW	X		X				X				
BT66-01-FW			X			X	X				

Fig. 7-4: Drive configuration based on basic configuration BE32

7.4 Drive Configuration DIAX03 Based on Basic Configuration BE37

Features:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
analog input								X		X	
didgital input/output		X								X	
ext. measurement system with Heidenhain square-wave encoder					X					X	
ext. measurement system with DSF encoder (1)						X				X	
ext. measurement system with SSI interface	X									X	
ext. measurement system with EnDat encoder	X									X	
master axis encoder measurement with DSF-Geber (1)						X				X	
master axis encoder measurement with EnDat encoder	X									X	
master axis encoder measurement with SSI interface	X									X	
master axis position output									X	X	
plug-in modules determined:										X	

Fig. 7-5: Additional features based on basic configuration BE37

(1) If the standard interface X4 is not used, then there is no need for the DFF02.1M module.

Configuration designation:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
BE02-02-FW	X					X				X	
BE03-02-FW	X	X								X	
BE04-02-FW	X									X	
BE19-01-FW								X		X	
BE22-01-FW		X				X				X	
BE26-01-FW				X						X	
BE27-01-FW						X				X	
BE32-01-FW		X		X						X	
BE37-01-FW										X	
BE38-01-FW		X								X	
BE63-01-FW		X							X	X	
BE65-01-FW						X			X	X	
BE67-01-FW		X						X		X	
BE70-01-FW									X	X	
BE72-02-FW	X								X	X	
BE88-01-FW						X		X		X	
BE89-01-FW					X			X		X	
BE90-01-FW	X							X		X	
BT55-01-FW			X							X	
BT59-01-FW					X					X	
BT60-01-FW			X							X	
BT61-01-FW			X		X					X	
BT62-01-FW		X			X					X	
BT63-01-FW	X		X							X	

Fig. 7-6: Drive configuration based on basic configuration BE37

7.5 Drive Configuration DIAX03 Based on Basic Configuration BE45

Features	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
analog inputs	X							X			
digital input/output	X	X									
ext. measurement system with Heidenhain sine encoder	X						X				
ext. measurement system with Heidenhain square-wave encoder	X			X	X						
ext. measurement system with DSF encoder (1)	X					X					
ext. measurement system with gear wheel encoder (Indramat)	X									X	
master axis encoder measure-ment with DSF encoder (1)	X					X					
master axis position output	X								X		
plug-in modules determined:	X										

Fig. 7-7: Additional features based on basic configuration BE45

(1) If the standard interface X4 is not used, then there is no need for the DFF module.

Configuration designation:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
BE02-02-FW	X					X				X	
BE03-02-FW	X	X								X	
BE04-02-FW	X									X	
BE45-01-FW	X										
BE66-01-FW	X							X			
BE72-02-FW	X								X	X	
BE74-02-FW	X	X									
BE83-00-FW	X	X				X					
BE87-01-FW	X	X						X			
BE90-01-FW	X							X		X	
BE93-01-FW	X										X
BT01-01-FW	X						X				
BT02-01-FW	X	X					X				
BT03-01-FW	X						X	X			
BT09-01-FW	X							X			X
BT11-01-FW	X					X					X
BT12-01-FW	X	X									X
BT14-01-FW	X								X		X
BT18-01-FW	X							X			
BT24-01-FW	X			X							
BT51-01-FW	X		X								
BT58-01-FW	X		X				X				
BT63-01-FW	X		X							X	
BT64-01-FW	X		X								X
BT65-01-FW	X	X		X							

Fig. 7-8: Drive configuration based on basic configuration BE45

7.6 Drive Configuration DIAX04 Based on Basic Configuration HS12

Features	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
analog input incremental feedback emulation								X			
digital input/output		X									
ext. measurement system with Heidenhain sine encoder							X				
ext. measurement system with Heidenhain square-wave encoder				X	X						
ext. measurement system with DSF encoder						X					
ext. measurement system with SSI interface	X										
ext. measurement system with EnDat encoder	X										
ext. measurement system with gear wheel encoder (Indramat)										X	
master axis encoder measurement with DSF encoder						X					
master axis encoder measurement with EnDat encoder	X										
master axis encoder measurement with SSI interface	X										
master axis position output									X		
plug-in modules determined:											

Fig. 7-9: Additional features based on basic configuration HS12

Configuration designation:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
HS09-01-FW						X					
HS10-01-FW		X							X		
HS12-01-FW											
HS23-01-FW		X									
HS25-01-FW		X				X			X		
HS30-01-FW		X				X					
HS47-01-FW						X			X		
HS54-01-FW									X		
HS56-01-FW								X			
HS59-01-FW						X		X			
HS60-01-FW				X				X			
HS73-01-FW		X				X		X			
HS76-01-FW				X							
HS78-01-FW		X		X							
HS79-01-FW											X
HS80-01-FW		X									X
HS84-01-FW		X						X			
HS86-01-FW		X		X				X			
HS91-01-FW									X		X
HS92-01-FW						X					X
HS94-01-FW						X			X		X
HS99-01-FW					X			X			X
HT08-01-FW		X						X			X
HT10-01-FW		X				X					X
HT13-01-FW		X							X		X
HT15-01-FW						X		X			X
HT20-01-FW			X								
HT31-01-FW			X	X							
HT32-01-FW			X			X					
HT35-01-FW			X								X
HT46-01-FW					X						X
HT47-01-FW			X		X						X
HT48-01-FW		X			X						X

Fig. 7-10: Drive configuration based on basic configuration HS12

7.7 Drive Configuration DIAX04 Based on Basic Configuration HS32

Features:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
analog input							X	X			
digital input/output		X					X				
ext. measurement system with Heidenhain square-wave encoder					X		X				
ext. measurement system with DSF encoder (1)						X	X				
ext. measurement system with SSI interface	X						X				
ext. measurement system with EnDat encoder	X						X				
master axis encoder measurement with DSF encoder (1)						X	X				
master axis encoder measurement with EnDat encoder	X						X				
master axis encoder measurement with SSI interface	X						X				
master axis position output							X		X		
plug-in modules determined:							X				

Fig. 7-11: Additional features based on basic configuration HS32

(1) If the standard interface X4 is not used, then there is no need for the DFF module.

Configuration designation:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
HS08-01-FW						X	X				
HS28-01-FW		X				X	X				
HS32-01-FW							X				
HS33-01-FW		X					X				
HS55-01-FW		X					X		X		
HS57-01-FW						X	X		X		
HS58-01-FW							X	X			
HS62-01-FW							X		X		
HS68-01-FW		X					X	X			
HT01-01-FW	X						X				
HT02-01-FW	X	X					X				
HT03-01-FW	X						X	X			
HT04-01-FW					X		X				
HT05-01-FW		X			X		X				
HT06-01-FW					X		X	X			
HT07-01-FW						X	X	X			
HT33-01-FW			X				X				
HT36-01-FW			X		X		X				
HT37-01-FW	X		X				X				
HT45-01-FW			X			X	X				

Fig. 7-12: Drive configuration based on basic configuration HS32

7.8 Drive Configuration DIAX04 Based on Basic Configuration HS37

Features:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
analog input								X		X	
digital input/output		X								X	
ext. measurement system with Heidenhain square-wave encoder					X					X	
ext. measurement system with DSF encoder (1)						X				X	
ext. measurement system with SSI interface	X									X	
ext. measurement system with EnDat encoder	X									X	
master axis encoder measurement with DSF-Geber (1)						X				X	
master axis encoder measurement with EnDat encoder	X									X	
master axis encoder measurement with SSI interface	X									X	
master axis position output									X	X	
plug-in modules determined:										X	

Fig. 7-13: Additional features based on basic configuration HS37

(1) If the standard interface X4 is not used, then there is no need for the DFF02.1M module.

Configuration designation:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
HS02-02-FW	X					X				X	
HS03-02-FW	X	X								X	
HS04-02-FW	X									X	
HS19-01-FW								X		X	
HS22-01-FW		X				X				X	
HS26-01-FW				X						X	
HS27-01-FW						X				X	
HS36-01-FW		X		X						X	
HS37-01-FW										X	
HS38-01-FW		X								X	
HS63-01-FW		X							X	X	
HS65-01-FW						X			X	X	
HS67-01-FW		X						X		X	
HS70-01-FW									X	X	
HS72-02-FW	X								X	X	
HS88-01-FW						X		X		X	
HS89-01-FW					X			X		X	
HS90-01-FW	X							X		X	
HT34-01-FW			X							X	
HT38-01-FW					X					X	
HT39-01-FW			X		X					X	
HT40-01-FW		X			X					X	
HT41-01-FW	X		X							X	

Fig. 7-14: Drive configuration based on basic configuration HS37

7.9 Drive Configuration DIAX04 Based on Basic Configuration HS45

Features	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
analog input	X							X			
digital input/output	X	X									
ext. measurement system with Heidenhain sine encoder	X						X				
ext. measurement system with Heidenhain square-wave encoder	X			X	X						
ext. measurement system with DSF encoder (1)	X					X					
ext. measurement system with gear wheel encoder (Indramat)	X									X	
master axis encoder measure-ment with DSF encoder (1)	X					X					
master axis position output	X								X		
plug-in modules determined:	X										

Fig. 7-15: Additional features based on basic configuration HS45

(1) If the standard interface X4 is not used, then there is no need for the DFF module.

Configuration designation:	DAG 01.2M	DEA 04.2M	DEA 08.1M	DEF 01.1M	DEF 02.1M	DFF 01.1M	DLF 01.1M	DAE 02.1M	DSA 01.1M	DZF 02.1M	DZF 03.1M
HS02-02-FW	X					X				X	
HS03-02-FW	X	X								X	
HS04-02-FW	X									X	
HS45-01-FW	X										
HS66-01-FW	X							X			
HS72-02-FW	X								X	X	
HS72-02-FW	X								X	X	
HS74-02-FW	X	X									
HS74-02-FW	X	X									
HS81-01-FW	X			X							
HS87-01-FW	X	X						X			
HS90-01-FW	X							X		X	
HS93-01-FW	X										X
HT01-01-FW	X						X				
HT02-01-FW	X	X					X				
HT03-01-FW	X						X	X			
HT09-01-FW	X							X			X
HT11-01-FW	X					X					X
HT12-01-FW	X	X									X
HT14-01-FW	X								X		X
HT18-01-FW	X							X			
HT24-01-FW	X			X							
HT30-01-FW	X		X								
HT37-01-FW	X		X				X				
HT41-01-FW	X		X							X	
HT42-01-FW	X		X								X
HT44-01-FW	X	X		X							
HT72-01-FW	X					X					

Fig. 7-16: Drive configuration based on basic configuration HS45

7.10 Example

The rotary press and folding machine of the plant shown in Fig. 7-17 should be equipped with the SYNAX200 system.

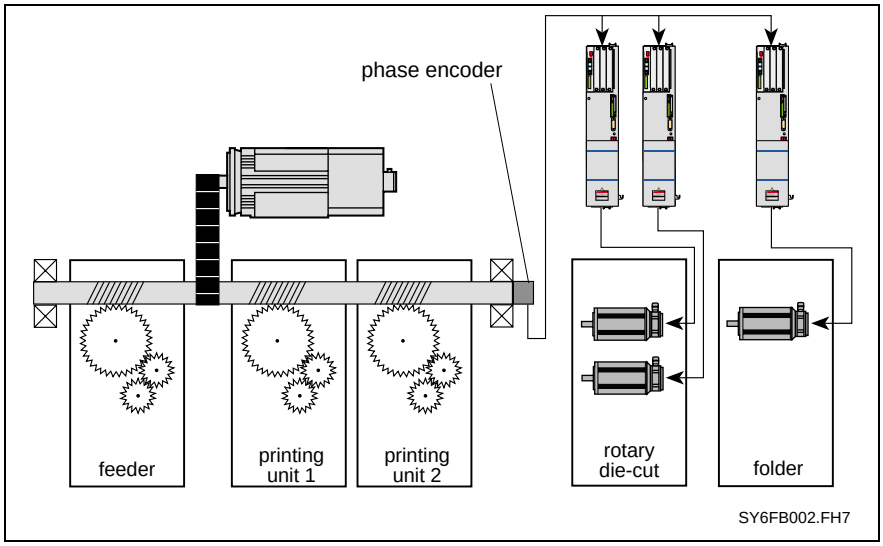


Fig. 7-17: Printing machine partially equipped with individual drives

Motion Control Configuration

The PPC-R is used as a motion control with 3 slots. One slot of the PPC-R is assigned with the ARCNET and the PPC link assembly (DAQ)

An input module RME with 16 inputs and an output module RMA with 16 outputs are used for I/O.

A mounting rack with 4 slots is used for taking up the motion control and the I/O modules.

How to Order the Motion Control Configuration

Pos. 1	motion control	PPC-R02.2N-P1N-Q1-NN-NN-FW
Pos. 1.1	relevant firmware	FWA-PPCR0*-SY*-07VRS-MS
Pos. 2	input module	RME02.2-16-DC024
Pos. 3	output module	RMA02.2-16-DC024-200
Pos. 4	mounting rack	RMB02.2-04

Drive Configuration

The following equipment is needed for all three drives and is always based on both precision and power requirements:

Axis	Drive controller	Motor
rotary die-cut	HDS03.2-W075	MHD
anvil zylinder	HDS03.2-W075	MHD
folding drive	HDS04.2-W200	2AD

Fig. 7-18: Drive equipment

The result is the basic drive configuration HS12-01 on section 7.6. The selection of the control-related plug-in modules follows the guidelines of section 6.

A DFF card is needed for the master axis circuit.

The drive configuration follows the guidelines in section 7.

This results the following drive configuration for example:

Axis	Configuration
rotary die-cut	HS09 (with DFF01)
anvil cylinder	HS12
folding drive	HS12

Fig. 7-19: Drive configuration

For checking the reliability of the resulting drive configuration and for determining the relevant configuration number, see the table on page 7-1 ff.

How to Order the Drive Controller

Pos.	1	drive controller	HDS03.2-W074-HS09-..-FW
Pos.	1.1	relevant firmware	FWA-DIAX04-ELS-05VRS-MS
Pos.	2	drive controller	HDS03.2-W075-HS12-..-FW
Pos.	2.1	relevant firmware	FWA-DIAX04-ELS-05VRS
Pos.	3	drive controller	HDS04.2-W200-HS12-..-FW
Pos.	3.1	relevant firmware	FWA-DIAX04-ELS-05VRS

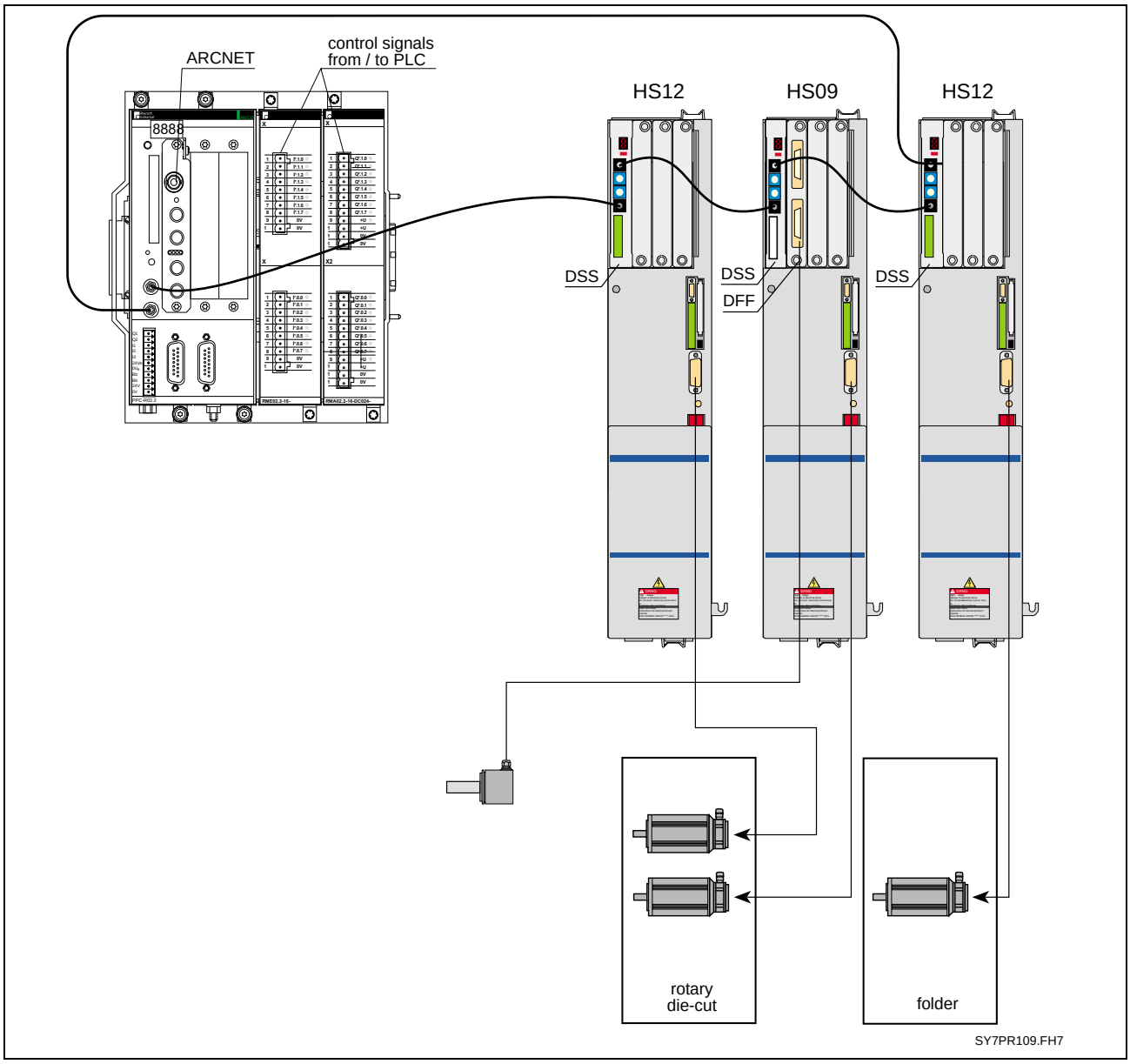


Fig. 7-20: System configuration for equipping SYNAX200

8 Set-Up SYNAX200 Ring

8.1 Data Transmission via Fibre-Optics Cable

Optical Transmission Ring Structure

The connection between the motion control (PPC) and the digital drives is conducted with help of fibre-optics cables (LWL).

SERCOS interface (IEC 61491 or EN 61491)

A ring structure as defined in SERCOS interface (IEC 61491 or EN 61491) is used.

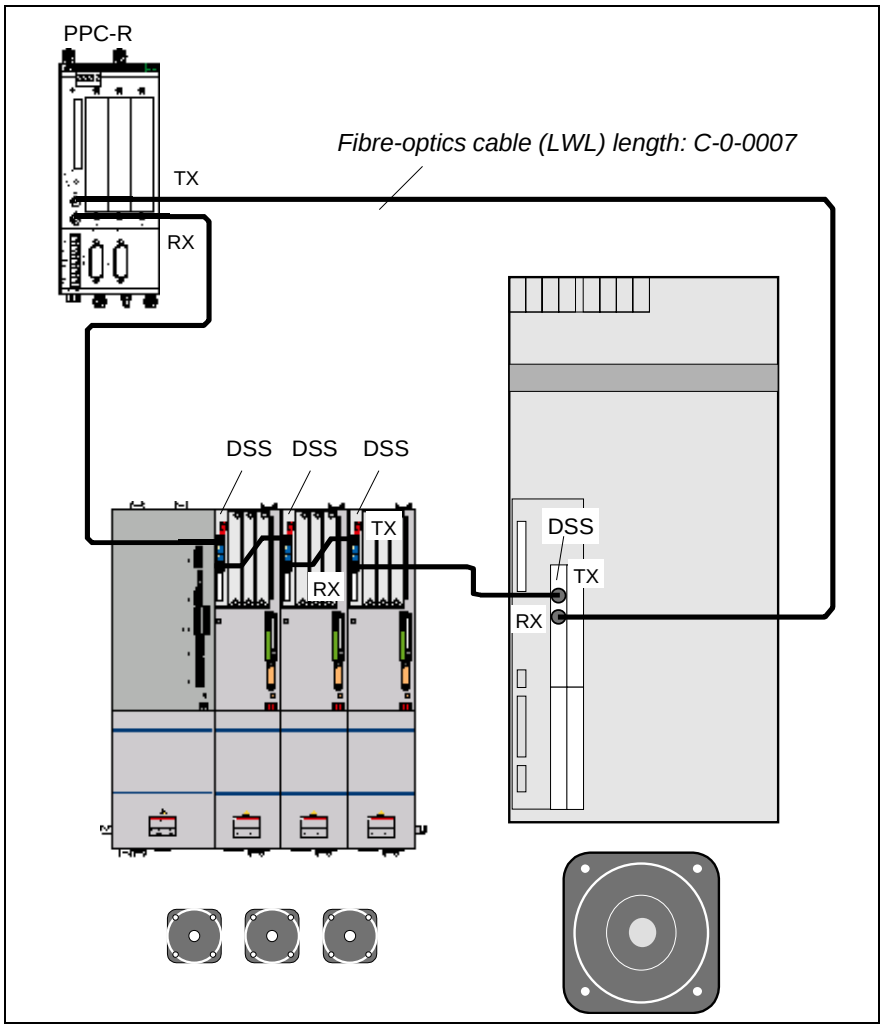


Fig. 8-1: Ring structure

The ring starts and ends at the motion control. The optical output of the motion control is connected with the optical input of the first drive. Its output is connected to the input of the next drive and so on. The output of the final drive is connected to the input of the motion control.

Drive address

Each drive is assigned its own drive address. It can be selected independently of the position within the fibre-optics cable ring. The drive address is set at the communications board (e.g., DSS 2.1) using a rotary switch.

Constructing the Transmission Path

A transmission path starts at a transmitter output and ends at a receiver input.

Fibre-optics cable isolating points

The transmission path is made up of fibre-optics cables and fibre-optics cable leadthroughs. These serve as, for example, coupling units for wall leadthroughs.

FSMA standard (IEC 874-2)

The plug-in connectors correspond to FSMA standards (IEC 874-2).

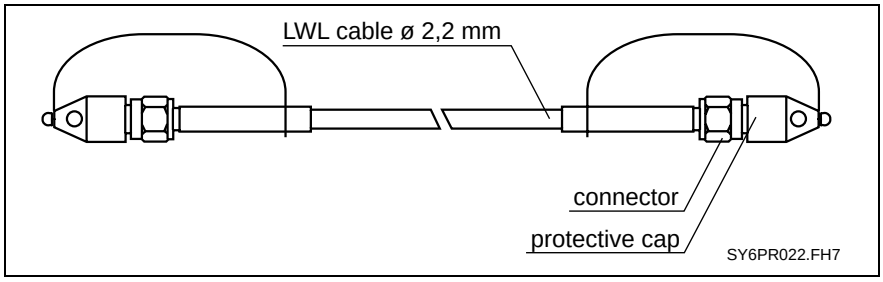


Fig. 8-2: Structure of a transmission path

Types of Fibre-Optics Cables

Plastic fibre-optics cables can be used for transmission length of up to 50 m and glass fibre-optics cables for lengths up to 500 m.

There are three different types of fibre-optics cables:

Plastic fibre-optics cable 2.2mm

Plastic fibre-optics cables for internal control cabinet use with a diameter of 2.2 mm.

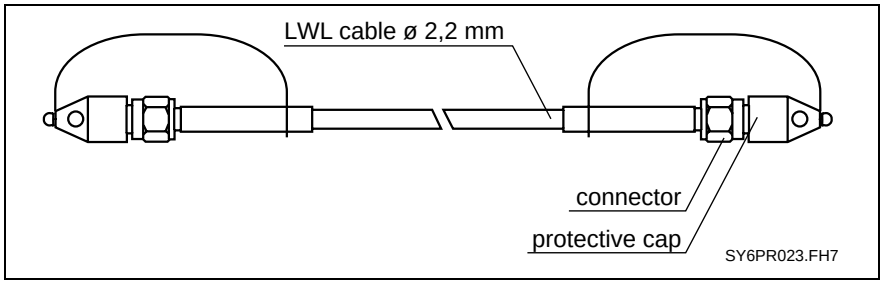


Fig. 8-3: Plastic fibre-optics cable 2.2 mm (IKO 982)

Plastic fibre-optics cable 6 mm

Plastic fibre-optics cables for internal and external control cabinet use with reinforced casings. The diameter of this fibre-optics cable equals 6 mm.

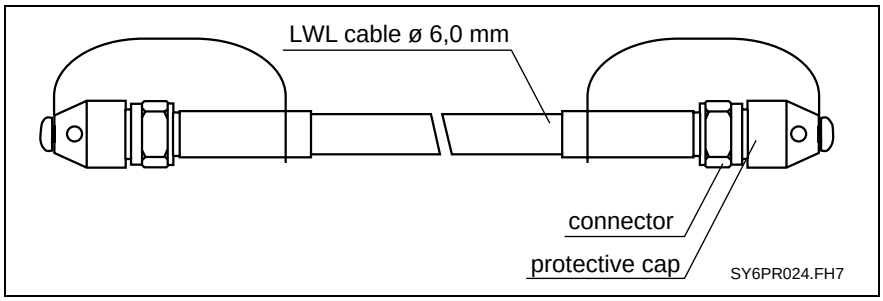


Fig. 8-4: Plastic fibre-optics cable 6 mm (IKO 985)

Glass fibre-optics cable 3 mm

Glass fibre-optics cable for internal and external control cabinet use with reinforced casing. The diameter of this fibre-optics cable equals 3 mm.

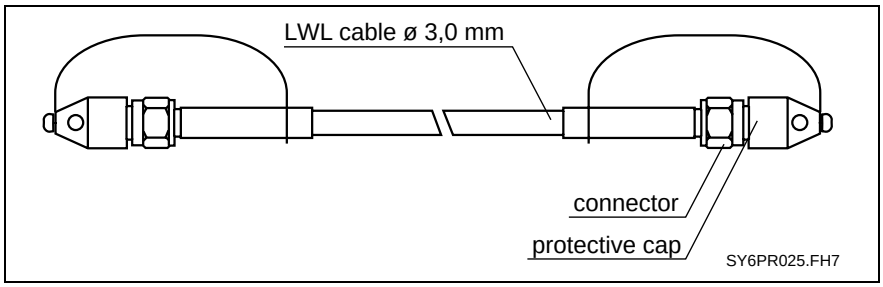


Fig. 8-5: Glass fibre-optics cable 3 mm (IKO 001)

Order information

Type of fiber optic cable	Part number
plastic fibre-optics cable, 2.2 mm	IKO0982/xx
plastic fibre-optics cable, 6 mm	IKO0985/xx
glass fibre-optics cable, 3 mm	IKO0001/xx

Fig. 8-6: Part numbers of fibre-optics cable types (xx: lengths in meters)

Fibre-Optics Cable Accessories

Accessories of the fibre-optics cables are:

- fibre-optics cable leadthroughs
- wrench for FSMA connector

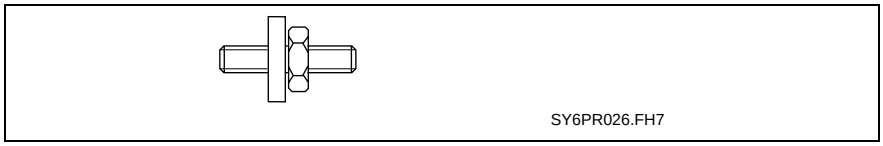


Fig. 8-7: Fibre-optics cable leadthroughs

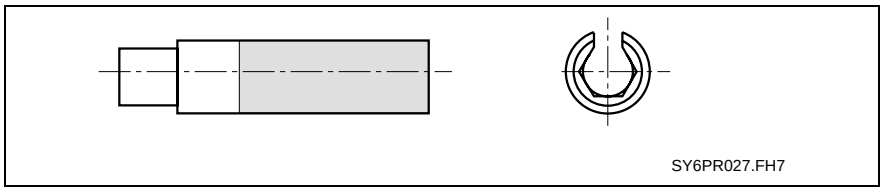


Fig. 8-8: Wrench for FSMA connector

Name	Order identification
fibre-optics cable leadthrough	PLUG-IN-LWL DF
wrench fibre-optics cable FSMA	TOOL WRENCH LWL-FSMA

Fig. 8-9: Fibre-optics cable accessories

8.2 Project Planning Notes

General Notes

Note the following when planning the project:

The length of the transmission path The length of the transmission path is limited. Isolating points decrease the maximum length of a fibre-optics cable stretch.

Mixing fibre-optics cable types Between transmitter and receiver either only plastic fibre-optics cables (IKO0982 or IKO0985) or only glass fibre-optics cables (IKO0001) may be used. There may be no change from plastic to glass or vice versa at isolating points.

Mechanical limits The mechanical limit values of fibre-optics cables (e.g., bend radii, tension, cross tension, alternate bends) must be maintained.

Thermal limit values Thermal limit values of the fibre-optics cables may not be exceeded.

Maximum Lengths of the Fibre-Optics Cables

Fibre-optics cable type	Without isolating point	1 isolating point	2 isolating points
plastic fibre-optics cables	50 m	40 m	30 m
glass fibre-optics cables	500 m	400 m	300 m

Fig. 8-10: Maximum fibre-optics cable lengths

Technical Data of Available Fibre-Optics Cables

	IKO0982	IKO0985	IKO0001
Outer casing	polyamide (PA)	polyurethane (PUR)	polyurethane (PUR)
Outer diameter	2,2 mm ± 0,07 mm	6,0 mm ± 0,2 mm	3,0 mm
Bend radius	> 50 mm	> 80 mm	> 25 mm
Bend radius in cable trailing install.	--	> 100 mm	--
Tension resistance - short-term	150 N	150 N	330 N
Tension resistance - continuous	100 N	100 N	110 N
Cross tension resistance	450 N/cm	450 N/cm	1000 N/cm
Alternating bend endurance	> 8000 cycles ± 90°	> 100000 cycles ± 90°	> 10000 cycles ± 90°
Temperature range - storage	-40 °C .. +85 °C	-20 °C .. +80 °C	-40 °C .. +85 °C
Temperature range - operations	-40 °C .. +85 °C	-20 °C .. +80 °C	-40 °C .. +85 °C
Core diameter of optic cable	1000 µm	1000 µm	200 µm
Specific opt. Damping	< 250 dB/km	< 250 dB/km	< 8 dB/km

Fig. 8-11: Fibre-optics cable technical data

General Safety Guidelines

DANGER

High-energy light
Risk of blindness and eye injury
⇒ Do not look into the light (transmitter output or fiber optic cable end)

CAUTION

Error during mounting or when handling
fiber optic cable components could be mechanically damaged
⇒ Do not screw fiber optic cable connector in too tightly

CAUTION

Error during mounting or when handling
fiber optic cable could be damaged
⇒ Mechanical limit values must be maintained

Handling

Connecting the Fibre-Optics Cables

Connections transmitter side

Fibre-optics cables are connected as follows at the transmitter
TX (PPC-R)
X10 (DSS 2.1 in DIAX03 or DIAX04 and ECODRIVE)
X20 (ECODRIVE03).

Connections receiver side

Fibre-optics cables are connected as follows at the receiver
RX (PPC-R)
X11 (DSS 2.1 in DIAX03 or DIAX04 and ECODRIVE)
X21 (ECODRIVE03).

Storage

When storing the fibre-optics cables, please note that

- the protective caps must be in place
- the mechanical limit values are maintained
- the thermal limit values are maintained.

Routing and Mounting

When routing and mounting the fibre-optics cables, please note that the specific load data do not damage the fibre-optics cables.

Bend radius The minimum bend radius may not be exceeded (e.g., when routing around corners).

Cross stress The maximum cross stress may not be exceeded (e.g., when routing around corners). In cable channels, please note that the fibre-optics cable is not subjected to excessive cross stress. This can be caused for example by the weight of power cables.

Routing over sharp edges or pointy, uneven surfaces must be avoided. Any cuts or mechanical damage could cause interference.

Do not twist fibre-optics cable Avoid twisting the fibre-optics cable when routing. There may be no tension in the final position of the fibre-optics cable.

8.3 Set-Up

Preparations

The correct connection of the fibre-optics cable should be checked before by hand. Is the transmiter output (TX) connected to a receiver input (RX)?

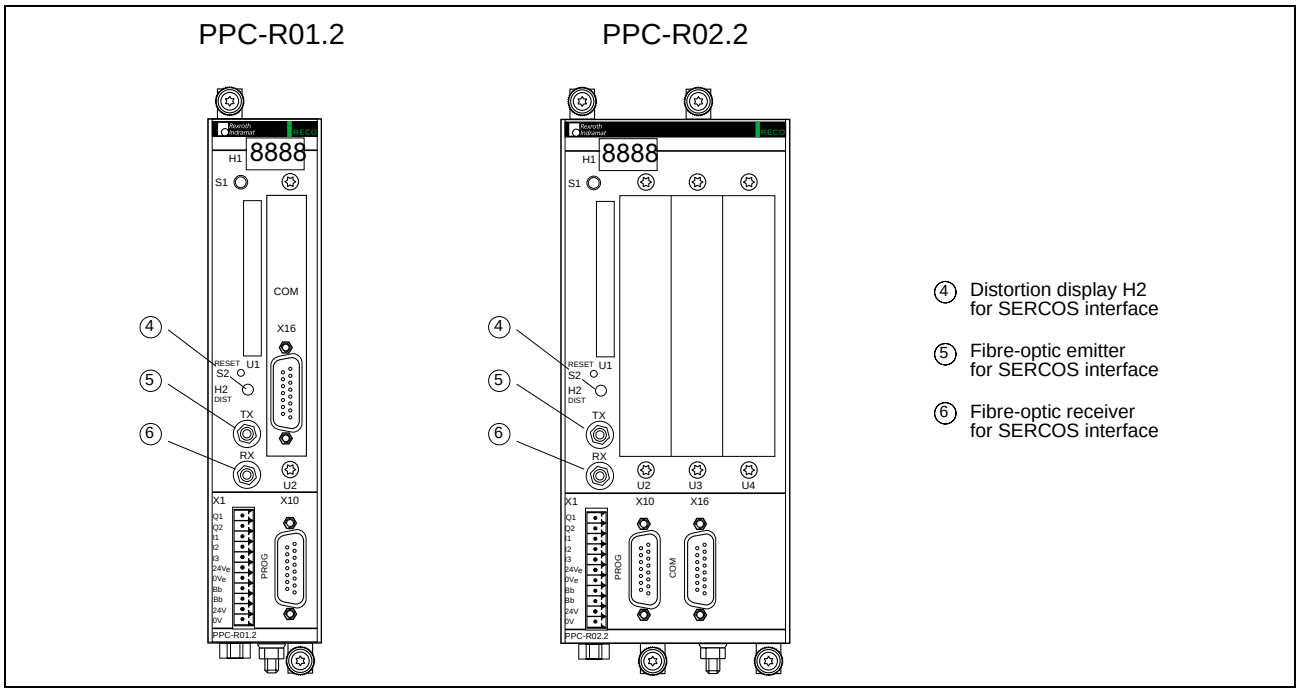


Fig. 8-12: Connections PPC

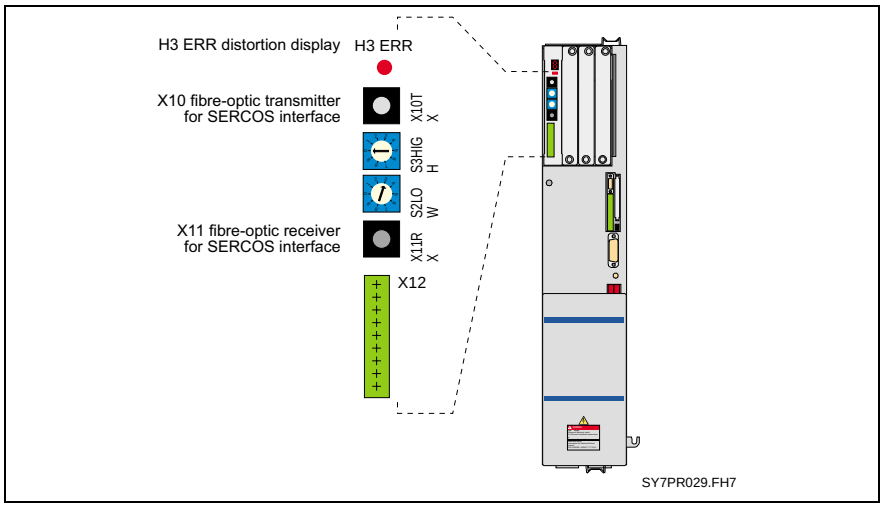


Fig. 8-13: Connections DSS 2.1 (DIAX03/DIAX04)

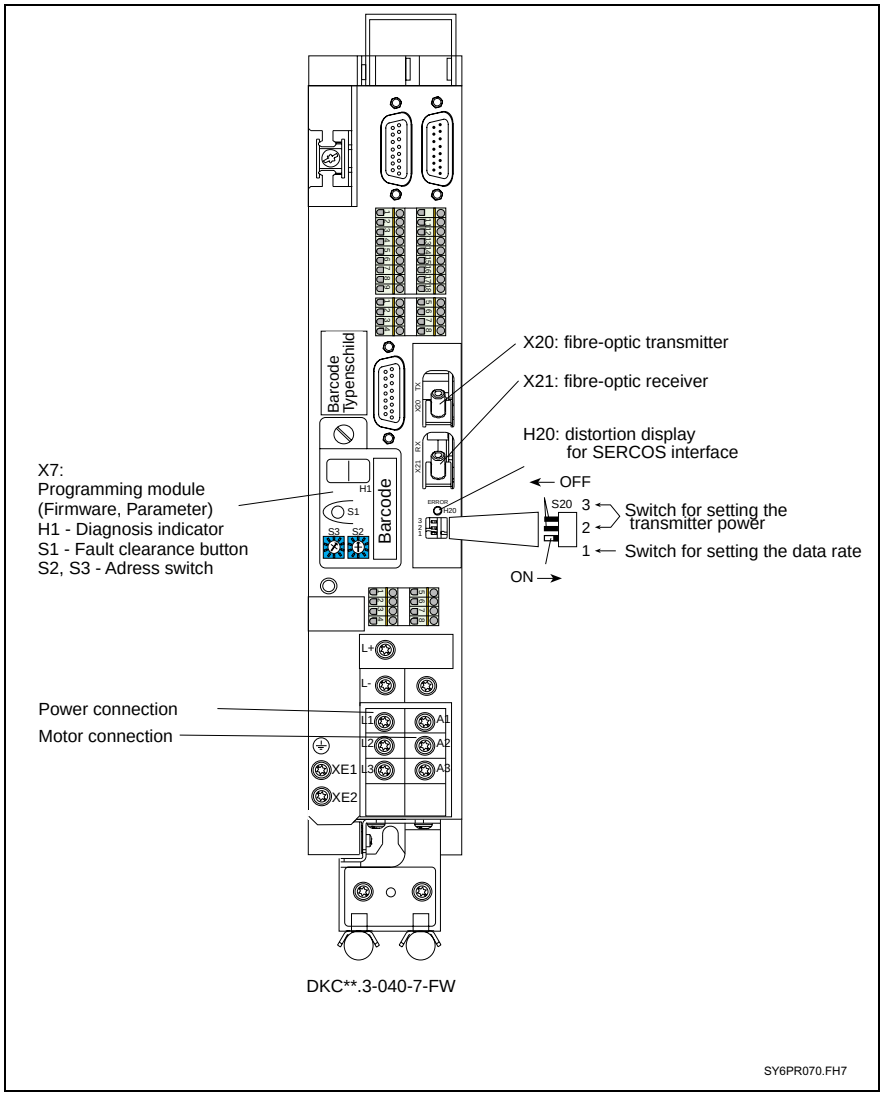


Fig. 8-14: Connections DKC02.3 (ECODRIVE03)

Setting Drive Address

The address is set at every drive (see Fig. 8-13 or Fig. 8-14). It must be unique in each SYNAX200 ring. There may not be two drives with the same address. Permitted addresses lie within the range of [1..40].

The machine can now be switched on.

Check Distortion Display

The next step is to check whether there is a sufficient optical level at each participant, in other words, make sure that the receiver is neither over nor under-controlled.

Distortion display may neither light up or glow!

Generally, the distortion display is dark (see Fig. 8-12, Fig. 8-13 or Fig. 8-14: LED H2, H3 ERR or H20). If it lights up, then the transmission path "ahead of" the participant must be checked.

Control - starting with the transmitter output of the control - in signal direction, the distortion display of the drive (see Fig. 8-13 or Fig. 8-14).

The distortion display of the PPC is the LED H2 DIST. The distortion display of the drives is LED "H3 ERR" or "H20".

Check distortion display in "light direction

Check the first drive in the ring. If its distortion display is dark, then proceed to the next drive. This procedure is followed until the final drive and then the PPC is checked.

If one of the displays is not dark, then the following must be checked:

- has the transmission path been correctly set?
- has the output power of the previous drive in the ring been correctly set?
- is the fibre-optics cable to the previous drive defective?

See section "Clearing Errors", chapter 8.4, for checking transmission rates and output power.

8.4 Clearing Errors

Communications errors are signalled via the following diagnoses:

Dis-play	C-0-0048 Error number	C-0-0047 Diagnostics text	C-0-0046 Diagnostics info
F01	01	""SERCOS interface - ring break"	10000h
F02	02	"SERCOS interface - no drive connected"	10000h
F05	05	"SERCOS interface - double drive telegram failure"	n = address
F06	06	"Fiber optic ring ring not closed"	10000h
F07	07	"drive addresses not correct (see C-0-0002, C-0-0086)"	10000h

Fig. 8-15: Error messages generated by communications errors

The causes could be:

- incorrectly set drive addresses
- incorrectly parametrized parameters C-0-0002 or C-0-0086
- incorrectly set transmission rates
- incorrectly set output power
- defective fibre-optics cable.

Use of Distortion Display

A distortion display (see Fig. 8-12: "H2", Fig. 8-13: "H3 ERR" or Fig. 8-14: "H20") lights up in the following cases:

- incorrectly set transmission rate
- incorrectly set output power
- defective fibre-optics cable

If a distortion display does light up, then check:

Checking the transmisison rate The transmission rate must be checked at the PPC and the respective drive (see Fig. 8-16, Fig. 8-17).

Checking output power Output power must be checked at the PPC and the physical predecessors of the relevant drive (see Fig. 8-16, Fig. 8-17).

Checking the fiber optic cable Check the fibre-optics cable from the physical predecessor to the relevant drive.

Setting the Transmission Rate

The transmission rate is set to 2 MBit/s. This is set at the time of delivery for both PPC and the drives so that generally speaking nothing has to be set here.

PPC The transmission rate is set on the PPC in parameter "SERCOS interface - configuration" (C-0-0038). The contents of this parameter must equal ’0000000000000000’.

DIAX03, DIAX04 (DSS 2.1) The transmission rate is set with help of switch S4 on the communications board DSS 2.1. For a transmission rate of 2 MBit/s the switch must be set to ’OFF’.

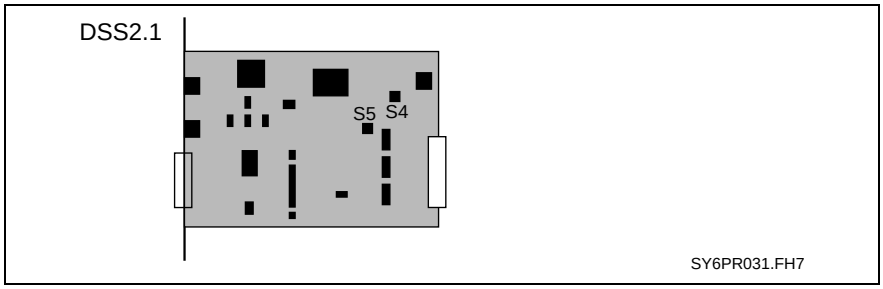


Fig. 8-16: DIP switch of the DSS 2.1 (DIAX03, DIAX04)

ECODRIVE03 (DKC02.3)

The transmission rate is set with the help of switch S20,1 on the front panel. For a transmission rate of 2 MBit/s the switch must be set to 'OFF' (=in front).

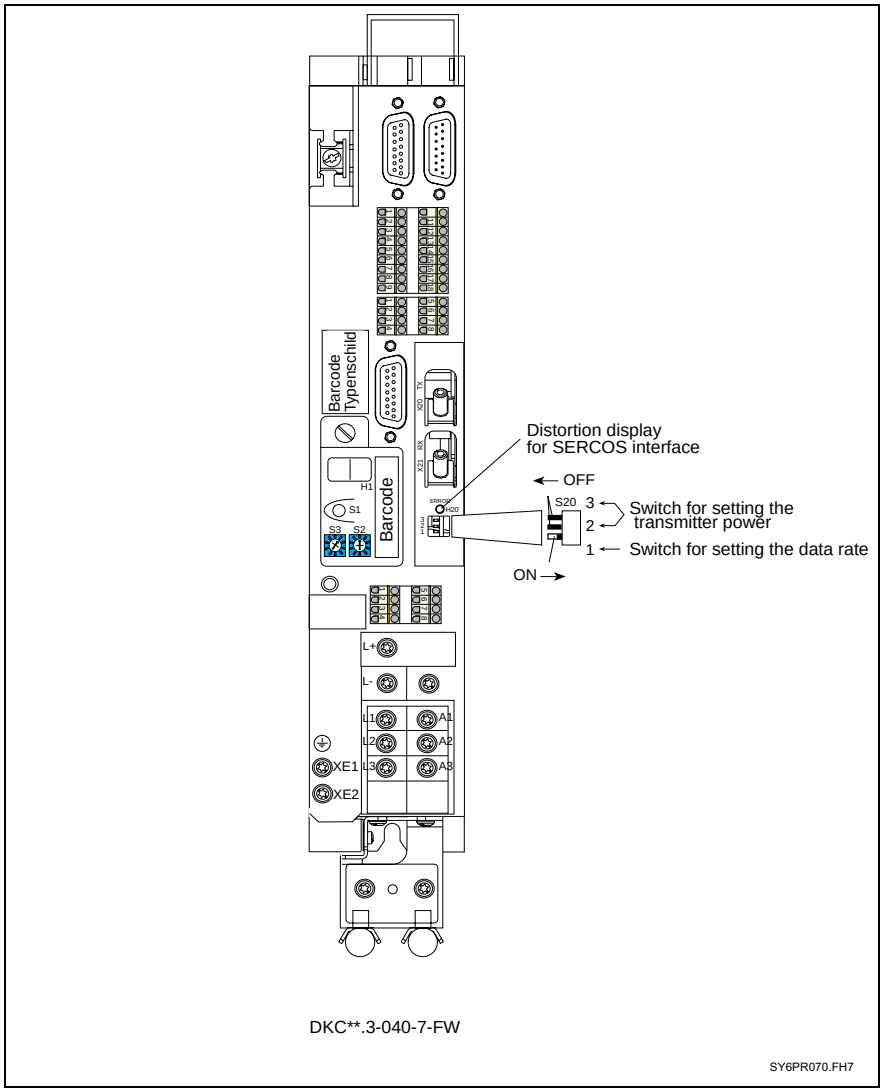


Fig. 8-17: DIP switch of the DKC02.3 (ECODRIVE03)

Setting the Optic Output Power

PPC

The output power of the PPC is parametrized using the parameters "fibre-optics cable (LWL) length" (C-0-0007). If plastic fibre-optics cables are used, then the length of the fibre-optics cable connected to the transmission output is set here. With glass fibre-optics cables, a length of 50.0 m must be set here.

DIAX03, DIAX04 (DSS 2.1)

Output power is set via switches S5A and S5B on the DSS 2.1 card (see Fig. 8-16).

ECODRIVE03 (DKC02.3)

Output power is set via switches S20,2 and S20,3 on the front panel (see Fig. 8-17).

If plastic fibre-optics cables are used then see Fig. 8-18. If glass fibre-optics cables are used then see Fig. 8-19.

Fibre-optics cable length	**0 .. 15 m**	**15 m ..30 m**	**30 m .. 50 m**
DIAX03, DIAX04	S5A = OFF S5B = OFF	S5A = ON S5B = OFF	S5A = ON S5B = ON
DKC02.3	S20,2 = OFF S20,3 = OFF	S20,2 = ON S20,3 = OFF	S20,2 = ON S20,3 = ON

Fig. 8-18: Setting the output power with plastic fibre-optics cables

Fibre-optics cable length	**0 .. 500 m**
DIAX03, DIAX04	S5A = ON / S5B = ON
DKC02.3	S20,2 = ON / S20,3 = ON

Fig. 8-19: Setting the output power with glass fibre-optics cables

Checking the Fibre-Optics Cables

If both transmission rates and output power have been correctly set, (see section "Clearing Errors", chapter 8.4) and communications still will not function, then it is possible that the fibre-optics cable has a defect. In this case, the distortion display will also light up.

The cause of a defective fibre-optics cable can be damage or poor manufacture (e.g., connector mounting).

A defective fibre-optics cable can possibly be recognized by the fact that at the end of the fibre-optics cable hardly any light is visible or the optical fibre has been "pulled in backwards" into the connector. Check the face of the connector. Other fibre-optics cable checks cannot be conducted without the appropriate tools.

The only remedial action is the exchange of the defective fibre-optics cable.

9 PPC Link

9.1 General Information

Several PPC motion controls can be combined to create one PPC link with which the following axes can be assigned to different master axes

This combination of PPC motion controls is accomplished with the help of PPC plug-in card DAQ. All DAQ boards are connected with a fibre-optics cable (LWL) ring thereby creating the PPC link.

Communications within the PPC link implements, as does the SYNAX200 ring, a fibre-optics cable ring.

Simple and double ring

The PPC link can be built on a simple or double LWL ring.

Plug-in card DAQ

The DAQ board DAQ03 supports not only double but single rings as well.

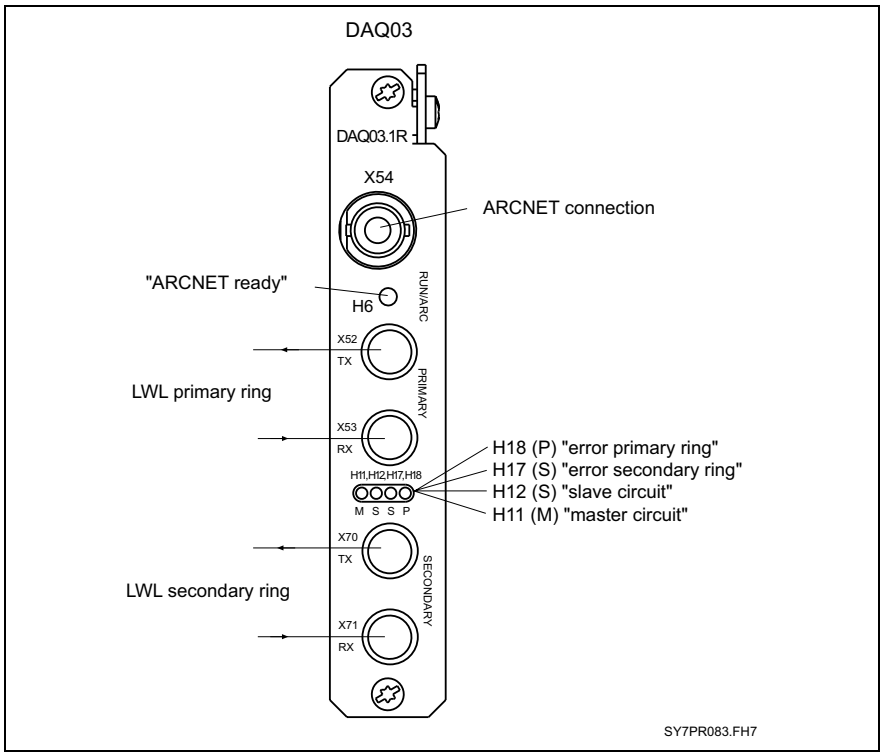


Fig. 9-1: Front view of plug-in card DAQ03

Max. 32 PPCs in a link

Up to 32 PPC motion controls can be combined to one PPC link.

Link addresses

Each link participant receives a link address. The link address is set via parameter "PPC link - address" (C-0-0179).

The link address must be within a range 1 ... 32.

9.2 PPC Link with Simple Ring

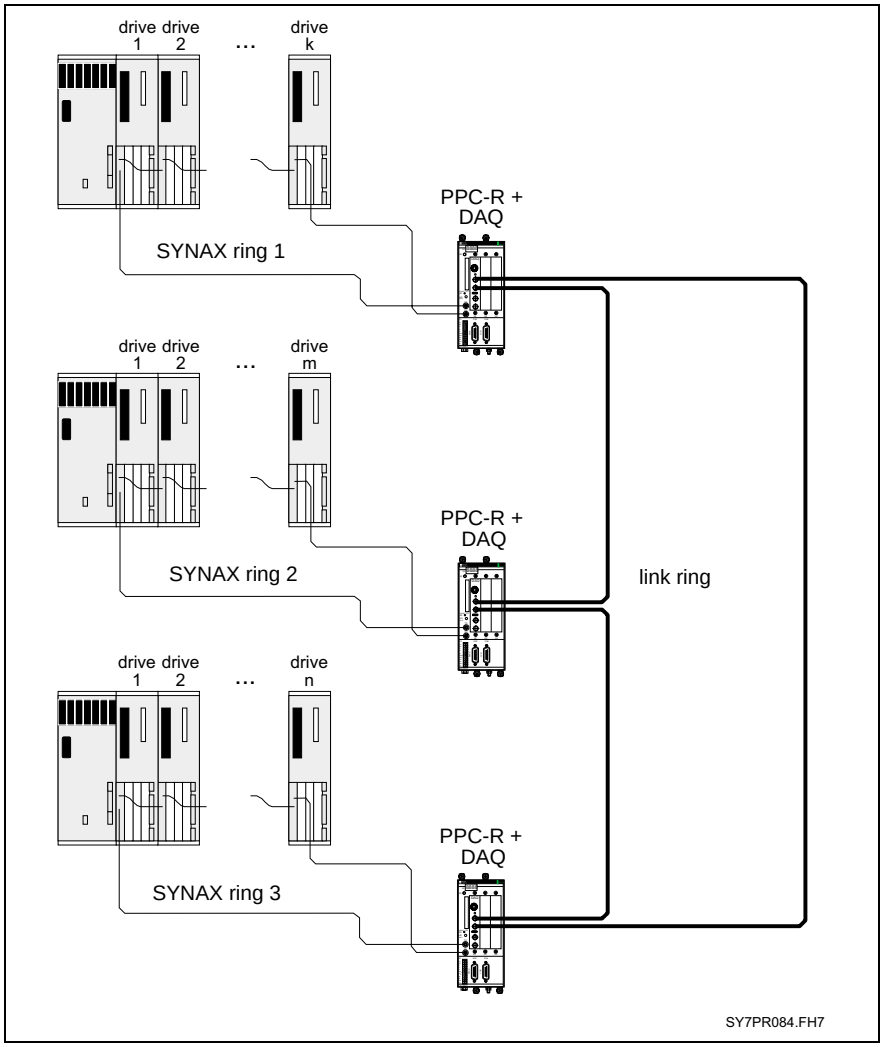


Fig. 9-2: PPC link with single ring

Simple ring: primary ring A simple ring only uses the primary ring. The secondary ring is not built.

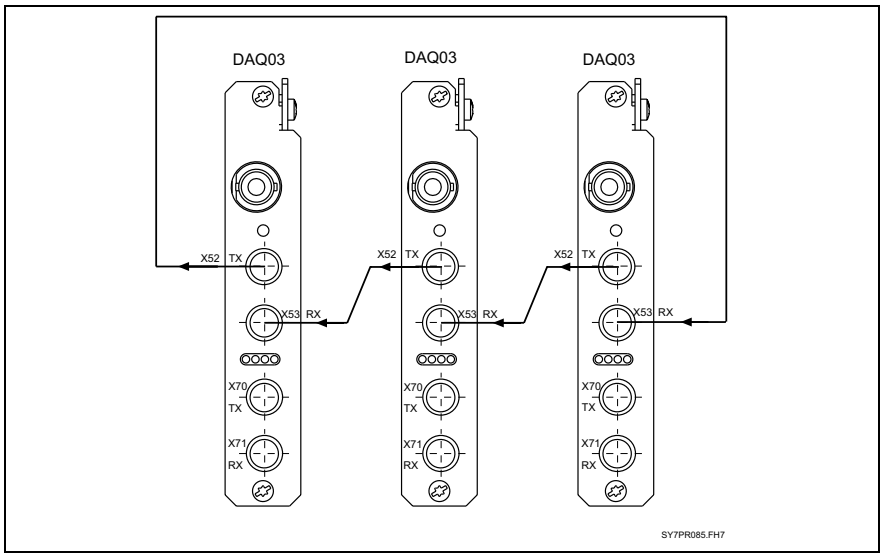


Fig. 9-3: LWL link in a simple ring

9.3 PPC Link With Double Ring

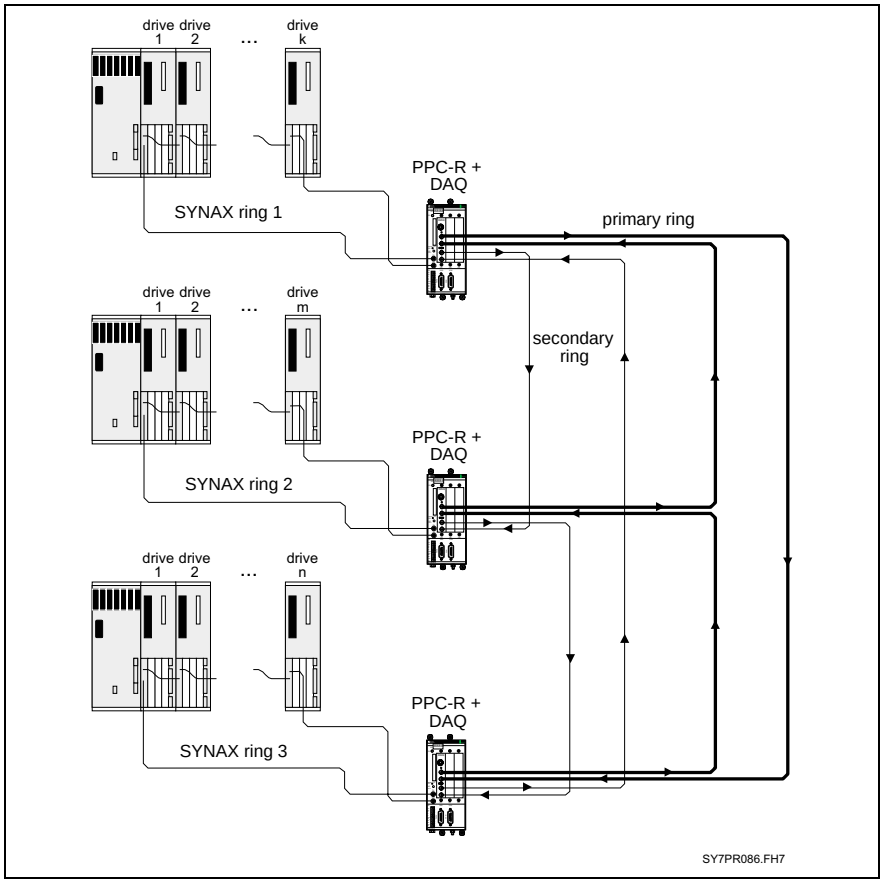


Fig. 9-4: PPC link with double ring

Primary ring, secondary ring

The primary ring is generally used for communication. The secondary ring only transmits diagnostics signals.

Note: The secondary ring must be connected - as shown - in a counter direction.

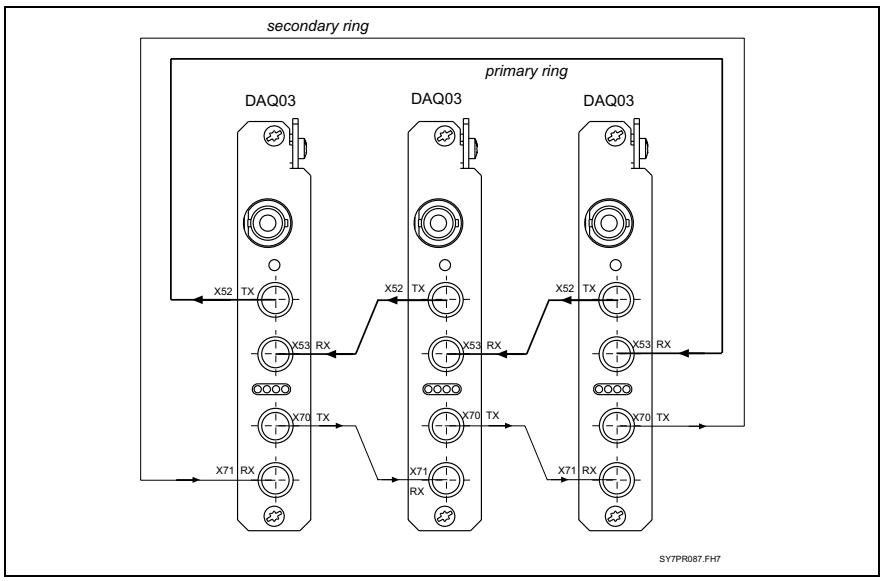


Fig. 9-5: LWL connections in a double ring

9.4 Configuration Example with PPC

With an eye towards increased machine availability PPC motion controls can become an own 24V electronic storage. So they can be supported as with master system UPS = uninterruptable power source.

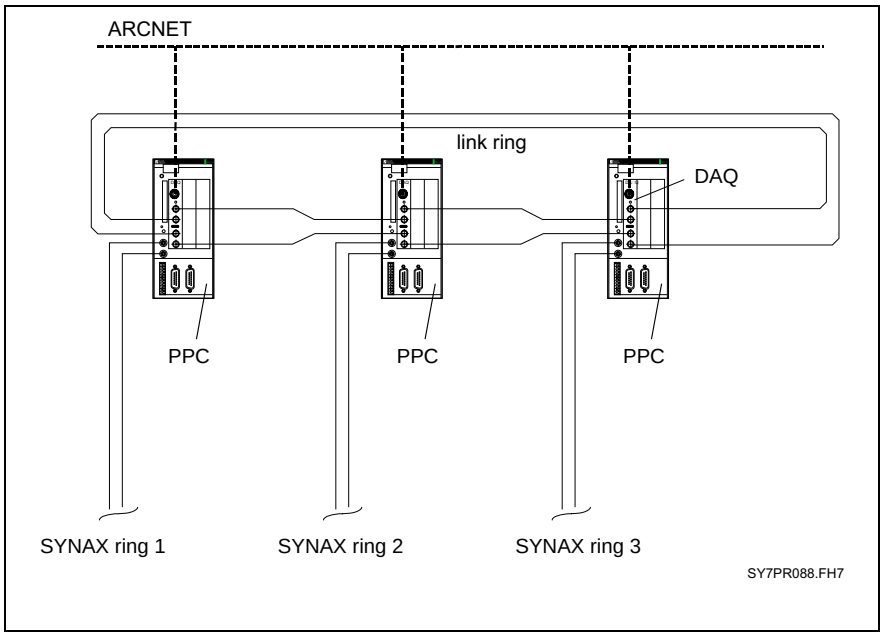


Fig. 9-6: Double ring configuration with PPC

9.5 Commissioning the PPC Link

General Information

Link address Each PPC needs a different link address. The link address is set with parameter "PPC link - address" (C-0-0179).

Parametrization The PPC link is parametrized via SynTop. An active PPC link is displayed on the DAQ03 using the H11 or H12 display.

Setting optical transmission power The optical transmission power of the primary or secondary rings is parametrized using SynTop.

Distortion display Using the distortion display of the DAQ (DAQ03.1R: LEDs H17 or H18) it is possible to check the quality of the optical receive signal.

Commissioning

First the PPC link and the fibre-optics lengths are parametrized via SynTop and the PPCs are brought into operating mode.

The active PPC link is displayed on displays H11 or H12 at each PPC using the parametrized PPC link. (Precisely one link master and several link slaves).

The H17 and H18 distortion displays must be checked and if necessary the transmission power of the immediate physical predecessor must be corrected or the fibre-optics lead checked for any damage.

In the case of a parametrized simple ring (no double ring) the H18 distortion displays will light up. This state is correct.

Clearing Errors

PPC link problems are signalled with binary PPC outputs and the following diagnoses

Dis-play	C-0-0048 Error number	C-0-0047 Diagnostic text	C-0-0046 Diagnostic information
F40	40	"PPC link - transmission path defective"	10000h
F42	42	"PPC link - master position fault (MDT)"	10000h
F43	43	"PPC link - master position fault (AT)"	n = address
F44	44	"PPC link - link address set - not permitted"	10000h
F93	93	"DAQ: SERCOS interface - ASIC: intialization error"	10000h
F15	190	"PPC link - other link master already active"	10000 h

Fig. 9-7: Error messages with PPC link errors

In such cases, the H11, H12, H17 and H18 displays can be used to locate the cause.

Causes can be:

- incorrectly set transmission power of primary and secondary rings
- wrong parametrization of PPC link (simple ring, double ring, no PPC link)
- defective fibre-optics cable.

10 Set-Up Interfaces

10.1 General Information

The PC set-up software SynTop is connected to the PPC by means of a serial interface. This uses the PPC interface X10 or X16. The choice of the interface can be made using a parameter. The interface X10 is galvanic seperated and therefore it should be used preferably.

10.2 Connecting the PPC

Use the standard control cable IKB0005 to connect the PPC.

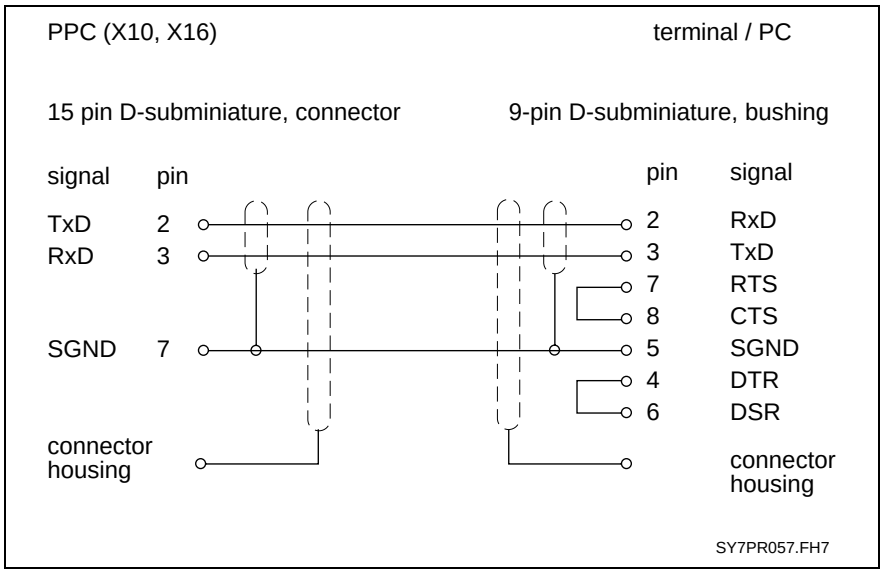


Fig. 10-1: IKB0005

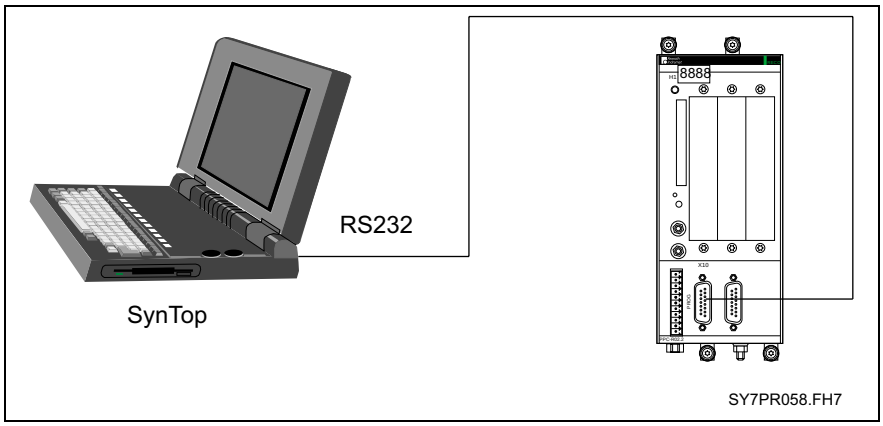


Fig. 10-2: Connecting SynTop to the PPC

10.3 RS485 Link

SynTop can communicate with many PPCs using an RS485 link.

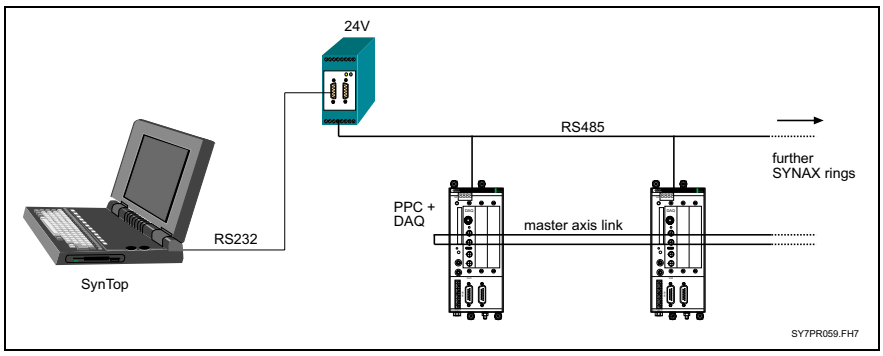


Fig. 10-3: RS485 link of SynTop to multiple PPCs

This necessitates couplers from RS485 to RS232 for the connection of the PC to the RS485 link.

An example is the coupler interface module PSM-EG-RS232/RS485-P/2D made by Phoenix Contact.

Interface Module PSM-EG-RS232/RS485-P/2D

The RS485 directional switches of the module uses the RTS signal. with these cables the TxD of the sender is connected to the RTS of the module, i.e. with each 1 bit there is a switch to transmit.

Switch settings:

- 180R BUS-END ON (only at the end of the bus)
- S1 on DTE
- RTS/CTS high-active (bridge jumper X6 from pin 3 to pin 4)

With switch 180R BUS-END a matching resistor 180R and each 470R against +5V and GND can be connected to the bus end.

The voltage supply for the interface modules comes from 24 V which is connected via the intended screw-in clamps.

Cable converter <->PC

The cable from interface module to PC is constructed as follows:

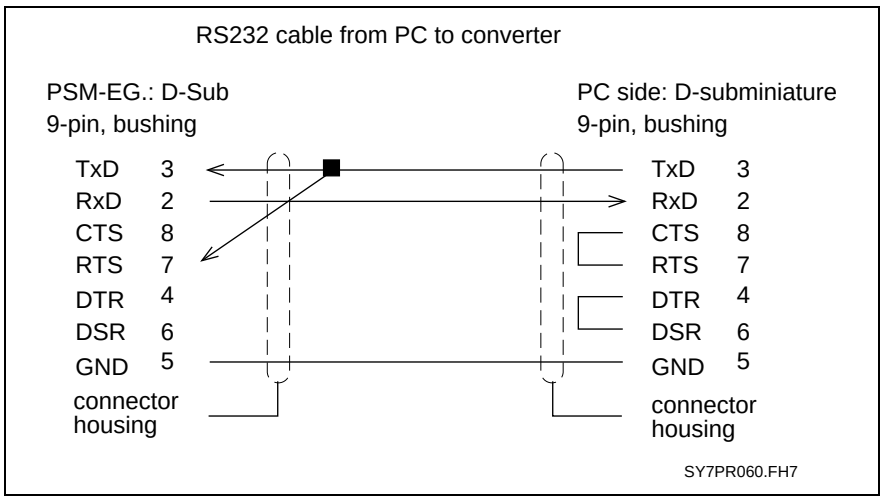


Fig. 10-4: RS232 cable from PC to converter

RS485 Connection of the PPCs

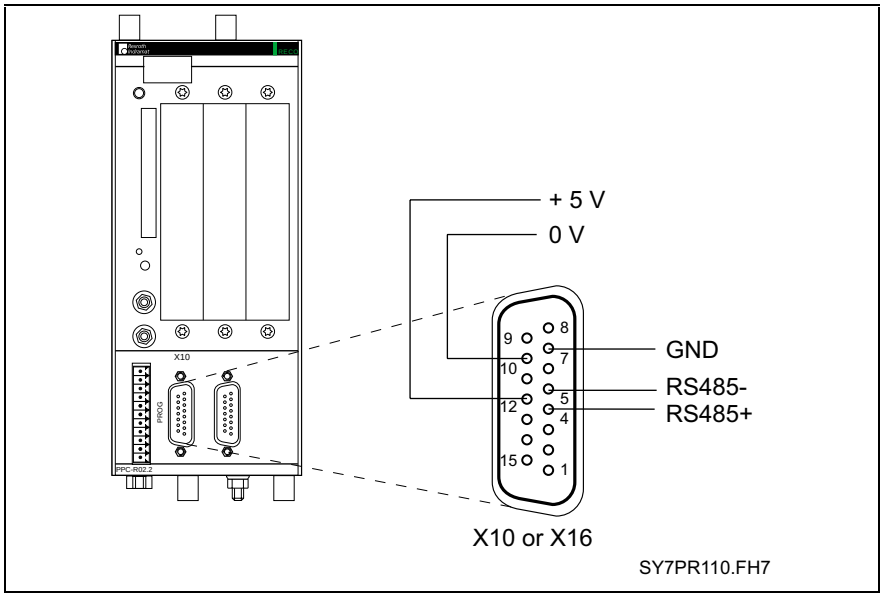


Fig. 10-5: RS485 connection of the PPC

RS485 Connection of the Interface Module

On RS485, the D(A) and D(B) are twisted in pairs and connected. GND is also connected. These can be connected to the interface module using either screw-in clamps or male D-subminiature 9-pin connectors (bushing is on the module).

Connector: D(A) data negative pin 8, D(B) data positive pin 3, GND pin2.

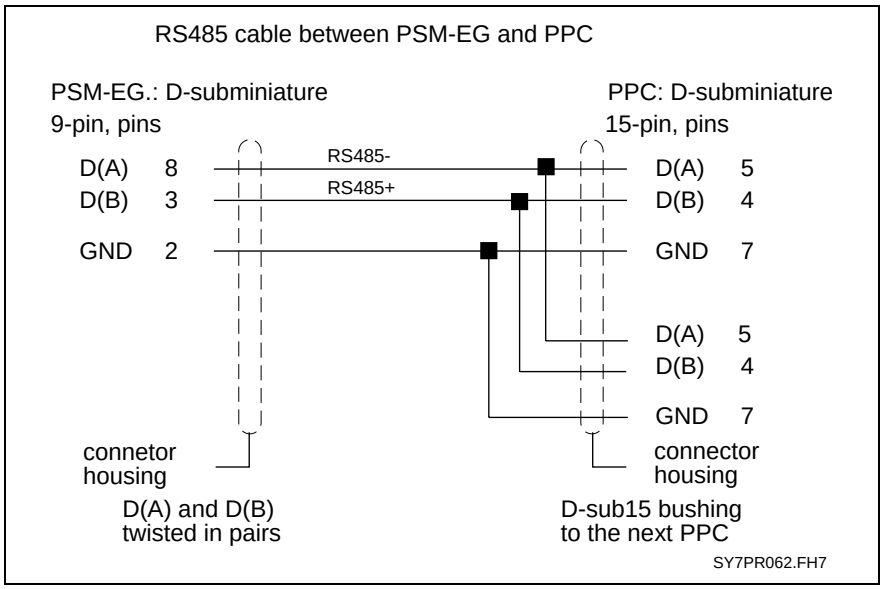


Fig. 10-6: RS485 cable between converter PSM-EG and PPC

RS485 Cable

The RS485 bus cable should be shielded and twisted in pairs. The diameter should equal at least 0.22mm^2, with a characteristic impedance of 100-120Ω.

The shield is applied at both ends of the transmission path. If equipotential currents are expected, then one side is directly grounded and the other is grounded via a 15nF capacitor.

Bus Matching

The bus matching must be effected on both bus ends. If a bus end is constructed with RS485 coupler above, then the bus matching in the coupler can be connected via switch in the coupler.

Power supply of the bus machting can also be received by the PPC.

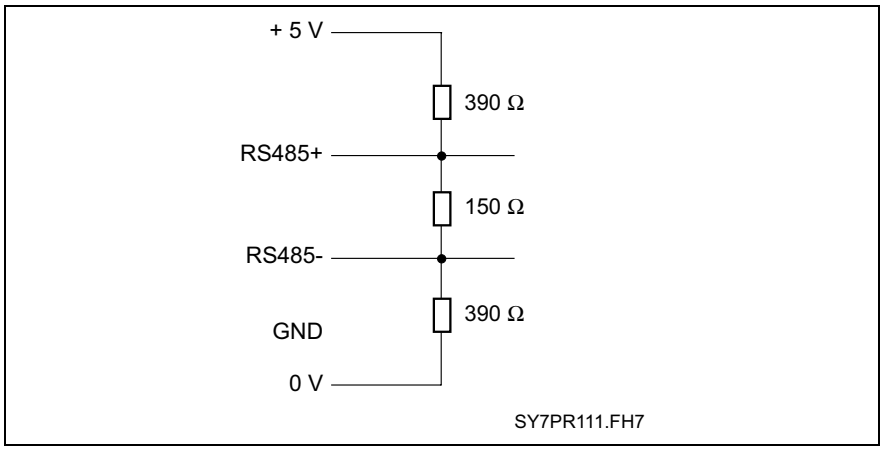


Fig. 10-7: Power supply of the bus matching via PPC

11 Appendix

11.1 Dimensional Sheets, Terminal Diagrams RECO

Mounting Dimensions Module Carrier RMB02.2-02

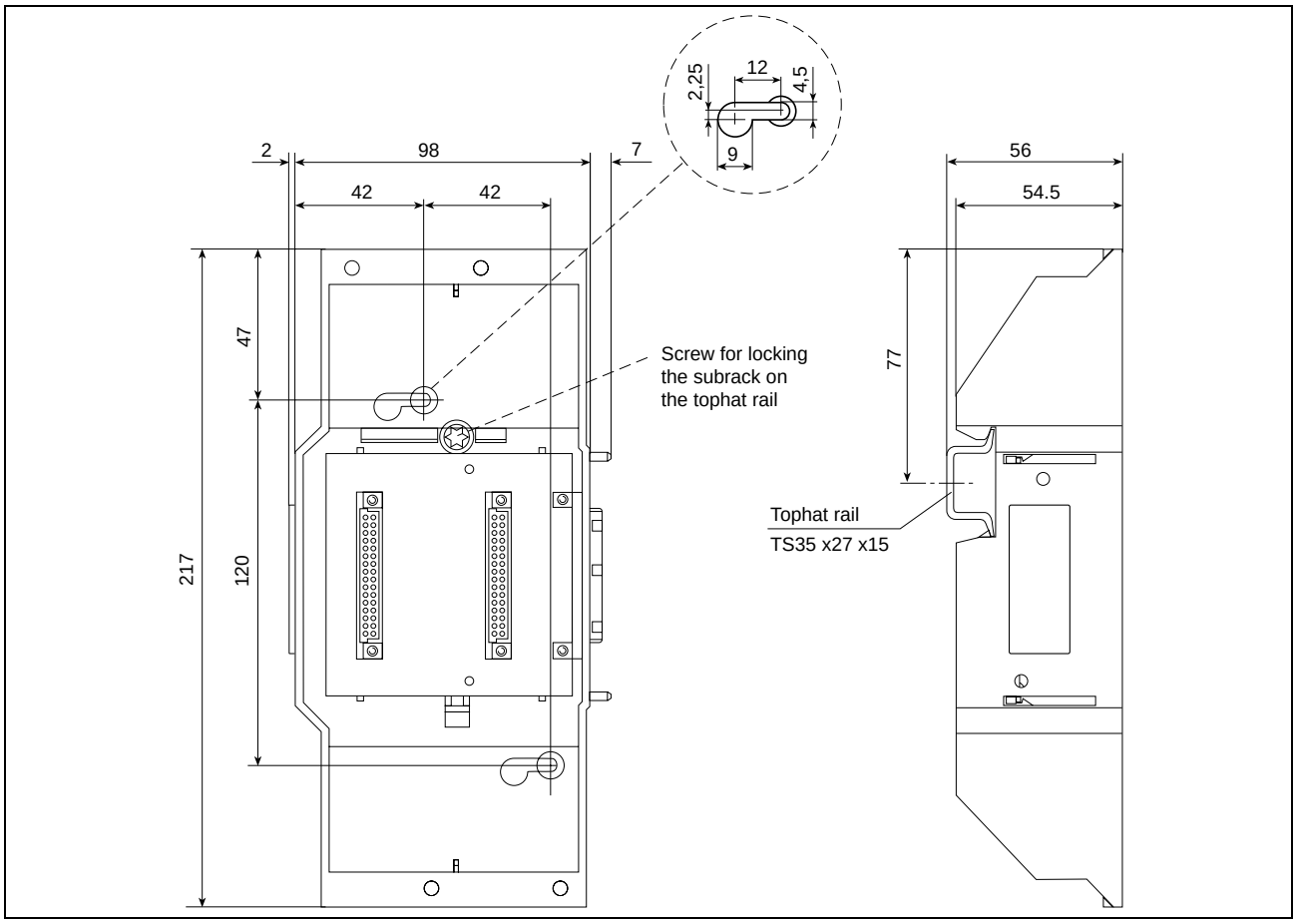


Fig. 11-1: Module carrier RMB02.2-02

Mounting Dimensions Module Carrier RMB02.2-04

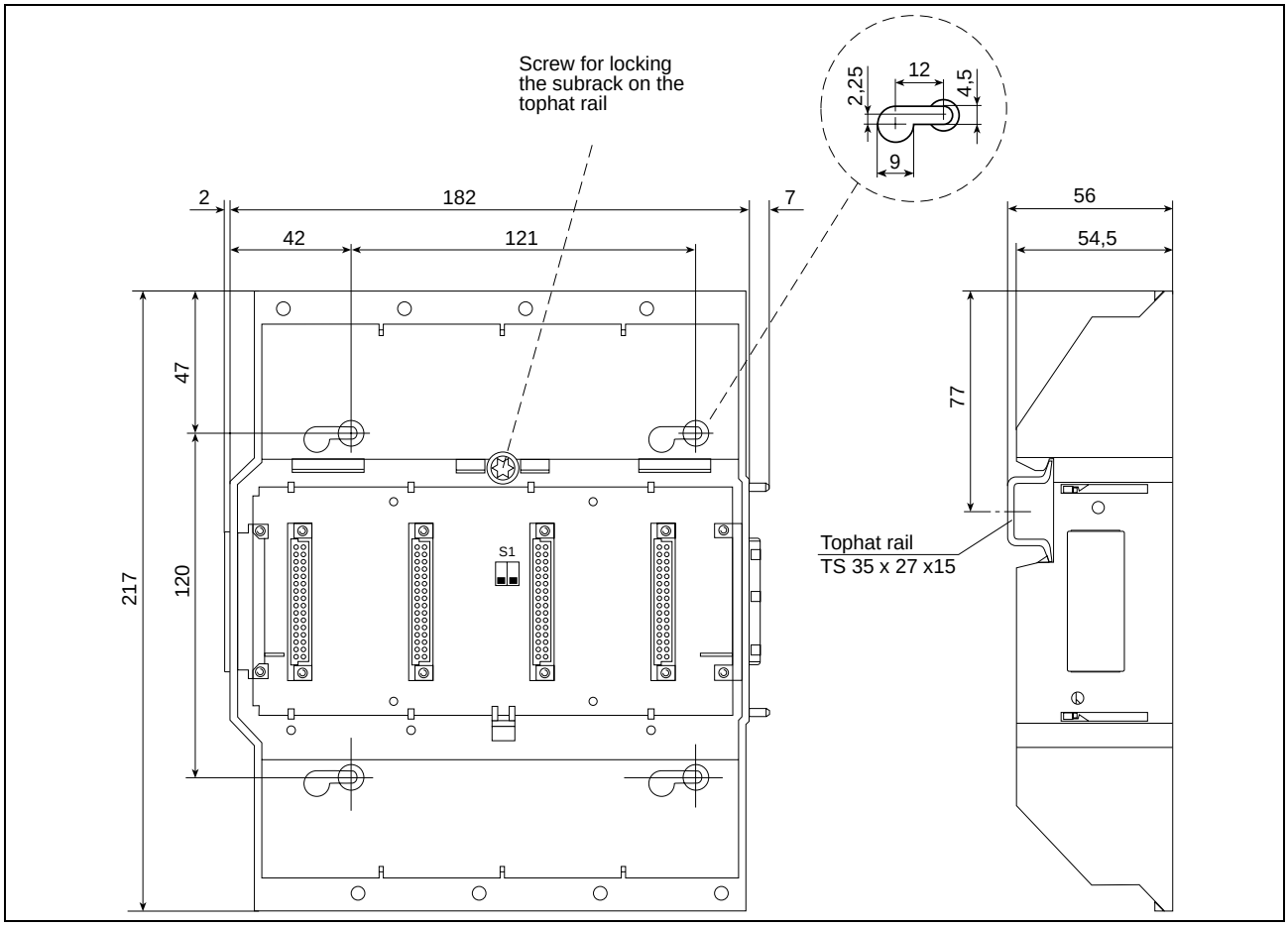


Fig. 11-2: Module carrier RMB02.2-04

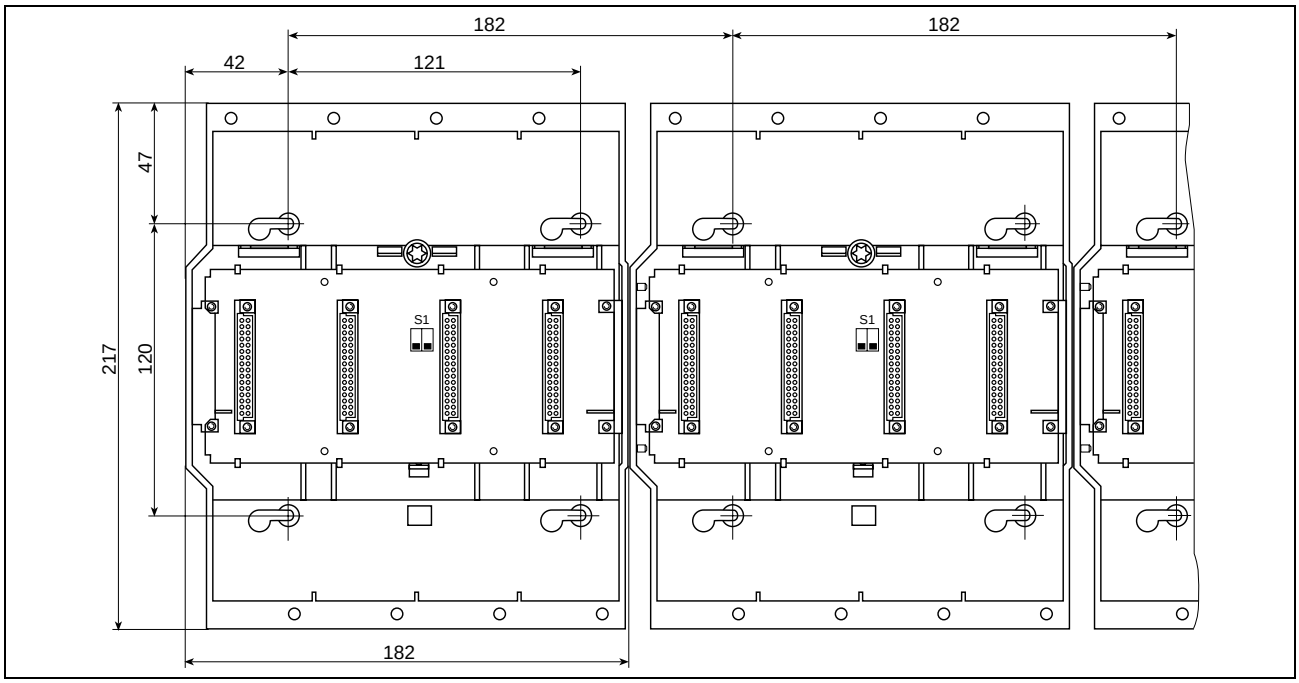


Fig. 11-3: Side-by-side installation of several RMB02.2-04 module carrier

PPC-R01.2 and PPC-R02.2

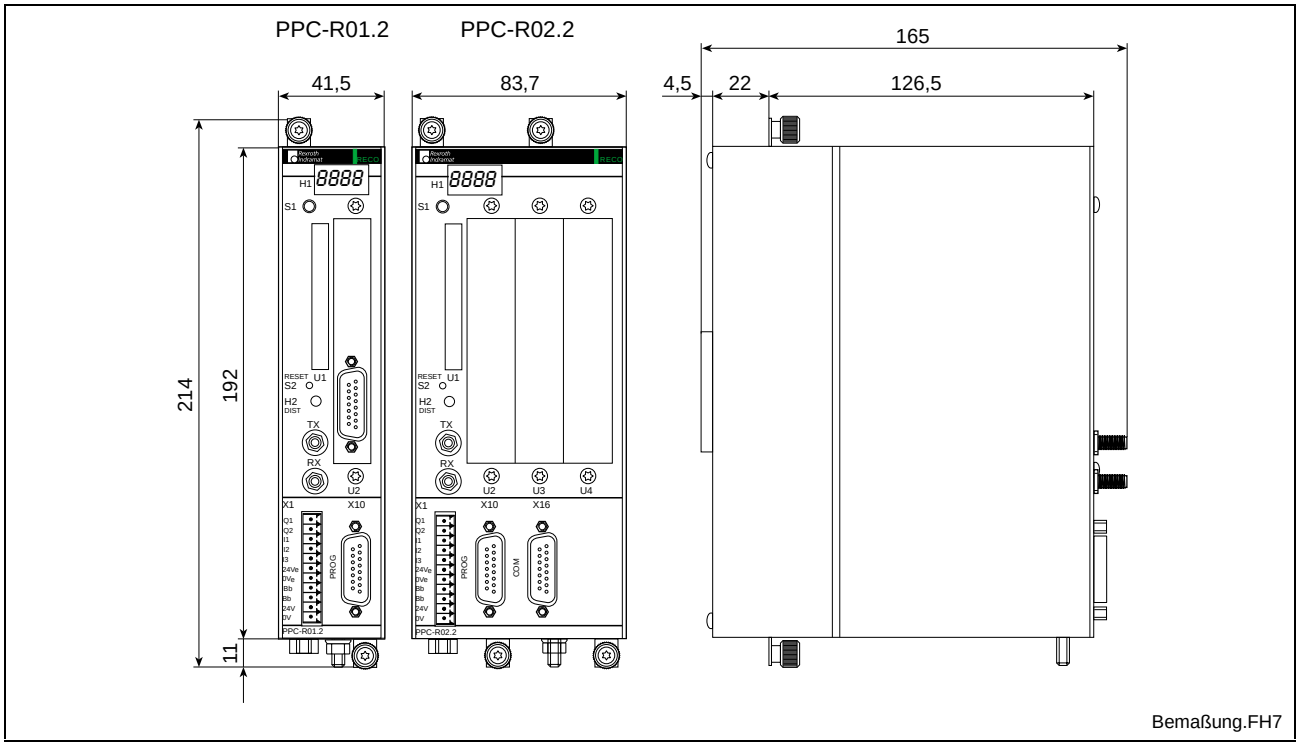


Fig. 11-4: Dimensioanl sheet PPC-R01.2 and PPC-R02.2

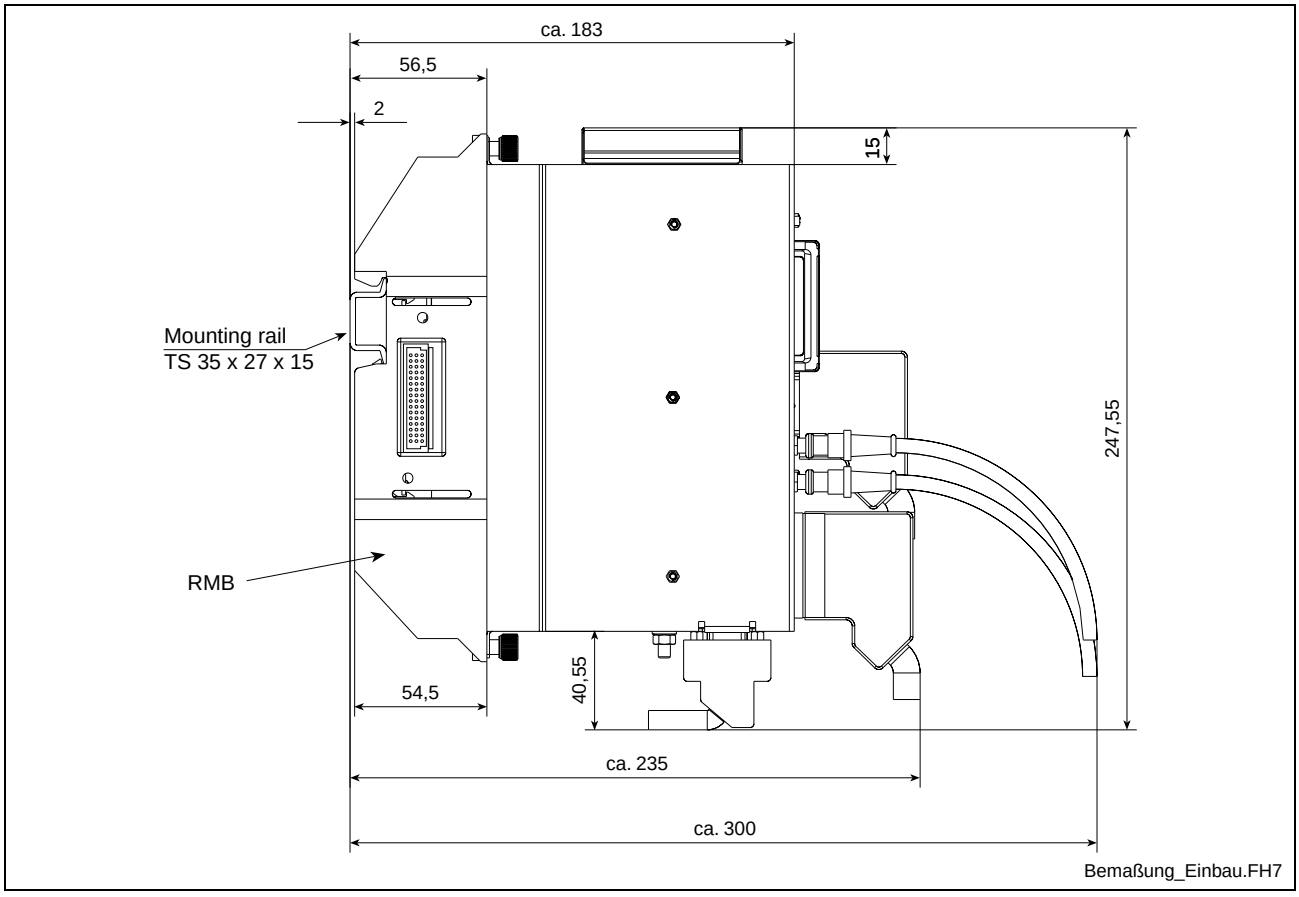


Fig. 11-5: Mouting dimensions PPC-R01.2 and PPC-R02.2

DAQ03.1R

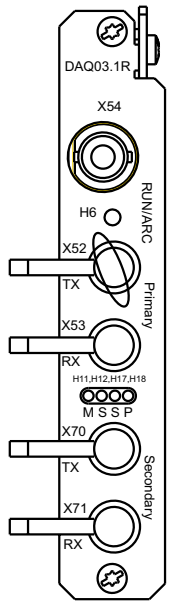


Fig. 11-6: DAQ03.1R

Profibus Interface DPS01

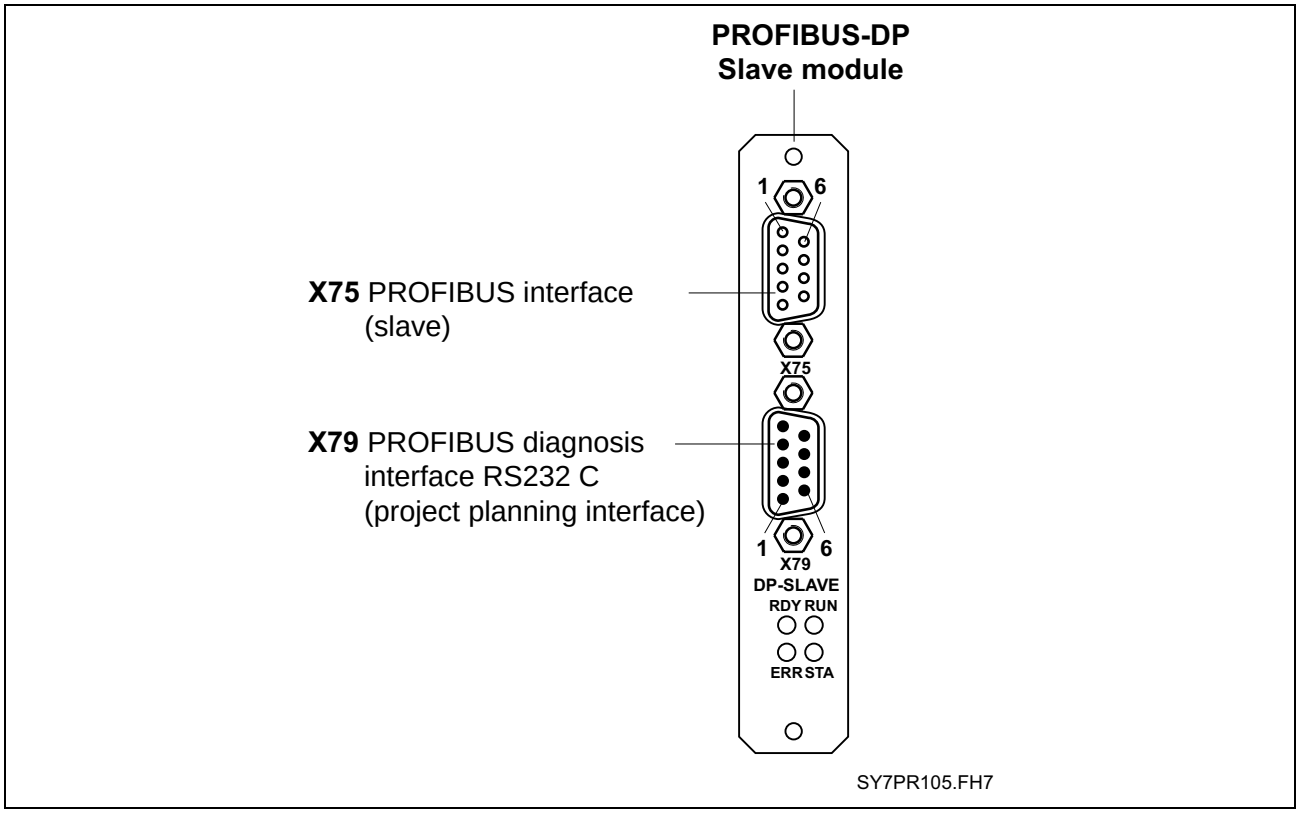


Fig. 11-7:Profibus interface DPS01

INTERBUS Interface IBS03

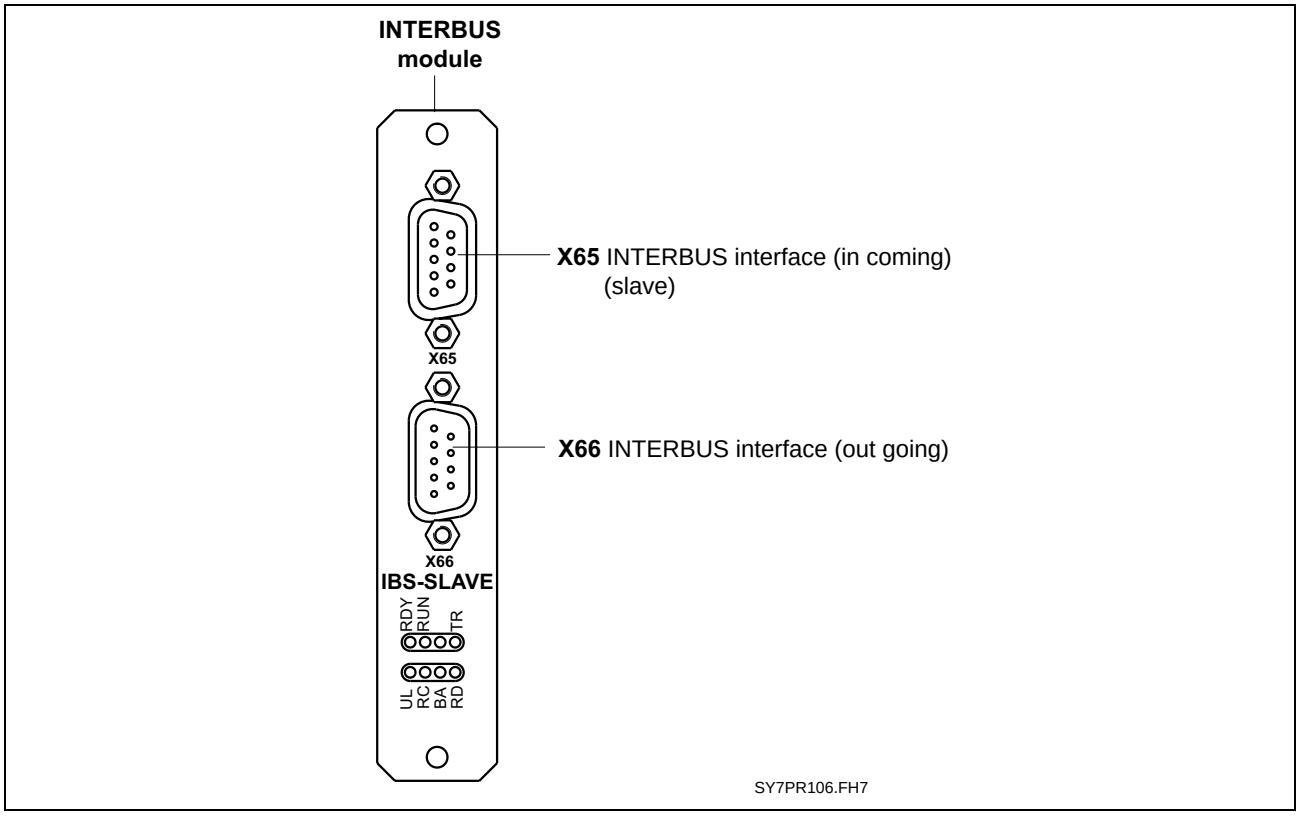


Fig. 11-8: INTERBUS interface IBS03

DeviceNet Interface DNS03

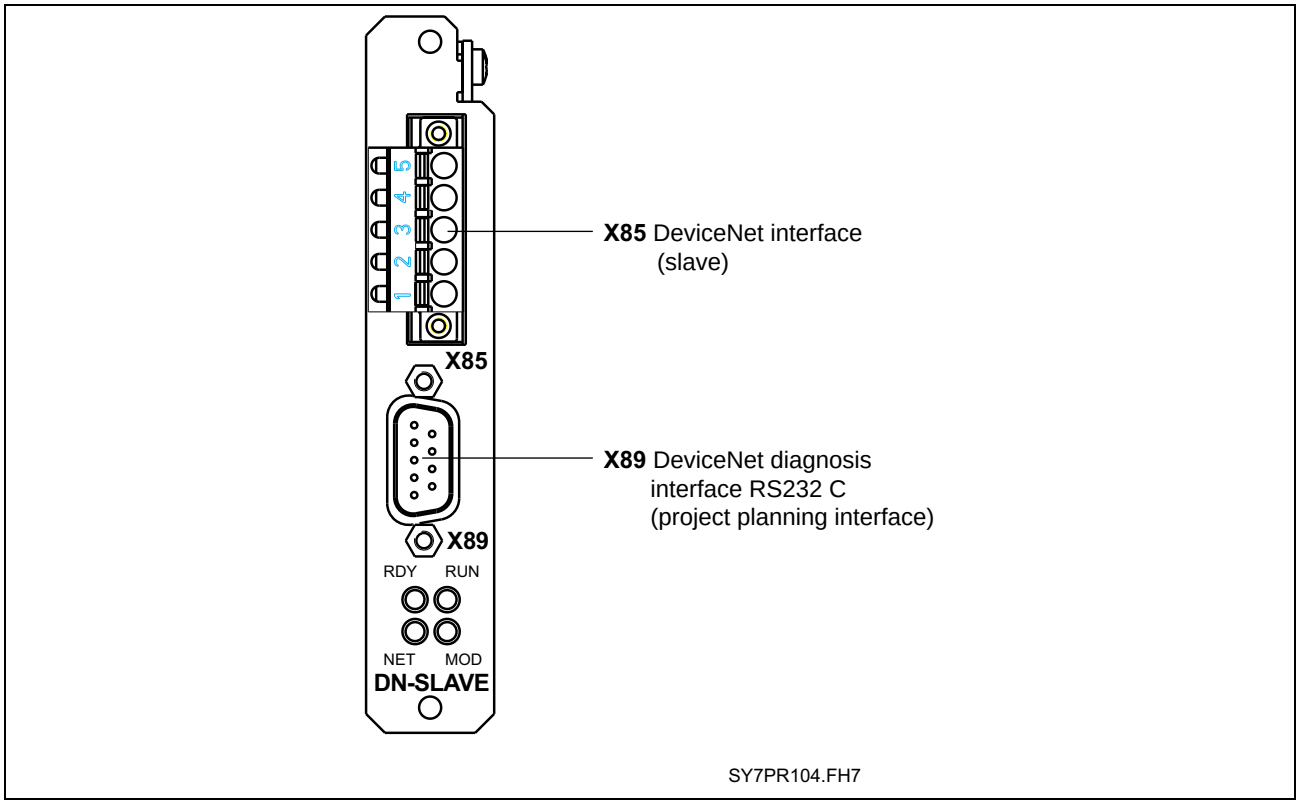


Fig. 11-9: DeviceNet interface DNS03

RME02.2-16-DC024 Input Module

Brief Description

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

Mounting Dimensions

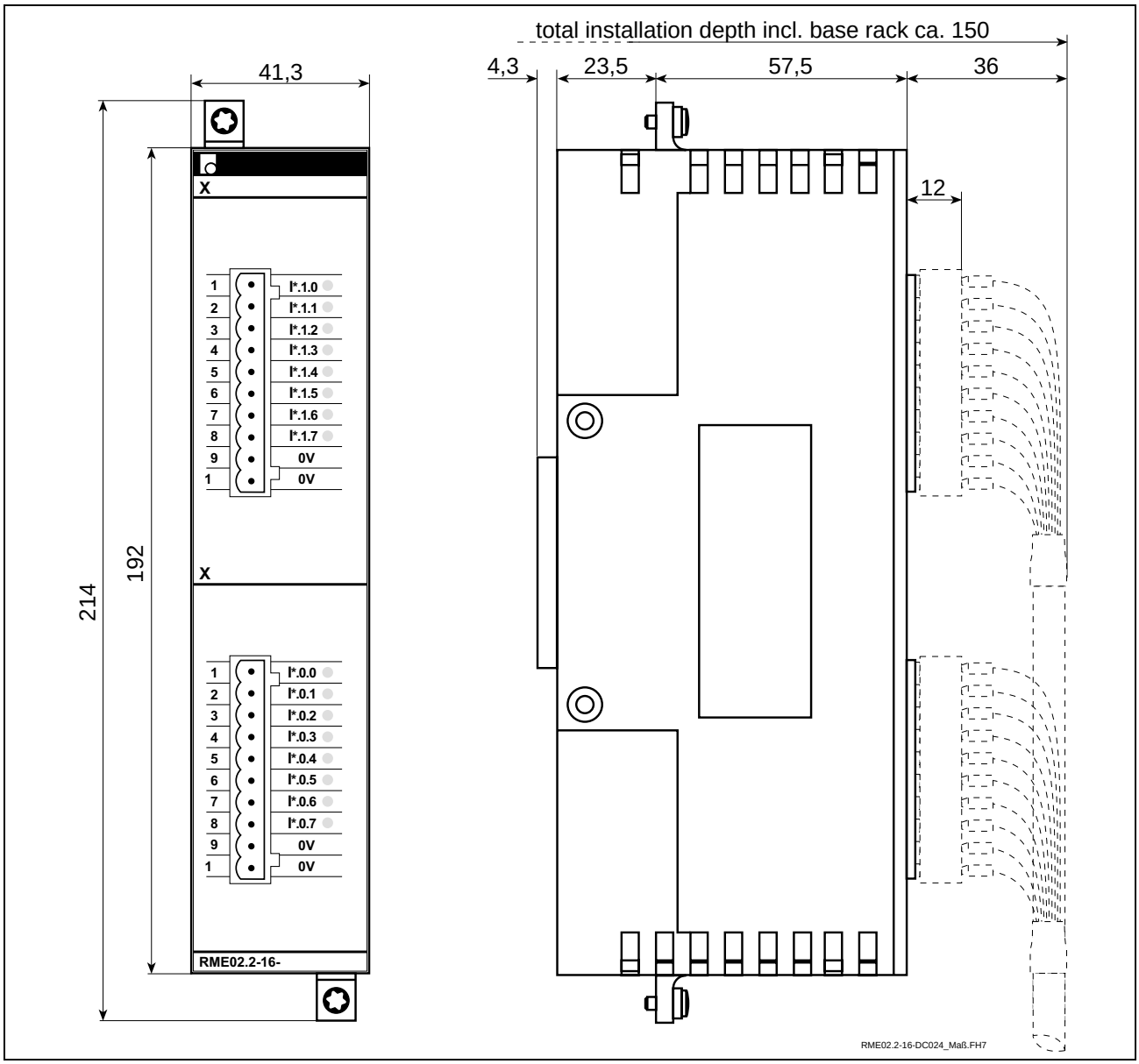
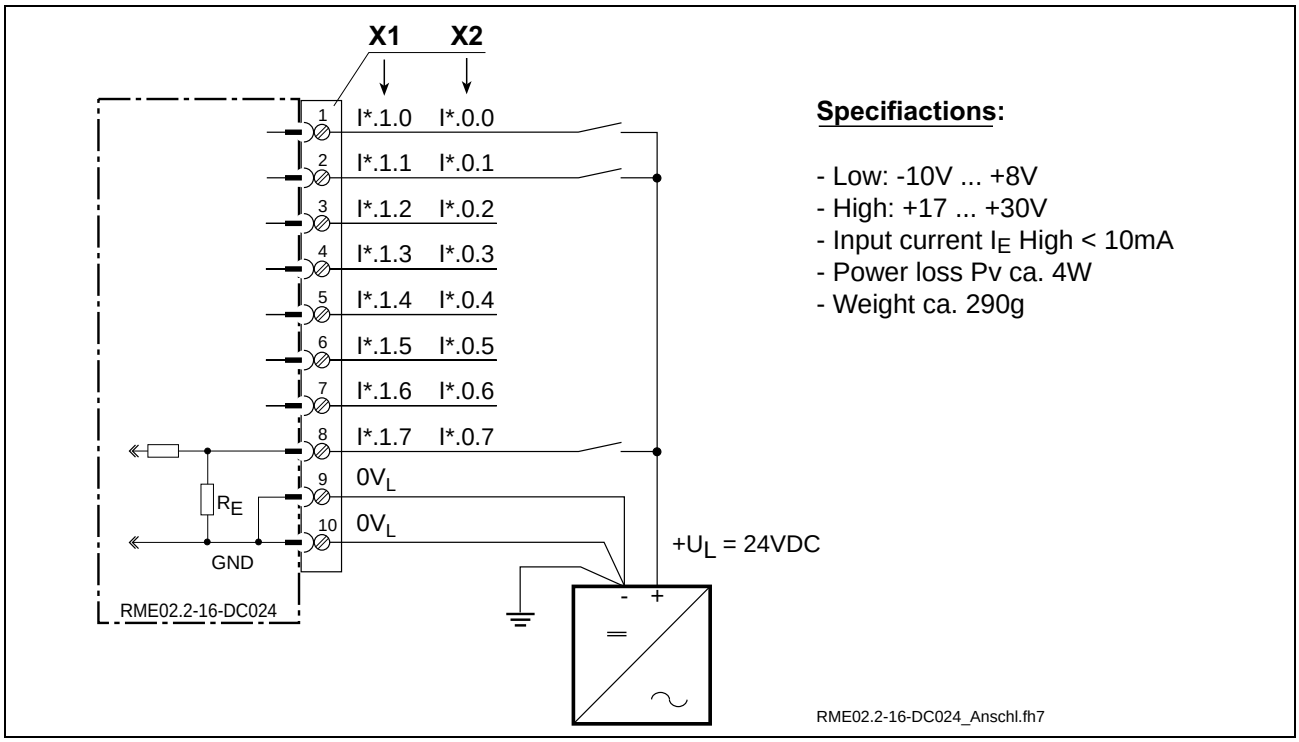


Fig. 11-10: Mounting dimensions RME02.2-16-DC024

Pin Assignments



Specifiactions:

- Low: -10V ... +8V
- High: +17 ... +30V
- Input current I_E High < 10mA
- Power loss Pv ca. 4W
- Weight ca. 290g

Fig. 11-11: Wiring diagram RME02.2-16-DC024

RME02.2-32-DC024 Input Module

Brief Description

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

Mounting Dimensions

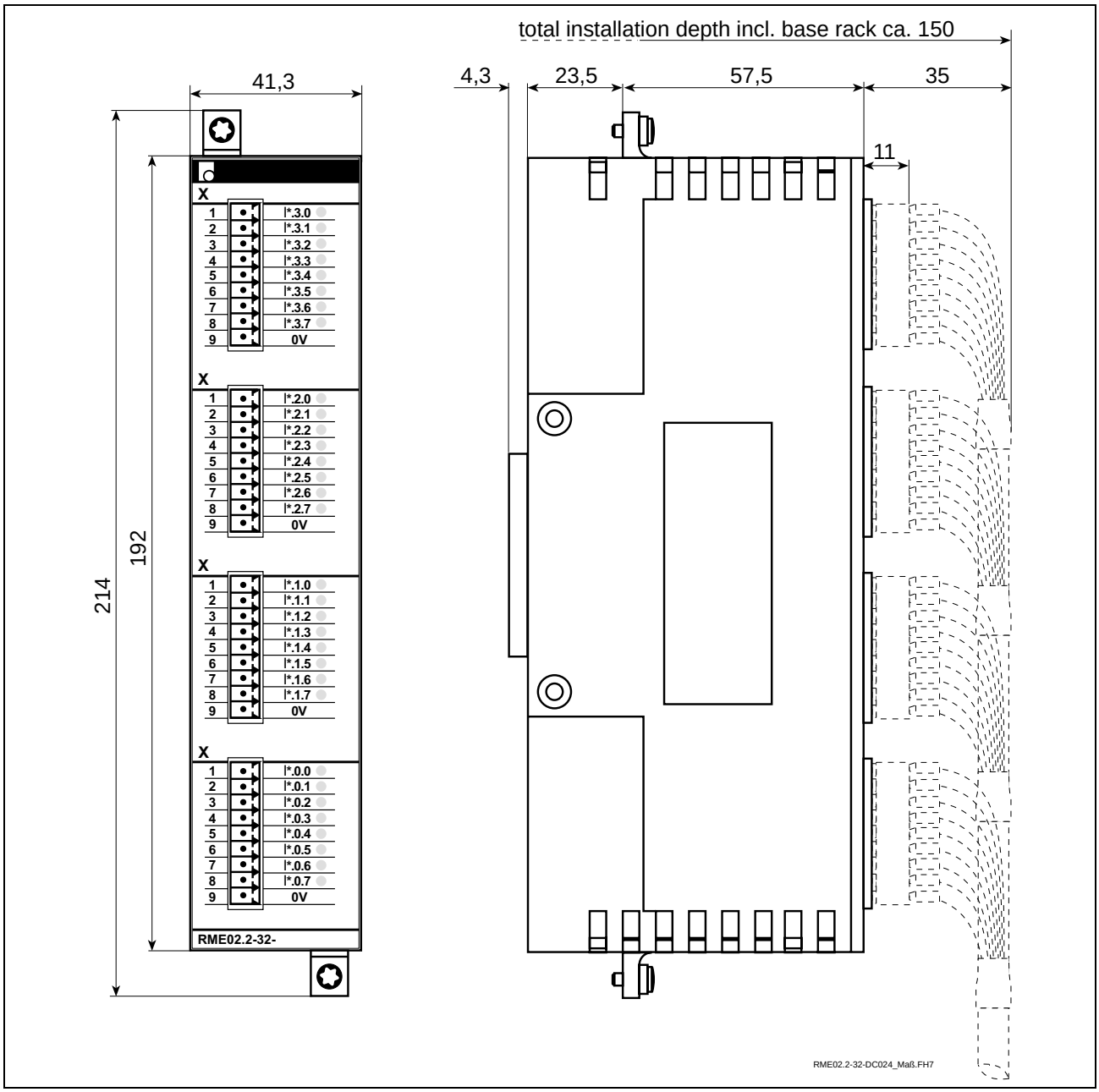


Fig. 11-12: Mounting dimensions RME02.2-32-DC024

Pin Assignments

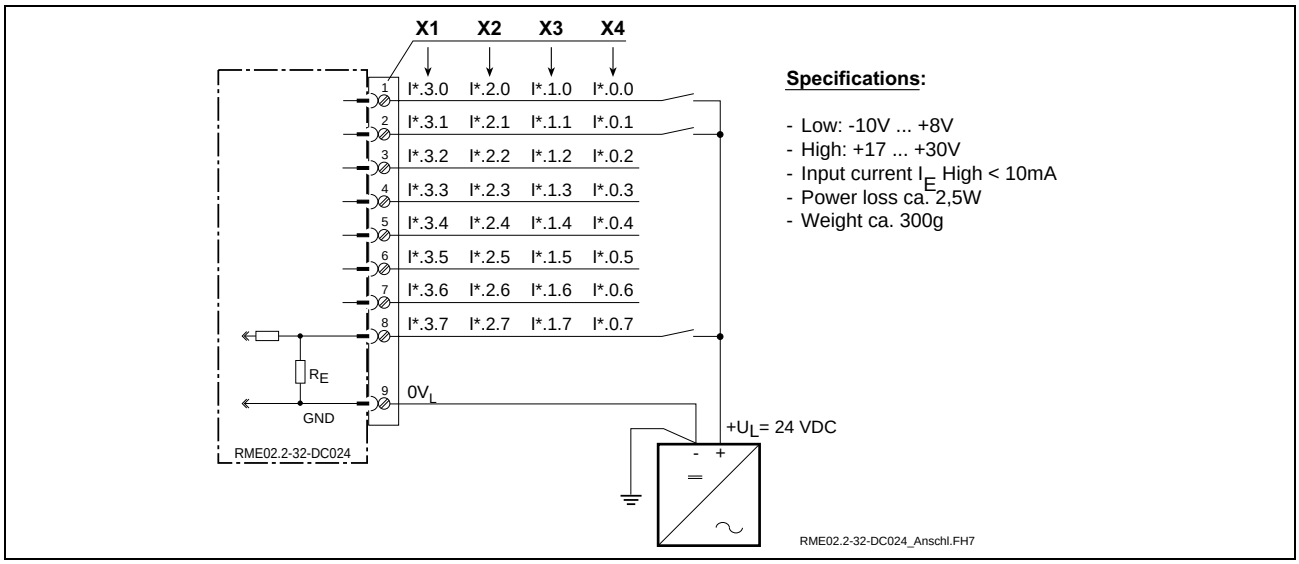


Fig. 11-13: Wiring diagram RME02.2-32-DC024

RME02.2-16-AC115 Input Module

Brief Description

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

Mounting Dimensions

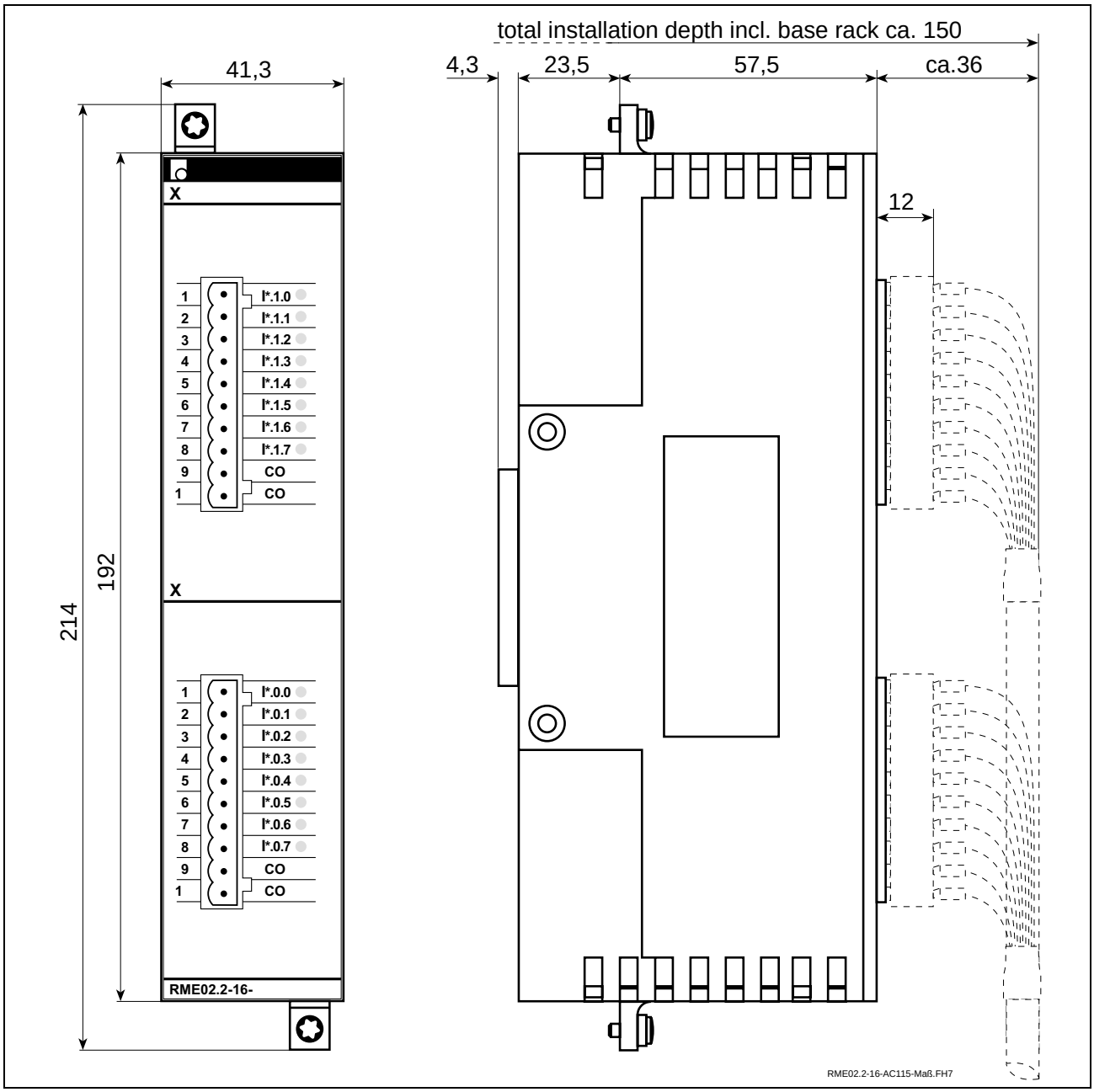
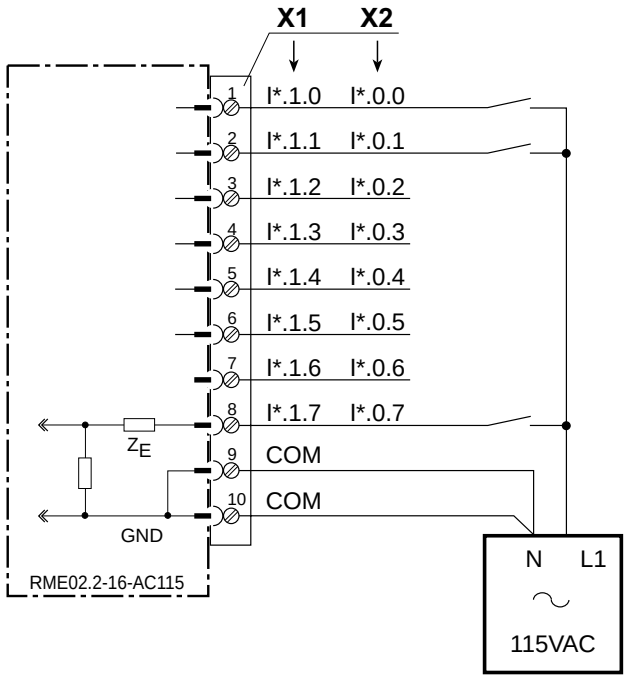


Fig. 11-14: Mounting dimensions RME02.2-16-AC115

Pin Assignments



Specifications:

- Low: < 35V AC
- High: 85 ... 138V AC
- Input current I_E High < 15mA
- Power loss Pv ca. 3W
- Weight ca. 300g

RME02.2-16-AC115_Anschl.FH7

Fig. 11-15: Wiring diagram RME02.2-16-AC115

RMA02.2-16-DC024-200 Output Module

Brief Description

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

Mounting Dimensions

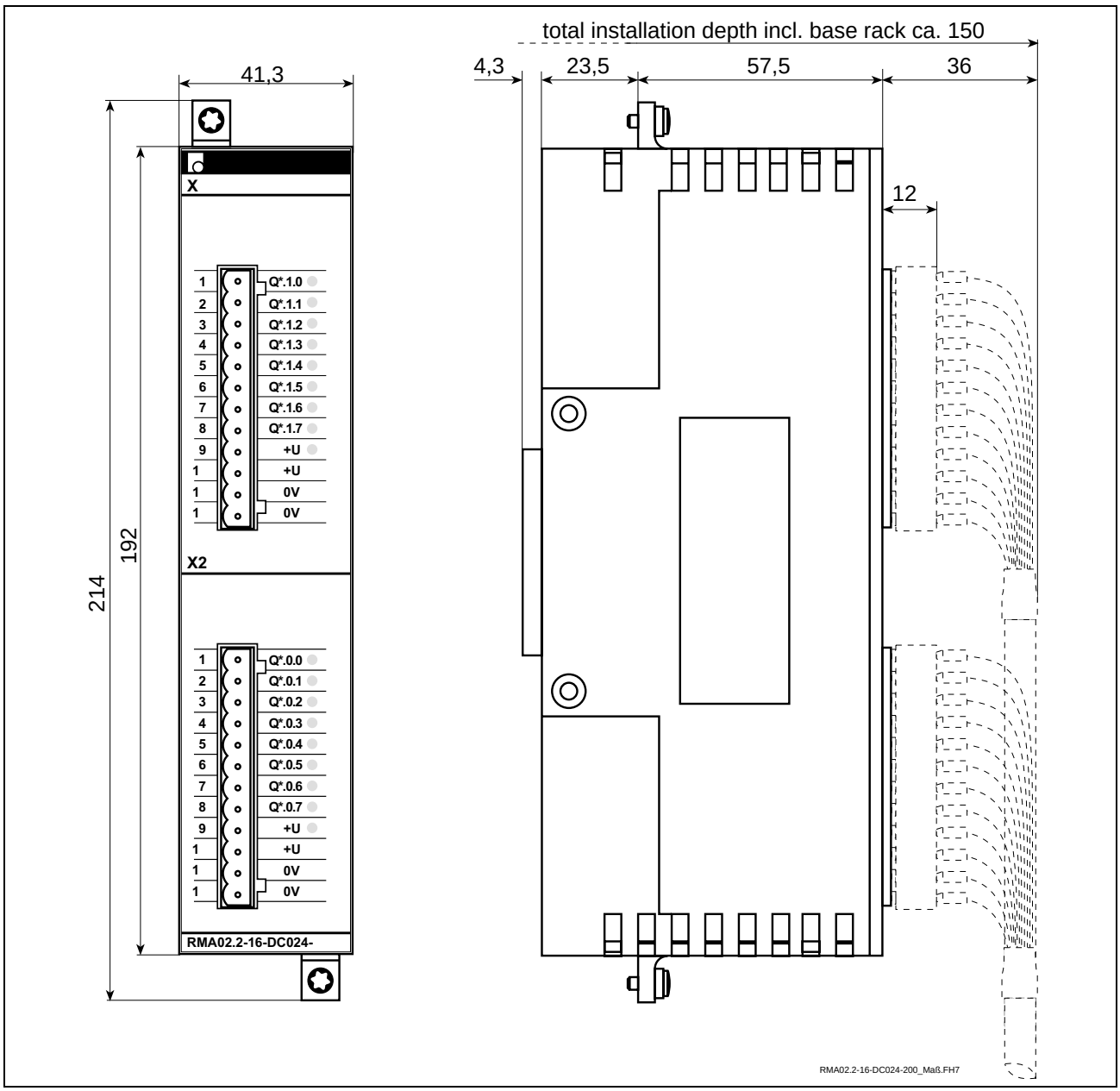
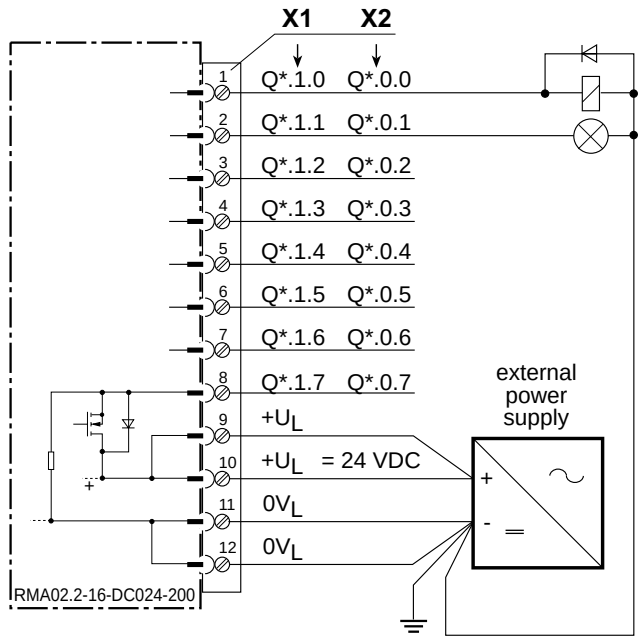


Fig. 11-16: Mounting dimensions RMA02.2-16-DC024-200

Pin Assignments



Specifications:

- FET - output switch for 24V DC
- output current I_L = 2A per output
- internal current limitation
- short-circuit-proof
- 2 isolated blocks with 8 outputs each
- with internal voltage monitoring of the externally applied voltage
- power loss P_V ca. 7,5W
- weight ca. 280g

RMA02.2-16-DC024-200_Anschl.FH7

Fig. 11-17: Wiring diagram RMA02.2-16-DC024-200

RMA02.2-32-DC024-050 Output Module

Brief Description

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

Mounting Dimensions

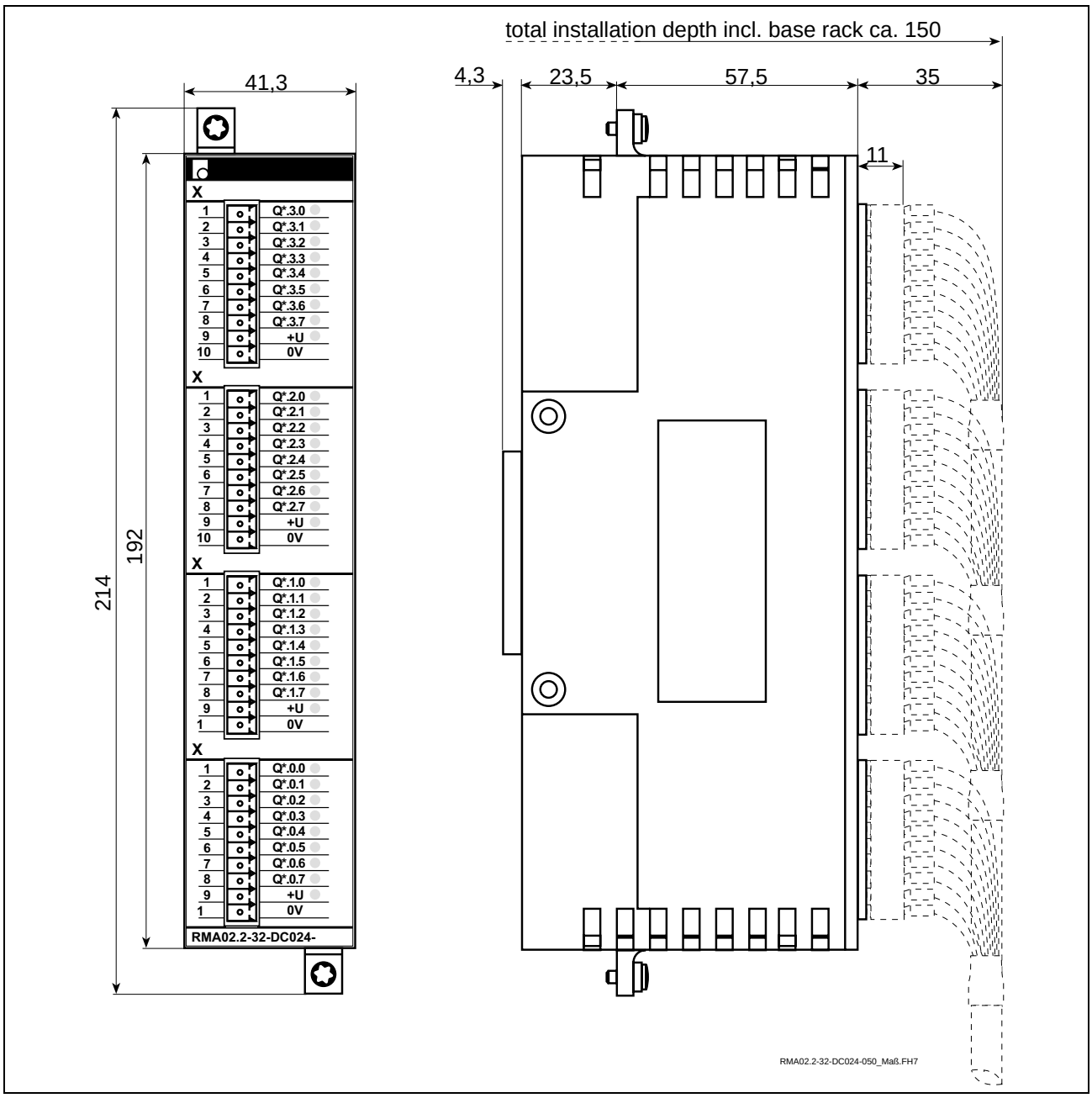
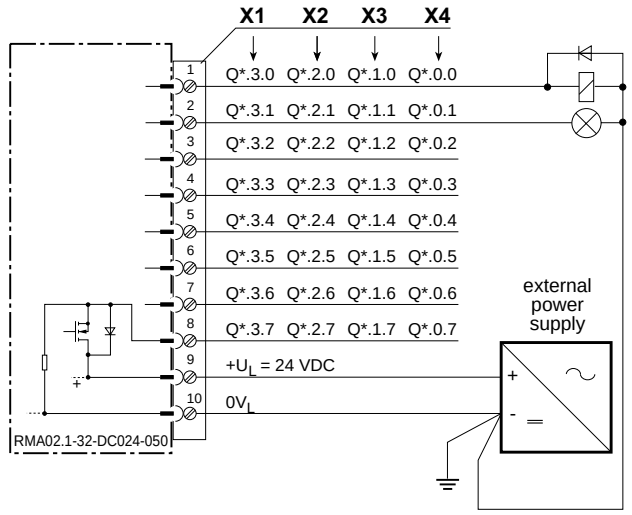


Fig. 11-18: Mounting dimensions RMA02.2-32-DC024-050

Pin Assignments



Specifications:

- FET - output switch for 24V DC
- output current I_L = 0.5A per output
- internal current limitation
- short-circuit-proof
- 4 isolated blocks with 8 outputs each
- with internal voltage monitoring of the externally applied voltage
- power loss Pv ca. 2,5W
- weight ca. 300g

Fig. 11-19: Wiring diagram RMA02.2-32-DC024-050

RMA02.2-16-AC230-200 Output Module

Brief Description

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

Mounting Dimensions

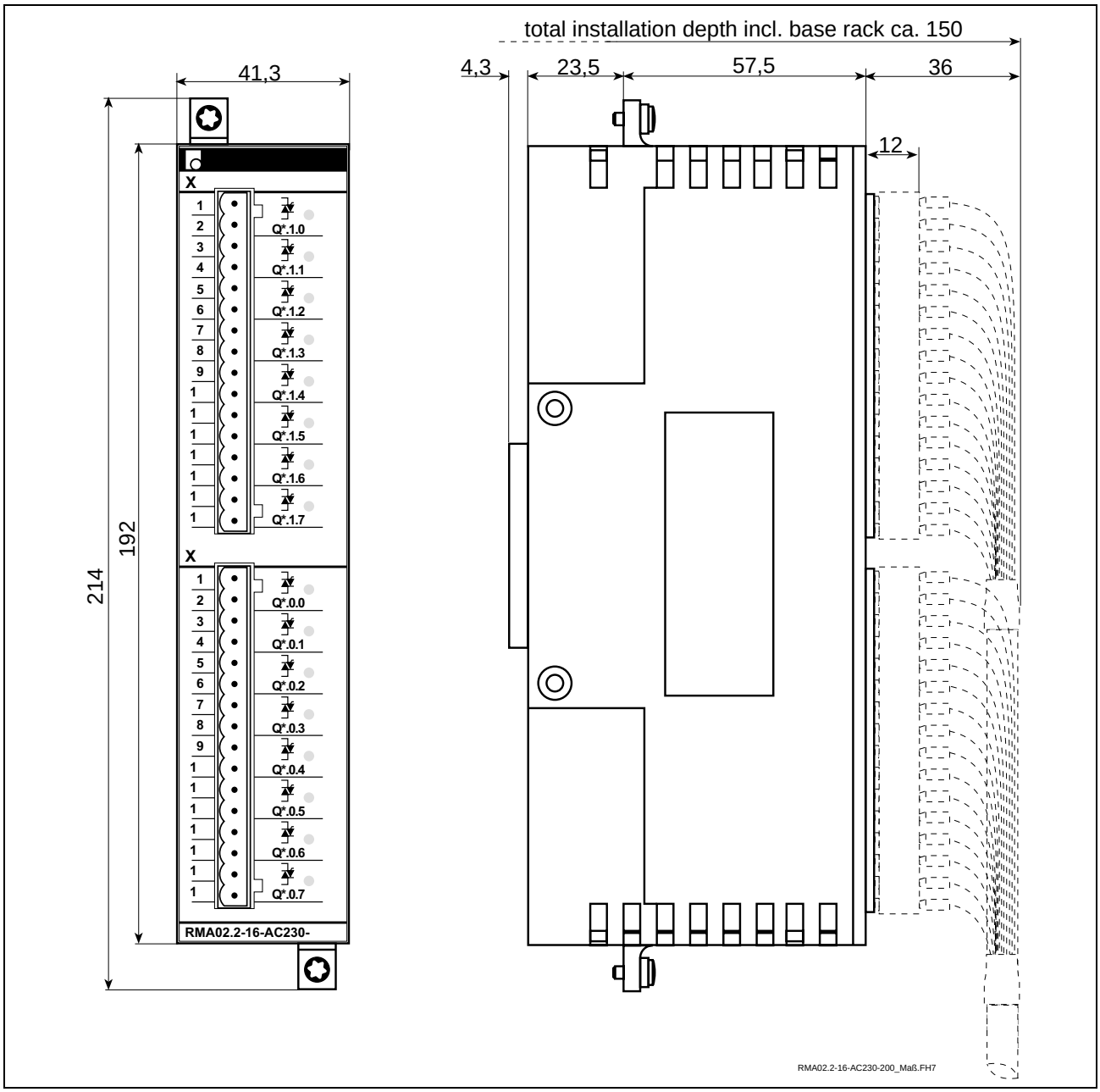
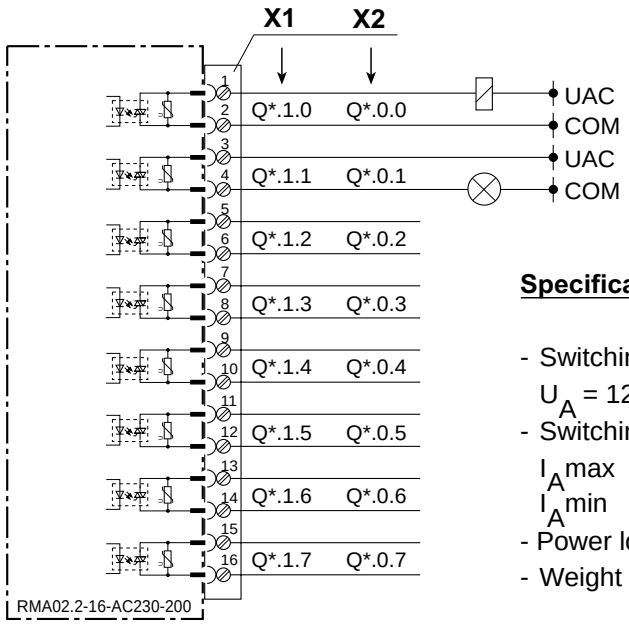


Fig. 11-20: Mounting dimensions RMA02.2-16-AC230-200

Pin Assignments



Specifications:

- Switching voltage:
  U_A = 12 ... 275Vrms AC / 10 ... 440Hz
- Switching current:
  $I_A$max = 2A
  $I_A$min = 5mA
- Power loss Pv ca. 12,8W
- Weight ca. 600g

RMA02.2-16-AC230-200_Anschl.FH7

Fig. 11-21: Wiring diagram RMA02.2-16-AC230-200

RMA02.2-16-RE230-200 Output Module

Brief description

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

Mounting Dimensions

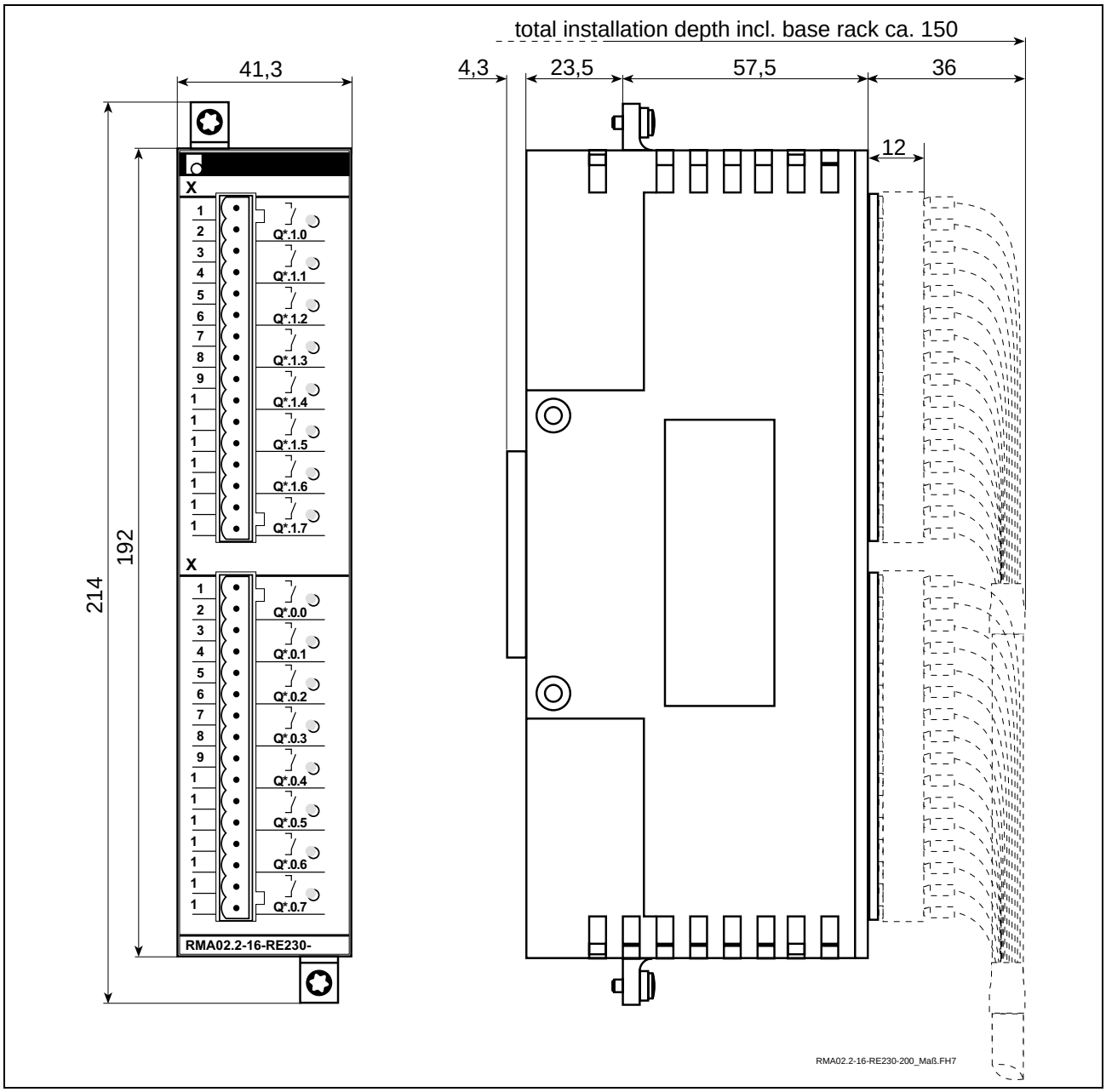


Fig. 11-22: Mounting dimensions RMA02.2-16-RE230-200

Pin Assignments

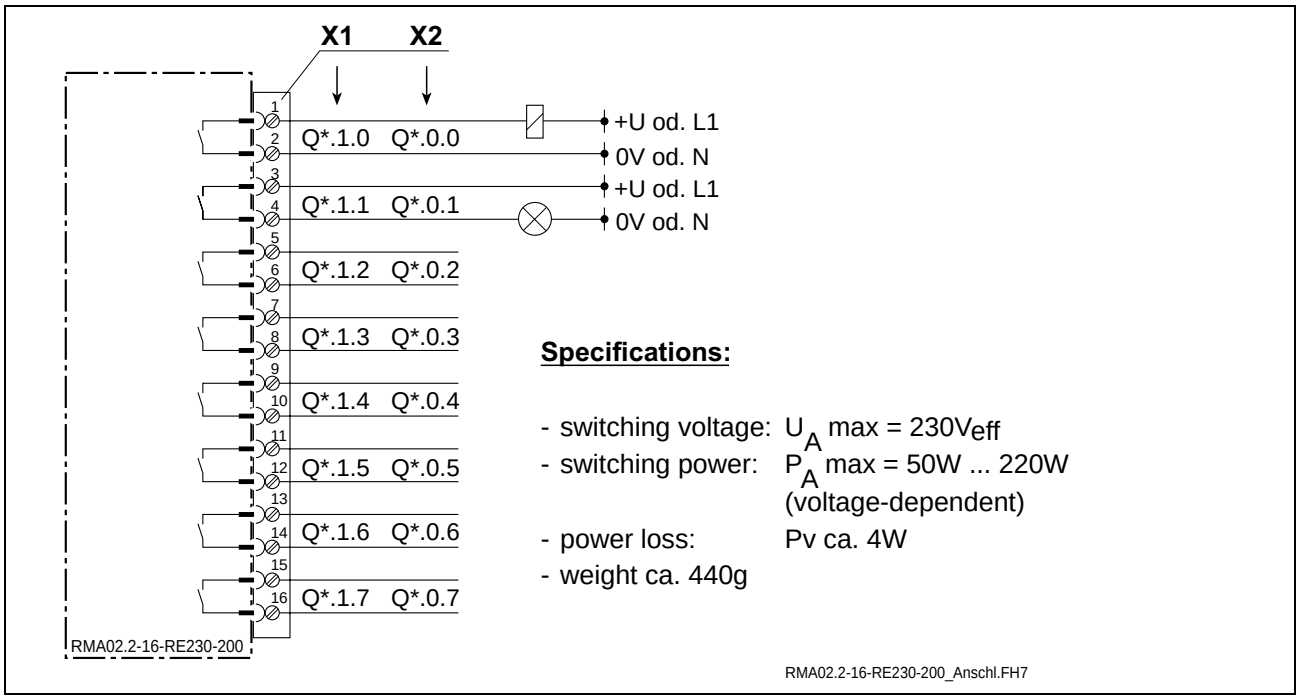


Fig. 11-23: Wiring diagram RMA02.2-16-RE230-200

11.2 Dimensional Sheet, Terminal Diagrams Drives

SERCOS interface DSS02.1M

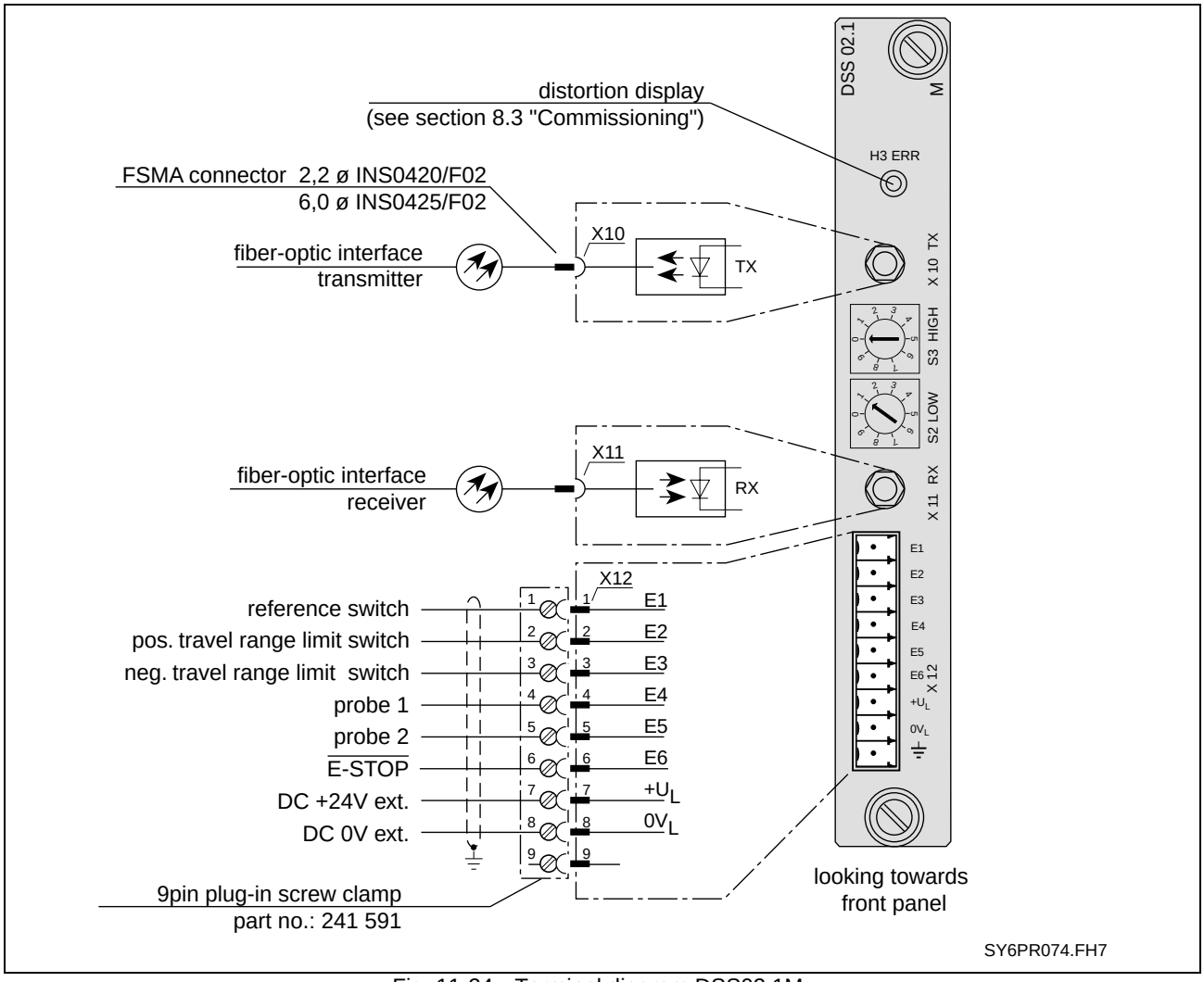


Fig. 11-24: Terminal diagram DSS02.1M

Input / Output interface DEA

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

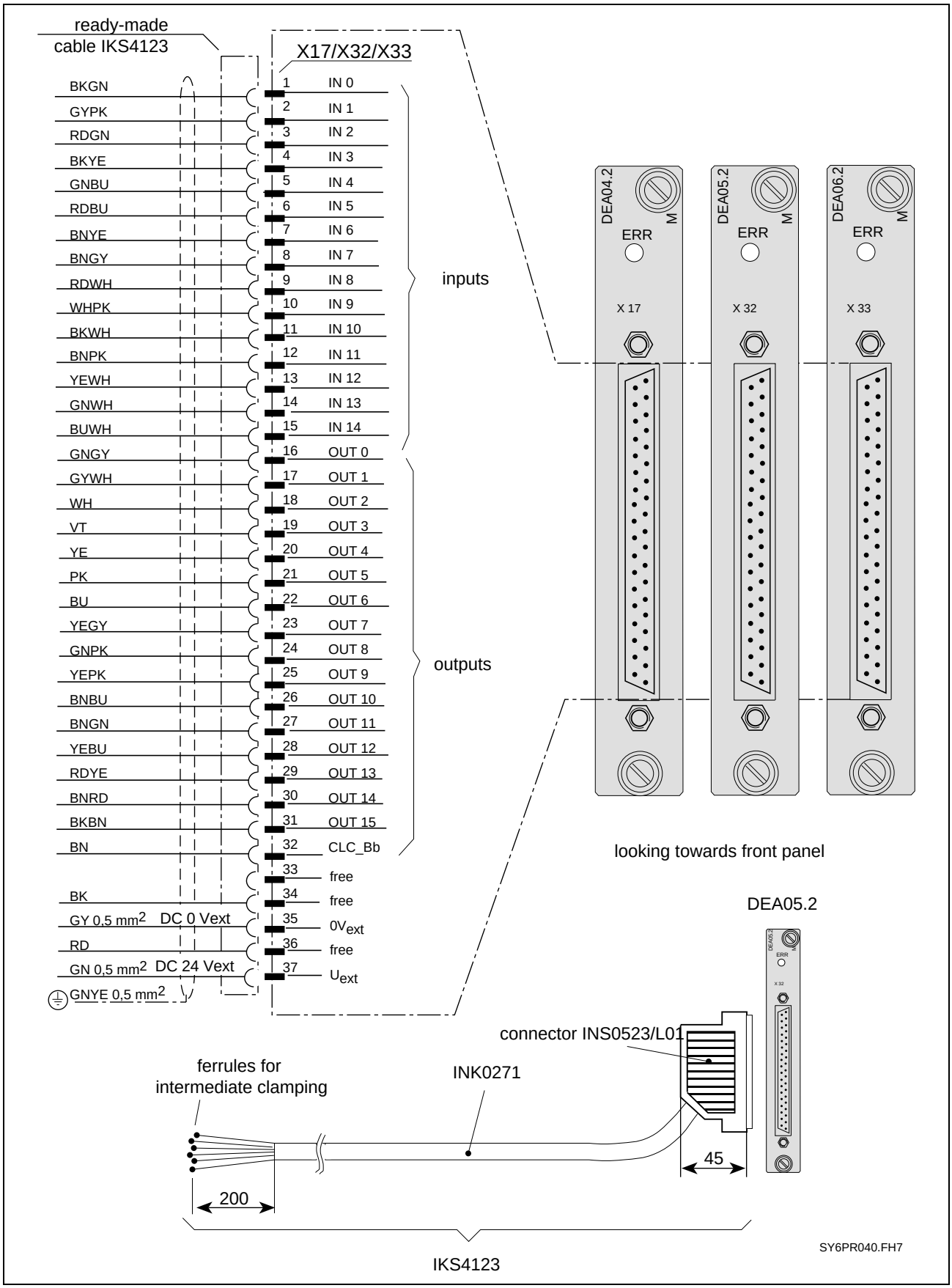


Fig. 11-25: Terminal diagram DEA04.2M, DEA05.2M, DEA06.2M

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

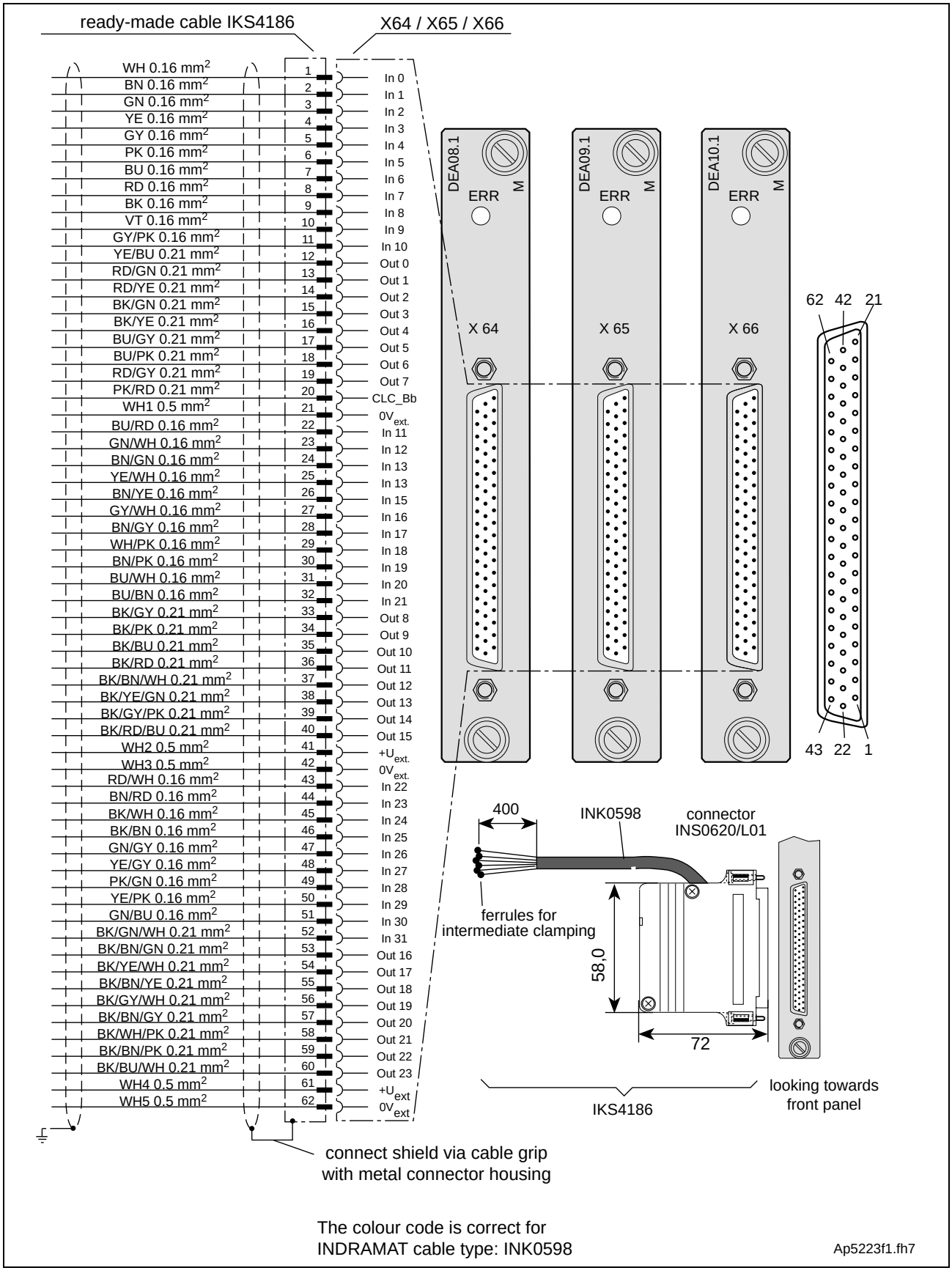


Fig. 11-26: Terminal diagram DEA08.1M, DEA09.1M, DEA10.1M

Encoder interface DAG01.2M (EnDat or SSI interface)

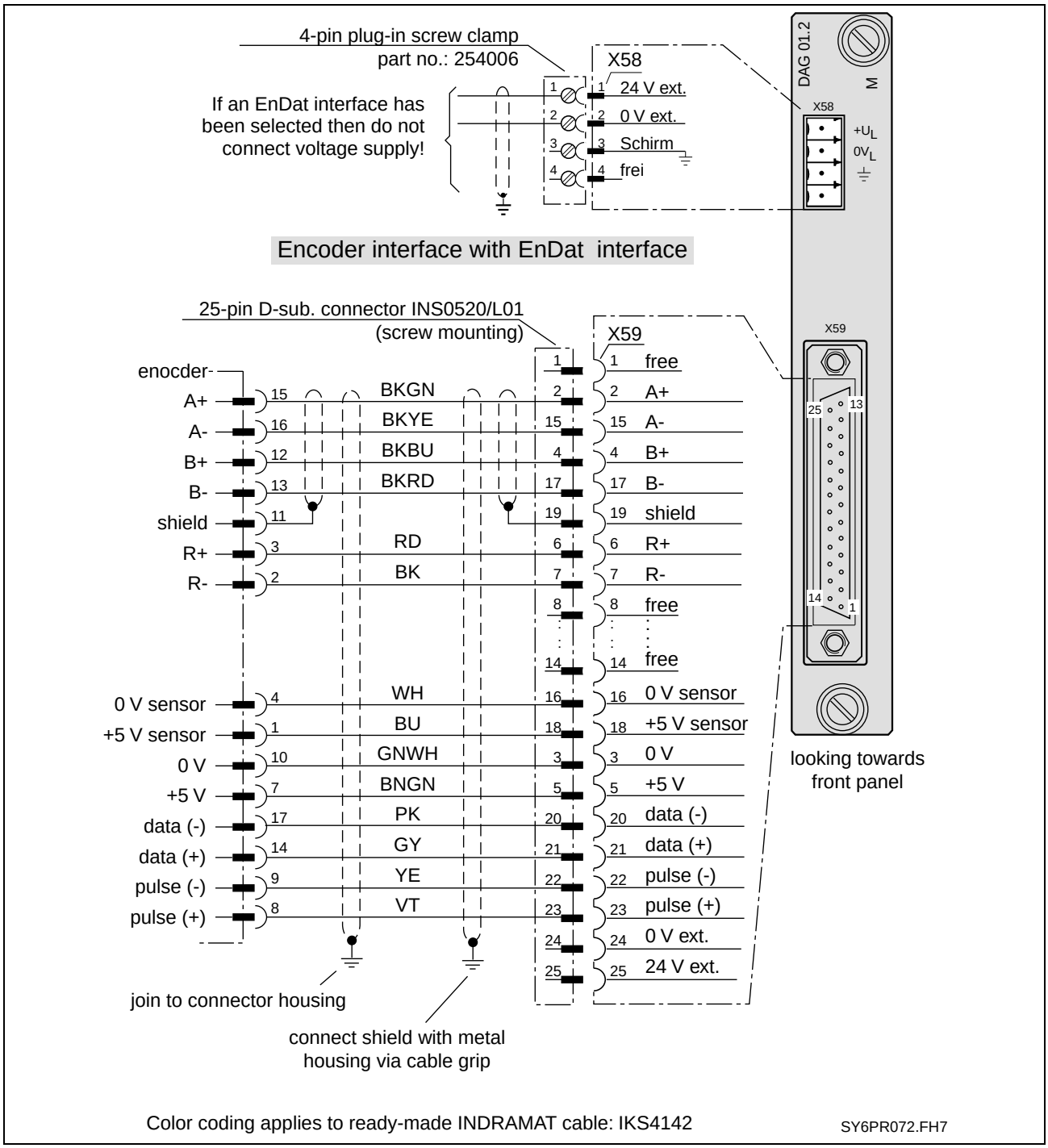


Fig. 11-27: Terminal diagram DAG01.2M

Analog interface with Actual Position Value Output DAE02.1M

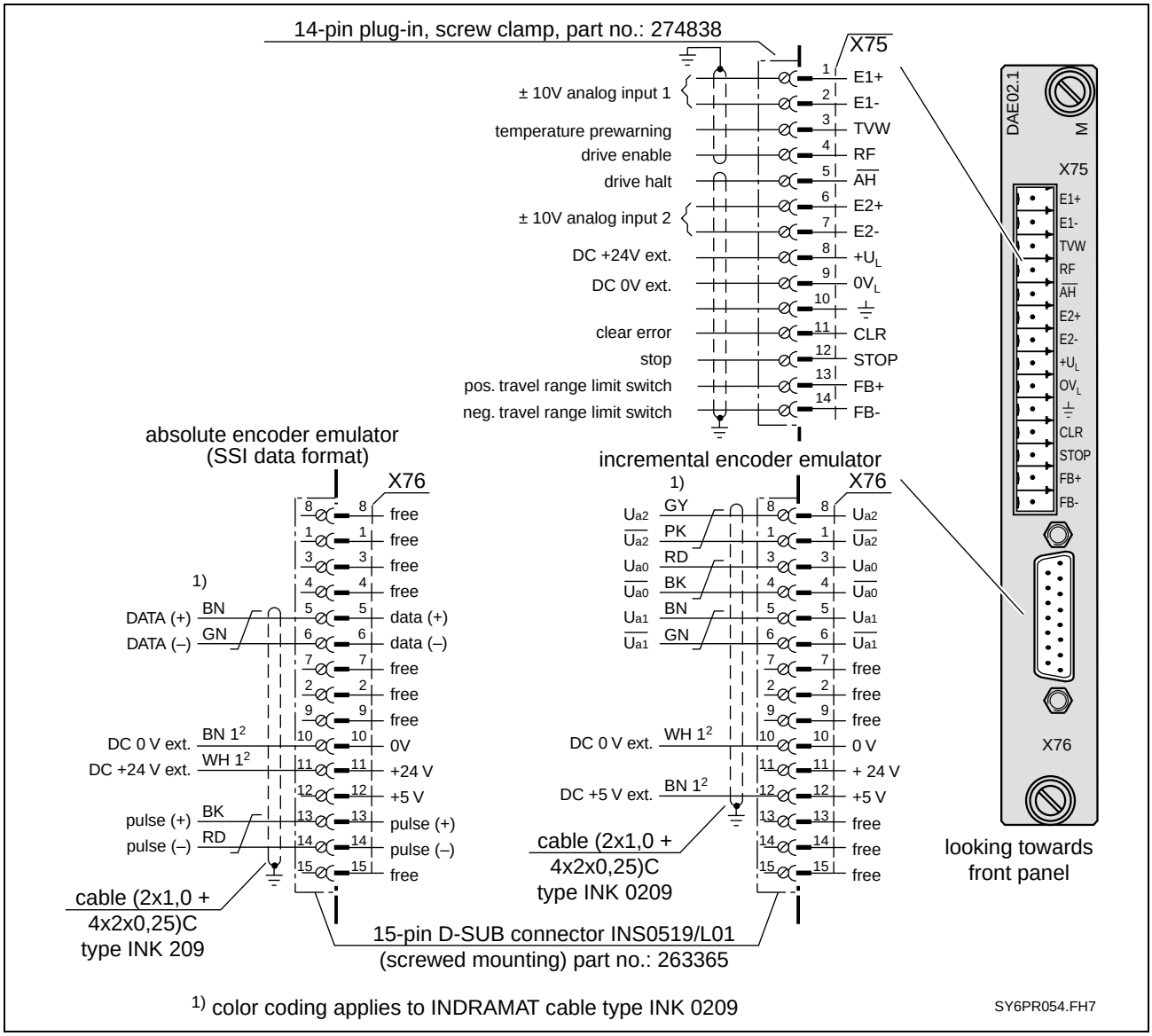


Fig. 11-28: Terminal diagram DAE02.1M

Absolute Encoder Emulator DSA01.1M

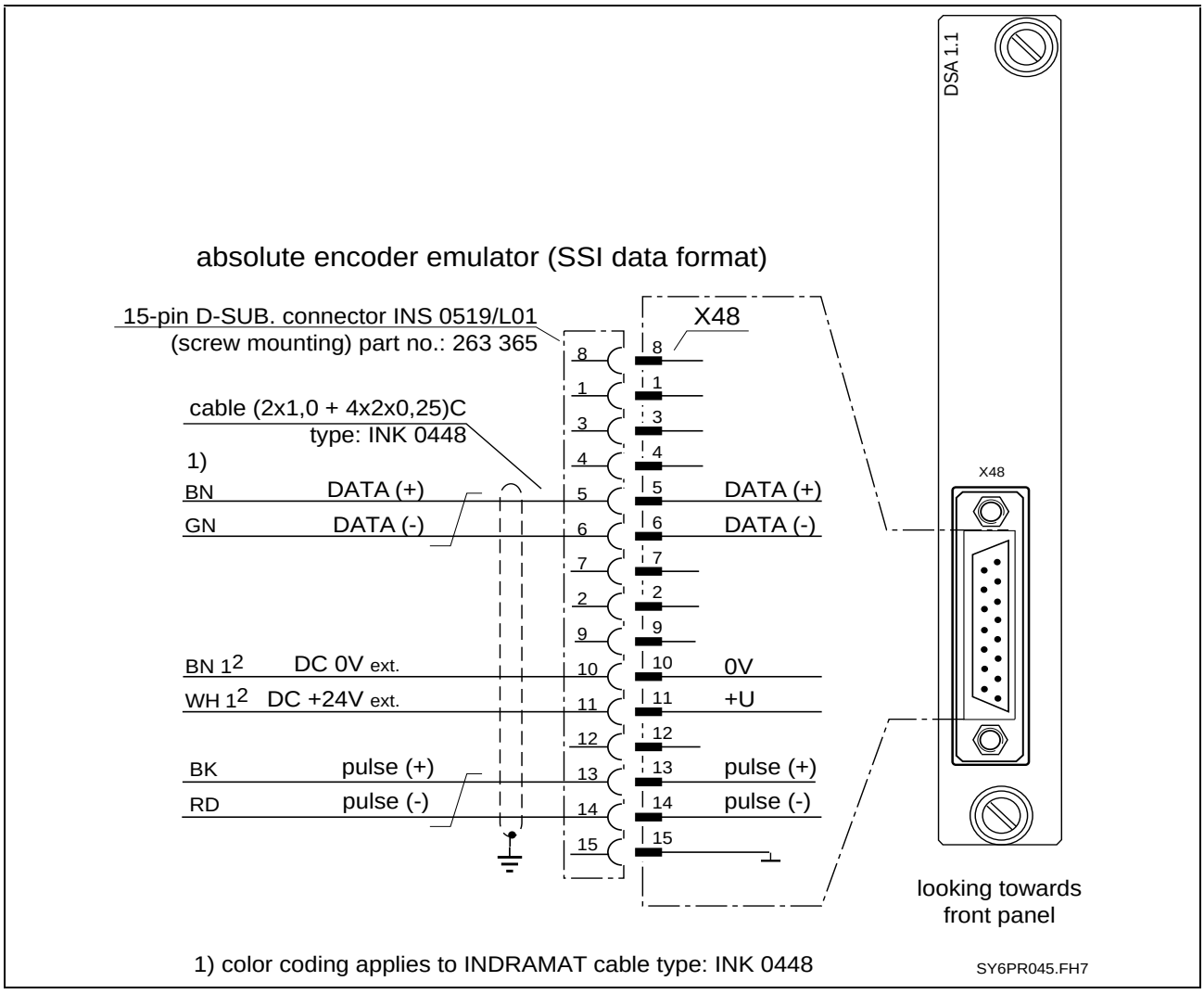


Fig. 11-29: Terminal diagram DSA01.1M

Position interface for Square-Wave Signals DEF01.1M

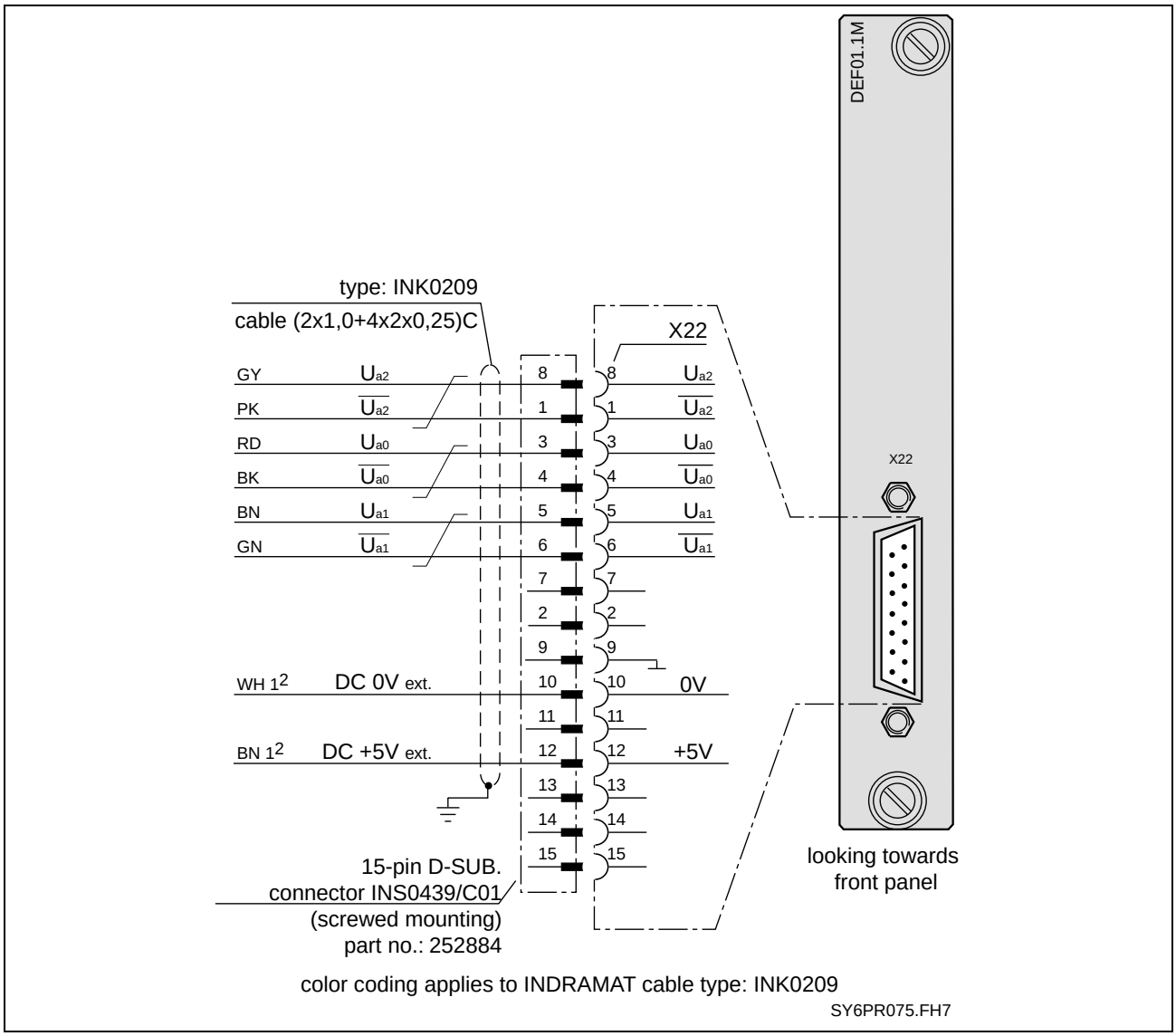


Fig. 11-30: Terminal diagram DEF01.1M

Encoder interface DFF01.1M

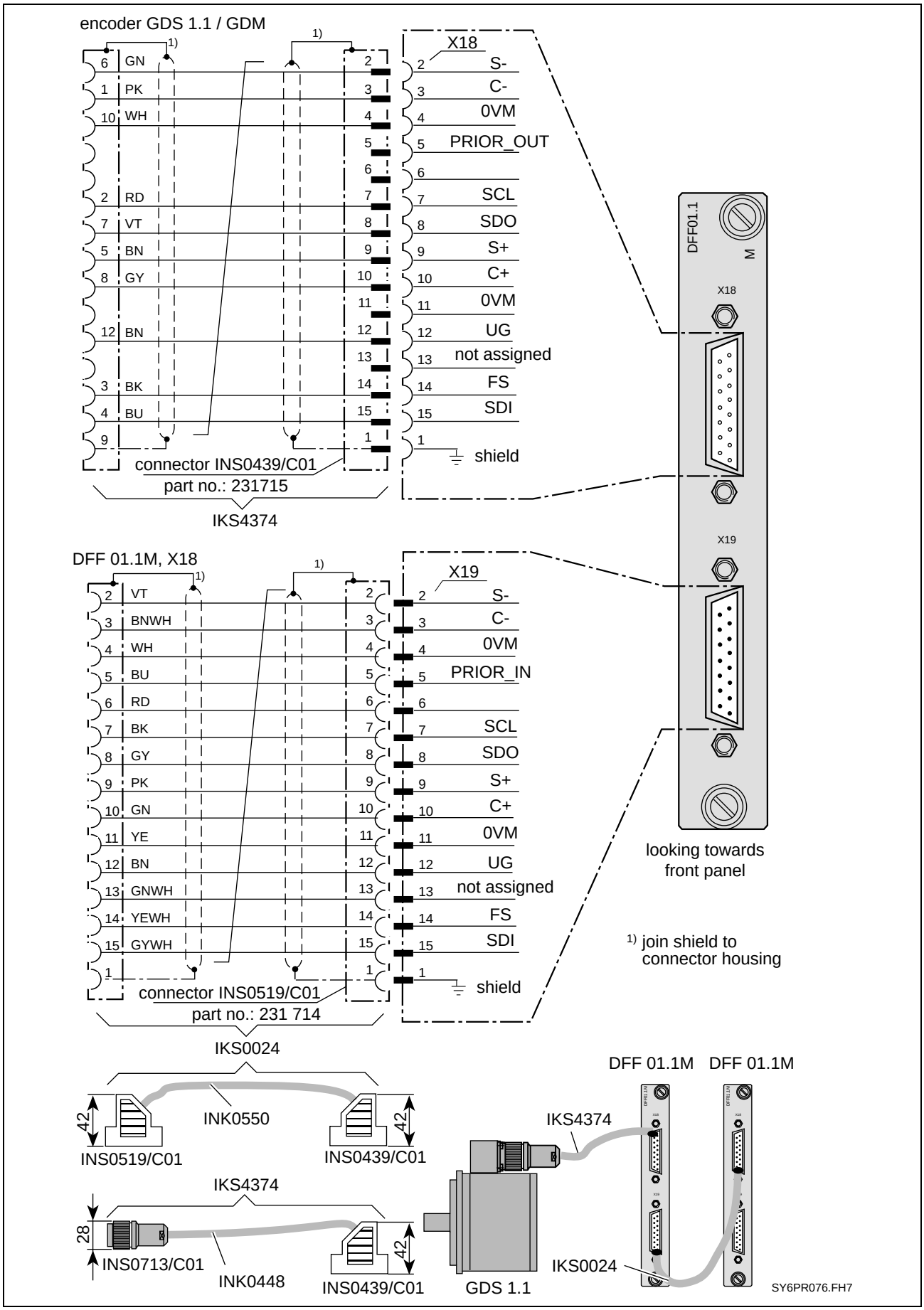


Fig. 11-31: Terminal diagram DFF01.1M

High-Resolution Position interface for Sinusoidal Signals DLF01.1M

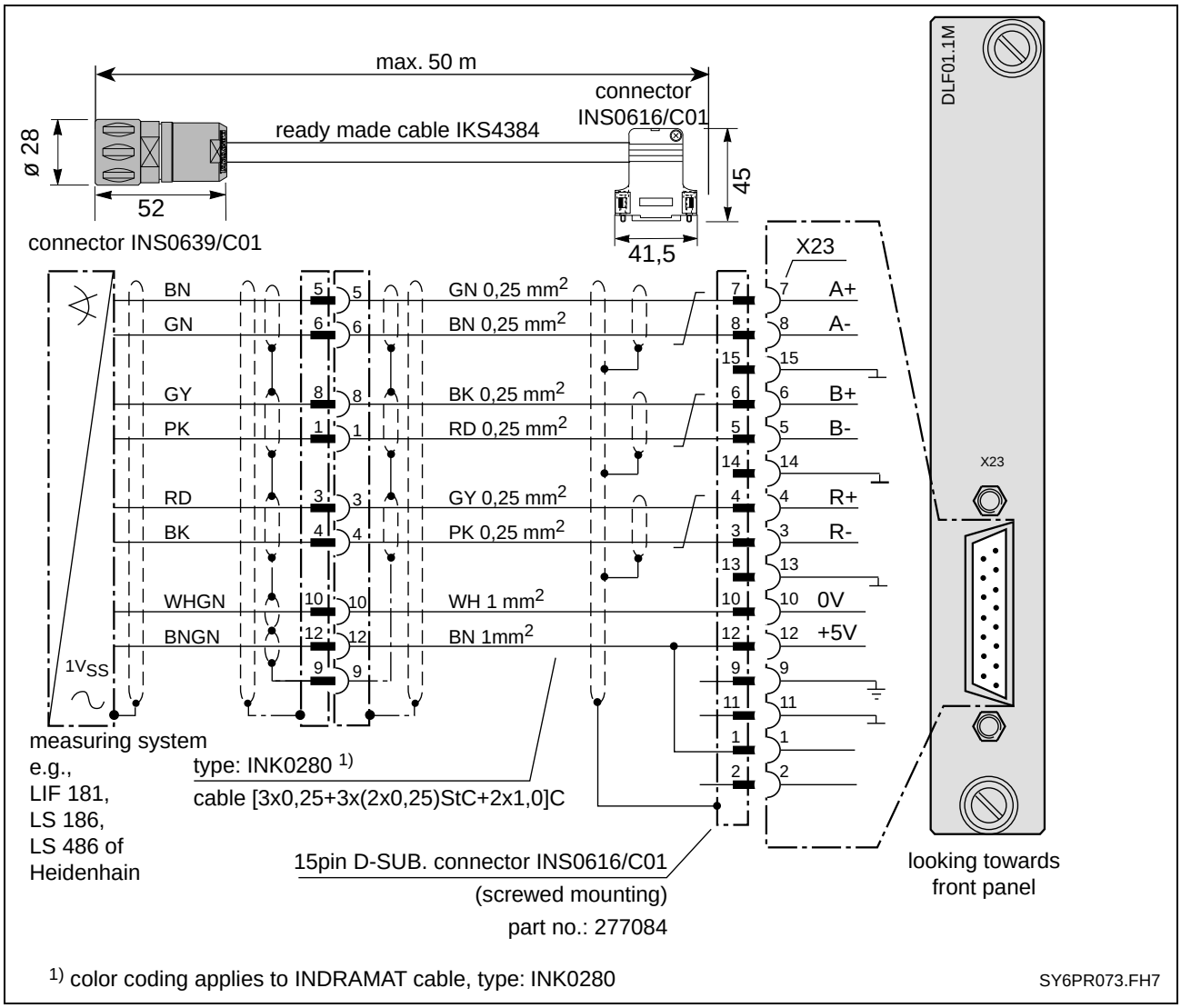


Fig. 11-32: Terminal diagram DLF01.1M

Gear Wheel Encoder interface DZF02.1M

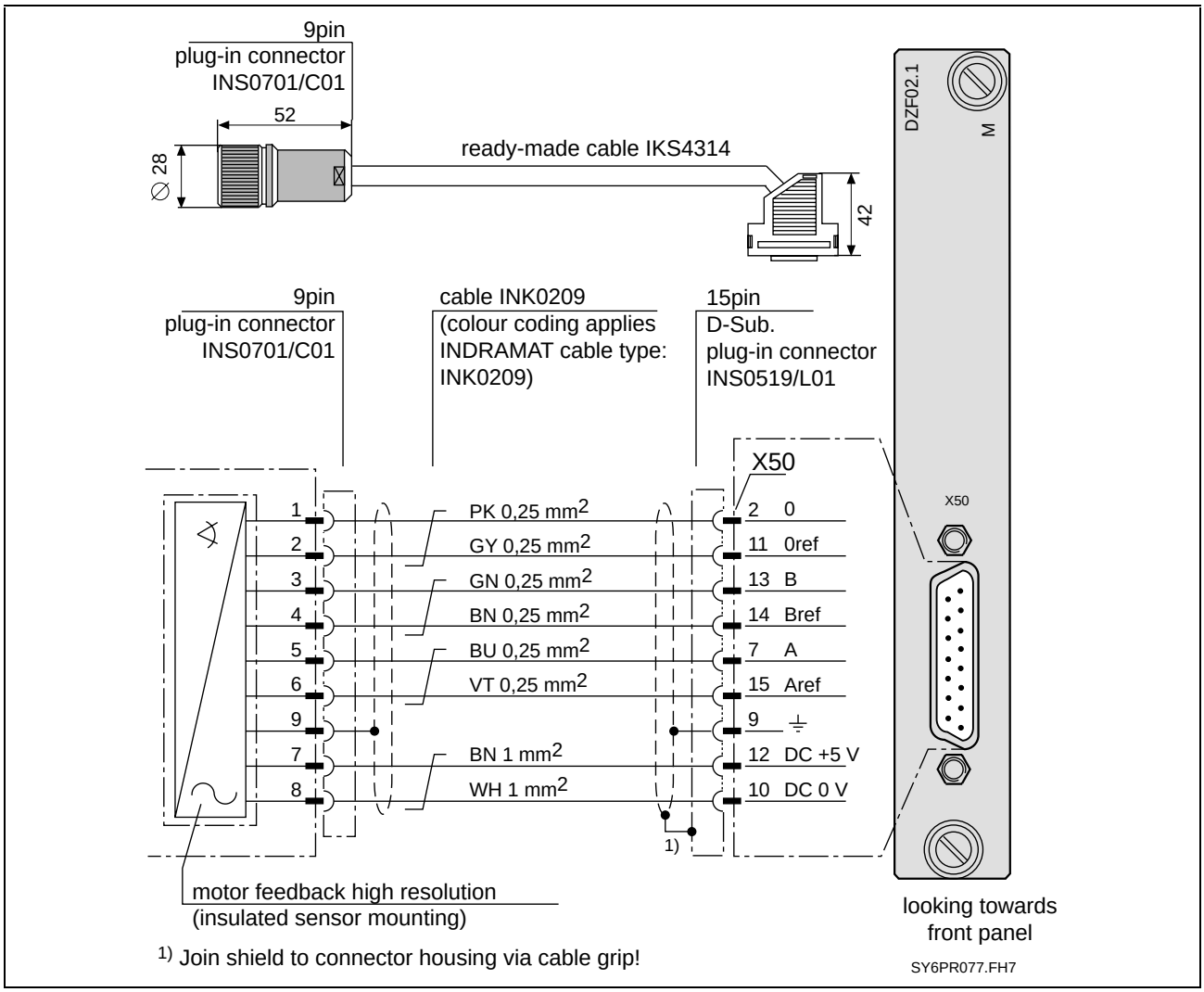


Fig. 11-33: Terminal diagram DZF02.1M

Gear Wheel Encoder interface DZF03.1M

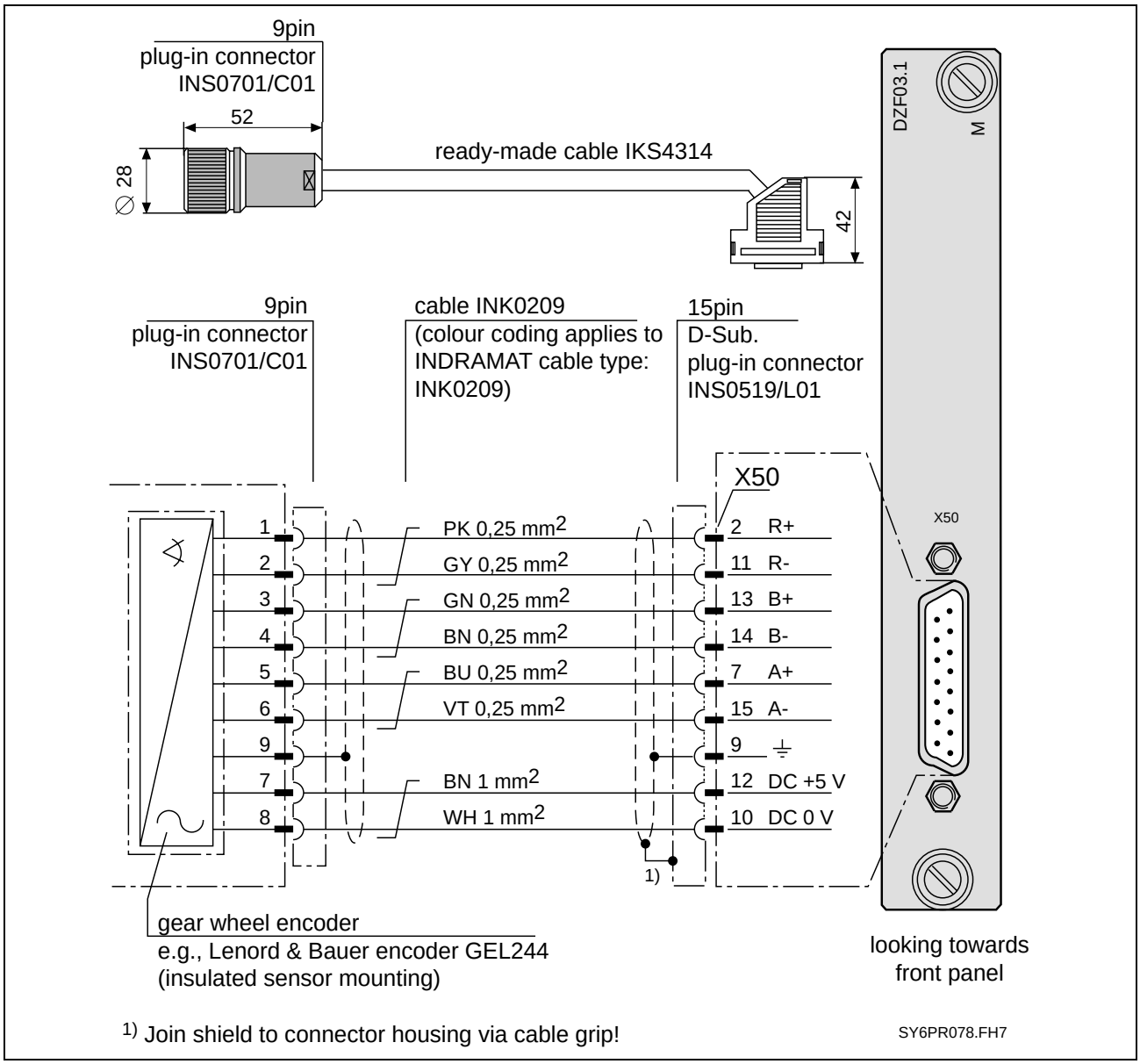


Fig. 11-34: Terminal diagram DZF03.1M

Dimensional Sheet DGA01.2

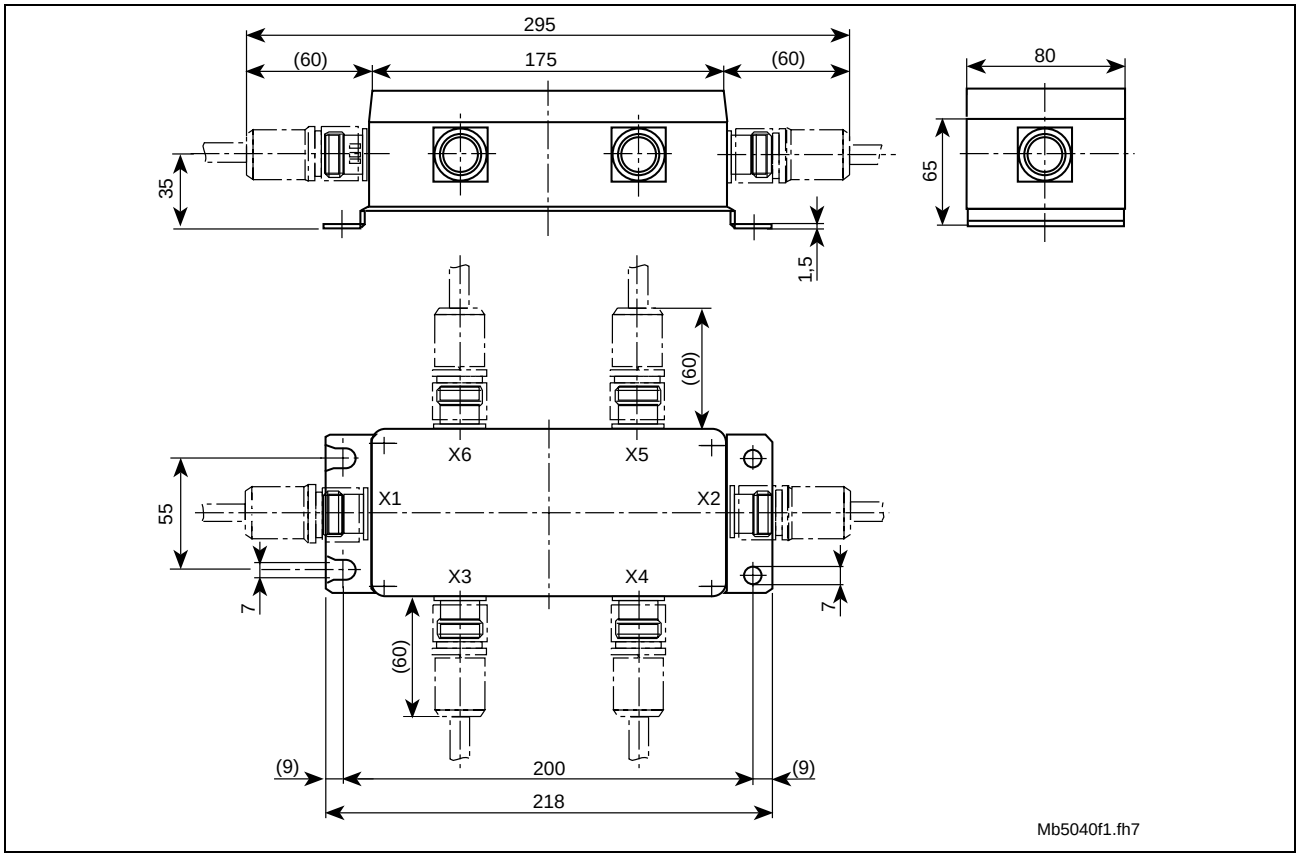
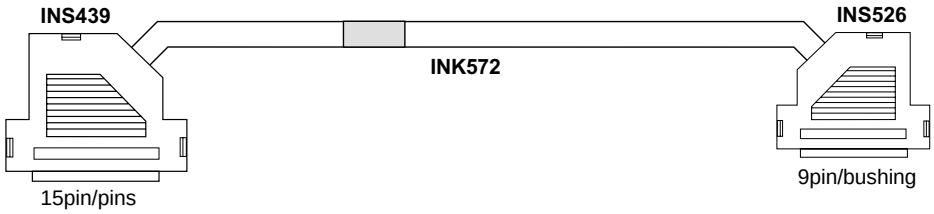
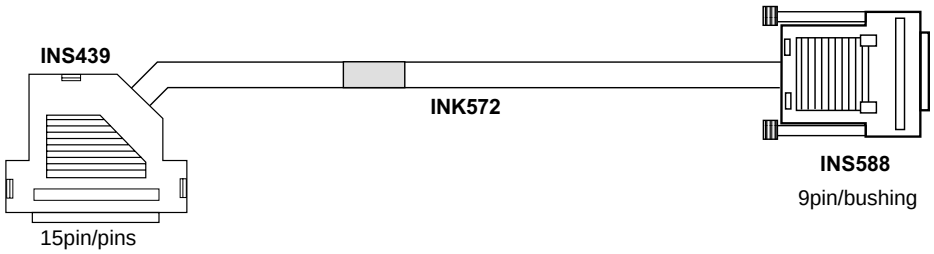
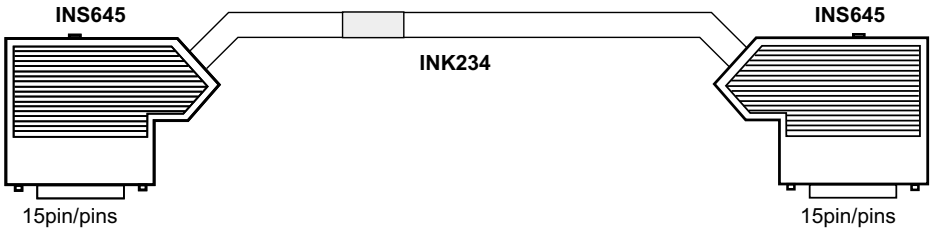
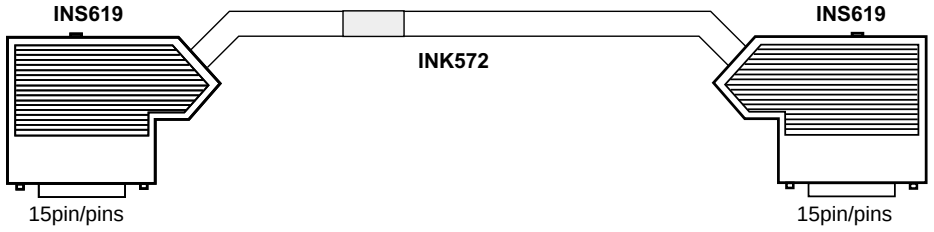


Fig. 11-35: Dimensional sheet DGA01.2

List of Connectors and Ready-Made Cable

Order designation for ready-made cable	Mating connector of the unit	INDRAMAT cable	Cable end
IKB0005 Part no.: 278 141, 2m Part no.: 278 144, 5m Part no.: 278 142, 10m Part no.: 278 143, 15m (RS232, max. 15m)			
IKB0012/000,0 Part no.: 281 715 (RS232, max. 15m)			
IKB0015/000,0 Part no.: 282 870 (RS422, max. 400m)			
IKB0017/000,0 Part no.: 282 872 (RS485, max. 400m)			
IKB0019/000,0 Part no.: 282 875 (RS485, max. 400m)			

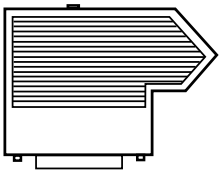
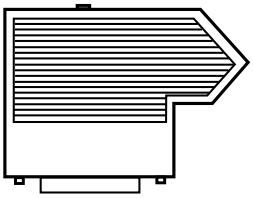
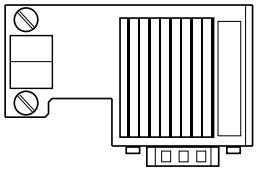
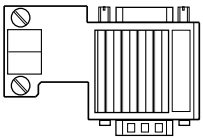
Connectors		
INS0619/K01 Part no.: 279 583	 **INS0619/RS485** (15pin/pins)	Y connector for ready-made cables with active termination
INS0645/K01 Part no.: 282 040	 **INS0645/RS422**	connector for ready-made cables with active termination
INS0540/K01 Part no.: 279 538	 **INS0540/Profibus** (pins)	Profibus connector for ready-made cables with active termination
INS0541/K01 Part no.: 279 539	 **INS541/Profibus** (pins/bushing)	Profibus connector for ready-made cables with active termination (mounting side-by-side possible))
Part No.: 279 788	Profibus connector: STECK-INS-FL-01-09-2-Z-GER-01-N-K-S-*	
Part No.: 281 461	DeviceNet connector: STECK-KL5,08 F FK FKC 2,5/5STF D 1-5	

Fig. 11-36: List of connectors and ready-made cable

11.3 Supplementary Documentation

This document contains dimensional sheets and terminal diagrams of plug-in modules related to SYNAX200.

Supplementary documentation:

- "DIAX03 Plug-in modules for digital intelligent drive controllers" (DOK-DIAX03-PLUG*IN*MOD-PR03-EN-P)
- "DIAX04 Plug-in modules for digital intelligent drive controllers" (DOK-DIAX04-PLUG*IN*MOD-PR03-EN-P)

12 Index

E

F

G

H

I

L

M

N

O

P

R

S

T

U

W

X

13 Kundenbetreuungsstellen - Sales & Service Facilities

Deutschland – Germany

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

Vertriebsgebiet Mitte ☒ SALES Germany Centre ☒ Service Rexroth Indramat GmbH Bgm.-Dr.-Nebel-Str. 2 97816 Lohr am Main Telefon: +49 (0)9352/40-0 Telefax: +49 (0)9352/40-4885	Vertriebsgebiet Mitte ☒ SALES Germany Centre ☐ Service Mannesmann Rexroth AG Gesch.ber. Rexroth Indramat Lilistraße 14-18 63067 Offenbach Telefon: +49 (0) 69/82 00 90-0 Telefax: +49 (0) 69/82 00 90-80	Vertriebsgebiet Ost ☒ SALES Germany East ☒ Service Rexroth Indramat GmbH Beckerstraße 31 09120 Chemnitz Telefon: +49 (0)371/35 55-0 Telefax: +49 (0)371/35 55-333	Vertriebsgebiet Ost ☒ SALES Germany East ☐ Service Mannesmann Rexroth AG GB Rexroth Indramat GmbH Holzhäuser Str. 122 04299 Leipzig Telefon: +49 (0)341/86 77-0 Telefax: +49 (0)341/86 77-219
Vertriebsgebiet Süd ☒ SALES Germany South ☐ Service Rexroth Indramat GmbH Ridlerstraße 75 80339 München Telefon: +49 (0)89/540138-30 Telefax: +49 (0)89/540138-10 indramat.mue@t-online.de	Gebiet Südwest ☒ SALES Germany South-West ☒ Service Mannesmann Rexroth AG Vertrieb Deutschland – VD-BI Geschäftsbereich Rexroth Indramat Regionalzentrum Südwest Ringstrasse 70 / Postfach 1144 70736 Fellbach / 70701 Fellbach Tel.: +49 (0)711/57 61–100 Fax: +49 (0)711/57 61–125	Vertriebsgebiet Nord ☒ SALES Germany North ☐ Service Rexroth Indramat GmbH Kieler Straße 212 22525 Hamburg Telefon: +49 (0)40/85 31 57-0 Telefax: +49 (0)40/85 31 57-15	Vertriebsgebiet Nord ☒ SALES Germany North ☐ Service Mannesmann Rexroth AG Vertriebsniederlassung Region Nord Gesch.ber. Rexroth Indramat Walsroder Str. 93 30853 Langenhagen Telefon: +49 (0) 511/72 66 57-0 Telefax: +49 (0) 511/72 66 57-93
Vertriebsgebiet West ☒ SALES Germany West ☒ Service Mannesmann Rexroth AG Vertrieb Deutschland Regionalzentrum West Borsigstrasse 15 D - 40880 Ratingen Telefon: +49 (0)2102/409-0 Telefax: +49 (0)2102/409-406		SERVICE - Hotline - 7 Tage / 24h - **H E L P D E S K** **MO – FR - von 7 – 17 Uhr** Telefax +49 (0)9352/40-4941 Telefon +49 (0)9352/40- Bernard A. -4894 Kolb R. -4922 Roeper P. -4359 Scheiner W. -4921 **H O T L I N E** (17 - 07 + SA / SO) Telefon: +49 (0)172/660 04 06 oder/or Telefon: +49 (0)171/333 88 26	ERSATZTEIL - Hotline ♦ nur an Werktagen - only on working days - ♦ von 15 -18 Uhr - from 15-18 o'clock - **Tel. +49 (0) 93 52/40 42 22**

Kundenbetreuungsstellen in Deutschland - Service agencies in Germany

Europa – Europe

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

Austria ☒ SALES ☐ Service Mannesmann Rexroth Ges.m.b.H. Gesch.ber. Rexroth Indramat Hägelingasse 3 A - 1140 Wien Telefon: +43 (0)1/9852540-400 Telefax: +43 (0)1/9852540-93	Austria ☐ SALES ☒ Service Mannesmann Rexroth G.m.b.H. Gesch.ber. Rexroth Indramat Industriepark 18 A - 4061 Pasching Telefon: +43 (0)7221/605-0 Telefax: +43 (0)7221/605-21	Belgium ☒ SALES ☒ Service Mannesmann Rexroth N.V.-S.A. Gesch.ber. Rexroth Indramat Industrielaan 8 B-1740 Ternat Telefon: +32 (0)2/5830719 Telefax: +32 (0)2/5830731 E-mail: indramat@rexroth.be	Denmark ☒ SALES ☒ Service BEC AS Zinkvej 6 DK-8900 Randers Telefon: +45 (0)87/11 90 60 Telefax: +45 (0)87/11 90 61
Czech Rep. ☒ SALES ☐ Service Mannesmann-Rexroth, spol.s.r.o. Hviezdoslavova 5 CS - 627 00 Brno Telefon: +420 (0)5/48 126 358 Telefax: +420 (0)5/48 126 112	England ☒ SALES ☒ Service Mannesmann Rexroth Ltd. Rexroth Indramat Division Broadway Lane, South Cerney GB - Cirencester, Glos GL7 5UH Telefon: +44 (0)1285/863000 Telefax: +44 (0)1285/863030 sales@indramat.co.ukservice@indramat.co.uk	Finland ☒ SALES ☐ Service Rexroth Mecman Oy Rexroth Indramat division Ansatie 6 SF-017 40 Vantaa Telefon: +358 (0)9/84 91-11 Telefax: +358 (0)9/84 91-13 60	France ☒ SALES ☒ Service Mannesmann Rexroth S.A. Division Rexroth Indramat Parc des Barbanniers 4, Place du Village F-92632 Gennevilliers Cedex Telefon: +33 (0)141 47 54 30 Telefax: +33 (0)147 94 69 41 Hotline: +33 (0)6 08 33 43 28
France ☒ SALES ☐ Service Mannesmann Rexroth S.A. Division Rexroth Indramat 270, Avenue de Lardenne F - 31100 Toulouse Telefon: +33 (0)5 61 49 95 19 Telefax: +33 (0)5 61 31 00 41	France ☒ SALES ☐ Service Mannesmann Rexroth S.A. Division Rexroth Indramat 91, Bd. Irène Joliot-Curie F - 69634 Vénissieux – Cedex Telefon: +33 (0)4 78 78 53 65 Telefax: +33 (0)4 78 78 53 62	Hungary ☒ SALES ☐ Service Mannesmann Rexroth Kft. Angol utca 34 H - 1149 Budapest Telefon: +36 (1) 364 00 02 Telefax: +36 (1) 383 19 80	Italy ☒ SALES ☒ Service Mannesmann Rexroth S.p.A. Divisione Rexroth Indramat Via G. Di Vittoria, 1 I - 20063 Cernusco S/N.MI Telefon: +39 02/92 36 52 70 Telefax: +39 02/92 36 55 12
Italy ☒ SALES ☒ Service Mannesmann Rexroth S.p.A. Divisione Rexroth Indramat Via Borgomanero, 11 I - 10145 Torino Telefon: +39 011/7 50 38 11 Telefax: +39 011/7 71 01 90	Italy ☒ SALES ☐ Service Mannesmann Rexroth S.p.A. Divisione Rexroth Indramat Via del Progresso, 16 (Zona Ind.) I - 35020 Padova Telefon: +39 049/8 70 13 70 Telefax: +39 049/8 70 13 77	Italy ☐ SALES ☒ Service Mannesmann Rexroth S.p.A. Divisione Rexroth Indramat Via Mascia, 1 I - 80053 Castellamare di Stabia NA Telefon: +39 081/8 71 57 00 Telefax: +39 081/8 71 68 85	Italy ☒ SALES ☐ Service Mannesmann Rexroth S.p.A. Divisione Rexroth Indramat Viale Oriani, 38/A I - 40137 Bologna Telefon: +39 051/34 14 14 Telefax: +39 051/34 14 22
Netherlands ☒ SALES ☐ Service Hydraudyne Hydrauliek B.V. Kruisbroeksestraat 1 (P.O. Box 32) NL - 5281 RV Boxtel Telefon: +31 (0)411/65 19 51 Telefax: +31 (0)411/65 14 83 e-mail: indramat@hydraudyne.nl	Netherlands ☐ SALES ☒ Service Hydrocare B.V. Kruisbroeksestraat 1 (P.O. Box 32) NL - 5281 RV Boxtel Telefon: +31 (0)411/65 19 51 Telefax: +31 (0)411/67 78 14	Norway ☒ SALES ☐ Service Rexroth Mecman AS Rexroth Indramat Division Berghagan 1 or: Box 3007 N -1405 Ski-Langhus N -1402 Ski Telefon: +47 (0)64 86 41 00 Telefax: +47 (0)64 86 90 62 jul.ruud@rexroth.no	Poland ☒ SALES ☐ Service Mannesmann Rexroth Sp.zo.o. Biuro Poznan ul. Dabrowskiego 81/85 PL - 60-529 Poznan Telefon: +48 061/847 67 99 Telefax: +48 061/847 64 02
Rumania ☒ SALES ☐ Service Mannesmann Rexroth Sp.zo.o. Str. Drobety nr. 4-10, app. 14 RO - 70258 Bucuresti, Sector 2 Telefon: +40 (0)1/210 48 25 +40 (0)1/210 29 50 Telefax: +40 (0)1/210 29 52	Russia ☐ SALES ☒ Service Tschudnenko E.B. Arsenia 22 RUS - 153000 Ivanovo Rußland Telefon: +7 093/223 96 33 oder/or +7 093/223 95 48 Telefax: +7 093/223 46 01	Spain ☒ SALES ☒ Service Mannesmann Rexroth S.A. Divisiòn Rexroth Indramat Centro Industrial Santiga Obradors s/n E-08130 Santa Perpetua de Mogoda Barcelona Telefon: +34 937 47 94 00 Telefax: +34 937 47 94 01 ricardo.panicello@rexroth-es.com	Spain ☒ SALES ☒ Service Goimendi S.A. División Rexroth Indramat Jolastokieta (Herrera) Apartado 11 37 E - 20017 San Sebastian Telefon: +34 9 43/40 01 63 Telefax: +34 9 43/39 17 99
Sweden ☒ SALES ☒ Service Rexroth Mecman Svenska AB Rexroth Indramat Division Varuvägen 7 S - 125 81 Stockholm Telefon: +46 (0)8/727 92 00 Telefax: +46 (0)8/647 32 77	Slowenia ☒ SALES ☒ Service Rexroth Indramat elektromotorji d.o.o. Otoki 21 SLO - 64 228 Zelezniki Telefon: +386 64/61 73 32 Telefax: +386 64/64 71 50	Switzerland-East- ☒ SALES ☒ Service Mannesmann Rexroth Schweiz AG Gesch.ber. Rexroth Indramat Gewerbestraße 3 CH - 8500 Frauenfeld Telefon: +41 (0)52/720 21 00 Telefax: +41 (0)52/720 21 11	Switzerland-West- ☒ SALES ☐ Service Mannesmann Rexroth Suisse SA Département Rexroth Indramat Rue du village 1 CH - 1020 Renens Telefon: +41 (0)21/632 84 20 Telefax: +41 (0)21/632 84 21
Turkey ☒ SALES ☒ Service Mannesmann Rexroth Hidropar A..S. Fevzi Cakmak Cad No. 3 TR - 34630 Sefaköy Istanbul Telefon: +90 212/541 60 70 Telefax: +90 212/599 34 07	rexroth@cea.ru		

Europäische Kundenbetreuungsstellen (ohne Deutschland)
European Service agencies (without Germany)

Außerhalb Europa - outside Europe

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

Argentina ☒ SALES ☐ Service Mannesmann Rexroth S.A.I.C. Division Rexroth Indramat Acassusso 48 41/7 RA - 1605 Munro (Buenos Aires) Telefon: +54 (0)11/4756 01 40 Telefax: +54 (0)11/4762 6862 e-mail:mannesmann@impsat1.com.ar	Argentina ☒ SALES ☒ Service NAKASE Servicio Tecnico CNC Calle 49, No. 5764/66 RA - 1653 Villa Balester Prov. - Buenos Aires Telefon: +54 (0) 11/4768 36 43 Telefax: +54 (0) 11/4768 24 13 e-mail: nakase@usa.net nakase@infovia.com.ar	Australia ☒ SALES ☒ Service AIMS - Australian Industrial Machinery Services Pty. Ltd. Unit 3/45 Horne ST Campbellfield , VIC 3061 AUS - Melbourne Telefon: +61 (0)3/93 59 02 28 Telefax: +61 (0)3/93 59 02 86	Australia ☒ SALES ☐ Service Mannesmann Rexroth Pty. Ltd. No. 7, Endeavour Way Braeside Victoria, 31 95 AUS – Melbourne Telefon: +61 (0)3/95 80 39 33 Telefax: +61 (0)3/95 80 17 33 Email: mel@rexroth.com.au
Brazil ☒ SALES ☒ Service Mannesmann Rexroth Automação Ltda. Divisão Rexroth Indramat Rua Georg Rexroth, 609 Vila Padre Anchieta BR - 09951-270 Diadema-SP [Caixa Postal 377] [BR-09901-970 Diadema-SP] Telefon: +55 (0)11/745 90 60 +55 (0)11/745 90 70 Telefax: +55 (0)11/745 90 50 e-mail: awittwer@rexroth.com.br	Brazil ☐ SALES ☒ Service Mannesmann Rexroth Automação Ltda. Divisão Rexroth Indramat R. Dr.Humberto Pinheiro Vieira, 100 Distrito Industrial BR - 89220-390 Joinville - SC [Caixa Postal 1273] Tel./Fax: +55 (0)47/473 58 33 Mobil: +55 (0)47 974 66 45 e-mail: prochnow@zaz.com.br	Canada ☒ SALES ☒ Service Basic Technologies Corporation Burlington Division 3426 Mainway Drive Burlington, Ontario Canada L7M 1A8 Telefon: +1 905/335 55 11 Telefax: +1 905/335-41 84	China ☒ SALES ☒ Service Rexroth International Trade (Shanghai) Co., Ldt. Wai Gaoqiao Free Trade Zone No.122, Fu Te Dong Yi Road Shanghai 200131 - P.R.China Telefon: +86 21/58 66 30 30 Telefax: +86 21/58 66 55 23
China ☒ SALES ☐ Service Mannesmann Rexroth (China) Ldt. 15/F China World Trade Center 1, Jianguomenwai Avenue Beijing 100004, P.R.China Telefon: +86 10/65 05 03 80 Telefax: +86 10/65 05 03 79	China ☒ SALES ☐ Service Mannesmann Rexroth (China) Ldt. A-5F., 123 Lian Shan Street Sha He Kou District Dalian 116 023, P.R.China Telefon: +86 411/46 78 930 Telefax: +86 411/46 78 932	China ☒ SALES ☐ Service Mannesmann Rexroth (China) Ldt. Guangzhou Repres. Office Room 1014-1016, Metro Plaza, Tian He District, 183 Tian He Bei Rd Guangzhou 510075, P.R.China Telefon: +86 20/8755-0030 +86 20/8755-0011 Telefax: +86 20/8755-2387	Hongkong ☒ SALES ☒ Service Rexroth (China) Ldt. 1/F., 19 Cheung Shun Street Cheung Sha Wan, Kowloon, Hongkong Telefon: +852 22 62 51 00 Telefax: +852 27 41 33 44
India ☒ SALES ☒ Service Mannesmann Rexroth (India) Ltd. Rexroth Indramat Division Plot. 96, Phase III Peenya Industrial Area IND - Bangalore - 560058 Telefon: +91 (0)80/8 39 73 74 Telefax: +91 (0)80/8 39 43 45	India ☒ SALES ☒ Service Mannesmann Rexroth (India) Ltd. Rexroth Indramat Division Plot. A-58, TTC Industrial Area Thane Turbhe Midc Road Mahape Village IND - Navi Mumbai - 400 701 Telefon: +91 (0)22/7 61 46 22 Telefax: +91 (0)22/7 68 15 31	Indonesia ☒ SALES ☐ Service PT. Rexroth Wijayakusuma Jl. Raya Bekasi Km 21 Pulogadung RI - Jakarta Timur 13920 Telefon: +62 21/4 61 04 87 +62 21/4 61 04 88 Telefax: +62 21/4 60 01 52	Japan ☐ SALES ☒ Service Rexroth Automation Co., Ltd. Service Center Japan Yutakagaoka 1810, Meito-ku, NAGOYA 465-0035, Japan Telefon: +81 (0)52/777 88 41 +81 (0)52/777 88 53 +81 (0)52/777 88 79 Telefax: +81 (0)52/777 89 01
Japan ☒ SALES ☒ Service Rexroth Automation Co., Ltd. Rexroth Indramat Division 1F, I.R. Building Nakamachidai 4-26-44, Tsuzuki-ku YOKOHAMA 224-0041, Japan Telefon: +81 (0)45/942 72 10 Telefax: +81 (0)45/942 03 41	Mexico ☒ SALES ☐ Service Mannesmann Rexroth Mexico S.A. de C.V. Calle Neptuno 72 Unidad Ind. Vallejo MEX - 07700 Mexico, D.F. Telefon: +52 5 754 17 11 +52 5 754 36 84 +52 5 754 12 60 Telefax: +52 5 754 50 73 +52 5 752 59 43 e-mail: gsoria@rexroth-mexico.com	Korea ☒ SALES ☒ Service Mannesmann Rexroth-Korea Ltd. Rexroth Indramat Division 1500-12 Dadae-Dong- Saha-Ku Pusan, 604-050 Republic of South Korea Telefon: +82 (0)51/2600 741 Telefax: +82 (0)51/2600 747 gyhan@rexrothkorea.co.kr	Korea ☒ SALES ☒ Service Seo Chang Corporation Ltd. Room 903, Jeail Building 44-35 Yeouido-Dong Yeoungdeungpo-Ku C.P.O.Box 97 56 ROK - Seoul Telefon: +82 (0)2/7 80 82 08 +82 (0)2/7 80 82 09 Telefax: +82 (0)2/7 84 54 08
Taiwan ☒ SALES ☐ Service Rexroth Uchida Co., Ltd. No.1, Tsu Chiang Street Tu Cheng Ind. Estate Taipei Hsien, Taiwan, R.O.C. Telefon: +886 2/2 68 13 47 Telefax: +886 2/2 68 53 88		South Africa ☒ SALES ☒ Service TECTRA Automation (Pty) Ltd. 28 Banfield Road,Industria North RSA - Maraisburg 1700 Telefon: +27 (0)11/673 20 80 Telefax: +27 (0)11/673 72 69 georgv@hyauto.com	

Kundenbetreuungsstellen außerhalb Europa - Service agencies outside Europe

Außerhalb Europa / USA - outside Europe / USA

USA ☒ SALES ☒ Service Mannesmann Rexroth Corporation Rexroth Indramat Division 5150 Prairie Stone Parkway USA -Hoffman Estates, IL 60192-3707 Telefon: +1 847/6 45 36 00 Telefax: +1 847/6 45 62 01 service@indramat.com	USA ☒ SALES ☒ Service Mannesmann Rexroth Corporation Rexroth Indramat Division Central Region Technical Center USA - Auburn Hills, MI 48326 Telefon: +1 248/3 93 33 30 Telefax: +1 248/3 93 29 06	USA ☒ SALES ☒ Service Mannesmann Rexroth Corporation Rexroth Indramat Division Southeastern Technical Center 3625 Swiftwater Park Drive USA - Suwanee Georgia 30174 Telefon: +1 770/9 32 32 00 +1 770/9 32 19 03	USA ☒ SALES ☒ Service Mannesmann Rexroth Corporation Rexroth Indramat Division Northeastern Technical Center 99 Rainbow Road USA - East Granby, Connecticut 06026 Telefon: +1 860/8 44 83 77 +1 860/8 44 85 95
USA ☒ SALES ☒ Service Mannesmann Rexroth Corporation Rexroth Indramat Division Charlotte Regional Sales Office 14001 South Lakes Drive USA - Charlotte, North Carolina 28273 Telefon: +1 704/5 83 97 62 +1 704/5 83 14 86			USA Service HOTLINE **+1-800-860-1055** - 7 days / 24hrs -

Kundenbetreuungsstellen außerhalb Europa / USA
Service agencies outside Europe / USA

Printed in Germany

Rexroth Indramat