SIEMENS

SIMOTION

SIMOTION C230-2

Equipment Manual

6AU1 900-0AB30-0BA0

04.2003 Edition

Safety notices

This manual contains notices that you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level of danger:

Danger

Indicates a potentially hazardous situation which, if not avoided, **will** result in death or serious injury or in substantial property damage.

Warning

Indicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury or in substantial property damage.

Caution

Used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, **may** result in minor or moderate injury or in property damage.

Caution

Used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, **may** result in property damage.

Notice

Used without the safety alert symbol indicates a potential situation which, if not avoided, **may** result in an undesirable result or state.

Qualified personnel

This device/system may only be set up and operated by **qualified personnel**. Qualified persons are defined as persons who are authorized to commission, to ground, and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

Correct usage

Note the following:

Warning

This device and its components may only be used for the applications described in the catalog or the technical descriptions and only in connection with devices or components from other manufacturers that have been approved or recommended by Siemens.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

Trademarks

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Other names in this publication might be trademarks the use of which by a third party for his own purposes may violate the rights of the registered holder.

Preface

Sections of information in the manual

The following list describes the purpose of this manual and how you can benefit from it.

- Product Overview (Chapter 1)

  This part explains the purpose and potential applications of the module.

- The Fundamentals of Motion Control (Chapter 2)

  Here you will find an introduction to motion control for individual axes and axis groupings. The various terms are also explained.

- Device Data (Chapter 3)

  This part introduces the C230-2 and its functions.

- Installation (Chapter 4)

  This part explains the design of the mechanical configuration and how to install the SIMOTION C230-2 components.

- Addressing the I/O (Chapter 5)

  This part contains the information you will require to define the module initial addresses of the modules used.

- Wiring (Chapter 6)

  This part describes the connection and wiring for the drives, encoders and digital inputs/outputs (onboard).

- Networking (Chapter 7)

  This part contains information that you need in order to create a PROFIBUS subnet or Ethernet subnet.

- Commissioning (Chapter 8)

  This part describes how you commission the hardware components and what you must take into account.

- Maintenance (Chapter 9)

  This part describes how you replace the module and update the SIMOTION kernel.

- Appendices with factual information for reference (e.g. standards and approvals, ESD etc.)

- List of References

  Here you can find an overview and list of all SIMOTION documentation which you need for the configuration and commissioning of the C230-2.

- Glossary and index to find the information

Standards and approvals

Our products meet the requirements of EU directive 89/336/EEC "Electromagnetic Compatibility" and the harmonized European Standards (EN) listed there.

You can find detailed information on approvals and standards in Appendix A.

The EC declaration of conformity in accordance with the above EU directive, Article 10, is contained in this manual (see Appendix B).

Recycling and disposal

SIMOTION C230-2 is an environmentally friendly product! It includes the following features:

- In spite of its excellent resistance to fire, the flame-resistant agent in the plastic used for the housing does not contain halogens.
- Identification of plastic materials in accordance with DIN 54840
- Less material used because the unit is smaller and with fewer components thanks to integration in ASICs

The C230-2 can be recycled because it is low in pollutants.

For environmentally friendly recycling and disposal of your old modules in accordance with most advanced techniques, please get in touch with your contact person. You can find the correct contact person under the following Internet address:

http://www.ad.siemens.de/partner

Contacts

If you have any problems or questions when working with this manual, please contact the Siemens department indicated on the remarks form at the end of this manual.

Hotline

If you have any queries please contact our Hotline (worldwide):

A & D Technical Support: Phone: ++49-180-5050-222
Fax: ++49-180-5050-223
E-mail: ad.support@siemens.com

If you have any comments on the documentation (suggestions, corrections), please send them to the following fax number or e-mail address:
Fax: ++49-9131-98-2176
E-mail: motioncontrol.docu@erlf.siemens.de
Fax form: See remarks form at the end of this document.

Additional support

We offer a range of courses to help you get started with the SIMOTION C230-2 system.

For more information, please contact your regional training center or the central training center in D-90027 Nuremberg, Phone: ++49-911-895-3202.

Siemens Internet address

You can obtain constantly updated information on SIMOTION products on the Internet at:

• General information **http://www.siemens.de/simotion**

• Technical information **http://www4.ad.siemens.de/view/cs/en/10805436**

Documentation for SIMOTION

SIMOTION Engineering
Order No.: 6AU1 900-0BA30-0BA0

SIMOTION Function Library
Order No.: 6AU1 900-0BC30-0BA0

SIMOTION Technology Functions
Order No.: 6AU1 900-0BE30-0BA0

SIMOTION Plastics
Order No.:   6AU1 900-0CX30-0BA0
6AU1 900-0CN30-0BA0

SIMOTION Reference Lists
Order No.: 6AU1 900-0BF30-0BA0

SIMOTION Hardware
Order No.: 6AU1 900-0BB30-0BA0
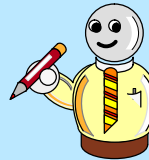
You are here ...

SIMOTION Hardware consists of the following documents:

SIMOTION C230-2
Equipment Manual

SIMOTION Panels
Equipment Manual

SIMOTION P350
Equipment Manual

ADI4 – Analog Drive Interface
for Four Axes
Equipment Manual

SIMOTION D435
Equipment Manual

Table of Contents

Product Overview

1

What can the C230-2 do?

The C230-2 is a motion control module for controlling servo drives via PROFIBUS DP and four onboard drive interfaces.

The following configurations can be selected:

- Four axes via the onboard drive interface or

- Axes via PROFIBUS DP or

- Mixed operation with a maximum of four axes via the onboard drive interface and axes via PROFIBUS DP

The number of operable axes on the PROFIBUS DP depends on the set system cycle clocks, i.e. more than four axes can be operated with longer cycle times.

The C230-2 is a powerful module for positioning independent, single axes or motions in an axis grouping.

Both rotary axes and linear axes can be operated.

The configuration, parameterization, commissioning, programming and diagnostics of the C230-2 is carried out via the Engineering System (ES).

For which applications can the C230-2 be used?

The C230-2 can be used both for positioning and synchronous operation (gearbox and cam).

Typical areas in which the motion control module can be used are:

- Packaging industry

- Plastics industry

- Presses

- Textile industry

- Printing industry

- Wood, glass, ceramic, stone

System integration

SIMOTION offers an optimized system platform for automation and drive solutions where priority is given to motion control applications and technological tasks.

The SIMOTION modular system consists of the Engineering System SIMOTION SCOUT and a shared runtime system for various hardware platforms.

The truly innovative aspect of SIMOTION is that it does away with the traditional separation between pure automation functions and motion functions.
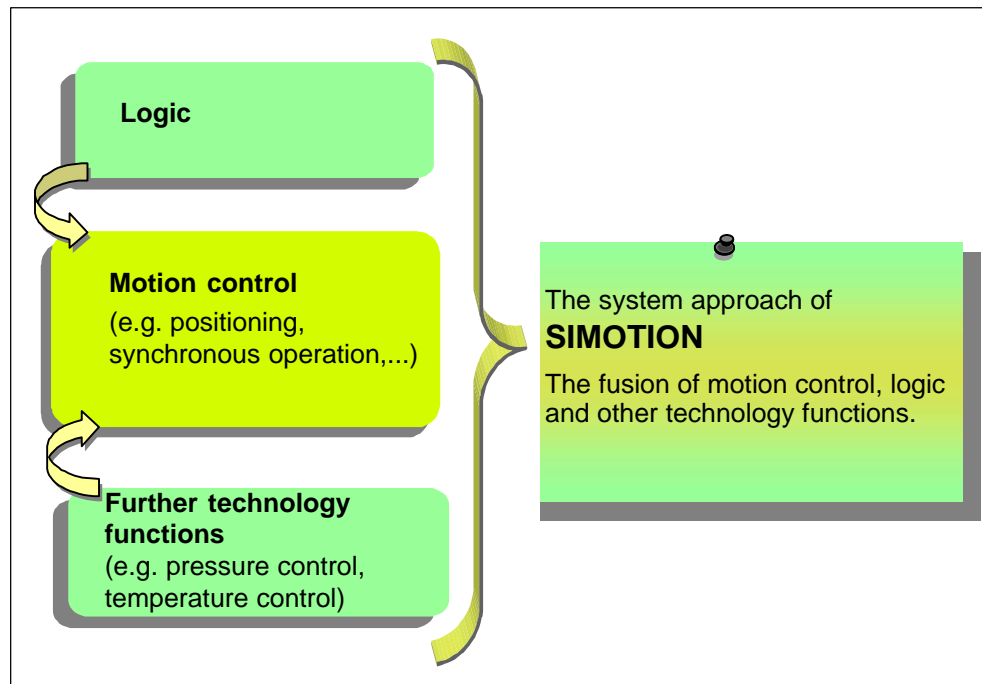
Fig. 1-1   System solution for production machines

Individual automation tasks for production machines are formulated in a uniform and consistent user interface. Logic and motion functions are programmed in this graphic programming tool. The logic commands can also be programmed using the structured text (ST) high-level language that complies with IEC 1131.

Technological tasks such as positioning or synchronous operation are available as functions that are simple for you to incorporate in the program, as are the logic commands too.

Consistency in the three areas of programming and project design, data management and communication is the core feature of Totally Integrated Automation (TIA).

The following figure shows a system configuration with SIMOTION C230-2.
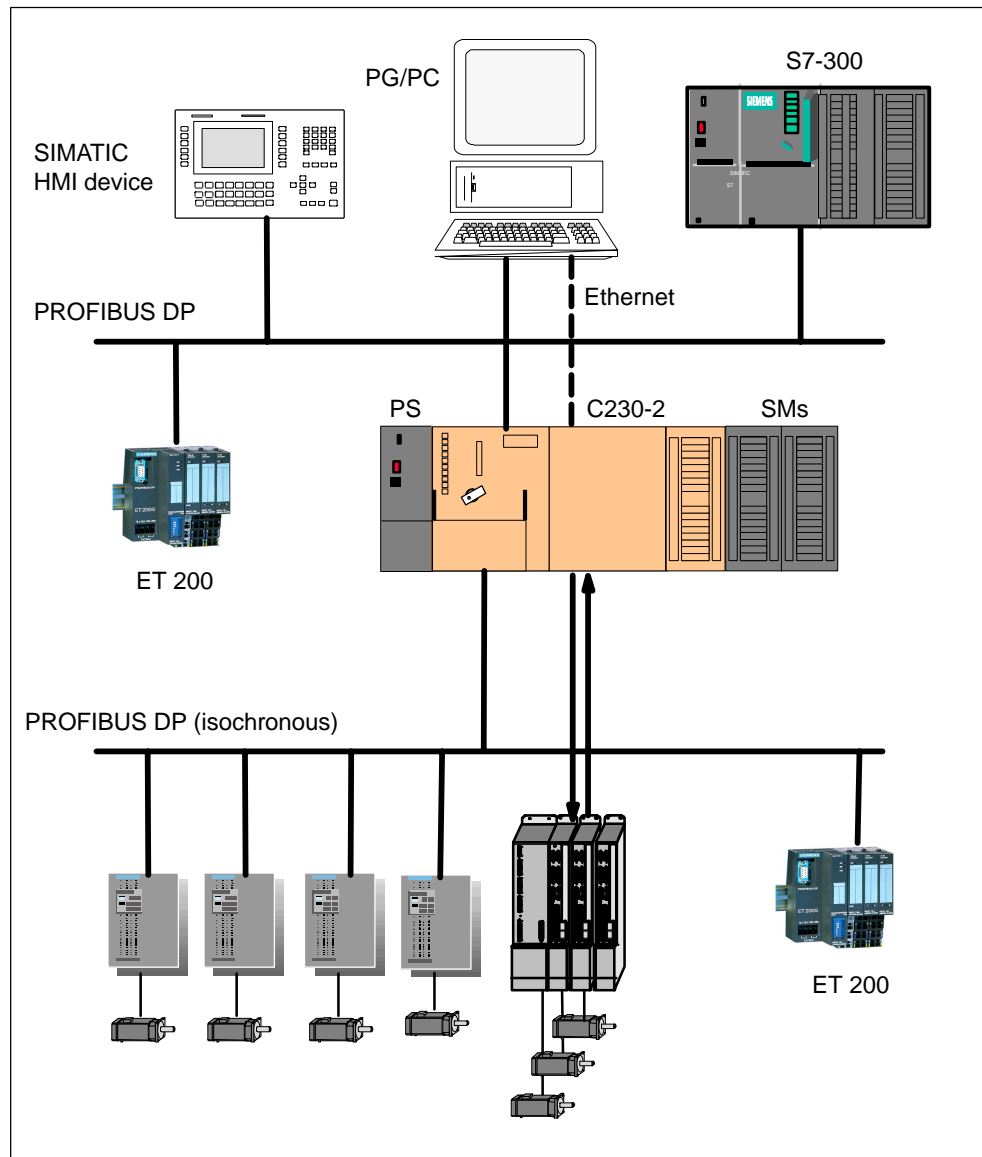
Fig. 1-2   System overview

Components

The most important components of a SIMOTION application with C230-2 and their functions are listed below.

Note

The modules or devices approved for the C230-2 can be found in the *SIMOTION PM 10 catalog*.

Refer to the list of references for the order number of the catalog.

Centralized peripherals

Table 1-1   C230-2 with centralized peripherals

Component	Function
C230-2	... is the motion control module. The C230-2 supplies the P-bus with 5 V; communicates over the P-bus (backplane bus) with the I/O modules.
	You can use the C230-2's integrated fast digital inputs/outputs as:
	• Homing inputs
	• Inputs for measuring inputs
	• User-addressable process inputs/outputs
	Drive devices with ±10 V analog interfaces can be connected to the onboard drive interface.
	Incremental encoders or absolute encoders can be connected to the measuring system interface.
Power supply (PS)	... converts the line voltage (120/230 VAC) into an operating voltage of 24 VDC to supply the C230-2.
Signal modules (SM)	... adapt various process signal levels to the C230-2 (digital input/output modules and analog input/output modules).
	Note: All approved modules are listed in the PM 10 catalog and in Subsection 3.1.5.
Function modules (FM)	...relieve the CPU of computation-intensive tasks, for example, counting.
	Note: All approved modules are listed in the PM 10 catalog and in Subsection 3.1.5.
Communications processors (CP)	... for data exchange
	Note: All approved modules are listed in the PM 10 catalog and in Subsection 3.1.5.

Distributed I/Os

Table 1-2   C230-2 with distributed I/Os

Component	Function

C230-2	... is the motion control module.
	
	 • The C230-2 communicates via two PROFIBUS DP interfaces with the:
	   – Programming device (PG/PC)
	   – SIMATIC HMI devices
	   – S7 controllers with PROFIBUS DP interface
	   – I/O systems ET 200
	   – Drive units
	   – Further C230-2s
	 • The C230-2 communicates via an Ethernet interface with the programming device (PG/PC).
	
	 Note:
	 All approved devices are listed in the PM 10 catalog and in Subsection 3.1.5.

Table 1-3   Further components that can be connected to the C230-2

Component	Function
Programming device (PG/PC)	... configures, parameterizes, programs and tests SIMOTION and C230-2.
SIMATIC HMI device	... is used for operating and monitoring functions. It is not absolutely essential for the operation of a C230-2. **Note:** All released modules are listed in the PM 10 catalog.
Drive units	... convert speed setpoints into signals for controlling the motor and provide the power required to operate the motors. **Note:** All released modules are listed in the PM 10 catalog.

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The Fundamentals of Motion Control

2

Position-controlled motion control for servo axes (onboard I/Os)

The C230-2 allows the position-controlled motion control of up to four axes. The C230-2 provides an analog output for the speed setpoint for each axis and an encoder input for the cyclic sensing of the actual position value.
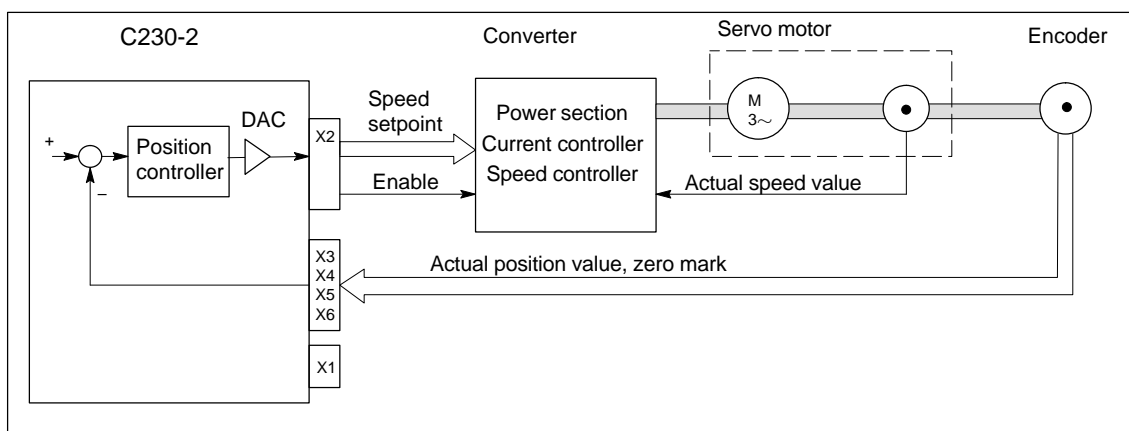
Fig. 2-1   Servo system with converter, e.g. SIMODRIVE 611 analog, with external incremental encoder

Incremental encoder

Encoders are generally connected for position measurement. These supply counting pulses, according to their resolution, for the incremental distance travelled. They can be either rotary or linear.
A "homing" (referencing) operation must be performed in order to determine the absolute position reference.

Absolute encoder (SSI)

Instead of conventional incremental encoders, which supply only one dimension for the distance travelled, absolute encoders with a serial interface can be connected. No homing operation need be performed for these encoders as they always supply the absolute position as an actual value.

A one-off adjustment of the absolute encoder is required when the machine is initially commissioned.
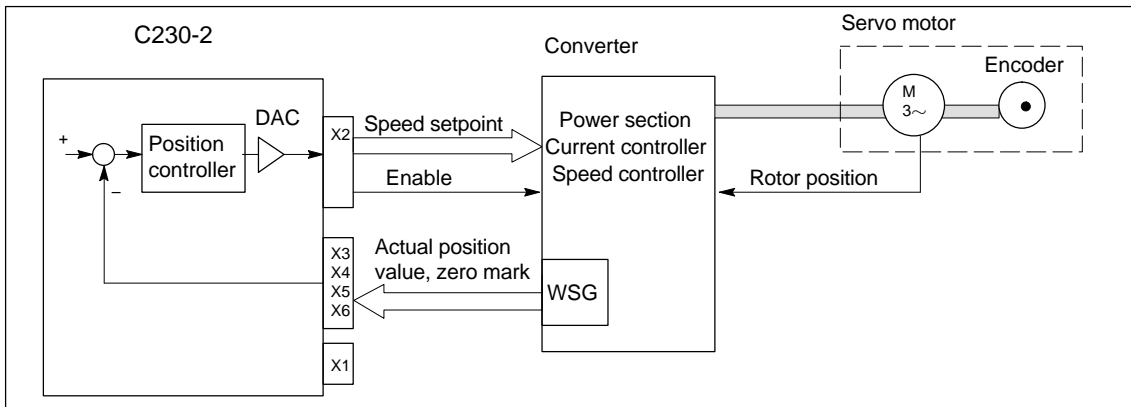
Fig. 2-2   Servo system with converter, e.g. SIMODRIVE 611 universal, with encoder emulation

Encoder emulation

Modern motor/converter systems often have a high-resolution motor measuring system (rotor position encoder) connected at the converter. Here the converter provides the position information via an interface that emulates an incremental encoder (e.g. incremental shaft encoder (WSG) interface with SIMODRIVE). A separate position measuring system is not required in this case.

Position-controlled motion control for servo axes (PROFIBUS DP)

The C230-2 allows the position-controlled motion of axes via PROFIBUS DP.

The following PROFIBUS protocol is used for specifying the speed setpoint and feeding back the actual position value:

PROFIdrive profile drive technology, Version 3 (isochronous)
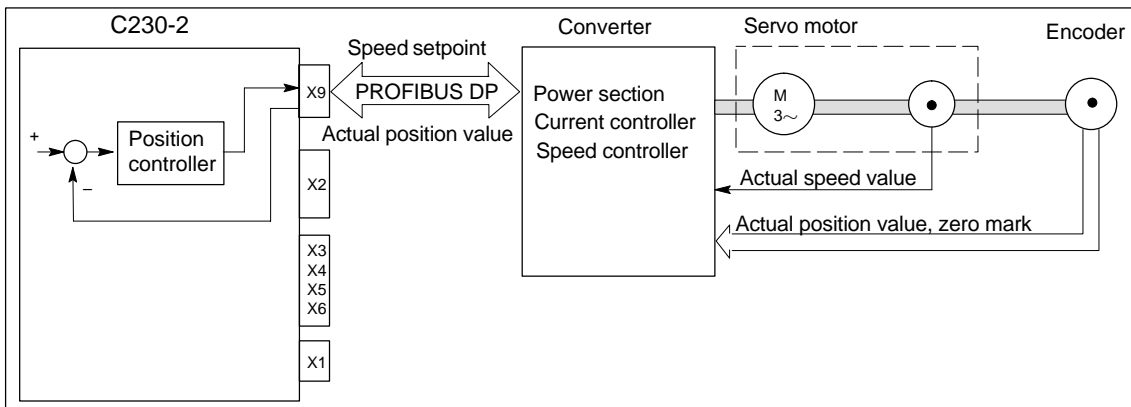
Fig. 2-3   Servo system with converter, e.g. SIMODRIVE 611 universal

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Device Data

3

Overview

This chapter contains information on:

- Layout of the module
- Mode selector
- Memory module slot
- PROFIBUS DP and drive interface
- Analog drive interface
- Measuring system interface
- I/O interface
- Clock
- Diagnosis using the LEDs
- Technical data
- Dimension drawing
- Accessories and spare parts

3.1 Layout of the module

View of C230-2

Fig. 3-1 shows the C230-2 module, indicating the interfaces and components on the front panel (fault and status displays).
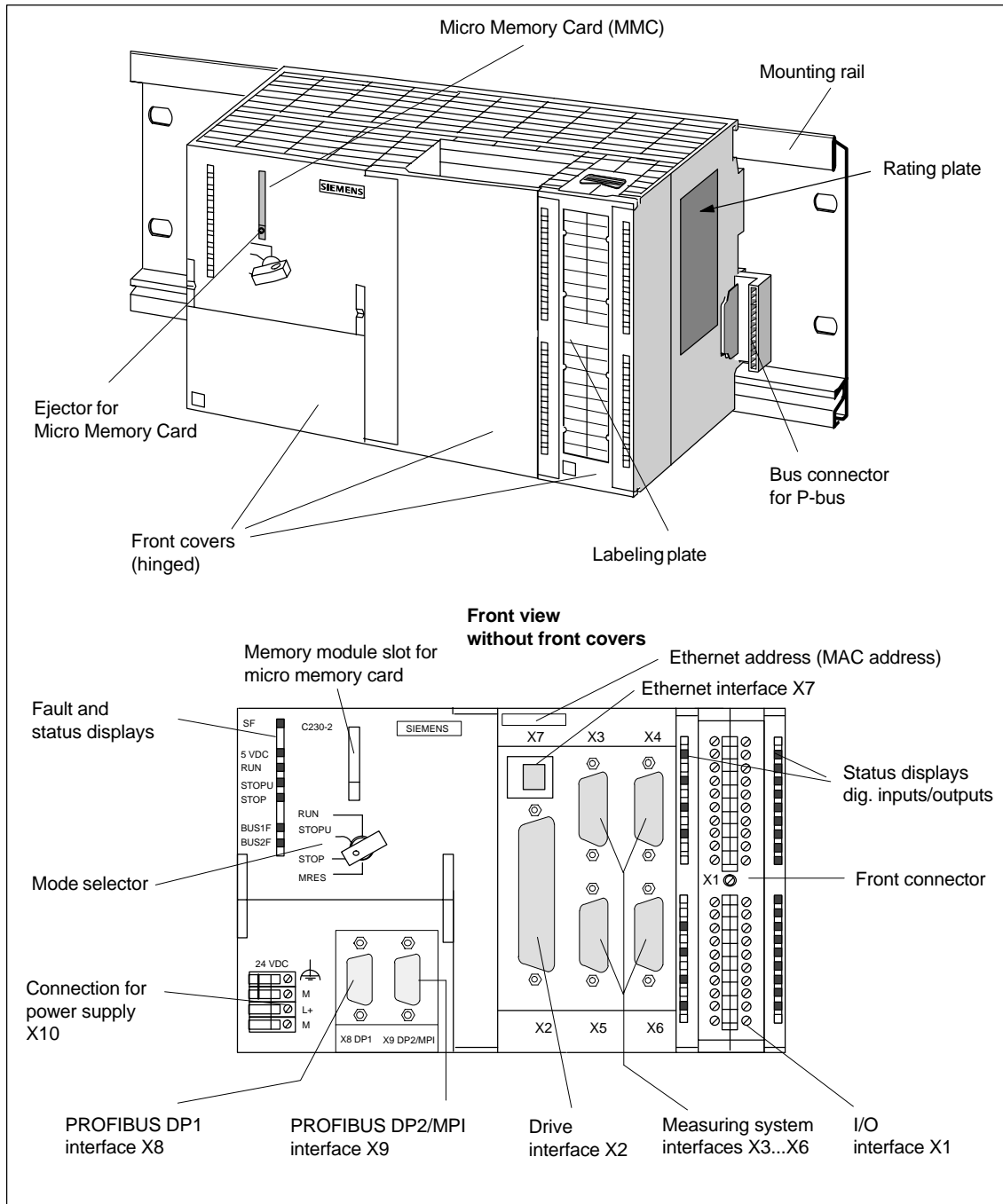
Fig. 3-1   Position of interfaces and front panel components

Interfaces

The interfaces and their functions are described in Table 3-1.

Table 3-1   Interfaces

Interfaces	Description
Bus connector	A rear-mounted connector for connecting the C230-2 with other S7-modules over the P-bus
Drive interface	50-pin Sub-D connector **X2** for the analog connection of drives (max. 4 axes) See Subsection 3.1.6
Measuring system interface	15-pin Sub-D sockets **X3** to **X6** for connection of encoders (max. 4) See Subsection 3.1.7
I/O interface	40-pin front connectors **X1** for connecting the fast digital inputs/outputs including measuring inputs, BEROs, and for wiring the READY relay See Subsection 3.1.8
Power supply connection	4-pin screw-type terminal connection **X10** for connecting the 24 V load power supply See Subsection 6.2.1
Memory module slot	7-pin connector for Micro Memory Card See Subsection 3.1.2
PROFIBUS DP1 interface	9-pin Sub-D socket **X8** for connection to the PROFIBUS DP. This interface can be used for isochronous operation. See Subsection 3.1.4
PROFIBUS DP2/MPI interface	9-pole **X9** Sub-D socket for connection to PROFIBUS DP (default setting) or an MPI bus. This interface can be used for isochronous operation. See Subsection 3.1.4
Ethernet interface	8-pin RJ45 socket **X7** for connection to a Fast Industrial Ethernet

Display of LEDs

The following LEDs are on the front panel of the C230-2. The LEDs and their function are described in Table 3-2.

Table 3-2   Status and fault displays

LED	Function
SF (red)	This LED indicates a fault on the C230-2. (See Section 3.3)
5 VDC (green)	This LED indicates that the power supply for the electronics is ready. (See Section 3.3)
RUN (green) - C230-2 in RUN	This LED indicates that the user program is running. (See Section 3.3)
STOPU (yellow) – C230-2 in STOP User Program	This LED indicates that the technology packages (e.g. synchronous operation, cam) are active. The user program is not active. (See Section 3.3)
STOP (yellow) – C230-2 in STOP	This LED indicates that no user program is running. The technology packages are not active. (See Section 3.3)
BUS1F (red) – group fault	This LED indicates a fault on the C230-2's PROFIBUS DP1 interface **(X8)**. (See Section 3.3)
BUS2F (red) – group fault	This LED indicates a fault on the C230-2's PROFIBUS DP2 /MPI interface **(X9)**. (See Section 3.3)
Q0...Q7, I0...I11, B1...B4, M1, M2 (green) – digital inputs/outputs	These LEDs show the status of the digital inputs/outputs. (See Subsection 3.1.8)

Control elements

Mode selector

Certain operating modes can be selected using the mode selector (see Subsection 3.1.1).

Rating plate

Fig. 3-2 explains all the information on the rating plate.

Note

The information contained in the individual fields of the rating plate on the actual module may differ from the information described in this manual (e.g. enhanced product development, authorizations and designations not yet granted, etc.).
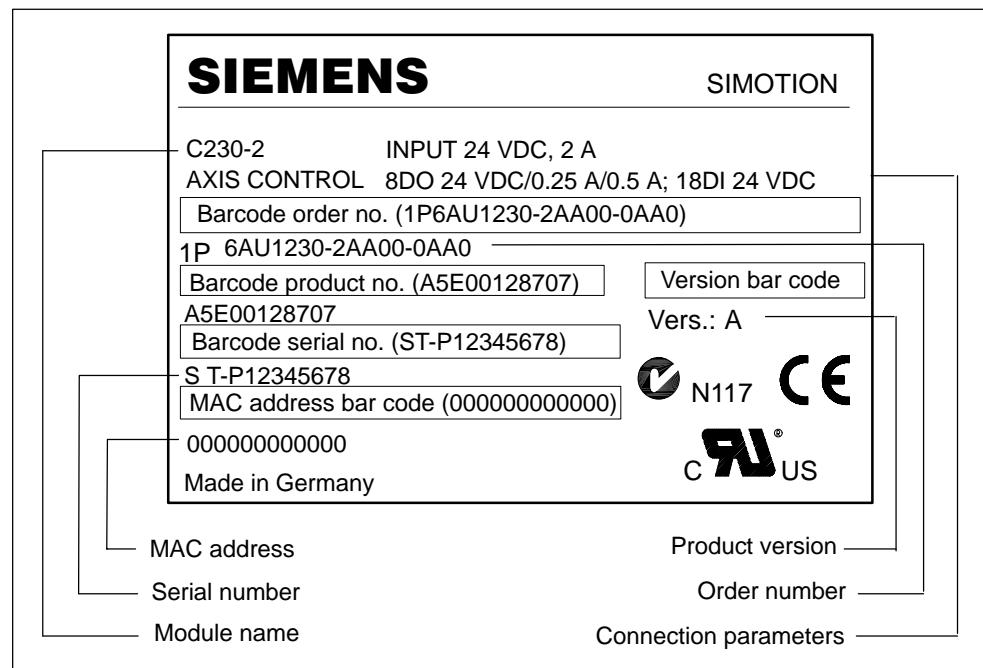
Fig. 3-2   Rating plate for the C230-2

3.1.1 Mode selector

Mode selector positions

The positions of the mode selector are explained in the sequence in which they are arranged on the C230-2.

Table 3-3   Mode selector positions

Position	Explanations
RUN	The C230-2 is executing the user program (UP) and the associated system functions: • Reading process image of inputs • Processing user programs assigned to the execution system • Writing process image of outputs The technology packages are active in this state. They can execute commands from the user program. The key cannot be removed in this position.
STOPU	The C230-2 is not executing a user program. • The technology packages are active. Test and commissioning functions can be executed. The user program is not active. • The I/O modules (SMs) are in a secure state. In this position the key can be removed so that no unauthorized person can change the operating modes.
STOP	• The C230-2 is not executing a user program. • It is possible to load a complete user program. • All system services (communications, etc.) are active. • The I/O modules (SMs) are in a secure state. • The technology packages are inactive, i.e. all enables are deleted. No axis movements can be executed. In this position, the key can be removed so that no unauthorized person can change the operating modes.
MRES (overall reset)	• Setting for overall reset on the C230-2 A specific sequence of operations is required to perform an overall reset using the mode selector (see Section 8.5). • Setting for Micro Memory Card formatting Micro Memory Card formatting see Section 8.4

3.1.2 Memory module slot

7-pin connector to plug in a Micro Memory Card (MMC)

Micro Memory Card

The following Micro Memory Card is available:

Order no.: 6AU1 700-0AA01-0AA0

The Micro Memory Card can be used:

- To save the SIMOTION Kernel (base system) in order to carry out an update (see Section 9.1)

  The SIMOTION Kernel should always be stored on the Micro Memory Card.

- To save the technology packages and user data (programs, configuration data, parameterization)

3.1.3 Ethernet interface

Interface for connecting a Fast Industrial Ethernet.

Fast Industrial Ethernet is a communication network with a transmission rate of 10/100 Mbit/s.

The C230-2 offers the following functions via the Ethernet interface:

- Communications with STEP 7 and SIMOTION SCOUT

  The "SIMATIC NET SOFTNET-PG (Protocol TPC/IP RFC 1006)" software must be installed on the PG/PC for this function.

- Communications between SIMOTION and SIMATIC NET OPC

  The "SIMATIC NET SOFTNET-S7 (S7-OPC-Server)" software must be installed on the PG/PC for this function.

  Note:
  SOFTNET-S7 is a superset of SOFTNET-PG, i.e. SOFTNET-S7 also contains this Protocol TPC/IP RFC 1006.

For further information about the software packages, see *Motion Control System SIMOTION, PM 10 catalog*, see List of References for the order number.

Connectable devices

A PG/PC can be connected to the Ethernet interface via a Fast Ethernet network. The PG must be equipped with an Ethernet card and the corresponding software must be available.

Position of the connectors

Fig. 3-4 shows the installation position and the designation of the connector on the module.
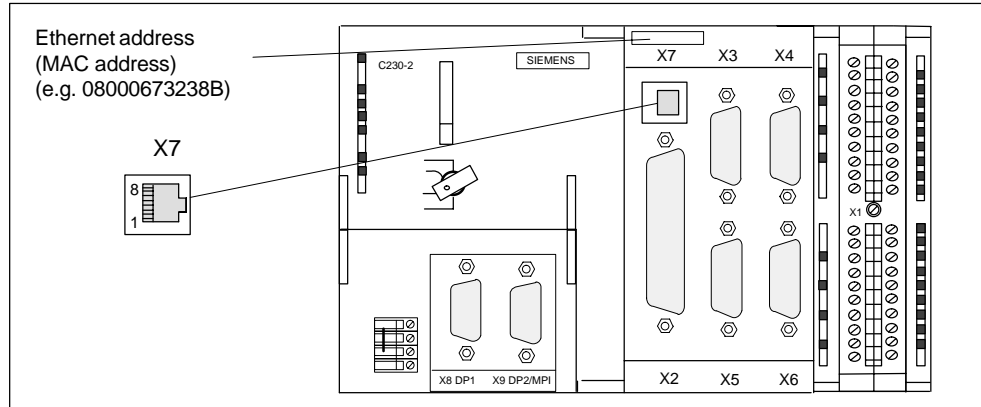
Fig. 3-3   Position of connector X7

Connector pin assignment

Designation: **X7   (Ethernet)**
Type: 8-pin RJ45 socket

Table 3-4   Assignment of X7 connector

Pin	Name	Type	Pin	Name	Type
1	TDP	O	5	Unassigned	
2	TDM	O	6	RDM	I
3	RDP	I	7	Unassigned	
4	Unassigned		8	Unassigned	

Signal names   RDP, RDM   Receive Data +/–
                            TDP, TDM   Transmit Data +/–

Signal type   I   Signal input
                           O   Signal output

3.1.4 PROFIBUS DP and drive interface

PROFIBUS DP interface (X8, X9)

The C230-2 provides you with two interfaces for connection to the PROFIBUS DP. Baud rates up to 12 Mbits/s are possible. Both interfaces can be used for isochronous operation.

The interfaces can be operated in the following combinations as master or slave (isochronous/not isochronous):

X8	X9	Remark	Actions in the application [1]
DP slave isochronous	DP master isochronous	Application synchronized with DP master (X9), application controls synchronization with DP slave (X8)	DP master/DP slave synchronization mechanisms
DP master isochronous	DP slave isochronous	Application synchronized with DP master (X8), application controls synchronization with DP slave (X9)	DP master/DP slave synchronization mechanisms
DP slave isochronous	DP master not isochronous	Application running freely or synchronized to the DP slave (X8) (can be monitored by the application)	DP slave synchronization mechanisms
DP master not isochronous	DP slave isochronous	Application running freely or automatically synchronized to the DP slave (X9) (can be monitored by the application)	DP slave synchronization mechanisms
DP master isochronous	DP master isochronous	Application synchronized with DP master (X8, X9)	None
DP master isochronous	DP master not isochronous	Application synchronized with DP master (X8)	None
DP master isochronous	DP slave not isochronous	Application synchronized with DP master (X8)	None
DP master not isochronous	DP master isochronous	Application synchronized with DP master (X9)	None
DP slave not isochronous	DP master isochronous	Application synchronized with DP master (X9)	None
DP master not isochronous	DP master not isochronous	Application asynchronous	None
DP slave not isochronous	DP master not isochronous	Application asynchronous	None
DP master not isochronous	DP slave not isochronous	Application asynchronous	None

1) Actions in the application see function description *SIMOTION Modular Machine Concepts*, order no. see List of References

If both interfaces (X8, X9) are to be operated isochronously, then they must both be configured with the same DP cycle clock.

The X9 can alternatively be used as an MPI interface with a baud rate of up to 12 MBit/s.

Connectable devices

The following devices can be connected to the PROFIBUS DP interfaces:

- PG/PC
- SIMATIC HMI devices
- S7 controllers with PROFIBUS DP interface
- Distributed I/Os (e.g. ET 200M)

  The updating of the digital inputs/outputs is carried out in the position control cycle clock.

- C230-2
- Teleservice adapter
- Drives with digital interface (e.g. SIMODRIVE 611 universal)

Note

A teleservice adapter can only be connected to **one** of the two interfaces.

All approved modules and devices are listed in the PM 10 catalog and in Subsection 3.1.5. Refer to the list of references for the order number.

Please note the documentation regarding the individual modules or devices!

Position of the connectors

Fig. 3-4 shows the mounting position and designation of the connectors on the module.
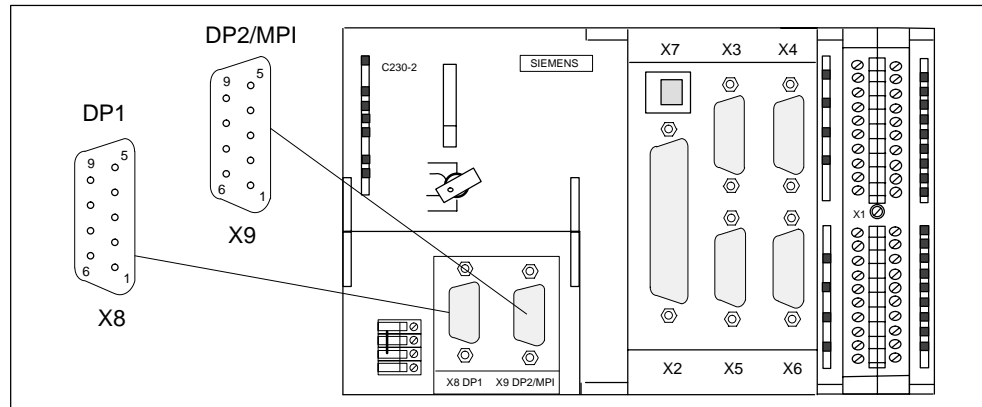
Fig. 3-4   Position of connectors X8, X9

Connector pin assignment

Designation: **X8, X9**   DP1, DP2/MPI
Type: 9-pin Sub-D socket

Table 3-5   Assignment of X8, X9 connector

Pin	Name	Type	Pin	Name	Type
1	Unassigned		6	P5	VO
2	M24	VO	7	P24	VO
3	B	I/O	8	A	I/O
4	RTS	I	9	Unassigned	
5	GND	VO			

Signal names   A, B   Data input/output (RS485)
RTS   Request to send
P5   5 V supply 60 mA, short-circuit-proof
GND   Ground for 5 V voltage
P24   24 V supply 150 mA, short-circuit-proof, not isolated
M24   24 V reference potential

Signal type   I   Signal input
I/O   Signal input/output
VO   Voltage output

3.1.5 I/O modules approved for SIMOTION

Preferred peripherals for use with SIMOTION C:

- Centralized peripherals:

  SIMATIC S7-300 I/O modules (only with SIMOTION C)

- Distributed I/O systems:

  – **SIMATIC ET 200M** (distributed use of SIMATIC S7-300 I/O modules):
    The modular I/O system for control cabinet installation and high channel densities

  – **SIMATIC ET 200S**:
    Fine modular I/O system for control cabinet installation including motor starters, safety technology and individual grouping of the load groups

  – **SIMATIC ET 200X**:
    The modular I/O system in the IP 65/67 degree of protection for use without a control cabinet and in the machine's proximity; includes motor starters and pneumatic modules as well as DESINA- and ECOFAST-conform modules

  – **SIMATIC ET 200eco**:
    The compact, economical I/O system in the IP 67 degree of protection for use without a control cabinet and in the machine's proximity; with the flexible and fast ECOFAST or M12 connection system

- Other PROFIBUS DP I/Os:

  ADI 4 (Analog Drive Interface)
  for connecting drives with a $\pm$ 10 V analog setpoint interface

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Note

Please note that not all modules of the above-mentioned I/Os or I/O systems are approved for SIMOTION. Additionally, system-related functional differences as regards use with SIMOTION and SIMATIC may occur. For example, special process-control functions (e.g. insertion and removal under voltage...) are not supported by SIMOTION for the ET 200M distributed I/O system.

A detailed, regularly updated list of the I/O modules approved for use with SIMOTION, as well as notes on their use, can be found on the Internet at:

http://www4.ad.siemens.de/view/cs/en/10805436

$\rightarrow$...Motion Control System SIMOTION

$\rightarrow$ Supplementary system components

$\rightarrow$ FAQ (entry ID: 11886029)

In addition to the I/O modules approved for SIMOTION, all certified standard slaves that support cyclical data exchange (DP V0) and, if applicable, a cyclical data exchange (DP V1), can be connected to SIMOTION. These modules are integrated via the GSD file of the device's manufacturer.

Note

Please note that in individual cases further boundary conditions must be fulfilled in order to integrate a standard slave into SIMOTION. Some modules need "driver modules", e.g. in the form of function blocks, which make integration possible or much easier.

For the modules approved for SIMOTION (e.g. S7-300 module FM 350-1...), these driver modules are part of the SIMOTION Function Library.

3.1.6 Analog drive interface

Connector to drive unit

Drive devices with a ($\pm$ 10 V) analog interface can be connected to the C230-2's X2 50-pole Sub-D socket.

In addition, the C230-2 provides one enable signal per axis.

Position of the connector

Fig. 3-5 shows the installation position and the designation of the connector on the module.
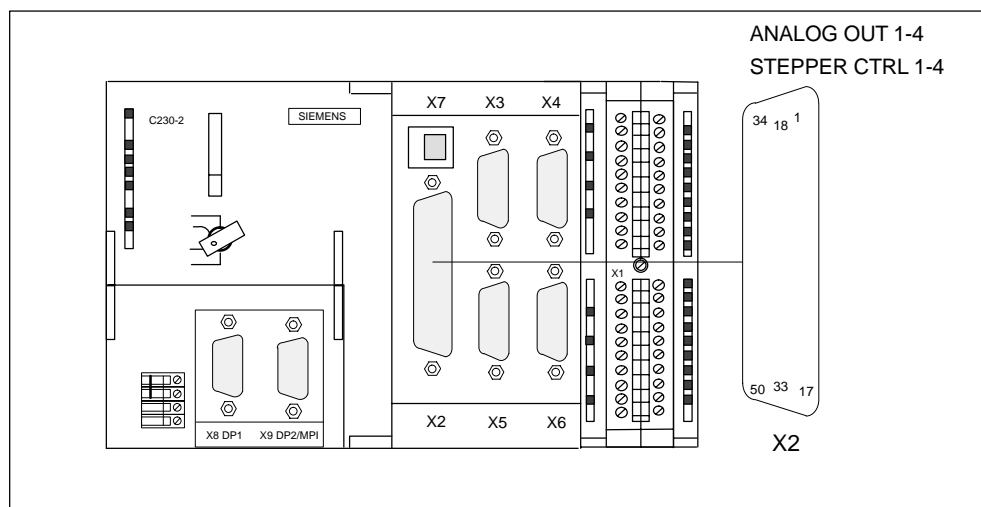
Fig. 3-5   Position of the X2 connector

Connector pin assignment

Drive interface (servo interface, 4 axes)

Designation: **X2**   ANALOG OUT 1-4/STEPPER CTRL 1-4
Type: 50-pin Sub-D plug male connector

Table 3-6   X2 connector pin assignment

Pin	Name	Type	Pin	Name	Type	Pin	Name	Type
1	SETP1	VO	18	Reserved	O	34	REFPOT1	VO
2	REFPOT2	VO	19	Reserved	O	35	SETP2	VO
3	SETP3	VO	20	Reserved	O	36	REFPOT3	VO
4	REFPOT4	VO	21	Reserved	O	37	SETP4	VO
5	Reserved	O	22	Reserved	O	38	Reserved	O
6	Reserved	O	23	Reserved	O	39	Reserved	O
7	Reserved	O	24	Reserved	O	40	Reserved	O
8	Reserved	O	25	Reserved	O	41	Reserved	O
9	Reserved	O	26	Reserved	O	42	Reserved	O
10	Reserved	O	27	Reserved	O	43	Reserved	O
11	Reserved	O	28	Reserved	O	44	Reserved	O
12	Reserved	O	29	Reserved	O	45	Reserved	O
13	Unas-signed		30	Unassigned		46	Unassigned	
14	CTREN1.1	K	31	Unassigned		47	CTREN1.2	K
15	CTREN2.1	K	32	Unassigned		48	CTREN2.2	K
16	CTREN3.1	K	33	Unassigned		49	CTREN3.2	K
17	CTREN4.1	K				50	CTREN4.2	K

Signal names

for drives with analog interface:

SETP[1...4]	Setpoint
REFPOT[1...4]	Reference potential for setpoint (analog ground)
CTREN[1.1...4.1], CTREN[1.2...4.2]	Controller enable contact

Signal type

O	Signal output
VO	Voltage output
K	Switching contact

Drives with analog interface

Signals:

One voltage and one enable signal are provided per axis.

- **SETPOINT (SW)**

  Analog voltage signal in the ± 10 V range for the output of a speed setpoint.

- **REFERENCE SIGNAL (BS)**

  Reference potential (analog ground) for the setpoint signal, connected internally to logic ground.

- **CONTROLLER ENABLE (RF)**

  Contact assembly mated set (NO contact), used for axis-specific enabling of the drive, e.g. a SIMODRIVE drive unit. The RF signal to the drive is set as soon as the controller enable is signalled by the user program.

⚠️ **Warning**

Brief voltage peaks may occur at the analog outputs when the supply voltage is switched on or off.

For this reason, it is important to make sure that the enable signals are wired correctly and that the necessary safety regulations are met.

3.1.7 Measuring system interface

Connectors to the encoder

A 15-pin Sub-D socket for the connection of incremental or absolute encoders (SSI) is provided for each axis.

Position of the connectors

Fig. 3-6 shows the mounting position and designation of the connectors on the module.
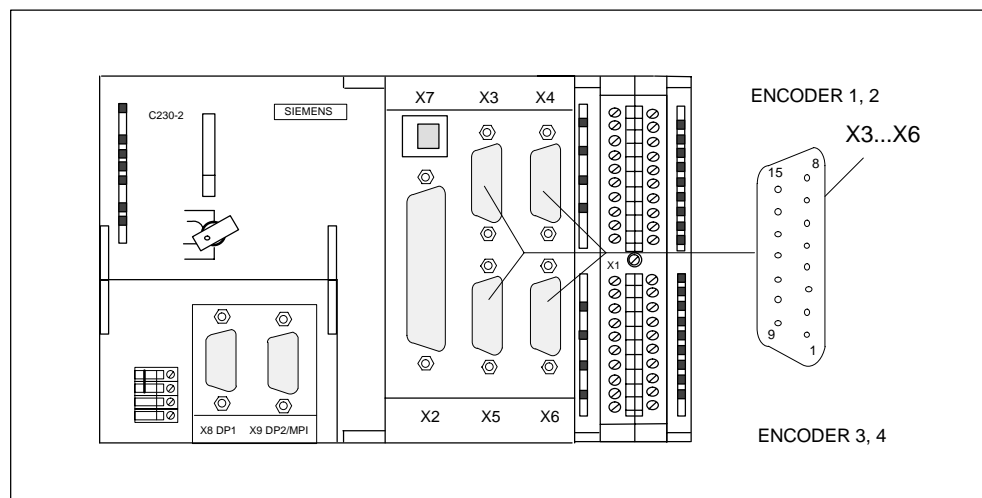
Fig. 3-6   Position of connectors X3 to X6

SIMOTION C230-2, 04.2003 Edition

Connector pin assignment

Designation: **X3, X4, X5, X6** ENCODER 1...4
                 X3   Axis 1
                 X4   Axis 2
                 X5   Axis 3
                 X6   Axis 4
Type: 15-pin Sub-D socket connector

Table 3-7   Assignment of connectors X3 to X6

Pin	Encoder		Type	Pin	Encoder		Type
	Incremental	**Absolute**			**Incremental**	**Absolute**	
1	Unassigned			9	MEXT		VO
2		CLS	O	10	Z		I
3		CLS_N	O	11	Z_N		I
4	P5EXT		VO	12	B_N		I
5	P24EXT		VO	13	B		I
6	P5EXT		VO	14	A_N	DATA_N	I
7	MEXT		VO	15	A	DATA	I
8	Unassigned						

Signal names

A, A_N   Track A non-inverted and inverted (incremental encoder)
B, B_N   Track B non-inverted and inverted (incremental encoder)
Z, Z_N   Zero mark non-inverted and inverted (incremental encoder)
CLS, CLS_N   SSI cycle clock shift pulse non-inverted and inverted (absolute encoder)
DATA, DATA_N   SSI data non-inverted and inverted (absolute encoder)
P5EXT   +5 V supply
P24EXT   +24 V supply
MEXT   Ground supply

Signal type

VO   Voltage output (supply)
O   Output (5 V signal)
I   Input (5 V signal)

Types of encoder that can be connected

Both rotary (shaft encoders, angle measurement systems) and linear (linear encoder, linear measurement systems) measuring systems can be used. These can be built on the machine/system (incremental encoder) or integrated in the motor (rotor shaft angle encoder).

The following table gives you an overview of the encoders that can be connected and what you should take into account here.

Table 3-8   Encoders that can be connected

Encoder	Connection to X3...X6 on the C230-2
Rotary encoders	
• Incremental encoders with 5 V (TTL/RS422) interface	Direct
• Absolute encoders (single/multiturn) with SSI	Direct
• Rotor shaft angle encoders with 5 V (TTL/RS422) interface	Direct
• Rotor shaft angle encoders with SINUSOIDAL signals	Via SIMODRIVE drive control using incremental shaft encoder (WSG) interface
• Resolver	Via SIMODRIVE resolver control using incremental shaft encoder (WSG) interface
Linear encoders	
• Linear encoders with 5 V (TTL/RS422) interface	Direct
• Linear encoders with SINUSOIDAL signals	Via EXE (External Pulse shaper Electronics)

Note

If you operate drives via the PROFIBUS DP, you do not need to connect any encoders to this interface. The encoders are connected directly to the drive.

Encoder emulation (incremental shaft encoder (WSG) interface)

If the drive unit is equipped with encoder emulation, this can be connected instead of an encoder. The drive control analyzes the information from a rotor shaft angle encoder and provides information on the actual position to this interface by emulating the signals of an incremental encoder.

Note

Please note the drive manufacturer's wiring specifications. As the encoder interface of the C230-2 is non-isolated, in individual cases it may be necessary to take special measures in respect of EMC.

Encoder characteristics

Encoders that can be connected directly (or EXEs) must fulfill the following conditions:

Incremental encoders

Transmission procedure: Differential transmission using 5 V rectangular signals (such as the Standard RS422)

Output signals: Track A as non-inverted and inverted signal
$(U_{a1}, \overline{U_{a1}})$
Track B as non-inverted and inverted signal
$(U_{a2}, \overline{U_{a2}})$
Zero signal Z as non-inverted and inverted signal
$(U_{a0}, \overline{U_{a0}})$

Max. output frequency: 1 MHz

Phase shift
of tracks A to B: $90° \pm 30°$

Power consumption: Max. 300 mA

Signal forms of incremental encoders

Fig. 3-7   Signal forms of incremental encoders

SIMOTION C230-2, 04.2003 Edition
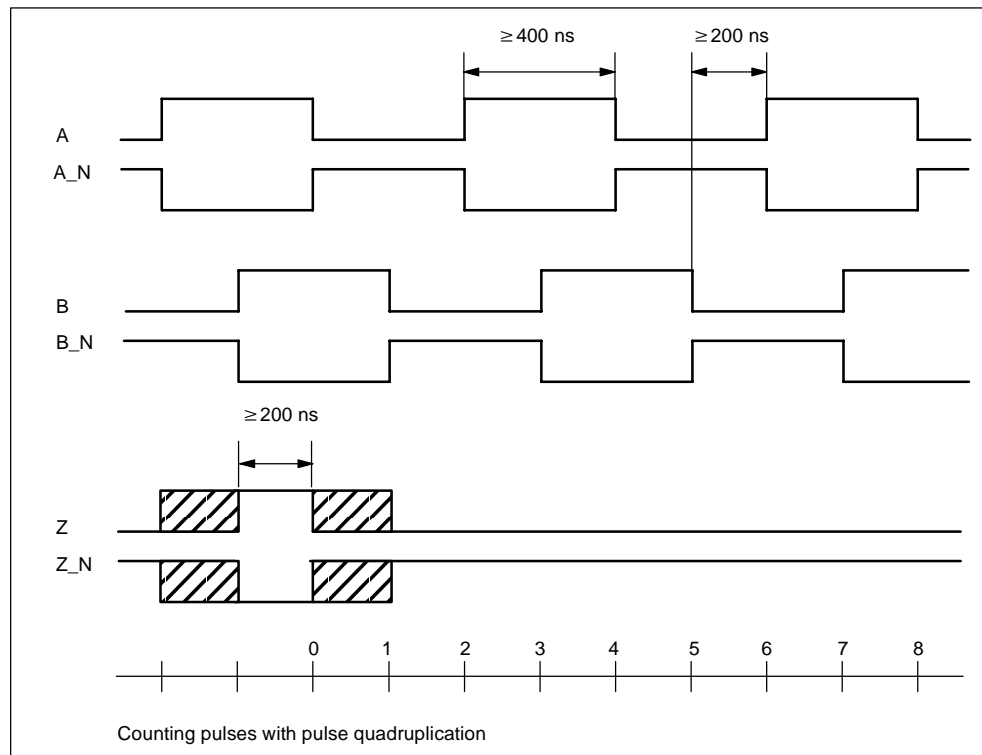
Note

If you want to connect incremental encoders without zero signals, then you must connect the corresponding pins in the connector with the encoder power supply:

Pin 10 with pin 7 or 9 (MEXT)
Pin 11 with pin 4 or 6 (P5EXT)

Absolute encoders (SSI)

Transmission procedure:	Serial synchronous interface (SSI) with 5 V differential signal transmission (such as the Standard RS422)
Output signal:	Data as non-inverted and inverted signal
Input signal:	Cycle clock shift as non-inverted and inverted signal
Format:	Single/Multiturn
Resolution:	Max. 25 bits
Max. baud rate:	1.5 Mbits/s
Power consumption:	Max. 300 mA

Encoder supply 5 V

The 5 V supply voltage for the encoders is generated inside the module and is therefore present at the Sub-D socket. This means you can supply the encoders via the connecting cable without the need for additional wiring. The voltage supplied is protected electronically against short circuits and thermal overload, and it is monitored. The encoder supply is not isolated from the load power supply to the module.

Encoder supply 24 V

For encoders with an operating voltage of 24 V, the 24 VDC power is supplied to the Sub-D sockets. This means you can supply the encoders via the connecting cable without the need for additional wiring. The voltage supplied is protected electronically against short circuits and thermal overload, and it is monitored. The encoder supply is not isolated from the load power supply to the module.

Connecting cable to the encoder

The maximum cable length depends on the specification for the encoder supply and the baud rate. If you use pre-assembled SIEMENS connecting cables (see *Catalogs NC Z/NC 60/ST 70*), problem-free operation can be guaranteed only if the following values are not exceeded:

Table 3-9   Maximum cable lengths, depending on the encoder power supply

Supply voltage	Encoder supply voltage range	Power con- sumption	Max. cable length
5 VDC	4.75 V...5.25 V	$\leq$ 300 mA	25 m
5 VDC	4.75 V...5.25 V	$\leq$ 210 mA	35 m
24 VDC	20.4 V...28.8 V	$\leq$ 300 mA	100 m
24 VDC	11 V...30 V	$\leq$ 300 mA	250 m

Table 3-10   Maximum cable lengths, depending on the baud rate

Encoder type	Frequency	Max. cable length
Incremental encoder	1 MHz	10 m
	500 kHz	35 m
Absolute encoder (SSI)	1.5 Mbits/s	10 m
	187.5 Kbyte/s	250 m

3.1.8   I/O interface

Front connector

Various encoders and actuators can be connected via digital inputs and outputs to the 40-pin front connector X1 with single-wire connection.

Position of the connector

Fig. 3-8 shows the position of the front connector.
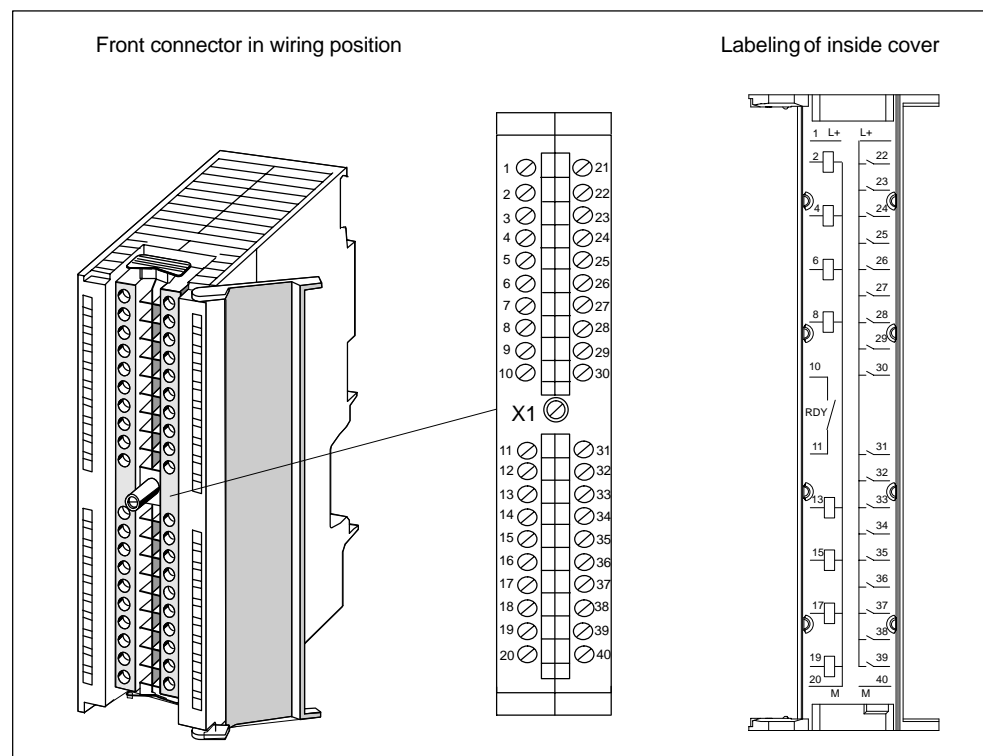
Fig. 3-8   Position of connector X1

Wiring and schematic diagram

Fig. 3-9 shows the wiring diagram and schematic diagram for digital inputs/outputs on the C230-2.
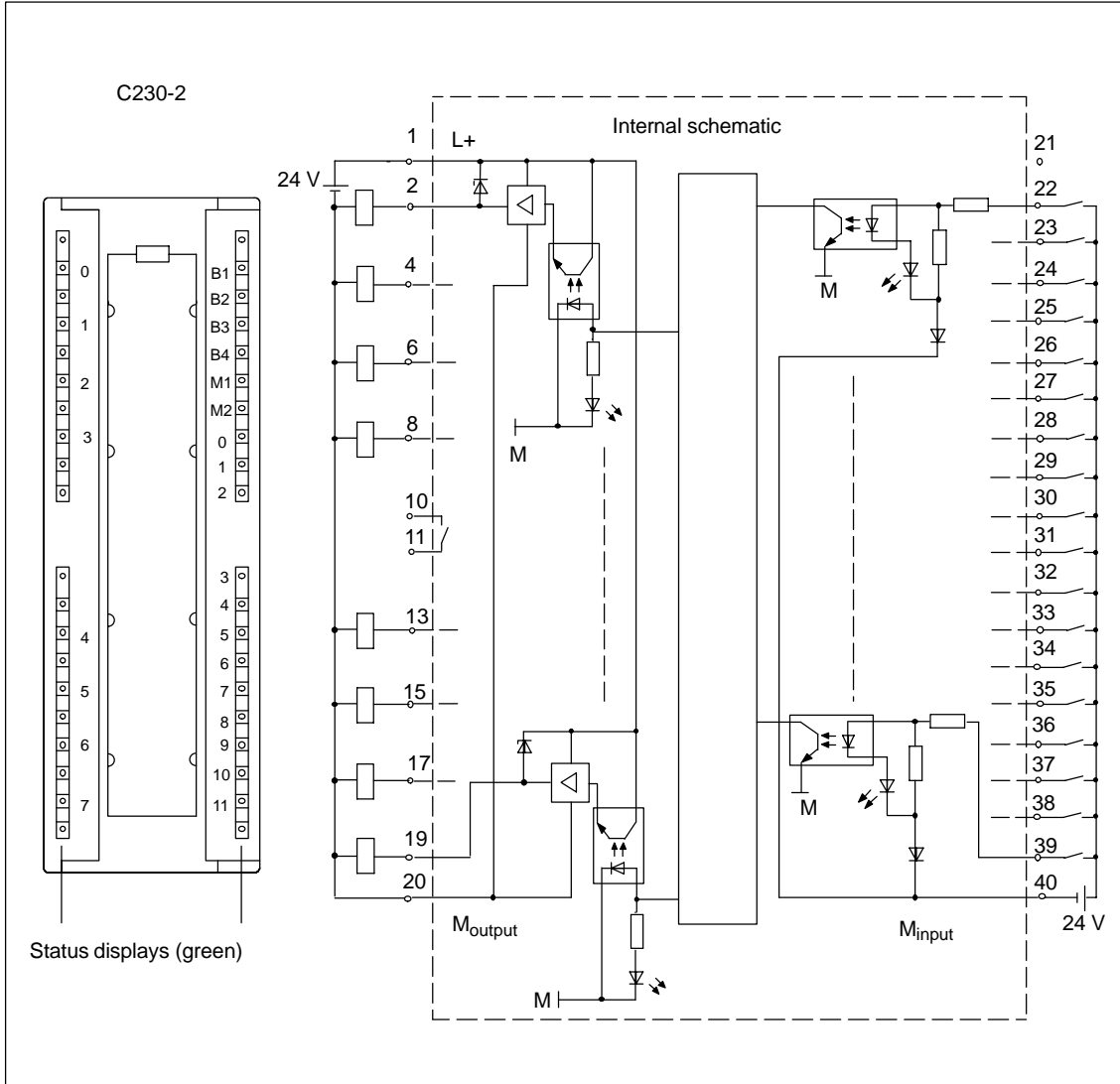
Fig. 3-9   Wiring and schematic diagram of digital inputs/outputs on the C230-2

Connector pin assignment

Designation: **X1**

Type: 40-pin S7 front connector for single-wire connection

Table 3-11   Front connector X1 pin assignment

Pin	Name	Type	Pin	Name	Type
1	L+	VI	21	Unassigned	
2	Q0	DO	22	BERO1	DI
3	Unassigned		23	BERO2	DI
4	Q1	DO	24	BERO3	DI
5	Unassigned		25	BERO4	DI
6	Q2	DO	26	MEPU1	DI
7	Unassigned		27	MEPU2	DI
8	Q3	DO	28	I0	DI
9	Unassigned		29	I1	DI
10	RDY.1	K	30	I2	DI
11	RDY.2	K	31	I3	DI
12	Unassigned		32	I4	DI
13	Q4	DO	33	I5	DI
14	Unassigned		34	I6	DI
15	Q5	DO	35	I7	DI
16	Unassigned		36	I8	DI
17	Q6	DO	37	I9	DI
18	Unassigned		38	I10	DI
19	Q7	DO	39	I11	DI
20	M_{output}	VI	40	M_{input}	VI

Signal names
RDY.1...2   Ready (READY contact 1...2)
BERO1...BERO4   BERO input for axes 1...4
MEPU1, MEPU2   Measuring pulse inputs 1 and 2
I0...I11   Digital inputs 0...11
Q0...Q7   Digital outputs 0...7
L+   Supply for digital outputs
M_{output} Reference potential for digital outputs
M_{input} Reference potential for digital inputs

Signal type
DI   Digital input (24 V signal)
DO   Digital output (24 V signal)
K   Switching contact
VI   Voltage input

⚠️ **Danger**

The 24 V power supply is to be designed as functional extra-low voltage with protective separation in accordance with EN60204-1, Section 6.4, PELV (with M ground).

Note

The connection cable between the voltage source and the load current supply connector L+ and the associated reference potential M should **not** exceed a maximum length of 10 m.

Digital inputs (onboard)

18 digital inputs, of which 2 are measuring inputs and 4 are BERO inputs, are present on the C230-2.

These fast inputs correspond to Standard IEC 1131-2/DIN EN 61131-2, characteristic curve type 2 (24 V-P-switching). Switches or proximity encoders (2- or 3-wire encoders) can be connected.

They can be used:

- As homing inputs (BERO1...BERO4)

  With a signal edge at the relevant input, the exact positions as indicated by the current encoder values for the relevant axes are recorded, so that the home position coordinates can be recorded.

  The inputs are assigned to the axes permanently:
  - BERO1 → axis 1   (Encoder at X3)
  - BERO2 → axis 2   (Encoder at X4)
  - BERO3 → axis 3   (Encoder at X5)
  - BERO4 → axis 4   (Encoder at X6)
- As inputs for measuring inputs (MEPU1, 2)

  When there is a signal edge at the corresponding input, the current encoder values of one or more axes will be recorded with positioning accuracy (accuracy ≤ 10 μs), in order to thus measure lengths or clearances.

  The assignment to the axes is carried out in the Engineering System.
- As user-addressable process inputs (I0...I11). Addresses are allocated in the hardware configuration. The inputs are recorded approx. every 125 μs.
- As an alternative, the inputs BERO1...BERO4 and MEPU1, MEPU2 can be used as user-addressable inputs. Addresses are allocated in the hardware configuration.

Digital outputs (onboard)

Eight digital outputs (Q0...Q7) are provided on the C230-2.

These fast outputs (onboard) correspond to the Standard IEC 1131-2/DIN EN 61131-2 (24 V-P-switching). They can be used as freely addressable process outputs or as "fast output cams" (path switching signals). Allocation is in the hardware configuration.

When used as cams, the outputs are output with an accuracy of approx. 140 μs.

When used as process outputs, the outputs are output with an accuracy of approx. 125 μs.

READY output

The ready signal (RDY.1, RDY.2) is an isolated contact assembly (make contact).

The contact can be used for the safe shutdown of parts of the system, for example, through integration in the EMERGENCY STOP circuit.

The following table describes the states of the enables and outputs in the corresponding C230-2 operating states with an open or closed READY contact.

Status of READY contact	C230-2 ...	Status of enable signals and outputs ...
Open	• During ramp-up • During overall reset • With fault condition • In STOP mode • In STOPU mode	• Controller enable deactivated • Analog outputs at 0 V • Digital outputs deactivated
Closed	• In RUN	Enable signals and outputs controlled by user program and technology

3.2 Clock

Table 3-12 contains the characteristics and functions of the C230-2 clock.

Table 3-12   Characteristics of the C230-2 clock

Characteristics	C230-2
Type	Hardware clock (integrated "real time clock")
Default setting when delivered	DT#1994-01-01-00:00:00
Backup	Permanently installed battery (no-maintenance Goldcap)
Accuracy • At a switched-on supply voltage 0 to 55° C • At a switched-off supply voltage 25° C −20° C to 70° C	Max. deviation per day: ± 9 s ± 2 s +2 s to −9 s
Backup time	Usually 4 weeks (at 0...25° C)
Charging time	1 h

With POWER OFF

The C230-2's clock continues to operate with the POWER OFF for the battery backup time (excluding software clock). The battery is recharged with POWER ON.

No error message is output if the backup function is defective. With the return of POWER ON, the clock continues operating at the time at which POWER OFF occurred.

When resetting the C230-2 to the default setting (see Section 8.7), the clock is also reset to "Default setting when delivered".

3.3   Diagnosis using the LEDs

The LEDs are explained in the order in which they are positioned on the C230-2.

Table 3-13   Diagnostic LEDs on the C230-2

Display	Function	Explanations
SF (red)	**System fault**	This LED indicates a fault on the C230-2.
LED – ON		An interrupt which can be acknowledged is present (alarm, message, note).
		(see Description of Functions *SIMOTION Technology Functions, Alarm Description.*)
LED – flashes (0.5 Hz)		No license exists for technology/optional objects under license. Technology/optional objects under license are, for example:
		• Position (position axis)
		• Cam (following axes with connected cam)
		• Gear (following axes with gearing)
		• Ethernet (Ethernet interface)
		• TControl (Temperature Control)
LED – OFF		C230-2 is operating correctly.
5 VDC (green)	**Power supply for the electronics**	This LED indicates that the power supply is ready for operation.
LED – ON		The power supply of the C230-2 is functioning correctly.
LED – OFF		If this is not illuminated, possible faults are:
		• No connected or switched-on network
		• No specified load power supply connected
		• Module not connected correctly
		• Module defective
RUN (green) LED – ON	**C230-2 in RUN**	This LED indicates that the user program is running.
LED – flashes (2 Hz)		The time from when the "RUN" operating mode is selected until this operating mode has been attained is indicated by the LED flashing.
STOPU (yellow) LED – ON	**C230-2 in STOP User Program**	This LED indicates that the technology packages are active. No user program is being executed.
LED – flashes (2 Hz)		The time from when the "STOPU" operating mode is selected until this operating mode has been attained is indicated by the LED flashing.
LED – "flickers"		Formatting the Micro Memory Card

Table 3-13   Diagnostic LEDs on the C230-2, continued

Display	Function	Explanations
STOP (yellow) LED – ON	**C230-2 in STOP**	This LED indicates that no user program is running. The technology packages are not active.
LED – flashes (2 Hz)		The time from when the "STOP" operating mode is selected until this operating mode has been attained is indicated by the LED flashing.
(0.5 Hz)		An overall reset request is indicated by slow flashing (see Section 8.5).
LED – "flickers"		Writing to Micro Memory Card
BUS1F (X8) (red) or **BUS2F (X9)** (red)	**Fault on interface**	This LED indicates a fault on the PROFIBUS DP interface.
LED – ON		**Interface configured as slave:** Bus fault Searching for baud rate
LED – flashes (0.5 Hz)		Parameterization error No cyclic data exchange
LED – OFF		Cyclic data exchange
LED – ON		**Interface configured as master:** Bus fault (bus short-circuit)
LED – flashes (0.5 Hz)		Bus fault (slaves have failed or cable faulty)
LED – OFF		No fault or no interface configured

Note

All LEDs light up briefly while the C230-2 is ramping up.

You can carry out a detailed diagnosis using a PG/PC and the Engineering System.

All permissible and/or necessary combinations of the LED are listed in the following table.

The meaning of the symbols used in the table is as follows:

1	=	LED on
0	=	LED off
0.5/1	=	LED flashes (0.5 Hz)
2/1	=	LED flashes (2 Hz)
☆	=	LED flickers
→	=	Running indicator
x	=	LED may illuminate

Table 3-14   Summary of LED displays

Function	LED display						
	SF (red)	5 VDC (green)	RUN (green)	STOPU (yellow)	STOP (yellow)	BUS1F (red)	BUS2F (red)
Ramp-up	1	1	1	1	1	1	1
STOPU → RUN	x	1	2/1	1	0	x	x
RUN	x	1	1	0	0	x	x
RUN → STOPU	x	1	1	2/1	0	x	x
STOPU	x	1	0	1	0	x	x
STOPU → STOP	x	1	0	1	2/1	x	x
STOP	x	1	0	0	1	x	x
STOP → STOPU	x	1	0	2/1	1	x	x
Power supply is ready for operation	x	1	x	x	x	x	x
Writing to Micro Memory Card (Copy RAM to ROM)	x	1	0	0	☆	x	x
Formatting the Micro Memory Card	x	1	0	☆	0	x	x
Request an overall reset by the C230-2 or via the C230-2's mode selector	x	1	0	0	0.5/1	x	x
Overall reset in progress	1	1	1	1	1	1	1
Overall reset completed	x	1	0	0	1	x	x
SIMOTION kernel update is running	→	1	→	→	→	→	→
SIMOTION kernel update completed	x	1	0	0	1	x	x
C230-2 is operating correctly	0	1	x	x	x	0	0
An interrupt which can be acknowledged (alarm, message, note) is present	1	1	x	x	x	x	x

Table 3-14   Summary of LED displays, continued

Function	LED display						
	SF (red)	5 VDC (green)	RUN (green)	STOPU (yellow)	STOP (yellow)	BUS1F (red)	BUS2F (red)
Fault to which the user program cannot respond. The following actions may be required to rectify the fault: • Power off/on • Check Micro Memory Card • New commissioning procedure • Replace the C230-2	x	1	x	☆	☆	☆	☆
No license exists for technology/optional objects under license	0.5/1	1	x	x	x	x	x
PROFIBUS DP interface as slave							
Bus fault Searching for baud rate	x	1	x	x	x	1	1
Parameterization error No cyclic data exchange	x	1	x	x	x	0.5/1	0.5/1
Cyclic data exchange	x	1	x	x	x	0	0
PROFIBUS P interface as master							
Bus fault (bus short-circuit)	x	1	x	x	x	1	1
Bus fault (slaves have failed or cable faulty)	x	1	x	x	x	0.5/1	0.5/1
No fault or no interface configured	x	1	x	x	x	0	0

3.4   Technical data

Memory for user data

- Area for the technology packages and user data (programs, configuration data, parameterization)
- Retentive data area
- Diagnostics buffer (100 messages)
- Micro Memory Card

System cycle clocks

Basic cycle clock (isochronous bus cycle not activated)	1.5 to 10 ms
DP cycle clock (isochronous bus cycle activated)	1.5 to 10 ms
Position control cycle clock	≥ 1 ms
Interpolator cycle clock (IPO cycle clock)	≥ 1 ms

A modification can be made in the Engineering System.

See *SIMOTION SCOUT* operating instructions for setting the system cycle clocks.

Address areas

Input address area, total	1 Kbyte
Output address area, total	1 Kbyte
Process image inputs	64 bytes
Process image outputs	64 bytes

Connection values

Supply voltage	24 VDC (permissible range: 20.4...28.8 V)
Power consumption from 24 V	• typically 0.9 A (inputs/outputs open) • typically 1.2 A (with 4 encoders, 5 V) • typically 1.9 A (with 4 encoders, 24 V)
Power loss	15 W
Starting current	8 A
Encoder supply 5 V max. output current	1.2 A
Encoder supply 24 V max. output current	1.2 A

Dimensions and weight

Dimensions W × H × D [mm]	200 × 125 × 118
Weight [g]	Approx. 1 200

Drive interface

Analog

Setpoint signal	
Number	4
Rated voltage range	−10.5...10.5 V
Output current	−3...3 mA
Electrically isolated	No
Load impedance	≥ 3 kOhm
Resolution	16-bit including sign
Contact assembly controller enable	
Number	4
Switching voltage	Max. 50 V
Switching current	Max. 1 A
Switching capacity	Max. 30 VA
Mechanical service life Electrical service life	Usually 10^9 switching cycles Usually $3*10^6$ switching cycles at 24 V/1 A

Cable length: Max. 35 m

Encoder inputs

Position measuring	• Incremental • Absolute (SSI)
Signal voltages	Inputs: 5 V as per RS422
Supply voltage and current consumption per encoder	• 5 V/300 mA • 24 V/300 mA
Input frequency for incremental encoder	Max. 1 MHz
Baud rate for absolute encoder (SSI)	• 187.5/375/750 Kbits/s • 1.5 Mbits/s
Cable length for incremental encoder 5 V encoder supply	• Max. 10 m at 1 MHz • Max. 25 m at 500 kHz and max. 300 mA (Tolerance 4.75...5.25 V) • Max. 35 m at 500 kHz and max. 210 mA (Tolerance 4.75...5.25 V)
Cable length for absolute encoder (SSI) 24 V encoder supply	• Max. 250 m at 187.5 kbit/s • Max. 10 m at 1.5 Mbit/s
Electrically isolated	No
Monitoring	Short-circuit in encoder supply and faulty wire

Digital inputs (according to IEC 1131-2/DIN EN 61131-2, characteristic curve type 2)

Number of inputs	18
Supply voltage	24 VDC (permissible range: 20.4...28.8 V)
Input voltage	• 0 signal: –3...5 V • 1 signal: 11...30 V
Input current	• 0 signal: 15 mA • 1 signal: 6...30 mA (typically 8)
Input delay (I0...I11, BERO1...BERO4, MEPU1...MEPU2)	• 0 → 1-Signal: 15 µs (type 6) • 1 → 0-Signal: 150 µs (type 40)
Connection of a 2-wire encoder Permissible quiescent current	Possible 2 mA
Electrical isolation between inputs Electrical isolation between inputs and logic Isolation	No Yes 500 V

Digital outputs (according to IEC 1131-2/DIN EN 61131-2)

Number of outputs	8
Supply voltage	24 VDC (permissible range: V_L = 20.4...28.8 V)
Output voltage	1-signal: From V_L[1] – 0.8 V to V_L[1] V
Max. output current	1-signal: 5 mA...0.6 A (via supply voltage)
Aggregate current of outputs	• Max. 4 A (at 0... 40°C) • Max. 2 A (at 40...55°C)
Extinguishing energy per output	400 mJ (not simultaneous)
Lamp load	5 W
Switching frequency	• 100 Hz (with resistive load) • 2 Hz (with inductive load)
Short-circuit protection Max. leakage current	Yes 0-signal: 2 mA
Output delay (Q0...Q7)	• 0 → 1-signal: 500 µs (type 150 µs) at RL = 60 Ohm • 1 → 0-signal: 500 µs (type 150 µs) at RL = 60 Ohm
Electrical isolation between out-puts	No
Electrical isolation between out-puts and logic	Yes
Isolation	500 V

1) V_L – Supply voltage of outputs

Note

The connection cable between the voltage source and the load current supply con-nector L+ and the associated reference potential M should **not** exceed a maximum length of 10 m.

READY output (RDY)

Table 3-15   Electrical parameters of RDY contact assembly

Contact assembly RDY	
Switching voltage DC	Max. 50 V
Switching current	Max. 1 A
Switching capacity	Max. 30 VA
Mechanical service life Electrical service life	Usually 10^9 switching cycles Usually $3*10^6$ switching cycles at 24 V/1 A

3.5 Dimension drawing
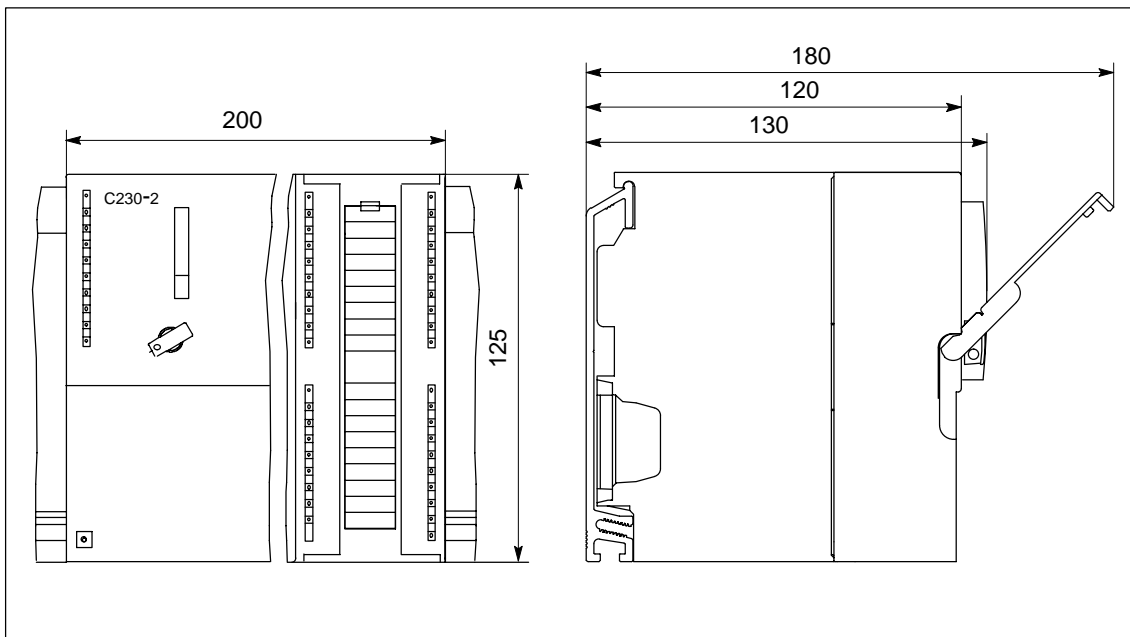
Fig. 3-10   Dimension drawing of the C230-2

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3.6 Accessories and spare parts

Spare parts

In Table 3-16 all the parts are listed that you can additionally order for C230-2.

Table 3-16   Accessories and spare parts

Parts for the C230-2	Order number	Acces-sories	Spare parts
Bus connector	6ES7 390-0AA00-0AA0	–	X
Power connector between power supply and C230-2	6ES7 390-7BA00-0AA0	–	X
2 × key for C230-2 (for mode selector)	6ES7 911-0AA00-0AA0	–	X
Micro Memory Card	6AU1 700-0AA00-0AA0	X	
Labeling plate (10 pieces)	6ES7 392-2XX00-0AA0	–	X
Slot number plate	6ES7 912-0AA00-0AA0	–	X
Front connector, 40-pin • Screw-type • Spring-tension type	 6ES7 392-1AM00-0AA0 6ES7 392-1BM01-0AA0	X	–
Shield connecting element	6ES7 390-5AA00-0AA0	X	–
Shield connection terminals for • 2 cables, each with 2 to 6 mm shield diameter • 1 cable with 3 to 8 mm shield diameter • 1 cable with 4 to 13 mm shield diameter	 6ES7 390-5AB00-0AA0 6ES7 390-5BA00-0AA0 6ES7 390-5CA00-0AA0	X	–

Installation

4

Overview

In this chapter we will explain how to design the mechanical configuration, prepare the SIMOTION components for installation and install them.

To mount the SIMOTION C modules, you must pay attention to the design of the electrical configuration. For this, please read Chapter 6 on "Wiring".

Open equipment

The modules are open equipment. This means they may only be installed in housings, cabinets or in electrical equipment rooms that can only be entered or accessed with a key or tool. Housings, cabinets or electrical operating areas may only be accessed by trained or authorized personnel.

4.1 Design and configuration using SIMOTION C modules

Overview

This chapter contains information on:

- Horizontal and vertical configuration
- Clearances
- Mounting dimensions of modules
- Layout of modules on a rack
- Layout of modules on several racks

4.1.1 Horizontal and vertical configuration

Configuration

You can install the rack either horizontally or vertically. The horizontal configuration should be used if possible.

Permissible ambient temperature

- Horizontal configuration: From 0 to 55 °C
- Vertical configuration: From 0 to 40 °C

Fig. 4-1   Horizontal and vertical configuration
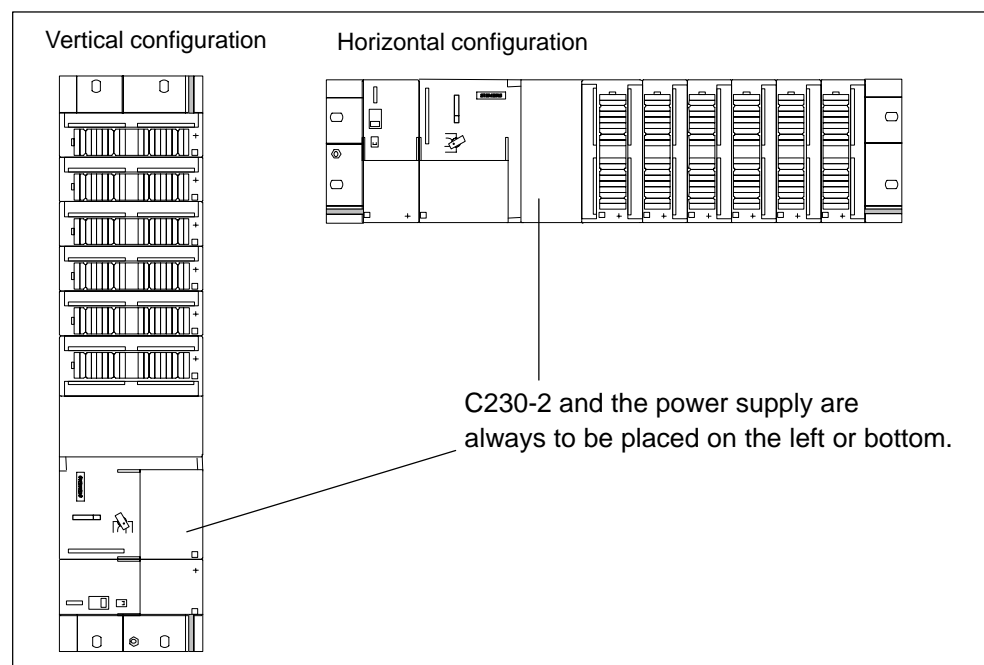
SIMOTION C230-2, 04.2003 Edition

4.1.2 Clearances

Rules

If you comply with the minimum clearances, you will:

- Ensure heat is dissipated from the modules

- Provide space to fit and remove modules

- Provide space to lay wiring

- Increase the mounting height of the rack to 205 mm

    To guarantee the functionality, clearances of 40 mm must be maintained.

Note

If you use a shield connecting element (see Section 6.3), the dimensions stated are measured from the lower edge of the shield connecting element.

Clearances

Fig. 4-2 shows the clearances between the individual racks and the clearance to adjacent equipment, cable ducts, cabinet walls, etc.
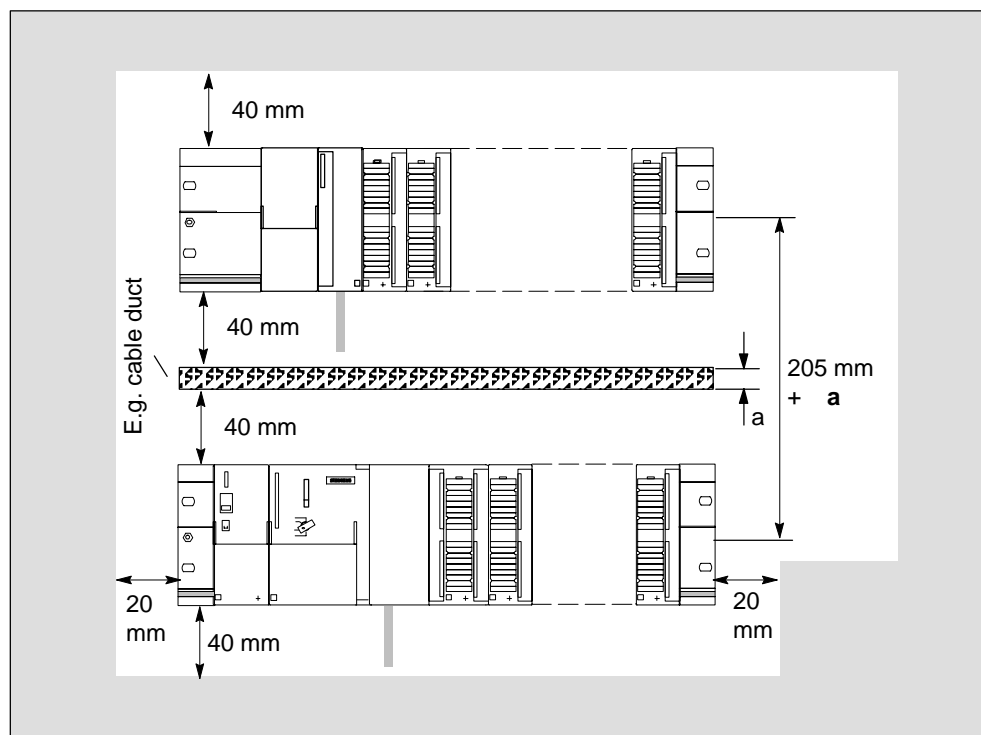
Fig. 4-2   Clearances

4.1.3 Mounting dimensions of modules

Table 4-1 shows the mounting dimensions of modules.

Table 4-1   Mounting dimensions of modules

Modules	Module width	Module height	Maximum installation depth
Power supply PS 307, 2 A	50 mm	125 mm, 185 mm with shield connecting element	130 mm or 180 mm with the front cover of the C230-2 open
Power supply PS 307, 5 A	80 mm		
Power supply PS 307, 10 A	200 mm		
C230-2	200 mm		
Signal modules (SMs)	40 mm		
Function modules (FM)	40 mm or 80 mm		
Communications processors (CP)	40 mm		

Mounting rail lengths

Depending on the configuration you have chosen, you can use the following mounting rails:

Mounting rail	Useful length for modules	Remark
160 mm	120 mm	Mounting holes are provided
482.6 mm	450 mm	
530 mm	480 mm	
830 mm	780 mm	
2000 mm	Cut to required length	Mounting holes must be drilled

4.1.4 Layout of modules on a rack

Rules

The following rules apply with respect to the layout of the modules on a rack:

- No more than 8 modules may be inserted to the right of the C230-2.

- The number of insertable modules is also limited by their power consumption from the backplane bus (see "Technical data" table of the individual modules in the manual *S7-300 Automation Systems, M7-300 module data*).

  The total power consumption from the backplane bus of all modules that are mounted on a rack must not exceed 1.2 A.

Fig. 4-3 shows the order of the modules in an installation with 8 I/O modules.

Fig. 4-3   Layout of modules on a rack

SIMOTION C230-2, 04.2003 Edition   4-61
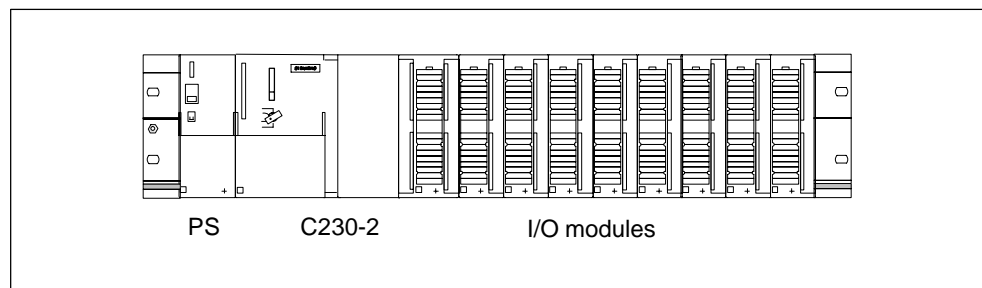
4.1.5 Layout of modules on several racks

Overview

With the C230-2, a 2-tier layout is possible.

Interconnection modules

Interconnection modules are required for the 2-tier layout which route the back-plane bus from one rack to the other. The C230-2 is always on rack 0.

Interconnection module	Usable for ...	Order number
IM 365 SEND	Rack 0	6ES7 365-0BA01-0AA0
IM 365 RECEIVE	Rack 1	

IM 365 interconnection modules

The two IM 365 interconnection modules have a fixed connection via a 1 m long connection cable.

The total power consumption of the inserted I/O modules of both racks must not exceed 1.2 A; the power consumption from rack 1 is limited to 800 mA.

Rules

The following rules apply with respect to the layout of the modules on two racks:

- The interconnection module always occupies Slot 3 and is always left of the first signal module.

- No more than 8 modules may be inserted per rack. These modules are always to the right of the interconnection modules.

- The number of inserted modules is limited by the permissible power consumption from the backplane bus. The total current drawn must not exceed 1.2 A (see "Technical data" table of the individual modules in the manual *S7-300 Automation Systems, M7-300 module data*).

2-tier layout

Fig. 4-4 shows the 2-tier layout with C230-2.
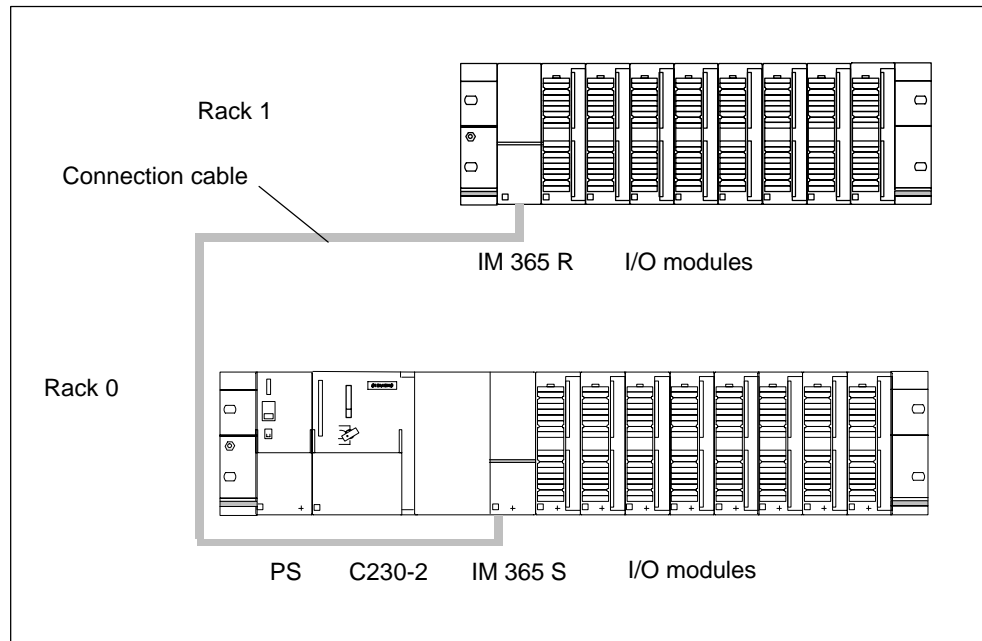
Fig. 4-4   Layout of modules on two racks

4.2 Installation

Overview

This chapter contains information on:

- Installing mounting rails
- Fitting modules on the mounting rail
- After installation

4.2.1 Fitting the mounting rail

Installing a 2-meter mounting rail

You must prepare the 2-meter mounting rail for installation. Proceed as follows:

1. Shorten the 2-meter mounting rail to the required dimension.

2. Mark in

   – Four holes for mounting screws (dimensions: See Table 4-2)

   – One hole for a protective conductor mounting screw

3. Is the mounting rail longer than 830 mm?

   If yes: Then you must drill additional holes for more mounting screws. Mark these additional holes along the groove in the middle of the mounting rail (see Fig. 4-5). These additional holes should be each made after approx. 500 mm.

   If no: No additional work required.

4. Drill the $6.5^{+\,0.2}$ mm dia. holes where marked for M6-size screws.

5. Fit an M6 screw to secure the protective conductor.
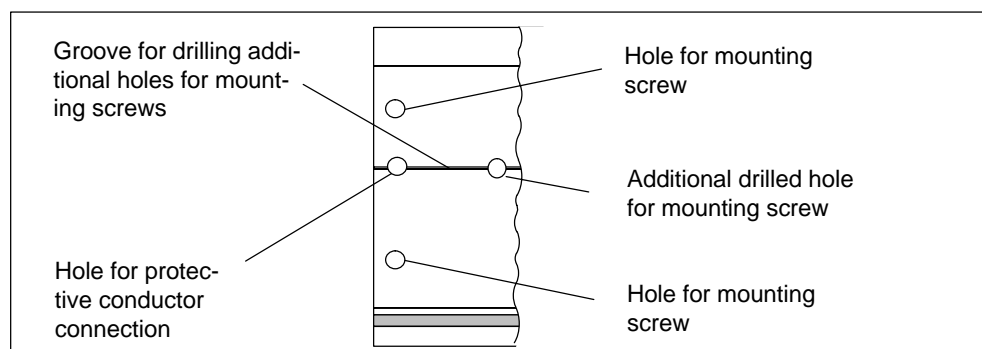
Fig. 4-5   Mounting holes in a 2-meter mounting rail

Dimension drawing for mounting holes

Table 4-2 provides information on dimensions for the rail mounting holes.

Table 4-2   Mounting holes for mounting rails

"Standard" mounting rail	2-meter mounting rail

Mounting rail length	Distance a	Distance b	–
160 mm	10 mm	140 mm	
482.6 mm	8.3 mm	466 mm	
530 mm	15 mm	500 mm	
830 mm	15 mm	800 mm	

Mounting screws

Choose one of the following types of screw to mount the mounting rail:

For	You can use...	Explanation
Outer mounting screws	M6 cylindrical screw as per ISO 1207/ISO 1580 (DIN 84/DIN 85)	Select a screw length that is appropriate to your configuration. In addition, you require 6.4 washers as per ISO 7092 (DIN 433).
	M6 hexagonal screw as per ISO 4017 (DIN 4017)	
Additional mounting screw (2-meter mounting rail only)	M6 cylindrical screw as per ISO 1207/ISO 1580 (DIN 84/DIN 85)	

Installing mounting rails

Install the mounting rails as follows:

1. Fit the mounting rail in a position that will allow enough room for the modules to be installed and for the heat to dissipate (a minimum of 40 mm above and below the mounting rail; see Fig. 4-2).

2. Screw the mounting rail onto the surface where it is to be affixed (screw size: M6). Is this substrate a grounded metal plate or a grounded mounting plate?

   If yes: Make sure that there is a low-resistance connection between the mounting rail and the substrate. If the surface of the metal is, say, painted or anodized, use suitable electro-lubricant or contact washers.

   If no: No special action required.

3. Connect the mounting rail with the protective conductor. An M6 protective conductor screw is provided on the mounting rail for this purpose.

   Minimum cross section of cable to protective conductor: 10 mm^2.

   Note

   Always make sure that there is a low-resistance connection to the protective conductor (see Fig. 4-6). If the rack is mounted on a movable frame, for example, ensure that the lead to the protective conductor is flexible.

Protective conductor connection

Fig. 4-6 shows how the protective conductor must be connected to the mounting rail.
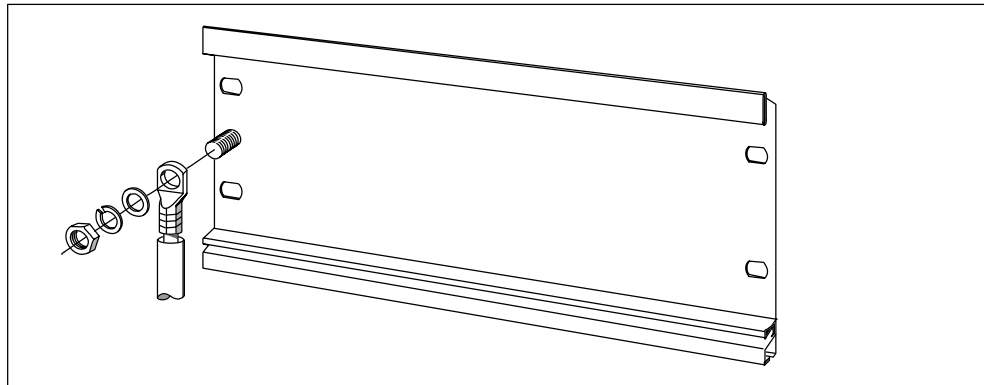
Fig. 4-6   Protective conductor connection on the mounting rail

4.2.2   Installing modules on the mounting rail

Accessories

Any accessories you need for installation are in the pack with the modules. Section 3.6 contains a list of accessories and spare parts, together with the relevant order numbers.

Table 4-3   Accessories for modules

Module	Accessories supplied	Explanation
C230-2	1 × slot number plate	For the assignment of slot numbers
	2 keys	The key is used to operate the mode selector for the C230-2.
	Labeling plate	For labeling of integrated inputs and outputs of the C230-2
Signal module (SM)	1 bus connector	To provide the electrical connections between the modules
	1 labeling plate	To label the inputs and outputs on the module

Sequence in which modules are affixed to the mounting rail

1. Power supply module

2. C230-2

3. Signal module(s)

Installation sequence

The individual steps for the installation of the modules are described below:

1. A bus connector is included with each signal module, but not with the C230-2. When inserting the bus connectors, always begin with the C230-2.

   Take the bus connector from the next module and plug it onto the C230-2's bus connector (the bus connector is on the back, see Fig. 3-1).

   Do not plug a bus link into the "last" module in the line.

2. Fit the modules by hooking them into position, push them against the left-hand module and lower them down into position.

3. Tighten the module fixing screws, applying a torque of 0.8 to 1.1 Nm.

4.2.3   After installation

Inserting the key

Once the C230-2 has been mounted on the mounting rail, you can insert the key in the STOP or STOPU position on the C230-2.
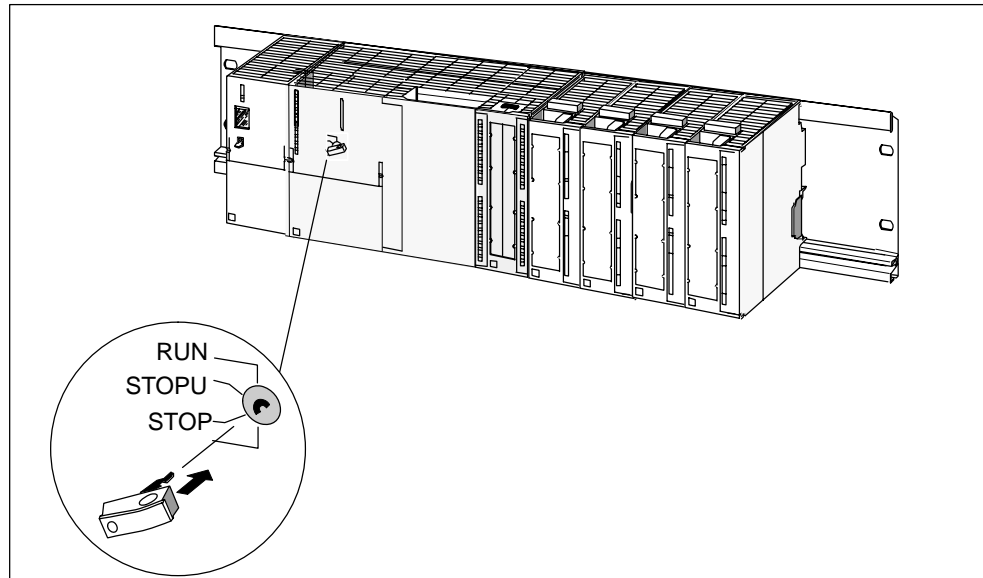
Fig. 4-7   Inserting the key in the C230-2

Assigning the slot numbers

After mounting, you can assign each module a slot number. This eases the assign-ment of the modules to the configuration table in the *Engineering System*. Table 4-4 shows the assignment of the slot numbers.

Table 4-4   Slot numbers for S7 modules and C230-2

Slot no.	Module	Remark
1	Power supply (PS)	–
2	C230-2	–
3	Reserved	–
4	1. I/O module	On the right next to C230-2
5	2. I/O module	–
6	3. I/O module	–
7	4. I/O module	–
8	5. I/O module	–
9	6. I/O module	–
10	7. I/O module	–
11	8. I/O module	–

Inserting slot numbers

Fig. 4-8 shows how you insert the slot numbers. The slot number plates are supplied with the C230-2.
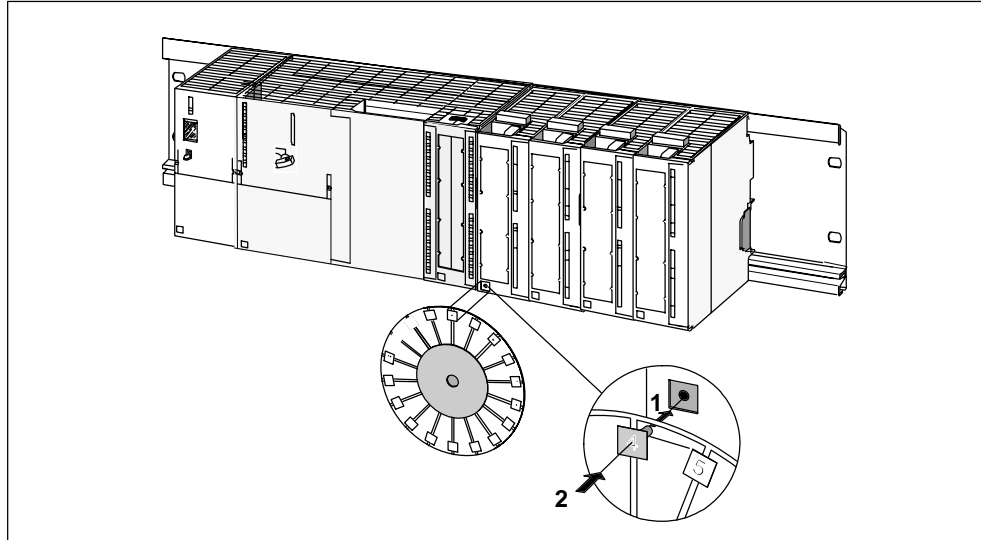
Fig. 4-8   Inserting slot numbers on the modules

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Addressing the I/O

5

Overview

This chapter contains information on:

- Assigning addresses on the basis of the module slot (default addresses)
- User-assignable addressing on the C230-2
- Addressing the I/Os
- Addressing the integrated digital inputs and outputs of the C230-2

5.1 Assigning addresses on the basis of the module slot (default addresses for centralized peripherals)

Introduction

In the case of addressing based on the slot (default addressing), a module initial address is assigned to every slot number. Depending on the type of module, these are different addresses for digital, analog, FM and CP modules (see Table 5-1). In this section we will show you which module initial address is assigned to which slot number. You need this information to determine the module initial addresses of the modules used.

Maximum configuration

Fig. 5-1 shows one configuration of a rack and the possible slots. **A 2-tier layout with IM 365 is possible with C230-2.**
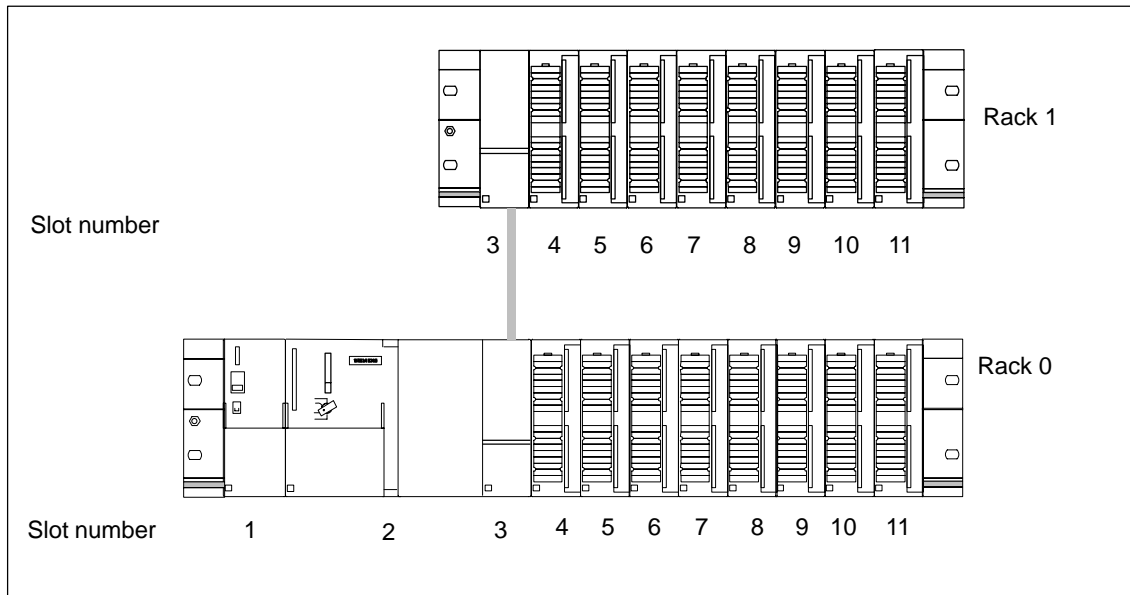
Fig. 5-1   Slots for modules on rack (centralized peripherals)

Module initial addresses

Table 5-1 shows the assignment of module initial addresses to slot numbers and racks.

In the case of input/output modules, the input addresses and output addresses start from the same module initial address.

Table 5-1   Module initial addresses of signal modules

Rack	Module initial ad-dresses	Slot number										
		1	2	3	4	5	6	7	8	9	10	11
0	Digital	PS	C230-2	IM 365 S	0	4	8	12	16	20	24	28
	Analog [1]				256	272	288	304	320	336	352	368
1	Digital	–	–	IM 365 R	32	36	40	44	48	52	56	60
	Analog [1]				384	400	416	432	448	464	480	496

[1]   The FM and CP modules are assigned to the analog address range.

5.2 User-assignable addressing on the C230-2 (centralized and distributed peripherals)

User-assignable addressing

User-assignable addressing means you can assign an address of your choice to each module or slot, for example, integrated inputs/outputs, drives. These are assigned in the *hardware configuration* (see *SIMOTION SCOUT* operating instructions). Here you specify the module initial address on which all further module addresses will then be based.

Advantages

Advantages of user-definable addressing:

- You can make the best possible use of the available address spaces because there are no "address gaps" between the modules.

- When creating standard software, you can specify addresses which are independent of the respective configuration of the SIMOTION modules.

5.3 Addressing signal modules

Introduction

The following section describes signal module addressing. You need the information so that you can address the signal module channels in the user program.

Addresses of digital modules

The address of an input or output of a digital module is made up of the byte address and the bit address.

E.g.   I 1.2

Input   Byte
         address   Bit address
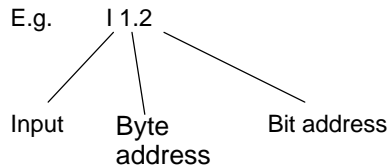
The byte address is governed by the module initial address.

You can note the bit address on the module.

Fig. 5-2 shows the plan on which the addresses for the individual channels of the digital module are based.
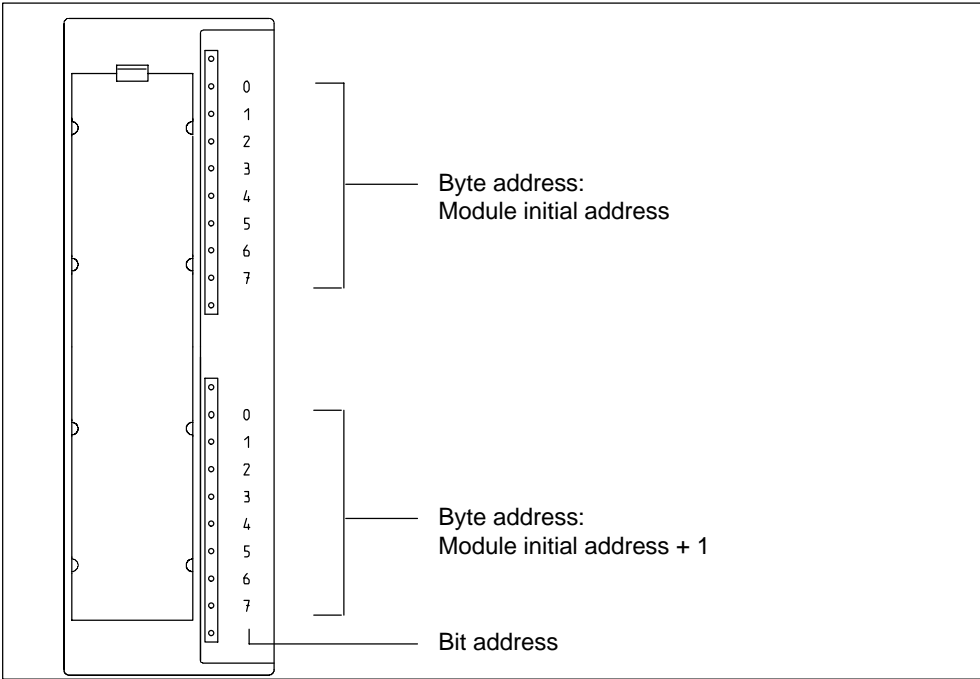
Fig. 5-2   Addresses for the inputs and outputs of digital modules

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Example of digital modules

Fig. 5-3 shows, as an example, the default addresses obtained for a digital module that is inserted in slot 4, i.e. if the module initial address is 0.

Slot number 3 is reserved as no interconnection module is present in the example.
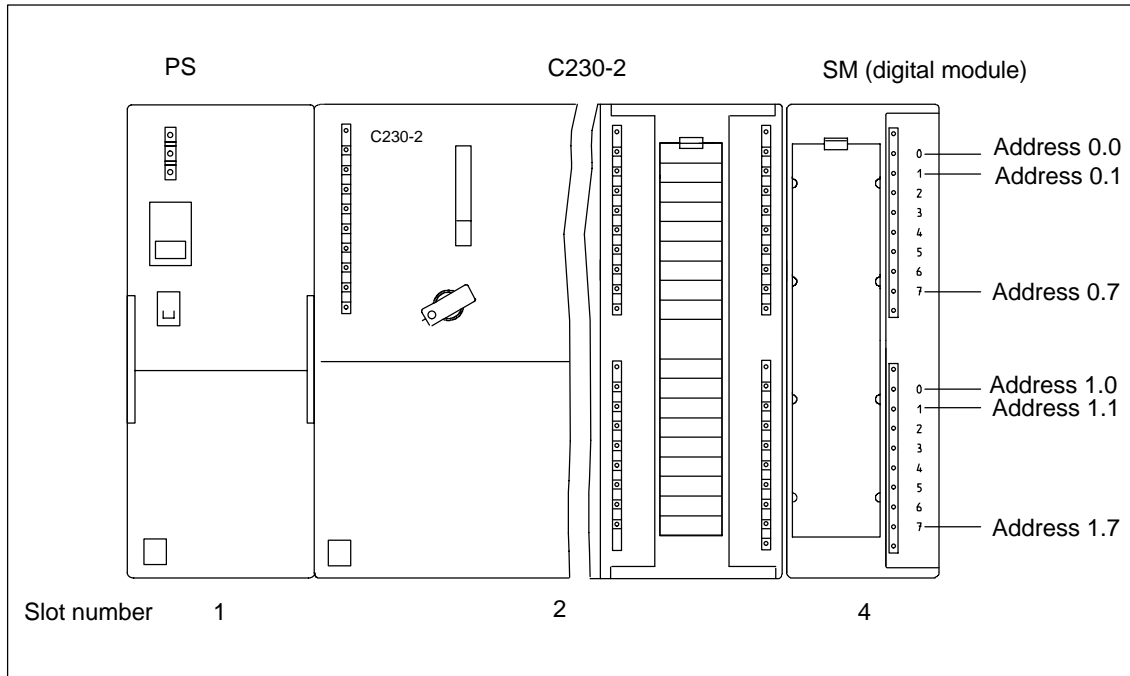
Fig. 5-3   Addresses for the inputs and outputs of the digital module in slot 4

Addresses of the analog modules

The address of an analog input or output channel is always an even address.

The channel address is based on the module initial address.

If the first analog module is in slot 4, then it has the defaut initial address 256. The initial address of each additional analog module is raised per slot by 16 (see Table 5-1).

An analog input/output module has the same initial addresses for the analog input and output channels.

Example for analog modules

Fig. 5-4 shows by way of an example which default channel addresses are obtained if an analog module is plugged into slot 4. You will see that in the case of an analog input/output module, the analog input and analog output channels are addressed from the same address, the module initial address.

Slot number 3 is reserved as no interconnection module is present in the example.
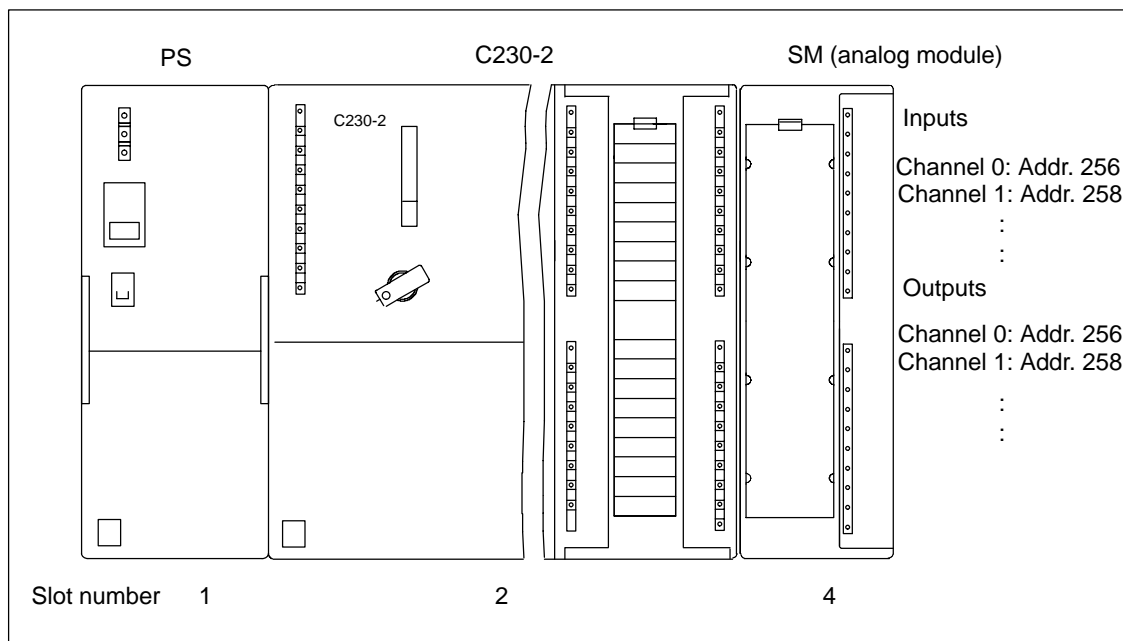
Fig. 5-4   Addresses of the inputs and outputs of the analog module in slot 4

Addresses of the FM and CP modules

The FM and CP modules are assigned to the analog address range.
In addition, the FM and CP modules have extended interfaces (data sets). For a detailed description, see the corresponding module's manual.

5.4 Addressing the integrated digital inputs and outputs of the C230-2

Fig. 5-5 shows the default initial addresses of the integrated digital inputs/outputs.
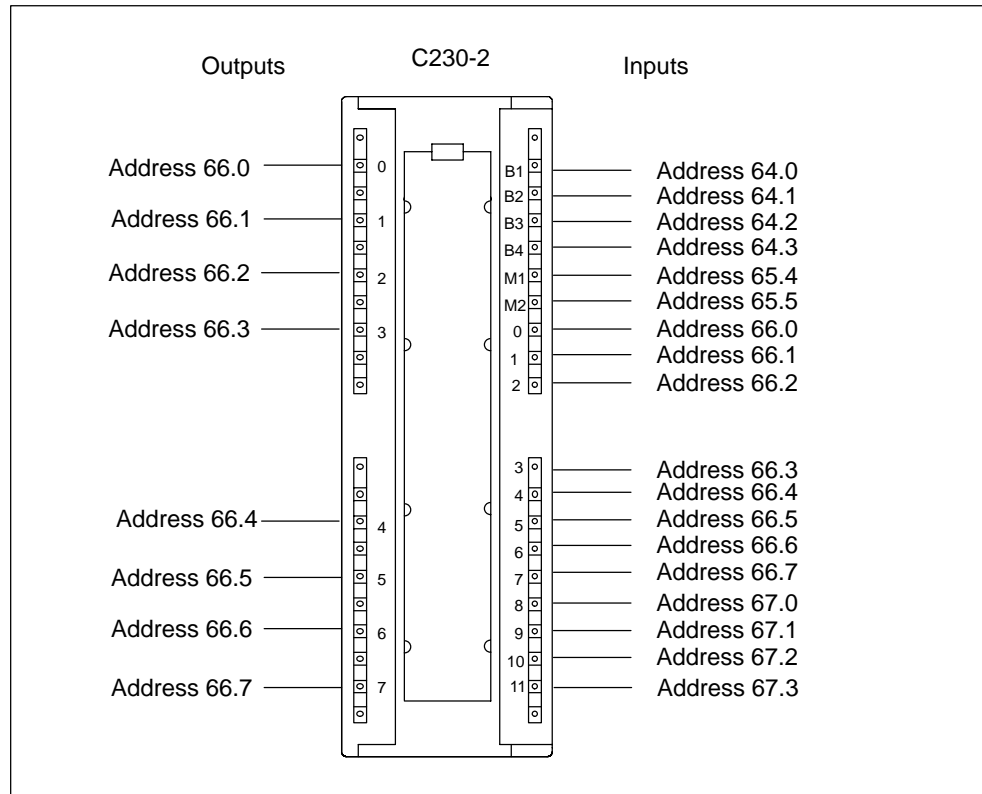
Fig. 5-5   Addresses of the integrated digital inputs/outputs

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Note

The addresses can be changed by the user in the *hardware configuration* (see *SIMOTION SCOUT* operating instructions).

All initial addresses/signal bits (64.4...64.7, 65.0...65.3, 65.6, 65.7, 67.4...67.7) not listed do not have any defined values and consequently may not be used in any way for evaluation.

Wiring

<div style="text-align: right; font-size: 3em; font-weight: bold;">6</div>

Basic rules

As a C230-2 can be used for a wide range of applications, we can only list the basic rules for the electrical configuration in this chapter. You must, as a minimum, comply with these basic rules to ensure problem-free operation.

Safety regulations

In order to ensure that your system operates safely, adopt the following measures and adapt them to suit your conditions:

- An EMERGENCY STOP strategy in accordance with the generally accepted rules of current engineering practice (e.g. European Standards EN 60204, EN 418 and similar).

- Additional measures to limit the end position of axes (e.g. hardware limit switches).

- Equipment and measures to protect motors and power electronics in accordance with the SIMODRIVE installation guidelines.

In addition, in order to identify hazards, we recommend that a risk analysis for the entire system be made in accordance with the basic safety requirements set out in Appendix 1 of EU Machinery Directive 89/392/EEC.

Other references

Please also note the information in the following sections of this manual:

- Guidelines on Handling Electrostatically Sensitive Devices (ESD), Appendix C.

- You can find further information on the design of a system with the S7-300 process I/O in the Manual *S7-300 Programmable Controller, Hardware and Installation, CPU Data, Section on "Wiring"*.

For further information on EMC guidelines we recommend the publication: *EMC Installation Guidelines, project design instructions (HW),*
Order no.: 6FC5 297-0AD30-0AP1.

Standards and specifications

When wiring the C230-2, you must observe the applicable VDE guidelines, especially VDE 0100 or VDE 0113 for shutdown devices, short-circuit and overload protection.

6.1 Project design of the electrical configuration

General rules for operating a C230-2

The following are the most important rules that you must observe when integrating a C230-2 in an automation system or plant.

Plant start-up after certain interrupts

The following table shows the points you have to take into account upon start-up of a plant following certain inerrupts.

If...	then...
Start-up after voltage drop or failure	No dangerous operating states may occur. If necessary, force an EMERGENCY OFF.
Start-up after unlocking of the EMER-GENCY STOP device	There must not be an uncontrolled or unde-fined start-up

Line voltage

The following table shows the points you have to take into account with respect to line voltage.

With...	then...
Stationary plants or systems without all-pole power disconnector switches	A mains disconnection switch or a fuse must be provided in the electrical installation for the building
Load power supply, power supply modules	The set rated voltage range must corres-pond to the local mains voltage
All electric circuits	The fluctuation/deviation of the mains vol-tage from the rated value must be within the permissible tolerance (see Technical Data for S7-300 Modules)

24 VDC supply

The following table shows you the points you have to take into account with regard to the 24 VDC supply.

With ...	pay attention to ...	
Buildings	Outdoor lightning pro-tection	Take lightning protection precautions (e.g. lightning conductors)
24 VDC supply lines, signal lines	Indoor lightning pro-tection	
24 V supply	Safe (electrical) isolation of extra-low voltage	

Protection against external electrical phenomena

The following table shows you what you have to observe in order to ensure protection against electrical phenomena or faults.

With ...	make sure that ...
All plants or systems in which SIMOTION C or S7-300 is installed	The plant or system is connected to a protective conductor to drain off electromagnetic disturbances.
Supply, signal and bus lines	The wiring arrangement and installation comply with EMC regulations.
Signal and bus lines	A line or connector break must not lead to any undefined plant or system states.

Regulations for power consumption and heat loss of a central configuration

The I/O modules on the P-bus take the power required for their operation from the P-bus as well as, when necessary, from an external load power supply.

- The power consumption of all I/O modules from the P-bus must **not** exceed 1.2 A. This is the power that the C230-2 can supply to the P-bus.

- PS 307 power supply modules are available for different loads (2 A, 5 A, 10 A). The selection of the appropriate power supply depends on the sum of the power consumption of the C230-2, the connected I/O modules and any other connected loads fed by the load power supply.

- The heat loss of **all** components used in a cabinet must not exceed the maximum amount that can be dissipated from the cabinet.

  Tip: When selecting the cabinet design, make sure that the temperature in the cabinet will not exceed the permissible ambient temperature for the installed components, even if the outside temperatures are high.

You will find information on the power consumption and heat loss of a module in the technical data of the corresponding modules.

6.2 Wiring diagram - Overview

C230-2 with servo drive (analog connection)

Fig. 6-1 shows how the individual components are connected to the C230-2 and the servo drive (analog connection).
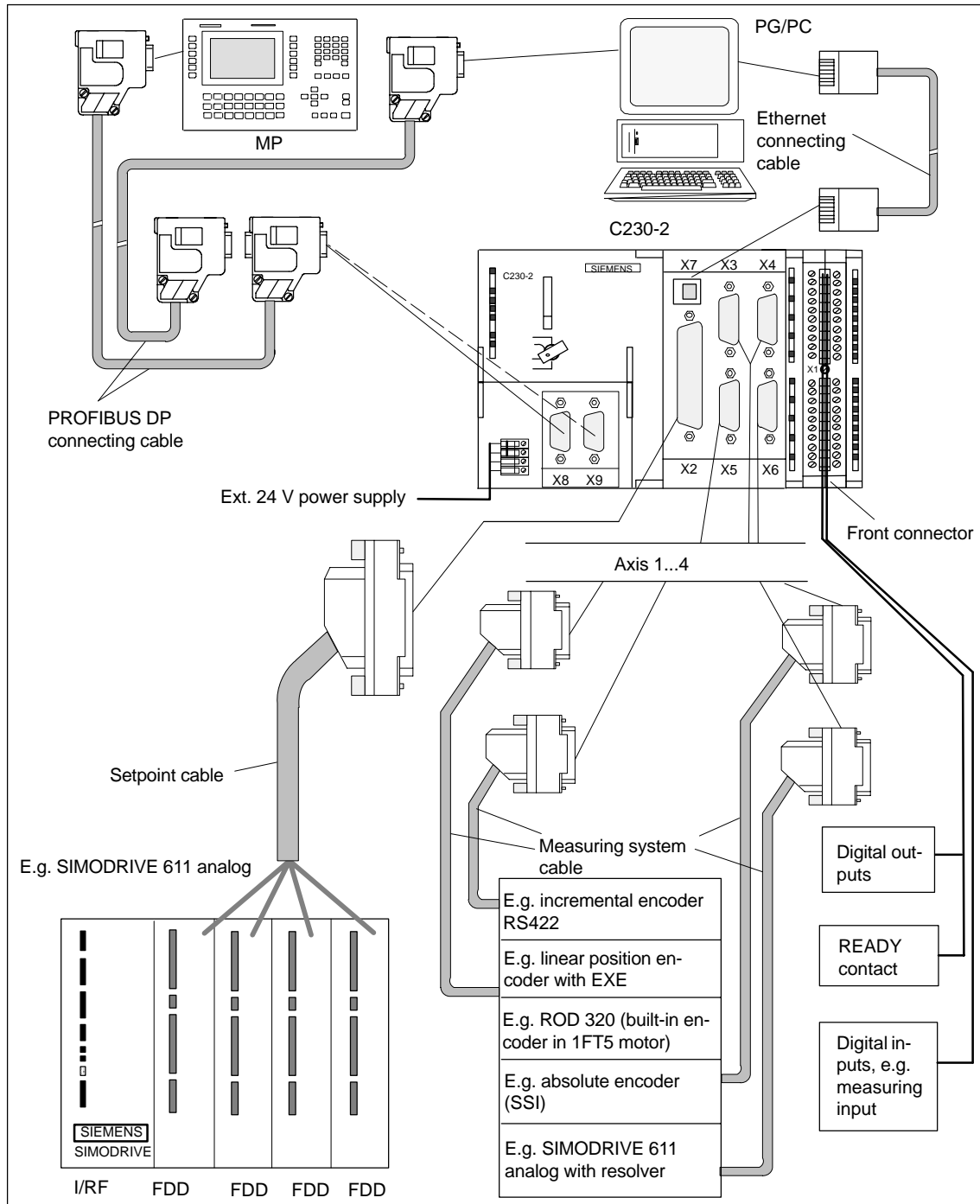
Fig. 6-1   Overview of the cable connecting the C230-2 to the servo drive (analog coupling) – Example

C230-2 with servo drive (digital connection) via PROFIBUS DP

Fig. 6-2 shows how the individual components are connected to the C230-2 and the servo drive (digital connection).
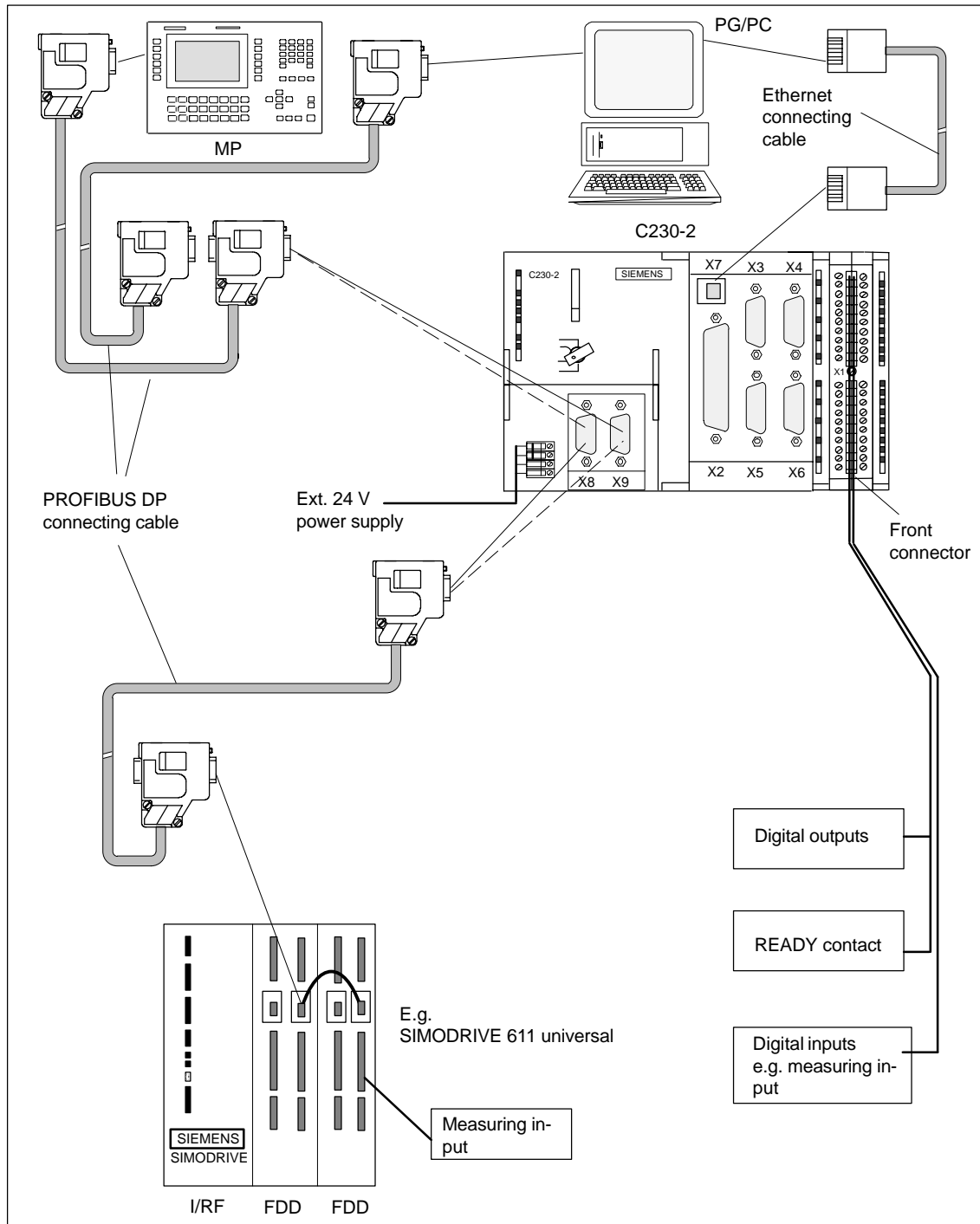
Fig. 6-2   Overview of the cable connecting the C230-2 to the servo drive (digital coupling) – Example

Overview of connections – Connecting cable

C230-2		
X1	– – – – – – – – – – – – – –	Digital inputs/outputs
X2	6FX2 002-3AD01-1□□0 ≤ 35 m Open strand ends	SIMODRIVE 611 analog/universal 4 setpoints
	6FX2 002-2CE02-1□□0 ≤ 35 m	1FT5 servo motor with integrated ROD 320
	6FX2 002-2CD01-□□□0 ≤ 35 m at 5 VDC	Incremental encoder 6FX2 001–2... with RS422 (TTL)
X3 to X6	6FX2 002-2CJ10-1□□0 ≤ 50 m	SIMODRIVE 611 universal with incremental shaft encoder (WSG) interface
	6FX2 002-2CJ00-1□□0 ≤ 50 m	SIMODRIVE 611 analog closed-loop control module for 1FK6 motors with resolver
	6FX2 002-2CC11-□□□0 ≤ 50 m at 500 kbit/s ≤ 300 m at 125 kbit/s	Absolute encoder 6FX2 001–5... with SSI
	6FX2 002-2CD01-1□□0 ≤ 25 m	Linear scale with EXE
X7	Ethernet bus cable	Ethernet node
X8 and X9	PROFIBUS bus cable	PROFIBUS DP node

Fig. 6-3   Overview of connections

The setpoint and measuring system cables (see Fig. 6-3) are available in various lengths.

see *Catalog NC Z,* Order No.: E86060-K4490-A001-A□
or
Catalog NC 60, Order no.: E86060-K4460-A101-A□
or
Catalog ST 70, Order no.: E86060-K4670-A111-A□
or
Catalog CA 01, Order no.: E86060-D4001-A101-B□

For information about the PROFIBUS bus cable or Ethernet bus cable, see Chapter 7.

For further information about PROFIBUS DP and Ethernet, see
Catalog IK PI, Order no.: E86060-K6710-A101-B□

Front connector

For the wiring of the digital inputs/outputs, you need a 40-pole front connector (screw type or spring tension type). This must be ordered separately.

Order No.: Screw type   6ES7 392-1AM00-0AA0
            Spring tension type   6ES7 392-1BM01-0AA0

see *Catalog ST 70,* Order no.: E86060-K4670-A111-A□
or
Catalog NC 60, Order no.: E86060-K4460-A101-A□

6.2.1 Connecting the power supply

Screw-type terminal block

The 24 VDC load power supply required is connected at the screw-type terminal block.

Properties of the load power supply

⚠️ **Danger**

The 24 VDC should be configured as function low-voltage with safe isolation.

Note

The connection cable between the voltage source and the load current supply connector L+ and the associated reference potential M should **not** exceed a maximum length of 10 m.

Table 6-1   Electrical parameters of load power supply

Parameters	Min	Max	Unit	Conditions
Voltage range – mean value	20.4	28.8	V	
Ripple		3.6	Vpp	
Transient overvoltage		35	V	500 ms continuous 50 s recovery time
Rated power consumption		2.2	A	See Section 3.4 "Connection values"
Starting current		8	A	

Pin connections

The table below shows the pin connections on the screw-type terminal block.

Table 6-2   Assignment of the screw-type terminal block

Terminal	
⏚	Functional ground
M	Ground
L+	24 VDC
M	Ground

If you wish to ground the reference potential, you must **not** remove the jumper between terminals M and the functional ground on the C230-2**.**

Mains buffering

The PS 307 load power supplies from the S7-300 system provide mains buffering for 20 ms.
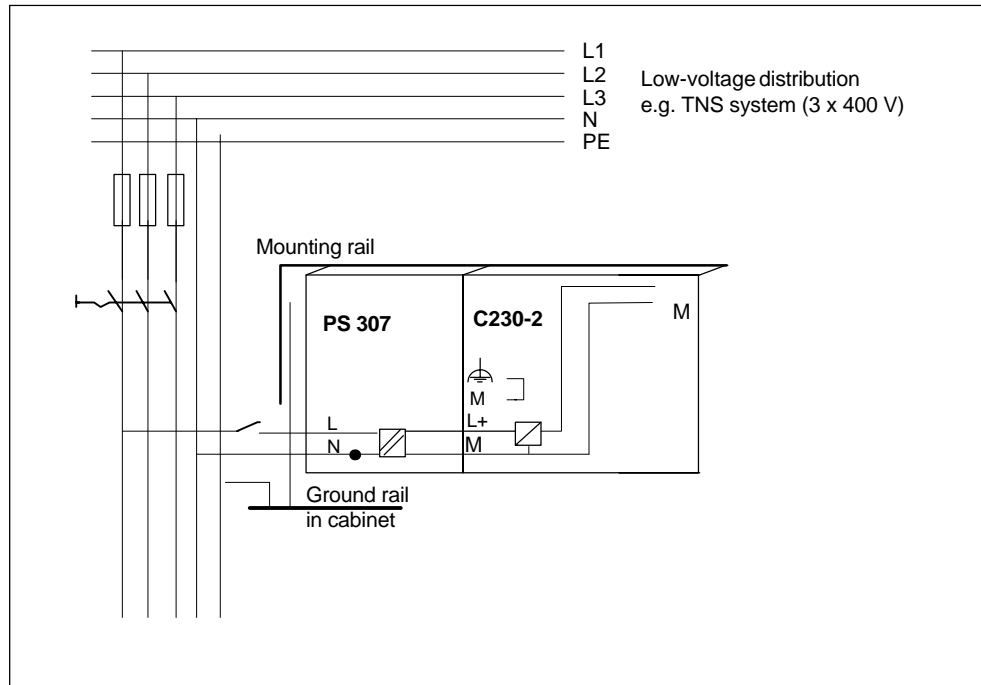
Fig. 6-4   Module supply options

Mains cables

Use flexible cables with a cross section of 0.25 to 2.5 mm^2 (or AWG 18 to AWG 14) to connect the power supply.

If you only use one cable per connection, a connector sleeve is not required.

You can use connector sleeves without an insulating collar in accordance with DIN 46228, Form A long version.

Power connector

Use the power connector to connect the PS 307 power supply module to the C230-2. The power connector is supplied with the power supply module.

Other 24 V connections

Above the power connector, 24 V connections for the supply of the I/O modules are available on the PS 307 power supply.

Wiring with the power connector

Proceed as follows to wire the PS 307 power supply module and the C230-2:

⚠ **Warning**

You could come into contact with live wires if the power supply module and any additional load power supplies are switched on.

Ensure that the system is de-energized when you wire the system!

1. Open the front covers of the PS 307 and the C230-2.

2. Release the clip for the cable strain relief on the PS 307.

3. Strip the mains cable (230 V/120 V) (strip off 12 mm) and connect it to the PS 307.

4. Tighten the clip for the cable strain relief.

5. Insert the power connector and screw it tight.

6. Close the front doors.
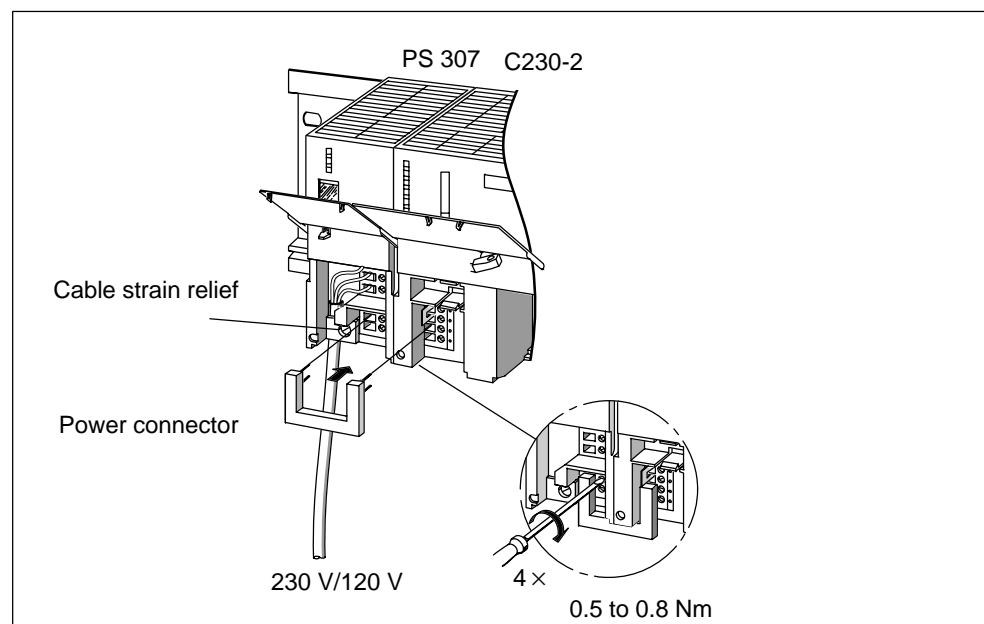
Fig. 6-5   Connecting power supply module and C230-2 with power connector

Adjusting power supply to the required mains voltage

Check whether the switch to select the mains voltage is set correctly for your mains voltage. The basic setting on the PS 307 is always 230 V. Proceed as follows to change the setting for the mains voltage:

1. Remove the covering cap using a screwdriver.

2. Set the switch for the relevant voltage supply.

3. Refit the covering cap over the switch opening.

Reverse voltage protection

If the connection is correct and the power supply is switched on, the "5 VDC" LED is illuminated green.

Note

Your module will not work in the case of reverse polarity. However, a built-in reverse polarity protection facility will protect the electronics against damage.

Fuse

If a fault is present on the module, a built-in fuse protects the electronics against consequential damage (e.g. fire). In this case, the module must be replaced.

6.2.2 Connecting the drive units

Connecting the connecting cable

Note the following:

Note

Only use shielded, twisted pair cables; the shield must be connected to the metallic or metalized connector housing on the control side. We recommend that the shield on the drive side should not be grounded. This is to separate low-frequency interference from the analog setpoint signal.

The pre-assembled cable available as an accessory provides the best possible immunity to interference.

Connection of drives (e.g. SIMODRIVE 611 analog) to the onboard drive interface

The figure below shows how to connect the C230-2 to a SIMODRIVE 611 analog drive unit.
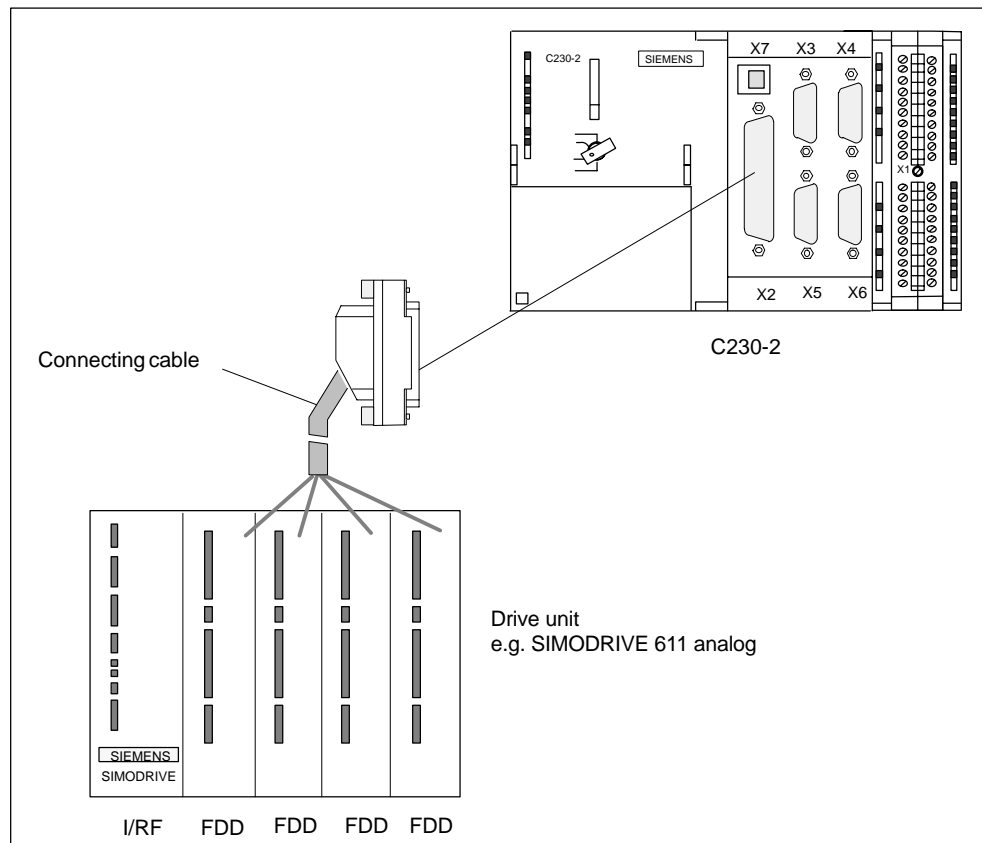
Fig. 6-6   Connection of a SIMODRIVE 611 analog drive unit

Proceed as follows:

1. Wire the free cable end of the connecting cable to the terminals on the drive unit. (The terminal markings on the cable ends indicate the corresponding terminals for SIMODRIVE devices).

2. Open the front cover of the C230-2 and insert the Sub-D socket (50-pin) into the X2 connector.

3. Lock the connector using the finger screws. Close the front cover.

Connecting cable

The connecting cable is a pre-assembled cable for four axes with an analog interface, terminal designation for SIMODRIVE drives.

The connecting cable is available in a choice of lengths.

See *Catalog NC Z or Catalog NC 60 or Catalog ST 70.*

Connection diagram
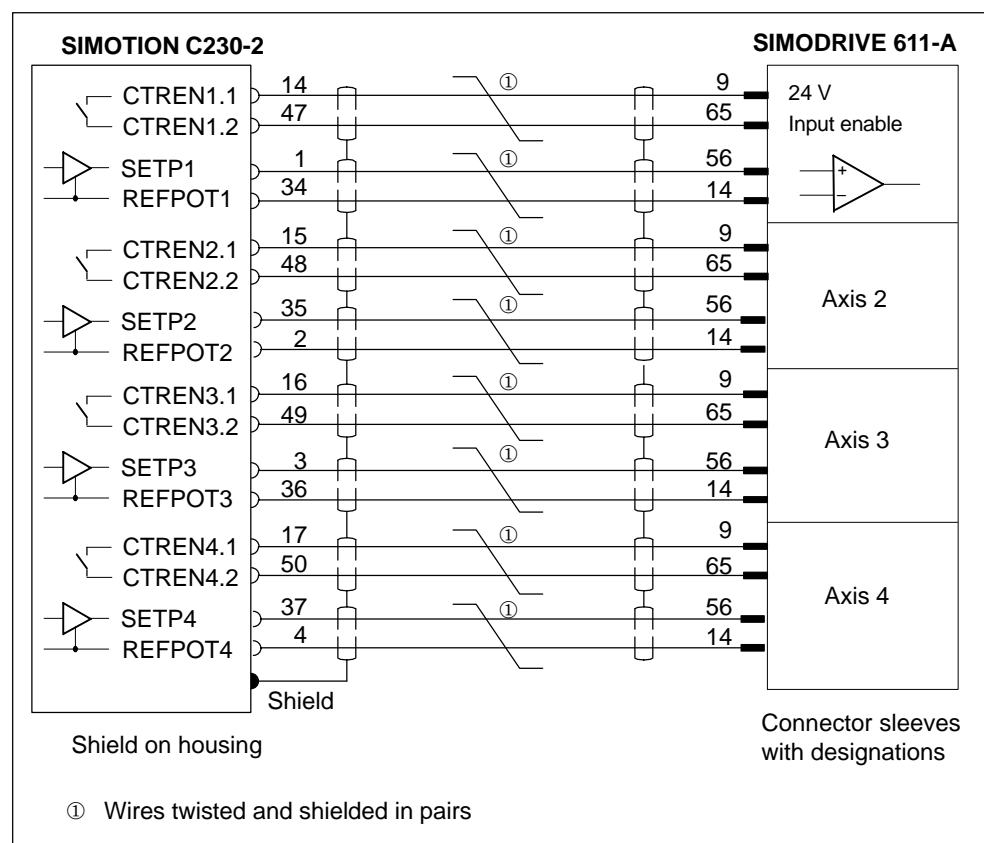
Fig. 6-7   Connection diagram of C230-2 to SIMODRIVE 611-A

Command value allocation

Allocation of the command values for axes 1 to 4 is fixed.

Command value output signals (X2) for **drives with analog interface:**

- SW1, BS1, RF1.1, RF1.2 for axis 1

- SW2, BS2, RF2.1, RF2.2 for axis 2

- SW3, BS3, RF3.1, RF3.2 for axis 3

- SW4, BS4, RF4.1, RF4.2 for axis 4

Connection of drives (e.g. SIMODRIVE 611 universal) on the PROFIBUS DP

The figure below shows the connection of a C230-2 to a SIMODRIVE 611 universal drive unit.

Please note that the PROFIBUS DP3 module must be fitted on your closed-loop control module.
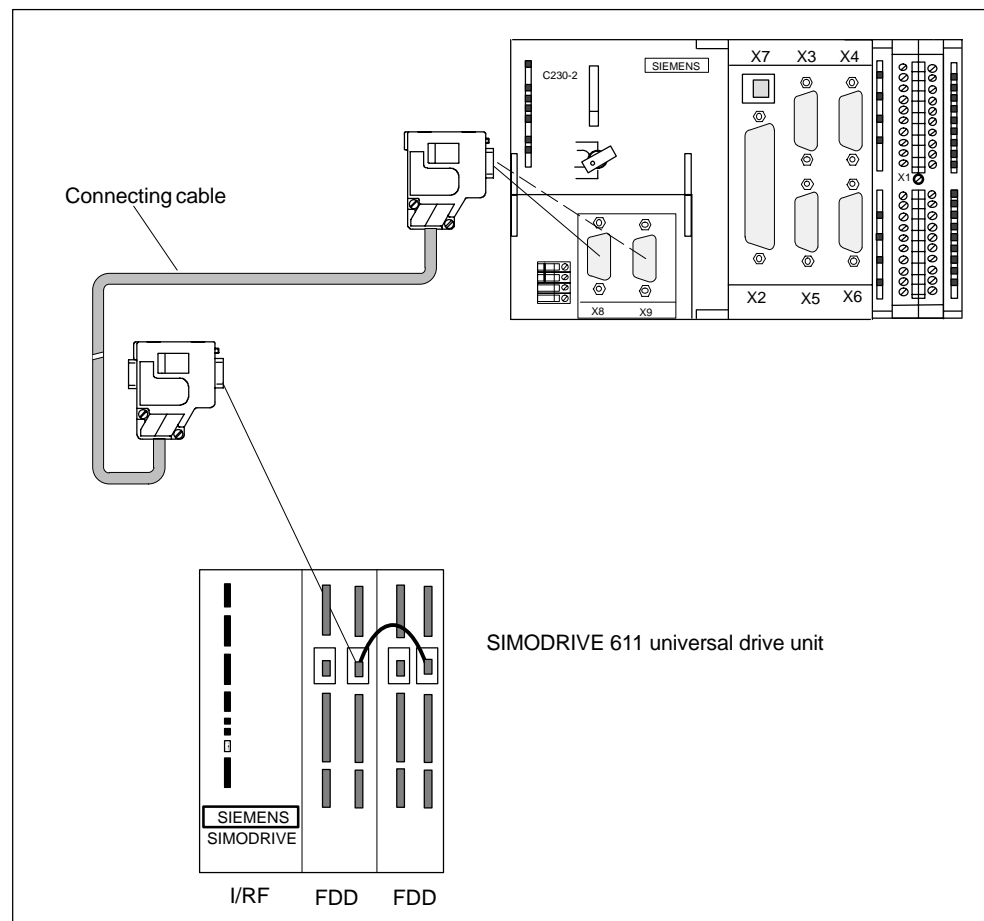
Fig. 6-8   Connection of SIMODRIVE 611 universal drive unit to PROFIBUS DP

Proceed as follows:

1. Insert the Sub-D connector (9-pin) into the drive unit.

2. Open the front cover of the C230-2 and insert the Sub-D connector (9-pin) into the X8/X9 socket.

3. Lock the connector using the finger screws. Close the front cover.

Connecting cable

Please see Chapter 7 on "Networking" for details about the bus cable, bus connector and installation.

Note

The maximum cable length is 100 m.

The terminating resistor must be switched in (switch position "On") at the beginning and end of the bus segment. See Fig. 7-2.

Mixed operation of drives at the onboard drive interface and at the PROFIBUS DP

Drives with analog and digital connections can be operated together.

Proceed as described for the connection of drives to the onboard drive interface or PROFIBUS DP.

6.2.3 Connecting encoders

Connecting the connecting cable

Note the following:

Note

Only use shielded cables; the shield must be connected to the metallic or metalized connector housing.

The pre-assembled cable available as an accessory provides the best possible immunity to interference and adequately dimensioned cross sections for the power supply to the encoders.
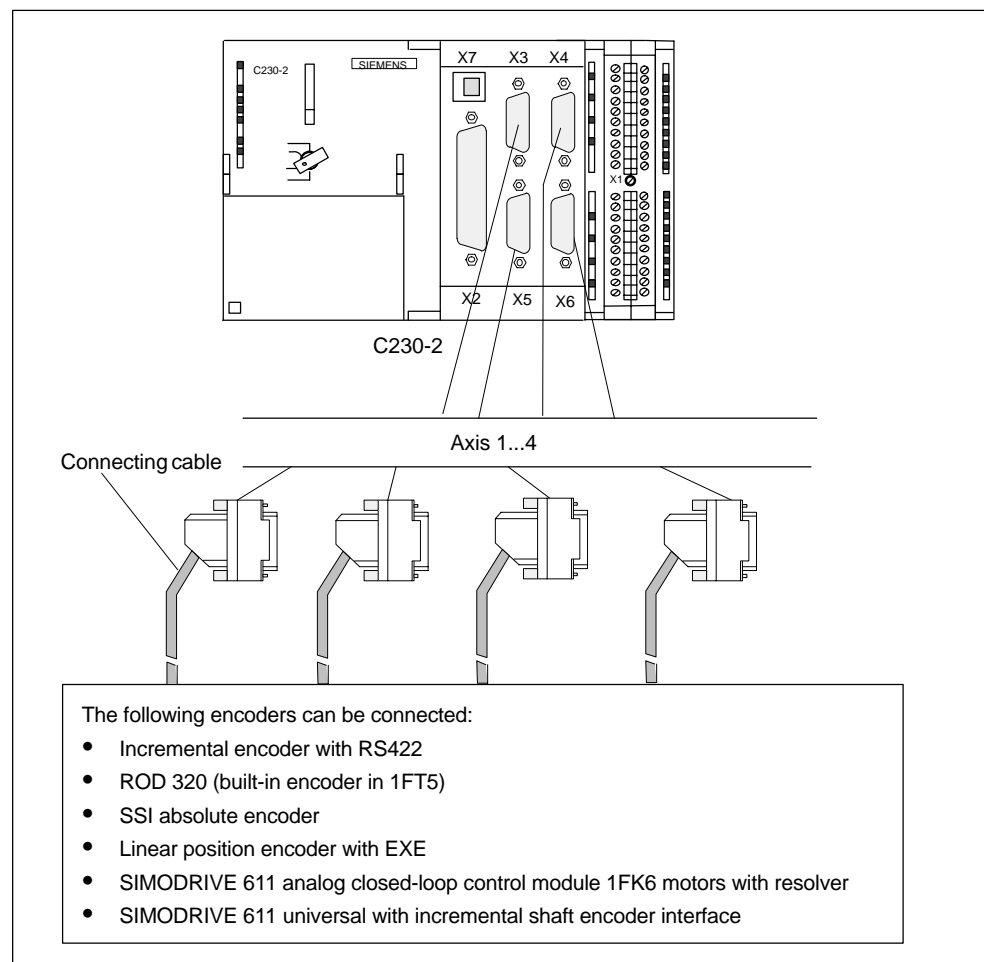
Fig. 6-9   Encoder connections

Procedure for connecting encoders

Proceed as follows to connect the encoders:

1. Connect the cable to the encoders.

2. Open the front cover of the C230-2 and insert the Sub-D connectors (15-pin) into sockets X3 to X6.

3. Lock the connector using the finger screws. Close the front cover.

Connecting cables available for encoders

The following connecting cables are available (see Fig. 6-3):

- Pre-assembled cable for external encoder or EXEs (for the connection of linear position encoders)

- Pre-assembled cable for built-in encoder with 17-pin round connector

- Pre-assembled cable for absolute encoders (SSI)

- Pre-assembled cable for SIMODRIVE 611 analog closed-loop control module 1FK6 motors with resolver

- Pre-assembled cable for SIMODRIVE 611 universal with incremental shaft encoder interface

   The incremental shaft encoder interface is used to emulate an incremental encoder. For this, the value for the actual position is recorded by the encoder connected to the drive unit and transmitted to the C230-2 as an incremental counting pulse.

   The encoder supply provided at the C230-2 is not used. Instead of this, ensure that there is a good earth connection between the C230-2 and the drive unit.

The connecting cables are available in a choice of lengths.

See *Catalog NC Z or Catalog NC 60 or Catalog ST 70.*

Actual value assignment

The assignment of actual values for axes 1 to 4 is fixed.

- The encoder for axis 1 must be connected to actual value input X3.

- The encoder for axis 2 must be connected to actual value input X4.

- The encoder for axis 3 must be connected to actual value input X5.

- The encoder for axis 4 must be connected to actual value input X6.

6.2.4 Wiring the front connector

Wiring the front connector

Fig. 6-10 shows how the cables are routed to the front connector and how to suppress line interference through the use of the shield connecting element.
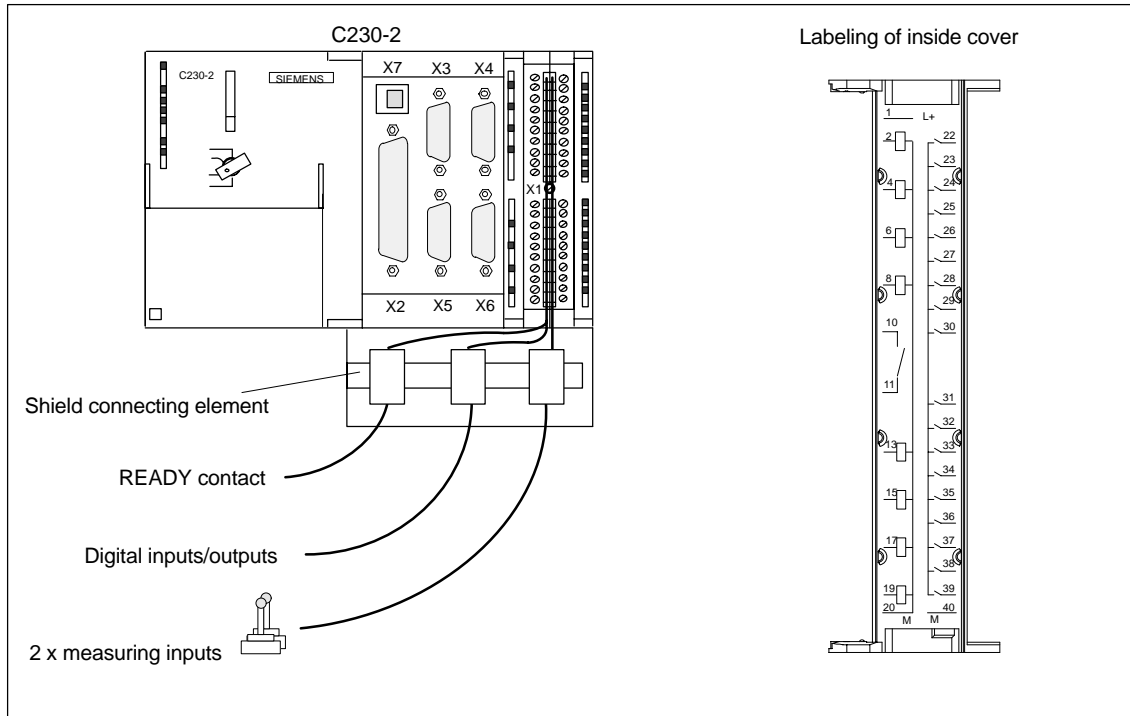
Fig. 6-10   Wiring the front connector

Connecting cables

Flexible cable, cross section 0.25 to 1.5 mm^2.

Connector sleeves are not required.

You can use connector sleeves without an insulating collar in accordance with DIN 46228, Form A long version.

You can connect two lines, each 0.25 to 0.75 mm^2, in one connector sleeve.

Note

In order to obtain optimum interference suppression, a shielded cable is required to connect measuring inputs or BEROs.

Tools required

Screwdriver or power screwdriver 3.5 mm.

Procedure for front connector wiring

Proceed as follows for the terminal strip:

1. Strip 6 mm of insulation off the cable. It may be necessary to fit a connector sleeve.

2. Open the front cover. Move the front connector into position for wiring.

   To do this, push the front connector into the module until it locks into position. In this position the front connector will still protrude from the module.

   The connector is locked in position, without electrical contact to the module.

3. If you route the wires out downwards, start the wiring at the bottom. If this is not the case, start at the top. Also screw in terminals that are unassigned.

   The tightening torque is 0.4 to 0.7 Nm.

4. Fit the cable strain relief provided around the wiring loom and the front connector.

5. Pull the cable strain relief for the wiring loom tight. Push the lock for the cable strain relief inwards to the left. This will ensure that the space available for cables can be utilized more effectively.

6. Tighten the mounting screw to move the front connector into operating position.

   Note: When the front connector is moved into operating position, a front connector keying engages in the front connector. The front connector will then fit only this module type.

7. Close the front cover.

8. You can fill out the labeling field provided and insert it in the front cover.

Shielded cables

If a shielded cable is used, the following additional operations are required:

1. Attach the cable shield to a grounded shielding rail immediately after the cable entry point in the cabinet (strip the insulation off the cable for this purpose).

   You can use the shield connecting element. This is mounted on the rail and can accommodate up to eight shielding terminals.

2. Continue routing the shielded cable as far as the module but do not make a connection to the shield there.

Shield connecting element

This element can be inserted in the mounting rail to provide screening for shielded cables. It can accommodate up to eight shielding terminals.

See Section 6.3

Connection of measuring inputs or proximity encoders (BEROs)

Proceed as follows:

1. Wire the power supply for the encoders. These must meet the same criteria as the load power supply for the C230-2.

2. Connect the shielded signal line to the encoders.

3. Remove a sufficient length of the cable sheath at the control end so that you can connect the shield to the shield connecting element and the free cable ends to the front connector.

4. Wire the signal line to the front connector.
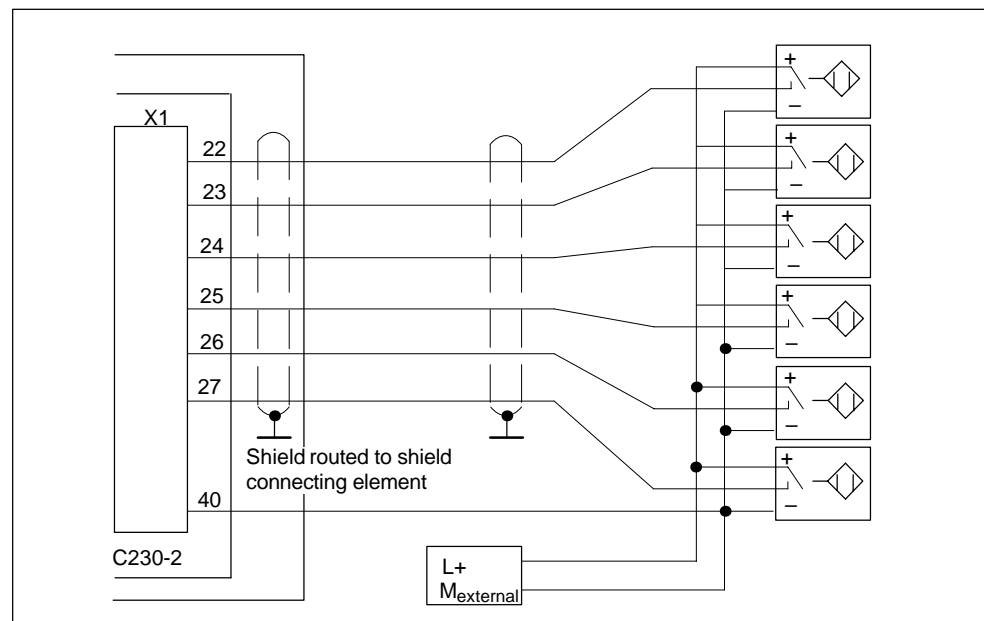
Fig. 6-11   Overview of connections for measuring inputs or proximity switches

Note

For the assignment of the front connector and the description of the I/O interface, refer to Subsection 3.1.8.

Connection of further actuators/encoders

If you wish to connect further actuators/encoders to the SMs on the P-bus, proceed in the same way as for connecting digital inputs/outputs to the SIMATIC S7-300.

See Manual for *S7-300 PLCs, M7-300 Module Data*.

The digital inputs/outputs on the central I/O system are recorded/output at a refresh rate of approx. 1 ms.

6.3 Connecting shielded cables via a shield connecting element

Application

With the shield connecting element, you can easily connect all the shielded wires of the C230-2 or S7 modules to ground – by directly connecting the shield connecting element with the mounting rail.

Design of the shield connecting element

The shield connecting element consists of:

- A retaining bracket with two threaded studs for connection to the rail (Order No.: 6ES5 390-5AA00-0AA0) and
- The shielding terminals

You must use the following shielding terminal, depending on the cable cross section used:

Table 6-3   Assignment of cable cross sections and shielding terminals

Wire with shield diameter	Shielding terminal Order No.:
2 cables, each with 2 to 6 mm shield diameter	6ES7 390-5AB00-0AA0
1 cable with 3 to 8 mm shield diameter	6ES7 390-5BA00-0AA0
1 cable with 4 to 13 mm shield diameter	6ES7 390-5CA00-0AA0

The shield connecting element is 80 mm wide and provides space for two rows, each with 4 shielding terminals.

Fitting the shield connecting element

Fit the shield connecting element as follows:

1. Push the two threaded studs for the retaining bracket into the guide on the underside of the rail. Position the retaining bracket under the modules to be wired.

2. Screw the retaining bracket tight on the mounting rail.

3. A slotted web is fitted on the underside of the shielding terminal. Fit the shielding terminal on edge a of the retaining bracket in this position (see Fig. 6-12). Press the shielding terminals down and pivot them into the required position.

   You can fit a maximum of four shielding terminals on each of the two rows.
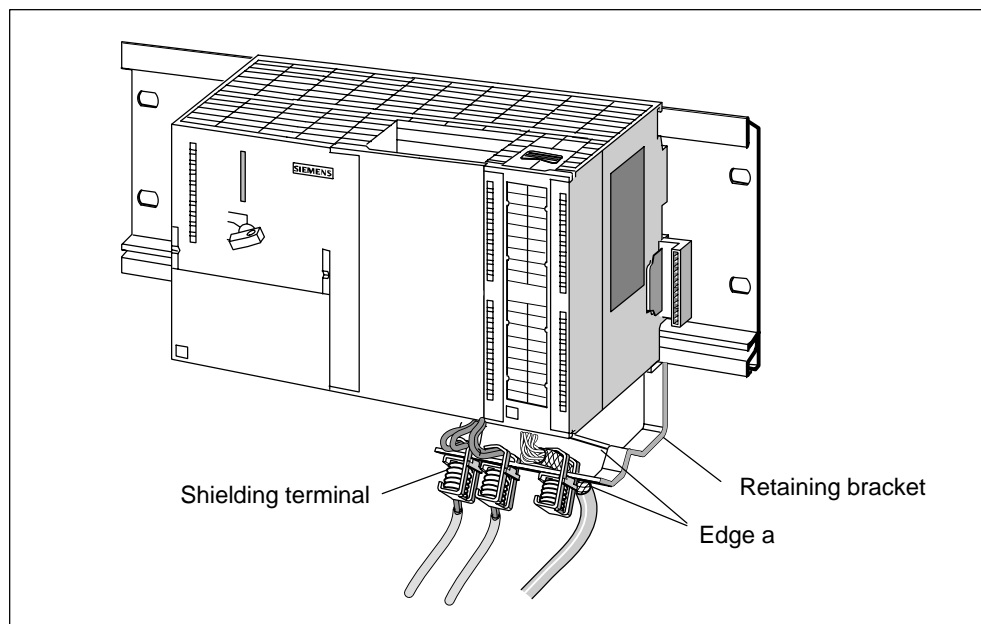
Fig. 6-12   Fitting the shield connecting element

Laying the cables

Only one or two shielded wires per shielding terminal may be attached (see Table 6-3). Connect the cable to the stripped cable shield. The stripped section of cable shield must have a minimum length of 20 mm. If you require more than four shielding terminals, start the wiring on the back row of the shield connecting element.

Tip: Make sure you allow a sufficient length of cable between the shielding terminal and the front connector. This will, for example, ensure that if a repair is required, you can unplug the front connector without also having to remove the shielding terminal.

Networking

<div style="text-align: right; font-size: large;">**7**</div>

Overview

How to configure a PROFIBUS subnet or Ethernet subnet appropriately for your application is described in the *SIMOTION SCOUT* operating instructions, order number: see bibliography.

7.1 Designing a PROFIBUS subnet

device = node

Agreement: In the following description, all devices that you connect in a subnet are referred to as nodes.

7.1.1 Requirements

PROFIBUS addresses

So that all nodes can communicate with each other, you must assign a "PROFI-BUS address" to them **before** they are networked.

You set this PROFIBUS address individually for each node using the PG/PC (in the case of some PROFIBUS DP slaves, also via the switch on the slave as well).

On the C230-2, **address 2** and **baud rate 1.5 Mbit/s** are parameterized as default settings for both PROFIBUS DP interfaces, X8 and X9.

Tip: Mark the set address on the housings of all nodes in a subnet. In this way, you will always be able to see which nodes have which address in your system.

For each PROFIBUS subnet, "highest PROFIBUS addresses" are preset. You can change these.

Rules for the PROFIBUS addresses

Observe the following rules before assigning PROFIBUS addresses:

- All PROFIBUS addresses in a subnet must be different.

- The highest PROFIBUS address of a subnet must be $\geq$ the greatest possible PROFIBUS node address of this subnet.

Recommendation for PROFIBUS addresses

Reserve the PROFIBUS address "0" for a service PG and "1" for a service SIMATIC HMI device which will be connected to the subnet if required.

Recommendation for the PROFIBUS address of the C230-2 for an exchange or a service call:

Reserve the address "2" for a C230-2. This way, you avoid any occurance of doubled addresses after installation of a C230-2 with the default setting into the subnet (for example, when exchanging a C230-2). This means that you will assign other nodes in the subnet an address higher than "2".

7.1.2 Rules for designing a subnet

Segment

A segment is a bus line between two terminating resistors. A segment with C230-2 as master can contain up to 32 slaves. A segment is also limited by the permissible length of the cable as a function of the baud rate (see Subsection 7.1.3).

Rules for connecting nodes in a subnet

- Connect all nodes in the subnet "in a line". Also integrate the PG's and SIMATIC HMI devices for commissioning or for maintenance work in series in the subnet.

- If you operate more than 32 nodes in a subnet, you must link the bus segments via RS 485 repeaters (also see the description of the RS 485 repeaters in the manual *S7-300 Automation Systems, M7-300, Module Data*).

  In a PROFIBUS subnet, all bus segments **together** must have at least one DP Master and one DP Slave.

- Link bus segments that are not grounded and grounded bus segments via RS 485 repeaters.

- The maximum number of nodes per bus segment is reduced for each RS 485 repeater used. This means that a bus segment with an RS458 repeater may only contain a further 31 nodes. However, the number of RS 485 repeaters does not have **any** effect on the maximum number of nodes on the bus.

  Up to 10 segments may be placed in a line.

- Activate the terminating resistor at the first and last node of a segment.

Components

You connect the individual nodes via the bus connector and the PROFIBUS bus cable (also see Section 7.2). Remember to provide a bus connector with a PG socket at the end of the subnet. This will give you the option of expanding the subnet if required (e.g. for a PG or SIMATIC HMI device).

For the connection between segments or for extending a wire, use RS 485 repeaters.

Terminating resistor

A cable must be terminated with a surge resistor to avoid faults as a result of reflected interference on the line. For this, activate the terminating resistor at the first and last node of a subnet or a segment (see Fig. 7-2).

Make sure that the nodes where the terminating resistor is activated are always supplied with voltage when ramping up and during operation.

Example

Fig. 7-1 shows an example of how a subnet is designed with the C230-2.

① Terminating resistor activated
② DP Master
③ DP Slave
0 to x PROFIBUS DP node addresses

Network	Highest PROFIBUS address	Possible PROFIBUS node
1	15	0 to 15
2	5	0 to 5
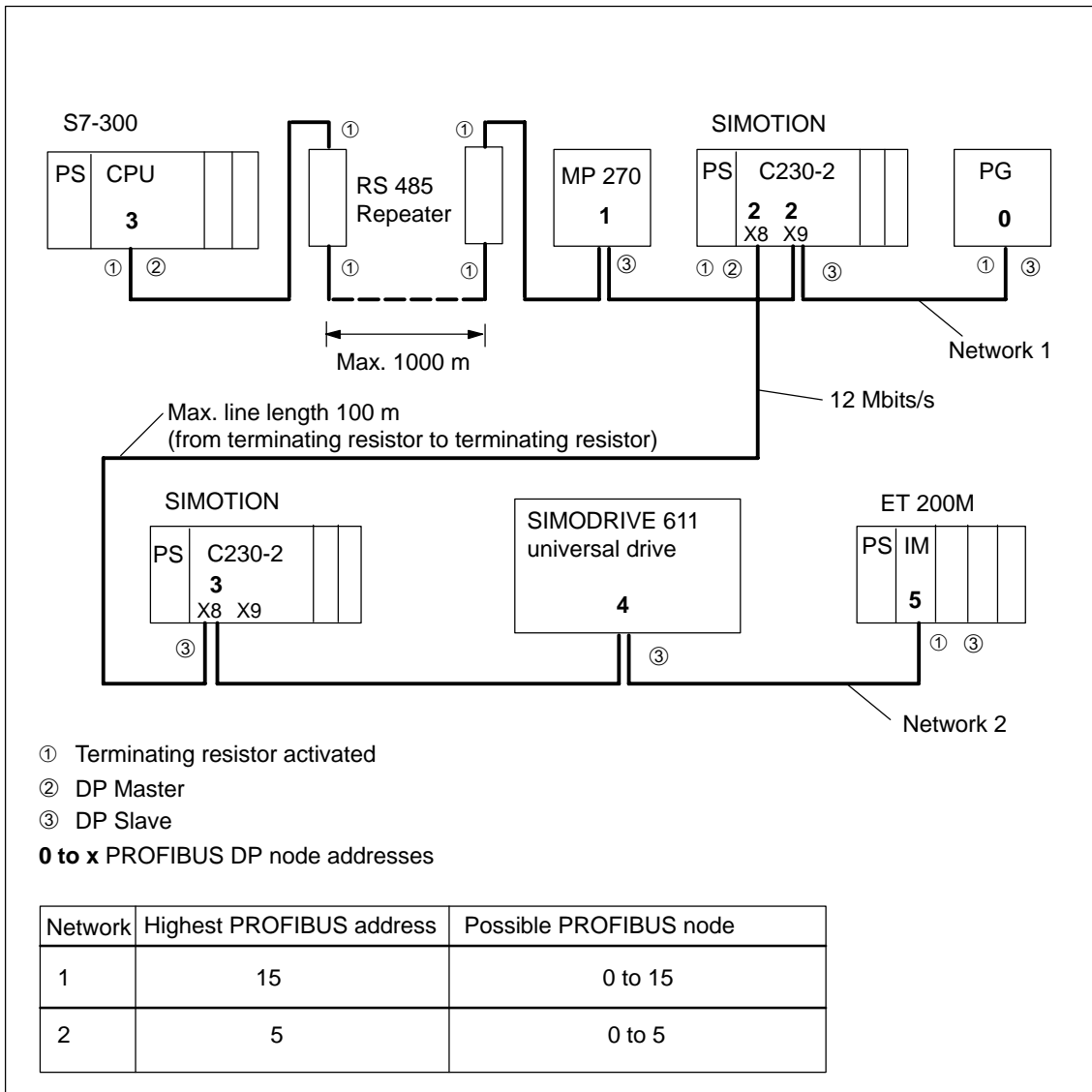
Fig. 7-1   Example of network

7.1.3   Cable lengths

Segment in subnet

The cable length in a segment of a subnet depends on the baud rate (see Table 7-1).

Table 7-1   Permissible cable length of a segment in the subnet as a function of the baud rate

Baud rate	Max. cable length of a segment (in m)
9.6 to 187.5 bits/s	1000[1]
500 Kbits/s	400
1.5 Mbits/s	200
3 to 12 Mbits/s	100

1) For isolated interface

Longer cable lengths

If you have to use longer cable lengths in a segment than are permissible, you must use RS 485 repeaters. The maximum possible cable lengths between two RS 485 repeaters correspond to the line length of a segment (see Table 7-1). However, please note that with these maximum cable lengths, **no** further node is permissible between the two RS 485 repeaters. You can fit up to nine RS 485 repeaters in sequence.

Please note that an RS 485 repeater must be counted as a node in the overall number of nodes that can be connected in the subnet, even if this does not have its own PROFIBUS address.

7.2 Network components for PROFIBUS subnet

Overview

This section contains information on:

- PROFIBUS bus cable
- Bus connector
- Plugging the bus connector into the module

7.2.1 PROFIBUS bus cable

We can supply you with the following PROFIBUS bus cables:

Cable	Order No.
PROFIBUS bus line	6XV1 830-0AH10
PROFIBUS grounding cable	6XV1 830-3AH10
PROFIBUS trailing cable	6XV1 830-3BH10

Characteristics of the PROFIBUS bus cable

The PROFIBUS bus cable is a two-core, twisted and shielded cable with the following characteristics:

Table 7-2   Characteristics of the PROFIBUS bus cable

Features	Values
Surge resistance	approx. 135 to160 Ω (f = 3 to 20 MHz)
Loop resistance	$\leqq$ 115 Ω/km
Operating capacity	30 nF/km
Attenuation	0.9 dB/100 m (f = 200 kHz)
Permissible core cross-section	0.3 mm^2 to 0.5 mm^2
Permissible cable diameter	8 mm $\pm$ 0.5 mm

Rules for laying cables

PROFIBUS bus cables should not be twisted, stretched or compressed.

Also, you must observe the following general conditions when routing the interior bus cable (d_A = outside diameter of cable):

Table 7-3   General conditions for routing the interior bus cable

Features	General conditions
Bending radius when bent once	$\geq$ 80 mm ($10 \times d_O$)
Bending radius when bent several times	$\geq$ 160 mm ($20 \times d_O$)
Permissible temperature range when laying cables	$-5°$ C to $+50°$ C
Operating temperature range in storage and in situ	$-30°$ C to $+65°$ C

7.2.2   Bus connector

Purpose of the bus connector

The bus connector is used to connect the PROFIBUS bus cable to the PROFIBUS DP interfaces (X8, X9). This is how you make the connection to other nodes.

The following bus connectors are available:

- Up to 12 Mbit/s, cable outlet 90°
    - Without steel conduit thread socket   (6ES7 972-0BA11-0XA0 or 6ES7 972-0BA50-0XA0)
    - With steel conduit thread socket   (6ES7 972-0BB11-0XA0 or 6ES7 972-0BB50-0XA0)
- Up to 12 Mbits/s, angular outgoing cable
    - Without steel conduit thread socket   (6ES7 972-0BA40-0XA0)
    - With steel conduit thread socket   (6ES7 972-0BB40-0XA0)

7.2.3 Plugging the bus connector into the module

Connecting bus connector

Proceed as follows to connect the bus connector:

1. Plug the bus connector into the module.

2. Screw the bus connector tightly onto the module.

3. If the bus connector is at the beginning or end of a segment, you must activate the terminating resistor (switch position "ON") (see Fig. 7-2).

Make sure that the stations where the terminating resistor is activated are always supplied with voltage when they are ramping up and during operation.

Terminating resis- on   Terminating resistor **not** on
tor switched on   off   switched on   off
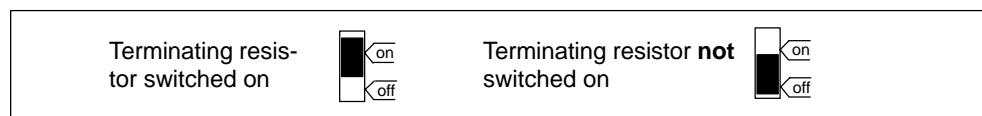
Fig. 7-2   Bus connector (6ES7...): Terminating resistor switched on and switched off

Unplugging bus connector

You can unplug the bus connector with the **looped through bus cable** from the PROFIBUS DP interface at any time, without interrupting the data traffic on the bus.

⚠ **Warning**

Disruption of data traffic on the bus possible!

A bus segment must always be terminated by the terminating resistor at both ends. This is not the case if the last node with the bus connector is de-energized. Because the bus connector takes its voltage from the station, the terminating resistor does not have any effect.

Make sure that the stations where the terminating resistor is switched on are always supplied with voltage.

7.3   Ethernet subnet

Overview

You can connect a Fast Industrial Ethernet to the 8-pin RJ45 socket **X7** (see Fig. 6-1).

Fast Industrial Ethernet is a communication network with a transmission rate of 10/100 Mbit/s.

You can communicate with STEP 7, SIMOTION SCOUT and SIMATIC NET OPC via a PG/PC.

The networking is carried out via a twisted pair cable. For further information, refer to the manual *SIMATIC NET, Industrial Twisted Pair and Fiber Optic Networks*, refer to the List of References for the order number.

The following connection cables are recommended:

*   SIMATIC NET, Ind. Ethernet TP XP CORD RJ45/RJ45, TP CORT pre-fabricated with 2 RJ45 connectors, crossed transmit and receiving line
    Order no.: 6XV1850-2H□□□ (□□□ – length code)

*   SIMATIC NET, Ind. Ethernet TP CORD RJ45/RJ45, TP CORT pre-fabricated with 2 RJ45 connectors
    Order no.: 6XV1850-2G□□□ (□□□ – length code)

You can receive further information on the wiring possibilities for Ethernet from your SIEMENS contact person.

Configuration via PROFIBUS DP

For the configuration via Fast Industrial Ethernet, the C230-2 must be supplied with an IP address, the subnet dialog box and the router address.

For the configuration and transfer of the Ethernet addresses to the C230-2, proceed as follows:

1. Open your project.

2. Open HW Config. Double-click the C230-2 to open the **Properties – C230-2** dialog box.

3. On the "General" tab, click the **Properties** button of the Ethernet interface. The **Properties – C230-2 Ethernet Interface** dialog box opens.

4. Click the **New** tab in this dialog box. The **New Industrial Ethernet Subnet** dialog box opens. Here, you can change the name of the new subnet or confirm the default setting by clicking on **OK**.

5. The newly created Ethernet subnet is now in the **Properties – C230-2 Ethernet Interface** dialog box under Subnet, and must be selected.

6. Enter the desired addresses in this dialog box at IP address and Subnet dialog box. Under Network transition, select whether a router should be used or not. If a router is used, enter a router address.

7. Confirm with **OK**.

8. Close the **Properties – C230-2** dialog box with **OK**.

9. Save and compile the changed hardware configuration.

10. Load the new hardware configuration via PROFIBUS DP to the C230-2.

Configuration via Ethernet (initial loading of the IP address)

If no PROFIBUS DP is available for the initial loading of the IP address, the following procedure is possible as of Windows 2000. In the TCP/IP configuration of the PC, the setting "Take IP address automatically" must be activated.

1. Connect the Windows PC and the C230-2 directly via the RJ45 crossover cable.

2. Boot the Windows PC. The PC cannot find a DHCP server and automatically selects an IP address from the APIPA subnet (**A**utomatic **P**rivate **IP A**dressing) 169.254.0.0.

3. Load the new hardware configuration with the new IP address via Ethernet to the IP address 169.254.11.22 (default IP address of the C230-2 as delivered).

Initial setting

The following addresses are set after resetting the C230-2 to the default setting (see Section 8.7) or on the module as delivered:

- IP address = 169.254.11.22
- Subnet dialog box = 255.255.0.0
- Router address = 169.254.11.22

7.4 MPI subnet

In principle, the design of an MPI subnet is the same as the design of a PROFI-BUS subnet. Therefore the same rules apply for the design as described in Section 7.1.

Commissioning

8

Overview

This chapter contains information on:

- Prerequisites for commissioning
- Inserting and changing the Micro Memory Card
- Switching on for the first time
- Writing, formatting and erasing the Micro Memory Card
- Overall reset of the C230-2

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8.1 Prerequisites for commissioning

Work required in advance	See...
Your system with C230-2 is installed	Chapter 4
Your system with C230-2 is wired	Chapter 6
For networking via PROFIBUS DP • The PROFIBUS addresses of the bus nodes with which the C230-2 communicates are set • The terminating resistors are switched on (at segment ends)	Chapter 7
For networking via Ethernet • The Ethernet addresses of the bus nodes with which the C230-2 communicates are set	Section 7.3

Software requirements

The programming device (PG/PC) must have a Pentium CPU (central processing unit) II (500 MHz) and at least a 256-MByte RAM (recommended: 512 MBytes). The screen resolution must not be less than 800 x 600 pixels.

Windows NT (as of V4.0 + Service Pack 5 or higher) or **Windows 2000** (Service Pack 1 or higher), the **STEP 7** program (as of V5.1 + Service Pack 2 or higher) and SIMOTION SCOUT (as of V2.0 or higher) must be installed on the programming device (PG) or standard PC.
We recommend the standard mouse driver from Windows NT 4.0 SP5.

Note:
Please take not of the information on the current CD for "SIMOTION SCOUT"!

In order to fully utilize all the functions, the Internet Explorer V5.0 or higher should be installed on your computer.

For online operation for communication over PROFIBUS DP, a connection must be made between the PG/PC to the C230-2 (connector X8 or X9) (see Fig. 6-1).

For online operation for communication via Ethernet, a connection must be made between the PG/PC and the C230-2 (connector X7) (see Fig. 6-1).

The programming device must have either a PROFIBUS card or an Ethernet card.

You require an MMC adapter to be able to write the Micro Memory Card (SIMOTION Kernel update) on the PG/PC (see Section 8.4).

Connecting the PG/PC to a C230-2

You can connect the PG/PC to the C230-2's PROFIBUS (connector X8 or X9) with a connector cable (see Section 7.2).

Information on the cable lengths in each case for PROFIBUS DP can be found in Subsection 7.1.3.

You can connect the PG/PC via a shielded twisted pair cable to the Ethernet of the C230-2 (connector X7).

Information on wiring the Ethernet subnet 7.3.

8.2 Inserting and changing the Micro Memory Card

Proceed as follows:

1. Switch off the power supply module.

2. Is a Micro Memory Card inserted? If yes: Then withdraw.

   To facilitate the withdrawal of the Micro Memory Card, the module slot is equipped with an ejector.

   Press the ejector and withdraw the Micro Memory Card.

   To eject the Micro Memory Card, use a small screwdriver or ball-point pen.

3. Insert the ("new") Micro Memory Card with a slight pressure in the C230-2 module slot until it latches. Take care that the sloping corner of the Micro Memory Card is pointing towards the ejector (see Fig. 8-1).

4. Switch on the power supply module again.

Ejector for
Micro Memory Card
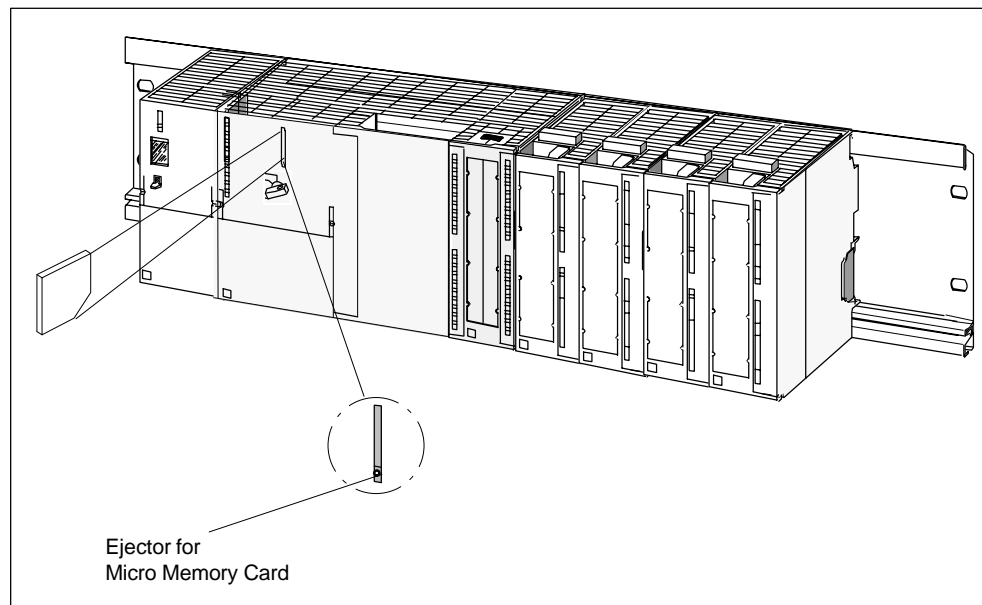
Fig. 8-1   Insert the Micro Memory Card into the C230-2

8.3 Switching on for the first time

Requirement

Your system with the C230-2 is installed and wired.

The mode selector must be set to STOP!

Switching on for the first time

Switch on the power supply module.

- The 24 VDC LED on the power supply module is illuminated.
- On the C230-2:
  - The 5 VDC LED illuminates.
  - All other LEDs light up briefly (approx. 2 seconds).

8.4 Writing, formatting and erasing the Micro Memory Card

Writing the Micro Memory Card

You can write the Micro Memory Card as follows:

- The Micro Memory Card is inserted in the C230-2 and is written to with the menu command **Copy RAM to ROM** (the connection programming device ↔ C230-2 must already exist, see Fig. 6-1).

  This is how you can save the technology packages and user data (programs, configuration data, parameterization) to the Micro Memory Card (see *SIMO-TION SCOUT* Operating Instructions).

- Write to the Micro Memory Card on the PG or PC.

  This is how you can copy SIMOTION Kernels to the Micro Memory Card for updating (see Section 9.1).

  For writing the Micro Memory Card, you require adapters for the various versions of Windows.

  We recommend the following adapters:

  – For **Windows NT/2000**

    SD/MultiMediaCard Floppy Disk Adapter
    Company: JVC
    Type designation: CU-VFSD50U

  – For **Windows 2000**

    USB UMSD-100
    Company: Simple Technologies

    Note: If you choose another USB adapter, you must ensure that the MMCs from Infineon Technologies AG are supported.

Erasing/formatting the Micro Memory Card

Note

The Micro Memory Card is always delivered formatted!

In order to guarantee error-free functioning of the Micro Memory Card in the C230-2, the card **cannot** be repartioned.

Using Windows tools to change or delete files on the Micro Memory Card that were written with **Copy RAM to ROM** could result in the destruction of the project.

During formatting, a stored license key is also deleted. This will subsequently have to be re-entered via SIMOTION SCOUT.

You have the following options for formatting the Micro Memory Card:

- Format the Micro Memory Card in an operation at the mode selector of the C230-2.

- Format the Micro Memory Card on the PG/PC with Windows functions.

When formatting the Micro Memory Card with the **mode selector,** proceed as follows:

1. Switch off the power supply for the C230-2.

2. Insert the Micro Memory Card into the C230-2.

3. Turn the key on the mode selector to the MRES position. Hold the key in this position and switch on the power supply for the C230-2. While formatting, the "STOPU" LED flickers. When the "STOP" LED is steadily lit, turn the key back to the STOP position.

When formatting the Micro Memory Card on the **PC/PG**, proceed as follows:

1. Insert the Micro Memory Card in the slot of the MMC adapter.

2. Open the Windows Explorer.

   Note
   The Micro Memory Card must be displayed as a drive with an arbitrary letter in the Windows Explorer.

3. Select the drive. Select the option **Formatting** with the right mouse button.

Note

As of Kernel version 2.1 in the C230-2, and the Micro Memory Card 6AU1 700-0AA01-0AA0, when the Micro Memory Card is being formatted, the C230-2 transfers its stored Kernel to the Micro Memory Card. If a particular Kernel version is required, it will have to be placed manually on the Micro Memory Card.

8.5 Performing an overall reset on the C230-2

An overall reset is a procedure that starts a new ramp up process.

What happens during an overall reset?

The following data on the C230-2 is deleted:

- Configuration data
- Programs
- Parameterizations
- Technology packages
- Retain variables

  Retain variables are variables that are defined as "Non-volatile variables" in the user program using the key word "Retain".

The following data is retained:

- SIMOTION Kernel (if available on the Micro Memory Card)
- Baud rate
- PROFIBUS DP addresses of the C230-2 (X8, X9)
- IP address, subnet dialog box and router address of the C230-2

The content of the diagnostics buffer is retained.

The technology packages and user data (configuration data, programs, parameterizations) are transferred from the Micro Memory Card into the "Volatile data" area of the C230-2.

After the overall reset, a project existing on an inserted Micro Memory Card is valid and activated.

When does an overall reset have to be performed on the C230-2?

- If you wish to undo the changes in your user data (programs, configuration data, parameterizations) in the "Volatile data" area of the C230-2.

  Note:

  If resetting is not performed, the consistency of your user data cannot be guaranteed.

- If the C230-2 requests an overall reset by the STOP LED flashing (slow flashing) (e.g. Micro Memory Card has been removed).

Overall reset using the mode selector

Proceed as follows (see Fig. 8-2):

1. Turn the key on the mode selector to the STOP position.

2. Turn the key to the MRES position. Hold the key in this position until the STOP LED changes from flashing to permanently illuminated.

3. Within 3 seconds, you must release the switch and return it to the MRES position. The overall reset procedure is executed. All LEDs illuminate during this time. The C230-2 has completed the overall reset procedure when the STOP LED illuminates.

The C230-2 has completed the overall reset procedure.
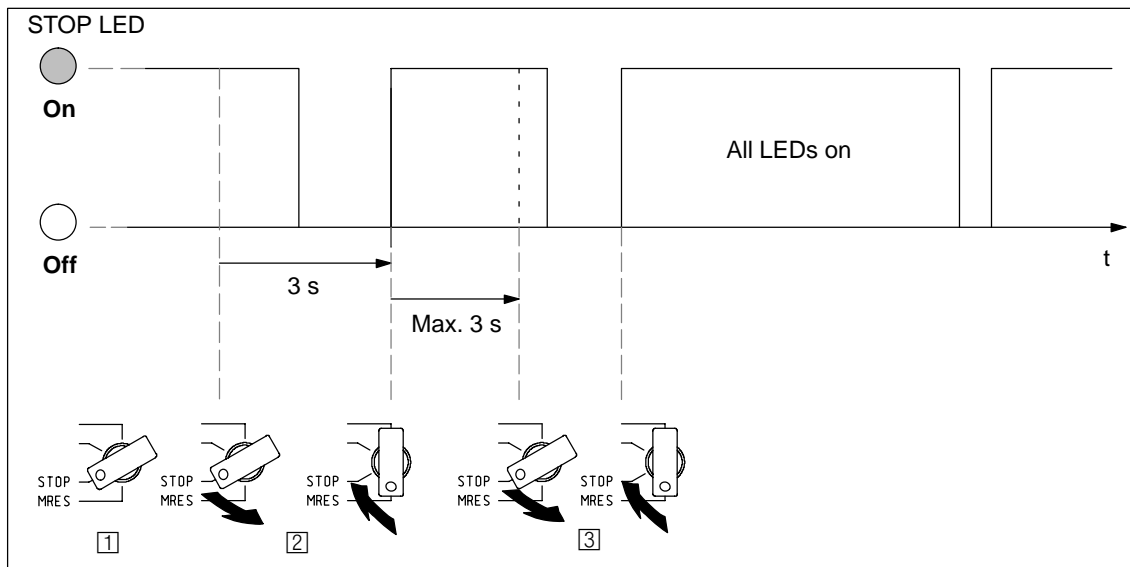
Fig. 8-2   Sequence in which the mode selector is operated to perform an overall reset

8.6   User memory concept

Overview

You have created the technology packages (TPs) and your user data (programs, configuration data, parameterization).

The connection has been made between the programming device and the C230-2.

Memory model

Fig. 8-3 and the following description on points 1 to 5 will give you an overview of the C230-2's memory model and the procedures for certain operations.
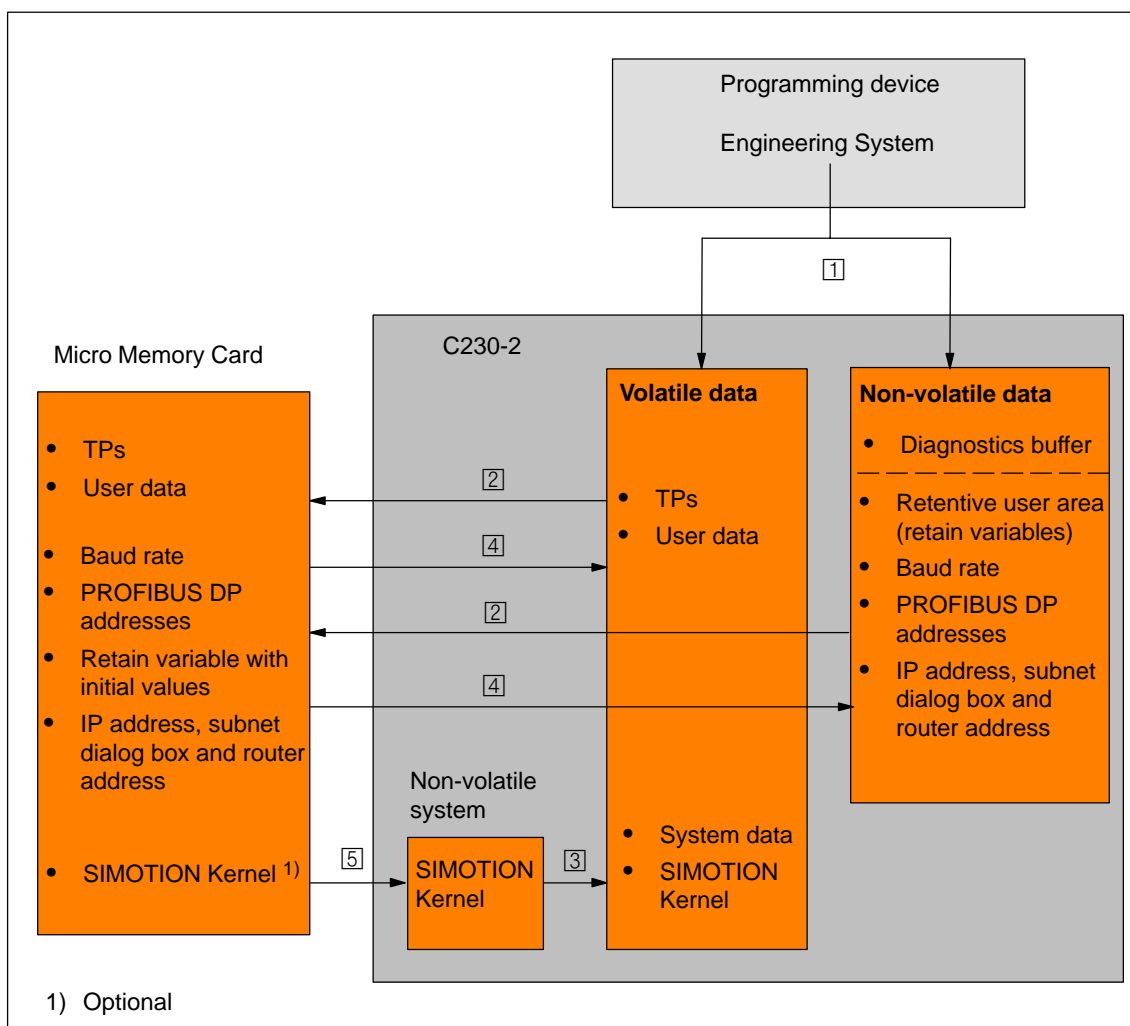
Fig. 8-3   C230-2 memory model

1. The following data is copied from the Engineering System into the "Volatile data" area of the C230-2 using the **Download** menu command:
   - Configuration data
   - Programs
   - Parameterizations
   - Technology packages

   Baud rates, PROFIBUS DP addresses for the C230-2 (X8, X9) and the retain variables are also stored in the "Non-volatile data" area.

2. Using the menu command **Copy RAM to ROM,** the following data is saved to the Micro Memory Card from the Engineering System:
   - The technology packages and user data from the "Volatile data" area
   - Baud rate, PROFIBUS DP addresses, IP address, subnet dialog box and router address and the Retain variables with their initial values from the "Non-volatile data" area
     Note:
     The current values of the Retain variables are **not** saved to the Micro Memory Card.

3. As the C230-2 ramps up, the SIMOTION Kernel (basic system) is loaded into the system area of the "Volatile data".

4. The contents of the "Volatile data" area are lost once the C230-2 is switched off. When the C230-2 is switched on, the following data is transferred from the Micro Memory Card:
   - The technology packages and user data to the "Volatile data" area
   - Baud rate, PROFIBUS DP addresses, IP address, subnet dialog box and router address and the Retain variables with their initial values to the "Non-volatile data" area

5. The SIMOTION Kernel is written to the "Non-volatile system" through a Micro Memory Card update.
   If you want to install a newer or an older version of the SIMOTION Kernel that is on the C230-2, you can use the Micro Memory Card to perform an update (see Section 9.1).

Note

You can also operate the C230-2 without a Micro Memory Card. The SIMOTION Kernel is in the "Non-volatile system" of the C230-2 and you can load the technology packages and user data from the Engineering System to the C230-2.

When the power supply is turned off, the contents of the "Volatile data" area are lost.

When the power supply is switched on, the following data is still present on the C230-2:

- SIMOTION Kernel
- Data in the "Non-volatile data" area
    - Diagnostics buffer
    - Baud rate
    - PROFIBUS DP addresses of the C230-2
    - IP address, subnet dialog box and router address of the C230-2
    - Retain variables

The technology packages and user data (configuration, programs, parameterizations) have to be loaded either from the Engineering System or a Micro Memory Card.

You can find further information about the Engineering System in the *SIMOTION SCOUT Operating Instructions,* refer to the List of References for the order number.

8.7 Resetting the C230-2 to the default setting as delivered

Overview

You can reset the C230-2 to the as delivered state (default setting) via operations on the mode selector.

The following data is deleted:

- Configuration data

- Programs

- Parameterizations

- Technology packages

- Retain variables

  Retain variables are variables that are defined as "Non-volatile variables" in the user program using the key word "Retain".

- Diagnostics buffer

- Clock

The following data is retained:

- SIMOTION Kernel

The following data is reset:

- Baud rate = 1.5 Mbit/s

- PROFIBUS address for the interfaces X8 = 2 and X9 = 2

- IP address = 169.254.11.22, subnet dialog box = 255.255.0.0 and router address = 169.254.11.22

Operations on the mode selector

Proceed as follows:

1. Switch off the power supply for the C230-2.

2. Remove the Micro Memory Card from the C230-2.

3. Turn the key on the mode selector to the MRES position. Hold the key in this position and switch on the power supply for the C230-2. When the "STOPU" LED flickers, turn the key to the STOP position again.

Maintenance

9

Overview

This chapter contains information on:

- SIMOTION Kernel update via Micro Memory Card

- Exchanging modules

- Module exchange without PG/PC

9.1 SIMOTION Kernel update

Each C230-2 always contains the latest version of the SIMOTION Kernel when it is delivered. The user can install newer or older versions via an update.

You can obtain the SIMOTION Kernel versions (CD ROM can be ordered) from your local Siemens contact person.

Note:
The SIMOTION Kernel and the technology packages must always have the same software version. To avoid incompatibilities when replacing the C230-2, it is recommended that the SIMOTION Kernel version of the current configuration is stored on the Micro Memory Card.

You can copy the SIMOTION Kernel via a PG/PC with the appropriate Micro Memory Card adapter (see Section 8.4) from this CD ROM to the Micro Memory Card.

Proceed as follows:

1. Insert the Micro Memory Card in the slot of the SD card/MMC adapter. Prerequisite is that the adapter has been installed.

2. Insert the CD ROM containing the SIMOTION Kernel in the CD drive of your PG/PC.

3. Open the Windows Explorer.

   Note
   The Micro Memory Card must be displayed as a drive with an arbitrary letter in the Windows Explorer.

4. Copy the **c230_2fw.bin** file from the CD to the Root Directory of the Micro Memory Card via the Windows Explorer.

5. Remove the Micro Memory Card from the PG/PC.

6. Switch off the power supply for the C230-2.

7. Insert the prepared Micro Memory Card into the C230-2.

8. Switch on the power supply for the C230-2.

   The C230-2 compares the version of the SIMOTION Kernel on the Micro Memory Card with that on the C230-2 and automatically carries out an update.
   – First, the version of the SIMOTION Kernel stored in the C230-2 is deleted. The "RUN", "STOP" and "BUS2F" LEDs flash.
   – Then the new version of the SIMOTION Kernel is transferred from the Micro Memory Card to the C230-2. During the data transfer, the "SF", "RUN", "STOPU", "STOP", "BUS1F" and "BUS2F" LEDs illuminate in sequence.

   Note: The C230-2 **cannot** be switched off during this phase.
   – After completing the SIMOTION Kernel update, the C230-2 performs a restart and goes into the STOP mode.

The C230-2 can then be operated with the new SIMOTION Kernel.

9.2   Removing and exchanging the C230-2

Overview

The C230-2 can only be exchanged as a complete unit.

⚠️ **Warning**

The C230-2 can only be exchanged with the load power supply switched off. Therefore, switch off the power supply, e.g. by operating the On/Off switch on the PS power supply module.

Removing a faulty module

Proceed as follows to remove the C230-2.

1. Switch off the power supply.

2. Open the front covers. If necessary, remove the labeling strip.

3. Undo the connections on the terminal strip for the power supply.

4. Unplug the Sub-D connectors to the encoders (X3 to X6), the drive unit (X2) and the PROFIBUS DP interfaces (X8, X9).

5. Release the front connector (X1).

   Loosen the mounting screw in the middle of the front connector and then pull out the front connector, holding it at the gripping points provided.

6. Unscrew the module's mounting screws and swing it upwards and out.

Installing a new module

Proceed as follows:

1. Remove the upper part of the front connector keying from the new module.

2. Insert a module of the same type, swing it down and screw it in tightly.

3. Plug in the front connector and move it into operating position (tighten mounting screw). The keying fitting adjusts so that the front connector only fits this module type.

4. Connect the Sub-D connectors.

5. Connect the load power supply on the terminal strip.

6. Close the front covers and insert the labeling strip.

   The control is now ready for operation again and can be commissioned.

7. Switch on the power supply.

9.3 Module exchange without PG/PC

Overview

If a defective C230-2 has to be exchanged and there is no PG/PC available, you can only load your data from the Micro Memory Card to the new module.

Requirement

The requirement for this is that when you commissioned your project, as described in Section 8.6, you saved from the Engineering System to the Micro Memory Card with the menu command Copy **RAM to ROM**.

The following data are on the Micro Memory Card and can be transferred to the new module:

- Technology packages
- User data
- Baud rate
- PROFIBUS DP addresses
- IP address, subnet dialog box and router address

Note

The Retain variables are saved with their initial values!

The current values of the Retain variables are lost!

The diagnostics buffer is lost!

Standards and Approvals

A

IEC 1131

The SIMOTION automation device meets the requirements and criteria of
IEC 1131, Part 2.

CE marking

Our products meet the requirements and protection objectives of the following EC
Directives and comply with the harmonized European Standards (EN) that have
been published in the Official Gazettes of the European Community for program-
mable logic controllers:

89/336/EEC "Electromagnetic Compatibility" (EMC Directive)

The EC declaration of conformity is part of this manual (see Appendix B).

EMC Directive

SIMOTION products are designed for use in an industrial environment.

Application	Requirement for	
	Emitted interference	**Immunity to noise**
Industry	EN 50081-2 : 1993	EN 61000-6-2 : 1999

UL recognition

Recognized component mark for Canada and the United States
Underwriters Laboratories (UL) in accordance with
Standard UL 508, File 16 4110

A.1 Electromagnetic compatibility

Definition

Electromagnetic compatibility is the ability of an electric device to function satisfactorily in its electromagnetic environment without interfering with its environment.

The requirements fulfilled by the C230-2 include those of the EMC Statute of the Single European Market.

Below you will find information on immunity to noise and data on radio interference suppression.

Pulse-shaped interference

The following table shows the electromagnetic compatibility of modules with regard to pulse-shaped interference.

Pulse-shaped interference	Tested with	Corresponds to severity
Electrostatic discharge n accordance with IEC 801-2 (DIN VDE 0843 Part 2)	8 kV 4 kV	3 (air discharge) 2 (contact discharge)
Burst pulses (rapid transient interference) in accordance with IEC 801-4 (DIN VDE 0843 Part 4)	2 kV (supply line) 2 kV (signal line)	3
Surge in accordance with IEC 801-5 (DIN VDE 0839 Part 10) Only with protection elements • Asymmetrical connection • Symmetrical connection	 2 kV (supply line) 2 kV (signal line/data line) 1 kV (supply line) 1 kV (signal line/data line)	 3

Sinusoidal interference

RF radiation on the device to ENV 50140 (corresponds to IEC 801-3):

- Electromagnetic RF field, amplitude-modulated
    - From 80 to 1000 MHz
    - 10 V/m
    - 80 % AM (1 kHz)

- Electromagnetic RF field, pulse-modulated
    - 900 $\pm$ 5 MHz
    - 10 V/m
    - 50 % CDF
    - 200 Hz repetition frequency

- RF coupling on signal and data lines, etc., to ENV 50141 (corresponds to IEC 801-6), high-frequency, asymmetric, amplitude-modulated
    - From 0.15 to 80 MHz
    - 10 V RMS, unmodulated
    - 80 % AM (1 kHz)
    - 150 Ω source impedance

Emission of radio interference

Emitted interference of electromagnetic fields in accordance with EN 55011: Limit Value Class A, Group 1.

From 20 to 230 MHz	< 30 dB (μV/m)Q
From 230 to 1000 MHz	< 37 dB (μV/m)Q
measured at a distance of 30 m	

Emitted interference via mains A.C. supply in accordance with EN 55011: Limit Value Class A, Group 1.

From 0.15 to 0.5 MHz	< 79 dB (μV)Q < 66 dB (μV)M
From 0.5 to 5 MHz	< 73 dB (μV)Q < 60 dB (μV)M
From 5 to 30 MHz	< 73 dB (μV)Q < 60 dB (μV)M

Extension of the area of deployment

If you use the C230-2 in residential areas, ensure that the criteria in respect of the emission of radio interference comply with Limit Value Class B in accordance with EN 55011.

Recommendation: Install the C230-2 in grounded metal cabinets, e.g. 8MC cabinets (see Catalog NV 21). Incorporate filters in the supply lines.

A.2 Shipping and storage conditions for the C230-2

The C230-2 surpasses the requirements set out in IEC 1131, Part 2 in respect of shipping and storage conditions. The following details apply to modules that are shipped and stored in their original packaging.

Type of condition	Permissible range
Free fall	≤ 1 m
Temperature	From – 40° C to + 70° C
Air pressure	From 1080 to 795 hPa (corresponds to an altitude of –1000 to 3500 m)
Relative humidity	From 5 to 95 %, without condensation

A.3 Mechanical and climatic environmental conditions for the operation of the C230-2

Operational conditions

The C230-2 is not protected against the weather and intended for non-mobile use. Operational conditions surpass the requirements set out in IEC 1131-2.

The C230-2 meets the operational conditions for Class 3C3 in accordance with DIN EN 60721 3-3 (use at locations with a high density of traffic and in close proximity to industrial plants with chemical emissions).

The C230-2 may **not** be used without additional measures.

- At locations with high levels of ionizing radiation
- At locations with severe operating conditions, e.g. as a result of
    - Dust
    - Corrosive vapors or gases
- In systems that require special monitoring, such as
    - Elevators
    - Electrical systems in premises at special risk

An additional measure for the use of the C230-2 may, for instance, be installation in cabinets.

Climatic environmental conditions

The C230-2 may be used under the following climatic environmental conditions:

Environmental conditions	Areas of application	Remarks
Temperature: For horizontal installation: For vertical installation:	From 0 to 55° C From 0 to 40° C	–
Relative humidity	From 5 to 95 %	Without condensation, complies with Relative Humidity (RH) loading factor 2 in accordance with IEC 1131-2
Air pressure	From 1080 to 795 hPa	Corresponds to an altitude of −1000 to 2000 m
Contaminant concentration	SO_2: < 0.5 ppm; Relative humidity < 60 %, no moisture condensation H_2S: < 0.1 ppm; Relative humidity < 60 %, no moisture condensation	Test: 10 ppm; 4 days 1 ppm; 4 days

Mechanical environmental conditions

The mechanical environmental conditions for the C230-2 are shown in the following table in the form of sinusoidal oscillations.

Frequency range (Hz)	Continuous	Occasional
$10 \leq f \leq 58$	0.0375 mm amplitude	0.075 mm amplitude
$58 \leq f \leq 150$	0.5 g constant acceleration	1 g constant acceleration

Reduction in vibration

If the C230-2 is subjected to severe shocks or vibration, take appropriate measures to reduce the acceleration or amplitude.

We recommend installation on dampening material (e.g. rubber-metal vibration dampers).

Testing mechanical environmental conditions

The following table provides information on the type and extent of tests of mechanical environmental conditions.

Test for ...	Test standard	Remarks
Vibration	Vibration test to IEC 68 Part 2-6 (sinusoidal) Severity 12	Vibration type: Frequency sweeps with a rate of change of 1 octave per minute. 10 Hz $\leq$ f $\leq$ 58 Hz, constant amplitude 0.075 mm 58 Hz $\leq$ f $\leq$ 500 Hz, constant acceleration 1 g Period of oscillation: 10 frequency sweeps per axis in all three perpendicular axes
Shock	Shock test to IEC 68 Part 2-27	Type of shock: Semi-sinusoidal Force of shock: 15 g peak value, 11 ms duration Direction of shock: 3 shocks per +/– direction in all three perpendicular axes

A.4 Details of insulation testing, safety class and degree of protection

Test voltages

Insulation strength is verified during routine testing with the following test voltage in accordance with IEC 1131 Part 2:

Circuits with rated voltage U_e to other circuits and ground	Test voltage
$0\ V < U_e \leq 50\ V$	500 VDC

Safety class

Safety Class I in accordance with IEC 536 (VDE 0106, Part 1), i.e. protective conductor connection to DIN rail required!

Protection against foreign bodies and water

Degree of protection IP 20 in accordance with IEC 529, i.e. protection against contact with standard test fingers.

In addition: Protection against foreign bodies with diameters greater than 12.5 mm.

No special protection against water.

A.5 Rated voltage to operate the C230-2

The C230-2 operates at a rated voltage. Table A-1 lists the rated voltage and the relevant tolerance range.

Table A-1   Rated voltage for C230-2

Rated voltage	Tolerance range
24 VDC	20.4 to 28.8 VDC

A.6 Safety of electronic controls

Introduction

The details listed here relate to fundamental criteria and apply irrespective of the type of electronic control and the manufacturer.

Reliability

The reliability of devices and components is maintained at the highest possible level thanks to comprehensive and cost-effective measures implemented during the development and manufacturing processes.

These include

- The selection of high-quality components

- Worst-case dimensioning of all circuits

- Systematic and computerized inspection of all components supplied

- Burning in of all LSI-circuits (e.g. processors, memories)

- Measures to prevent static discharge when handling MOS circuits

- Visual checks during various stages of manufacture

- Continuous heat testing at higher ambient temperatures for several days

- Thorough computerized final inspection

- Statistical analysis of all returned goods so that corrective measures can be initiated immediately

- Monitoring the most important control components through online tests (watchdog for C230-2, etc.)

From the point of view of safety engineering, these procedures are considered to be basic measures. They avoid or control the majority of faults that may occur.

The risk

Special safety standards must be applied to any system – and therefore to the situation as well – where, if a fault occurs, it may cause injury to persons or damage to property. Special regulations specific to the system apply to such applications. These cover the configuration of the control (e.g. VDE 0116 for heating plants).

In the case of electronic controls with safety implications, the measures that have to be taken to avoid or contain faults must be based on the risk posed by the system in which they are installed. In this respect, the basic measures listed above are no longer adequate after the hazard exceeds a certain potential. Additional measures (e.g. double redundancy, tests, checksums) for the control must be carried out and certified (DIN VDE 0801).

Division into safety-critical and non-safety-critical areas

Nearly all systems contain parts that perform safety-related tasks (e.g. emergency stop switch, protective grills, two-hand controls). So that the safety criteria do not have to be applied to the entire control, it is usual to divide the control into two areas – one that is **critical to safety** and one that is **not critical to safety**. No special demands are made as regards safety in the area that is not safety critical because an electronic fault would not have any effect on the safety of the system. However, in the safety-critical area only controls and circuits that meet the relevant specifications may be used.

Important note

Even if the project design of an electronic control ensures that it provides maximum possible safety by virtue of its design (e.g. as a result of a configuration with multiple redundancy), the instructions contained in the operating manual must be adhered to precisely, because it is possible that incorrect handling may put out of action features intended to prevent hazardous faults and additional hazards may also be created.

EC Declaration of Conformity

B

SIEMENS

EG-Konformitätserklärung
EC Declaration of Conformity

No. E002 Version 02/01/10

Hersteller: *Manufacturer:*	SIEMENS AG
Anschrift: *Address:*	SIEMENS AG; A&D MC Frauenauracherstraße 80
	91056 Erlangen

Produkt- bezeichnung: *Product* *description*		
	SINUMERIK	802D, 802S, 805, 805SM-P, 805SM-TW, 810, 810D 820, 840C, 840CE, 840D, 840DE, 840Di, FM NC
	SIMOTION	C230, C230-2, P350
	SIMATIC	FM 353, FM 354, FM 357
	SIROTEC	RCM1D, RCM1P
	SIMODRIVE	610, 611, MCU, FM STEPDRIVE, POSMO A / SI / CA / CD

Die bezeichneten Produkte stimmen in den von uns in Verkehr gebrachten Ausführungen mit den Vorschriften folgender Europäischer Richtlinie überein:

The products described above in the form as delivered is in conformity with the provisions of the following European Directives:

89/336/EWG Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit
(geändert durch 91/263/EWG, 92/31/EWG, 93/68/EWG und 93/97/EWG).

Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility (amended by 91/263/EEC, 92/31/EEC, 93/68/EEC and 93/97/EEC).

Die Einhaltung dieser Richtlinie setzt einen EMV-gerechten Einbau der Produkte gemäß EMV-Aufbau-richtlinie für SINUMERIK, SIROTEC, SIMODRIVE (Best. Nr. 6FC 5297-0AD30-0AP0) in die Gesamtanlage voraus. Anlagenkonfigurationen, bei der die Einhaltung dieser Richtlinie nachgewiesen wurde, sowie angewandte Normen, siehe:

For keeping the directive, it is required to install the products according to "EMC Mounting regulation for SINUMERIK, SIROTEC, SIMODRIVE" (Order No. 6FC 5297-0AD30-0BP0). For details of the system configurations, which meet the requirements of the directives, as well as for the standards applied see:
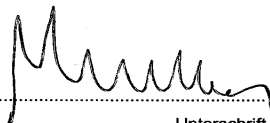
- **Anhang A (Anlagenkonfigurationen)** - *Anhang A* (system configurations) : **Version 02/01/10**
- **Anhang B (Komponenten)** - *Annex B* (components) : **Version 00/01/14**
- **Anhang C (Normen)** - *Annex C* (standards) : **Version 00/11/27**

Erlangen, den / *the* 10.01.2002

Siemens AG

R. Müller
Entwicklungsleitung ....
Name, Funktion   Unterschrift
Name, function   *signature*

K. Krause
Qualitätsmanagement ....
Name, Funktion   Unterschrift
Name, function   *signature*

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusicherung von Eigenschaften.
Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the conformity to the specified directives but contains no assurance of properties.
The safety documentation accompanying the product shall be considered in detail.

Appendix A to EC declaration of conformity No. E002

A21:   Typical system configuration
     SIMOTION C230 and C230-2/SIMODRIVE 611 with closed-loop control 611 U
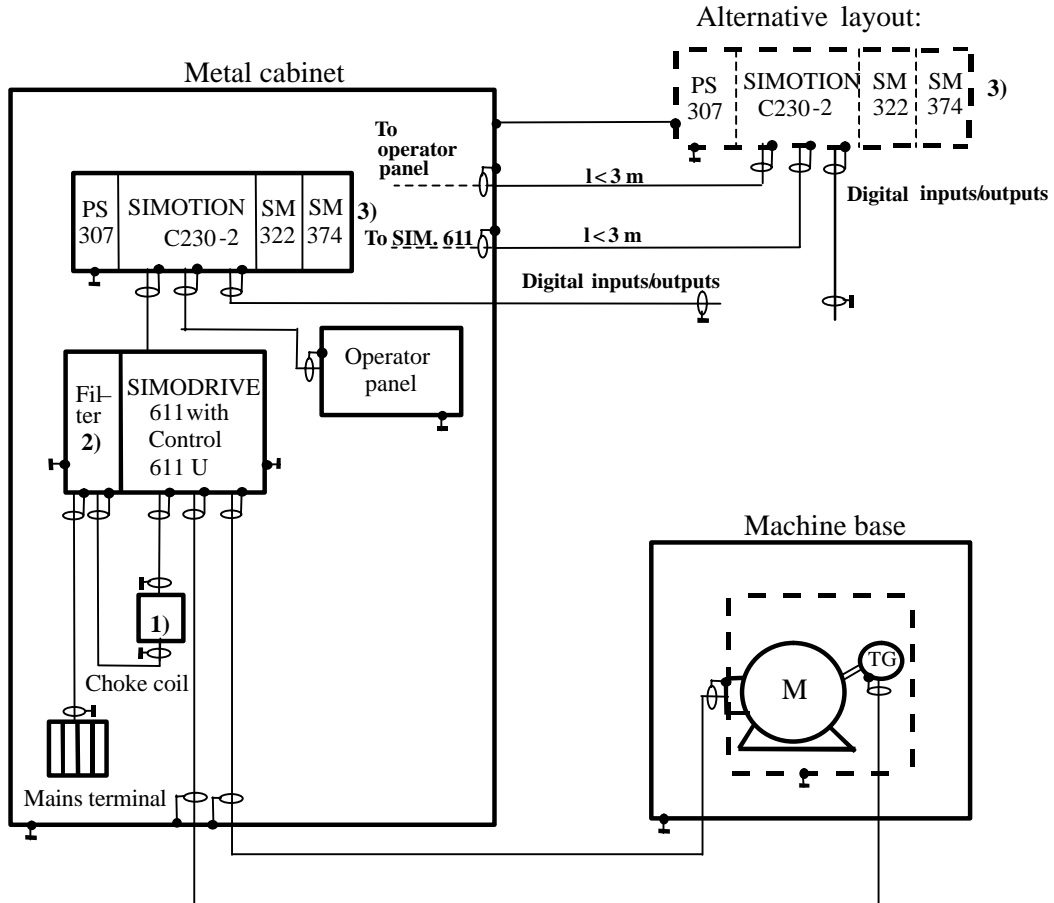
1) For I/RF module and UE module, 28kW
2) Filter in module assembly or separate
3) If SIMOTION C230/C230-2 and replacement components are used, it is also permissible
     for the components to be mounted outside the cabinet. (Cable length between cabinet and
     external components < 3 m.)

- All components that are indicated in the order documentation as being approved for use with
  SIMOTION C230/C230-2 comply with the Directive 89/336/EEC when they are used in this
  combination.
- See Appendix C for information on compliance with Standards.

Note:

Only the basic measures for compliance with the Directive 89/336/EEC as they apply to a typi-
cal system configuration are shown in the sketch.

In addition and in particular when deviating from this system configuration, please note the
installation instructions for correct system installation to comply with EMC criteria, as detailed in
the product documentation and the EMC installation guidelines for SINUMERIK; SIROTEC,
SIMODRIVE (Order No.: 6FC 5297-0AD30-0AP□).

Appendix C for EC Conformity Declaration No. E002

Compliance of the products with Council Directive 89/336/EEC including amendments 91/263/EEC, 92/31/EEC, 93/68/EEC and 93/97/EEC has been verified by an inspection in accordance with the following product standards, basic technical specifications and the listed specifications contained therein. Different Standards criteria apply to SINUMERIK, SIMOTION, SIMATIC, SIROTEC and SIMODRIVE.

C1 <u>SINUMERIK product category (except 810D), SIMOTION, SIMATIC, SIROTEC:</u>

<u>Basic technical specification on emitted interference in an industrial environment:</u>   EN 50081-2   1)

<u>Basic standards:</u>   <u>Area tested</u>:
EN 55011 + A1 + suppl. sheet. 1   2) Radio interference

<u>Basic technical specification on emitted interference in an industrial environment:</u>   EN 61000-6-2   3)

<u>Basic standards:</u>	<u>Area tested:</u>
EN 61000-4-2 + A1	4) Static discharge
EN 61000-4-3 + A1	5) Radio-frequency radiation (amplitude-modulated)
EN 61000-4-4	6) Rapid transients (bursts)
EN 61000-4-6	7) RF radiation on lines
EN 61000-4-8	8) Magnetic fields with power engineering frequencies
EN 61000-4-11	9) Voltage dips and breaks in voltage supply

C2 <u>Product category SIMODRIVE, SINUMERIK 810D:</u>

<u>Product Standard:</u>   <u>Area tested:</u>
EN 61800-3 + A11   10) Variable speed electric drives;
                                          EMC product standard including special test
                                          procedure

C3 <u>Standards also satisfied:</u>

1)	VDE 0839 Part 81-2	6)	VDE 0847 Part 4-4 IEC 61000-4-4
2)	VDE 0875 Part 11 + suppl. sheet 1 IEC/CISPR 11 + A1 + 28	7)	VDE 0847 Part 4-6 IEC 61000-4-6
3)	VDE 0839 Part 6-2 IEC 61000-6-2	8)	VDE 0847 Part 4-8 IEC 61000-4-8
4)	VDE 0847 Part 4-2 + A1 IEC 61000-4-2 + A1	9)	VDE 0847 Part 4-11 IEC 61000-4-11
5)	VDE 0847 Part 4-3 IEC 61000-4-3 + A1	10)	VDE 0160 Part 100 IEC 61800-3

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Directive for the Handling of Electrostatically Sensitive Devices (ESD) C

C.1   What does ESD mean?

Definition

All electronic modules are equipped with highly integrated modules or components. Because of the technology used, these electronic components are very sensitive to overvoltages and thus to discharges of static electricity.

For these **E**lectrostatically **S**ensitive **D**evices the abbreviation **ESD** is used internationally.

Electrostatically sensitive devices are identified by the following symbol:
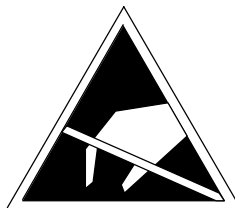
⚠ **Caution**

Electrostatically sensitive devices can be irreparably damaged by voltages that are far lower than anything a person can perceive. These voltages occur if you touch a component or the electrical connection for a module without discharging any static from your body beforehand. Any damage that occurs to a module as a result of overvoltage is generally not recognized immediately and only comes to light after the equipment has been operating for some time.

C.2   Electrostatic discharge from persons

Accumulating an electrostatic charge

Anyone who is not conductively connected to the electrical potential of their environment can accumulate an electrostatic charge.

Fig. C-1 indicates the maximum electrostatic voltages that can accumulate in a person who is operating equipment when he/she comes into contact with the materials shown in the Figure. These voltages comply with the data in IEC 801-2.
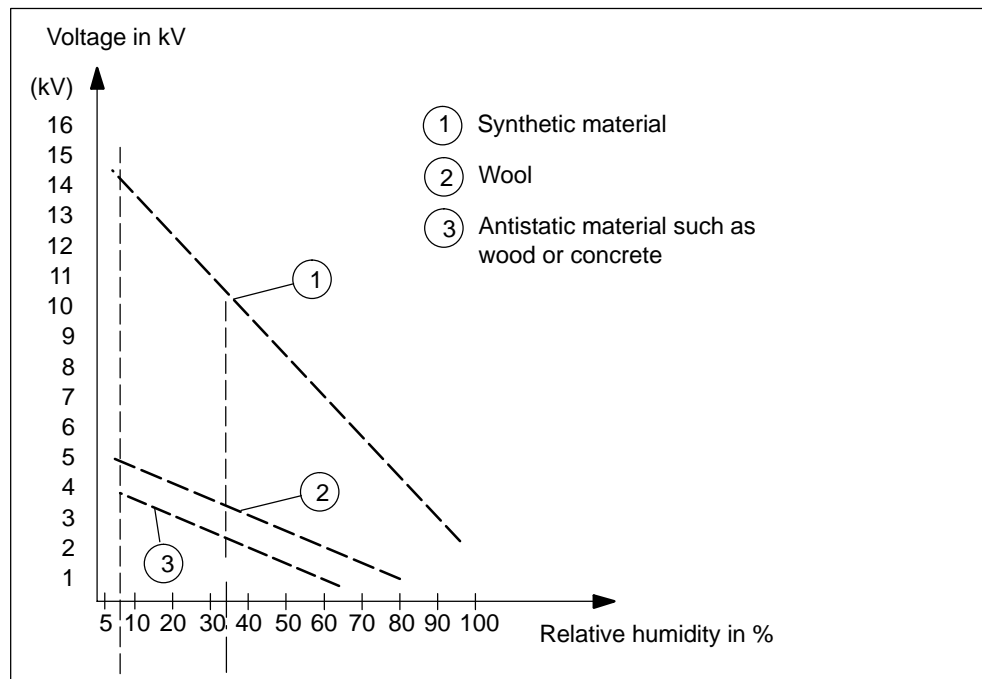

Fig. C-1   Electrostatic voltage that can accumulate in operating personnel

C.3   Basic measures to protect against the discharge of static electricity

Make sure the grounding is good

> When working with electronically endangered components, make sure the person, the workstation and packaging are properly grounded. This is how you can avoid static.

Avoid direct contact

> Never touch electrostatically sensitive devices if this can be avoided (e.g. during maintenance work). When you touch modules, make sure that you do not touch either the pins on the components or the printed conductor. If you follow these instructions, electrostatic discharge cannot reach – or damage – sensitive components.

> If you have to take measurements on a module, make sure that you first discharge any static that may have accumulated in your body. To do this, touch a grounded metal object. Only used grounded measuring instruments.

C-148

References

SIMOTION documentation

Engineering
This documentation package contains document **1** to **7**

Order No.: 6AU 1900-0BA30-0BA0　　　　**04.2003 Edition**

1　**SIMOTION Getting Started, Operator's Guide**
A quick introduction to the SIMOTION Engineering System SCOUT

Order No.: 6AU1 900-0AJ30-0BB0　　　　**04.2003 Edition**

2　**SIMOTION SCOUT, Operator's Guide**
For SIMOTION Engineering System SCOUT

Order No.: 6AU1 900-0AD30-0BA0　　　　**04.2003 Edition**

3　**SIMOTION MCC, Programming Guide**
For the graphical SIMOTION programming language Motion Control Chart

Order No.: 6AU1 900-0AF30-0BA0　　　　**04.2003 Edition**

4　**SIMOTION ST, Programming Guide**
For the textual SIMOTION programming language Structured Text

Order No.: 6AU1 900-0AG30-0BA0　　　　**04.2003 Edition**

5　**SIMOTION LAD, Programming Guide**
For the graphical SIMOTION programming language Ladder Diagram

Order No.: 6AU1 900-0BH30-0BA0　　　　**04.2003 Edition**

6　**SIMOTION CamTool, Manual**
Regarding the easy-to-use CamTool

Order No.: 6AU1 900-0AP30-0BA0　　　　**04.2003 Edition**

7　**SIMOTION Terms and Abbreviations, Manual**

Order No.: 6AU1 900-0CW30-0BA0　　　　**04.2003 Edition**

SIMOTION Technology Functions
This documentation package contains document **8** to **12**

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8　**SIMOTION Motion Control, Basic Functions, Description of Functions**
Describes the system architecture and configuration of the basic functions for Motion Control

Order No.: 6AU1 900-0CA30-0BA0　　　　**04.2003 Edition**

9　**SIMOTION Motion Control, Technology Object Axis, Description of Functions**
Describes the operating principle of the drive and position axis

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10　**SIMOTION Motion Control, Supplementary Technology Functions, Description of Functions**
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11　**SIMOTION Motion Control, Technology Functions Synchronous Operation, Description of Functions**
Describes the operating principle of the technology objects Gearing and Camming for Motion Control

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12　**SIMOTION Modular Machine Concepts, Description of Functions**

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15　**SIMOTION Technology Package Cam, System Variables, Reference List**

Order No.: 6AU1 900-0CG30-0BA0　　　　**04.2003 Edition**

16 SIMOTION C230-2, System Functions / System Variables, Reference List

    Order No.: 6AU1 900-0CJ30-0BA0   **04.2003 Edition**

17 SIMOTION P350, System Functions / System Variables, Reference List

    Order No.: 6AU1 900-0CH30-0BA0   **04.2003 Edition**

18 SIMOTION D435, System Functions / System Variables, Reference List

    Order No.: 6AU1 900-0BJ30-0BA0   **04.2003 Edition**

19 SIMOTION Configuration Data, Reference List

    Order No.: 6AU1 900-0CK30-0BA0   **04.2003 Edition**

20 SIMOTION Technology Package TControl, Reference List

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    Documentation regarding Hardware
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21 SIMOTION C230-2, Equipment Manual
For CPU-based hardware in the SIMOTION product range

    Order No.: 6AU1 900-0AB30-0BA0   **04.2003 Edition**

22 SIMOTION P350, Equipment Manual
For PC-based hardware in the SIMOTION product range

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23 SIMOTION D435, Equipment Manual
For Drive-based hardware in the SIMOTION product range

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24 SIMOTION Panels, Equipment Manual
Control units for SIMOTION P350

    Order No.: 6AU1 900-0AR30-0BA0   **04.2003 Edition**

25 ADI4 – Analog Drive Interface for Four Axes, Equipment Manual

    Order No.: 6FC5 297-0BA01-0BP0   **04.2003 Edition**

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Documents regarding SIMOTION Function Library
This documentation package contains document **26** to **35**

Order No.: 6AU1 900-0BC30-0BA0   **04.2003 Edition**

26   Supplements to Modules CP 340 and CP 341, Manual

Order No.: 6AU1 900-0AS30-0BA0   **04.2003 Edition**

27   Supplements to Modules FM 350-1, FM 350-2, FM 352, Manual

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28   Basic Control, Manual

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29   Supplement to SIMODRIVE POSMO A Positioning Motor, Manual

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30   Supplement to the Serial Interface Module ET 200S, Manual

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31   Standard Functions to Control Axes, Manual

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32   Standard Functions for Roller Feed, Manual

Order No.: 6AU1 900-0CR30-0BA0

33   Reading and Writing Drive Data, Manual

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34   Standard Functions to Control Axes according to PLCopen standard, Manual

Order No.: 6AU1 900-0AY30-0BA0   **04.2003 Edition**

35   SIMOTION TemperatureControl, Description of Functions

Order No.: 6AU1900-0CN30-0BA0   **02.2003 Edition**

36   ProTool/Pro – SIMOTION HMI Sample User Interface for Start-Up, Operator's Guide
This Operator's Guide is available only on the CD "SIMOTION SCOUT" (directory: \Function_Library\...)

Plastics documentation
This documentation package contains document **37** to **38**

37   **SIMOTION Injection Molding All Electric, Description of Functions**

      Order No.: 6AU1900-0CX30-0BA0   02.2003 Edition

38   **SIMOTION TemperatureControl, Description of Functions**

      Order No.: 6AU1900-0CN30-0BA0   02.2003 Edition

Product information
Product information is available through the product CD only.

39   **SIMATIC NET for SIMOTION, Product Information**
      SIMATIC Manual Collection, incl. SIMATIC NET

      02.2003 Edition

40   **Interfacing SIMOVERT MASTERDRIVES with Standard Telegram 5, Product Information**
      Commissioning with SCRIPT-FILES Drive ES/SIMOVIS

      02.2003 Edition

41   **Interfacing SIMODRIVE 611U to SIMOTION, Product Information**

      02.2003 Edition

42   **Licensing, Product Information**

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43   **SIMOTION Communication Package OPC XML Server, Product Information**

      02.2003 Edition

SIMOTION supplementary documentation:

Catalogs for SIMOTION and additional components

44 **SIMOTION Motion Control System, Catalog PM10 – 2002**
Ordering Catalog

Order No.: E86060-K4910-A101-A3-7600

45 **Automation and Drives, Catalog CA 01**
Ordering Catalog

Order No.: E86060-D4001-A100-B8-7600

46 **Automation Systems for Machine Tools, Catalog NC 60**
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48 **SIMATIC Components for Totally Integrated Automation, Catalog ST 70**
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49 **Industrial Communication and Field Devices, Catalog IK PI**
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Order No.: E86060-K6710-A101-B2-7600

Additional supplementary documentation for SIMOTION

50   SIMATIC HMI, ProTool Project Design

Communication for Windows-based systems,
SIMATIC Manual Collection, incl. SIMATIC HMI

Order No.: 6ES7 998-8XC01-8YE0

51   SIMATIC NET, Manual

Industrial Twisted Pair and Fiber Optic Networks

52   SIMATIC ET 200M, Manual

Distributed I/O Device ET 200M

Reference Manual: Module Data

(These manuals are part of the documentation package with
Order No.: 6ES7 153-1AA00-8BA0   10.2002 Edition)

53   SIMATIC Point to Point Link CP 340, Manual

Configuring and Parameterizing

Order No.: 6ES7 340-1AH00-8BA0   06.2002 Edition

54   SIMATIC Point to Point Link CP 341, Manual

Configuring and Parameterizing

Order No.: 6ES7 341-1AH00-8BA0   04.2000 Edition

55   SIMATIC Functions Module FM 350-1, Manual

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56   SIMATIC Counter Module FM 350-2, Manual

Configuring and Parameterizing

(These manuals are part of the documentation package with
Order No.: 6ES7 350-2AH00-7BG0   01 Edition

57   SIMATIC Electronic Output Cam Control FM 352, Manual

Configuring and Parameterizing

(These manuals are part of the documentation package with
Order No.: 6ES7 352-1AH00-8BG0   02.2000 Edition)

58   SIMATIC ET 200S, Manual

Distributed I/O Device ET 200S

(These manuals are part of the documentation package with
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59   SIMATIC Serial Interface Modules ET 200S, Manual

(These manuals are part of the documentation package with
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60   SIMATIC Automation System S7-300, Installation Guide
Assembly
Reference Manual: Module Data
(These manuals are part of the documentation package with
Order No.: 6ES7 398-8FA10-8BA0   10.2001 Edition)

61   SIMATIC Statement List (STL) S7-300/400, Reference Manual
(These manuals are part of the documentation package with
Order No.: 6ES7 810-4CA05-8BR0   08.2000 Edition)

62   EMC Installation Guideline, Planning Guide (HW)

Order No.: 6FC5 297-0AD30-0BP1   06.1999 Edition

63   SIMODRIVE POSMO A, User's Guide
Distributed positioning motor on PROFIBUS-DP

Order No.: 6SN2 197-0AA00-0BP4   08.2002 Edition

64   SIMODRIVE 611 Universal, Description of Functions
Closed-loop control component for speed control and positioning

Order No.: 6SN1 197-0AB20-0BP5   02.2002 Edition

65   SIMOVERT MASTERDRIVES Motion Control, Compendium

Order No.: 6SE7 080-0QX50   01.2002 Edition

66   Distributed Servo Drive Technology, User's Guide
SIMODRIVE POSMO SI, SIMODRIVE CD/CA

Order No.: 6SN2 197-0AA20-0BP2   02.2002 Edition

67   Drive ES Basic V5.1, Description of Functions
Engineering system for drives in the SIEMENS A&D product range

Order No.: 6SW1 700-0JA00-0BA0   08.2001 Edition

68   SINUMERIK 840D/840Di/810D, Operator Components, Manual

Order No.: 6FC5 297-6AA50-0BP1   09.2001 Edition

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