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SIEMENS

SIMADYN D

Hardware

Manual

Edition 04.2011

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Safety guidelines

This Manual contains notices which 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 an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

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

CAUTION

used without 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 undesireable result or state.

Correct usage

Note the following:

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

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Disclaimer of Liability

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

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Editions

SIMADYN D

Manual

Hardware

Edition 04.2011

NOTE

Please note that the current edition of this documentation contains different editions of the individual chapters. The following overview tells you when a chapter was revised the last time.

Overview (chapter editions)

Chapter		Edition
	Foreword	Edition 12.2004
1	General technical data	Edition 08.2005
2	Subracks	Edition 04.2011
3	CPU module	Edition 03.2001
4	Coupling memory module	Edition 03.2001
5	Input/output modules	Edition 12.2004
6	Communications support modules	Edition 12.2004
7	Technology subrack	Edition 03.2001
8	Program memory modules / Interface modules	Edition 04.2011
9	Plug-in cables	Edition 06.2002
10	Operator control panel OP2	Edition 03.2001

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Foreword

Purpose of this Manual

This Manual explains the principle use and functions of the STEP 7 automation software with the main focus on the appropriate technological and drive control components T400, FM 458-1 DP, SIMADYN D, SIMATIC TDC or D7-SYS.

TDC: Technology and Drives Control

Basic knowledge required

This Manual addresses programmers and commissioning engineers. General knowhow regarding automation technology is required in order to understand the contents of the Manual

Validity of the Manual

This Manual is valid for SIMATIC D7-SYS Version 6.2.

Additional support

If you have questions relating to the use of the products described in the Manual, which cannot be answered here, then please contact your local Siemens office. You can also call the Hotline:

- **Tel.:** +49 (180) 5050-222
- **Fax:** +49 (180) 5050-223
- **e-mail:** adsupport@siemens.com

Training Center

Appropriate training courses are available in order to make it easier to get to know the SIMADYN D automation system. Please contact the central Training Center in D-Erlangen (I&S IS INA TC):

- **Tel.:** +49 (9131) 7-27689, -27972
- **Fax:** +49 (9131) 7-28172
- **Internet:** www.siemens.de/sibrain
- **Intranet:** http://info-tc.erlm.siemens.de/

NOTE

This user part of the Manual does not include any detailed information/instructions with individual descriptions, but is only intended to provide a basic procedure. More detailed information on the dialog boxes in the software and how they are handled is provided in the appropriate online help.

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Information overview

This manual is part of the overall documentation for the technological and drive control components T400, FM 458, SIMADYN D, SIMATIC TDC and SIMATIC D7-SYS:

Title	Content
System and communications configuring D7-SYS	**The first project in a few steps** This Section provides an extremely simple entry into the methodology when assembling and programming the SIMATIC TDC/SIMADYN D control system. It is especially conceived for first-time users of a control system. **System software** This Section provides basic know-how about the structure of the operating system and an application program of a CPU. It should be used to obtain an overview of the programming methodology, and basis for configuring user programs. **Communications configuring** This section provides you with basic know-how about the communication possibilities and how you configure links to the communication partners. **Changeover from STRUC V4.x to D7-SYS** Essential features are included in this section, which have changed over STRUC V4.x with the introduction of SIMATIC D7-SYS.
STEP 7 option packages for D7-SYS	**Basis software** This section explains the essential use and the functions of the STEP 7 automation software. For first users, it provides an overview on configuring, programming and commissioning a station. When working with the basis software, you can access the online help which provides you with support when it comes to detailed questions on using the software. **CFC** The CFC language (Continuous Function Chart) allows you to graphically interconnect blocks. When working with the particular software, you can also use the online help which can answer detailed questions regarding the use of the editors/compiler. **SFC** Configuring sequence controls using SFC (Sequential Function Chart) of SIMATIC S7. In the SFC editor, you generate a sequence chart using graphic resources. The SFC elements of the chart are then positioned according to specific rules.
Hardware	The complete hardware spectrum is described as reference in this Manuals.
Function blocks	These Reference Manuals provide you with an overview of selected function blocks for the associated technological and drive control components T400, FM 458-1 DP, SIMADYN D and SIMATIC TDC.

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Guide

As first time user, we recommend that this Manual is used as follows:

- Please read the first section on using the software in order to get to know some of the terminology and basic procedure.
- Then use the particular sections of the Manual if you wish to carry-out certain processing steps (e.g. loading programs).

If you have already executed a small project, and have gained some experience, then you can read individual sections of the Manual in order to get up to speed about a specific subject.

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World-wide (Nürnberg) **Technical Support** Local time: 0:00 to 24:00 / 365 days Phone: +49 (180) 5050-222 Fax: +49 (180) 5050-223 E-Mail: adsupport@siemens.com GMT: +1:00		
Europe / Africa (Nürnberg) **Authorization** Local time: Mo.-Fr. 8:00 to 17:00 Phone: +49 (180) 5050-222 Fax: +49 (180) 5050-223 E-Mail: adsupport@siemens.com GMT: +1:00	**United States** (Johnson City) **Technical Support and Authorization** Local time: Mo.-Fr. 8:00 to 17:00 Phone: +1 (423) 262 2522 Fax: +1 (423) 262 2289 E-Mail: simatic.hotline@sea.siemens.com GMT: -5:00	**Asia / Australia** (Peking) **Technical Support and Authorization** Local time: Mo.-Fr. 8:00 to 17:00 Phone: +86 10 64 75 75 75 Fax: +86 10 64 74 74 74 E-Mail: adsupport.asia@siemens.com GMT: +8:00
Technical Support and Authorization speak generally German and English.		

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1 General technical data

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1.1 Installation and EMC guidelines

NOTE

The information in this Manual does not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, please contact your local Siemens office.

Further, the contents of this Manual shall not become a part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties nor modify the existing warranty.

1.1.1 Definitions

1.1.1.1 Qualified personnel

For the purpose of this Manual and product labels, a „Qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved. He or she must have the following qualifications, for example:

1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
3. Trained in rendering first aid

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1.1.1.2 Danger and warning information



DANGER For the purpose of this Manual and product labels, „Danger“ indicates death, severe personal injury and/or substantial property damage will result if proper precautions are not taken.



WARNING For the purpose of this Manual and product labels, „Warning“ indicates death, severe personal injury or property damage can result if proper precautions are not taken.



CAUTION For the purpose of this Manual and product labels, „Caution“ indicates that minor personal injury or material damage can result if proper precautions are not taken.

NOTE For the purpose of this Manual, „Note“ indicates information about the product or the respective part of the Instruction Manual which is essential to highlight.





CAUTION This board contains components which can be destroyed by electrostatic discharge. Prior to touching any electronics board, your body must be electrically discharged. This can be simply done by touching a conductive, grounded object immediately beforehand (e.g. bare metal cabinet components, socket protective conductor contact).



WARNING Hazardous voltages are present in this electrical equipment during operation.

Non-observance of the safety instructions can result in severe personal injury or property damage.

It is especially important that the warning information in all of the relevant Operating Instructions/Instruction Manuals are strictly observed.

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1.1.2 Introduction

What is EMC ?

Electromagnetic compatibility (EMC) is the ability of an electrical device to function, fault-free in a specified electromagnetic environment without influencing the environment in an inadmissible fashion.

This design- and EMC guideline supplements the documentation on the individual components.

The SIMADYN D control system consists of individual components (e. g. subracks, modules, interface modules, operator control panels, position transmitters). The components can be installed in the widest range of system configurations according to individual requirements. When the components are arranged in a distributed fashion (decentral topology) a noisy environment cannot be neglected. Thus, specific requirements are placed on the design and EMC of the system.

EMC represents a quality feature for

- **Intrinsic noise immunity:** Immunity against internal electrical noise and disturbances
- **External noise immunity:** Immunity against external electromagnetic noise
- **Noise emission level**: Influencing the environment due to electromagnetic radiation

Operational reliability and noise immunity

In order to achieve the highest possible operational reliability and safety and noise immunity for a complete system (closed-loop control and drive motor) the control manufacturer and user (including end customers) must take certain measures.

Perfect functioning of SIMADYN D can only be guaranteed and the legal requirements fulfilled (89/336/EC) if all of these measures are observed.

1.1.3 Use and operation

SIMADYN D components are designed for use in industrial environments in accordance with EN 50081-2 and
EN 50082-2. They may not be operated or connected to the public low-voltage network.

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1.1.4 Machinery Directive

In accordance with the Machinery Directive 89/392/EC, it should be ensured that if SIMADYN D fails or executes an incorrect function, that this does not result in the machine/system going into a potentially hazardous condition. This must always be taken into account when configuring the machine/system.

The system may not be commissioned until it has been proven that the final product is in conformance with the Directive.

Low-Voltage Directive

The Low-Voltage Directive 73/23/EC is only applicable for products with supply voltages of ≥ 50 V AC and/or > 75V DC.

For SIMADYN D, this involves the following components:

- SP 7 6DD 1683-0BB0
- SP 8.5 6DD 1683-0BC0
- SP 9.5 6DD 1683-0BE5
- SP 22.5 6DD 1683-0CC5
- SP 23.5 6DD 1683-0CD5
- SB 60 6DD 1681-0AF4
- SB 70 6DD 1681-0AG2
- SRT 400 6DD 1662-0CG0

These components correspond to the requirements of the Low-Voltage Directive.



WARNING

Open equipment
SIMADYN D is regarded as open equipment. This means that you must always install SIMADYN D in a cubicle, cabinet or electrical control room that can only be accessed using a key or tool. Only trained or authorized personnel are allowed access to such cubicles, cabinets or electrical operating rooms.

1.1.4.1 SIMADYN D outputs



DANGER

When the equipment is powered-up or powered -on, the outputs have undefined statuses while the power supply voltages are running-up. This fact must be taken into account when designing the system.

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1.1.4.2 Professionally-trained and knowledgeable personnel

Only professionally-trained, knowledgeable personnel may configure, install, commission and operate SIMADYN D.

1.1.4.3 CE Mark

SIMADYN D components have **no** CE Mark for the following reasons:

- they cannot be practically used autonomously
- they are not generally available
- they can only be used by specially-trained personnel

NOTE If a CE Mark is required, this is the responsibility of the manufacturer of the machine/complete system.

1.1.4.4 Connecting external voltages

If external voltages (e. g. pulse encoders) are connected to SIMADYN D inputs, which are supplied from an external power supply, then this external supply must also be shutdown when the SIMADYN D power supply is shutdown or fails.

1.1.5 Mounting

SIMADYN D components must be mounted in a metal cabinet, enclosed on all sides.

1.1.6 Cables

All signal cables which are connected to SIMADYN D must be screened.

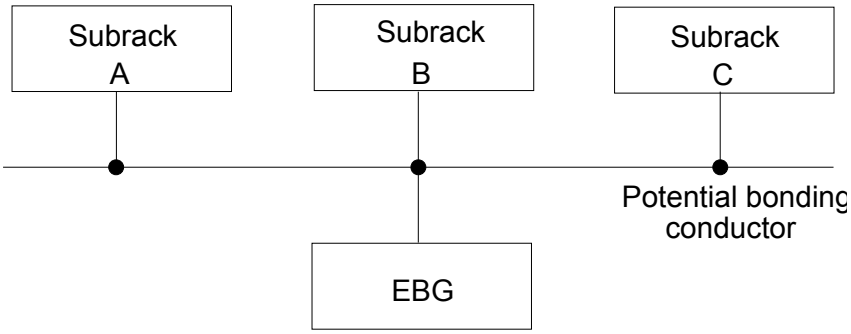
1.1.7 Potential bonding

In order to ensure disturbance-free operation, the components which are connected and communicate with one another may not be at different potentials. This means that all components must be connected with one another through potential bonding cables.

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1.1.8 Principle when connecting components

All of the components (subracks, power supplies etc.), which are connected using signal cables, must also be connected with potential bonding cables (exception: Components with fiber-optic cable connections).

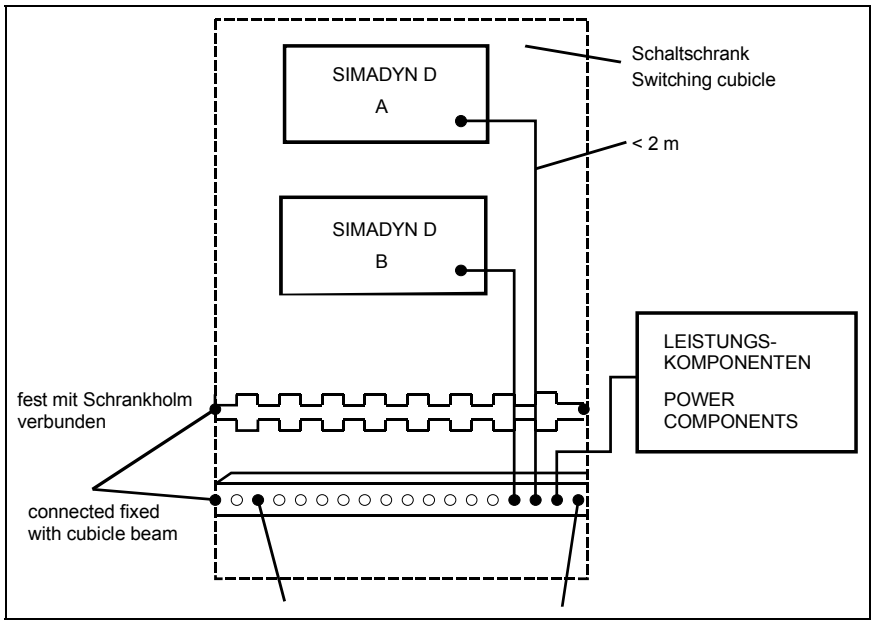


1.1.9 Potential bonding rail

A potential bonding- or grounding rail must be provided in each cabinet to allow simple wiring.

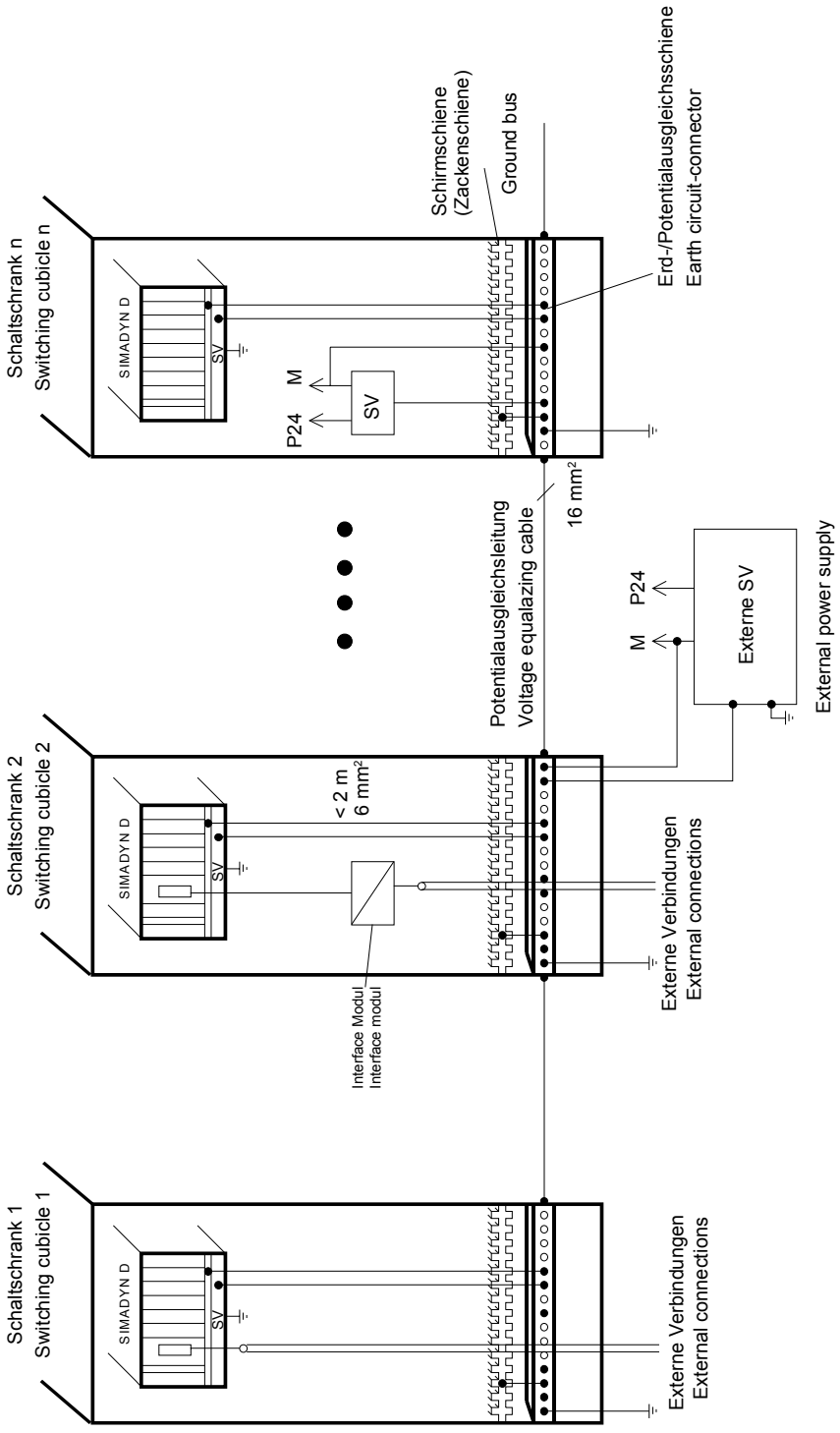
All of the internal and external components must be connected to this potential bonding- and grounding rail.

Basic circuit



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1.1.10 Actual example of a multi-motor drive



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1.1.11 Protective grounding

The protective ground is connected via the protective conductor (PE) at the cabinets and components. For SIMADYN D, the potential bonding conductor/cable does not have a protective conductor function. For SIMADYN D it is required for reliable operation and noise suppression.

The protective conductor must be routed in accordance with DIN VDE 0100 and DIN VDE 0160.

For subracks, the protective conductor cross-section must be $\geq 6\ mm^2$ and for cabinets, $\geq 10\ mm^2$.

1.1.12 Radios

It is not permissible to use radios > 2W close to SIMADYN D.

For low-rating radios, a distance of > 1m must be maintained between the radio and SIMADYN D.

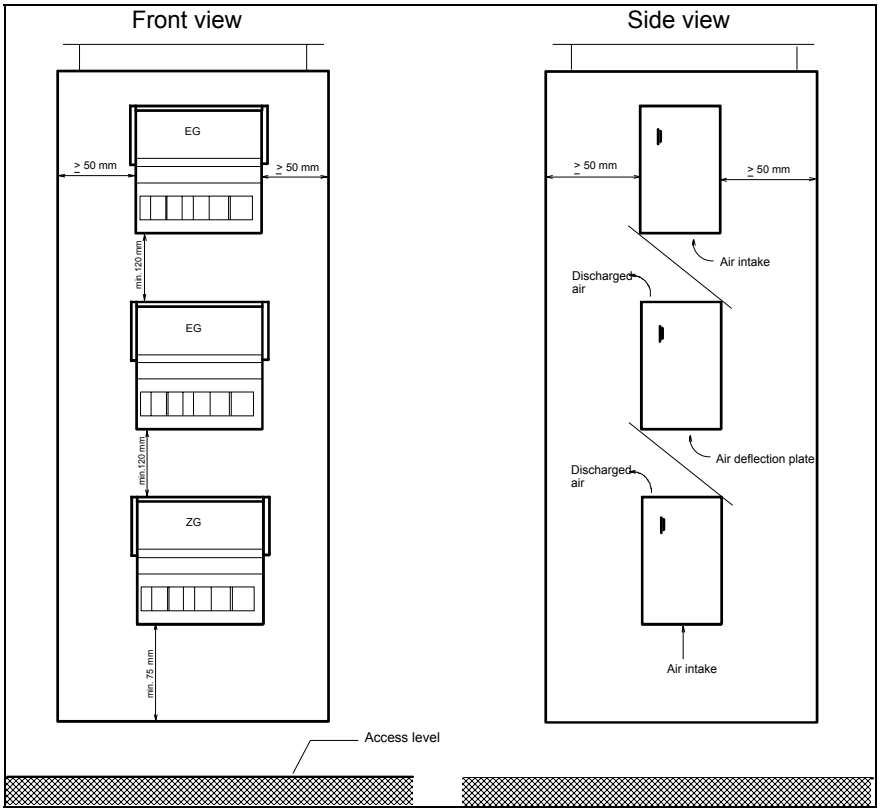
1.1.13 Cabinet

- All SIMADYN D components must be mounted in a metal cabinet
- Each cabinet must have a ground/potential bonding rail, which is connected to the cabinet frame at both ends.
- All SIMADYN D subracks must be connected to the grounding/potential bonding rail through a 6 mm^2 cable which should be as short as possible. The connection via the PE connection of the power supply is not sufficient.
- Non-damped contactors may not be used in a cabinet with SIMADYN D components.
- If non-damped contactors are used in a cabinet next to SIMADYN D, then the cabinets must be separated by a metal partition.
- All of the cabinets associated with multi-motor SIMADYN D drives must be connected through a potential bonding conductor with at least a 16 mm^2 cross-section (the customers PE connection is not sufficient).
- Each cabinet in which SIMADYN D components are installed/mounted must have a screen rail. Serrated rails are suitable. The screen rail must be connected directly to the cabinet frame.
- No gas discharge lamps may be used in the cabinet.
- The screens of incoming cables must be connected directly to the screen rail.
- The cabinets must be designed so that air can circulate freely within them.

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1.1.14 Mounting clearances

The following minimum clearances must be maintained if SIMADYN D subracks are mounted one on top of the other:
(For 2200 × 600 × 600 mm cabinets)

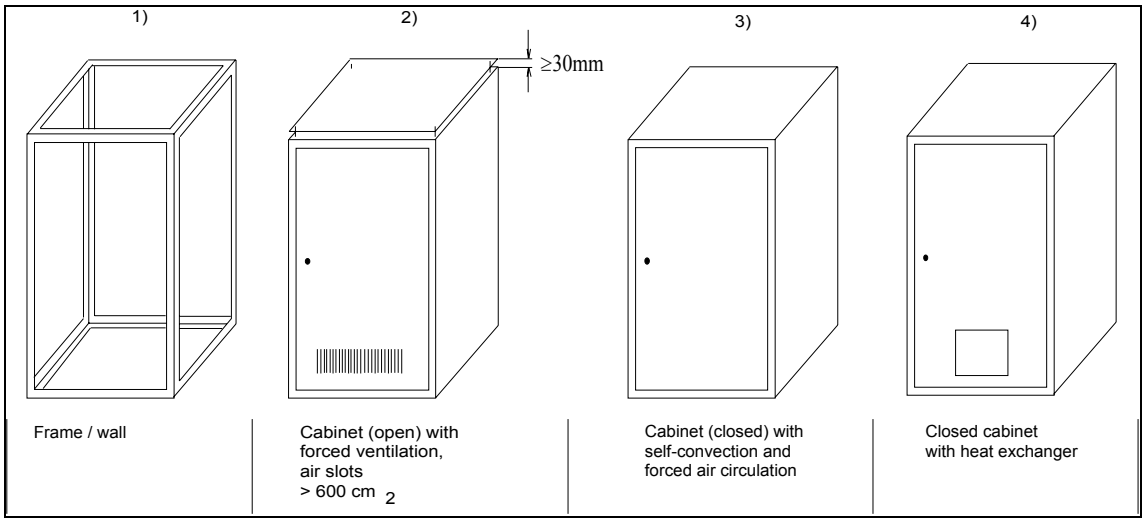


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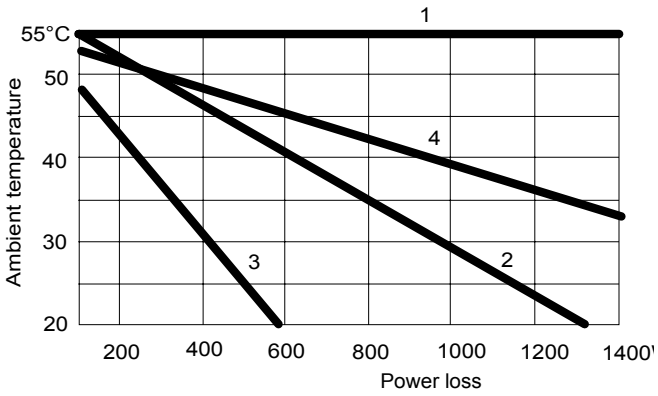
1.1.15 Power loss in the cabinet

Different maximum temperature values are obtained for the SIMADYN D components, depending on the installation type

- open rack
- cabinet with air mesh
- closed cabinet with forced convection
- closed cabinet with heat exchanger



The power loss dissipated from a cabinet depends on the cabinet design, its ambient temperature and the arrangement of the various devices in the cabinet.



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Nominal values for permissible ambient temperatures of a cabinet with the dimensions 600 mm × 600 mm ×2200 mm as a function of the installed power loss can be taken from the figure above.

1. Open unit / wall
2. Cabinet with air slots
3. Closed cabinet with self-convection and forced air circulation using an equipment fan
4. Closed cabinet with heat exchanger

If a cabinet is ventilated from below via the cable duct, more favorable conditions are obtained as illustrated under 2).

For mounting types 1) and 2), it is assumed, that there is a minimum of 1m clearance between the cabinet and the ceiling.

1.1.16 Power supply

Measures against noise voltages

The following instructions to suppress noise in systems/plants must be observed so that noise voltage spikes on the supply cable in the cabinet are eliminated.

Suppressing supply cables

When the equipment is supplied from a 115/230 V supply, a line filter must be installed in the cable as close as possible to where the cable enters the cabinet (e. g. 250 V AC/ 10 A). The ground connection of the line filter must be connected to the central grounding point in the cabinet through the shortest possible path.

Discharge capacitors for DC supplies

If a cabinet is connected to a central 24 V supply, noise voltages can be coupled-into the cabinet via the supply cable.

We recommend that noise suppression capacitors are installed where the 24 V supply cable enters the cabinet. These capacitors can be mounted on the cabinet ground or the screen rail.

If several 24 V power supplies are used in networked systems, then the grounds of the power supplies must be connected with on another via the grounding / potential bonding rail and connected to the subrack.

In order to diminish the effects of noise and disturbances, a line filter should be provided for the 24V DC power supply of the digital inputs and outputs (e.g. line filter SIFI-B, Order No. B84112-B-.... from Epcos / line filter NF 1-1 from Phönix Contact). This should be located as close as possible to the terminal block. The shield connection of the line filter must be connected to ground through the shortest possible distance.

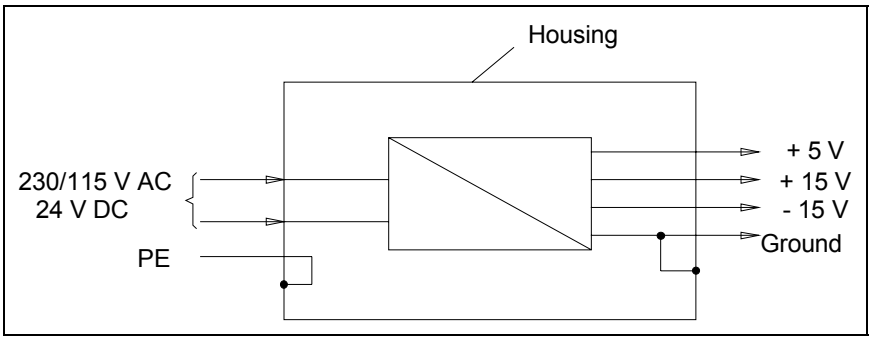


WARNING Protective separation in accordance with VDE 0160 must be guaranteed for all power supply units which are used to supply SIMADYN D units and modules.

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Power supply potentials

For SIMADYN D, the grounds of all secondary voltages must be connected together and connected to the subrack housing and grounded; this enhances the discharge of noise signals and voltages.



Using clocked power supplies

If a clocked power supply is used for the 24V supply, the rated output of the clocked power supply units must be designed for the inrush current of SIMADYN D (the factor is 200 % of the rated current). Otherwise, the clocked power supply can ramp-up along the short-circuit current limiting and undefined conditions can occur.

1.1.17 Subracks

- The subracks must be connected to the grounding/potential bonding rail using the shortest possible 6mm^2 cable.
- All of the boards must be screwed into subracks. This is also required during the commissioning phase!
- Empty slots must be provided with SIMADYN D slot covers.
- If modules are inserted in an adapter during the commissioning phase, the front panel must be electrically connected to the housing through the shortest possible path.
- Modules may neither be removed nor inserted under voltage.
- The connectors for serial interfaces must be screwed to the front panel.
- The maximum temperature of the air drawn-in by the subrack is 55ºC. The subrack must be mounted so that air can freely circulate. It must be ensured that heat cannot build-up (no hotspots).
- The air drawn-in by the subrack must be as dust-free as possible.

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1.1.18 Cables

Cables from the outside (e. g. to the terminal modules) may not be routed in a common cable duct with internal cables in the cabinet.

For incoming screened cables (analog and binary), the screen must be connected to the screen rail where the cable enters the cabinet. The cable must then be routed, still screened up to the terminal module/module. Screens are not connected to terminal modules/modules.

Serial connecting cables must be screened. The screen must be connected to a metallized connector housing. Further, it must also be connected to the screen rail. The cable screen may not be connected to pin 1 of the connector.

Screening using just the front panels of the modules is not effective

The screen cables must be connected at both ends to the screen rails in the cabinets.

All analog signal cables must be screened, both in the cabinet as well as outside the cabinet.

Single-ended grounding of cable screens

For analog signal cables, which only conduct low signal levels (mV or μA), the cable screen is connected to the cable rail at one side in the cabinet.

Screening, permissible cable lengths

All of the signal cables must be provided with screen.

Module	Cable length, screened
Outputs	1000 m
Inputs, 230 V AC	1000 m
Inputs, 24...60 V DC	1000 m

Below 500 V AC, a minimum clearance of > 10 cm must be maintained between signal cables and power cables; for power cables above 1 kV AC, a clearance > 30 cm must be maintained.

1.1.19 Mounting SIMADYN D unit in drive converters

When mounting SIMADYN D modules in drive converters, the following should be observed:

- The tachometer cables of the pulse encoders should have double screens for lengths >10m.
- Only terminal modules and cables in the SIMADYN D program may be used.
- All cable screens must be connected through the largest possible surface area to the screen rail. The screen rail must be grounded using the shortest possible 10mm^2 cable.

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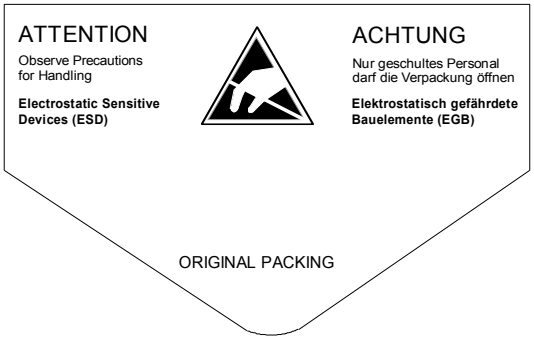
- Avoid installing the drive converters close to radio transmitter antennas
- The drive converters must always be mounted in enclosed metal cabinets.

1.2 ESD guidelines

1.2.1 What is ESD?

Almost all of the SIMADYN D modules have highly-integrated devices. These devices are, from their very nature, extremely sensitive to overvoltage conditions, and therefore also to electrostatic discharge.

ESD The abbreviation stands for electrostatic discharge



Modules, which use these devices have the following warning label on the component side:

Electrostatic sensitive devices can be destroyed by voltage- and energy level which lie far below the perception levels of human beings. Voltages such as these occur when personnel touch a component or a module without having first being previously electrostatically discharged. Components, which have been subject to such overvoltage conditions, can generally not be immediately identified as being faulty, as this is only manifested after a somewhat longer operating time.

1.2.2 Handling ESD modules

- As a general rule, electronic modules should only be touched if this is absolutely necessary.
- Components may only be touched if the person
  - is continuously grounded through an ESD bracelet, or
  - is wearing ESD shoes or ESD shoe grounding strips.

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- Before touching an electronics module, you must electrically discharge your body. This can be simply done by touching a conductive, grounded object immediately beforehand (e. g. bare metal cabinet parts, water pipe etc.)
- Modules may not come into contact with highly insulating materials which can be statically charged. This includes plastic foils, insulating desktops, clothing manufactured out of man-made fibers.
- Modules may only be placed down on conductive surfaces (desktop with ESD surface, conductive ESD foam rubber, ESD packing bags, ESD transport containers, cardboard- or paper surfaces).
- Modules may not be brought close to data terminals, monitors or television sets.

1.2.3 Measuring and making changes on ESD modules

- It only permissible to make measurements at the modules, if
  - the measuring unit is grounded (e. g. via protective conductor) or
  - before making measurements with an electrically-isolated measuring device, the probe is briefly discharged (for example by touching a bare metal control housing).

When carrying-out soldering work on modules, ESD soldering irons must be used or at least the soldering iron tip grounded.

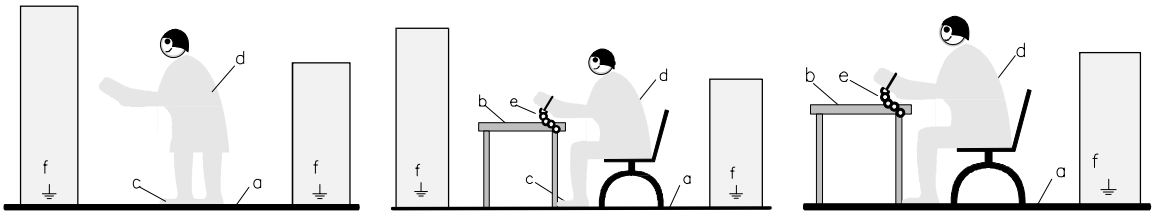
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1.2.4 Transporting modules

Modules and components may only be stored and transported in conductive packing materials (e. g. metallized plastic boxes, metal containers).

If the packaging is not conductive, then the modules must first be wrapped in conductive packaging materials. This can include, for example conductive foam rubber or normal household aluminum foil.

The necessary ESD protective measures are clearly shown in the following diagram.



a = conductive flooring surface

d = ESD coat/jacket

b = ESD desk = ESD chain

c = ESD shoes

f = grounding connection for the cabinets

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1.3 Ambient conditions

The following **safety regulations** must be applied:	VDE 0160
	Electric power equipment with electronic devices
	Data for „Protective separation“ of 115/230 V AC power supply parts with respect to PELV circuits
	Data for „Protective separation“ of 25V AC/ 60V DC signal voltages with respect to PELV circuits
	VDE 0106 Part 1
	Data regarding shock protection
Protective class according to VDE 0106 Part	I (with protective conductor) for 115/230V supply voltage
	II (safety extra-low voltage) for 24V supply („protective separation“)
Air intake temperature for self- or forced cooling It should be observed whether the module is designed for natural air cooling or forced ventilation	0 degrees C up to + 55 degrees C
Storage temperature	-25 degrees C up to +70 degrees C
Mechanical specifications: Testing in accordance with SN 29050	
in operation	Severity grade, class 12
during transport	Severity grade, class 22
certification	Manufacturers certification for EMC (in accordance with the EC Directive)

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2 Subracks

Overview

2.1	Subracks SR6, SR6V	2-2
2.2	Subracks SR12 and SR24	2-13
2.3	Subrack SRT400	2-26

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2.1 Subracks SR6, SR6V

Description

The subracks accommodate SIMADYN D modules with the format (H×D) 233.4 × 220 mm².
An integrated power supply provides the necessary voltages for the modules via the backplane bus (**L bus**) and permits data transfer between them.

No. of slots

SR6/SR6V: **6**
The slots are identified by a labeling strip.

2.1.1 Power supply

The power supply (type SP7, 6DD1683-0BB0) plugs into the SIMADYN D ES 902 C subrack system in the righthand subrack slot.
It is secured using a screw locking so that it cannot slide out and guarantees natural air cooling (SR6) or unrestricted forced ventilation with mounted fan (SR6V) of the subrack.

Power

The current demand of the modules may not exceed the available output currents of the 5 V and +/-15 V supplies (refer to the Chapter „Technical data“). Otherwise, a larger subrack must be used, e. g. SR12.x.

Front panel elements

- green LED green: Error-free operation
- red LED: Fault condition
- reset button to restart modules
- connection for the supply voltage (screw/plug-in terminal X1)
- connection for an external back-up battery (screw/plug-in terminal X2)
- test sockets to check the 3 output voltages 5 V, +/-15 V
  (short-circuit protection is provided via protective resistors)

Supply connection

The 230 V supply voltage is fed-in via the 4-pole screw/plug-in terminal X1.
The connection assignment is printed on the front panel:

Connector X1, Pin	Significance
1	L phase conductor
2	N neutral conductor
3	*Not connected*
4	PE protective conductor

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NOTES

It must be a slightly accessible circuit breaker in the supply circuit.

The connector X1 is not permissible as a circuit breaker.

The connector X1 is permissible only for the internal wiring and may be plugged only in the voltageless state or be split.

The connector X1 must not be used for a power cable removable of the terminal user.

The protective conductor must be connected at connector X1, pin 4. It is not sufficient to connect a protective conductor.

Fuses

The following fuses are located on the power supply PC board

F 1:	T800 mA H	250 V (supply)
F 2:	T800 mA H	250 V (supply)
F:	T50 mA H	

NOTE

Caution: bipolar fuse

An external fuse must be dimensioned according to the following operating data:

Input current (at 230 V):	In = 600 mA
Fuse link:	I^2t = 0.5 A^2s
Peak inrush current:	Is = 25 A

NOTE

The power supply PC board is suitable for the connection to IT systems.

2.1.2 Voltage monitoring functions

Input voltage

The input voltage is monitored for undervoltage and overvoltage conditions.

Input voltage (V_{rated} = 1-ph. 230 V AC)	**Response**
Undervoltage: < 170 ...175 V	Green OK LED goes dark The output voltages are shutdown; CPU stop (DSAVE signal) The system automatically restarts when the input voltage increases to approx. 190 V.
Overvoltage > approx. 265 V	Red fault LED is lit; The output voltages are shutdown, CPU stop (DSAVE signal) No automatic restart (the line supply voltage must be disconnected)

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Output voltage

All of the output voltages are monitored for an undervoltage condition (e. g. as a result of overload/short-circuit).

Undervoltages at the output	Response
V (5 V) < 4.7 ... 4.85 V (for t>100-200 µs)	Red fault LED is lit The output voltages are shutdown (CPU stop) No automatic restart (the line supply voltage must be disconnected)
V (+ 15 V) < approx. 14 V **V (- 15 V)** > approx. -14 V	Red fault LED is lit 5V voltage remains System failure message

System failure message

The associated module („STOP“ tab) is configured in HWConfig under „Object properties“ to define how the module behaves when a system failure message is output (bus signal *RDYIN=low):

- Modules can reset their binary and analog outputs
- CPU modules can go into the „STOP“ condition („H“)

2.1.3 Battery back-up

The SR6 subrack does not have its own back-up battery.

Battery connection

A back-up battery can be connected at the screw/plug-in terminal X2 to save configured values (application software) during a power failure (using function block SAV). The connection assignment is printed on the front panel:

Connector X2, Pin	Designation	Comment
1	0 V	Battery ground
2	BATAL	Battery monitoring („alarm“ for logical 0)
3	V_{CC}	+ 3.0 ...4.5 V battery voltage

External battery

Current load: Approx. 10 µA depending on the particular CPU module

It is recommended that the battery is changed every year.

When using a Lithium battery, a series resistor of 39 Ω must be provided to prevent an inadmissibly high charging current when a fault condition develops (5V of the power supply is applied to the battery via a defective diode - which could be a potential explosion hazard).

The monitoring CPU module in SR6(V) does not initially identify when there is no back-up battery or the back-up battery is discharged (no flashing „b“).

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Battery voltage monitoring

The SE60 interface module (6DD1681-0GA0, information will be provided on request) includes the battery and supplies a monitoring signal, which is connected at X2, pin2 „BATAL“. This TTL signal outputs a „0“ when the battery voltage falls below 3.0 V.



WARNING

For safety reasons, it is not permissible that lithium batteries are in the equipment when it is transported unless the battery manufacturer permits this expressly using an appropriate declaration.



DANGER

- When the equipment is stored and shipped, the batteries must be individually and separately packed in a non-conductive material.
- There is a danger of explosion if they are not correctly handled. We can accept no liability for incorrectly handled batteries.
- Used batteries must be disposed of in compliance with national and European legislation and regulations.
- The lithium batteries must be removed from the battery holder before the subrack or power supply is disposed of.

2.1.4 Backplane bus

All of the inserted modules receive their voltages and exchange data via a parallel backplane bus (**L bus**).

Daisy chain jumpers

The bus uses the daisy chain principle where a CPU module accepts the token signal and then transfers it to the next CPU module.

Thus, a daisy chain jumper must be **inserted** in all backplane bus PC board slots where there is **no CPU module** (or EPx signal processor module).

If another module is inserted, the jumper is unimportant.
The jumpers must be correctly inserted up to the last (righthand) CPU module.
A jumper is required if a module is not located at that connector slot!

The two pins to insert the jumpers are located to the right of the backplane bus connector (96-pin socket connector).

All of the jumpers are inserted **when the equipment is shipped**.

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Signal assignment, backplane connector

X201 to X206 96-pole socket connector DIN 41612 Type C

Pin No.	Row a	Row b	Row c
1	5V	5V	5V
2	AUX2	AB20	AB22
3	AUX1	AB21	AB23
7 4	+15V	+15V	+15V
5	AUX0	-15V	-15V
6	*LOCK	*CSPER	*CSINI
7	5VEXT	5VEXT	*RSERQ
8	Vcc	AB12	AB0
9	*BATAL	0V	AB1
10	*DSAD	AB13	AB2
11	*DSAVE	PLC0	AB3
12	AB19	AB14	AB4
13	*OUTDS	PLC1	AB5
14	*RESET	AB15	AB6
15	*BHE	PLC2	AB7
16	*BRQ	AB16	AB8
17	*BGIN	PLC3	AB9
18	*BGOUT	AB17	AB10
19	*BCLR	PLC4	AB11
20	*IR0	AB18	DB0
21	*IR1	0V	DB1
22	*IR2	DB11	DB2
23	*IR3	0V	DB3
24	*RDYIN	DB12	DB4
25	*RDY	PRIVAT	DB5
26	*WR	DB13	DB6
27	*RD	0V	DB7
28	CLK	DB14	DB8
29	*CLK.M	0V	DB9
30	*DEN	DB15	DB10
31	*HWE	RES	SBR
32	DT/*R	0V	SBT

2.1.5 Ventilation/cooling

The subrack **SR6** is designed for natural air cooling.
The **SR6V** has a fan on the top panel to operate CPU modules which require forced ventilation.
The fan has a connecting terminal for its 1-ph. 230 V AC supply voltage. The fan is not monitored.

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Discharged air

The subrack must be able to discharge hot air:

- The discharged air may not be restricted by mounted components
- When mounting equipment or other components, a minimum clearance of 60 mm must be maintained above and below the subrack

If the subrack is mounted in a cabinet, the cabinet must have air ventilation slots. If the cabinet is enclosed, the subrack must be force-ventilated (an SR6V must be used).
If two subracks are mounted one on top of the other, there must be a minimum 120 mm clearance between the two subracks, whereby the upper subrack must be separated from the lower subrack by an air deflection plate.

2.1.6 Mounting guidelines and noise immunity

EMC

- The subrack must be connected to the grounding rail via the connecting studs through a min. 6 mm² cable which should be kept as short as possible.
  Potential bonding using the PE pin of line connector X1 is not sufficient!
- All of the cabinets associated with networked SIMADYN D drives must be connected with one another through a potential bonding conductor having a minimum cross-section of 16 mm².
- Empty slots must be provided with SIMADYN D slot covers (SR81, SR82, SR83).
- All modules must be tightly screwed into the subrack.
- No undamped contactors may be used in a cabinet together with SIMADYN D.
- If undamped contactors are mounted in a cabinet next to SIMADYN D, the cabinets must have a metal partition between them.
- The protective contactor is connected at the subrack and at the power supply. Both components must be at protective conductor potential.
- Before removing the power supply, the connecting cables must be disconnected. The connecting cables must first be disconnected from the supply so that they are in a no-voltage condition!
- The screens of screened cables must be directly connected to the grounding- or screen rails and fed to the interface modules, still screened.

NOTE Additional information regarding EMC and the ambient conditions, refer to the Section „General technical data“!

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2.1.7 Technical data

Input voltages

AC power supply according to DIN IEC 38

Input voltage V_{in}	230 V (+ 10% / - 15%)
Input frequency	47.5 ... 62.5 Hz

Non-periodic overvoltages according to DIN VDE160, A5.3.1.1.2	
Voltage	460 V
Duration	1.3 ms
Recovery time, min	0.1 s
Events per hour	max. 10

Brief voltage dips according to DIN VDE 0160, A5.3.1.1.3	
Voltage	0
Duration	5 ms
Recovery time, min	0.1 s
Events per hour	max. 10

Output voltages

Output voltage 5 V	+5.1 V +/- 0.1 V
Output current	1.5 to **7 A**
Ripple	< 50 mV_{pp}
Commutating spikes	< 5% (of 5V)
Base load	1.5 A when a CPU module is inserted
Overvoltage protection	with suppressor diode to protect the modules
Stabilization time	< 80 ms after V_{in}= 230 V; <1 ms after load step (0.5 ->1)*I_{rated}

Output voltage +15 V	+15 V +/- 0.3 V
Output current	0 to **0.7 A**
Ripple	< 150 mV_{pp}
Base load	Guaranteed by an inserted module which requires this voltage

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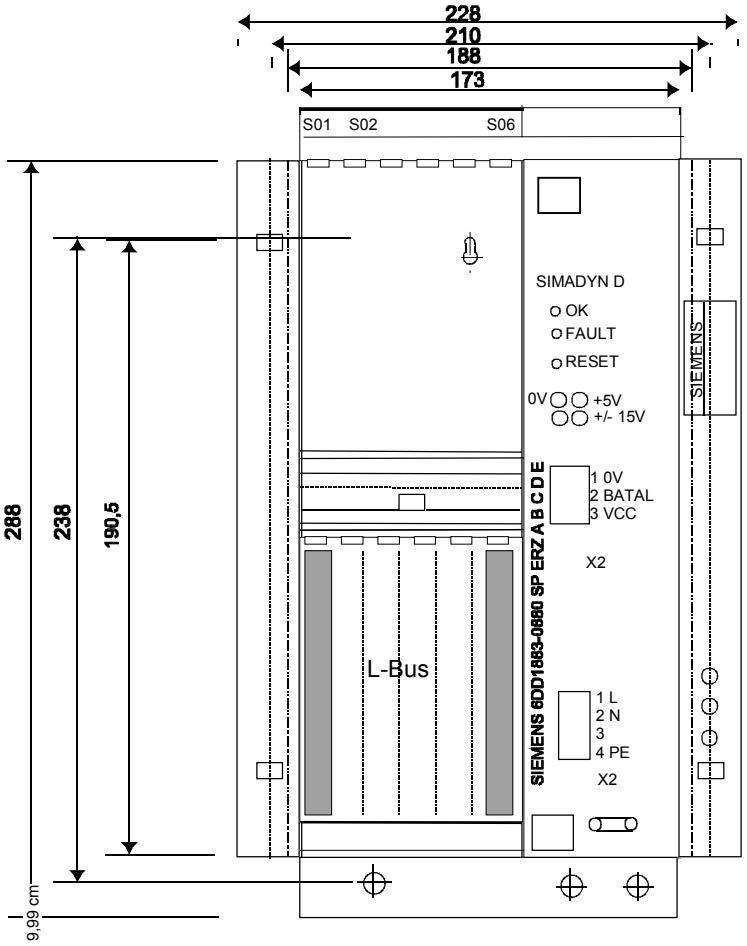
Output voltage -15 V	-15 V +/- 0.3 V
Output current	0 to **0.6 A**
Ripple	< 150 mV_{pp}
Base load	Guaranteed by an inserted module which requires this voltage
Time to establish the output voltages	Approx. 200 ms after the power supply voltage has been applied

General data

SR6 dimensions in mm (W x H x D)	225 x 320 x 280
Dimensions of the SP7 power supply in mm (W x H x D)	45.72 x 233.4 x 220
Weight	4 kg
Radio interference suppression level	Limit value class B according to VDE 0871
Ventilation	SR6: Natural air cooling SR6V: Fan on the top panel
Screw/plug-in terminal X1	Phönix, type MSTB 2.5/4-ST/5,08, cable cross-section 2.5mm²
Screw/plug-in terminal X2	Phönix, type MSTB 2.5/3-ST/5,08, cable cross-section 2.5mm²

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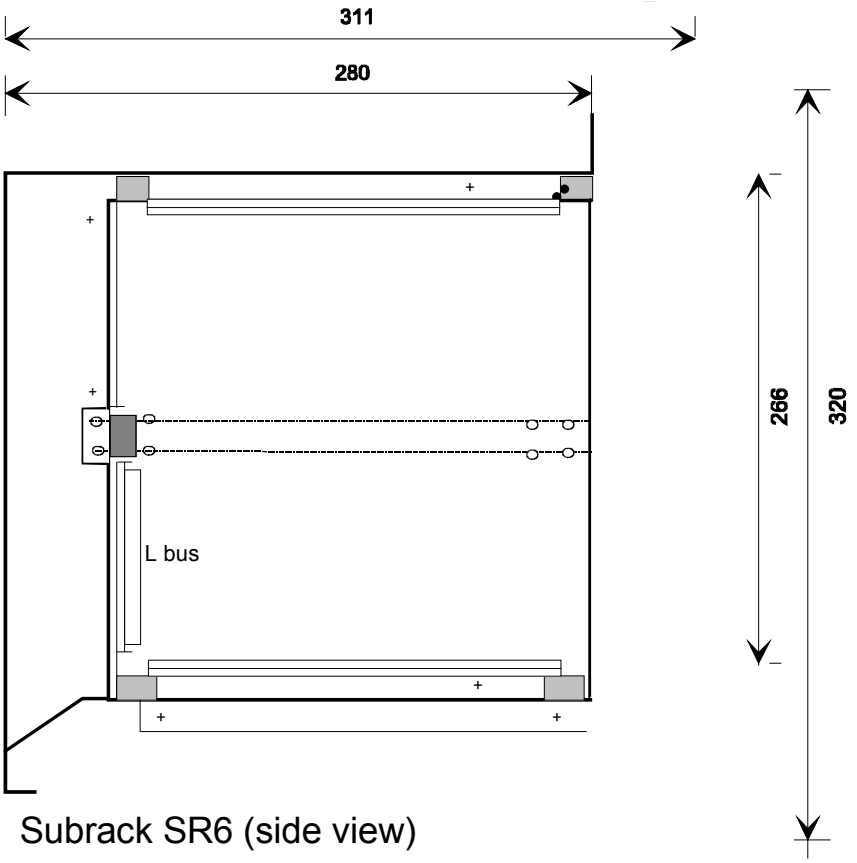
2.1.8 Dimension drawings



Explanation: Subrack SR6 (front view)

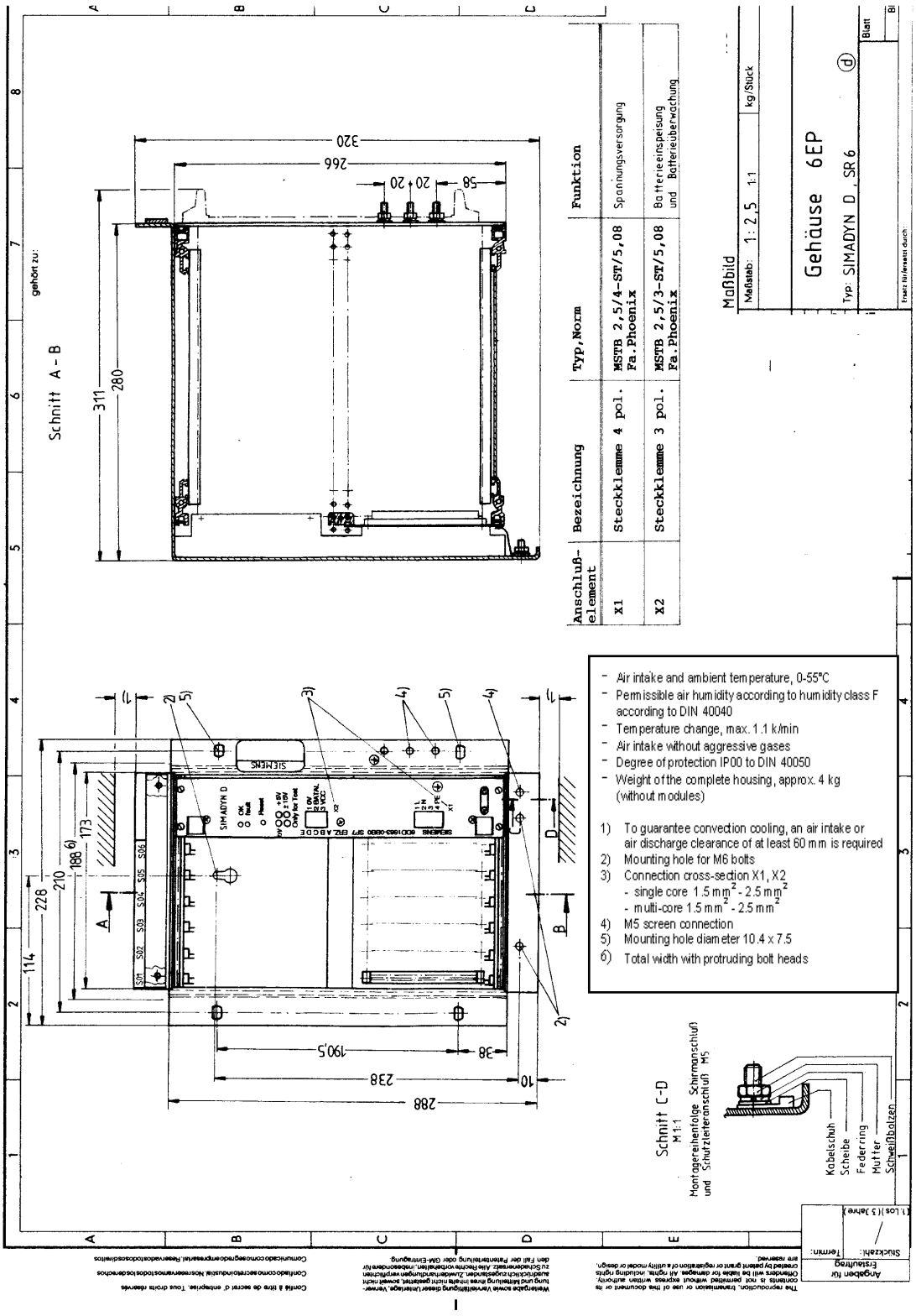
I Cable retention

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Subrack SR6 (side view)

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2.2 Subracks SR12 and SR24

Order No.

Subracks SR12.x and SR24.x are available for different supply voltages and with or without fan.

	Order No.	Supply voltage	Fan	Power supply type
SR12.1	6DD1682-0CC0	24 V DC	yes	SP22
SR12.2	6DD1682-0CD0	24 V DC	no	SP23
SR12.3	6DD1682-0BC3	115/230 V AC	yes	SP22.5
SR12.4	6DD1682-0BC4	115/230 V AC	no	SP23.5

SR24.1	6DD1682-0BC0	24 V DC	yes	SP8
SR24.2	6DD1682-0BE0	24 V DC	no	SP9
SR24.3	6DD1682-0CE3	115/230 V AC	yes	SP8.5
SR24.4	6DD1682-0CE4	115/230 V AC	no	SP9.5

Description

The subracks accommodate SIMADYN D modules with the format (H×T) 233.4 × 220 mm².
An integrated power supply provides the necessary voltages for the modules via 2 backplane buses **(L bus, C bus)** and permits data transfer between them.

Number of slots

SR12.x: **12**
SR24.x: **24**
The slots are identified by a labeling strip.

2.2.1 Power supply

The power supply plugs into the SIMADYN D rack.

Line filter

The power supply has a line filter which limits the radio interference voltage to limit value class A in accordance with VDE 0871.

Front panel elements

- Green LED: Error-free operation
- Red LED: Fault condition
- Compartment for the back-up battery
- Supply voltage connection (screw/plug-in terminal X1)
- Connection for an external back-up battery via screw/plug-in terminal X3 (this is optional to a back-up battery which can be inserted in the subrack itself)
- Reset (cold restart of the modules) by
  - Depressing the reset button
  - Jumpering pins 1 and 2 at connector X4

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- Test sockets to check the 3 output voltages 5 V, +/-15 V (short-circuit proof)

Supply connection

The line supply voltage is connected through the 3-pole screw/plug-in terminal X1.
The connection assignment is printed on the front panel:
Above the voltage selector switch (Slide switch) can be switched to between an input nominal voltage from 230 V and 115 V.

The in each case valid value becomes visible with transfer of the switch.

	SR12.1 and SR12.2 **SR24.1 and SR24.2**	**SR12.3 and SR12.4** **SR24.3 and SR24.4**
Input voltage	**24 V DC**	**230 V AC** (default setting of voltage selector switch) 115 V AC (change over voltage selector switch)
X1 Pin 1	+24 V	Phase conductor L
X1 Pin 2	Ground (0 V)	Neutral conductor N
X1 Pin 3	Protective ground conductor PE	Protective conductor PE
External fuse (rating)	For SR12.x: In = 16 A max.. I^2t= 6 A^2s Is = 32 A (inrush peak) For SR24.x: In = 32 A max.. I^2t= 10 A^2s Is = 64 A (inrush peak)	For SR12.x: (AC230V) In = 1.2 A max.. I^2t= 0.6 A^2s Is = 6 A (inrush peak) For SR24.x: (AC230V) In = 2.7 A max.. I^2t= 1 A^2s Is = 9 A (inrush peak)
X2 pins 1 - 4	Monitoring the power supply and fan assembly (relay)	
X3 pins 1 - 2	Feed for an external back-up battery	
X4 pins 1 - 2	Reset: A reset is initiated by jumpering the contents (optional to using the reset button)	

The specified current In is the current that can occur at a maximum insertion of the subrack. The power supplies are in part oversized, and have a higher maximum input current (Chapter: Technical dates).

NOTES

The **protective conductor** must be connected at connector X1, pin 3.
It is not sufficient to connect a protective conductor at the subrack.

It must be a slightly accessible circuit breaker in the supply circuit.

Interface modules with binary output function **SB70, SB71** should be powered-up approximately 200 ms before the modules are powered-up to prevent power-on effects.
This is achieved by **simultaneously powering-up** the subrack power supplies (this requires approximately 200 ms to establish the voltages) and the interface modules.

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There are following fuses on the printed circuit board of the power supplies:

Power supply	Fuse	Type	Voltage rated value
SP22.5/SP23.5	F601	T4A H	250 V
SP8.5	F400	T8A H	250 V

NOTE The power supply PC boards are suitable for the connection to IT systems.

2.2.2 Voltage monitoring functions

Input voltage

The input voltage is monitored for undervoltage and overvoltage conditions.

Input voltage	Response
Undervoltage: SRx.1/SRx.2: **< 20 V** or SRx.3/SRx.4: **< 170 ...175 V**	Green OK-LED goes dark The output voltages are shutdown; CPU stop (DSAVE signal) The system automatically restarts when the input voltage increases to approx. 196 V.
Overvoltage SRx.1/SRx.2: **> 32 V** or SRx.3/SRx.4: **> approx. 265 V**	Red fault LED is lit; The output voltages are shutdown, CPU stop (DSAVE signal) Automatic restart

Output voltage

All of the output voltages are monitored for an undervoltage condition (e.g. as a result of overload/short-circuit)

Undervoltages at the output	Response
V (5 V) < 4.7 ... 4.85 V (for t>100-200 µs)	Red fault LED is lit The output voltages are shut down; (CPU stop) No automatic restart (the line supply voltage must be disconnected)
V (+ 15 V) < approx. 14 V **V (- 15 V)** > approx. -14 V	Red fault is lit 5V voltage remains System failure message

System failure message

The associated module (under the „STOP“ tab) is configured in HWConfig under "object properties" to define how the module behaves when a system failure message is output (bus signal *RDYIN=low):

- Modules can reset their binary and analog outputs
- CPU modules can go into the "stop" condition ("H")

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2.2.3 Battery back-up

Battery connection

A back-up battery can be installed in the power supply to save configured values during a power failure (using function block SAV) (nominal voltage, approx. 3.6 V).

Current load: approx. 10 µA depending on the particular CPU module

It is recommended that the battery is changed every year.

When removing the power supply (the defect, changing the fan) back-up is no longer possible. If required, the back-up voltage must be provided through the appropriate contact of the backplane connector.

Battery type

Lithium battery 3,4 V, 5 Ah

Design C (Baby element)

Battery voltage monitoring

The monitoring CPU module identifies if there is no back-up battery or if the back-up battery is discharged (at slot 1; flashing "B").

Battery change

The battery should be changed with the subrack powered-up to prevent data loss. If a supply voltage is not available, then a voltage must be applied via connector X3!



WARNING

For safety reasons, it is not permissible that lithium batteries are in the equipment when it is transported unless the battery manufacturer permits this expressly using an appropriate declaration.



DANGER

- When the equipment is stored and shipped, the batteries must be individually and separately packed in a non-conductive material.
- There is a danger of explosion if they are not correctly handled. We can accept no liability for incorrectly handled batteries.
- Used batteries must be disposed of in compliance with national and European legislation and regulations.
- The lithium batteries must be removed from the battery holder before the subrack or power supply is disposed of.

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2.2.4 Backplane buses

All of the inserted modules receive their voltages and exchange data via 2 parallel backplane buses:

- **L bus** („local bus“, below)
- **C bus** („communications bus“, top)

Daisy chain-jumpers

The bus uses the daisy chain principle where a CPU module accepts the token signal and then transfers it to the next CPU module.

Thus, a daisy chain jumper must be **inserted** in all backplane bus PC board slots where there is **no CPU module** (or EPx signal processor module).

If another module is inserted, the jumper is unimportant.
The jumper must be correctly inserted up to the last (righthand) CPU module.
A jumper is required if a module is not located at a connector.

The two pins to insert the jumpers are located to the right of the backplane bus connector (96-pin socket connector).

All of the jumpers are inserted **when the equipment is shipped**.

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Signal assignment, backplane connector

X101 to X124 96-pole socket connector DIN 41612 Type C (C bus)

X201 to X224 96-pole socket connector DIN 41612 Type C (L bus)

The L- and C buses are essentially assigned the same.
The signals with **grey** background are **only available at the L bus**.

Pin No.	Row a	Row b	Row c
1	5V	5V	5V
2	AUX2	AB20	AB22
3	AUX1	AB21	AB23
4	+15V	+15V	+15V
5	AUX0	-15V	-15V
6	*LOCK	*CSPER	*CSINI
7	5VEXT	5VEXT	*RSERQ
8	Vcc	AB12	AB0
9	*BATAL	0V	AB1
10	*DSAD	AB13	AB2
11	*DSAVE	PLC0	AB3
12	AB19	AB14	AB4
13	*OUTDS	PLC1	AB5
14	*RESET	AB15	AB6
15	*BHE	PLC2	AB7
16	*BRQ	AB16	AB8
17	*BGIN	PLC3	AB9
18	*BGOUT	AB17	AB10
19	*BCLR	PLC4	AB11
20	*IR0	AB18	DB0
21	*IR1	0V	DB1
22	*IR2	DB11	DB2
23	*IR3	0V	DB3
24	*RDYIN	DB12	DB4
25	*RDY	PRIVAT	DB5
26	*WR	DB13	DB6
27	*RD	0V	DB7
28	CLK	DB14	DB8
29	*CLK.M	0V	DB9
30	*DEN	DB15	DB10
31	*HWE	RES	SBR
32	DT/*R	0V	SBT

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2.2.5 Ventilation/cooling

The power supplies for SR12.1 and SR12.3 have 1 fan.
The power supplies for SR24.1 and SR24.3 have 3 fans.

The subracks do not have an air filter. If a filter is required, this must be provided at the cabinet.

Fan monitoring

The fans are monitored by the power supply (fan speed). At power-up, the monitoring is enabled with a time delay to ensure that the subrack reliably runs-up.

If a fault condition develops, a message is output via a relay contact (24 V, 100 mA) at connector X2, pins 3 and 4:

- Relay contact closed: Fault-free operation
- Relay contact open : Faulted operation; or the subrack has no fan



WARNING

The subrack may not be used if the fan has a fault, as reliable operation of the boards cannot be guaranteed due to the danger of excessive temperature rise.

Fan change

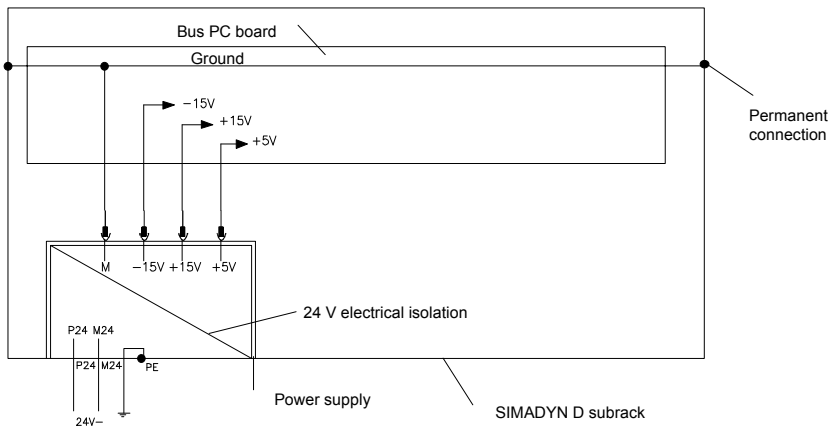
It is recommended that the fan is changed after approximately **40,000 operating hours** at a 50° C ambient temperature. The power supply must be removed. The bottom panel is completely changed, together with the fans.
The battery back-up is interrupted when the fan is changed (refer to the appropriate section.

Self-convection

The cabinet must have cooling air slots if the subracks are not equipped with fans.

2.2.6 Mounting guidelines and noise immunity

Ground connections



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EMC

- The subrack must be connected to the grounding rail via the connecting studs through a min. 6 mm² cable which should be kept as short as possible.
  Potential bonding using the PE pin of supply connector X1 is not sufficient!
- All of the cabinets associated with networked SIMADYN D drives must be connected with one another through a potential bonding conductor of at least 16 mm².
- Empty slots must be provided with SIMADYN D slot covers (SR81, SR82, SR83).
- All modules must be screwed into the subrack.
- No undamped contactors may be used in a cabinet together with SIMADYN D.
- If undamped contactors are mounted in a cabinet next to SIMADYN D, the cabinet must have a metal partition between them.
- The protective contactor is connected at the subrack and at the power supply. Both components must be at protective conductor potential.
- Before removing the power supply, the connecting cables must be disconnected. The connecting cables must first be disconnected from the supply so that they are in a no-voltage condition!
- The screens of screen cables must be directly connected to the grounding- or screen rails and fed to the interface modules, still screened.

NOTE Additional information regarding EMC and the ambient conditions, refer to Section „General technical data“!

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2.2.7 Technical data

Input voltages

DC-input

	Supply voltages	
	24 V DC SR12.1 SR12.2	**DC 24 V** SR24.1 SR24.2
Input voltage range	20 ... 30 V	20 ... 30 V
Input current	16 A	32 A
Non-periodic overvoltages acc. to DIN VDE160, A5.3.1.1.2		
Max. voltage	35 V	
Duration	500 ms	
Recovery time, min.	50 s	
Events per hour	-	
Brief voltage dips acc. to DIN VDE 0160, A5.3.1.1.3		
Voltage	0 V	
Duration	5 ms	
Recovery time, min.	0.1 s	
Events per hour	max. 10	

Input voltages

AC-input

	Connecting voltages	
	AC 115/230 V SR12.3 SR12.4	**AC 115/230 V** SR24.3
Input voltage range	+ 10% / - 15%	+ 10% / - 15%
Input frequency	47.5-62.5 Hz	47.5-62.5 Hz
Input current	4 / 2 A	9 / 4 A
Aperiodic overvoltages acc. to DIN VDE160, A5.3.1.1.2		
Max. voltage	460 V	
Duration	1.3 ms	
Recovery time at least	0.1 s	
Events per hour	max. 10	
Short-term voltage drops acc. to DIN VDE 0160, A5.3.1.1.3		
Voltage	0 V	
Duration	10 ms	
Recovery time at least	10 s	
Events per hour	-	

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Output voltages

Output voltage 5 V	+5.1 V +/- 0.1 V
Output current	SR12: 0 to **26 A** SR24: 0 to **52 A**
Ripple	< 50 mV_{pp}
Commutating spikes	< 5% (of 5V)
Base load	Guaranteed when a CPU module is inserted
Overvoltage protection	With suppressor diode, to protect the modules
Stabilization time	< 80 ms after U_{in}= 230 V; <1 ms after a load step (0.5 ->1)*I_{rated}

Output voltage +15 V	+15 V +/- 0.3 V
Output current	SR12: 0 to **3.3 A** SR24: 0 to **6.5 A**
Ripple	< 150 mV_{pp}
Base load	Guaranteed by an inserted module which requires this voltage

Output voltage -15 V	-15 V +/- 0.3 V
Output current	SR12: 0 to **3.0 A** SR24: 0 to **6.0 A**
Ripple	< 150 mV_{pp}
Base load	Guaranteed by an inserted module which requires this voltage

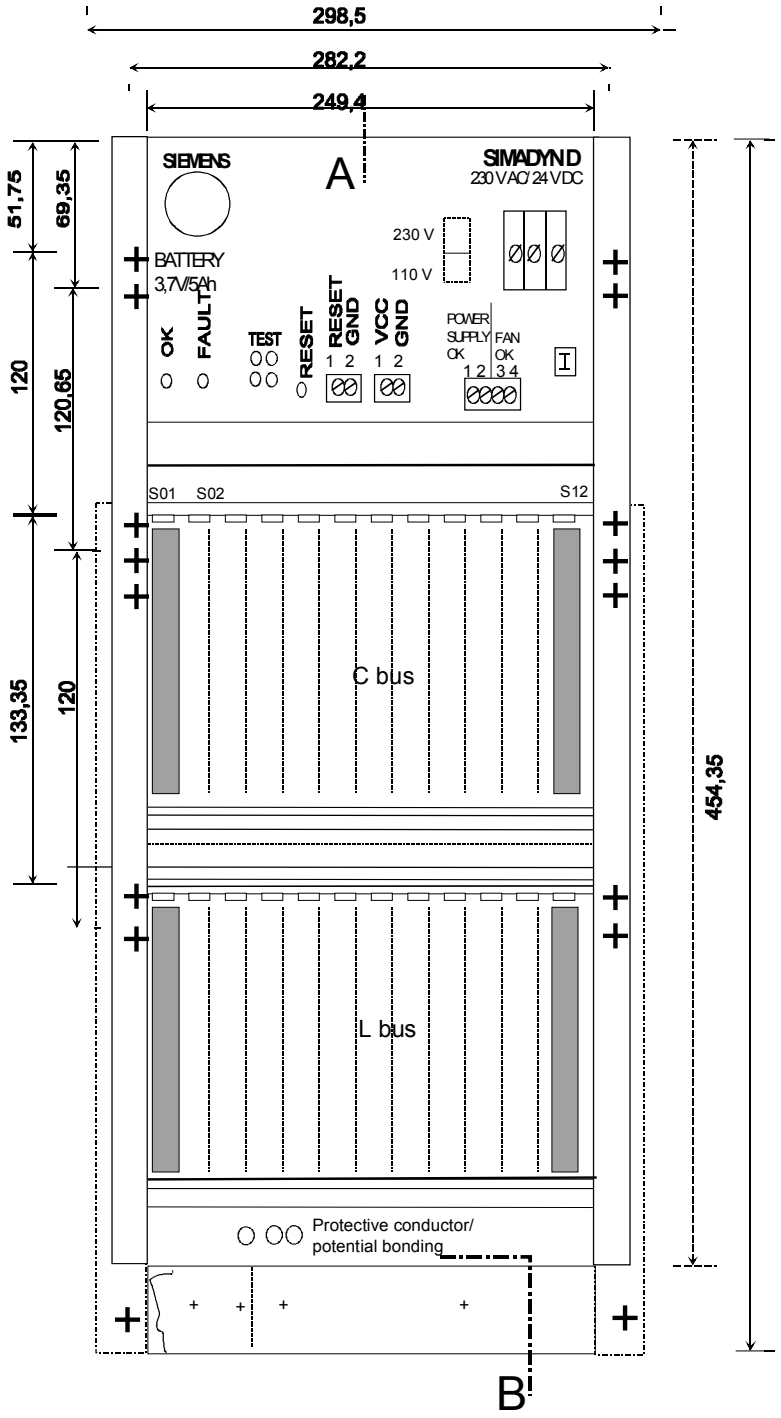
General data

	SR12	**SR24**
Dimensions in mm (W x H x D)	298.5 x 508.5 x 320	542 x 508.5 x 320
Weight	10.5 - 11 kg	16.2 - 17.3 kg

Radio interference suppression level	Limit value class B acc. to VDE 0871

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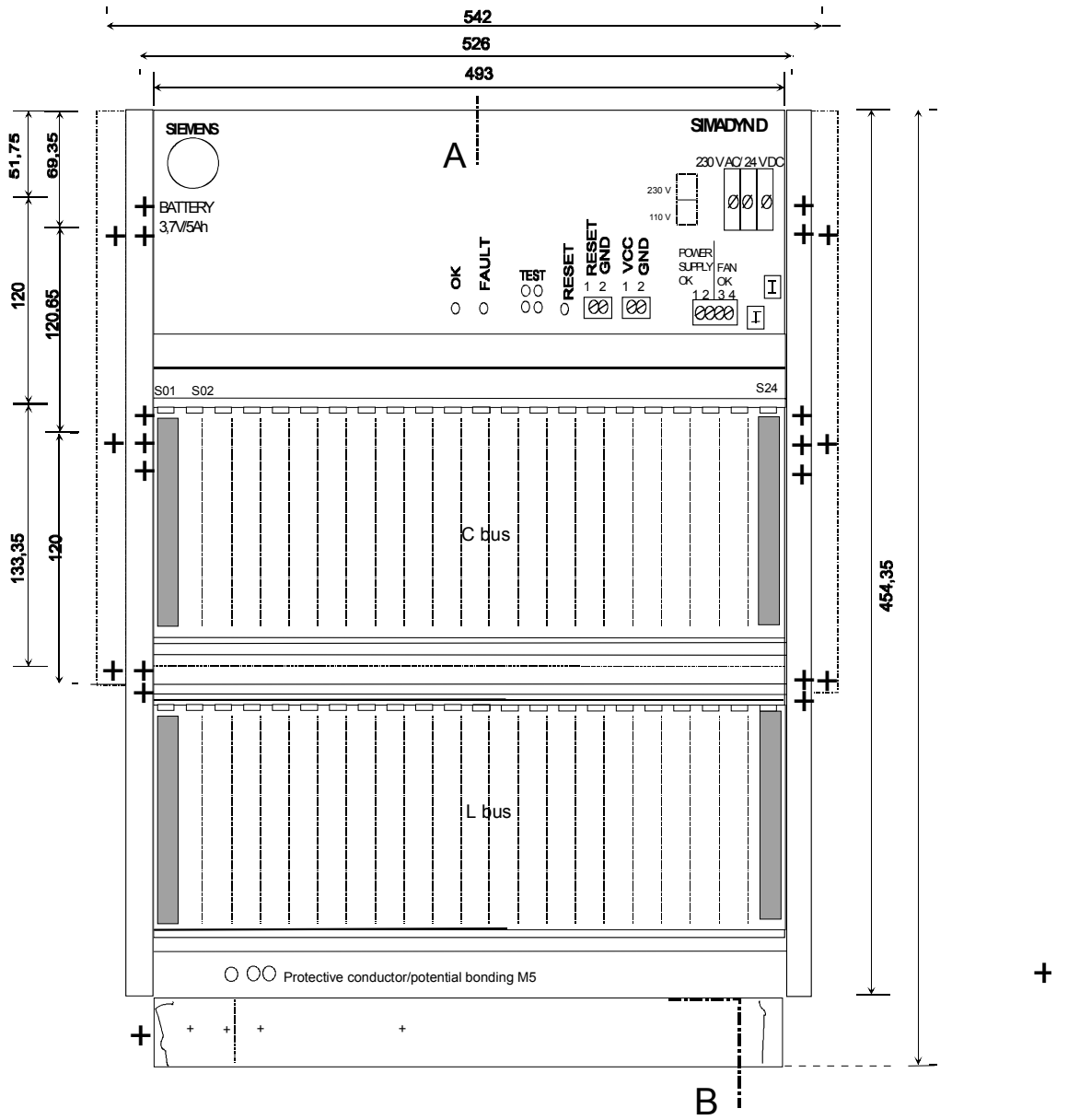
2.2.8 Dimension drawings



Explanation: Subrack SR12 (Front view)

I Cable retention

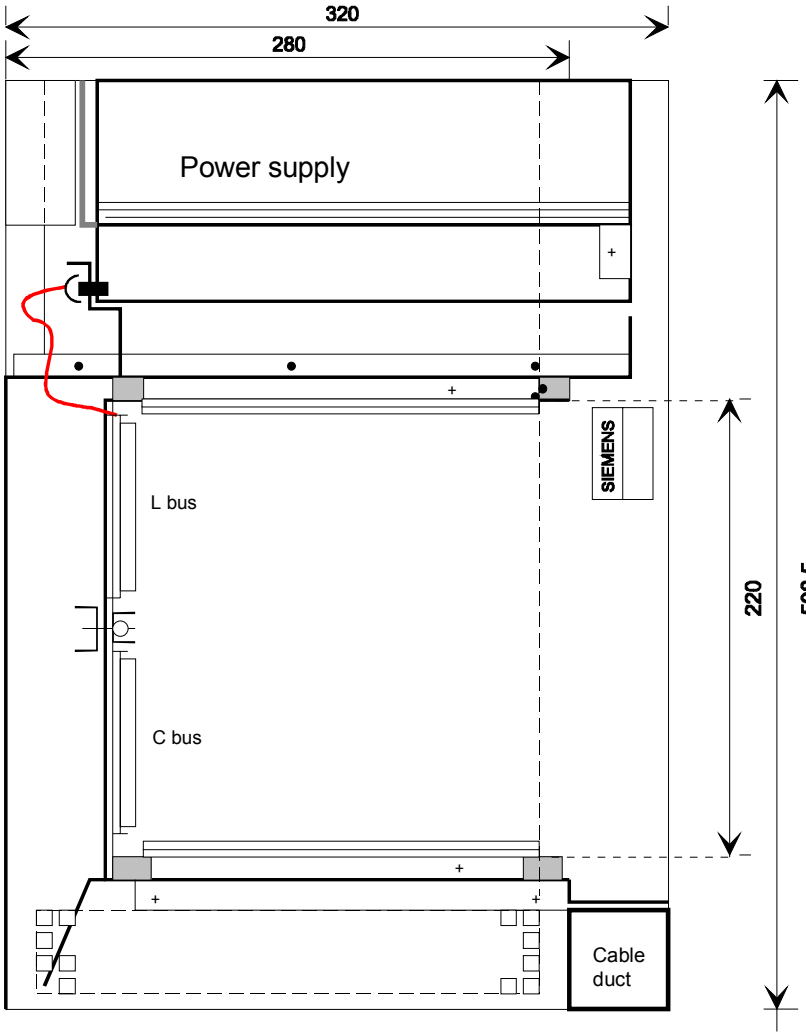
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Explanation: Subrack SR24 (front view)

I Cable retention

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Subracks SR12 and SR24 (Section A-B)

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2.3 Subrack SRT400

Order No.

Order No.	Supply voltage	Fan	Power supply type
6DD1682-0CG0	AC 115/230 V	no	Integrated

Description

SRT400 is a compact subrack for open-loop and control tasks that have a technological orientation.

Number of slots

It is comparable with the electronics box of the SIMOVERT MASTERDRIVES. The following boards can be inserted in the SRT400.

- up to two T400 technology boards
- one T400 and one MASTERDRIVES communications board (e.g. CB1, ADB, …)

In addition to the T400, no other SIMADYN D boards can be inserted in the subrack. Using these components, for example, functions can be expanded at a reasonable price and existing plants/systems modernized.

The drives can be controlled via analog or serial interfaces - such as Profibus DP, USS or peer- to -peer.

2.3.1 Power supply

The power supply is a plug-in unit and is permanently located in the righthand slot of the subrack. It is interlocked using screws so that it cannot slide out. It is self-ventilated.

It cannot be separately ordered.

Front panel elements

- Green LED: Error-free operation
- Connection for the line supply voltage
- 24V supply for the digital (binary) outputs of the T400
- Voltage selector switch (115 V / 230 V)

Supply connection

The incoming line supply voltage 115V/230V is connected through a 3-pin screw terminal.
The connection assignment is stamped on the front plate:

Line supply connection	Significance
⏚	Protective conductor
L	Phase conductor
N	Neutral conductor

It is possible to toggle between rated input voltages of 230 V and 115 V using the voltage selector switch (slide switch).

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The value that has been selected can be seen when the switch is set.

NOTE An isolating device that is easy to access must be provided in the power circuit.



WARNING The protective conductor must be connected at the line supply connector. It is not sufficient to connect the protective conductor at the subrack itself.

Fuses

There are following fuses on the printed circuit board of the power supplies:

F1:	T800 mA H	250 V	(line supply)
F2:	T800 mA H	250 V	(line supply)

NOTE Caution: Two-pole fuse

NOTE The power supply PC board is suitable for the connection to IT systems.

2.3.2 Voltage monitoring functions

Input voltage

The input voltage is monitored for undervoltage conditions.

Input voltage (V_{rated} = 1-ph. 230 V AC)	**Response**
Undervoltage: < 170 V	The output voltages are shutdown; CPU stop (DSAVE signal) After the power supply voltage has been shutdown and the input voltage increases to approx. 195 V, then the system automatically restarts.
Input voltage (V_{rated} = 1-ph. 115 V AC)	**Response**
Overvoltage < 95 V	The output voltages are shutdown; CPU stop (DSAVE signal) After the power supply voltage has been shutdown and the input voltage increases to approx. 100 V, then the system automatically restarts.

Output voltage

Undervoltages at the output	**Response**
V (5 V) < 4.7 ... 4.85 V (for t>100-200 µs)	Green OK-LED goes dark The output voltages are shutdown (CPU stop) The system does not automatically restart (the line supply voltage must be switched-out)

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2.3.3 Battery back-up

The SRT400 subrack does not have a buffer (back-up) battery.

2.3.4 Backplane bus

The power supply for the boards and the data exchange is realized via the backplane bus.

2.3.5 Ventilation/cooling

The **SRT400** subrack is designed for natural air cooling.

Discharged air

The warm air discharged from the subrack must be able to be dissipated to the surrounding environment:

- Other mounted components may not restrict the hot discharged air
- When mounting equipment or other components a minimum clearance of 60 mm must be maintained above and below the subrack

If the subrack is mounted in an electrical cabinet, then the cabinet cooling must be ensured using ventilation slots.

If two subracks are located one above the other then a minimum clearance of 120 mm must be maintained between the two subracks; an air deflection plate must be provided so that the hot discharged air of the lower subrack does not pass through to the second subrack.

2.3.6 Mounting guidelines and noise immunity

EMC

- The subrack must be connected to the grounding rail via the connecting studs through a min. 6 mm² cable which should be kept as short as possible.
  Potential bonding using the PE pin of supply connector is not sufficient!
- All of the cabinets associated with networked SIMADYN D drives must be connected with one another through a potential bonding conductor of at least 16 mm².
- All modules must be screwed into the subrack.
- No undamped contactors may be used in a cabinet together with SIMADYN D.
- If undamped contactors are mounted in a cabinet next to SIMADYN D, the cabinet must have a metal partition between them.
- The protective contactor is connected at the subrack and at the power supply. Both components must be at protective conductor potential.

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- The screens of screen cables must be directly connected to the grounding- or screen rails and fed to the interface modules, still screened.

NOTE Additional information regarding EMC and the ambient conditions, refer to Section „General technical data“!

2.3.7 Technical data

Input voltages

AC power supply according to DIN IEC 38

	Supply voltages (can be set using the voltage selector switch)	
	AC 115 V	**AC 230 V**
Input voltage range	±10%	±10%
Input frequency	47-63 Hz	47-63 Hz
Input current	0.8 A	0.4 A

Non-periodic overvoltages acc. to DIN VDE160, A5.3.1.1.2	
Voltage	460 V
Duration	1.3 ms
Recovery time, min	0.1 s
Events per hour	max. 10

Brief voltage dips acc. to DIN VDE 0160, A5.3.1.1.3	
Voltage	0 V
Duration	5 ms
Recovery time, min	0.1 s
Events per hour	max. 10

Output voltages

Output voltage 5 V	+5.1 V +/- 0.1 V
Output current	**3 A**
Ripple	< 50 mV_{ss}
Commutating spikes	< 5% (of 5V)
Overvoltage protection	With suppressor diode, to protect the modules
Stabilization time	< 80 ms after U_{in}= 230 V; <1 ms after a load step (0.5 ->1)*I_{rated}

Output voltage +15 V	+15 V +/- 0.3 V
Output current	0 to **0.5 A**
Ripple	< 150 mV_{ss}

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Output voltage -15 V	-15 V +/- 0.3 V
Output current	0 to 0.2 A
Ripple	< 150 mV_{ss}

Output voltage **+24 V**	+24 V (20-30 V)
Output current	0 to **0.6 A**

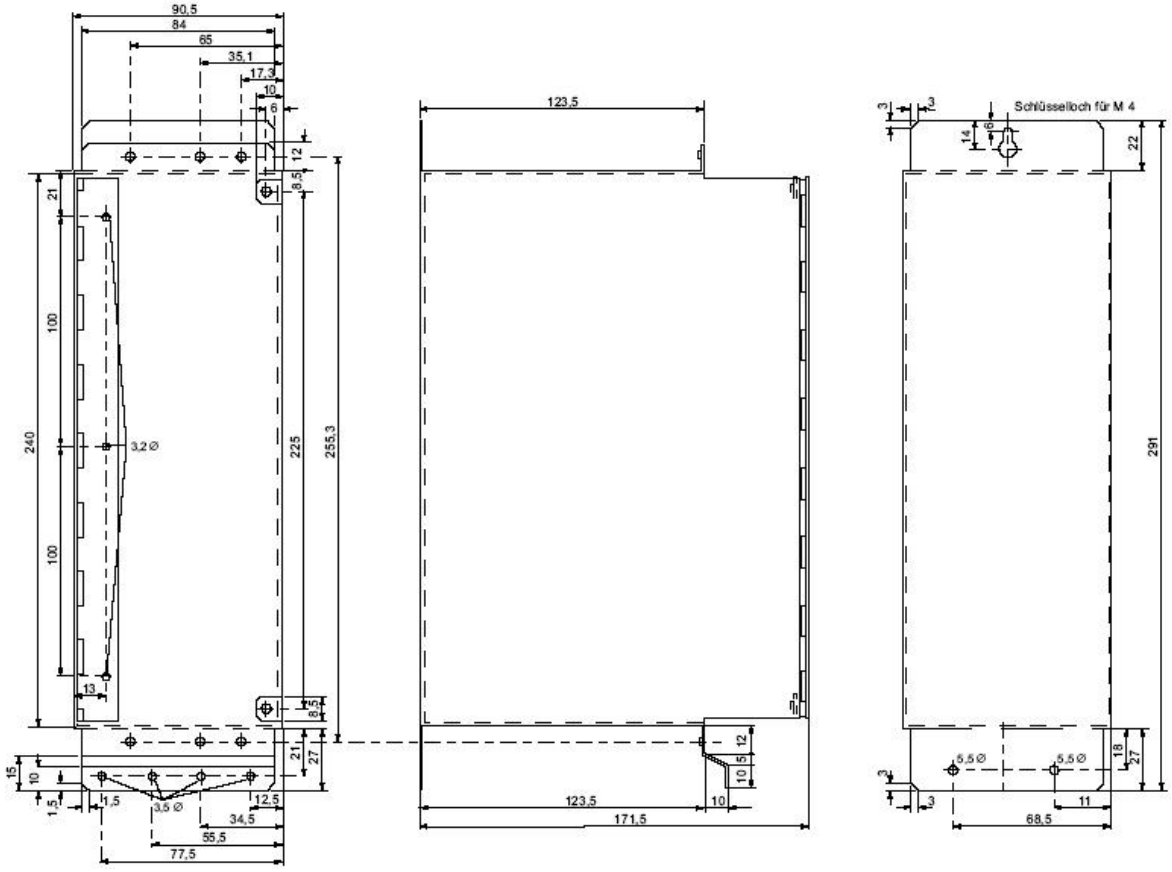
Time that it takes for the output voltages to establish themselves	Approx. 200 ms after the power supply voltage has been applied

General data

Dimensions in mm (W x H x D)	90.5 x 291 x 168.5
Weight	2 kg
Radio interference suppression level	Limit value class B acc. to VDE 0871
Ventilation	Natural air cooling
Line supply connection Screw/plug-in terminal 3 pin	Phönix, type Front 2,5H cable cross-section max. 2,5mm²
24V output terminal Screw/plug-in terminal 2 pin	Phönix, type Front 2,5H cable cross-section max. 2,5mm²

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Dimension drawing



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3 CPU module

Overview

3.1	CPU module PM5	3-2
3.2	CPU module PM6	3-11
3.3	Signal processor module EP3 with IS_x	3-17

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3.1 CPU module PM5

Order No. 6DD1600-0AJ0

Description The CPU module processes general open- and closed-loop tasks. In addition to

- max. 8 binary inputs,

it also has the possibility to connect up to

- 2 absolute value encoders
- 2 incremental encoders.

Performance data

Computational performance:	32 MHz, 32 bit RISC processor
DRAM	4 Mbytes (EDO)
SRAM	64 Kbytes

This CPU module permits fast cycle times of 0.1 ms.
A typical application (e. g. control loop) can be configured in approx. 0.6 ms.

DRAM The DRAM contains:

- program code (is loaded and expanded when the memory module is initialized)
- data memory for the operating system, communications, message buffer, trace function

If the DRAM is not large enough for complex applications, a PM6 (with 8Mbyte DRAM) must be used.

SRAM, buffered The buffered SRAM (using either a battery in the subrack or an external battery) contains the following data, which are to be saved during and after a power failure:

- operating system error diagnostics („exception buffer“)
- max. 1000 process quantities configured with function block **SAV**
- data recorded/traced using the message system or trace function (can be optionally configured on the SRAM)

Programming The program, running on the CPU module, is configured on a PC using STEP7/HWConfig and CFC. This is then loaded into an MS5 program memory module (or MS51).

The program memory module is inserted in the module receptacle provided on the CPU module. The user program can be loaded in 2 ways:

- via an PCMCIA card installed in the PC-programming adapter (**offline loading**)
- directly from the PC via a serial communications connection in the memory module inserted in the CPU module (**online loading**)

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Program size

The size of the software to be loaded in the memory module (compressed to approx. 50%) and the size of the available program memory is displayed in CFC under the following menu item:

Target system \ Load \ Info

MS5, MS51

The program is loaded in a program memory module

MS5, 2 Mbyte Flash-EPROM, 8 Kbyte EEPROM

MS51, 4 Mbyte Flash-EPROM, 8 Kbyte EEPROM

A **MS51** memory module which could be used with the PM5 may only be used up to approx. 50 % so that the expanded code can be accepted on the PM5.

Serial service interface

An RS 232 interface (V.24) with service protocol DUST1 with **19.2 kbd** is permanently installed in **connector X01** (9-pin sub-D socket). It is used to:

- test and commission the user program (using CFC or "IBS")
- loading the user program from the PC (only in this module)

Inputs

The connections available at the 10-pin **connector X5** (8 signals and ground) are functionally sub-divided into 2 groups, each with 4 inputs:

Pins	Function		
1...4	Bin. input 1...4	Absolute value encoder 1	Incremental encoder 1
5...8	Bin. input 5...8	Absolute value encoder 2	Incremental encoder 2

A plug-in socket is provided on the PM5 for each of the 6 functions. A function is not selected by configuring, but by inserting a coded connector into the associated socket.

Selection

The available connections can therefore be used for one of the following combinations of functions:

- 8 binary inputs or
- 4 binary inputs and 1 absolute value encoder or
- 4 binary inputs and 1 incremental encoder or
- 1 absolute value encoder and 1 incremental encoder or
- 2 absolute value encoders or
- 2 incremental encoders

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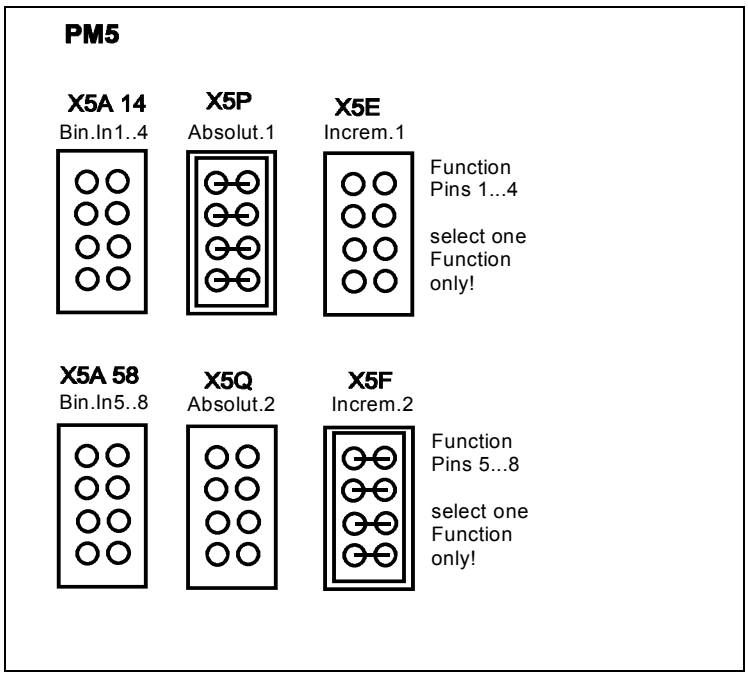


Fig. 3-1 Slots for coding connectors to select the functions for connector X5 (in this case, an absolute value encoder 1 and incremental encoder 2 have been selected)

NOTE Only **one** coding connector may be inserted in each socket row (pins 1..4 or pins 5..8). A connection can only be assigned one function.

Incremental encoders Uni-polar 15V encoders (HTL) with 2 tracks, displaced through 90°, A, B and if required zero pulse, can be connected for closed-loop speed- or position controls.

Absolute value encoder SSI, EnDat Encoders with SSI- or EnDat protocol can be connected for positioning tasks.

Interface modules The screw terminals for the connections are provided via interface modules (can be connected using cable SC7):

Interface module	Function
SB10 SU10	If at least 1 encoder connection is used (electrical 1:1 connection)
SB60 SB61	Optionally to SB10/SU10, if only binary inputs are used (with electrical isolation and signal conversion)

Table 3-1 Possible interface modules for PM5

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7-segment display

In normal operation, the configured number of the CPU module (1...8) is displayed. When an error occurs, a letter is displayed, which refers to the error type.

Possible operating- and error statuses:

Display	Operating- and error statuses	Display can be deleted with key
1...8	Configured number of the CPU module in normal operation	-
A	User error: with function block USF from the diagnostics event defined by the user. This has no influence on the program run.	yes
-	Initialization phase individual initialization steps are displayed with increasing numbers during the run-up phase	-
.	5V available; no program is being executed	-
0	Error during initialization: the user program does not start if errors occur when the system is being initialized. Initialization error due to erroneous or incorrectly inserted modules for the actual software which has been configured: • flashing „0“: Error on this module • steady „0“: Error on other modules • continuous: Error when loading the system software Start diagnostics at the CPU module, which first displayed the "0" error message. If you cannot identify which CPU module was the first to have displayed the error message, then you should start with that CPU module which displays a "0" and is inserted farthest to the left.	no
b	Monitoring error • e.g. missing, discharged buffer battery • background processing error • when initializing non-critical error which permits standard operation to start	yes
C	Communications error erroneous configured communications or connection	no
d	• steady "d": Module is in the STOP mode; selection in the „Target system/operating mode“ menu; software is still not being downloaded • flashing "d": Data is being downloaded in the STOP mode is faster than download in the RUN mode (runs in the background)	no

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Display	Operating- and error statuses	Display can be deleted with key
E	Task administrator error: • cycle error a task was not able to be processed within the sampling time • task backup if the task is not designated as a high-priority task, and has to be re-started. • no free local buffer the data buffer is no longer enabled. Task start is skipped. • software watchdog if the base sampling time is not processed for four consecutive times. The basic clock timer is re-initialized with the configured base sampling time and processing is continued.	yes
H	Fatal system error: hardware or software problem which cause a program crash: Display: • flashing „H“: Fault/error on this module • steady „H“: Fault/error on another module	no

Additional information
on diagnostics refer to the Manual "SIMADYN D Basis Software for D7-SYS".

Button S1

The button has 2 functions:

- Deleting the error display:
  By depressing button S1, sporadic errors („E“) or non-critical errors („b“) appearing in the display can be deleted.
  If another error is present, this is displayed after the first has been acknowledged.

- Binary signal input with function block ASI

Real-time clock

Resolution, 0.1 ms;
e. g. to time stamp messages

Software protection

A plug-in socket for a 28-pin EPLD device is provided on the module (ALTERA company) so that the user program can be copy-protected („Hardlock PAL“).
Using a special function block, this EPLD device can be checked and program stopped if the code is missing or is incorrect.
Additional information on request.

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3.1.1 Supplementary components

- MS5 and MS51 program memory modules
- cable SC57 for PC connection, 9-core, 5 m
- cable SC7 to connect an interface module, 10-core, 2 m

If additional input/output signals and other functions are required, then these can be implemented by inserting a maximum of 2 **expansion modules**; the types are subsequently listed:

- IT41
- IT42
- ITDC
- ITSL

3.1.2 Application information and noise immunity

- operation **without fan** is possible
- noise-immune operation is only possible if the module is tightly screwed into the subrack
- do not insert or withdraw the module when the subrack is powered-up

Other information For more information regarding EMC and ambient conditions, refer to the Section „General technical data“

3.1.3 Connector assignments

Serial interface X01 RS 232

Pin	Designation	Comment
2	RxD	Receive data
3	TxD	Transmit data
5	M	Ground
7	RTS	Request to send („1“)

Table 3-2 Connector assignment X01

Binary- and encoder inputs X5

Pin	As binary input	As absolute value encoder (SSI or EnDat)	As incremental encoder (15V)
1	Binary input 1	SSI1: Data +	Encoder 1: Track A
2	Binary input 2	SSI1: Data -	Encoder 1: Track B

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Pin	As binary input	As absolute value encoder (SSI or EnDat)	As incremental encoder (15V)
3	Binary input 3	SSI1: Clock +	Encoder 1: Zero pulse
4	Binary input 4	SSI1: Clock -	-
5	Binary input 5	SSI2: Data +	Encoder 2: Track A
6	Binary input 6	SSI2: Data -	Encoder 2: Track B
7	Binary input 7	SSI2: Clock +	Encoder 2: Zero pulse
8	Binary input 8	SSI2: Clock -	-
9	+ 15 V Encoder power supply		
10	Ground		

Table 3-3 Connector assignment X5

3.1.4 Technical data

General data

No. of slots occupied	1
Dimensions W x H x D [mm]	20.14 x 233.4 x 220
Weight	Approx. 0.7 kg

Power supply

Rated voltage	min.	max.	Typical current drain
+5 V	+4.75 V	+5.25 V	1200 mA
+15 V	+14.4 V	+15.6 V	35 mA + encoder load (max. 100 mA, electronic. limited)
-15 V	-15.6 V	-14.4 V	35 mA
24 V (external)	20 V	30 V	100 mA + binary output currents

Binary inputs

No.		Depending on the selection via coding plug: 0 no coding plug at sockets X5A... 4 coding plug at 1 socket X5A... 8 2 coding plugs at both sockets X5A... of which, max. 4 are interrupt-capable
Input **voltage**		+24 V rated voltage
	for 0 signal	-1 V to +6 V or binary inputs open-circuit
	for 1 signal	+13 V to +33 V
Input **current**		
	for 0 signal	0 mA
	for 1 signal	3 mA typ.
Input delay		Max. 20 µs
Electrical isolation		No; only via SB60, SB61 interface modules

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3.1.5 Connector assignments

Serial interface X01 RS 232

Pin	Designation	Comment
2	RxD	Receive data
3	TxD	Transmit data
5	M	Ground
7	RTS	Request to Send („1“)

Table 3-4 Connector assignment X01

Binary- and encoder inputs X5

Pin	As binary input	As absolute value encoder (SSI oder EnDat)	As incremental encoder (15V)
1	binary input 1	Encoder1: Data +	Encoder1: Track A
2	binary input 2	Encoder1: Data -	Encoder1: Track B
3	binary input 3	Encoder1: Clock +	Encoder1: Zero pulse
4	binary input 4	Encoder1: Clock -	-
5	binary input 5	Encoder2: Data +	Encoder2: Track A
6	binary input 6	Encoder2: Data -	Encoder2: Track B
7	binary input 7	Encoder2: Clock +	Encoder2: Zero pulse
8	binary input 8	Encoder2: Clock -	-
9		+ 15 V Encoder power supply (100 mA current limited)	
10		Ground	

Table 3-5 Connector assignment X5

Specification absolute value encoder

	SSI-Protokoll	EnDat-Protokoll
Pegel	RS 485	RS 485
max. frequence	2 MHz	2 MHz
Data direction	unidirectional	bidireCtional
Data bits	13 + Parity 25 + Parity	variabel (max. 33)
Codierung	Gray Binär	Gray Binär

Table 3-6 Specification absolute value encoder

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3.1.6 Connection diagram

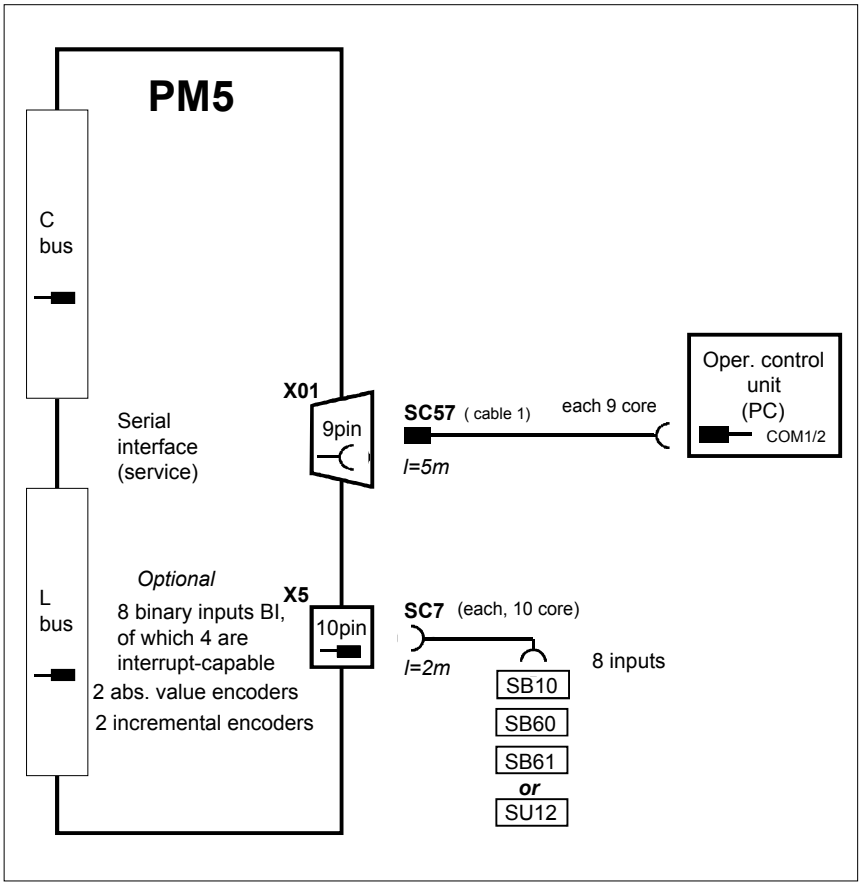


Fig. 3-2 Connecting cables and interface modules

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3.2 CPU module PM6

Order No. 6DD1600-0AK0

Description The CPU module processes open- and closed-loop tasks which demand an **extremely high computational performance,** or where the program is very large. They have

- 8 binary inputs,

of which a maximum of 4 can be used to call-up interrupt tasks.

Performance data

Computational performance:	64/128 MHz, 32/64 bit RISC processor
DRAM	8 MByte (SD), version with 16Mbyte
SRAM	256 KByte

The CPU module permits extremely fast cycle times of 0.1 ms. A typical application (e.g. control loop) can be configured in approx. 0.5 ms.

DRAM The DRAM contains:

- Program code (is loaded and expanded when the memory module is initialized)
- Data memory for the operating system, communications, message buffer, trace function

SRAM, buffered The buffered SRAM (using either a battery in the subrack or an external battery) contains the following data, which are to be saved during and after a power failure:

- Operating system error diagnostics ("exception buffer)
- Max. 1000 process quantities, configured with the function block **SAV**
- Data recorded/traced using the message system or trace function (can be optionally configured on the SRAM)

Programming The program, running on the CPU module, is configured on a PC using STEP7/HWConfig and CFC. This is then loaded into an MS5 program memory module (or MS51).

The program memory module is inserted in the module receptacle provided on the CPU module. The user program can be loaded in two ways:

- via a PCMCIA card installed in the PC-programming adapter (**offline loading**)
- directly from the PC via a serial communications connection in the memory module inserted in the CPU module (**online loading**)

Program size The size of the software to be loaded in the memory module (compressed to approx. 50% and the size of the available program memory is displayed in CFC under the following menu item:

Target system \ Load \ Info

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MS5, MS51, MS52

The program is loaded in a program memory module

- MS5 2 Mbyte Flash-EPROM, 8 Kbyte EEPROM
- MS51 4 Mbyte Flash-EPROM, 8 Kbyte EEPROM
- MS52 8 MByte Flash-EPROM, 8 KByte EEPROM

Serial service interface

An RS 232 interface (V.24) with service protocol DUST 1 **with 19.2 kbaud** is permanently installed in **connector X01** (9-pin sub-D socket). It is used to:

- test and commission the user program (using CFC or "basic IBS")
- loading the user program from the PC (only in this module)

Binary inputs

8 binary inputs can be connected at the 10-pin **connector X5**.

Interface modules

The screw terminals for the binary inputs are available via the interface modules (can be connected using cable SC7):

Interface module	Function
SB10, SU10	Electrical 1:1 connection
SB60, SB61	With electrical isolation (floating) and signal conversion

Table 3-7 Possible interface modules for PM6

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7-segment display

In normal operation, the configured number of the CPU module (1...8) is displayed. When an error occurs, a letter is displayed, which refers to the error type. Possible operating- and error statuses:

Display	Operating- and error statuses	Display can be deleted with key
1...8	Configured number of the CPU module in normal operation	-
A	User error: with function block USF from the diagnostics event defined by the user. This has no influence on the program run	yes
-	Initialization phase Individual initialization steps are displayed with increasing numbers during the run-up phase	-
.	5V available; no program is being executed	-
0	Error during initialization: the user program does not start if errors occur when the system is being initialized. Initialization error due to erroneous or incorrectly inserted modules for the actual software which has been configured: • flashing „0“: Error on this module • steady „0“: Error on other modules • continuous: Error when loading the system software Start diagnostics at the CPU module, which first displayed the "0" error message. If you cannot identify which CPU module was the first to have displayed the error message, then you should start with that CPU module which displays a "0" and is inserted farthest to the left.	no
b	Monitoring error • e.g. missing, discharged buffer battery • background processing error • when initializing non-critical error which permits standard operation to start	yes
C	Erroneous configured communications or connection	no
d	• steady "d": Module is in the STOP mode; selection in the „Target system/operating status“ menu; software is still not being downloaded • flashing "d": Data is being downloaded in the STOP mode is faster than download in the RUN mode (runs in the background)	no
E	Task administrator error: • cycle error a task was not able to be processed within the	yes

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Display	Operating- and error statuses	Display can be deleted with key
	sampling time • task backup if the task is not designated as a high-priority task, and has to be re-started. • no free local buffer the data buffer is no longer enabled. Task start is skipped. software watchdog if the base sampling time is not processed for four consecutive times. The basic clock timer is re-initialized with the configured base sampling time and processing is continued.	
H	Fatal system error: hardware or software problem which caused a program crash: Display: • flashing „H“: Fault/error on this module • steady „H“: Fault/error on another module	no

Additional information
on diagnostics refer to the Manual "SIMADYN D Basis Software for D7-SYS

Button S1

The button has 2 functions:

- Deleting the error display:
  By depressing button S1, sporadic errors ("E") or non-critical errors ("B") appearing in the display can be deleted.
  If another error is present, this is displayed after the first has been acknowledged.

- Binary signal input with function block ASI

Real-time clock

Resolution 0.1 ms; e.g. to time stamp messages;

An MM3 coupling memory module must be used as time source if the time is to be backed-up during power failures.

Software protection

A plug-in socket for a 28-pin EPLD device is provided on the module (ALTERA company) so that the user program can be copy-protected („Hardlock-PAL“).
Using a special function block, this EPLD device can be checked and the program stopped if the code is missing or is incorrect.
Additional information on request.

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3.2.1 Supplementary components

- MS5 and MS51 program memory modules
- Cable SC57 for PC connection, 9-core, 5 m
- Cable SC7 to connect an interface module, 10-core, 2 m

If additional input/output signals and other functions are required, then these can be implemented by inserting a maximum of 2 **expansion modules**:

- IT41
- IT42
- ITDC
- ITSL

3.2.2 Application information and noise immunity

- Operation **without fan** is not possible
- Noise-immune operation is only possible if the module is tightly screwed into the subrack
- Do not insert or withdraw the module when the subrack is powered-up

Other information For more information regarding EMC and ambient conditions, refer to the section "General technical data“!

3.2.3 Technical data

General data

Number of slots occupied	1
Dimensions W x H x D [mm]	20.14 x 233.4 x 220
Weight	approx. 0.51 kg

Power supply

Rated voltage	min.	max.	**Typical current drain**
+5 V	+4.75 V	+5.25 V	1700 mA
+15 V	+14.4 V	+15.6 V	50 mA
-15 V	-15.6 V	-14.4 V	30 mA
24 V (external)	20 V	30 V	100 mA + binary output currents

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Binary inputs

No.		8 of which, max. 4 are interrupt-capable
Input **voltage**		+24 V rated voltage
	for 0 signal	-1 V to +6 V or binary inputs open-circuit
	for 1 signal	+13 V to +33 V
Input **current**		
	for 0 signal	0 mA
	for 1 signal	3 mA typ.
Input delay		max. 20 µs
Electrical isolation		no; only via SB60, SB61 interface modules

3.2.4 Connection diagram

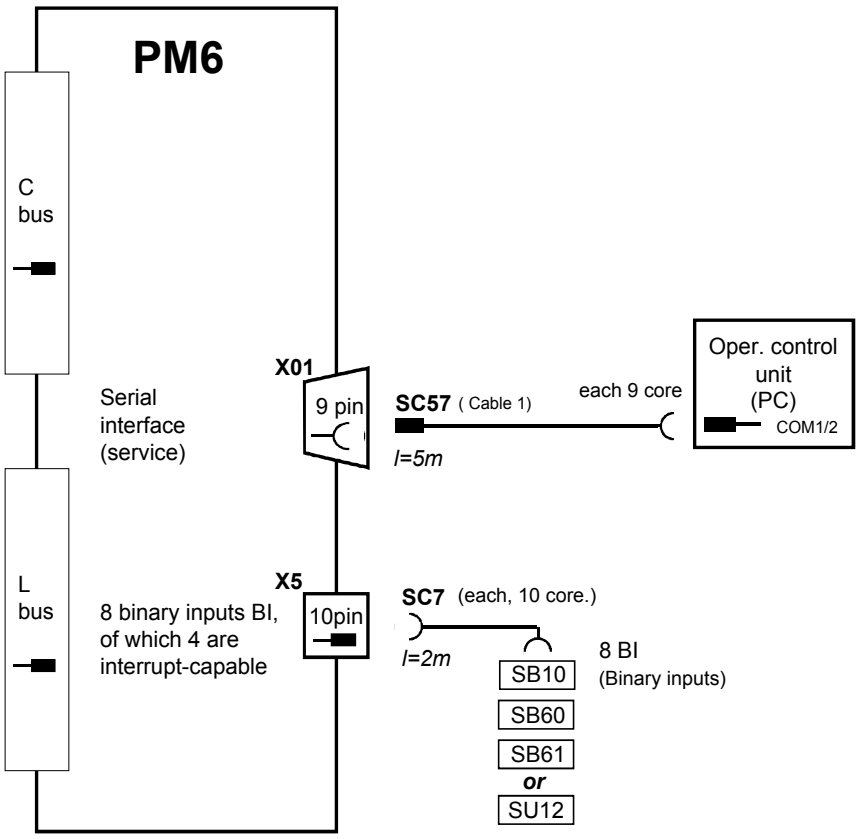


Fig. 3-3 Connecting cables and interface modules

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3.3 Signal processor module EP3 with IS_x

Order No.

6DD1645-0AE0

Description

The EP3 module is used for special applications. Especially for fast closed-loop control and arithmetic operations involving converter-related functions including the gating unit and fast analog signal processing (digital filter).

The EP3 has a DSP56002 signal processor.
The module is configured in HWConfig (the board is inserted in the SIMADYN D station).

IS_1, IS_2 and IS_3

It includes interfaces to plug-in technology cards IS_1, IS_2 and IS_3, which can optimally adapt the peripheral hardware to the particular task.

They are also configured in HWConfig
(the module is inserted in the SIMADYN D station).

NOTE

You will find a detailed description and technical data on EP3 in the following documentation

"Hardware description large drives"

Order No.: 6DD2921-0XH10.

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4 Coupling memory module

Overview

4.1 Coupling memory modules MM11, MM3, MM4 4-2

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4.1 Coupling memory modules MM11, MM3, MM4

Order No.

MM11: 6DD1611-0AD0

MM3: 6DD1611-0AF0

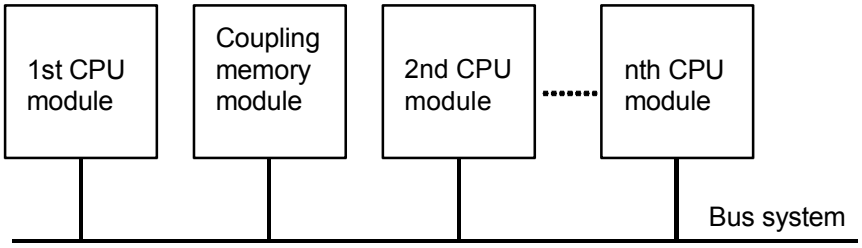
MM4: 6DD1611-0AG0

Application

A coupling memory module has a data memory (RAM), which is used to transfer data via the CPU modules. A coupling memory module must always be used if there is more than one CPU module in a subrack, and if the CPU modules wish to transfer data within the module. For instance, using configured „$ connections“, „coupling memory module coupling“ or if several CPU modules access a CS7 serial interface.

Slot

A coupling memory module can be inserted at any slot between the first and second CPU module.



Features

	MM11	MM3	MM4
Bus connection	L bus, C bus	L bus, C bus	L bus, C bus
Memory size	2 * 64 Kbytes	2 * 64 Kbytes	2 * 2 Mbytes
Other functions		• System error-relay; • Radio clock	System error-relay;

- Data is buffered against power failure using a back-up battery (3.4 V) in the subrack
- Integrated bus termination for the C bus and L bus

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4.1.1 Real-time clock in the MM3 coupling memory module

The MM3 coupling memory module includes, in addition to the buffer function, also a real-time clock, which can be set and synchronized via a

- DCF-77 radio signal

An additional dual port RAM connected to the **L bus** provides the clock time to other functions in the CPU modules (e. g. message system). To realize this, the MM3 must be configured as real-time source on the 1st CPU module with function block RTCM.

Data back-up

The clock time (time of day) is buffered by the subrack back-up battery.

MM3 + MM4

An MM3 can be inserted, **together with an MM4** in a SIMADYN D subrack to use the large MM4 memory, and to utilize the buffered real-time clock of the MM3. In this case, the MM3 can be inserted at any subrack slot. The MM3 memory is not used.

Front panel elements

- 10-digit, 7-segment displays H1 - H10 for seconds, minutes, hours, months, days located under one another in pairs (from top to bottom)
- 2 keys to manually set the clock
- 4 LEDs for status displays
- Screw/plug-in terminal (X5) for **system error signal relay**:
  When a CPU module identifies a fatal error, normal operation is aborted; the subrack goes into the STOP condition,
  the relay opens when an error occurs
- Screw/plug-in terminal (X6) is prepared for IRIG-B audio signal;
  this functionality has still not been implemented!
- BNC socket (X7) for DCF-77 antenna connection
- 1 double test socket for the reset signal (X10/X11) to reset the module (caution: This must only be used for test purposes!)

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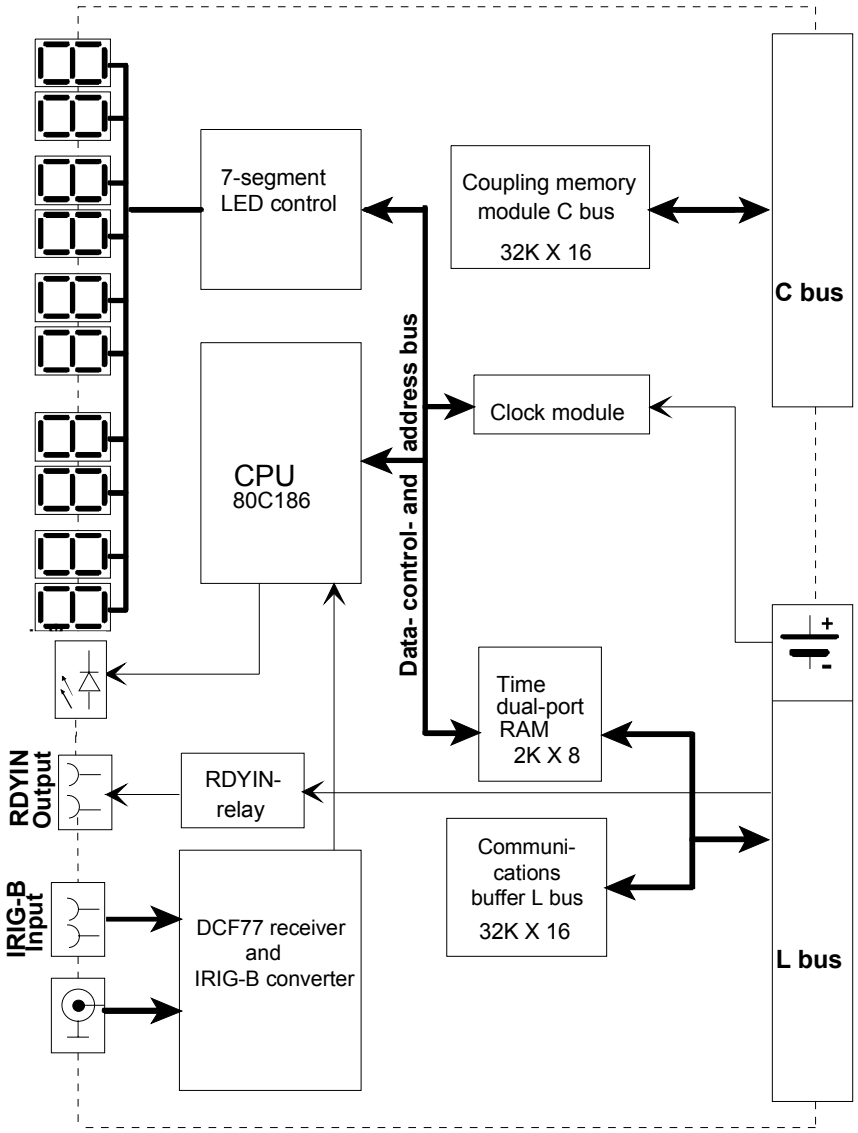


Fig. 4-1 MM3 block diagram

Note: Led H1 (seconds) is located at the top, H10 (days) at the bottom!

Radio clock DCF-77

The time is synchronized (time of day setting) via antenna using the **DCF-77 radio signal**. This signal can be received in Central Europe.

A differentiation is made between the following antennas:

- antenna for inside installation
- antenna for outside installation

The antenna must be aligned so that optimum reception is guaranteed. Generally, this is towards Frankfurt/Main, where the signal transmitter is located. The BNC socket X7 at the front panel is used to connect the antenna.

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NOTE

The **antenna for outdoor installation** normally ensures better reception, as the rooms, in which SIMADYN D is used, are generally screened and/or can accommodate devices/equipment which emit noise radiation.

Time displayRadio clock DCF-77:Time display

If the time display flashes, then the time hasn't been set after power-up (voltage on).

Setting the clock time

The clock can be set in 3 different ways:

- using the **DCF-77 radio signal**:
  The clock is set using the antenna signal when the appropriate data is configured at the IS input of function block RTCM, an antenna is connected and the reception conditions are OK (refer below).

  The complete time of day is received after approximately 2 minutes as a result of the telegram data transfer time of the DCF-77. The clock display flashes for this time after power-up.

- when the signal at input IS changes from 0 to 1 at **function block RTCM**, the time of day, available at its connections, is transferred.

- the time of day can always be **manually** set using two keys:

  – using upper key S1, all numerical pairs (digit pairs) of the 7-segment display are selected one after the other. They flash after they have been selected.

  – using lower key S2, a „1“ is added to the value in the flashing display, each time the key is depressed. When seconds is selected the value is set to zero.

  – after the seconds display has been selected, the next time that S1 is depressed, the year is displayed on the two upper digit pairs (H1, H2) - the year - can be set.

  – after all of the digit pairs have been selected, the next time that S1 is depressed, the setting mode is exited. The display stops flashing.

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Receive status

LEDs H20 to H23 are loaded on the front panel. They indicate the status of the clock receiver (time of day receiver).

LED	Color	Function	Description
H20	Green	Lit	The module has been initialized to receive the DCF77 signal
		Dark	The module has been initialized to receive the IRIG-B signal
H21	Red	Flashes in a second rhythm	The time signal is received
		Lit	The signal does not contain information - check the signal cable!
H22	Green	Dark	The time signal contains incorrect information
		Lit	The information is received for at least 10 seconds in the correct format
H23	Red	Lit	Time telegram error
		Dark	Decoding running

Ordering data, radio clock antenna

Order designation	Supplier
FG443610 antenna for indoor installation 4436 (long distance)	Hopf Elektronik Nottebohmstr. 41 58511 Lüdenscheid
FG441800 antenna for outdoor installation 4418	

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4.1.2 Technical data MM11, MM3, MM4

General data

No. of slots occupied	1
Dimensions W x H x D [mm]	20.14 x 233.4 x 220
Weight	MM11: Approx. 0.51 kg MM3: 0.7 kg MM4: 0.5 kg

Power supply voltage

Rated voltage	min.	max.	**Typ. current drain**
+5 V	+4.75 V	+5.25 V	MM11: 300 mA MM3: 600 mA MM4: 800 mA
+15 V	+14.4 V	+15.6 V	MM3: 50 mA
Back-up battery	2.2 V	3.9 V	20 µA

System error relay

RDYIN signal output for MM3 and MM4:

Description	**Values**
Voltage	max. 60 V DC
Switching current	max. 0,5 A
NC contact interrupt time	100 ms
Switching power	max. 20 W

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5 Input/output modules

Overview

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5.3	Expansion module IT41	5-16
5.4	Expansion module IT42	5-33
5.5	Converter control ITDC	5-45

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5.1 Input/output modules EA12

Order No. 6DD1642-0BC0

Features
- 8 analog outputs
- 20-pin connector for the analog outputs
- 8 test socket pairs (2.3 mm) on the front panel to connect measuring equipment (for start-up)
- L bus connection

Load capability An analog output (signal at the connector and interface module and at the test socket) can be loaded **up to 10 mA** and is short-circuit proof for 2 min.

Adjustment, temperature The manufacturer adjusts the outputs as far as offset and gain are concerned for an ambient temperature of approximately 20° C:
This adjustment is made using 2 **potentiometers** for each output, which are not sealed so that they can be re-adjusted in operation (e. g. due to different ambient temperatures).
The temperature dependency is max. approx. +/-240 µV at a temperature change of +/-1° C.

Analog output	Offset	Gain
Output 1	-R49	-R46
Output 2	-R55	-R52
Output 3	-R61	-R58
Output 4	-R67	-R64
Output 5	-R73	-R70
Output 6	-R79	-R76
Output 7	-R85	-R82
Output 8	-R91	-R88

Table 5-1 Adjustment potentiometers for analog outputs

Adjustment The module should be operated for approx. 2 min before any adjustment is made so that it has time to reach its operating temperature.
The **offset adjustment** is first made. The value 0.0 (0%) should be output in the configured software at the connection of the associated function block, and the associated offset potentiometer should be adjusted until 0 V is measured.
The output voltage is increased by rotating the potentiometer clockwise.
The **gain is then adjusted**. The associated analog output should be driven with 2.0 (200%) (configured software) and the associated offset potentiometer should be adjusted until 10 V is measured.

Noise signals at the outputs The switch-mode power supply causes voltage spikes (these can be measured up to 100 mV) on the ground cable. They can be suppressed by:
- smoothing at the load input
- low-ohmic load

5.1.1 Supplementary components

Interface modules with terminals All of the cables for the output signals are not directly connected at the module, but via interface modules. The interface modules serve as mechanical connecting element (**screw/plug-in terminals**) and toelectrically adapt the system/plant signals (optional).

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Interface module	Function
SU11	20 signals can be directly connected, no signal conversion

Table 5-2 Interface modules which can be connected at the module

Cables

- The module is connected to the interface modules using matching plug-in cables:
- **SC12** to connect an SU11

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5.1.2 Connector assignment X5

SU11 terminal assignment

EA12 X5	Significance	Associated test socket	SU11	Connector designation when configuring
1	Analog output 1	X11 SIG	1	X5A
2	Ground	X11 COM	2	
3	Analog output 2	X12 SIG	3	X5B
4	Ground	X12 COM	4	
5	Analog output 3	X13 SIG	5	X5C
6	Ground	X13 COM	6	
7	Analog output 4	X14 SIG	7	X5D
8	Ground	X14 COM	8	
9	Analog output 5	X15 SIG	9	X5E
10	Ground	X15 COM	10	
11	Analog output 6	X16 SIG	11	X5F
12	Ground	X16 COM	12	
13	Analog output 7	X17 SIG	13	X5G
14	Ground	X17 COM	14	
15	Analog output 8	X18 SIG	15	X5H
16	Ground	X18 COM	16	
17	Electronics ground (connected with the electronics ground via 0 Ohm resistor)	---	17	
18	Electronics ground (connected with the electronics ground via 0 Ohm resistor)	---	18	
19	Ground	---	19	
20	Ground	---	20	

Table 5-3 EA12 connector- and SU11 terminal assignment

All of the **"ground" terminals** are connected together via 0 Ohm resistors and are connected to electronics ground via an associated inductance.

5.1.3 Application information and noise immunity

- operation **without fan** is possible
- noise-immune operation is only possible if the module is tightly screwed into the subrack

Screening

The input/output signals must be screened on the plant/system side. The screen must be connected through the largest possible surface area to the screen rail between the interface module and where the cable enters or exits the cabinet.

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Ground connections

The front panel and if relevant, a connector housing, initially have no contact to the electronics ground of the module. The front panel is only connected to the electronics ground of the module via the backplane bus connector (L/C bus connection) and a cable connection, which can be released, between the backplane bus and the subrack housing.

Other information

Further information on EMC and ambient conditions, refer to Section "General technical data"

5.1.4 Technical data

General data

No. of slots occupied	1
Dimensions W x H x D [mm]	20.14 x 233.4 x 220
Weight	Approx. 0.5 kg

Power supply

Rated voltage	min.	max.	**Typ. current drain**
+5 V	+4.75 V	+5.25 V	600 mA
+15 V	+14.4 V	+15.6 V	200 mA
-15 V	-15.6 V	-14.4 V	200 mA

Analog outputs

No.		8
Output voltage, min.		- 10 V
Output voltage, max.		+ 10 V
Output current		+/- 10 mA max.
Output current (at +/- 10 V)		+/- 5 mA (recommended to suppress noise)
Resolution		13 bits + sign (corresponds to 1 mV)
Accuracy		14 bits (corresponds to 1 mV)
Short-circuit protection to ground		With 56 Ohm resistor
Short-circuit duration		120 s
Total load		All outputs simultaneously, each 10 mA
Temperature dependency		Max. 240 µV/degrees
Error		
	absolute linearity	+/-0.6 mV
	differential linearity	+/- 1 mV
	monotony	14 bits (corresponds to 1 mV)

5

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5.1.5 Connecting diagram

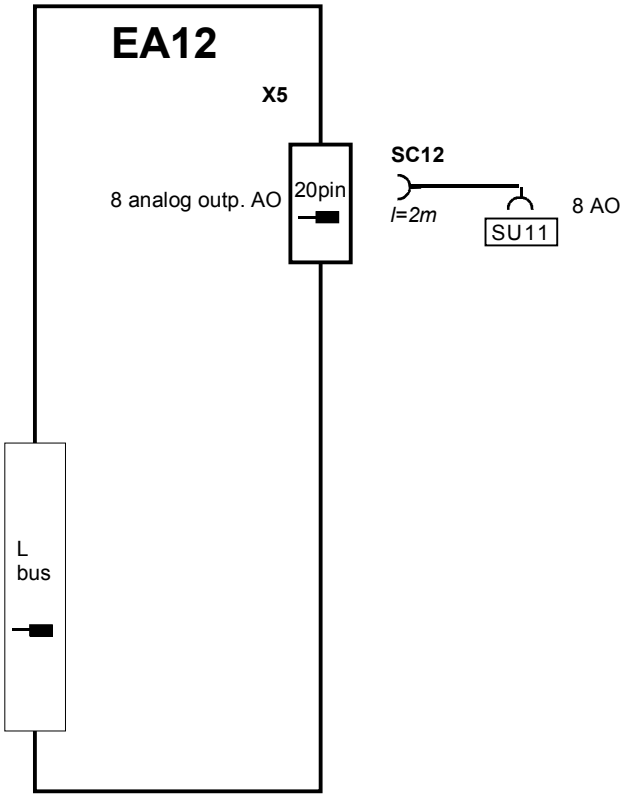


Fig. 5-1 Connecting cables and interface modules

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5.2 Input/output module EB11

Order No. 6DD1641-0AC0

Features

- 32 binary inputs and outputs
- 2 40-pin connectors
- 2*8 binary inputs and outputs per connector
- binary outputs with thermal overload protection
- 2 LED keys to reset after an overload condition
- L-bus connection

Overload protection

An overloaded binary output due to an excessively high current (thermal overload, e. g. short-circuit) is electronically shutdown. The output is switched into an open-circuit condition. The LED key of the associated connector lights-up.
The associated output is operational again after a recovery time (during which time it cools-down). To realize this, the associated electronics must be **reset**; this can be done in 2 ways:

- Using the **background program** of the CPU module, on which the associated binary output function block is configured.
  For a normal CPU utilization, this reset takes several seconds after cooling-down.
  Resetting can take somewhat longer for extremely high CPU loading levels.
- By depressing the illuminated **LED key**.
  Key assignment:
  - connector X5: Key S1
  - connector X6: Key S2

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5.2.1 Supplementary components

Interface modules with terminals

All of the cables for the input / output signals are not directly connected to the module, but via interface modules. The interface modules are used as mechanical connecting element (**screw/plug-in terminals**) and also to electrically adapt the plant/system signals and convert them (optional).

Interface module	Function
SB10	Direct connection (1:1 connection) of 8 binary inputs/outputs, LED, no signal conversion
SB60	8 binary **inputs**, converted from 230V to 24V (module signal level), LED, electrically isolated (floating)
SB61	8 binary **inputs**, converted from 48V to 24V, LED, electrically isolated (floating)
SB70	8 binary **outputs**, converted from 24V to 230V (changeover relay), LED, electrically isolated (floating)
SB71	8 binary **outputs**, converted from 25V to 48V (transistor)
SU11	20 signals are directly connected, no signal conversion
SU12	10 signals are directly connected, no signal conversion

Table 5-4 Interface modules which can be connected to the module

Cables

The module is connected to the interface modules using the matching plug-in cables. A plug-in cable has several cable ends to connect several interface modules:

- SC13 to connect 4 interface modules (SBxx, SU12)
- SC55 to connect 2 SU11

Depending on the required function (signal conversion, LED display), different interface modules can be connected at the binary inputs and outputs. If interface modules with signal conversion are used, the SC13 cable must be selected:

Cable **SC55** max. **2** interface modules, type	**SC13** cable max. **4** interface modules, type
SU11 (20 screw terminals, no signal conversion)	SB10 SB60 SB61 SB70 SB71 SU12

Table 5-5 Cable and interface modules which can be connected to EB11, connectors X5, X6

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5.2.2 Connector- and terminal assignment

5.2.2.1 Terminal assignment for SC55

SU11 terminal assignment at SC55, end A

EB11 X5, X6	Significance	SU11 at SC55, cable end A	Connector designation when configuring
1	Binary output 1	1	
2	Binary output 2	2	
3	Binary output 3	3	
4	Binary output 4	4	
5	Binary output 5	5	X5A
6	Binary output 6	6	X6A
7	Binary output 7	7	
8	Binary output 8	8	
9	External 24 V	9	
10	External ground	10	
11	Binary output 9	11	
12	Binary output 10	12	
13	Binary output 11	13	
14	Binary output 12	14	
15	Binary output 13	15	X5B
16	Binary output 14	16	X6B
17	Binary output 15	17	
18	Binary output 16	18	
19	External 24 V	19	
20	External ground	20	

*Table 5-6 SU11 terminal assignment for SC55, cable **end A***

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SU11 terminal assignment at SC55, end B

EB11 X5, X6	Significance	SU11 at SC55, cable end B	Connector designation when configuring
1	Binary input 1	1	
2	Binary input 2	2	
3	Binary input 3	3	
4	Binary input 4	4	X5C
5	Binary input 5	5	X6C
6	Binary input 6	6	
7	Binary input 7	7	
8	Binary input 8	8	
9	External 24 V	9	
10	External ground	10	
11	Binary input 9	11	
12	Binary input 10	12	
13	Binary input 11	13	
14	Binary input 12	14	
15	Binary input 13	15	X5D
16	Binary input 14	16	X6D
17	Binary input 15	17	
18	Binary input 16	18	
19	External 24 V	19	
20	External ground	20	

*Table 5-7 SU11 terminal assignment for SC55, cable **end B***

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5.2.2.2 Terminal assignment for SC13

At the particular cable ends, only certain signal types are available, where only the correct interface modules can be used:

Terminal assignment, interface module

Interface module	Screw terminal *(x=1...8)*	Significance
SB10		**1:1 screw terminal**
	x	Signal
	5x	Reference potential (ground or P24)
SB60		**Binary inputs 115/230 V**
	x1	Ground
	x2	Binary input 115 V
	x4	Binary input 230 V
SB61		**Binary inputs 24/48 V**
	x	Binary input 24 V
	1x	Binary input 48 V
	5x	Reference
SB70		**Binary outputs (relay)**
	x1	Common (center contact)
	x2	NC contact
	x4	NO contact
SB71		**Binary outputs (transistor)**
	x	Signal
	5x	Ground

Table 5-8 Terminal assignment, interface module

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Terminal assignment at SC13, end A

EB11 X5,X6	Significance	SU12	SB10	SB60	SB61	SB70	SB71
1	Binary output 1	1	1/51			12/11/14	1/51
2	Binary output 2	2	2/52			22/21/24	2/52
3	Binary output 3	3	3/53			32/31/34	3/53
4	Binary output 4	4	4/54			42/41/44	4/54
5	Binary output 5	5	5/55			52/51/54	5/55
6	Binary output 6	6	6/56			62/61/64	6/56
7	Binary output 7	7	7/57			72/71/74	7/57
8	Binary output 8	8	8/58			81/82/84	8/58
9	External 24 V	9	1P			1P	1P
10	External ground	10	1M			1M	1M

*Table 5-9 Terminal assignment, interface modules at SC13, cable **end A***

Terminal assignment at SC13, end B

EB11 X5,X6	Significance	SU12	SB10	SB60	SB61	SB70	SB71
1	Binary output 1	1	1/51			12/11/14	1/51
2	Binary output 2	2	2/52			22/21/24	2/52
3	Binary output 3	3	3/53			32/31/34	3/53
4	Binary output 4	4	4/54			42/41/44	4/54
5	Binary output 5	5	5/55			52/51/54	5/55
6	Binary output 6	6	6/56			62/61/64	6/56
7	Binary output 7	7	7/57			72/71/74	7/57
8	Binary output 8	8	8/58			81/82/84	8/58
9	External 24 V	9	1P			1P	1P
10	External ground	10	1M			1M	1M

*Table 5-10 Terminal assignment, interface modules at SC13, cable **end B***

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Terminal assignment at SC13, end C

EB11 X5,X6	Significance	SU12	SB10	SB60	SB61	SB70	SB71
21	Binary input 1	1	1/51	14,12/11	1,11/51		
22	Binary input 2	2	2/52	24,22/21	2,12/52		
23	Binary input 3	3	3/53	34,32/31	3,13/53		
24	Binary input 4	4	4/54	44,42/41	4,14/54		
25	Binary input 5	5	5/55	54,52/51	5,15/55		
26	Binary input 6	6	6/56	64,62/61	6,16/56		
27	Binary input 7	7	7/57	74,72/71	7,17/57		
28	Binary input 8	8	8/58	84,82/81	8,18/58		
29	External 24 V	9	1P	1P	1P		
30	External ground	10	1M	1M	1M		

*Table 5-11 Terminal assignment, interface modules at SC13, cable **end C***

Terminal assignment at SC13, end D

EB11 X5,X6	Significance	SU12	SB10	SB60	SB61	SB70	SB71
31	Binary input 9	1	1/51	14,12/11	1,11/51		
32	Binary input 10	2	2/52	24,22/21	2,12/52		
33	Binary input 11	3	3/53	34,32/31	3,13/53		
34	Binary input 12	4	4/54	44,42/41	4,14/54		
35	Binary input 13	5	5/55	54,52/51	5,15/55		
36	Binary input 14	6	6/56	64,62/61	6,16/56		
37	Binary input 15	7	7/57	74,72/71	7,17/57		
38	Binary input 16	8	8/58	84,82/81	8,18/58		
39	External 24 V	9	1P	1P	1P		
40	External ground	10	1M	1M	1M		

*Table 5-12 Terminal assignment, interface modules at SC13, cable **end D***

5.2.3 Application information and noise immunity

- operation **without fan** is possible
- noise-immune operation is only possible if the module is tightly screwed into the subrack

Other information

Further information on EMC and ambient conditions, refer to Section "General technical data"

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5.2.4 Technical data

General data

No. of slots occupied	1
Dimensions W x H x D [mm]	20.14 x 233.4 x 220
Weight	Approx. 0.6 kg

Power supply

Rated voltage	min.	max.	**Typ. current drain**
+5 V	+4.75 V	+5.25 V	420 mA
-15 V	-15.6 V	-14.4 V	20 mA (only as reference)
+24V	+20 V	+30 V	0,2 A (from an external power supply) + current drain of the connected SB70, SB71 interface modules + current drain from the binary outputs which are directly connected at the binary outputs of the connected components (when using SB10, SU11, SU12)

Binary inputs

No.		2 x 16
Input voltage		+24 V rated value
	for 0 signal	-1 V to +6 V; or open-circuit binary inputs
	for 1 signal	+13 V to +33 V
Input current for an 1 signal		5 mA typ.
Delay time		200 µs

Binary outputs

No.		2 x 16
Power supply voltage		
	rated value	+24 V DC
	ripple	3.6 V DC
	permissible range	+20 to +30 V, including ripple
	briefly	+35 V for < 0.5 s
Output current for a 1 signal		
	rated value	50 mA
	permissible range	0.2 mA to 50 mA
Short-circuit protection		Thermal / electronic
Limiting inductive switch-off voltage		To the supply +1 V
Residual current		20 µA for a 0 signal
Signal level		
	for 0 signal	Max. 3 V
	for 1 signal	Min. supply - 2.5 V
Delay time		15 µs

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5.2.5 Connecting diagram

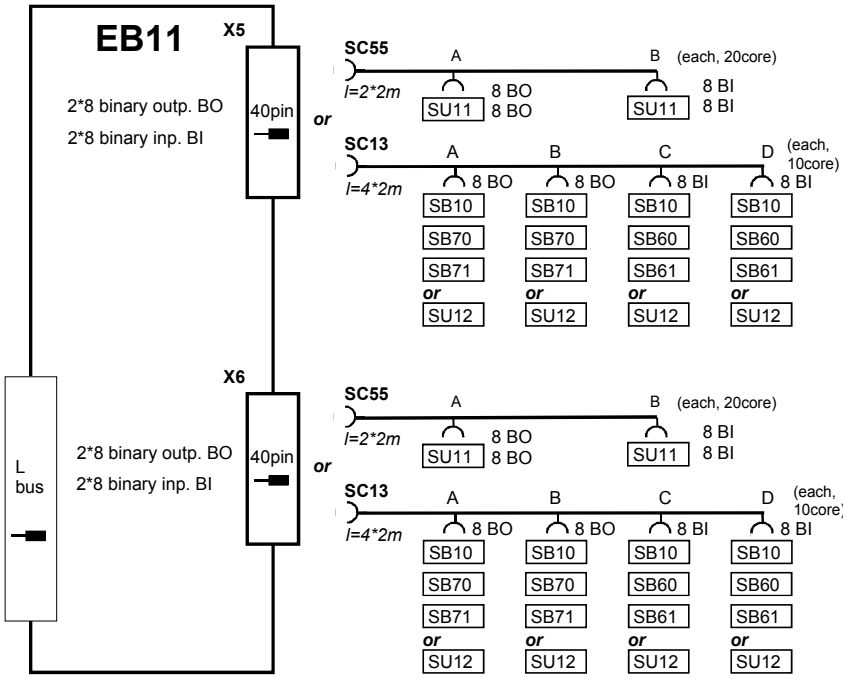


Fig. 5-2 Connecting cables and interface modules

5

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5.3 Expansion module IT41

Order No. 6DD1606-3AC0

Description The IT41 expansion module provides
incremental encoder inputs and
analog and binary inputs and outputs
The expansion module is inserted on a CPU module (PM5, PM6). A maximum of 2 expansion modules ITxx can be inserted on a CPU module. An ITxx occupies 1 slot (in addition to the mounting slot of the CPU module itself).

Inputs and outputs

- 4 analog outputs
- 4 analog inputs
- 16 binary outputs
- 16 binary inputs
- 4 incremental encoders with monitoring tracks
- 1 alarm (interrupt) input for each incremental encoder
- 1 alarm (interrupt) reset output for each incremental encoder

Block diagram

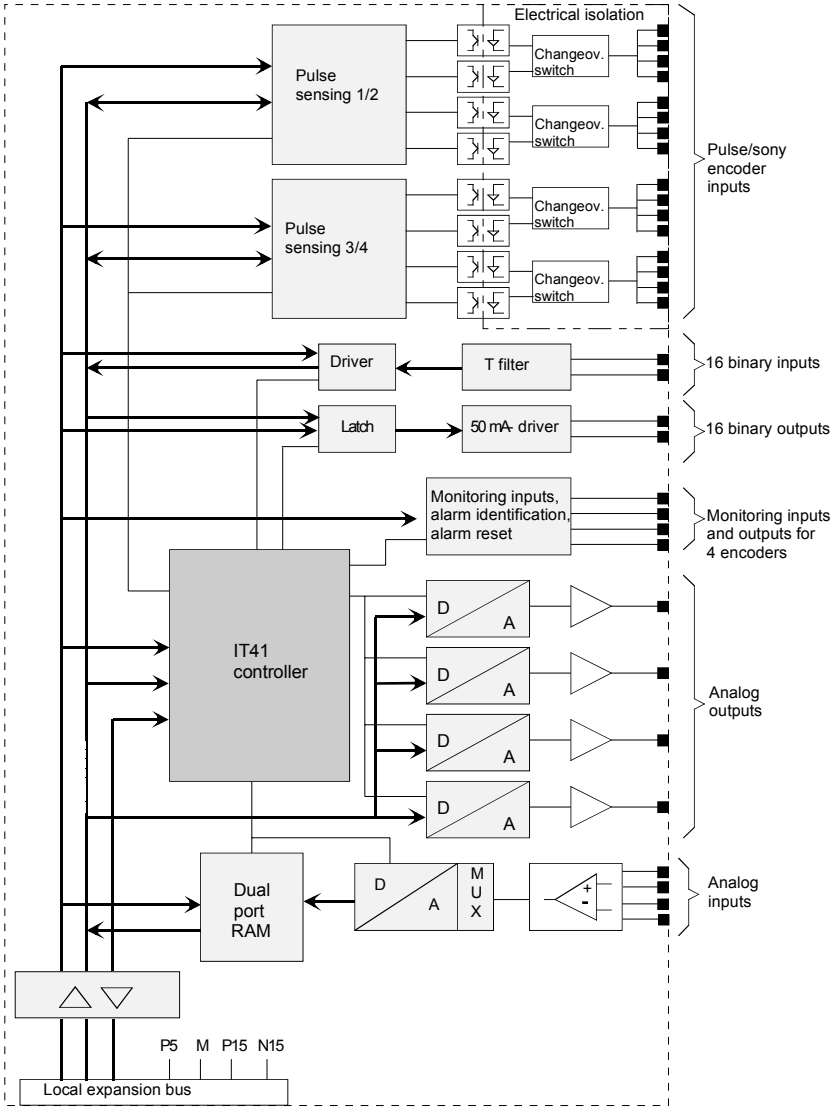


Fig. 5-3 Block diagram of IT41

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Incremental encoder types

Incremental encoders can be connected to IT41, with:

- 2 tracks, displaced through 90º, A, B and if required zero pulse
- separate pulses for forwards- and reverse pulses, e. g. Sony encoders

The selection is configured at the speed actual value function block.

Selecting the encoder signal voltage

Incremental encoders with the following signal voltages can be connected to IT41

- 15V
- 5V (also as push-pull signals or RS485 differential signals)

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Coding plug

The signal voltage is selected, i. e. the associated receive driver is connected by inserting 2 coding plugs, lying one behind the other, into a certain setting (also refer to the following diagram).
If the coding plug is used so that the closed wire jumper is towards the front panel of the IT41, then a **5V encoder** has been selected.
If the interrupted jumpers point towards the front panel, a **15V encoder** has been selected. This is the **factory setting**.

NOTE

15V encoders with separate forwards/reverse tracks cannot be used without any further measures.

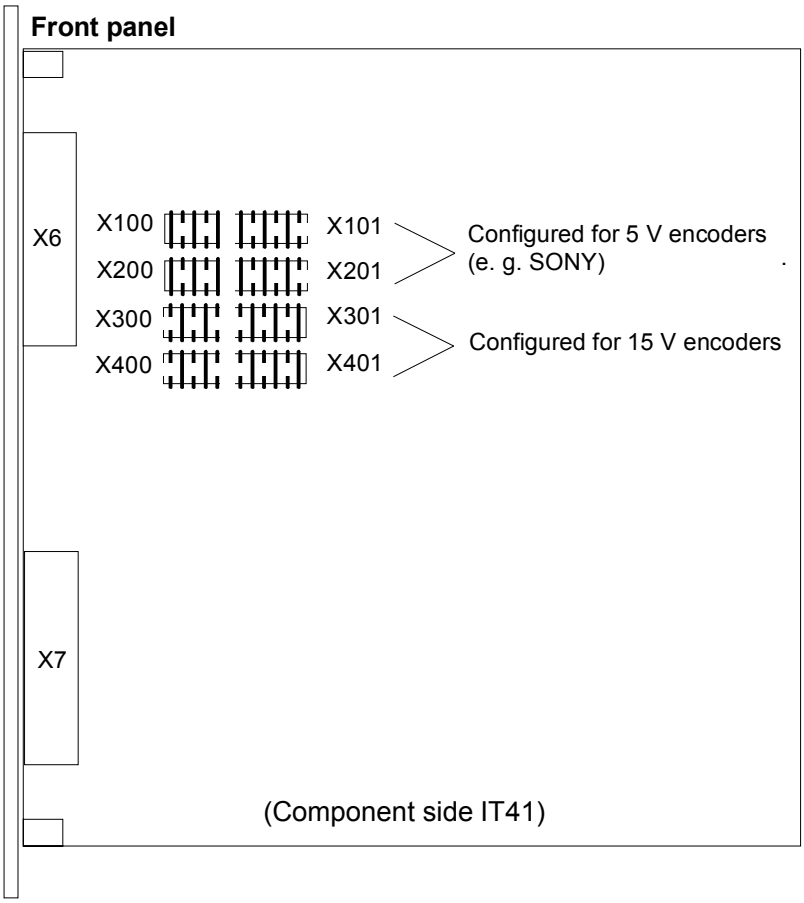


Fig. 5-4 Assignment of the coding plug for incremental encoders

WARNING

If coding plugs are incorrectly inserted, the inputs could be destroyed when pulses are input!

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5.3.1 Supplementary components

Interface modules with terminals

All of the cables for the input/output signals are not directly connected to the module, but via interface modules. The interface modules serve as mechanical connecting element (**screw/plug-in terminals**) as well as electrically adapting and converting the plant signals (optional).

Interface module	Function
SB10	Direct connection (1:1 connection) of 8 binary inputs/outputs, LED, no signal conversion
SB60	8 binary **inputs**, converted from 230V to 24V (module signal level), LED, electrical isolation (floating)
SB61	8 binary **inputs**, converted from 48V to 24V, LED, electrical isolation (floating)
SB70	8 binary **outputs**, converted from 24V to 230V (changeover relay), LED, electrical isolation (floating)
SB71	8 binary **outputs**, converted from 25V to 48V (transistor)
SU10	25 signals can be directly connected, no signal conversion
SU12	10 signals can be directly connected, no signal conversion

Table 5-13 Interface modules which can be connected to the module

Cables

The module is connected to the interface modules using the matching plug-in cables. Cables for large connectors have several cable ends to which the appropriate number of matching interface modules can be connected. Interface modules with or without signal conversion (e. g. signal level adaption, electrical isolation) and LED display can be used at connectors with binary inputs and outputs.
The cable selection depends on the interface modules used:

Connector IT41	Signals	Cable	Interface module
X6	Incremental encoder analog outputs	SC49	2 x SU10
X7	Analog inputs binary inputs/outputs	SC49 or SC54	2 x SU10 or 5 x SB10 SB60 SB61 SB70 SB71 SU12

Table 5-14 Cables to be used with the various modules

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5.3.2 Connector assignment X6

Connector X6 (50 pin, sub D) connects signals for

- 4 incremental encoders
- 4 analog outputs

Two **SU10** interface modules can be connected via an **SC49** plug-in cable ("1:1" connection from the module to terminals):

SU10 encoder connections at SC49, end A

IT41 X6	Encoder with tracks displaced through 90°		Encoder with forwards/ reverse tracks	SU 10 at the cable end A	Connector designation when configuring
1	Encoder 1	Track A+	V+	1	X6A
34		Track A-	V-	2	
18		Track B+	R+	3	
2		Track B-	R-	4	
35		Zero pulse+	-	5	
19		Zero pulse-	-	6	
3	Encoder 2	Track A+	V+	7	X6B
36		Track A-	V-	8	
20		Track B+	R+	9	
4		Track B-	R-	10	
37		Zero pulse+	-	11	
21		Zero pulse-	-	12	
5	Encoder 3	Track A+	V+	13	X6C
38		Track A-	V-	14	
22		Track B+	R+	15	
6		Track B-	R-	16	
39		Zero pulse+	-	17	
23		Zero pulse-	-	18	
7	Encoder 4	Track A+	V+	19	X6D
40		Track A-	V-	20	
24		Track B+	R+	21	
8		Track B-	R-	22	
41		Zero pulse+	-	23	
25		Zero pulse-	-	24	
9	Encoder power supply approx. +15 V DC, max. 100 mA			25	
Not assigned				26	

*Table 5-15 Pin assignment IT41, connector X6 and terminal assignment SU10 at SC49, **end A***

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SU10 terminal assignment at SC49, end B

IT41 X6	Encoder with tracks displaced through 90°	Encoder with forwards/ reverse tracks	SU 10 at cable end B	Connector designation when configuring
42	Encoder ground		1	
26	Encoder ground		2	
10	Monitoring input, encoder 1		3	
43	Monitoring input, encoder 2		4	
27	Monitoring input, encoder 3		5	
11	Monitoring input, encoder 4		6	
44		Alarm input 1	7	
28		Alarm input 2	8	
12		Alarm input 3	9	
45		Alarm input 4	10	
29		Alarm output 1	11	
13		Alarm output 2	12	
46		Alarm output 3	13	
30		Alarm output 4	14	
14		Alarm ground	15	
47	Ground (de-coupled)	Analog outputs	16	
31	Ground (de-coupled)	Analog outputs	17	
15	Analog output 1		18	X6E
48	Ground		19	
32	Analog output 2		20	X6F
16	Ground		21	
49	Analog output 3		22	X6G
33	Ground		23	
17	Analog output 4		24	X6H
50	Ground		25	

Table 5-16 Pin assignment IT41, connector X6 and terminal assignment SU10 at SC49, ***end B***

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5.3.3 Connector assignment X7

Connector X7 (50 pin, sub D) connects signals for:

- 4 analog inputs
- 2*8 binary inputs and 2*8 binary outputs

Depending on the required function (signal conversion, LED display) different interface modules can be connected to the binary inputs and outputs. If interface modules with signal conversion are used, the SC54 cable must be used:

SC49 cable **max. 2 interface modules, type**	**SC54 cable** **max. 5 interface modules, type**
SU10 (25 screw terminals, no signal conversion)	SB10 SB60 SB61 SB70 SB71 SU12

Table 5-17 Cables and interface modules which can be connected at IT41, connector X7

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5.3.3.1 Connector assignment X7 for SC49

SU10 terminal assignment at SC49, end A

IT41 X7	Significance	SU 10 at SC49, cable end A	Connector designation when configuring
1	Binary output 1	1	X7A
34	Binary output 2	2	
18	Binary output 3	3	
2	Binary output 4	4	
35	Binary output 5	5	
19	Binary output 6	6	
3	Binary output 7	7	
36	Binary output 8	8	
20	External P24 voltage	9	
4	External ground	10	
37	Binary output 9	11	X7B
21	Binary output 10	12	
5	Binary output 11	13	
38	Binary output 12	14	
22	Binary output 13	15	
6	Binary output 14	16	
39	Binary output 15	17	
23	Binary output 16	18	
7	External P24 voltage	19	
40	External ground	20	
24	Binary input 1	21	X7C
8	Binary input 2	22	
41	Binary input 3	23	
25	Binary input 4	24	
9	Binary input 5	25	

*Table 5-18 SU10 terminal assignment for SC49, cable **end A***

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SU10 terminal assignment at SC49, end B

IT41 X7	Significance	SU 10 at SC49, cable end B	Connector designation when configuring
42	Binary input 6	1	X7C
26	Binary input 7	2	
10	Binary input 8	3	
43	External P24 voltage	4	
27	External ground	5	
11	Binary input 9	6	X7D
44	Binary input 10	7	
28	Binary input 11	8	
12	Binary input 12	9	
45	Binary input 13	10	
29	Binary input 14	11	
13	Binary input 15	12	
46	Binary input 16	13	
30	External P24 voltage	14	
14	External ground	15	
47	Reference ground for differential analog input	16	
31	Reference ground for differential analog input	17	
15	Analog input 1+	18	X7E
48	Analog input 1-	19	
32	Analog input 2+	20	X7F
16	Analog input 2-	21	
49	Analog input 3+	22	X7G
33	Analog input 3-	23	
17	Analog input 4+	24	X7H
50	Analog input 4-	25	

*Table 5-19 SU10 terminal assignment for SC49, cable **end B***

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5.3.3.2 Connector assignment X7 for SC54

Only specific signal types are available at the cable ends, where only the matching interface modules can be used:

Terminal assignment, interface modules

Interface module	Screw terminal *(x=1...8)*	Significance
SB10		**1:1 screw terminal connection**
	x	Signal
	5x	Reference potential (ground or P24)
SB60		**Binary inputs 115/230 V**
	x1	Ground
	x2	Binary input 115 V
	x4	Binary input 230 V
SB61		**Binary inputs 24/48 V**
	x	Binary input 24 V
	1x	Binary input 48 V
	5x	Reference
SB70		**Binary outputs (relay)**
	x1	Common (center contact)
	x2	NC contact
	x4	NO contact
SB71		**Binary outputs (transistor)**
	x	Signal
	5x	Ground

Table 5-20 Terminal assignment, interface modules

Terminal assignment at SC54, end A

IT41 X7	Significance X7A	SU12	SB10	SB60	SB61	SB70	SB71
1	Binary output 1	1	1/51			12/11/14	1/51
34	Binary output 2	2	2/52			22/21/24	2/52
18	Binary output 3	3	3/53			32/31/34	3/53
2	Binary output 4	4	4/54			42/41/44	4/54
35	Binary output 5	5	5/55			52/51/54	5/55
19	Binary output 6	6	6/56			62/61/64	6/56
3	Binary output 7	7	7/57			72/71/74	7/57
36	Binary output 8	8	8/58			81/82/84	8/58
20	External voltage (24 V)	9	1P			1P	1P
4	External ground	10	1M			1M	1M

*Table 5-21 Terminal assignment, interface module at connector X7,SC54 - **end A***

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Terminal assignment at SC54, end B

IT41 X7	Significance X7B	SU12	SB10	SB60	SB61	SB70	SB71
37	Binary output 9	1	1/51			12/11/14	1/51
21	Binary output 10	2	2/52			22/21/24	2/52
5	Binary output 11	3	3/53			32/31/34	3/53
38	Binary output 12	4	4/54			42/41/44	4/54
22	Binary output 13	5	5/55			52/51/54	5/55
6	Binary output 14	6	6/56			62/61/64	6/56
39	Binary output 15	7	7/57			72/71/74	7/57
23	Binary output 16	8	8/58			81/82/84	8/58
7	External voltage (24 V)	9	1P			1P	1P
40	External ground	10	1M			1M	1M

*Table 5-22 Terminal assignment, interface module at connector X7, SC54 - **end B***

Terminal assignment at SC54, end C

IT41 X7	Significance X7C	SU12	SB10	SB60	SB61	SB70	SB71
24	Binary input 1	1	1/51	14,12/11	1,11/51		
8	Binary input 2	2	2/52	24,22/21	2,12/52		
41	Binary input 3	3	3/53	34,32/31	3,13/53		
25	Binary input 4	4	4/54	44,42/41	4,14/54		
9	Binary input 5	5	5/55	54,52/51	5,15/55		
42	Binary input 6	6	6/56	64,62/61	6,16/56		
26	Binary input 7	7	7/57	74,72/71	7,17/57		
10	Binary input 8	8	8/58	84,82/81	8,18/58		
43	External voltage (24 V)	9	1P	1P	1P		
27	External ground	10	1M	1M	1M		

*Table 5-23 Terminal assignment, interface module at connector X7, SC54 - cable **end C***

Terminal assignment at SC54, end D

IT41 X7	Significance X7D	SU12	SB10	SB60	SB61	SB70	SB71
11	Binary input 9	1	1/51	14,12/11	1,11/51		
44	Binary input 10	2	2/52	24,22/21	2,12/52		
28	Binary input 11	3	3/53	34,32/31	3,13/53		
12	Binary input 12	4	4/54	44,42/41	4,14/54		
45	Binary input 13	5	5/55	54,52/51	5,15/55		
29	Binary input 14	6	6/56	64,62/61	6,16/56		
13	Binary input 15	7	7/57	74,72/71	7,17/57		
46	Binary input 16	8	8/58	84,82/81	8,18/58		
30	External voltage (24 V)	9	1P	1P	1P		
14	External ground	10	1M	1M	1M		

*Table 5-24 Terminal assignment, interface module at connector X7, SC54 - cable **end D***

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Terminal assignment at SC54, end E

IT41 X7	Significance X7E-X7H	SU12	SB10	SB60	SB61	SB70	SB71
47	Reference ground for differential analog inputs	1					
31	Reference ground for differential analog inputs	2					
15	Analog input 1+	3					
48	Analog input 1-	4					
32	Analog input 2+	5					
16	Analog input 2-	6					
49	Analog input 3+	7					
33	Analog input 3-	8					
17	Analog input 4+	9					
50	Analog input 4-	10					

*Table 5-25 Terminal assignment, interface module at connector X7, SC54 - **cable end E***

5.3.4 Mounting

The Itxx module is mounted outside the subrack on a PMx CPU module or is inserted on an Itxx module already mounted on a PMx (using the 96-pin plug connector on the module).

Distance pieces

All of the modules must be bolted together using the distance pieces provided (3 are provided)!

For the first ITxx

The first ITxx, located directly on a CPU modules must be retained using the **metal distance pieces** (these are included in the scope of supply of the PMx). This establishes the electrical contact which is required to identify the first expansion board.
The metal distance pieces are first retained on the PM4 using the M3 screws, washers and spring washers supplied.
If only **one ITxx** module is used, then it is screwed to the metal distance pieces using the M4 nuts provided (and washers).

For the second ITxx

If a second ITxx module is used, the first ITxx must be screwed using **plastic** distance pieces (these are included in the scope of supply of the ITxx modules).
The second ITxx module can then be inserted and retained using the M4 nuts provided (and washers).
The complete module assembly is then inserted in the subrack.

5.3.5 Application information and noise immunity

- operation **without fan** is possible
- noise-immune operation is only possible if the module is tightly screwed into the subrack

Other information

Further information on EMC and ambient conditions, refer to Section "General technical data"

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5.3.6 Technical data

General data

No. of slots occupied	1
Dimensions W x H x D [mm]	20.14 x 233.4 x 220
Weight	Approx. 0.6 kg

Power supply

Rated voltage	min.	max.	**Typ. current drain**
+5 V	+4.75 V	+5.25 V	420 mA
+15 V	+14.4 V	+15.6 V	450 mA + encoder load (max. 100 mA, electron. limited)
-15 V	-15.6 V	-14.4 V	175 mA
24 V (external)	20 V	30 V	100 mA + binary output currents

Analog inputs

Number	4
Type	Differential inputs, non-floating
Input voltage range	-10 V +/- 4 LSB to +10 V +/- 4 LSB (1 LSB = 4.88 mV)
Input resistance	470 kOhm
Input filter	3 dB transition frequency: 1.5 kHz
Resolution	12 bits
Absolute accuracy	Typ. 11 bits over the complete temperature range
Max. conversion time	45 µs

Analog outputs

Number	4
Type	Outputs with associated ground terminal, non-floating
Output voltage range	-10 V to +10 V
Output current	+/- 10 mA
Resolution	16 bits
Monotony	14 bits over the complete temperature range
Absolute accuracy	Typ. 13 bits over the complete temperature range
Short-circuit protection to ground	Yes

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Binary inputs

Number		16 non-floating
Input voltage		24 V DC rated voltage
	for 0 signal	-1 V to +6 V or open-circuit inputs
	for 1 signal	+13 V to +33 V
Input current		
	for 0 signal	0 mA
	for 1 signal	3 mA typ.
Delay time		50 µs

Binary outputs

Number		16, non-floating
Power supply voltage		From external
	nominal value	24 V DC
	perm. range	+20 V to 30 V including ripple
	briefly	+35 V, max. 0.5 s
Output current for 1 signal		
	nominal current	50 mA (corresponds to max. value)
Short-circuit protection		Electronically and thermally
Limiting inductive switch-off voltages		Power supply voltage + 1 V
Residual current		20 µA for 0 signal
Signal level		
	for 0 signal	Max. 3 V
	for 1 signal	Power supply voltage - 2.5 V
Switching delay		Max. 15 µs

15 V incremental encoders

Number of encoders		Total, max. 4 (including 5 V encoder)
Type		Differential inputs, electrical isolation (optocoupler)
Input voltage range		Differential voltage -30 V to +30 V
Input voltage (for 15 mA load)		
	for 0 signal	-30 V to +4 V
	for 1 signal	+8 V to + 30 V
Input current		Approx. 15 mA (electronically limited)
Pulse frequency		Max. 1 MHz (track frequency)
Phase difference of the track signals		Independent of the pulse frequency, min. 200 ns
Input filter		Can be configured via software (function block)

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5 V incremental encoders

Number of encoders		Total, max. 4 (including 15 V encoder)
Type		Differential inputs, floating (optocoupler)
Input voltage range		Differential voltage -6 V to +6 V
Input voltage		
	for 0 signal	-5 V to 0 V
	for 1 signal	+3 V to +5 V
Max. input current		15 mA Caution: Is not limited!
Pulse frequency		Max. 1 MHz (track frequency)
Input circuit, cable termination		
	steady-state	180 Ohm (series resistor)
	dynamic	100 Ohm (corresponds to the characteristic impedance of a twisted-pair cable)
Input filter		Can be configured via software (function block)

Alarm inputs

Number		4 (1 per encoder)
Type		Not floating
Input voltage range		0 V to +5 V
Input voltage		
	for 0 signal	< 1.4 V
	for 1 signal	> 2.0 V
Input current		
	for 0 signal	Min. -5 mA, max. -3.6 mA
	for 1 signal	Min. -3 mA, max. 0 mA

Alarm reset outputs

Number	4 (1 per encoder)
Type	Non-floating
Output voltage	15 V via 1 kOhm output resistance
Output voltage	5 V (for 10 mA load)

Sony encoder

A Sony encoder HA 705 LK / MSD-560 can be connected without any signal level adaption.

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5.3.7 Connecting diagrams

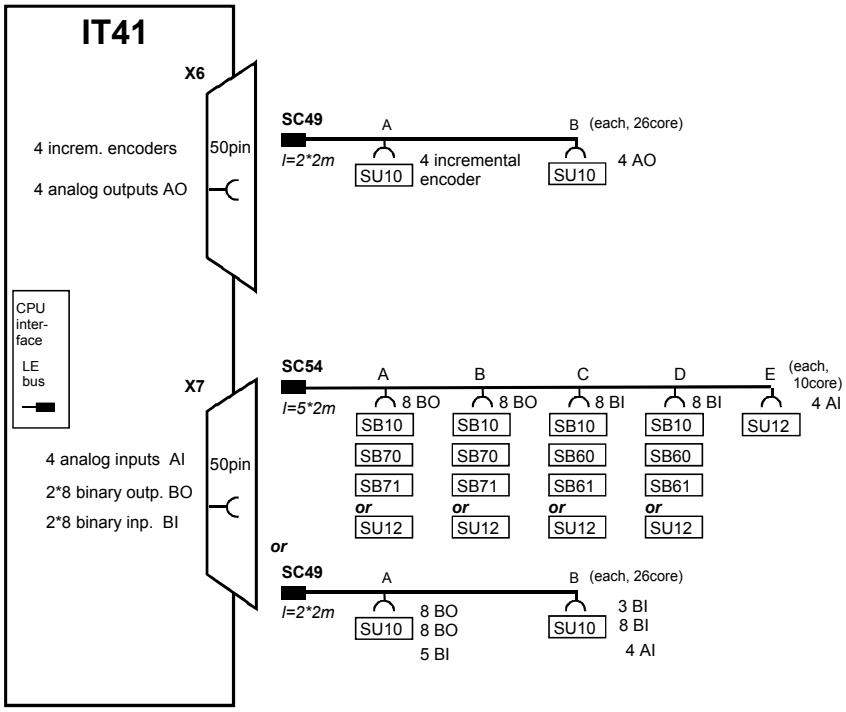


Fig. 5-5 Connecting cables and interface modules

Binary outputs with SB10

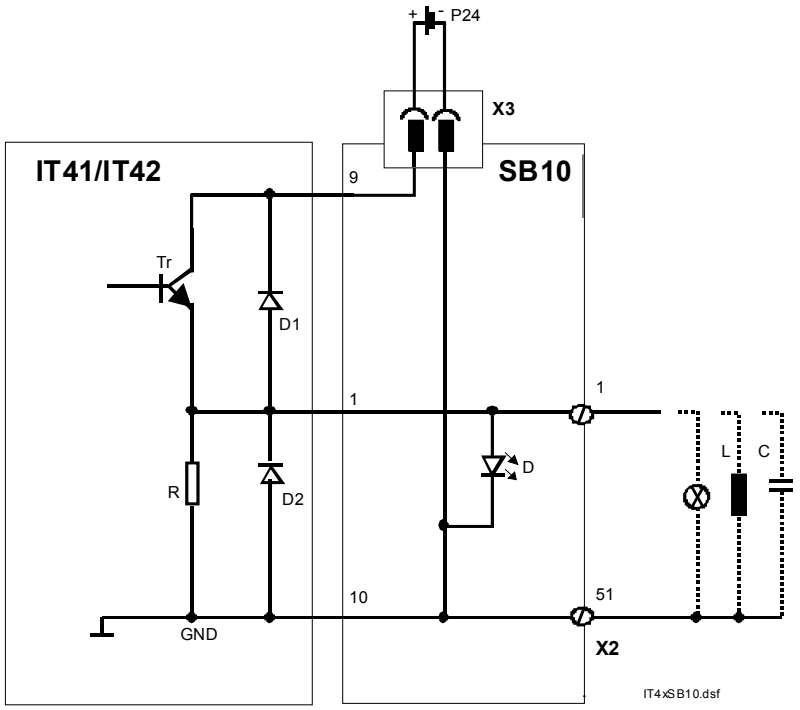


Fig. 5-6 Connecting binary outputs with SB10

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Binary outputs with SU10

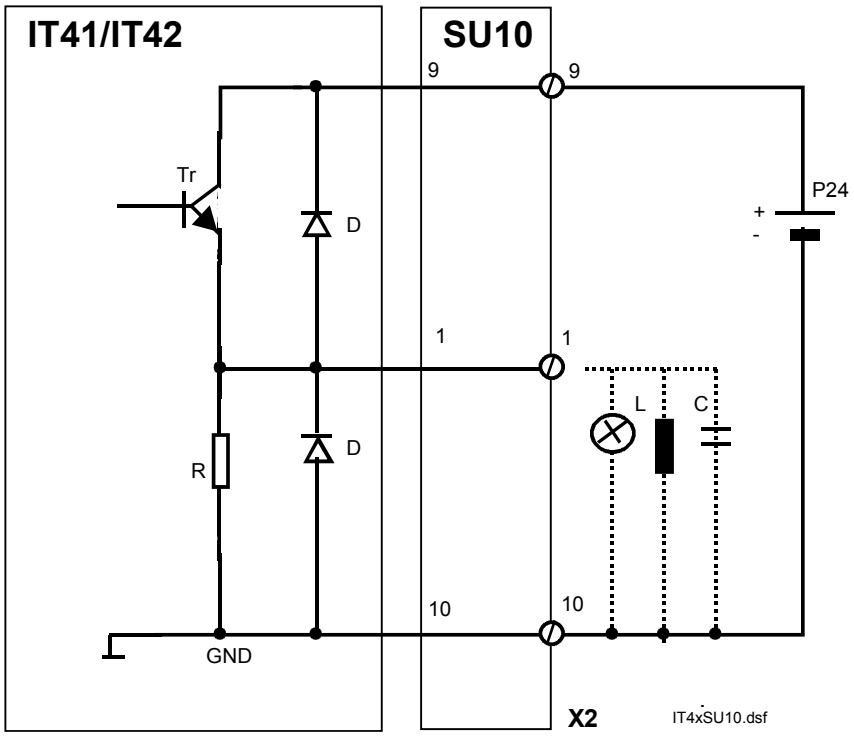


Fig. 5-7 Connecting binary outputs with SU10

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5.4 Expansion module IT42

Order No. 6DD1606-4AB0

Description

The IT42 expansion module provides analog and binary inputs and outputs

The expansion module is inserted on a CPU module (PM5, PM6). A maximum of 2 expansion modules ITxx can be inserted on a CPU module. An ITxx occupies 1 slot (in addition to the mounting slot of the CPU module itself).

Inputs and outputs

- 4 analog outputs
- 4 integrating, high-resolution analog inputs (V/fc voltage/frequency conversion)
- 4 analog inputs (ADU)
- 16 binary outputs
- 16 binary inputs

Block diagram

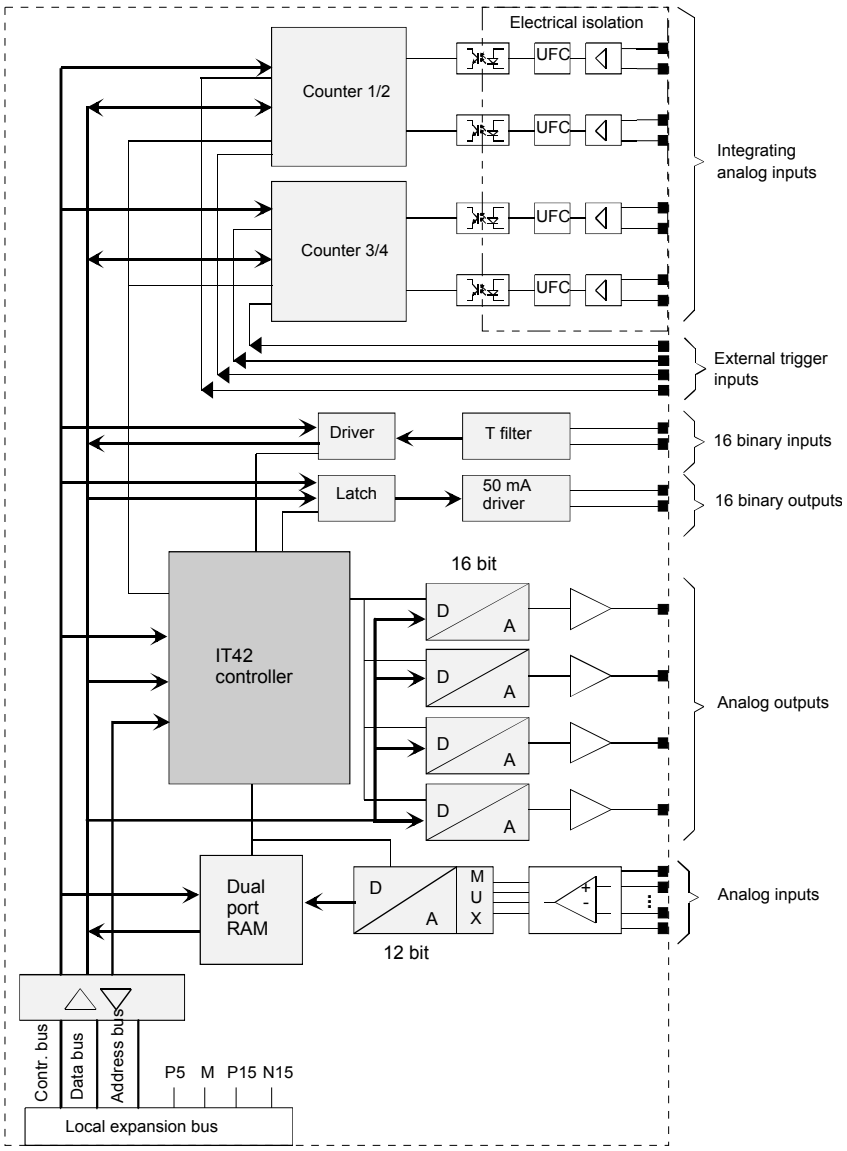


Fig. 5-8 Block diagram of IT42

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5.4.1 Supplementary components

Interface modules with terminals

All of the cables for the input / output signals are not directly connected to the module, but are connected via interface modules. The interface modules serve as mechanical connection element (**screw/plug-in terminals**) and to electrically adapt the plant/system signals (optional).

Interface module	Function
SB10	Direct connection (1:1 connection) of 8 binary inputs/outputs, LED, no signal conversion
SB60	8 binary **inputs**, converted from 230V to 24V (signal level on the module), LED, electrical isolation (floating)
SB61	8 binary **inputs**, converted from 48V to 24V, LED, electrical isolation (floating)
SB70	8 binary **outputs**, converted from 24V to 230V (changeover relay), LED, electrical isolation (floating)
SB71	8 binary **outputs**, converted from 25V to 48V (transistor)
SU10	25 signals are directly connected, no signal conversion
SU12	10 signals are directly connected, no signal conversion

Table 5-26 Interface modules which can be connected to the module

Cables

The module is connected to the interface modules using the matching plug-in cables. The plug-in cables for large connectors have several cable ends, to which the appropriate number of matching interface modules can be connected.
Either interface modules with or without signal conversion (e. g. signal level conversion, electrical isolation) and LED display can be connected at connectors with binary inputs and outputs.
The selected cable depends on the type of interface module:

Connector IT42	Signals	Cable	Interface module
X6	Integrating analog inputs	SC50	SU10
X7	Analog outputs/inputs	SC51	SU10
X8	Binary outputs/inputs; trigger inputs for integrating analog inputs	SC49 or SC54	2 x SU10 or 5 x SB10 SB60 SB61 SB70 SB71 SU12

Table 5-27 Cables available for use with the module

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5.4.2 Connector assignment X6

Connector X6 (15-pin, sub D) connects the signals for

- 4 integrating analog inputs

An **SU10** interface module can be connected via plug-in cable **SC50** ("1:1 connection from the module to the terminals:

Integrating analog inputs at X6 with SU10

IT42 X6	Significance	SU10	Connector designation when configuring
1	UFC analog input 1+	1	X6A
9	UFC analog input 1-	2	
2	Ground, input 1	3	
10	Ground, input 2	4	X6B
3	UFC analog input 2+	5	
11	UFC analog input 2-	6	
4	UFC analog input 3+	7	X6C
12	UFC analog input 3-	8	
5	Ground, input 3	9	
13	Ground, input 4	10	X6D
6	UFC analog input 4+	11	
14	UFC analog input 4-	12	
7	Not connected	13	
15	Not connected	14	
8	Not connected	15	
-	Not connected	16 - 26	

Table 5-28 Pin assignment IT42, connector X6 and terminal assignment SU10

5.4.3 Connector assignment X7

Connector X7 (25-pin, sub D) connects the signals for

- 4 analog outputs
- 4 analog inputs

An **SU10** interface module can be connected via plug-in cable **SC51**.

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Analog inputs/outputs at X7 with SU10

IT42 X7	Significance	SU10	Connector designation when configuring
1	ADU analog input 1+	1	X7A
14	ADU analog input 1-	2	
2	ADU analog input 2+	3	X7B
15	ADU analog input 2-	4	
3	ADU analog input 3+	5	X7C
16	ADU analog input 3-	6	
4	ADU analog input 4+	7	X7D
17	ADU analog input 4-	8	
5	Reference ground for differential ADU analog inputs (due to push-pull)	9	
18	Reference ground for differential ADU analog inputs (due to push-pull)	10	
6	Analog **output** 1+	11	X7E
19	Ground, inductively de-coupled	12	
7	Analog output 2+	13	X7F
20	Ground, inductively de-coupled	14	
8	Analog output 3+	15	X7G
21	Ground, inductively de-coupled	16	
9	Analog output 4+	17	X7H
22	Ground, inductively de-coupled	18	
10	Ground	19	
23	Ground	20	
11	Not connected	21	
12	Not connected	22	
13	Not connected	23	
24	Not connected	24	
25	Not connected	25	
-	Not connected	26	

Table 5-29 Pin assignment IT42, connector X7 and terminal assignment SU10

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5.4.4 Connector assignment X8

Connector X8 (50 pin, sub D) connects the signals for:

- 2*8 binary inputs and 2*8 binary outputs
- 4 trigger signals for integrating analog inputs

The assignment of the 16 binary inputs and outputs corresponds to those of **IT41**, connector X7.

5.4.4.1 Connector assignment X8 for SC49

SU10 terminal assignment at SC49, end A

IT42 X8	Significance	SU10 at SC49, cable end A	Connector designation when configuring
1	Binary output 1	1	X8A
34	Binary output 2	2	
18	Binary output 3	3	
2	Binary output 4	4	
35	Binary output 5	5	
19	Binary output 6	6	
3	Binary output 7	7	
36	Binary output 8	8	
20	External P24 voltage	9	
4	External ground	10	
37	Binary output 9	11	X8B
21	Binary output 10	12	
5	Binary output 11	13	
38	Binary output 12	14	
22	Binary output 13	15	
6	Binary output 14	16	
39	Binary output 15	17	
23	Binary output 16	18	
7	External P24 voltage	19	
40	External ground	20	
24	Binary input 1	21	X8C
8	Binary input 2	22	
41	Binary input 3	23	
25	Binary input 4	24	
9	Binary input 5	25	

Table 5-30 SU10 terminal assignment for SC49, cable end A

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SU10 terminal assignment at SC49, end B

IT42 X8	Significance	SU10 at SC49, cable end B	Connector designation when configuring
42	Binary input 6	1	X8C
26	Binary input 7	2	
10	Binary input 8	3	
43	External P24 voltage	4	
27	External ground	5	
11	Binary input 9	6	X8D
44	Binary input 10	7	
28	Binary input 11	8	
12	Binary input 12	9	
45	Binary input 13	10	
29	Binary input 14	11	
13	Binary input 15	12	
46	Binary input 16	13	
30	External P24 voltage	14	
14	External ground	15	
47	Trigger input 1	16	
31	Trigger input 2	17	
15	Trigger input 3	18	
48	Trigger input 4	19	
32	Not connected	20	
16	Not connected	21	
49	Not connected	22	
33	Not connected	23	
17	External P24 voltage	24	
50	External ground	25	

*Table 5-31 SU10 terminal assignment for SC49, cable **end A***

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5.4.4.2 Connector assignment X8 for SC54

Only certain signal types are available at the particular cable ends where only the matching interface modules can be used:

Terminal assignment, interface modules

Interface module	Screw terminal *(x=1...8)*	Significance
SB10		**1:1 screw terminal connection**
	x	Signal
	5x	Reference potential (ground or P24)
SB60		**Binary inputs 115/230 V**
	x1	Ground
	x2	Binary input 115 V
	x4	Binary input 230 V
SB61		**Binary inputs 24/48 V**
	x	Binary input 24 V
	1x	Binary input 48 V
	5x	Reference
SB70		**Binary outputs (relay)**
	x1	Common (center contact)
	x2	NC contact
	x4	NO contact
SB71		**Binary outputs (transistor)**
	x	Signal
	5x	Ground

Table 5-32 Terminal assignment of the interface modules

Terminal assignment at SC54, end A

IT42 X8	Significance X8A	SU12	SB10	SB60	SB61	SB70	SB71
1	Binary output 1	1	1/51			12/11/14	1/51
34	Binary output 2	2	2/52			22/21/24	2/52
18	Binary output 3	3	3/53			32/31/34	3/53
2	Binary output 4	4	4/54			42/41/44	4/54
35	Binary output 5	5	5/55			52/51/54	5/55
19	Binary output 6	6	6/56			62/61/64	6/56
3	Binary output 7	7	7/57			72/71/74	7/57
36	Binary output 8	8	8/58			81/82/84	8/58
20	External P24 voltage	9	1P			1P	1P
4	External ground	10	1M			1M	1M

*Table 5-33 Terminal assignment, interface module at connector X8, SC54 - cable **end A***

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Terminal assignment at SC54, end B

IT42 X8	Significance X8B	SU12	SB10	SB60	SB61	SB70	SB71
37	Binary output 9	1	1/51			12/11/14	1/51
21	Binary output 10	2	2/52			22/21/24	2/52
5	Binary output 11	3	3/53			32/31/34	3/53
38	Binary output 12	4	4/54			42/41/44	4/54
22	Binary output 13	5	5/55			52/51/54	5/55
6	Binary output 14	6	6/56			62/61/64	6/56
39	Binary output 15	7	7/57			72/71/74	7/57
23	Binary output 16	8	8/58			81/82/84	8/58
7	External P24 voltage	9	1P			1P	1P
40	External ground	10	1M			1M	1M

*Table 5-34 Terminal assignment, interface module at connector X8, SC54 - cable **end B***

Terminal assignment at SC54, end C

IT42 X8	Significance X8C	SU12	SB10	SB60	SB61	SB70	SB71
24	Binary input 1	1	1/51	14,12/11	1,11/51		
8	Binary input 2	2	2/52	24,22/21	2,12/52		
41	Binary input 3	3	3/53	34,32/31	3,13/53		
25	Binary input 4	4	4/54	44,42/41	4,14/54		
9	Binary input 5	5	5/55	54,52/51	5,15/55		
42	Binary input 6	6	6/56	64,62/61	6,16/56		
26	Binary input 7	7	7/57	74,72/71	7,17/57		
10	Binary input 8	8	8/58	84,82/81	8,18/58		
43	External P24 voltage	9	1P	1P	1P		
27	External ground	10	1M	1M	1M		

*Table 5-35 Terminal assignment, interface module at connector X8, SC54 - cable **end C***

Terminal assignment at SC54, end D

IT42 X8	Significance X8D	SU12	SB10	SB60	SB61	SB70	SB71
11	Binary input 9	1	1/51	14,12/11	1,11/51		
44	Binary input 10	2	2/52	24,22/21	2,12/52		
28	Binary input 11	3	3/53	34,32/31	3,13/53		
12	Binary input 12	4	4/54	44,42/41	4,14/54		
45	Binary input 13	5	5/55	54,52/51	5,15/55		
29	Binary input 14	6	6/56	64,62/61	6,16/56		
13	Binary input 15	7	7/57	74,72/71	7,17/57		
46	Binary input 16	8	8/58	84,82/81	8,18/58		
30	External P24 voltage	9	1P	1P	1P		
14	External ground	10	1M	1M	1M		

*Table 5-36 Terminal assignment, interface module at connector X8, SC54 - cable **end D***

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Terminal assignment at SC54, end E

IT42 X8	Significance X8E-X8H	SU12	SB10	SB60	SB61	SB70	SB71
47	Trigger input 1	1					
31	Trigger input 2	2					
15	Trigger input 3	3					
48	Trigger input 4	4					
32	Not connected	5					
16	Not connected	6					
49	Not connected	7					
33	Not connected	8					
17	External P24 voltage	9					
50	External ground	10					

*Table 5-37 Terminal assignment, interface module at connector X8, SC54 - cable **end E***

5.4.5 Mounting

The Itxx module is mounted outside the subrack on a PMx CPU module or is inserted on an Itxx module already mounted on a PMx (using the 96-pin plug connector on the module).

Distance pieces

All of the modules must be bolted together using the distance pieces provided (3 are provided)!

For the first ITxx

The first ITxx, located directly on a CPU module, must be retained using the **metal distance pieces** (these are included in the scope of supply of the PMx). This establishes the electrical contact which is required to identify the first expansion board.
The metal distance pieces are first retained on the PM4 using the M3 screws, washers and spring washers supplied.
If only **one ITxx** module is used, then it is screwed to the metal distance pieces using the M4 nuts provided (and washers).

For the second ITxx

If a second ITxx module is used, the first ITxx must be screwed using **plastic** distance pieces (these are included in the scope of supply of the ITxx modules).
The second ITxx module can then be inserted and retained using the M4 nuts provided (and washers).
The complete module assembly is then inserted in the subrack.

5.4.6 Application information and noise immunity

- operation **without fan** is possible
- noise-immune operation is only possible if the module is tightly screwed into the subrack

Other information

Further information on EMC and ambient conditions, refer to Section "General technical data"

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5.4.7 Technical data

General data

No. of slots occupied	1
Dimensions W x H x D [mm]	20.14 x 233.4 x 220
Weight	Approx. 0.5 kg

Power supply

Rated voltage	min.	max.	**Typ. current drain**
+5 V	+4.75 V	+5.25 V	420 mA
+15 V	+14.4 V	+15.6 V	450 mA
-15 V	-15.6 V	-14.4 V	140 mA
24 V (external)	20 V	30 V	100 mA + binary output currents

Integrating analog inputs

No.	4
Integrating analog inputs	Differential inputs, floating, V/f conversion
Integration time	• sampling time of the AFC function block or • the time between 2 positive edges of the external trigger signal
Input voltage range	-10 V to +10 V
Input resistance	470 kOhm
Input filter	-3 dB transition frequency : 2 kHz
Resolution	Up to 17 bits, depending on the integration time:
	13 bits at 1 ms integration time
	15 bits at 4 ms integration time
	17 bits at 20 ms integration time
Relative accuracy	Typ. 14 bits

Sampling analog inputs

No.	4
Type	Differential inputs, non-floating
Input voltage range	-10 V to +10 V
Input resistance	470 kOhm
Input filter	-3 dB transition frequency : 1.5 kHz
Resolution	12 bits
Absolute accuracy	Typ. 10 bits over the complete temperature range
Max. conversion time	45 µs.

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Analog outputs

No.	4
Type	Output with associated ground, non-floating
Output voltage range	-10 V to +10 V
Output current	+/- 10 mA
Resolution	16 bits
Monotony	14 bits over the complete temperature range
Absolute accuracy	Typ. 13 bits over the complete temperature range
Short-circuit protection to ground	Yes

Binary inputs

No.		16 non-floating
Input voltage		24 V DC rated voltage
	for 0 signal	-1 V to +6 V or open-circuit inputs
	for 1 signal	+13 V to +33 V
Input current		
	for 0 signal	0 mA
	for 1 signal	3 mA typ.
Delay time for +24 V input signal		50 µs

Binary outputs

No.		16, non-floating
Power supply voltage		From external
	nominal value	24 V DC
	perm. range	+20 V to 30 V including ripple
it	briefly	+35 V, max. 0.5 s
Output current for an 1 signal		
	nominal current	50 mA (also corresponds to the max. value)
Short-circuit protection		Electronically and thermally
Limiting inductive switch-off voltages		Supply voltage + 1 V
Residual current		20 µA for 0 signal
Signal level		
	for 0 signal	Max. 3 V
	for 1 signal	Supply voltage - 2.5 V
Switching delay		Max. 15 µs

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5.4.8 Connecting diagram

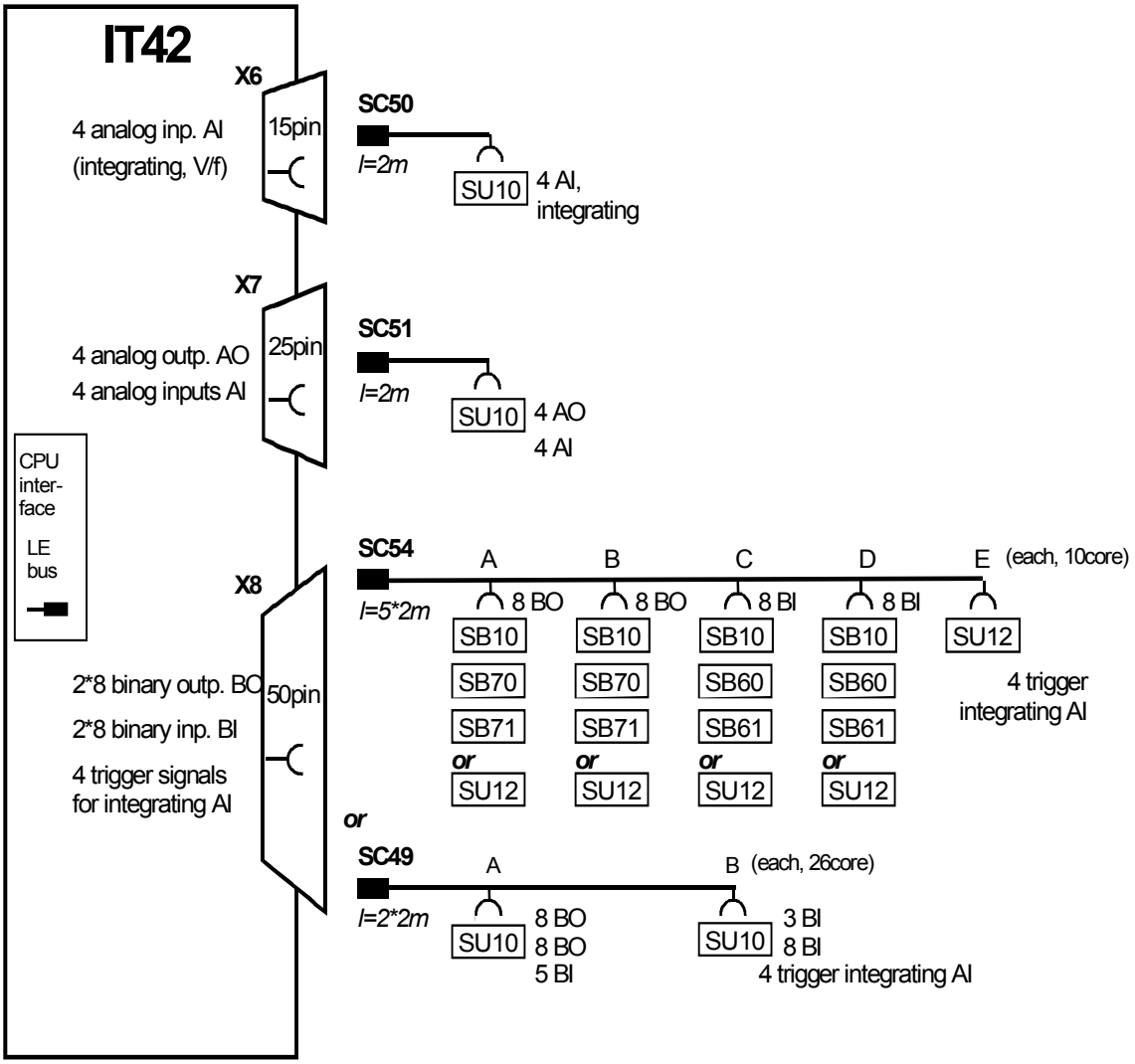


Fig. 5-9 Connecting cables and interface modules

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5.5 Converter control ITDC

Order No. 6DD1601-0AH0

Description

The ITDC expansion module corresponds to the earlier PG16 module, and provides the gating (control) for

- line-commutated drive converters.

It includes:

- Auto-reversing stage
- Current controller
- Gating unit (for max. 400 Hz output frequency)
- For 6-pulse drive converters

It is especially suitable for connection to SITOR power sections.
The expansion module is inserted on a CPU module (PM5, PM6). A maximum of 2 expansion modules ITxx can be inserted on a CPU module. One ITxx occupies 1 slot (in addition to the slot in the CPU module). Presently, the operation of 2 ITDC modules in one processor module is not supported.

Inputs and outputs

- 1 SITOR interface
- 2 analog outputs
- 4 binary outputs
- 4 binary inputs
- 1 incremental encoder input:
  - With zero pulse
  - Optionally, for differential signals
  - For tracks, shifted through 90 degrees (A, B)
  - For 15 V (HTL)- or 5 V encoders
  - Max. 1 MHz pulse frequency
- No electrical isolation of the inputs-/outputs

Incremental encoder setting

Incremental encoders can be connected to the ITDC, with the following signal voltages

- 15V
- 5V (also as push - pull signals and RS485 differential signals)

The incremental encoder type is selected using DIL switch S1 on the component side of the ITDC (refer to the following diagram).

There is the following assignment of the DIL switch settings S1.X to the pulse encoder channels :

Switch	Switch setting	Function
S1.1	ON	Track A, zero volt switching threshold f. 5V encoders
S1.1	OFF	Track A, 7V switching threshold f. 15V encoders
S1.2	ON	Track B, zero volt switching threshold f. 5V encoders
S1.2	OFF	Track B, 7V switching threshold f. 15V encoders
S1.3	ON	Zero pulse, 0V switching threshold f. 5V encoders
S1.3	OFF	Zero pulse, 7V switching threshold f. 15V encoders
S1.4	any	none

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Corresponding to the setting of the switch on S1, either select the 15V 3-phase encoder (7V switching threshold) or 5V 3-phase encoder (0V switching threshold).

For the **factory setting**, the switch is in the OFF position for 15V 3-phase encoders.

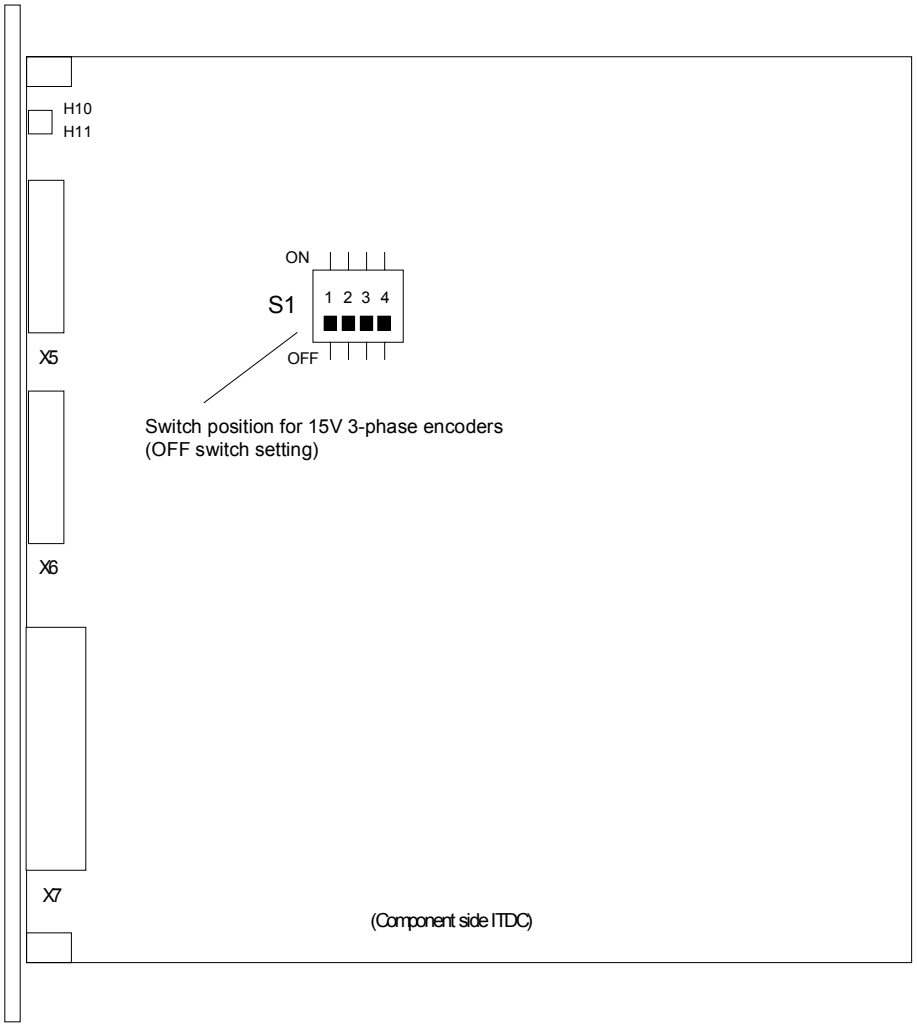


Fig. 5-10 Switch position for incremental encoders

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Block diagram

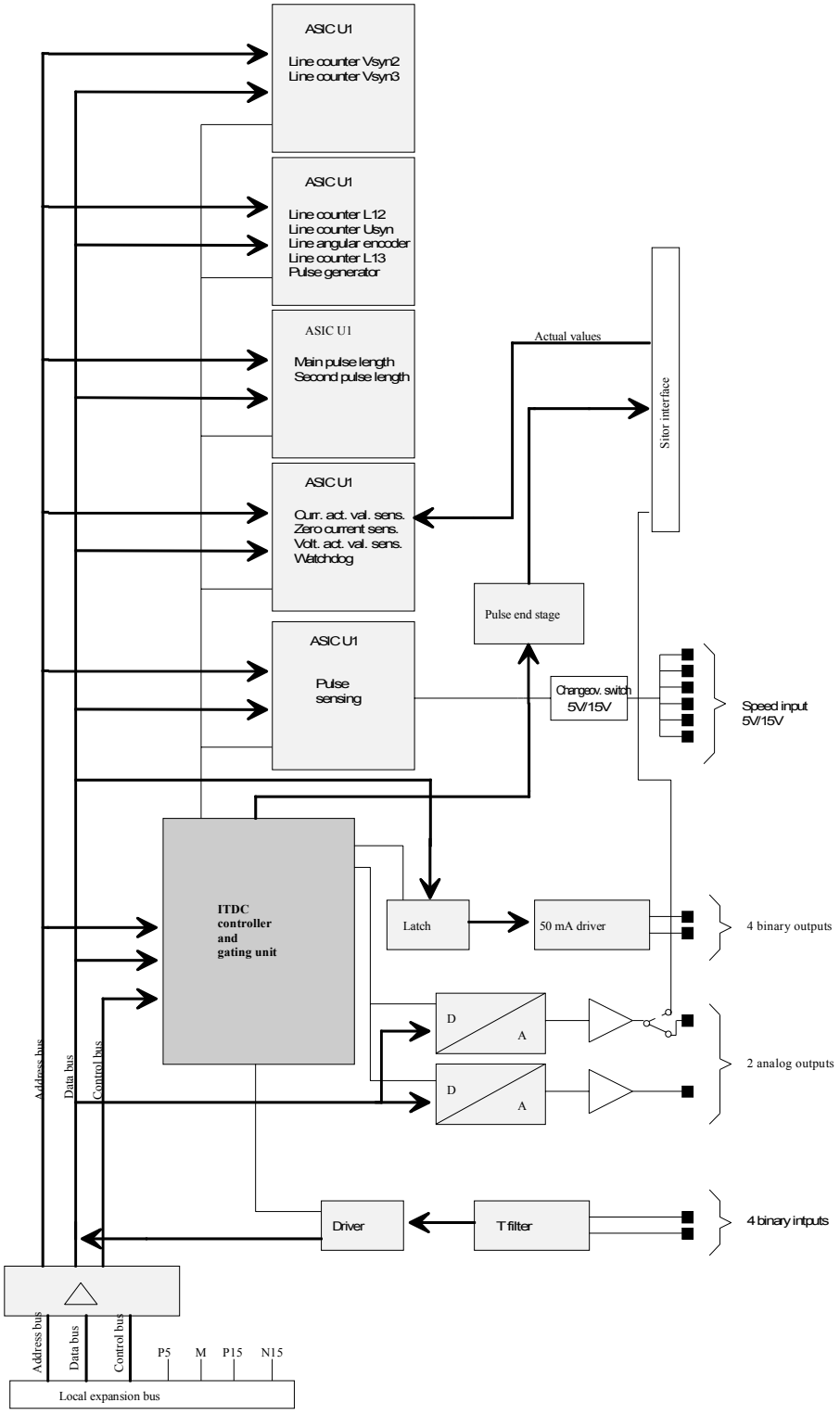


Fig. 5-11 Block diagramm ITDC

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5.5.1 Supplementary components

Interface modules with terminals

All of the input / output signal cables are not directly connected to the module, but are connected through interface modules. The interface modules serve as mechanical connecting elements (**screw plug-in terminals**), and to electrically adapt the plant /system signals and convert them (optional).

Interface-module	Function
SB10	Direct connection (1:1 connection) from 8 binary inputs /outputs, LED, no signal conversion
SB60	8 binary **inputs**, 230V to 24V conversion (signal level of the module), LED, electrical isolation
SB61	8 binary **inputs**, 48V to 24V conversion, LED, electrical isolation
SB70	8 binary **outputs**, 24V to 230V conversion (changeover relay), LED, electrical isolation
SB71	8 binary **outputs**, 25V to 48V conversion (transistor)
SU11	20 signals can be directly connected, no signal conversion

Table 5-38 Interface modules which can be connected to the module

Cables

The module is connected to the interface modules using plug-in cables. Pre-assembled cables are available for the SU11 interface module.
Interface modules either with or without signal conversion (e.g. signal level conversion, electrical isolation) and LED display can be used at connector X5 with binary inputs and outputs.
Pre-assembled cables are not available for the SB10, SB60, SB61, SB70 and SB71 interface modules in conjunction with the ITDC.

Conn., ITDC	Signals	Cable	Interface module
X5	Analog outputs SITOR start-up signals	SC12	1 x SU11
X6	Binary inputs /outputs and speed sensing	SC12 - - - - - -	1 x SU11 or SB10 SB60 SB61 SB70 SB71 SU12

Table 5-39 Cables which can be used together with the modules

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5.5.2 Connector assignment X5

Connector X5 (20-pin plug connector) connects signals for

- 2 analog outputs
- SITOR start-up signals

The **SU11** interface module can be connected via **SC12** plug-in cable (1:1-connection from the module to the terminals):

SU11 analog outputs and start-up signals via the SC12 cable

ITDC X5 Pin	Designation	SU 11 X2	Connector designation for configuring
1	Analog output 1+	1	X5A
2	Ground, analog output 1	2	
3	Analog output 2+	3	X5B
4	Ground, analog output 2	4	
5	External synchronizing voltage, L1 for 3-phase synchronization	5	
6	Reference voltage for the synchronizing voltage	6	
7	P15 output, 15V (R_i =600 ohm, not suitable to supply the encoders)	7	
8	Measuring signal "Zero crossover of the SITOR power supply phase voltage" L13	8	
9	Display, zero crossover signal identification, synchronizing voltage Logic signal level 15V, Ri=2.2K ohm for an "H" signal	9	
10	External pulse inhibit, if connected to pin 7 or 24V -> pulses enabled	10	
11	Excitation current setpoint, 0..10V, R_i=2.2K ohm	11	
12	Measuring signal "Summed pulses"	12	
13	Analog current actual value +/-10V, R_i=2.2K ohm	13	
14	Ground (digital), reference potential for measuring signals	14	
15	Measuring signal, "Total pulse inhibit", pulses enabled = 5V	15	
16	Ground, synchronizing module	16	
17	Synchronizing voltage U12 for 3-phase synchronization	17	
18	Synchronizing voltage U23 for 3-phase synchronization	18	
19	Synchronizing voltage U31 for 3-phase synchronization	19	
20	Pulse chain synchronizing, connected with additional PG11/PG16 or ITDC "H" output voltage: 10-14V "H" output current: 40mA	20	

Table 5-40 Pin assignment ITDC, connector X5 and terminal assignment SU11,

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5.5.3 Connector assignment X6

Connector X6 (20-pin plug connector) connects the signals for:

- 4 binary inputs
- 4 binary outputs
- 1 speed input

The **SU11** interface module can be connected via the **SC12** plug-in cable (1:1 connection from the module to the terminals):

SU11 binary input/output and speed sensing via cable SC12

ITDC X6 Pin	Designation	SU 11 X2	Connector designation for configuring
1	Binary input 1	1	X6A
2	Binary input 2	2	
3	Binary input 3	3	
4	Binary input 4	4	
5	Binary output 1	5	X6G
6	Binary output 2	6	
7	Binary output 3	7	
8	Binary output 4	8	
9	P_{ext}, positive power supply, max. 30 V	9	
10	M_{ext}, 0V power supply	10	
11	Speed sensing, track 1A-	11	X6C
12	Speed sensing, track 1A+	12	
13	Speed sensing, track 1B-	13	
14	Speed sensing, track 1B+	14	
15	Speed sensing, zero pulse 1N-	15	
16	Speed sensing, zero pulse 1N+	16	
17	Coarse pulse	17	
18	GND ext.	18	
19	GND ext.	19	
20	n. c.	20	

Table 5-41 Pin assignment ITDC, connector X6 and terminal assignment SU11

5.5.4 Connector assignment X7

Connector X7 (sub-D 50-pin) connects the signals to control (gate) a SITOR set (three-phase bridge).

Via plug-in cable:

- **SC17.2** (screened round cable, 50-pin SUB-D, 2m long), or
- **SC31.2** (screened round cable, 50-pin SUB-D, 10m long)

The module can be directly connected to a SITOR set.

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SITOR signals

ITDC X7 Pin	Designation	Connector designation for configuring
1	Screen	X7G
2	Screen	
3	Fuse monitoring (fault = "L")	
4	Screen	
5	Zero crossover (L1-L3)	
6	Screen	
7	+/- I_{act} frequency: 60KHz +/- 30KHz corresponds to +/- 2 I_N	
8	Reference voltage, excitation current setpoint	
9	M24 external	
10	Pulse. 1.6	
11	M24 external	
12	Pulse 1.3	
13	Screen	
14	M24 external	
15	Pulse 2.4	
16	M24 external	
17	Pulse 2.1	X7G
18	V_{SYN} (synchronizing voltage) neutral point	
19	Excitation current monitoring (fault = "H") I_{E_act} < 3,3 %, I_{E_N} = "H")	
20	Temperature monitoring (fault = "L")	
21	Screen	
22	+/- V_{AIst} frequency 60KHz +/- 30KHz corresponds to +/- V_{AN}	
23	Screen	
24	+/- I_{act} analog +/-10V corresponds to +/- I_N (only when connecting a SITOR set, for SE20.1--> 2P24)	
25	Screen	
26	M24 external	
27	Pulse 1.4	
28	M24 external	
29	Pulse 1.1	
30	Pulse 2.2	
31	M24 external	
32	Pulse 2.5	
33	M24 external	
34	V_{SYN} (L1)	
35	Undervoltage monitoring (fault = "L")	
36	Screen	
37	Zero crossover (L1-L2)	

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ITDC X7 Pin	Designation	Connector designation for configuring
38	Screen	
39	I = 0 signal (I = 0 corresponds to "H")	
40	Screen	
41	Excitation current setpoint $I_{E_N_S}$ (Feldsteller) corresponds to 10 V	
42	Pulse 1.2	
43	M24 external	
44	Pulse 1.5	
45	M24 external	
46	M24 external	
47	Pulse 2.6	
48	M24 external	
49	Pulse 2.3	
50	Screen	

Table 5-42 Pin assignment ITDC, connector X7 SITOR signals

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5.5.5 Technical data

General data

Insulation group	A according to VDE 0110 § 13 Group 2 for 24 V DC, 15 V DC, 5 V DC
Ambient temperature	0 to +55 degrees C and fan operation (force ventil.)
Storage temperature	-25 to +70 degrees C
Humidity rating	F according to DIN 40050
Altitude rating	S according to DIN 40040
Mechanical rating	Installed in stationary equipment, which is not necessarily vibration-free
Packaging system	ES 902 C
Dimensions	233.4 mm * 220 mm
Module width	20.14 mm
Installation size	1 slot
Weight	600 g

Power supply

Rated voltage	min.	max.	**Typ. current drain**
+5 V	+4.75 V	+5.25 V	100 mA
+15 V	+14.4 V	+15.6 V	490 mA (+ encoder load)
-15 V	-15.6 V	-14.4 V	75 mA
24 V (external)	+15V	+30 V	70 mA (+ load of the binary outputs)

Analog outputs, connector X5

No.	2
Version	Output with associated ground, non-floating
Output voltage range	-10 V to +10 V
Output current	+/- 10 mA
Resolution	12 bits
Monotony	10 bits over the complete temperature range
Absolute accuracy	Typ. 9 bits over the complete temperature range
Short-circuit protection to ground	Yes

Binary inputs connector X6

No.		4 non-floating
Input voltage		24 V DC rated voltage
	For 0 signal	-1 V to +6 V or inputs open-circuit
	For 1 signal	+13 V to +33 V
Input current		
	For 0 signal	0 mA
	For 1 signal	3 mA typ.
Delay time		120 µs

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Binary outputs connector X6

No.		4, non-floating
Supply voltage		Must be supplied externally
	Nominal value	24 V DC
	Permiss. range	+20 V to 30 V, including ripple
	Briefly	+35 V, max. 0.5 s
Output current for 1 signal		
	Rated current	50 mA
	Permiss. range	To 50 mA
Short-circuit protection		Electronic (thermal)
Limiting inductive switch-off voltages		+ 1 V power supply voltage
Total load		80 % at 50 degrees C, all outputs 50 mA
Residual current		20 µA for a 0 signal
Signal level		
	For 0 signal	Max. 3 V
	For 1 signal	- 2.5 V power supply voltage
Switching delay		1->0: max. 10 µs 0->1: max. 100 µs

Incremental encoders

No. of encoders		1, non-floating
Version		Differential inputs without electrical isolation, can be changed over between 5V/15V(HTL)
Track signals		Tracks A and B (phase shifted through 90 degrees), if required with zero pulse N
Pulse frequency		Max. 1 MHz (track frequency)
Phase difference of the track signals		Independent of the pulse frequency, min 200 ns
Input voltage for 15V (HTL)		
	For 0 signal	-30 V to +5 V
	For 1 signal	+8 V to + 30 V
Input voltage for 5V		
	For 0 signal	-7 V to -1.5 V
	For 1 signal	+1.5 V to + 7 V
Permissible input voltage range		Differential voltage, -30 V to +30 V
Input resistance		Approx. 40K
Fault pulse suppression		Can be configured at the speed actual value function block: 0 - 16 µs (62.5 kHz)

The module does not provide a power supply for the encoder.

5.5.6 Mounting/Installation

When mounted outside the subrack, the ITxx module is inserted on a CPU module PMx or on an ITxx module, already mounted on PMx (using a 96-pin plug connector on the module).

Spacers

All of the modules must be screwed to one another using the spacers provided (3 spacers)!

For the first ITxx

The first ITxx, mounted directly on a CPU module, must be retained using the **metal spacers** (these are included with the PMx). The electrical contact which is established is required to identify the first expansion module.
The metal spacers are attached to the PMX using the M3 screws provided together with the washers and spring washers.

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If only **one ITxx** module is used, it can be screwed to the metal spacers using the M4 nuts (and washers) provided.

For a second ITxx

If a second ITxx module is used, the first ITxx module is not screwed using the nuts, but instead, using **plastic** spacers (these are included with the ITxx modules).
The second ITxx module can then be inserted on the **plastic** spacers, and screwed together using the M4 nuts (and washers).
After the module assembly has been screwed together, it is inserted into the subrack.

5.5.7 Application information and noise immunity

- Operation **without** fans is possible
- Noise immune operation is only possible, if it is tightly screwed into the subrack.

Other information

For more detailed information on EMC and the ambient conditions, refer to the "General technical data" section!

5.5.8 Connecting diagrams

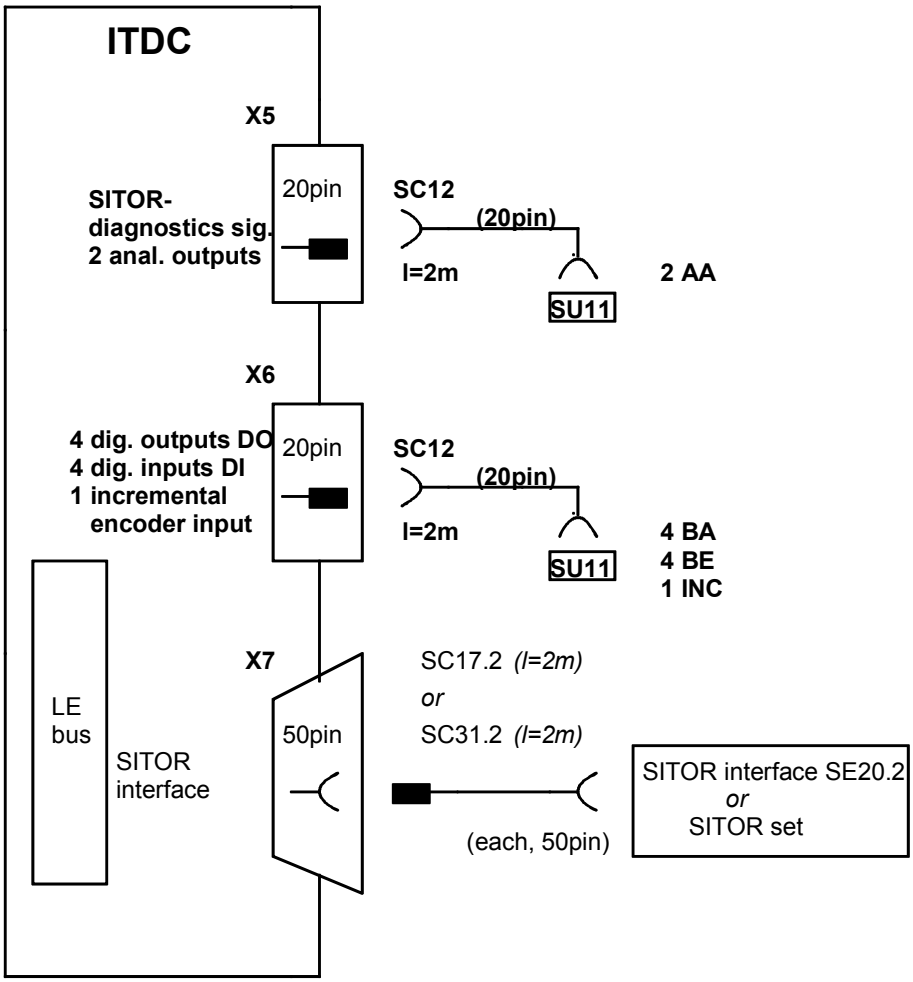


Fig. 5-12 Connecting cables and interface modules

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6 Communications support modules

Overview

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6.3	Fiber-optic cable subrack coupling CS12-CS22	6-15
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6.1 Communications support modules CS

6.1.1 Communications support module CS7

Order No. 6DD1662-0AB0

Description

The CS7 module is a **support module** for the following **communication modules:**

- SS4
- SS5
- SS52

Serial data transfer protocols (DUST, USS, PROFIBUS) can be implemented using the CS7 and the communication modules.

There is a dual port RAM on the CS7, via which the communication modules can transfer data with the CPU modules.

Features

- 3 plug-in recptacle for communication modules (X01 to X03)
- Dual port RAM with 16 Kbytes per communications module
- 2 **diagnostic LEDs** per plug-in compartment (H10/H11, H20/H21 , H30/H31) to display the status of the communications module; the significance of the LED depends on the particular communications module.
- Transfers the L-bus basic sampling time (for synchronization) on the communications module; this function is not used for SS4, SS5, SS52 communication modules.
- Transfers the clock interrupt from the communications module to the CS7 to set the real-time clock of a CPU module; this function is not used for SS4, SS5, SS52 communication modules.
- An interrupt signal on the L bus can be generated from the communications module. However, it must be ensured that only **one** interface module executes this function (configured). This function is not used for SS4, SS5, SS52 communication modules,.
- Test socket pair for each plug-in receptacle (X10/X11, X20/X21, X30/X31) to initiate a reset; only for test purposes! not for operation!
- L-bus connection

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Interface to the communications module

The connection between the CS7 support module and the communications modules is established via the 48-pin socket connectors of the 3 plug-in receptacle X01, X02 and X03:

Pin	A	B	C
1	P5	P5	L_LOCK
2	AB1	AB2	AB3
3	AB4	AB5	AB6
4	AB7	AB8	AB9
5	AB10	AB11	AB12
6	L_RESET	CTCLK	AB13
7	DB0	DB1	DB2
8	DB3	DB4	DB5
9	DB6	DB7	DB8
10	DB9	DB10	DB11
11	DB12	DB13	DB14
12	DB15	L_DEN	L_CSMSB
13	L_INTDPR	DT_L_R	L_CSLSB
14	L_RDYDPR	L_LED1	L_LED2
15	P15	N15	L_INTUHR
16	M5	M5	M5

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6.1.1.1 Application information and noise immunity

- operation **without fan** is possible
- the **front panels** of the inserted communication modules must be connected to the CS7 front panel using the screen cable supplied!
- slot covers must be provided at empty receptacle.
- noise-immune operation is only possible if the module is tightly screwed into the subrack

Other information Further information on EMC and ambient conditions, refer to Section „General technical data“

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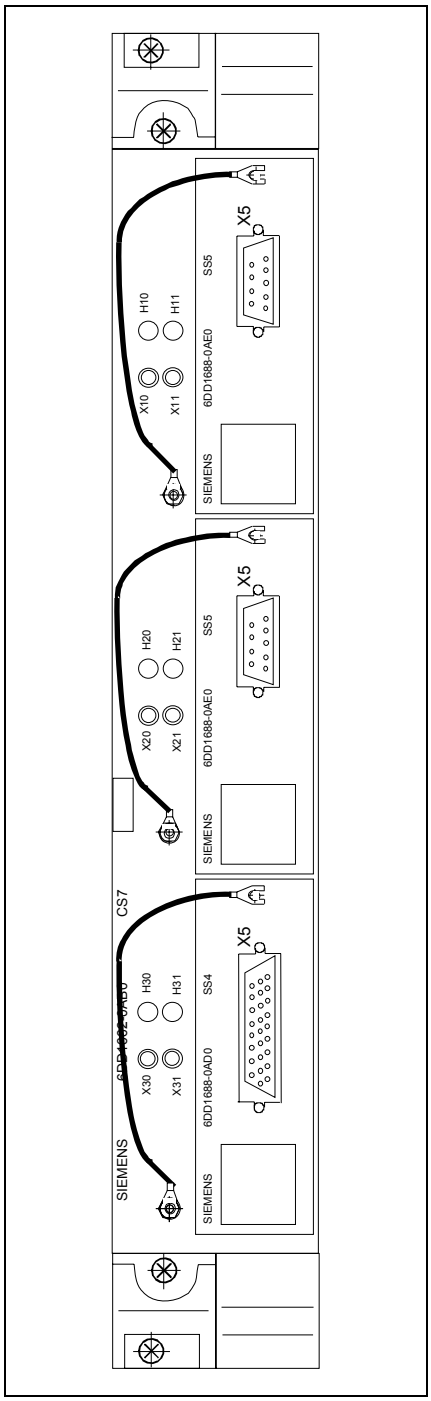


Fig. 6-1 CS7 front panel

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6.1.1.2 Technical data

General data

No. of slots occupied	2
Dimensions W x H x D [mm]	40.28 x 233.4 x 220
Weight	Approx. 0.5 kg

Power supply

Rated voltage	min.	max.	**Typ. current drain**
+5 V	+4.75 V	+5.25 V	0.5 A + current drain of the interface modules
+15 V	+14.4 V	+15.6 V	Current drain of the interface modules
-15 V	-15.6 V	-14.4 V	Current drain of the interface modules

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6.1.1.3 Connecting diagram

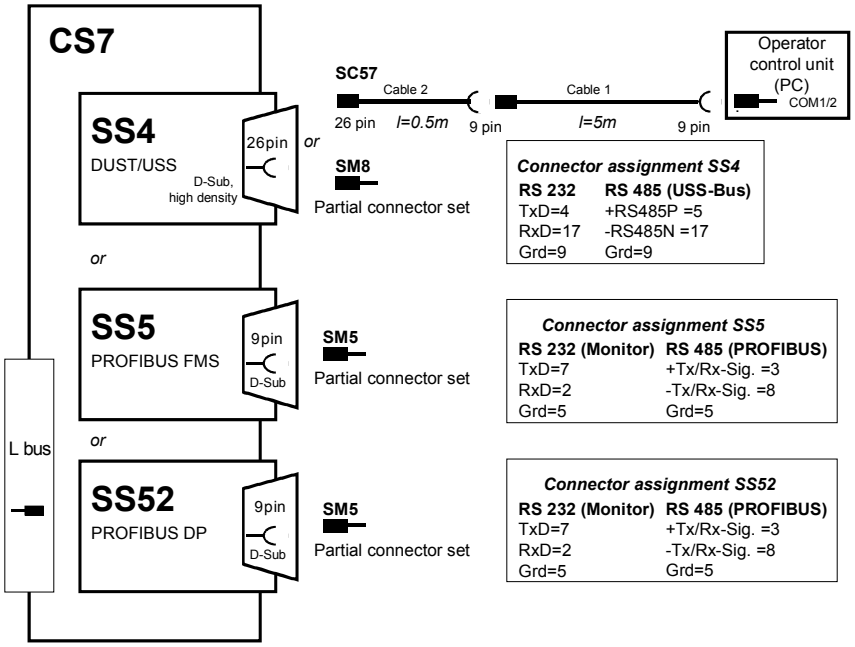


Fig. 6-2 Connecting communication modules and cables

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6.1.2 Communications support module CS8

Order No. 6DD1662-0AC0

Description

The CS8 module is a **support module** for the following **communication modules:**

- CBP1, CBP2
- CBC, CBD, CBI, CBL

Serial data transfer protocols (CAN, DEVICE-NET, PROFIBUS) can be implemented using CS8 and the communication modules.

Features

- 2 slots (X01, X02) to accept 2 communication modules (COMBOARDs).
- The special covers supplied must be mounted onto the COMBOARDs, so that they are electrically connected and grounded, for EMC-, dust protection- and safety reasons.
- L-bus connection

Interface to the communications module

The connection between the CS8 support module and the communication modules is established via the 64-pin plug connectors of the 2 slots X01 and X02:

Pin-No.	Signal-name	Pin-No.	Signal-name	Pin-No.	Signal-name	Pin-No.	Signal name
A1	N15	A9	D10	A17	M	A25	L_BUSY
B1	N15	B9	D11	B17	P5	B25	L_INT_CU_DPR
A2	M	A10	D12	A18	A8	A26	L_INT_DPR_CU
B2	M	B10	D13	B18	A9	B26	TEMPERATURE
A3	D0	A11	D14	A19	A10	A27	L_DSAVE
B3	D1	B11	D15	B19	A11	B27	ATACHO_DPR
A4	D2	A12	M	A20	A12	A28	BTACHO_DPR
B4	D3	B12	SYNC_DNE	B20	Excitation	B28	P15_OK
A5	D4	A13	NR_TACHO	A21	M	A29	P24_AUX
B5	D5	B13	A1	B21	P5	B29	M24_AUX
A6	D6	A14	A2	A22	L_RD	A30	P15
B6	D7	B14	A3	B22	L_WR	B30	P15
A7	M	A15	A4	A23	L_CS	A31	M
B7	P5	B15	A5	B23	SYNC_TAC	B31	M
A8	D8	A16	A6	A24	M	A32	SINE
B8	D9	B16	A7	B24	L_RESET	B32	COSINE

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6.1.2.1 Application information and noise immunity

- Operation **without fans** possible
- The communication modules are screwed to the **PC board** of CS8! The cut-outs of the covers supplied, must be adapted to the connector dimensions of the communication modules.
- The **cover** is mounted between the CS8 and the communications module.
- Free slots must be covered with complete covers.
- Noise-immune operation is only possible if they are screwed into the subrack

Other information For additional information on EMC and the ambient conditions, refer to Section "General technical data“!

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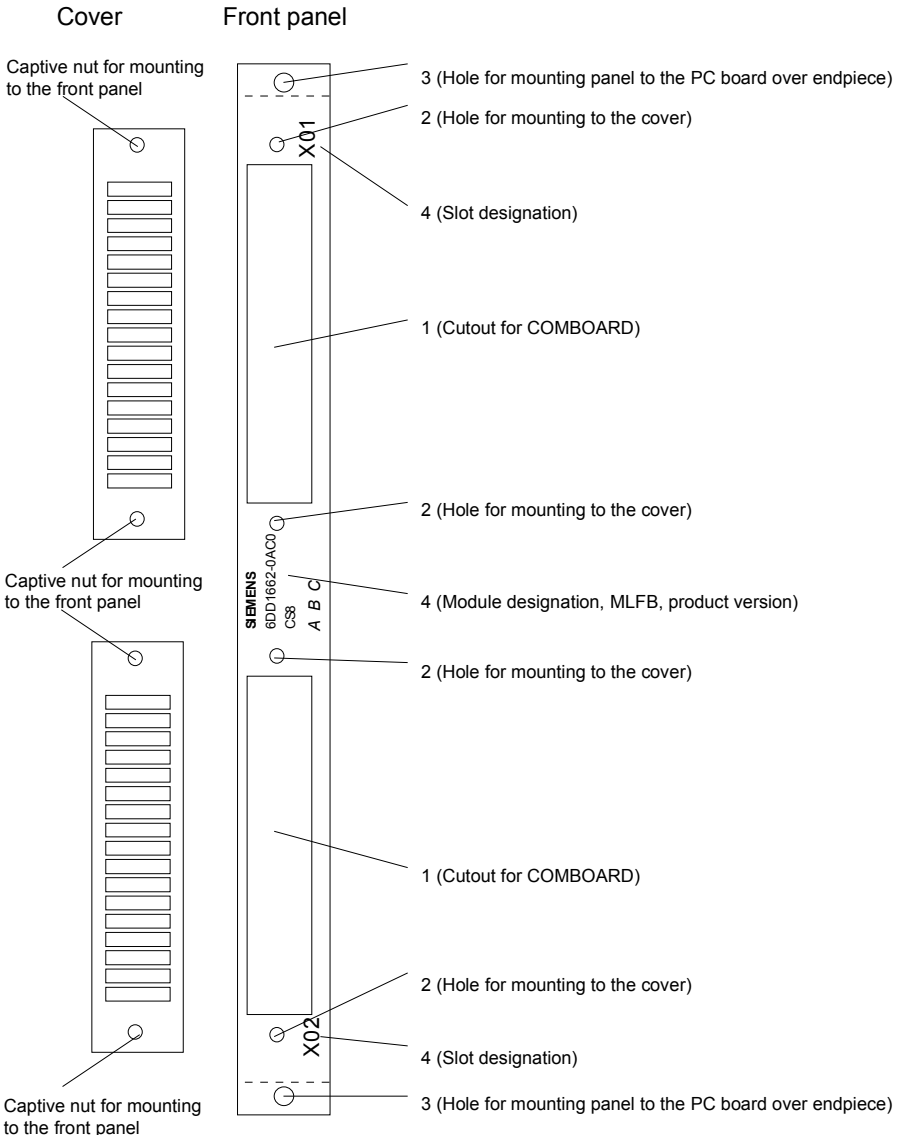


Fig. 6-3 CS8 front panel and cover

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6.1.2.2 Technical data

General data

Slot assignment	1
Dimensions W x H x D [mm]	18.3 x 233.4 x 220
Weight	approx. 0.3 kg

Power supply

Rated voltage	min.	max.	**Typ. current drain**
+5 V	+4.75 V	+5.25 V	0.5 A + current drain of the interface modules
+15 V	+14.4 V	+15.6 V	Current drain of the interface modules
-15 V	-15.6 V	-14.4 V	Current drain of the interface modules

6.1.2.3 Connection diagram

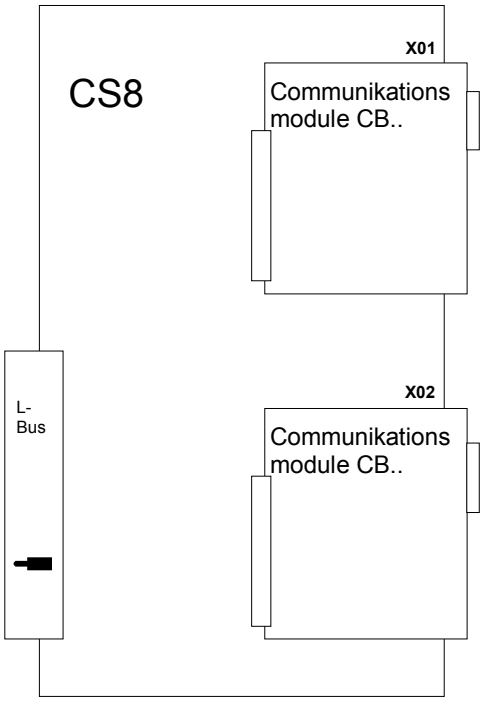


Fig. 6-4 Possibilities of connecting communication modules

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6.2 SINEC H1 module CSH11

Order No. 6DD1661-0AB1

Description

A connection to the industrial SINEC H1 communications network („Industrial Ethernet“) is established using the CSH11 module.

The module includes the **CP1470** module (CP: Communications Processor) and a dual port RAM to transfer data to the CPU modules.

Features

- serial interface to parameterize the CP1470 (X5)
- serial interface to connect to SINEC H1 (X6)
- diagnostics LED
- function selector switch and reset button
- transferring clock interrupts from the CP1470 onto the C bus
- L- and C bus connection

Connection to SINEC H1

The 15-pin connector X6 is connected to SINEC H1 **bus coupler** via the SINEC H1 drop cable 727-1. The drop cable must be latched into place using the latch mechanism.
The maximum cable length of the bus coupling cable may not exceed **50 m**.

Ordering data

A description of the SINEC H1 drop cable and additional bus components and their Order Nos. are provided in Catalog "SINEC Industrial Communication Networks, IK 10".

Parameterization

There is an asynchronous serial interface to parameterize the CP1470 (e. g. setting the Ethernet address) and administration using the configuring software **SINEC NML** from a PC, at the 25 pin connector X5.

SINEC NML must also be ordered:
Order No.: 6GK 1740-0AB01-0EA0

To connect PG7xx programmers or AT-compatible PCs, it also has

- a passive 20 mA line current interface (TTY) as well as
- RS 232 (V.24) interface

with a **9.6 kbaud** baud rate.

Switch

A switch with the ADM/RUN/STP settings and a reset button are provided on the front panel.

Switch position	Function
ADM	Resetting the CP1470 via reset button
RUN	Communications is established
STP	Communications is interrupted

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Reset button

The CP1470 can be reset using the **reset button**. The switch must first be set to "ADM".

LED

Green	Red	Significance
Dark	Dark	No power supply; temporary initialization status
Lit	Dark	Database and synchronization O.K.
Flashing	Dark	Database inconsistent; correct NML configuring
Dark	Lit	No synchronization with the initializing CPU module; possible cause: @CSH11 function block not configured, incorrect slot or incompatible firmware
Dark	Flashing	Hardware fault
Flashing	Lit	Switch in the STOP setting or ADM

The function of the LEDs is also described in the User Instructions „Configuring the communications“.

6.2.1 Application information and noise immunity

- the module may only be used in **forced-ventilated** subracks.
- the serial connecting cables must be latched-in using the latching mechanisms provided.
- noise-immune operation is only possible if the module is tightly screwed into the subrack

Other information

Further information on EMC and ambient conditions, refer to Section „General technical data“.

6.2.2 Connector assignment of the interfaces

Parameterizing interface X5

25-pin sub D socket connector

Pin	RS-232	TTY
1	Screen	----
2	TxD	----
3	RxD	----
7	Ground	----
9	----	+RxD
10	----	-RxD
18	----	+TxD
21	----	-TxD

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SINEC H1 interface X6

15-pin sub D socket connector

Pin	Signal name	Code
1	Collision (screen)	CI-S
2	Collision (+)	CI-A
3	Transmit data (+)	DO-A
4	Receive data (screen)	DI-S
5	Receive data (+)	DI-A
6	Power supply (-)	VC
7	Control signal (+)	CO-A
8	Control signal (screen)	CO-S
9	Collision (-)	CI-B
10	Transmit data (-)	DO-B
11	Transmit data (screen)	DO-S
12	Receive data (-)	DI-B
13	Power supply (+)	VP
14	Power supply (screen)	VS
15	Control signal (-)	CO-B
Housing	Overall screen	PG

6.2.3 Technical data

General data

No. of slots occupied	1
Dimensions W x H x D [mm]	20.14 x 233.4 x 220
Weight	Approx. 0.5 kg

Power supply

Rated voltage	min.	max.	Typ. current drain
+5 V	+4.75 V	+5.25 V	2,5 A
+15 V	+14.4 V	+15.6 V	100 mA without connecting to a SINEC H1 bus coupler 600 mA with connecting to a SINEC H1 bus coupler
-15 V	-15.6 V	-14.4 V	Max. 100 mA

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6.3 Fiber-optic cable subrack coupling CS12-CS22

Order No.

CS12:	6DD1660-0BC0
CS13:	6DD1660-0BB0
CS14:	6DD1660-0BA0
CS22:	6DD1660-0BD0

Description

An extremely fast coupling can be established between as many **subracks** as required via **fiber-optic cable** using the CS12 modules (or CS13, CS14) and CS22.

A fiber-optic coupling consists of a master module, to which 1 to max. 8 slave modules can be connected. All of the master- and slave modules are accommodated in a dedicated subrack.

The coupling practically represents an extension of the backplane bus, whereby data transfer is realized via the RAM memory on the CS12. All of the connected CS22 slave modules can access this; they all have the same priority.

CS13 and CS14 consist of a CS12- and one or two ICS1 modules, which have fiber-optic cable connections for up to 4 or 8 slaves.

Features

- max. fiber-optic cable **length** of a point-to-point connection: **200 m**
- **data transfer time**:
  approx. 5 µs each 16-bit value for a L/C bus under normal load conditions
  max. approx. 32 µs per 16-bit value for an L/C bus under extremely high load conditions
- 128 kbyte RAM memory on CS12
- a master module can transfer the following signals to the slave:
  - basic sampling time (to synchronize the slave)
  - alarm interrupt (to call an interrupt task)
  - clock interrupt (to set the real-time clock)
- L- and C bus connections;
- not intended for use in the SR6(V), as data transfer is only realized via the C bus

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6.3.1 Slave connection

Depending on the master module type, 1 to 8 slaves (CS22) can be connected:

Master module	No. of slots	No. of slaves (CS22)
CS12	1	1
CS13 (consists of CS12 + ICS1)	2	1 to 4
CS14 (consists of CS12 + ICS1 + ICS1)	3	1 to 8

The following diagrams and tables illustrate the fiber-optic cable connections to be connected for the possible master-slave configurations.

The interfaces are defined (fiber-optic cable connections) by appropriately configuring in HWConfig.

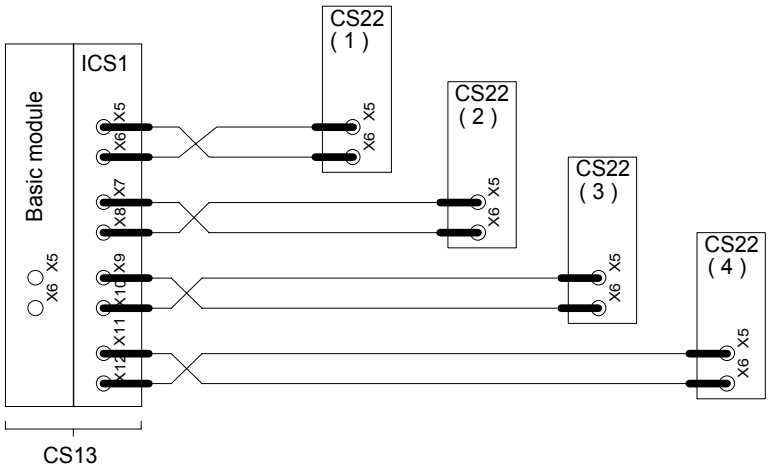
For CS13 and CS14, the two fiber-optic cable connections on the basic CS12 module are not used

Connecting 1 slave

Master module CS12			Slave module CS22				
CS12		**Type**	**1**				
X5		Trans.	X6				
X6		Rec.	X5				

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Connecting 4 slaves

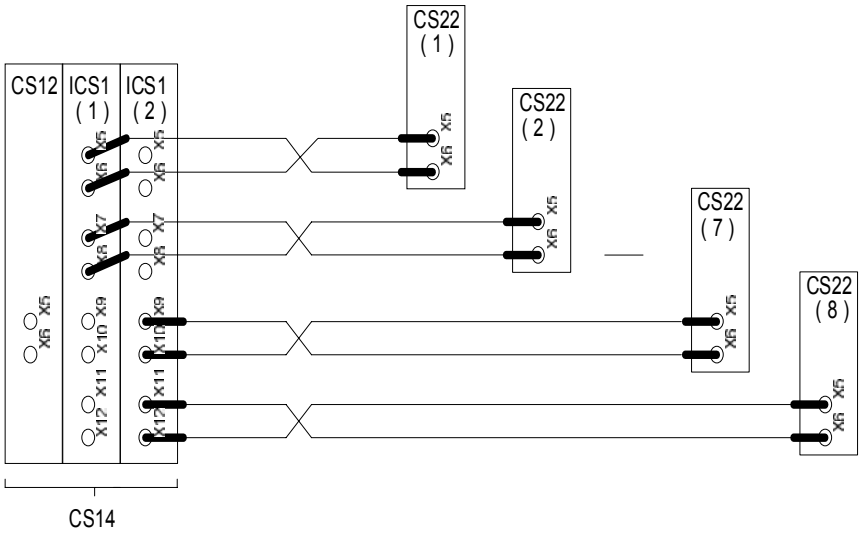


Master module CS13				Slave module CS22			
CS12	**ICS1**		**Type**	**1**	**2**	**3**	**4**
X5			*Not used*				
X6							
	X5		Trans.	X6			
	X6		Rec.	X5			
	X7		Trans.		X6		
	X8		Rec.		X5		
	X9		Trans.			X6	
	X10		Rec.			X5	
	X11		Trans.				X6
	X12		Rec.				X5

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Connecting 8 slaves



Master module CS14				Slave module CS22							
CS12	**ICS1**	**ICS1**	**Type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
X5			*Not*								
X6			*used*								
	X5		Trans.	X6							
	X6		Rec.	X5							
	X7		Trans.		X6						
	X8		Rec.		X5						
	X9		Trans.			X6					
	X10		Rec.			X5					
	X11		Trans.				X6				
	X12		Rec.				X5				
		X5	Trans.					X6			
		X6	Rec.					X5			
		X7	Trans.						X6		
		X8	Rec.						X5		
		X9	Trans.							X6	
		X10	Rec.							X5	
		X11	Trans.								X6
		X12	Rec.								X5

Cascading capability

In a subrack, several master modules as well as master- and slave modules can be used together. Thus, branched or extremely large networks can be created.

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6.3.2 Supplementary components

Fiber-optic cable Order designation

The following fiber-optic cable is used for the coupling:

SINEC FIBER OPTIC CABLE standard cable,
assembled in pairs with 4 BFOC connectors

A detailed description of the fiber-optic cable is described in Catalog "SINEC Industrial Communication Networks, IK 10".

6XV1 820-5B □ □ □		
Multiplier	0,1 m	**H**
	1 m	**N**
	10 m	**T**
	100 m	**U**
Length code	0.	**0**
	1.	**1**
	2.	**2**
	3.	**3**
	4.	**4**
	5.	**5**
	6.	**6**
	7.	**7**
	8.	**8**
	.0	**0**
	.1	**1**
	.2	**2**
	.3	**3**
	.4	**4**
	.5	**5**
	.6	**6**
	.7	**7**
	.8	**8**

Table 6-1 Fiber-optic cable Order No. and length code

6.3.3 Application information and noise immunity

- The CS1x, CS22 modules may only be used in a **force-ventilated** subrack.
- The modules can only be used in SR12.x and SR24.x subracks (C bus required).
- Before the power supply voltage of a subrack is **switched-on (powered-up)**, all of the plug connections of the fiber-optic cables involved must be inserted.
  In operation, the plug connectors of the fiber-optic cable coupling may not be released.
- Master- and slave **subracks can be powered-down while in operation and powered-up again**. The coupling is then re-established.

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- If a fiber-optic cable is not inserted, the transmit- and receive connections must be protected using the appropriate caps
- As CS13, CS14 of the ICS1 partial modules do not have a connector at the L/C bus, when required, **Daisy Chain jumpers** must be inserted (if there is still a CPU module to the right)!
- noise-immune operation is only possible if the module is tightly screwed into the subrack

Other information Further information on EMC and ambient conditions, refer to Section "General technical data"

6.3.4 Technical data

General data

No. of slots occupied	CS12: 1 CS13: 2 CS14: 3 CS22: 1
Dimensions W x H x D [mm]	CS12: 20.14 x 233.4 x 220 CS13: 40.28 x 233.4 x 220 CS14: 60.42 x 233.4 x 220 CS22: 20.14 x 233.4 x 220
Weight [kg]	CS12: 0.5 CS13: 0.8 CS14: 1.1 CS22: 0.4

Power supply voltage

Rated voltage	min.	max.	**Typ. current drain**
+5 V	+4.75 V	+5.25 V	CS12: 1.8 A CS13: 4.0 A CS14: 5.5 A CS22: 1.5 A
+15 V	+14.4 V	+15.6 V	CS12: 50 mA CS13: 100 mA CS14: 150 mA CS22: 150 mA

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6.4 SIMOLINK interface ITSL

Order No. 6DD1663-0AB0

Description Using the ITSL expansion module, a connection is established to an extremely fast, synchronous

SIMOLINK fiber-optic cable bus

The expansion module is inserted on a CPU module (PM5, PM6). A maximum of 2 ITxx expansion modules can be inserted on a CPU module. An ITxx occupies 1 slot (in addition to the CPU module slot).

Inputs and outputs

- 2 plug connectors for an incoming and outgoing fiber-optic cable

6.4.1 Supplementary components

Fiber-optic cable

6.4.2 Mounting

The Itxx module is mounted outside the subrack on a PMx CPU module or is inserted on an Itxx module already mounted on a PMx (using the 96-pin plug connector on the module).

Distance pieces All of the modules must be bolted together using the distance pieces provided (3 are provided)!

For the first ITxx The first ITxx, located directly on a CPU module must be retained using the **metal distance pieces** (these are included in the scope of supply of the PMx). This establishes the electrical contact which is required to identify the first expansion board.

The metal distance pieces are first retained on the PM4 using the M3 screws, washers and spring washers supplied.

If only **one ITxx** module is used, then it is screwed to the metal distance elements using the M4 nuts provided (and washers).

For the second ITxx If a second ITxx module is used, the first ITxx must be screwed using **plastic** distance pieces (this is included in the scope of supply of the ITxx modules).
The second ITxx module can then be inserted and retained using the M4 nuts provided (and washers).

The complete module assembly is then inserted in the subrack.

6.4.3 Application information and noise immunity

- operation **without fan** is possible
- noise-immune operation is only possible if the module is tightly screwed into the subrack

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Other information Further information on EMC and ambient conditions, refer to Section „General technical data“

6.4.4 Technical data

General data

No. of slots	1
Dimensions W x H x D [mm]	20.14 x 233.4 x 220
Weight	Approx. 0.6 kg

Power supply

Rated voltage	min.	max.	**Typ. current drain**
+5 V	+4.75 V	+5.25 V	420 mA
+15 V	+14.4 V	+15.6 V	450 mA
-15 V	-15.6 V	-14.4 V	175 mA

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6.5 Interface module SS1

Order No. 6DD1688-1AA0

Description

The SS4 communications module with SS1 interface module can be equipped with a **20 mA line current interface**.

The SS1 has, for the receiver and for the transmitter, a current source and current drain, so that coupling partners without current sink can be connected.

The interface module is a 40-pin (dual-in-line) hybrid circuit which is used in the socket provided on the SS4 communications module.

When inserting the module, ensure that it is correctly aligned: The recesses of the socket of the interface module (or pin 1, marked with a point) and the socket on the SS4 (X51) must coincide.

Features

- electrical isolation via optocoupler
- independent transmit- and receive channels
- 2 current sources
- 2 current sinks
- data transfer rate up to 38.4 kbaud
- max. cable length: 1000 m

Recommended connection

In order to achieve data transfer with the highest possible noise immunity, even at high baud rates and long cable lengths, we recommend that the cables are connected, so that the **current source (+Iq) and transmitter (+/-TxD)** are located **at the same cable end**.

In this case, the cable capacitance must only be charged with the diode voltage (receiver). If the transmitter (transmit transistor) is located as current source at the other cable end, the cable capacitance must be charged with approximately the supply voltage.

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Please compare the following connection examples:

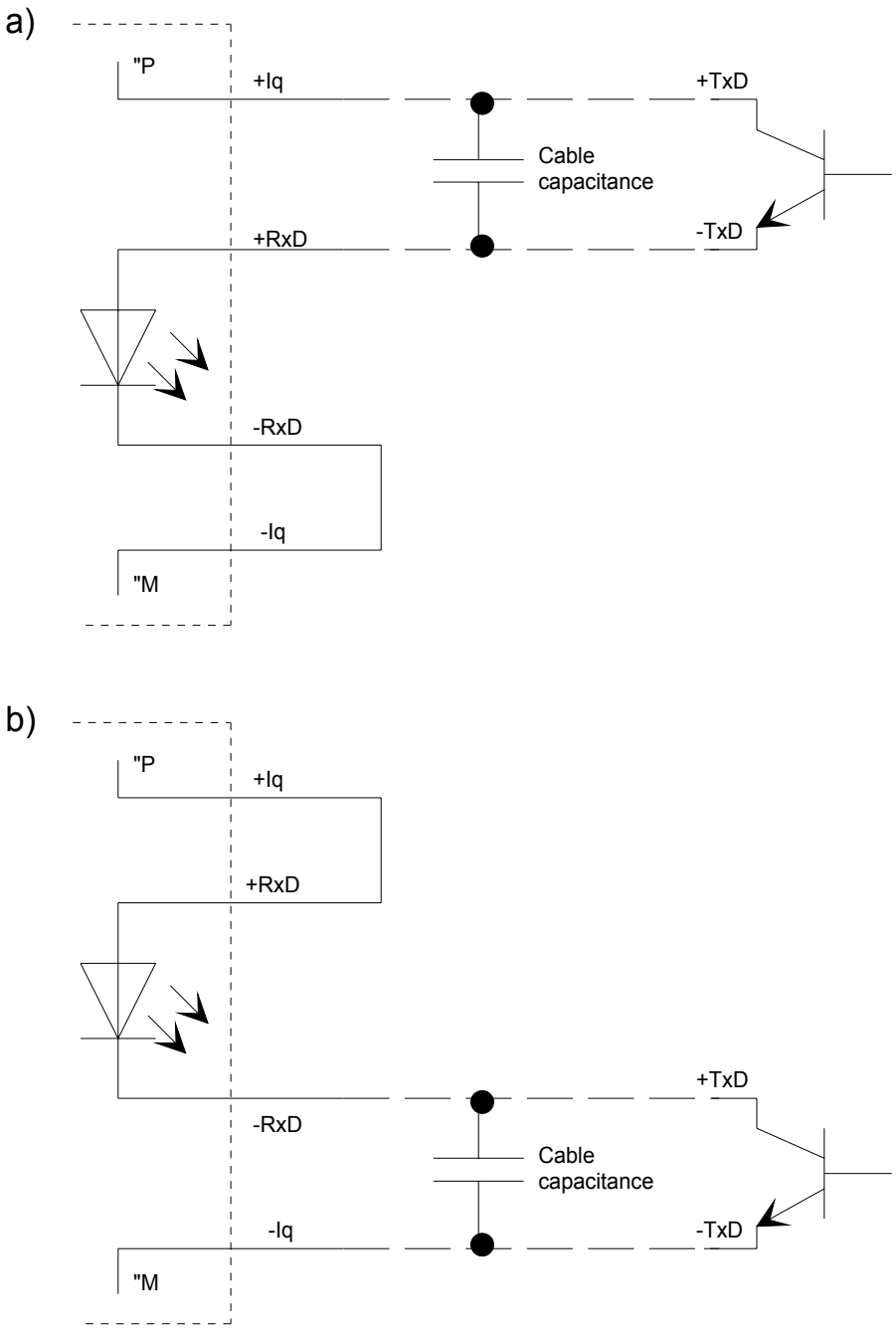


Fig. 6-5: ***Unfavorable*** *cable connection:*
Current source and transmitter at different ends

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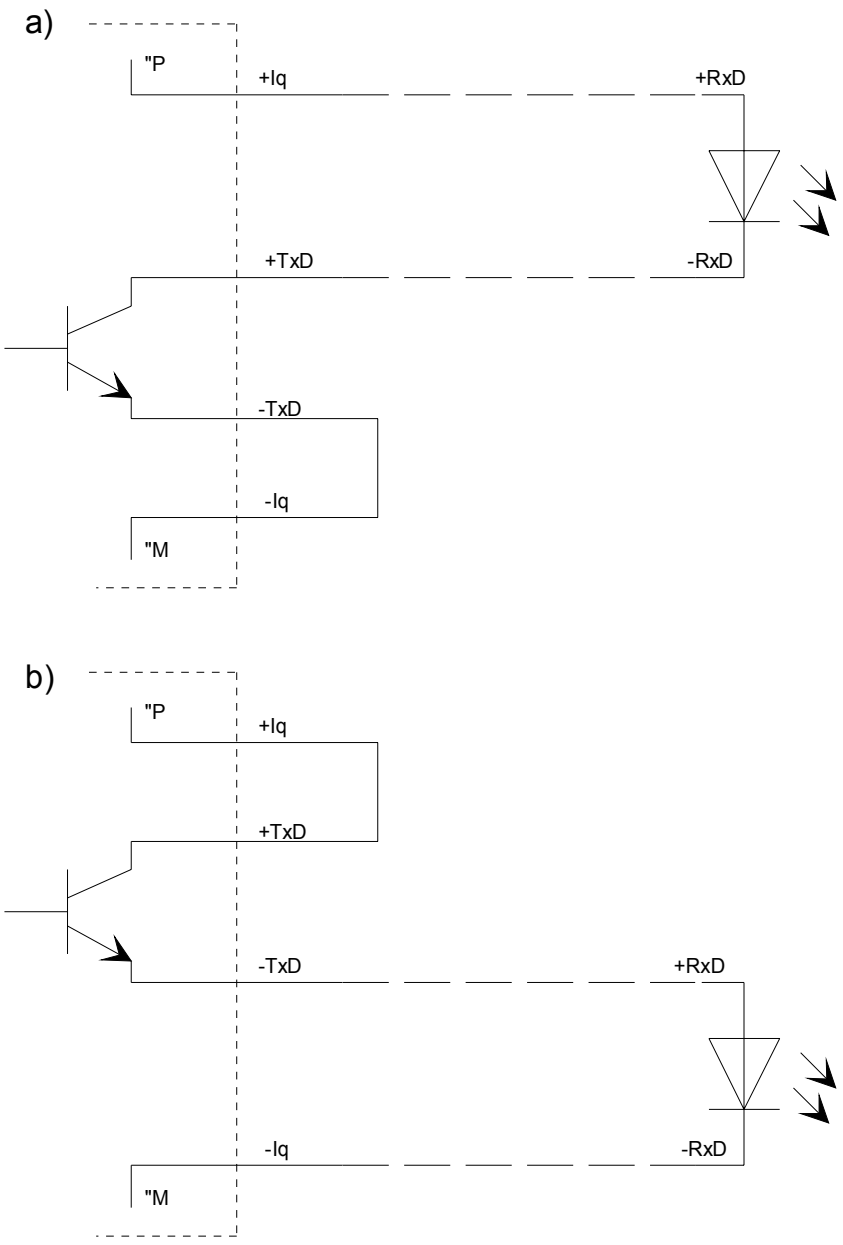


Fig. 6-6: ***Recommended*** *cable connection:*
Current source and transmitter at the same end

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6.5.1 Pin assignment

Pin	Significance
1	+15 V
2	GND
3	-
4	GND
5	-15 V
6	Not assigned
7	Not assigned
8	Not assigned
9	Not assigned
10	T*D
11	NC
12	R*D
13	-
14	-
15	-R*D
16	-
17	-
18	Not assigned
19	+Iq2
20	Not assigned

Pin	Significance
21	GND
22	GND
23	-
24	-
25	-
26	-
27	-T*D
28	-
29	Not assigned
30	Not assigned
31	-Iq2
32	-
33	-
34	+T*D
35	-
36	-
37	-Iq1
38	+Iq1
39	-
40	+R*D

Table 6-2 Pin assignment of the SS1 (dual inline, 40 pin)

6.5.2 Technical data

General data

Dimensions (W x H x D)	50.8 x 18.6 x 8.6 mm
Weight	11 g
Data transfer rate	Max. 38.4 kbaud
Max. cable length	Max. 1000 m

Power supply

+5 V	Max. 95 mA
+15 V	Max. 75 mA
-15 V	Max. 75 mA

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6.6 Interface module SS2

Order No. 6DD1688-1AB0

Description

The SS4 communications module can be equipped with an additional/extended **RS 232 (V.24) interface** using the SS2 interface module.

The interface module is a 40 pin (dual-in-line) hybrid device which can be inserted in the socket provided on the SS4 communication module.

When inserting the sub-module, ensure that it is correctly aligned: The recesses of the socket of the interface module (or pin 1, marked with a point) and the socket on the SS4 (X51) must coincide.

Features

- suitable for modem connection
- data transfer rates up to 38.4 kbaud
- max. cable length: 15 m
- external connections with V.28 signal level:

  E2, D1, D2, S1.2, S2, M1, M2, M5, T1, T2, T4

6.6.1 Pin assignment

Pin	Significance
1	+15 V
2	Ground
3	+ 5 V
4	Ground
5	-15 V
6	*DCD
7	*CTS
8	*RTS
9	*DTR
10	T*D
11	*(TR*C)
12	R*D
13	*(RT*C)
14	Not assigned
15	Not assigned
16	D1
17	T2
18	D2
19	Not assigned
20	S2

Pin	Significance
21	Ground
22	Ground
23	T4
24	M2
25	NC
26	M1
27	NC
28	E2
29	S1.2
30	M5
31	-
32	-
33	Not assigned
34	Not assigned
35	Not assigned
36	-
37	T1
38	-
39	-
40	-

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6.6.2 Technical data

General data

Dimensions (W x H x D)	50.8 x 18.6 x 8.6 mm
Weight	11 g
Data transfer rate	Max. 38.4 kbaud
Max. distance	15 m

Power supply

+15 V	Max. 75 mA
+5 V	Max. 95 mA
-15 V	Max. 75 mA

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6.7 Interface module SS31

Order No. 6DD1688-1AC1

Description

The SS4 communications module can be equipped with an **RS 485 interface** to establish a **USS bus connection** using the SS31 interface sub-module.

The interface module is a 40 pin (dual-in-line) hybrid device which can be inserted in the socket provided on the SS4 communications module.

When inserting the module, ensure that it is correctly aligned: The recesses of the socket of the interface module (or pin 1, marked with a point) and the socket on the SS4 (X51) must coincide.

Features

- data transfer rate up to 1 Mbaud
- max. cable length dependent on the baud rate:
  200 m at 1 Mbaud
- no terminating resistor

Enabling the transmitter

To enable the transmitter, the RTS signal must be set to „1“.

This enable signal is generated using an appropriate jumper in the connector of the SS4 communications module.

6.7.1 Pin assignment

Pin No	Function
1	Not assigned
2	0V
3	5V
4	0V
5	Not assigned
6	DCD
7	0V
8	RTS
9	Not assigned
10	TxD
11	TRxC
12	RxD
13	RTxC
14	Not assigned
15	-RTS
16	+RTS
17	-TRxC
18	+TRxC
19	Not assigned
20	Not assigned

Pin No	Function
21	0V
22	0V
23	-TxD
24	+TxD
25	Not assigned
26	+RTxC
27	-RTxC
28	+DCD
29	-DCD
30	+RxD
31	-RxD
32	5V
33	5V
34	Not assigned
35	0V
36	0V
37	Not assigned
38	Not assigned
39	Not assigned
40	Not assigned

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Table 6-3 Pin assignment of SS31, dual-in-line version, 40 pin

6.7.2 Technical data

General data

Dimensions (W x H x D)	50.8 x 18.6 x 9.0 mm
Weight	Approx. 15 g
Data transfer rate	Max. 1 Mbaud
Cable length	Max. 200 m

Power supply

Power supply voltage	+5 V +/- 5%
Current drain, nominal value	90 mA

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6.8 Communications module SS4

Order No. 6DD1688-0AD0

Description The following **serial interfaces** (data transfer protocols) can be implemented using the SS4 communications module:

Protocol	Application
DUST1	Connecting configuring- and operator control PCs, e. g. to load the program mode and for start-up (commissioning)
DUST2	Connecting a message printer
DUST3	Connecting SIMATIC S5 (AS 512 or CP 525)
USS	Connecting • OP2 operator control panels • VD1 text displays • drive converters to the process coupling; The SS4 is **USS master** and can be operated on the USS bus. Max. baud rate: 187.5 kbaud

CS7 plug-in module The communications module is a plug-in module for the CS7 support module. The CS7 support module, the communications module and its selected receptacle are configured using HWConfig. A maximum of 3 communication modules can be inserted on the CS7.

Data is transferred with the CPU modules via a 16 kbyte dual port RAM which is located on the CS7 support module.

Physical interface The configurable SS4 interface has, as standard an **RS 232** physical interface to connect to the COM interfaces of a PC.
Other physical interfaces can be selected using an optional interface module which can be inserted on the SS4:

Interface module	Physical interface (signal level along the cable)	Application
SS1	20 mA line current (TTY)	Long data transfer lines; interrupted lines can be reliably identified
SS2	RS 232 („V.24“)	For printers with control signals (RTS, CTS)
SS31	RS 485	USS protocol

The maximum baud rate is **187.5 kbaud** and is dependent on the associated protocol software and if relevant, the interface modules used (refer under interface modules).

6.8.1 Connecting programmers or PC

Connecting cables for PG740, PG750 or PG770 programmers can be assembled using the SM8 parts set (for SS4) or an appropriate parts set for

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the programmer side, according to the following drawing.
A 4-core screened round cable is required (e. g. LICYC 4*0,5, Metrofunk).

RS 232 interface

Operating a PC or PG750/770 via the standard RS 232 (V.24) interface:

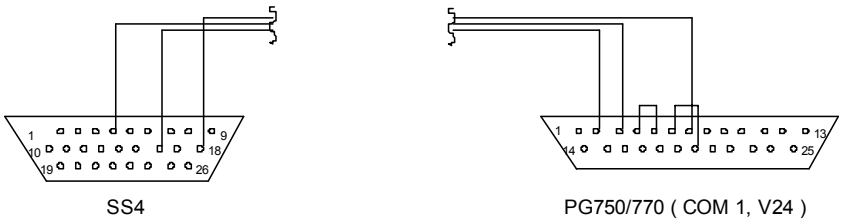


Fig. 6-7 SS4 at a PG750/770 (COM1) via the RS 232 interface (the two jumpers for the PC are not required!)

20mA interface

Operating the PG750/770 at the **active** SS4 communications module (active: Line current source and -sink on the SS4 side; thus, higher data integrity can be achieved with long cables and high baud rates):

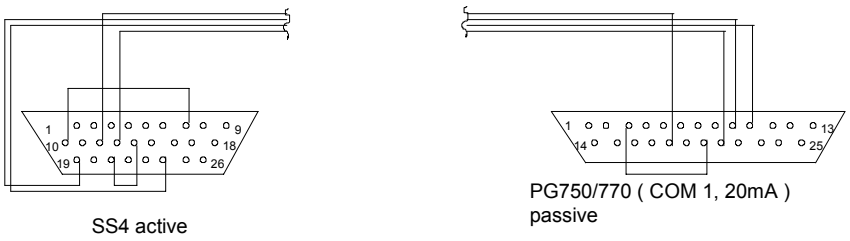


Fig. 6-8 SS4 at PG750/770 (COM1) via the 20mA interface (active)

Operating the PG750/770 at the **passive** SS4 communications module (passive: Line current source and -sink are not at the SS4 side):

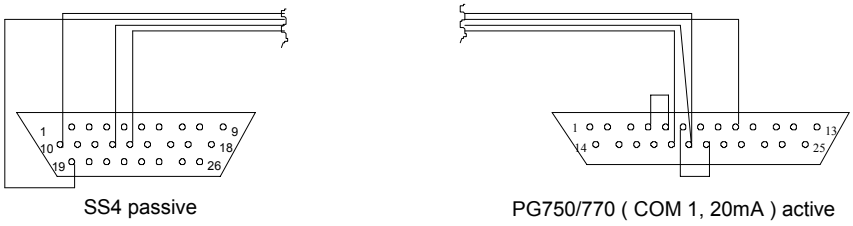


Fig. 6-9 SS4 at PG750/770 (COM1) via the 20mA interface (passive)

NOTE

If the **PG750/770** is operated as passive 20 mA current interface, then switches S3/2 and S3/3 in the PG must be opened (refer to the PG750/770 Manual).

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6.8.2 USS connection for OP2, VD1

Connecting cables for the OP2 operator control device or the VD1 numerical display can be assembled using the SM8 parts set (for SS4) or an appropriate parts set for OP2/VD1 (OP2: Parts set SM5) according to the following diagrams.
A 4-core screened round cable is required (e. g. LICYC 4*0,5, Metrofunk).

Bus termination

In order to increase the data integrity, the bus cable at both ends (at the first and last nodes) must be terminated using a resistor network:

- an 150Ω resistor between the RS485+, RS485- data signal lines
- one 390Ω resistor each from the data signal cables RS485+ to +5 V and from RS485- to ground to define a quiescent signal level when a node is not transmitting („basis network“)

For the **VD1 numerical display,** the bus termination (including basis network) is already integrated in the unit. These can be activated using the two DIL switches S1/S2.

USS bus with connection

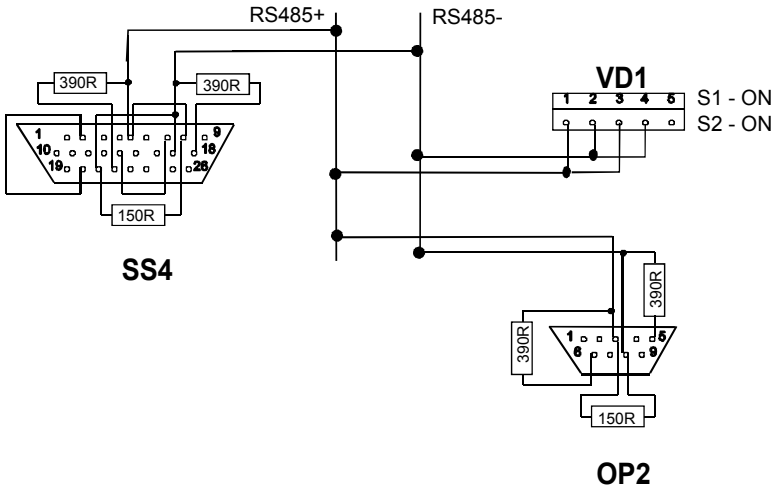


Fig. 6-10 SS4 at OP2 and VD1; with bus terminating circuitry

6

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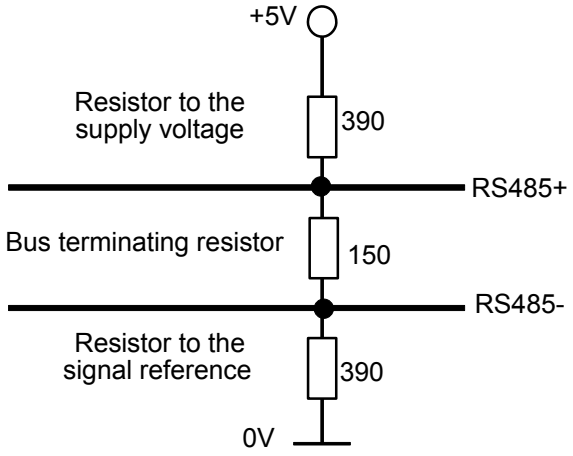


Fig. 6-11 RS 485 bus termination

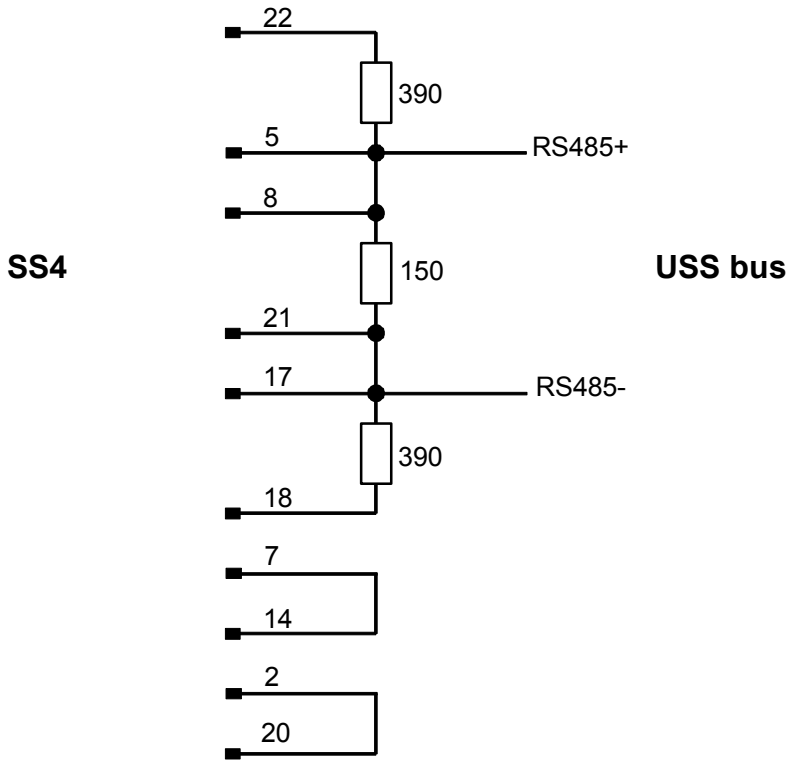


Fig. 6-12 Connector assignment SS4 with bus termination

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USS bus cable without circuitry

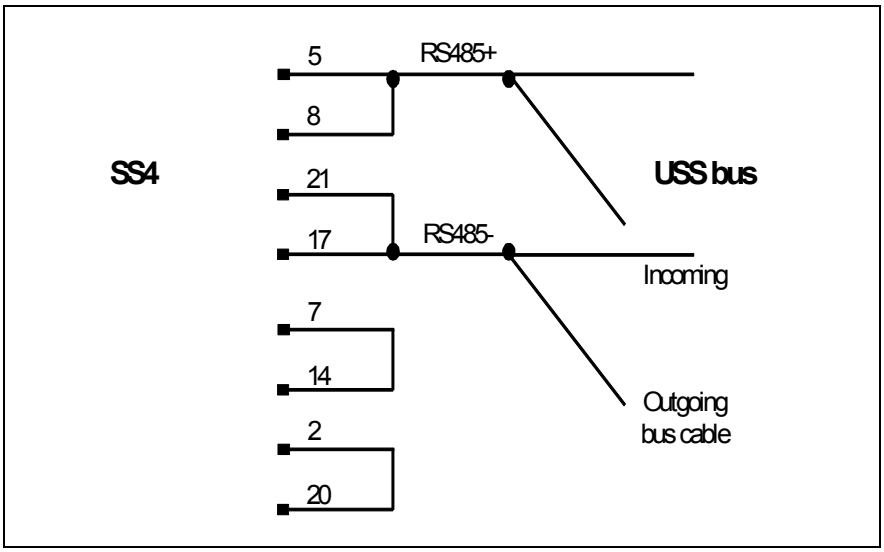


Fig. 6-13 SS4 Connector assignment without bus termination (SS4 at the center of the bus cable)

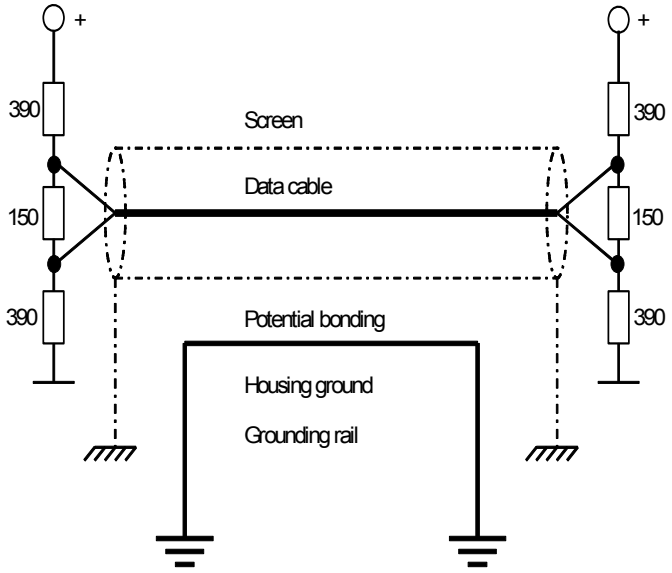


Fig. 6-14 Screening and potential bonding of the data cable

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6.8.3 Supplementary components

- SM8 **connector parts set** (26 pin, high-density plug connector)
- **interface module:**
  A 40-pin dual inline socket X51 is provided in the communications module. An **interface module** can be inserted in this socket in order to implement an RS 485 (for USS) or 20mA interface instead of the existing RS 232.
  - interface module SS1 (20 mA)
  - interface module SS2 (RS 232)
  - interface module SS31 (RS 485)

When inserting the interface module, the **mounting position** must be observed:
The recesses of the socket of the interface module (and pin 1, marked by the point) and that of the socket on the SS4 (X51) must coincide.

6.8.4 Mounting guidelines and noise immunity

Front panel grounding with CS7

The front panel of the communications module must be connected to the front panel of the CS7 using the cables provided with the CS7.

Cable screen

The data transfer cable screen (bus cable) must be grounded to a grounding rail through the largest possible surface area where the cable enters the equipment. In addition, the screen must be connected to the housing in the connector housing. The connector must be screwed to the communications module.

Other information

Further information on EMC and ambient conditions, refer to Section „General technical data“

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6.8.5 SS4 diagnostic functions

LED on CS7

Each receptacle of the CS7 support module has 2 LEDs, which allow diagnostic of the associated communication module (operating and fault/error conditions).

LEDs on CS7		Significance for SS4
Green H10 / H20 / H30	Yellow H11 / H21 / H31	
Dark	Dark	Communications module not initialized
Flashing	Flashing	RAM test error
Flashing	Dark	Hardware of the communications module is initialized; wait for a connection to be established to the initializing CPU module
Lit	Dark	DUST / USS initialized
Lit	Lit	Data transfer running
Dark	Lit	Software error

Table 6-4 Functions of the LEDs on CS7

LED on SS4

An additional four LEDs for interface diagnostics is provided on the communications module. However, when installed these LEDs are not visible.

LED on SS4		Significance for SS4
H1	Dark / lit: Flickers / glows:	Hex monitor not receiving Hex monitor receiving data
H2	Dark / lit: Flickers / glows:	Hex monitor not transmitting data Hex monitor transmitting data
H3	Dark / lit: Flickers / glows:	DUST/USS interface not transmitting DUST/USS interface transmitting data
H4	Dark / lit: Flickers / glows:	DUST/USS interface not receiving data DUST/USS interface receiving data

Table 6-5 Functions of the LEDs on SS4

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Diagnostics interface X5

The 26-pin interface connector X5 includes, in addition to the signals of the configurable interface, also the signals of an RS 232 diagnostics interface („hexadecimal monitor“).
The required connecting cable, together with the cable of the configurable interface must be connected at the interface connector to use this diagnostics interface:

Pin	Diagnostics interface X5 (RS-232)
1	TxD
9	GND
26	RxD

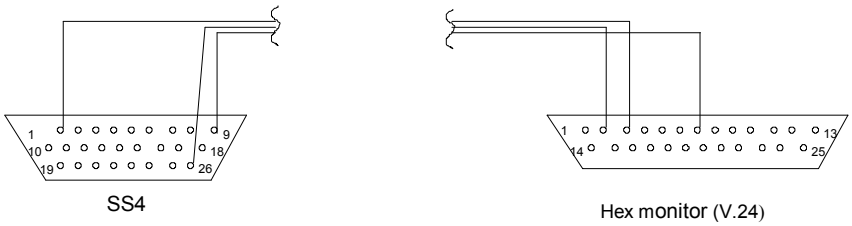


Fig. 6-15 Pin assignment of the diagnostics interface

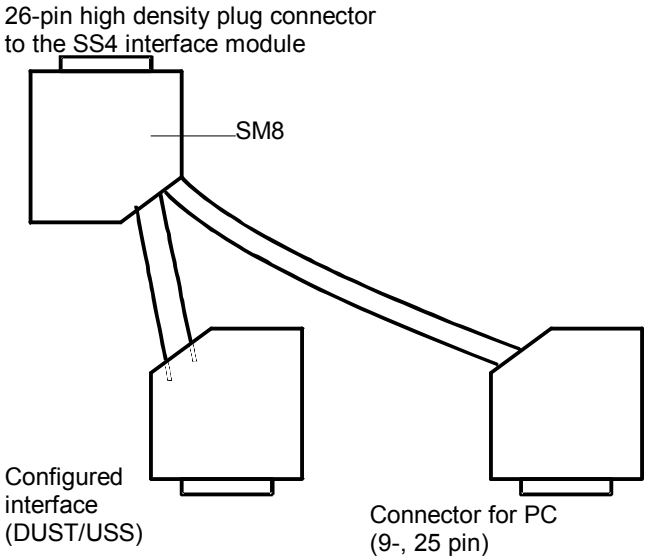


Fig. 6-16 Connecting the configuring- and diagnostics interface at connector X5.

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6.8.6 Connector assignment X5

Pin	RS 232 standard interface	RS 232 with SS2	20 mA with SS1	RS 485 with SS31
1				
2		**TxD**		+RTS
3		**RxD**		+TRxD
4	**TxD**			
5		CTS		**RS485+**
6		DCD		+RTxC
7		**GND**	+Iq2	+DCD
8		DCD		+RxD
9	**GND**	GND	GND	GND
10			**+TxD**	
11	P15	P15	P15	P15
12			+Iq1	
13		RTS	**+RxD**	
14			**-RxD**	-RTS
15		RTxC		-TRx
16	**RxD**			
17		RTxC		**RS485-**
18	GND	GND	GND	GND
19			**-TxD**	-RTxC
20		DTR		-DCD
21			-Iq1	-RxD
22	P5	P5	P5	P5
23	P5	P5	P5	P5
24		TRxC	-Iq2	
25	N15	N15	N15	N15
26				

Table 6-6 Pin assignment of connector X5

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6.8.7 Technical data

General data

Dimensions W x H x D [mm]	22 x 70 x 184
Weight:	0.2 kg

Power supply

The power supply (+5V, +15V and -15V) is established via the 48-pole plug connector X1 to CS7.

+5 V	0,4 A
+15 V	20 mA
-15V	20 mA

When calculating the total current drain of the communications module, the current drain, if relevant, of the inserted **interface module** must be taken into account.

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6.9 Communication modules SS5, SS52

Order No.

SS5: 6DD1688-0AE0

SS52: 6DD1688-0AE2

Description

SS5	SS52
Master interface for **PROFIBUS-FMS** (SINEC L2-FMS), FMS is a utility-oriented client/server communications	• Master- or slave interface for **PROFIBUS-DP** (SINEC L2-DP) including the „shared input“, SYNC, FREEZE functions • **MPI** (multiple-point protocol; for SIMATIC S7/M7)

Plug-in CS7 module

The communications module is a module which is inserted into the CS7 support module. The CS7 support module, the communications module and its selected receptacle are configured using HWConfig. A maximum of 3 communication modules can be inserted in each CS7.

Data is transferred with the CPU modules via a 16 kbyte dual port RAM, which is located on the CS7 support module.

Interfaces

Connector X5 has the following interfaces:

- PROFIBUS interface with RS 485 format with electrical isolation
- 5V power supply for the Optical Link Modules OLM with electrical isolation (floating)
- SS52: Parameterizing- and diagnostics interface with RS 232 format (for COM PROFIBUS)

PROFIBUS connection

PROFIBUS is connected at connector X5:

- directly with the SINEC L2 bus connector
- via an SINEC L2 bus terminal; in this case, the drop cable capacitance must be taken into account depending on the baud rate

The SINEC L2 bus terminal as well as the SINEC L2 bus connector have terminating resistors which can be switched-in.

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6.9.1 Supplementary components

Bus connection

- SINEC L2 bus terminal RS 485, 1.5 m connecting cable
- SINEC L2 bus terminal RS 485, 3 m connecting cable
- SINEC L2 bus connector RS 485
- SINEC L2 optical bus terminals PF/SF

Example of a cable:

Designation	Order No.
connecting cable (Profibus)	6XV1 830-0AH10
bus connector	6ES7 972-0BA40-0XA0

For further information, refer to:

- SINEC Catalog IK10
- SIMATIC S5/S7 Catalog
- Equipment Manual "SIMATIC S5 ET200 distributed peripheral system"

SS5 parameterization

A COM database must be generated and loaded in the SS5 using the **COMSS5** program so that the SS5 can be used.

COMSS5 can run on

- PG programmers under S5-DOS, or
- PC with S5-DOS emulation or COM adapter

The database is, for example, loaded into the SS5 via PROFIBUS using the **CP5412** PC plug-in card (PCMCIA).

SS52 parameterization

To operate the SS52 as master, a COM database must be generated, using the **COM PROFIBUS** (or **COM ET200**) program, and loaded into the SS52. The program runs on a PC under Windows.

The database is loaded into the SS52 via

- PROFIBUS
  (with PC PROFIBUS card CP5411, CP5511 or
  MPI card or interface)
- COM1/2 interface of the PC and RS 232 parameterizing/diagnostics interface of the SS52 with „SS52load“ driver program.

COM PROFIBUS must also be ordered if SS52 is configured as master:
Order No.: 6ES5 895-6SE12 (German)

Drive program „SS52load“

The driver program SS52load is included in COM PROFIBUS from V3.1 or can be obtained at no charge from Siemens via the Intranet:

ftp://www.erlf80.asi.siemens.de/SIMADYN_D/html/treiber.htm

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We are preparing an Internet page for SIMADYN D.

6.9.2 Mounting guidelines and noise immunity

Grounding the front panel with CS7

The front panel of the communications module must be connected to the front panel of the CS7 using the cables provided with the CS7.

Cable screening

The screen of the data transfer cable (bus cable) must be grounded to a grounding rail through the largest possible surface area where the cable enters the equipment.
In addition, the screen in the connector housing must be connected to the housing. The connector must be tightly screwed to the communications module.

Other information

Further information on EMC and ambient conditions, refer to Section „General technical data“

6.9.3 Diagnostics LED

Each receptacle of the CS7 support module has 2 LEDs, which allow diagnostics of the associated communications module (operating- and error/fault conditions).

CS7 LED for SS5

LEDs on CS7		Significance for SS5
Green H10 / H20 / H30	Yellow H11 / H21 / H31	
Dark	Dark	Processor not initialized
Dark	Lit	Without database at the bus; COMSS5 must be parameterized
Dark	Flickers	No database, with bus activity; COMSS5 must be parameterized
Slow flash	Dark	Initialization erroneous; COMSS5 database erroneous
Fast flash	Dark	Initialization phase 1
Lit	Dark	Initialization phase 2
Lit	Lit	Correctly connected at the bus; presently no bus activity
Lit	Flickers	Bus activity

CS7 LED for SS52

LED	Green H10 / H20 / H30	Yellow H11 / H21 / H31
Dark	CPU stopped	No bus operation (initialization phase)
Flashing, 5 Hz	Fatal error: Read-out the error codes at	Error on the bus, e. g. short-circuit:

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	function block @CSPRO and contact the SIMADYN Hotline	Check the bus cable and other bus nodes
Flashing, 1 Hz	Initialize the connection to the associated CPU module (@CSPRO); check @CSPRO configuring;	COM database not available or inactive (during download)
Flashing, 0.5 Hz	-	CFC- and COM configuring do not match; bus operation possible with some restrictions
Lit	Initialization O.K.	Bus operation O.K.

Additional LEDs are available on SS5/SS52; however, they are only visible when the module is inserted in an adapter card:

LED on SS5

LEDs on SS5		Significance for SS5
D1		No function
D2		No function
D3	Off / on: Flickers / glows:	Not transmitting; PROFIBUS interface transmitting data
D4	Off / on: Flickers / glows:	Not receiving; PROFIBUS interface receiving data

LED on SS52

LEDs SS52		Significance for SS52
H1	On	PROFIBUS interface operational
	Off	PROFIBUS interface not operational

6.9.4 Connector assignment X5

SS5:

PIN	Designation	Function

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PIN	Designation	Function
1	-	-
2	-	-
3	**RS485 +**	Receive- and transmit signal + (corresponding to **data B**)
4	RTS	Request to send
5	M5EXT	External ground; to supply OLMs
6	P5EXT	5V external; to supply OLMs
7	-	-
8	**RS485 -**	Receive- and transmit signal - (corresponding to **data A**)
9	RTS	Request to send

Table 6-7 SS5: Pin assignment of the 9-pin SUB D socket connector X5

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SS52:

Pin	Designation	Explanation
1	RS 232: Ground	For „SS52load“; (for SS52 from edition, approx. 7.97!)
2	RS 232: TxD	For „SS52load“: Transmit signal
3	**RS485 +**	PROFIBUS: Receive- and transmit signal + (corresponding to **data B**)
4	RTS	Request to send (to drive an OLM; „1“ when transmitting; as for pin 9)
5	M5EXT	External ground; to supply OLMs
6	P5EXT	External P5; to supply OLMs
7	RS 232: RxD	For „SS52load“: Receive signal
8	**RS485 -**	PROFIBUS: Receive- and transmit signal - (corresponding to **data A**)
9	RTS	Request to send (to drive the OLM; „1“ when transmitting; as for pin 4)

Table 6-8 SS52: Pin assignment of the 9-pin SUB D socket connector X5

6.9.5 Technical data

General data

Dimensions (W x H x D)	70 x 184 x 22 mm
Weight	0.2 kg

Power supply

The power supply (+5V, +15V and -15V) is established via the 48-pin plug connector X1 to CS7.

+5 V	SS5: max. 0,4 A SS52: max. 0,7 A
+15 V	max. 10 mA
-15 V	max. 10 mA

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7 Technology subrack

Overview

7.1	Technology subrack SRT400	7-2
7.2	Technology module T400	7-2

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7.1 Technology subrack SRT400

Order No. 6DD1682-0CG0

Description The subrack SRT400 has 2 slots to accept

- 1 or 2 technology modules **T400**
- SIMOVERT MASTER DRIVES **communication modules**
  - CB1 (PROFIBUS-DP)
  - CB2 (CAN)
  - SCB1 (binary and analog inputs/outputs connected to SCI1/2 via fiber-optic cable)
  - SCB2 (USS, Peer-to-Peer)

Features

- input voltage: 115 / 230 V
- output voltage:
  - + 5 V, +/- 15 V for modules
  - 24 V DC for binary inputs/outputs
- metal housing, closed at all sides
- wall mounting

7.2 Technology module T400

7.2.1 General features

Order No. 6DD1606-0AD0

Description The technology module T400 has a range of comprehensive peripheral functions (inputs/outputs) on the module. This allows it to be used by itself to realize favorably-priced smaller applications for drives and controls. It represents an innovated T300.

As far as the backplane bus and module format, it is designed as option module for use in the SIMOVERT **MASTER DRIVES** 6SE70/71 (FC, SC) drive converters.
A high-performance coupling to the basic control module of MASTER DRIVES („BASE BOARD“ CU) is established via its dual port RAM.

Further it can also be used in the **SRT400 subrack**(„Technology Box“). Here, it can be used together with a second T400 or a MASTER DRIVES communications module („COM BOARD“).

It is configured on a Windows 95-PC with SIMATIC STEP7 (HWConfig) and CFC.

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Inputs/outputs

- 2 analog outputs
- 5 analog inputs
- 2 binary outputs
- 4 bi-directional binary inputs/outputs
- 8 binary inputs, of which a maximum of 4 can be used to call-up interrupt tasks
- 2 incremental encoder connections with zero pulse
- 2 coarse pulse connections to suppress zero pulses;
  rough pulses can be optionally used as binary input
- 2 absolute value encoder connections (SSI/EnDat interface);
  absolute value encoder connection 2, optionally to serial interface 2!
- Serial interface 1 for
  - download and service with DUST1 protocol(RS 232) or
  - USS protocol (RS 485)
- Serial interface 2 (RS 485), optionally to absolute value encoder connection 2 for
  USS (master or slave) or peer-to-peer

Functional features

- The module is configured by **downloading** data into the permanently inserted flash EPROM (the EPROM is soldered-in)
- **MASTER DRIVES operator control panel** OP1S and SIMOVIS can be connected via USS slave for parameterization (for applications without MASTER DRIVES BASE-BOARD (CU), e. g. in the SRT400)
- 2*T400 can be used in the SRT400 subrack
- Selectable T400 **synchronizing** from the BASE- or COM BOARD, synchronizing signals can be output to the BASE- and COM BOARD;
- Dual port RAM interface to MASTER DRIVES
  BASE BOARD, CU and
  interface to the dual port RAM on a communications module (COM BOARD CB)

Features, electronics

- 32-bit RISC processor, 32 MHz
- **2Mbyte Flash** for compressed program code.
- **4Mbyte DRAM** for the de-compressed (unzipped) program which can be run
- 32 kbyte permanent change memory (**EEPROM**)
  (e.g. for fuzzy control)
- 4 kbyte dual port RAM

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Software protection

A socket for a 28 pin EPLD device (ALTERA) is provided on the module for copy-protecting the user program („Hardlock-PAL“).
Using a special function block, this EPLD block can be checked and the program execution stopped if it has the incorrect code or no code.
Further information on request.

7.2.2 Mechanical design, terminals

- The T400 can be used at slot 2 in the MASTER DRIVES electronics box (outer right!). The PROFIBUS-DP interface (CB1) or CAN bus (CB2) can be used at slot 3.
  The connection to the baseboard at slot 1 and to the expansion board ("COMBOARD") at slot 3 is established via two 64-pin plug connectors.
- The PC board is 100 mm * 233.35 mm. The maximum component height above the PC board is 14 mm.
- All of the input and output terminals are located at the front of the module. MINI-COMBICON plug connectors from the Phönix company are used.
- **55 terminals** (five blocks of 11) are located at the foremost edge of the module.
- Several terminals are assigned twice as a result of the restricted space. The actual function is selected using a switch or is configured.
- Operation **without fan is possible** for a 55°C ambient temperature!.
- The backplane bus wiring in the **SRT400** technology box is designed so that two T400 can be used. In this case, connector X2 (below) of the lefthand slot is connected with connector X1 (top) of the righthand slot.

7.2.3 Incremental encoder with coarse- and fine-pulse evaluation

Incremental encoder

- 2 incremental encoder inputs, with tracks A, B, and zero pulse of which
  - encoder 1 for HTL signal level
  - encoder 2 for either **HTL or differential signals (RS422);**
- The pulses for encoder 1 (tracks A, B, zero pulse) can be optionally retrieved from the BASE BOARD via the **backplane bus** („incremental encoder simulation“ of the CUx; as TTL signal level).
  The pulse source is selected by configuring the speed actual value block NAV.
- Max. input frequency 1MHz
- Selectable, direction of rotation-dependent evaluation of the zero pulses

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Coarse / fine pulse evaluation

A coarse/fine (zero) pulse evaluation is provided to suppress noise- or bounce pulses for synchronous- and positioning tasks.

The coarse pulse enables a window for the fine pulse. Generally, coarse- and fine pulse are defined by the mechanical design of the machine (e.g. cams). The smoothing time of the coarse pulse input is approx. 1 ms (as for binary inputs). The fine pulse has no smoothing time.

A differentiation is made between the following situations when evaluating the coarse- and fine pulses:

	The evaluation signal is generated, if...
Case 1	A fine pulse is received; the coarse pulse is not taken into account; (also for disturbances/noise on the fine pulse)
Case 2	Coarse- **and** fine pulse have an H signal level, however only 1 evaluation signal per coarse pulse (fine faults/noise are suppressed)
Case 3	Coarse- **and** fine pulse have an H signal level, fine pulse noise is *not* suppressed.
Case 4	**After deleting** the coarse pulse, a positive fine pulse *edge* was identified. Additional fine pulses (noise) are suppressed!
Case 5	**Coarse pulse is inactive** (L signal level) **and** fine pulses are active (H signal level), the fine pulse noise is *not* suppressed!

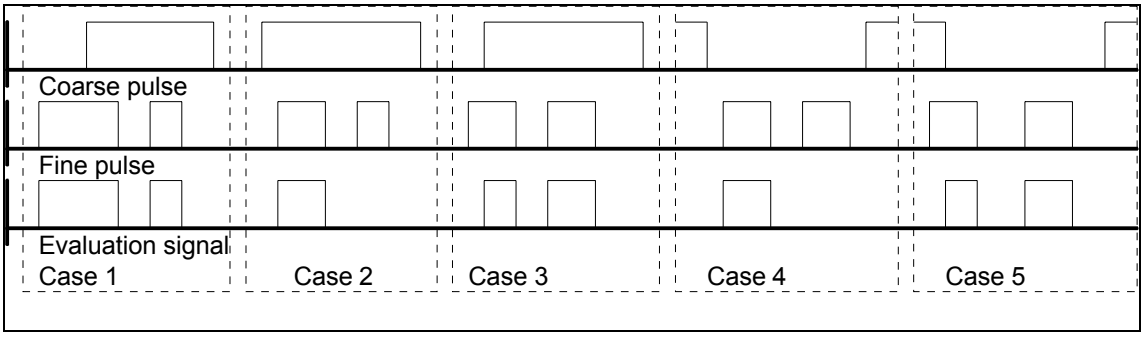


Fig. 7-1 Coarse- and fine-pulse evaluation

7.2.3.1 Pulse encoder 2

Pulse encoders with different signal levels can be connected at encoder input 2:

- RS422
- HTL± (± 3V)
- HTL (3V ... 8V)

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- TTL (0V ... 5V)

The setting is made using the DIL switches S2/1 - S2/8

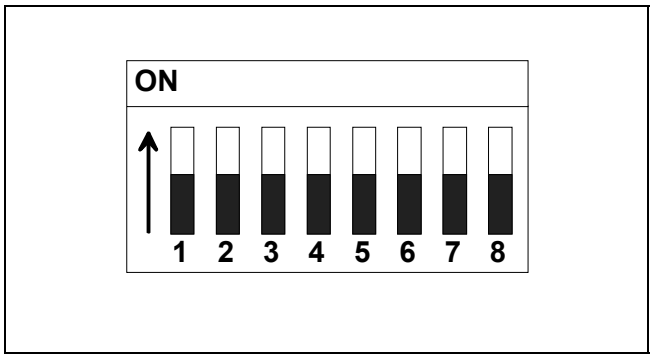


Fig. 7-2 Switch S2

Track signals A and B are set according to the following table:

Significance	Switch S2	Setting	Significance	Switch S2	Setting
TTL RS422	1	ON	TTL (0V ... 5V)	1	ON
	2	ON		2	ON
	3	ON		3	OFF
HTL± (±3V)	1	OFF	HTL (3V ... 8V)	1	OFF
	2	OFF		2	OFF
	3	OFF		3	OFF

The zero impulse can be switched indepenent from Track A or B:

TTL RS422	4	ON	TTL (0V ... 5V)	4	ON
	5	ON		5	OFF
HTL± (±3V)	4	OFF	HTL (3V ...8V)	1	OFF
	5	ON		2	OFF

For differential signals, bus terminating resistors can be switched-in via switch S2/6 - 8:

Significance	Switch S2
Track A	6
Track B	7
Zero pulse	8

The terminating resistors are switched-out in the OFF setting; they are switched-in in the ON setting.

The switches can only be changed when the module has been withdrawn. The switches are not accessible when the module is inserted.

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7.2.4 Absolute value encoders

The T400 has up to 2 synchronous-serial interfaces for multi-turn absolute value encoders:

- SSI- and EnDat protocol (according to the Heidenhain company)
- Selectable cycle between 100 kHz and 2 MHz
- Either dual- or Gray-, or Gray-excess code can be selected

However, terminals 72 - 75 can only be alternatively used as

- second synchronous-serial interface ("absolute value encoder 2") or
- peer-to-peer or USS protocol

It is possible to simultaneously use, for example, peer-to-peer and "absolute value encoder 1" (terminals 76-79).

7.2.5 Serial interfaces

T400 has 2 serial interfaces:

„Service“ interface 1

The following is realized via interface 1,

- the program is downloaded
- service („CFC in the test mode", "basic service") for start-up

(DUST1 protocol).

Baud rate: 19.2 kbaud

Optionally, the **USS protocol** (master/slave), to connect a MASTER DRIVES OP1S operator control unit or SIMOVIS can be set per hardware **switch** on the T400.

Interface 1 has both physical interfaces (can be optionally used!):

- RS 232 — for PC coupling (download, service)
- RS 485 (**2 wire**) — e.g. for USS to the operator control panel connection (OPx, SIMOVIS) or to higher-level (master) systems (SIMATIC); incl. terminating resistors which can be switched-in

Interface 2

Interface 2 is a mix asynchronous and synchronous interface with **RS 485** data transfer signal level:

- **Peer-to-peer**
  with full duplex, 4-wire connection
- **USS** protocol (master/slave)
  with half-duplex, 2-wire connection

The following **baud rates** can be set:

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9.6 kbaud
19.2 kbaud
38.4 kbaud
93.75 kbaud
187.5 kbaud

7.2.5.1 Bus termination

Bus terminating resistors for serial interfaces 1- and 2 can be switched-in via switch S1/1-S1/8 if the T400 is located at the beginning or end of the bus.

	Terminals	**Switch S1**
Serial interface 1	70/71	1,2
Serial interface 2 (2-conductor, 4-conductor)	74/75	3,4
Serial interface 2 (4-conductor)	72/73	5,6

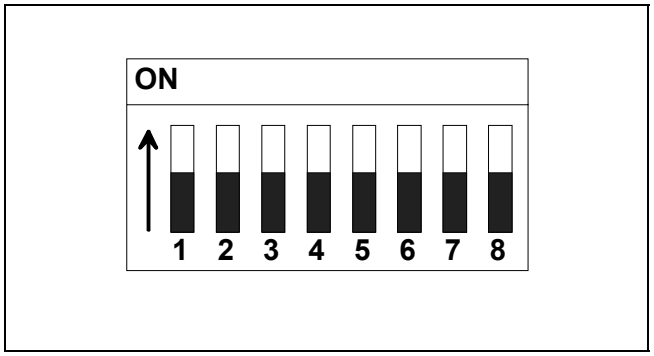


Fig. 7-3 Switch S1

The terminating resistors are switched-in in the ON setting.

The switch settings can only be changed after the module has been withdrawn. These switches are not accessible if the module is inserted.

Switch S7 has no function.

7.2.5.2 Communications switch

Switch S1/8 toggles between the service- and USS protocol at serial interface 1. More detailed information can be taken from the description of the USS protocol.

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7.2.6 Synchronizing possibilities

The T400 offers various ways to process and transfer synchronizing signals.

The processing possibilities are listed in the following diagram. The three selector switches indicated, are set by appropriate configuring.

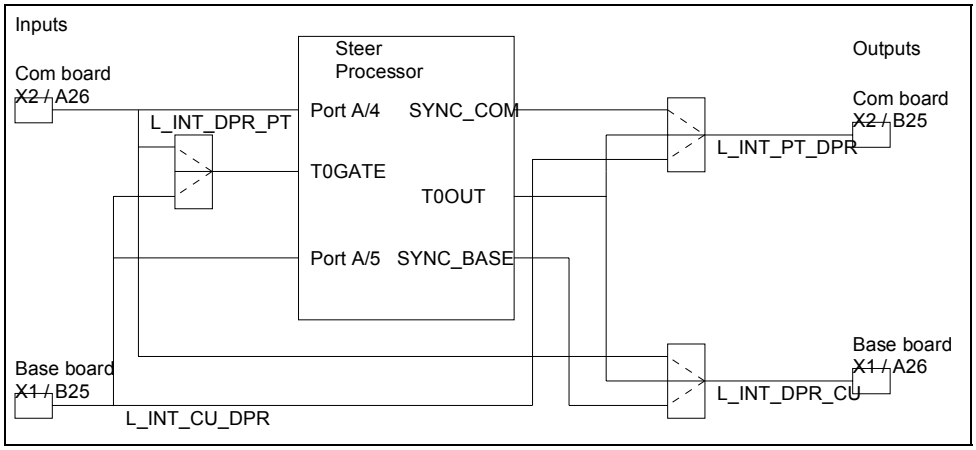


Fig. 7-4 Synchronizing possibilities

Synchronizing possibilities

The **basic cycle** of the T400 can be taken from three various sources (can be configured in HWConfig):

- Basic cycle time of the T400 (standard)
- Synchronizing signal of the BASE BOARDs (L_INT_CU_DPR (connector X1/B25) for T0GATE)
- Synchronizing signal of the COM BOARDs (L_INT_DPR_PT (connector X2/A26) for T0GATE)

Thus, a cycle from the CBX can synchronize the T400 and BASE BOARD (CU).

Configurable **interrupt tasks** can also be called using the synchronizing signals from BASE- or COM BOARDs (ports A/4, A/5).

Sync signals for BASE- and COM BOARD

The T400 can supply BASE- and COM BOARD synchronizing signals, which come from the following three sources and can be selected by appropriately configuring:

- Basic cycle time of the T400 (T0OUT of MFB1)
- Directly connecting synchronizing signals from the BASE- or COM BOARD to the other module
- In an FP with a special FB-generated synchronizing signal (SYNC_BASE, SYNC_COM)

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Synchronizing 2 T400:

BASE BOARD-T400, synchronized via X2/B25 --> X1/B25 TECH BOARD-T400, and

TECH BOARD-T400 synchronized via X1/A26 --> X2/A26 BASE BOARD-T400;

7.2.7 Parameters

The I/O of the function blocks as well as the parameters can be defined (configured) on the T400. Thus, these I/O can be read and changed using the "parameter mechanism" via

- Dual port RAM
- PROFIBUS (CB1)
- USS protocol (for operator control device, SIMOVIS)

2000 parameters can be configured, whereby a differentiation can be made between those at the operator control panel (and SIMOVIS), and the basic drive converter parameters („r“ and „P“) using one of the two prefixes

- „H“
- „L“

7.2.8 Terminal assignment

All of the signals are connected at 55 terminals, which are accessible from the front.
They are distributed over 5 11-pin MINI-COMBICON plug connectors in a 3.5 mm grid dimension (connectors X5 - X9):

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T400 terminal assignment				Con.	Con.-pin	Terminal
+ 24 V external (for binary inputs and outputs)				X5	1	45
Bi-directional binary input and output 1					2	46
Bi-directional binary input and output 2					3	47
Bi-directional binary input and output 3					4	48
Bi-directional binary input and output 4					5	49
Ground, binary inputs and outputs					6	50
Binary output 1					7	51
Binary output 2					8	52
Binary input 1 (interrupt-capable)					9	53
Binary input 2 (interrupt-capable)					10	54
Binary input 3 (interrupt-capable)					11	55
Binary input 4 (interrupt-capable)				X6	1	56
Binary input 5					2	57
Binary input 6					3	58
Binary input 7					4	59
Binary input 8					5	60
Ground, binary inputs and outputs					6	61
Encoder 2 :	Track A (HTL)	Encoder 2:	Track A+ (RS422)		7	62
Encoder 2:	Track B (HTL)	Encoder 2:	Track B+ (RS422)		8	63
Encoder 2:	Zero pulse (HTL)	Encoder 2:	Zero pulse + (RS422)		9	64
Encoder 2: Coarse pulse					10	65
Encoder 2 ground					11	66
Serial interface 1:	Rx-RS232			X7	1	67
Serial interface 1:	Tx-RS232				2	68
Serial interface ground					3	69
Serial interface . 1:	Tx/Rx-RS485+				4	70
Serial interface 1:	Tx/Rx-RS485-				5	71
Serial interface 2: Rx-RS485+		Absolut-Encoder 2: Data+			6	72
Serial interface 2: Rx-RS485-		Absolut-Encoder 2: Data-			7	73
Serial interface 2: Tx (Rx)-RS485+		Absolut-Encoder 2: Pulse+			8	74
Serial interface 2: Tx (Rx)-RS485-		Absolut-Encoder 2: Pulse-			9	75
Absolut-Encoder 1:	Data+				10	76
Absolut-Encoder 1:	Data-				11	77
Absolut-Encoder 1:	Pulse+			X8	1	78
Absolut-Encoder 1:	Pulse-				2	79
+ 15 V -Encoder Power Supply (max. 100 mA)					3	80
Increm.-Encoder 1:	Track A				4	81
Increm.-Encoder 1:	Track B				5	82
Increm.-Encoder 1:	Zero pulse				6	83
Increm.-Encoder 1:	Coarse pulse				7	84
Increm.-Encoder 1 Ground					8	85
Increm.-Encoder 2:	Track A- (with RS422)				9	86
Increm.-Encoder 2:	Track B- (with RS422)				10	87
Increm.-Encoder 2:	Zero pulse- (with RS422)				11	88
Ground, analog inputs and outputs				X9	1	89
Analog input 1		Analog input 1+			2	90
		Analog input 1-			3	91
Analog input 2		Analog input 2+			4	92
		Analog input 2-			5	93
Analog input 3					6	94
Analog input 4					7	95
Analog input 5					8	96
Analog input 1					9	97

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Analog input 2		10	98
Ground, analog inputs and outputs		11	99

Note: All grounds are connected mutually via inductivity and with electronics ground.

Grounding

The grounds connections of

- interfaces 1 and 2
- analog inputs/outputs
- binary inputs/outputs.
- incremental encoders 1 and 2

are connected to the T400 electronics ground through 0 Ohm resistors, reactors and capacitors which can be soldered-out. For production-related reasons, the 0 Ohm resistor is an SMD device (not separately connected) and when required must be soldered-out (to interrupt the electrical connection)!

7.2.9 Technical data

General data

No. of slots occupied	1
Dimensions W x H x D [mm]	20.14 x 233.4 x 220
Weight	approx. 0.6 kg

Power supply

The T400 requires the following voltages at the upper backplane bus connector X1:

Rated voltage	min.	max.	**Typ. current drain**
+5 V	+4.75 V	+5.25 V	1000 mA
+15 V	+14.4 V	+15.6 V	140 mA + encoder load (max. 100 mA, electronically limited)
-15 V	-15.6 V	-14.4 V	140 mA
24 V (external)	20 V	30 V	150 mA + binary output current

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Analog inputs

No.	5
Type	Of which, 2 are differential inputs, 3 unipolar; non-floating
Input voltage range	-10 V +/- 4 LSB to +10 V +/- 4 LSB (1 LSB = 4.88 mV)
Input resistance	20 kOhm
Input filter	3 dB transition frequency: 1.5 kHz
Resolution	12 bits
Absolute accuracy	Typ. 10 bits over the complete temperature range
Linearity	± 1 LSB
Offset error	± 3 LSB
Max. conversion time	15 µs
Differential input resistance	≥ 20 kOhm
Hardware smoothing	5 µs

Analog outputs

No.	2
Output voltage range	-10 V to +10 V
Output current	+/- 10 mA
Resolution	12 bits
Monotony	11 bits over the complete temperature range
Absolute accuracy	Typ. 10 bits over the complete temperature range
Short-circuit protection to ground	Yes
Slew rate of the output	Approx. 3.4 V/µs
Offset- and amplification error (gain error)	± 3 LSB

Binary inputs

No.		10 and max. 4 bi-directional non-floating
Input voltage		24 V DC nominal voltage
	for 0 signal	-1 V to +6 V or inputs open-circuit
	for 1 signal	+13 V to +33 V
Input current		
	for 0 signal	0 mA
	for 1 signal	8 mA typ.
Input smoothing		500 µs

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Binary outputs

No.		2 and max. 4 bi-directional; non-floating
Power supply voltage		From external
	nominal value	24 V DC
	perm. range	+20 V to 30 V including ripple
	briefly	+35 V, max. 0.5 s
Output current for 1 signal		
	nominal current	50 mA (also corresponds to max. value)
Short-circuit protection		Electronic and thermal
Limiting inductive switch-off voltages		Supply voltage + 1 V
Residual current		20 µA for 0 signal
Signal level		
	for 0 signal	Max. 3 V
	for 1 signal	Supply voltage - 2.5 V
Switching delay		Max. 15 µs

15 V incremental encoder

No. of encoders		Total max. 2
Type		Differential inputs, electrical isolation (floating) (optocoupler)
Input voltage range		Differential voltage -30 V to +30 V
Input voltage (for 15 mA load)		
	for 0 signal	-30 V to +4 V
	for 1 signal	+8 V to + 30 V
Input current		Approx. 15 mA (electronically limited)
Pulse frequency		Max.. 1 MHz (track frequency)
Phase difference of the track signals		Independent of the pulse frequency at least 200 ns
Input filter		Can be configured via software (function block)

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8 Program memory modules / Interface modules

Overview

8.1	Program memory modules MS5, MS51, MS52	8-2
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8.1 Program memory modules MS5, MS51, MS52

Order Nos.

MS5: 6DD1610-0AH0

MS51: 6DD1610-0AK0

MS52: 6DD1610-0AH2

Description

The MS5, MS51 and MS52 program memory modules are used to save the processor program, configured by the user with HWConfig and CFC (including the operating system).

Installation / programming

The program memory module is inserted in the module receptacle of the CPU module provided and the user program can be downloaded in two ways:

- via a PCMCIA card, integrated in the PC (**offline loading**) (PC card)
- directly from the PC via a serial communications link into the memory module inserted in the CPU module (**online loading**)

Program size

The size of the software to be loaded into the memory module ("zipped" to approximately 50%), and the size of the available program memory in the CFC is displayed under the following memory item:

Target system / load / info

Memory overview

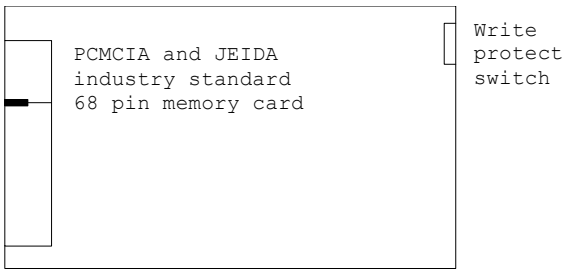
The differences in the application and the memory expansion of the MS5, MS51 and MS52 program memory modules are shown in the following table:

Application	MS5	MS51	MS52
Flash memory to store the configuring software	2 Mbyte	4 Mbyte	8 Mbyte
EEPROM for operating parameters which can be changed	8 Kbyte	8 Kbyte	8 Kbyte

Table 8-1 Application areas of the program memory modules

NOTE

The flash memory is a non-volatile memory which can be electrically programmed and erased.



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8.1.1 Technical data

General data

Dimensions (W x H x D)	54 x 85.6 x 3.3 mm
Weight	30 g

Power supply

	MS5	MS51	MS52
Power supply	+5 V	+5 V	+5 V
Current drain	100 mA	100 mA	100 mA
Connection to JEIDA/PCMCIA	68 Pin		
Access time	200 ns		

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8.2 Interface module SE13.1

Order No. 6DD1681-0BD1

Description The interface module is used to adapt passive signals via voltage divider and T elements. It includes

- 6 T elements which can be connected/configured using solder pins, and
- 2 voltage dividers which can be freely configured

Module design

- housing for snapping-on to mounting rail
- 3-row, 3 x 16-pin terminal block
- 6 configurable T elements
- 2 voltage dividers with spindle potentiometers which can be freely dimensioned
- solder pins to connect components with axially-located connections
- labeling field for the user to identify his plant/system

T element

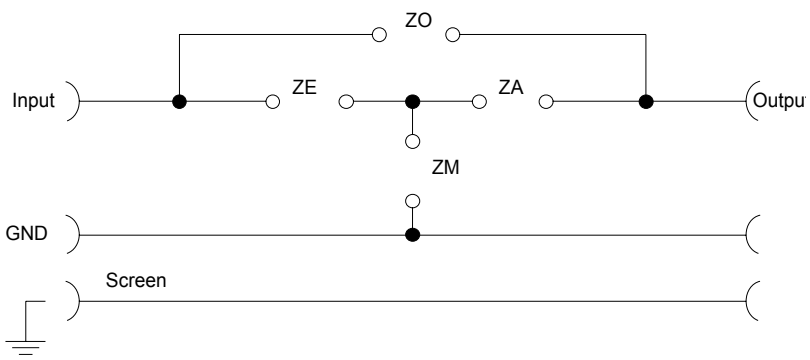


Fig. 8-1 Connecting the T element on the interface module

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Voltage divider

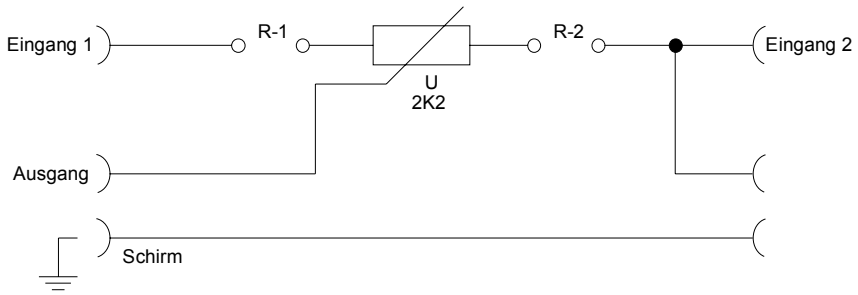


Fig. 8-2 Wiring the voltage divider on the interface module

8.2.1 Application information

The circuits on the interface module are defined by the user. Here are some of the examples of the circuits which can be implemented:

- filters:
  - low-pass
  - high-pass
  - bandpass
  - bandstop
  - RC element
- voltage divider

Other information

Further information on EMC and ambient conditions, refer to Section „General technical data“

8.2.2 Technical data

General data

Mounting system	Can be snapped onto mounting rails
Dimensions (W x H x D)	77 x 112.5 x 72.5 mm
Weight	0.23 kg

Power supply

Voltage divider, nominal value	1.76 to 2.64 kΩ
Power supply	Max. +33 V DC
Current drain	Max. 15 mA
Maximum rating	500 mW

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8.2.3 Connector assignment X1

Terminal	Designation	Terminal	Designation	Terminal	Designation
1	Input volt. divider 1	21	GND volt. divider 1	41	Screen volt. divider 1
2	Output "	22	"	42	"
3	Input volt. divider 2	23	GND volt. divider 2	43	Screen volt. divider 2
4	Output "	24	"	44	"
5	Input channel 1	25	GND channel 1	45	Screen channel 1
6	Output "	26	"	46	"
7	Input channel 2	27	GND channel 2	47	Screen channel 2
8	Output "	28	"	48	"
9	Input channel 3	29	GND channel 3	49	Screen channel 3
10	Output "	30	"	50	"
11	Input channel 4	31	GND channel 4	51	Screen channel 4
12	Output "	32	"	52	"
13	Input channel 5	33	GND channel 5	53	Screen channel 5
14	Output "	34	"	54	"
15	Input channel 6	35	GND channel 6	55	Screen channel 6
16	Output "	36	"	56	"

Table 8-2 Connector assignment of X1

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8.3 Interface module SE26.1

Order No. 6DD1681-0CG1

Description The module is used to convert analog signal quantities and provide electrical isolation (floating). The module filters analog signals using a low-pass filter.

Module design

- housing for snapping-on to mounting rails
- differential input
- short-circuit proof output
- operating message via LED
- labeling field for module identification

Features The module is supplied with 24 V DC. A DC/DC converter generates electrically isolated +/-15 V DC voltages from this 24 V DC supply. These supply the isolating- and signal amplifiers at the input. The 24 V DC power supply and the analog output are electrically connected.

A second order Butterworth low pass filter filters the applied signal. The frequency characteristics and the transfer characteristics are specified in Chapter 1.6.

A differential amplifier is used as the input circuitry. Thus, parallel voltage- or serial current measurements are possible. This allows analog signals of the plant/system to be processed in electrically-isolated (floating) SIMADYN D subracks.

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8.3.1 Application information

The module has screw terminals to connect the input- and output signals. SIMADYN D is connected via an SU10, SU11 interface module which is connected to an input/output module (EA12) or an expansion module (IT41) using a ribbon cable.

Example

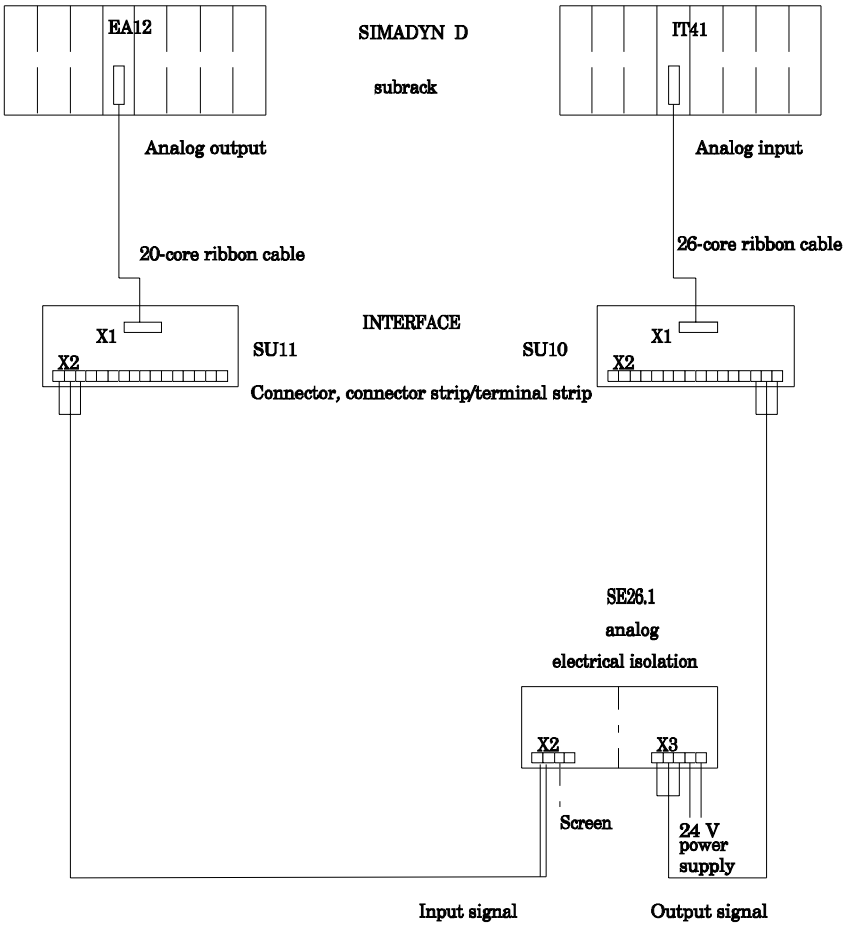


Fig. 8-3 Connecting example for the interface module SE26.1

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8.3.2 Technical data

General data

Mounting system	Can be snapped onto mounting rails
Dimensions (W x H x D)	135 x 77 x 59
Weight	0.2 kg

Power supply

External power supply		+24 V DC
Range		+20 to +30 V DC
Briefly (t<500 ms)		1,5 x V_{rated}
Current drain at 24 V		170 mA at the rated output current
Signal level		
	input	+/- 10 V
	output	+/- 10 V
Input resistance		100 kΩ
Signal level		±10 V
Output load resistor		≥1 kOhm
Zero point error [1]		± 2 mV
Maximum error		±10 mV
Push-pull output		5 mA
Transfer frequency range:		
	0 to 1 kHz	|A/AO| = 0 dB
	1 to 3 kHz	|A/AO| ε 3 dB

[1] 25 °C ambient temperature

8.3.3 Connector assignment

Terminal block -X2		Terminal block -X3	
Terminal	**Designation**	**Terminal**	**Designation**
031	**Pos.** input signal	04	Output signal
032	**Neg.** input signal	05	Output ground
05	Input ground	L+	P24 power supply P_{ext}
1S	Push-pull output	1S	Connected with terminal X2/3S
2S	Terminal connected with X2/05 input ground	2S	Connected with terminal X3/05
3S	Connected with X3/1S	M	M24 power supply M_{ext}

Table 8-3 Connections of terminal blocks X2 and X3

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8.3.4 Diagram

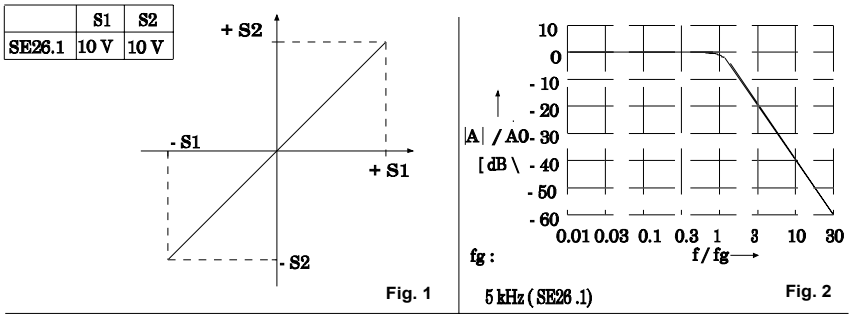


Fig. 8-4 Voltage- and frequency characteristic of interface module SE26.1

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8.4 Interface module SB10

Order No. 6DD1681-0AE2

Description The interface module outputs binary signals from SIMADYN D / SIMATIC TDC / S7-400 FM 458- components to the plant/system **or** receives binary signals from the plant/system and transfers these to SIMADYN D / SIMATIC TDC / S7-400 FM 458- components. The connection to SIMADYN D / SIMATIC TDC / S7-400 FM 458- components is established through ribbon cables and on the plant/system side, via terminals. There is no electrical isolation between the SIMADYN D / SIMATIC TDC / S7-400 FM 458- components side and the plant/system side.

Module design

- housing which can be snapped onto mounting rails
- ribbon cable connector (X1):
  - 8 pins for binary signals, 24 V DC
  - 2 pins for 1P, 1M power supply voltages
- connector (X2), 2x 8 pin:
  - 8 terminals for 24 V DC binary signals
  - 8 terminals for the reference point (1M, 1P is also possible)
- 1 terminal pair X3: 1P and 1M
- double test socket X5: 1P(+), 1M(G)
- diagnostic LEDs

Power supply on the SIMADYN D side

The power supply on the SIMADYN D side is fed-in at terminal X3:

Terminal X3	Voltage at the SIMADYN D side
1P	+24 V
1M	0 V

To connect the power supply use accessory
SM11 power supply connector for interface modules
(Order No. 6DD1680-0BB0)

The maximum conductor cross section is 2,5 mm².

NOTE To connect the power supply see “User manual FM 458-1 DP” chapter “Installation and EMC guideline”.

Green LED The SIMADYN-side power supply is displayed using a green LED (P).

Red LED The SIMADYN-side power supply (1P, 1M) is short-circuited (fault condition).

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Test socket

Voltages 1P and 1M can be used, via the double test socket (G; +) to simulate an input signal for SIMADYN D.

Double test socket X5		Voltage
+	(1P from X3)	+24 V
G	(1M from X3)	0 V

WARNUNG **Explosion Hazard**

No connections are to be made to X5 unless the area is known to be non-hazardous.

8.4.1 Signals

Yellow LED

Each status of the 8 signals is displayed using a yellow LED (1...8). There is a screw connection for each signal at the two terminal strips X2:

- terminals 1 to 8 for binary signals
- terminals 51 to 58 for reference points

Reference potential of the signals

The reference points of the signals are either at 1M potential or 1P potential. The polarity is selected on the module using a solder link:

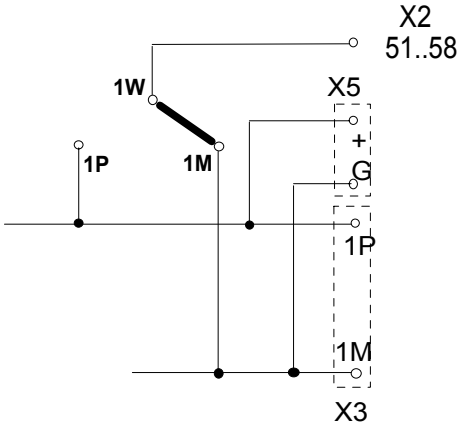


Fig. 8-5 Solder link to set the signal reference points

NOTE Link 1M-1W is inserted in the factory

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8.4.2 Application information

The interface module can be mounted both vertically **and** horizontally.

Other information Further information on EMC and ambient conditions, refer to Section „General technical data“

Example A typical application is shown in the following diagram:

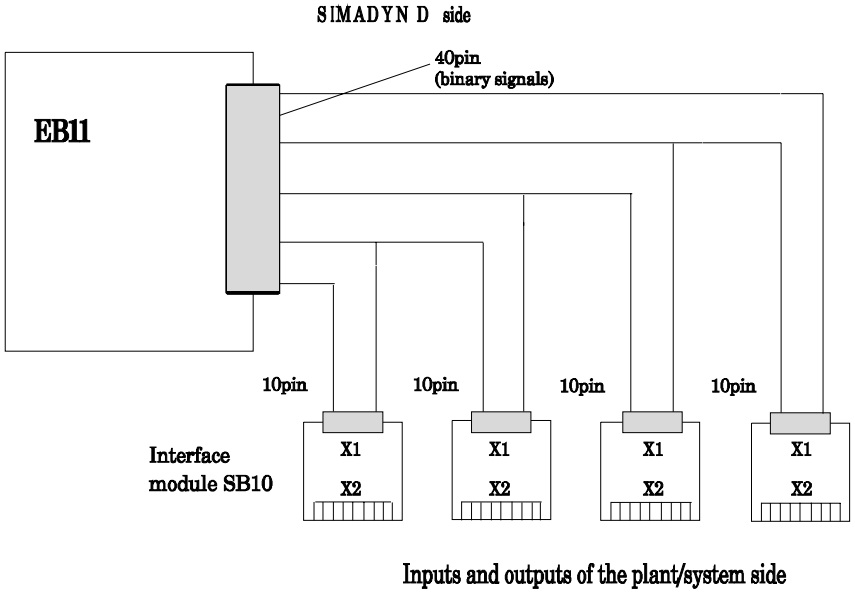


Fig. 8-6 Application example for SB10 interface module at the binary input-, output module EB11

The binary signals of the plant/system side are connected directly with the SIMADYN D modules via the interface module. A ribbon cable is used (refer to the Chapter Plug in cables).

8

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8.4.3 Technical data

General data

Mounting system	Can be snapped onto mounting rails
Dimensions (W x H x D)	45 x 129 x 160 mm
Weight	Approx. 0.28 kg

ambient temperature

ambient temperature for approbations	max. 50° C

Power supply

Description		**SIMADYN D**
Power supply voltage (V_V) at the nominal value		24 V DC
Permissible range		20 V to 30 V DC
Briefly t<500 ms		1,5 x V_{rated}
Current drain		
	At the nominal value [1)]	20 mA
	Maximum current per power supply cable	400 mA

[1)] LED current drain without the load of the system modules

The maximun current on connector X3 is 1 A, if this is the power supply for several interface modules.

Binary signals

No.	8
Nominal voltage value	24 V DC
Maximum current per channel	30 mA

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8.4.4 Connector assignment

Flat connector X1

To connect the interface module to the SIMADYN D / SIMATIC TDC / S7-400 FM 458- components use cable SC62 or SC64 (for further informations see the documentation of the SIMADYN D / SIMATIC TDC / S7-400 FM 458- components).

Terminal block X2

Terminal	Designation
1	Channel 1 (binary input/output 1)
2	Channel 2 (binary input/output 2)
3	Channel 3 (binary input/output 3)
4	Channel 4 (binary input/output 4)
5	Channel 5 (binary input/output 5)
6	Channel 6 (binary input/output 6)
7	Channel 7 (binary input/output 7)
8	Channel 8 (binary input/output 8)
51	Reference rail, 1M (1P can be set)
52	Reference rail, 1M (1P can be set)
53	Reference rail, 1M (1P can be set)
54	Reference rail, 1M (1P can be set)
55	Reference rail, 1M (1P can be set)
56	Reference rail, 1M (1P can be set)
57	Reference rail, 1M (1P can be set)
58	Reference rail, 1M (1P can be set)

Table 8-4 Assignment of the binary inputs and outputs of interface module SB10

Conductor cross section

The minimun conductor cross section for the terminal block X2 is 0,2mm², the maximum conductor cross section is 2,5 mm².

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8.4.5 Block diagram

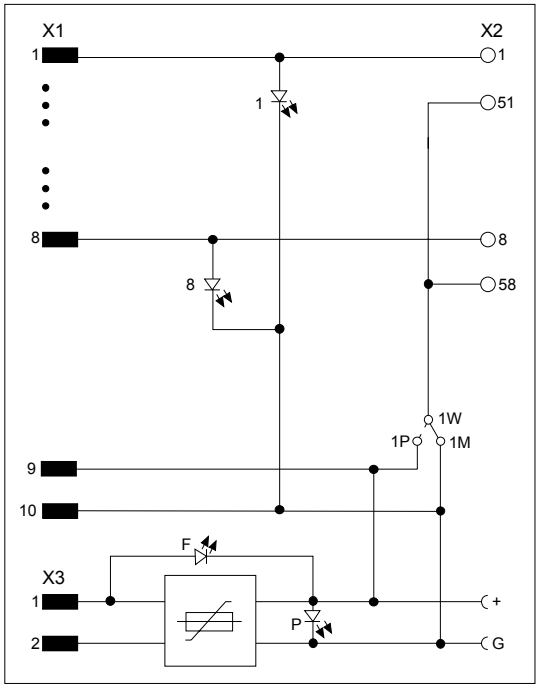


Fig. 8-7 Block diagram of interface module SB10

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8.5 Interface module SB60

Order No. 6DD1681-0AF4

Description

8 binary input signals can be adapted to the signal level of SIMADYN D / SIMATIC TDC, electrically-isolated (floating) via optocouplers using the SB60 interface module. The input signal voltage can be 120 V DC or AC.

There is protective separation between the eight binary inputs and the SIMADYN D / SIMATIC TDC rack. The eight binary inputs are electrically isolated with respect to one another.

Module design

- housing which can be snapped onto mounting rails
- ribbon cable connector (X1):
  - 8 pins for binary outputs
  - 2 pins for 1P, 1M
- connector (X2), 2x 12 pins:
  - 8 pins for binary inputs 120 V
  - 8 pins for the reference point
- 1 terminal pair X3:
  - 1P and 1M for the voltage on the SIMADYN D side
- LEDs for diagnostics
- optocouplers to electrically isolate input and output

Power supply on the SIMADYN D side

The power supply at the SIMADYN D side is connected at terminal X3:

Terminal X3	Voltage on the SIMADYN D side
1P	+24 V
1M	0 V

To connect the power supply use accessory
SM11 power supply connector for interface modules
(Order No. 6DD1680-0BB0)

The maximum conductor cross section is 2,5 mm².

NOTE

To connect the power supply see “User manual FM 458-1 DP” chapter “Installation and EMC guideline”.

WARNUNG

Between inputs this interface module have a protective separation

The system side (rack including 24V power supply) have a protective separation from touch dangerous voltage to the process side (8 input signals).

8

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Green LED The SIMADYN D power supply is indicated using a green LED (P).

Red LED The SIMADYN D power supply (1P, 1M) is short-circuited (fault condition).

8.5.1 Signals

Signals up to a maximum of 120 V (nominal value) DC or AC can be connected at the SB60 interface module.

Yellow LED The status of the binary interface module outputs (binary inputs for SIMADYN D) is indicated using yellow LEDs (1...8).

There are two screw connections for each signal at terminal strip X2:

- terminals 12, 22, ... up to 82 for binary signals 120 V
- terminals 11, 21, ... up to 81 for the reference point

NOTE To connect the signal lines to the terminals see “User manual FM 458-1 DP” chapter “Installation and EMC guideline”.

8.5.2 Application information

The interface module can **only be vertically mounted** due to the power loss which has to be dissipated.

Other information Further information on EMC and ambient conditions, refer to Section „General technical data“

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8.5.3 Technical data

General data

Mounting system	Can be snapped onto mounting rails
Dimensions (W x H x D)	45 x 129 x 160 mm
Weight	Approx. 0.32 kg

Power supply

Nominal power supply voltage (V_V)	24 V DC
Permissible range	20 V to 30 V DC
Briefly t<500 ms	1,5 x V_{rated}
Current drain at the nominal value	90 mA

The maximun current on connector X3 is 1 A, if this is the power supply for several interface modules.

Binary inputs

Number		8
Nominal input voltage		120 V AC/DC
	'1 signal'	98 to 132 V
	'0 signal'	0 to 33 V [1)]
Input current ('1 signal')		max. 3 mA
Insulation voltage		Protective separation provided: - between inputs and outputs Electrical isolation provided: - between input circuits (with respect to one another) Test voltage 1125V AC

[1)] Or open-circuit input

8

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8.5.4 Connector assignment

flat connector X1

To connect the interface module to the SIMADYN D / SIMATIC TDC components use cable SC62 or SC64 (for further informations see the documentation of the SIMADYN D / SIMATIC TDC components).

Binary inputs, terminal block X2

Terminal	120 V	Channel No.
11	Reference	Channel 1
21	Reference	Channel 2
31	Reference	Channel 3
41	Reference	Channel 4
51	Reference	Channel 5
61	Reference	Channel 6
71	Reference	Channel 7
81	Reference	Channel 8
12	120 V-input	Channel 1
22	120 V-Input	Channel 2
32	120 V-Input	Channel 3
42	120 V-Input	Channel 4
52	120 V-Input	Channel 5
62	120 V-Input	Channel 6
72	120 V-Input	Channel 7
82	120 V-Input	Channel 8
14	nc	Channel 1
24	nc	Channel 2
34	nc	Channel 3
44	nc	Channel 4
54	nc	Channel 5
64	nc	Channel 6
74	nc	Channel 7
84	nc	Channel 8

Table 8-5 Assignment of the binary inputs of interface module SB60

Conductor cross section

The minimun conductor cross section for the terminal block X2 is 0,2mm², the maximum conductor cross section is 2,5 mm².

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8.5.5 Block diagram

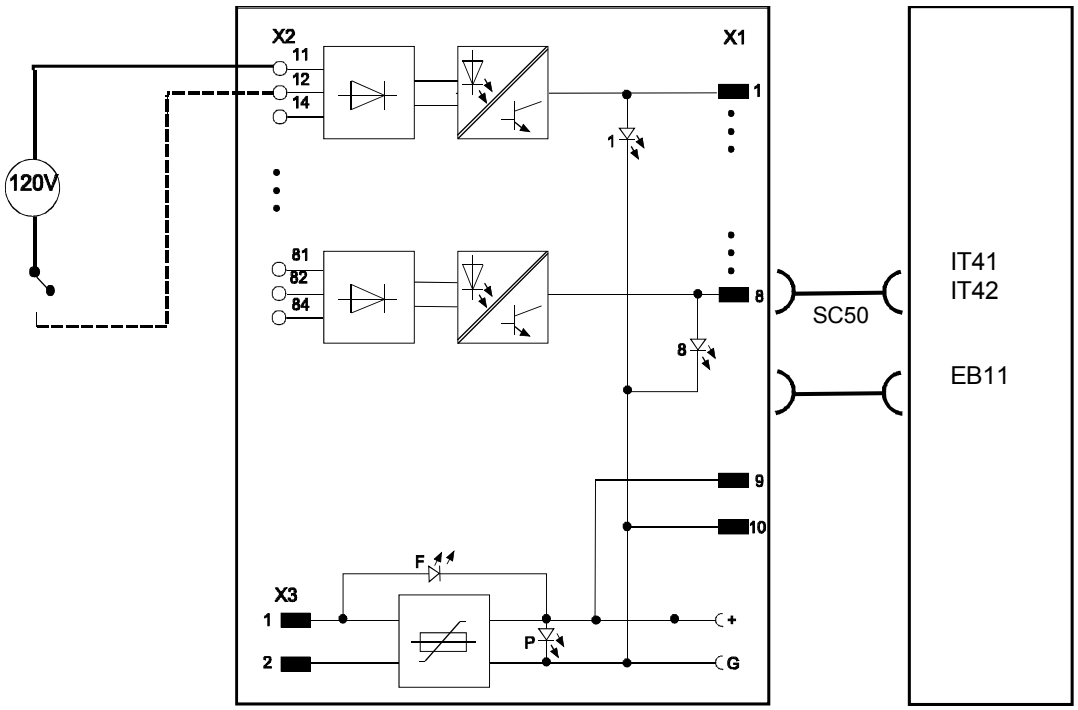


Fig. 8-8 Block diagram of interface module SB60

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8.6 Interface module SB61

Order No. 6DD1681-0EB3

Description 8 binary DC signals are adapted to the signal level of SIMADYN D / SIMATIC TDC / S7-400 FM 458- components, electrically isolated (floating) using the SB61 interface module.

Module design

- housing which can be snapped onto mounting rails
- ribbon cable connector (X1):
  - 8 pins for binary outputs
  - 2 pins for 1P, 1M
- connector (X2), 2x 12 pin:
  - 8 terminals for 24 V binary inputs
  - 8 terminals for 48 V binary inputs
  - 8 terminals for the reference point
- 1 terminal pair X3: 1P,1M (SIMADYN D-side power supply)
- 1 terminal pair X4: 2P, 2M (plant/system-side power supply)
- plug connector for the short-circuit connector
- double test socket X5: 2P (+), 2M (G)
- LED displays for diagnostics
- optocoupler to provide electrical isolation between the input and output

Power supply on the SIMADYN D side

The SIMADYN D-side power supply is connected at terminal X3:

Terminal X3	Voltage SIMADYN D side
1P	+24 V
1M	0 V

To connect the power supply use accessory SM11 power supply connector for interface modules (Order No. 6DD1680-0BB0)

The maximum conductor cross section is 2,5 mm².

Green LED The SIMADYN D power supply is indicated using a green LED (P).

Red LED The SIMADYN D power supply (1P, 1M) is short-circuited (fault condition).

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8.6.1 Signals

Power supply, plant/system side

The 24/48 V DC voltage for the plant/system side signals is available at terminal block X4:

Terminal X4	Voltage, plant/system side
2P	+24/48 V
2M	0 V

To connect the power supply use accessory SM11 power supply connector for interface modules
(Order No. 6DD1680-0BB0).

The maximum conductor cross section is 2,5 mm².

NOTE

To connect the power supply see “User manual FM 458-1 DP” chapter “Installation and EMC guideline”.

Test socket

The power supply for the plant/system side is available at double test socket X5 (G; +):

Double test socket X5		Voltage, plant/system side
+	(2P from X4)	+24/48 V
G	(2M from X4)	0 V



WARNUNG

Explosion Hazard

No connections are to be made to X5 unless the area is known to be non-hazardous.

Yellow LED

The status of the 8 signals is displayed, for each signal, using a yellow LED (1...8).

Terminal block for binary signals

There are three screw connections on terminal strip X2 for each signal:

- terminals 1 to 8 for 24 V binary signals
- terminals 11 to 18 for 48 V binary signals
- terminals 51 to 58 as reference point

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8.6.2 Application information

Plant/system-side signal voltages of 48V or 24V DC can be processed using the interface module. The plant/system side of the module has 8 electrically isolated input channels. Using short-circuit connectors (X11), the connection of each channel can be electrically isolated from one another, or connected to a common reference point:

Electrically-isolated inputs (floating)

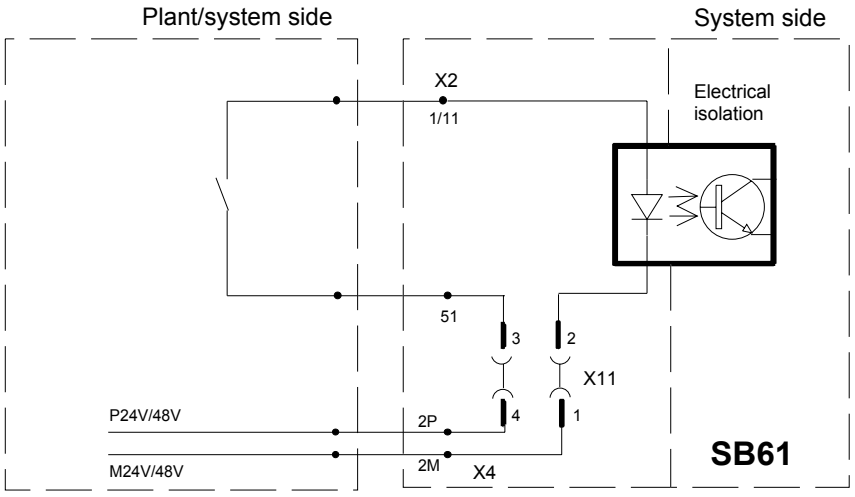


Fig. 8-9 Position of the jumpers for inputs which are electrically isolated with respect to one another

Inputs with common reference potential

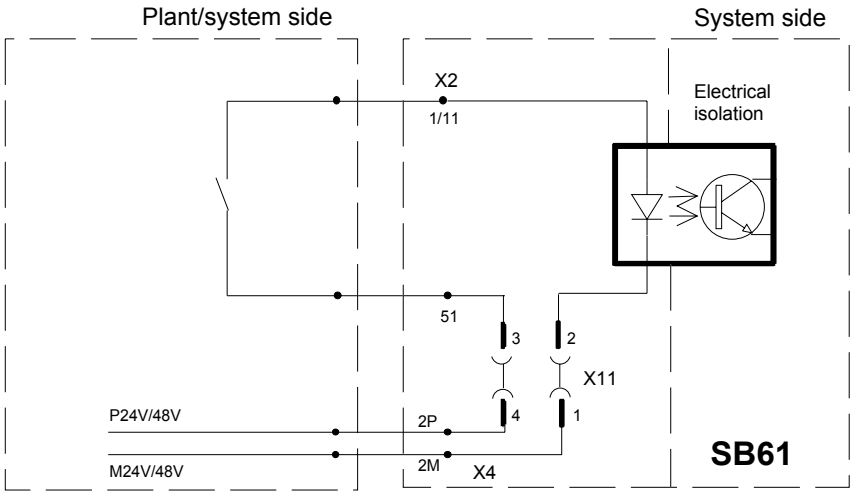


Fig. 8-10 Position of the jumpers for inputs with common reference potential

CAUTION

When supplied, all outputs have a common reference potential, i. e. terminal pair X11 to X18 is equipped with two short-circuit connectors.

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Position of the jumpers

The jumpers (short-circuit connectors) are located in the section of the housing cover facing away from the LEDs. These are **only accessible after the interface module has been removed**.

The potential assignment between the plant- and system side is defined as follows:

Reference potential of the inputs	Position of the short-circuit connector (jumper)
Inputs are additionally electrically-isolated with respect to one another	Connector X1n[1)] :2:3 inserted
Inputs with common reference potential	Connector X1n :1:2 and X1n :3:4 inserted

[1)] n = number of input 1 to 8

Table 8-6 Position of the jumpers

NOTE The **potential reference** can be separately set for each input.

The interface module can **only be mounted vertically** due to the power loss which has to be dissipated.

Other information

Further information on EMC and ambient conditions, refer to Section „General technical data“

A typical application is shown in the following diagram:

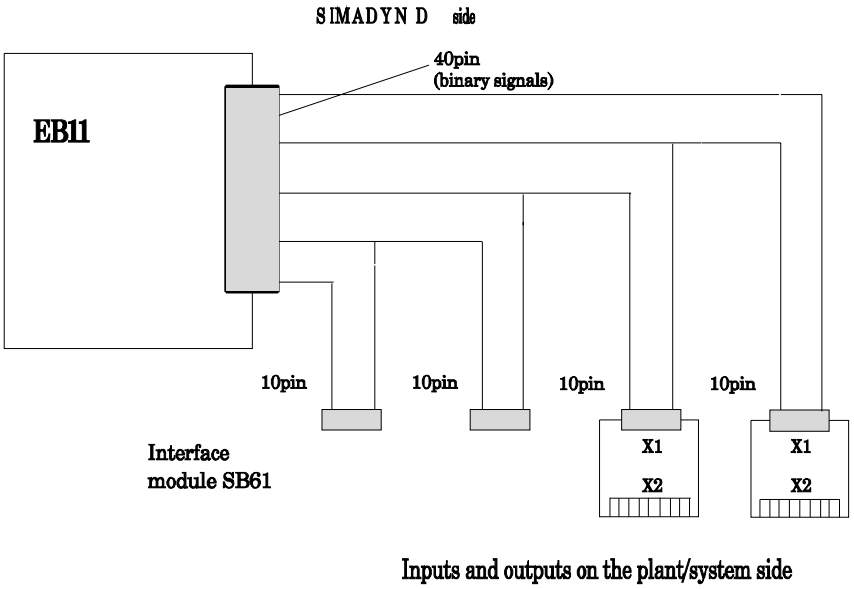


Fig. 8-11 Application example for interface module SB61 at the binary input-, output module EB11

8

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8.6.3 Technical data

General data

Mounting system	Housing for snapping onto mounting rails
Dimensions (W x H x D)	45 x 129 x 160 mm
Weight	Approx. 0.32 kg

ambient temperature

ambient temperature for approbations	max. 50° C

Power supply

	SIMADYN D	Plant/system side 24 V DC	Plant/system side 48 V DC
Power supply voltage (V_V)	24 V DC	24 V DC	48 V DC
Permissible range	20 to 30 V DC	20 to 30 V DC	40 to 60 V DC
Briefly t<500 ms	1.5 x V_{rated}	1.5 x V_{rated}	1.5 x V_{rated}
Current drain at the nominal value	90 mA	50 mA	50 mA

The maximun current on connector X3 is 1 A, if this is the power supply for several interface modules. The maximun current on connector X4 is 2 A, if this is the power supply for several interface modules.

Binary inputs

		Plant/system side 24 V DC	Plant/system side 48 V DC
No.		8	8
Input voltage for			
	‘1 signal’	13 to 30 V DC	26 to 60 V DC
	‘0 signal’	-3 to +6 V [1)]	-3 to +12 V [1)]
Input current (‘1signal’)		6 mA	6 mA

[1)] Or open-circuit input

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8.6.4 Connector assignment

flat connector X1

To connect the interface module to the SIMADYN D / SIMATIC TDC / S7-400 FM 458- components use cable SC62 or SC64 (for further informations see the documentation of the SIMADYN D / SIMATIC TDC / S7-400 FM 458- components).

Binary inputs, terminal block X2

Terminal	Inputs, electrically isolated (floating)	Inputs with common reference point	Channel No.
1	+24 V input		Channel 1
2	+24 V input		Channel 2
3	+24 V input		Channel 3
4	+24 V input		Channel 4
5	+24 V input		Channel 5
6	+24 V input		Channel 6
7	+24 V input		Channel 7
8	+24 V input		Channel 8
11	+48 V input		Channel 1
12	+48 V input		Channel 2
13	+48 V input		Channel 3
14	+48 V input		Channel 4
15	+48 V input		Channel 5
16	+48 V input		Channel 6
17	+48 V input		Channel 7
18	+48 V input		Channel 8
51	Input 24 V/48 V	2P(+24 V)	Channel 1
52	Input 24 V/48 V	2P(+24 V)	Channel 2
53	Input 24 V/48 V	2P(+24 V)	Channel 3
54	Input 24 V/48 V	2P(+24 V)	Channel 4
55	Input 24 V/48 V	2P(+24 V)	Channel 5
56	Input 24 V/48 V	2P(+24 V)	Channel 6
57	Input 24 V/48 V	2P(+24 V)	Channel 7
58	Input 24 V/48 V	2P(+24 V)	Channel 8

Table 8-7 Assignment of the binary inputs of interface module SB61

Conductor cross section

The minimun conductor cross section for the terminal block X2 is 0,2mm², the maximum conductor cross section is 2,5 mm².

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8.6.5 Block diagram

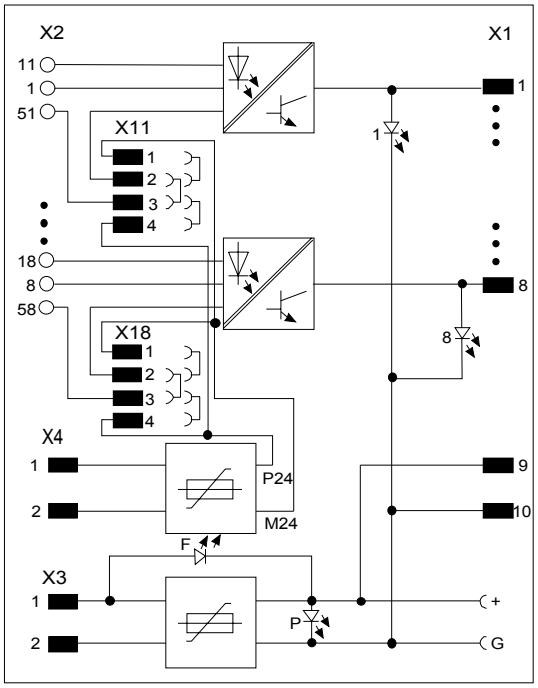


Fig. 8-12 Block diagram of interface module SB61

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8.7 Interface module SB70

Order No. 6DD1681-0AG2

Description

8 binary output signals from SIMADYN D / SIMATIC TDC are adapted to the signal level of the plant/system via relays using the SB70 interface module.

The output signal voltage can be up to max. 120 V DC or AC.

Module design

- housing which can be snapped onto mounting rails
- ribbon cable connector (X1):
  - 8 pins for binary inputs
  - 2 pins for 1P, 1M
- connector (X2), 2x 12pin
  - 8 terminals for the NO contact
  - 8 terminals for the NC contact
  - 8 terminals for the center contact
- 1 terminal pair X3: 1P,1M (power supply on the SIMADYN D side)
- double test socket X5: 1P(+), 1M (G)
- LED displays for diagnostic purposes
- relay to provide electrical isolation between the input and output
- PTC thermistor as cable protection after the SIMADYN D-side power supply

Power supply on the SIMADYN D side

The SIMADYN D power supply is connected at terminal X3:

Terminal X3	Voltage on the SIMADYN D side
1P	+24 V
1M	0 V

To connect the power supply use accessory SM11 power supply connector for interface modules (Order No. 6DD1680-0BB0)

The maximum conductor cross section is 2,5 mm².

NOTE To connect the power supply see “User manual FM 458-1 DP” chapter “Installation and EMC guideline”.

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WARNUNG

Between outputs this interface module have a protective separation

The system side (rack including 24V power supply) have a protective separation from touch dangerous voltage to the process side (8 output signals).

Between outputs they have only an electrical isolation.

The output signals on the process side only have an electrically (galvanically) isolation between each other. A mix with safety small voltage and touch dangerous voltage is not allowed.

Green LED

The SIMADYN D-side power supply is displayed using a green LED (P).

Red LED

The SIMADYN D-side power supply (1P, 1M) is short-circuited (fault condition).

Test socket

The SIMADYN D power supply is available at the double test socket X5 (G; +):

Double test socket X5		Voltage, SIMADYN D side
+	(1P of X3)	+24 V
G	(1M of X3)	0 V

8.7.1 Signals

Yellow LED

The status of the 8 signals is displayed using a yellow LED for each of the signals (1...8).

Terminal block for binary signals

There are three screw connections on terminal strip X2 for each signal to the plant/system side:

- terminals 14, 24 ... up to 84 for NO contact
- terminals 12, 22 ... up to 82 for NC contact
- terminals 11, 21 ... up to 81 as center contact

The relay contact connections are determined as follows:

Quiescent state	Connections (screw terminals)
Contact closed (NC contact)	n2 - n1 [1)]
Contact open (NO contact	n4 - n1

[1)] n: 1...8 depending on the channel No.

NOTE

To connect the power supply see “User manual FM 458-1 DP” chapter “Installation and EMC guideline”.

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8.7.2 Application information

The interface module can be mounted both vertically and horizontally

Other information

Further information on EMC and ambient conditions, refer to Section „General technical data“

A typical application is illustrated in the following diagram:

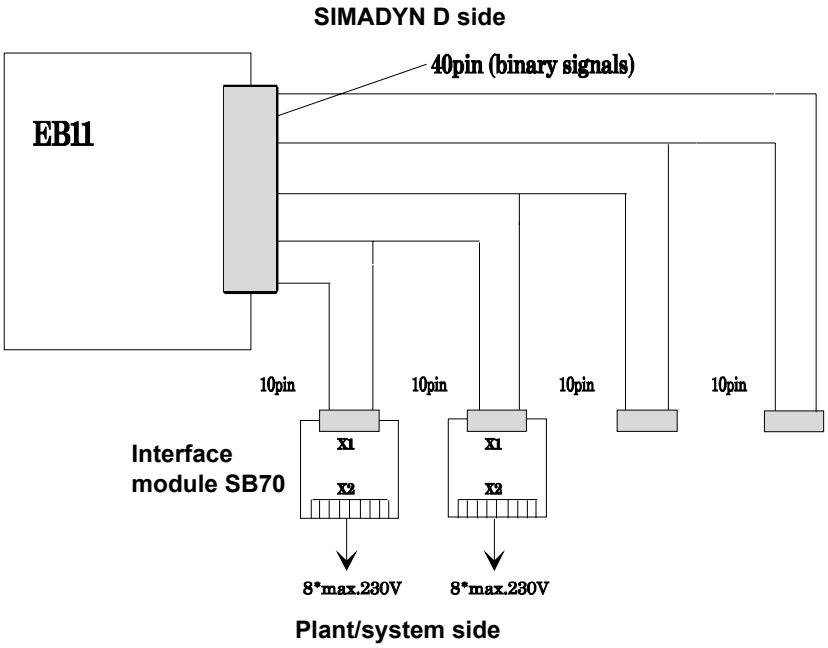


Fig. 8-13 Application example for interface module SB70 at binary input-, output module EB11

The binary inputs of the interface module are connected to the SIMADYN D outputs via ribbon cables (refer to the Chapter Plug in cables).

8

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8.7.3 Technical data

General data

Mounting system	Housing can be snapped onto mounting rails
Dimensions (W x H x D)	45 x 129 x 160 mm
Weight	Approx. 0.37 kg

Power supply

Power supply voltage (V_V) nominal value	24 V DC
Permissible range	20 V to 30 V DC
Briefly t<500 ms	1,5 x V_{rated}
Current drain at the nominal value	150 mA

The maximun current on connector X3 is 1 A, if this is the power supply for several interface modules.

Binary outputs

No.		8
Switching capability of the relay contacts		
	120 V AC	2 A
	120 V DC	0.4 A
	60 V DC	1 A
	< 35 V DC	2 A
Switching frequency		max 20 Hz
Insulation voltage		Protective separation provided: - between inputs and outputs Electrical isolation provided: - between input circuits (with respect to one another) Test voltage 1125V AC

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8.7.4 Connector assignment

flat connector X1

To connect the interface module to the SIMADYN D / SIMATIC TDC components use cable SC62 or SC64 (for further informations see the documentation of the SIMADYN D / SIMATIC TDC components).

Binary inputs, terminal block X2

Terminal	120 V	Channel No.
11	Center contact	Channel 1
21	Center contact	Channel 2
31	Center contact	Channel 3
41	Center contact	Channel 4
51	Center contact	Channel 5
61	Center contact	Channel 6
71	Center contact	Channel 7
81	Center contact	Channel 8
12	NC contact	Channel 1
22	NC contact	Channel 2
32	NC contact	Channel 3
42	NC contact	Channel 4
52	NC contact	Channel 5
62	NC contact	Channel 6
72	NC contact	Channel 7
82	NC contact	Channel 8
14	NO contact	Channel 1
24	NO contact	Channel 2
34	NO contact	Channel 3
44	NO contact	Channel 4
54	NO contact	Channel 5
64	NO contact	Channel 6
74	NO contact	Channel 7
84	NO contact	Channel 8

Table 8-8 Assignment of the binary inputs of interface module SB70, terminal block X2

Conductor cross section

The minimun conductor cross section for the terminal block X2 is 0,2mm², the maximum conductor cross section is 2,5 mm².

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8.7.5 Block diagram

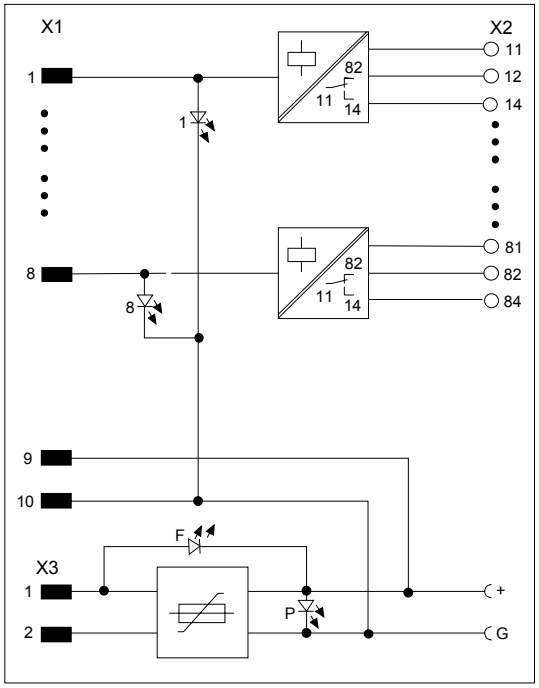


Fig. 8-14 Block diagram of the SB70 interface module

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8.8 Interface module SB71

Order No. 6DD1681-0DH1

Description 8 binary DC signals from the SIMADYN D / SIMATIC TDC / S7-400 FM 458- components system are adapted to the signal level of the plant/system via the SB71 interface module.

Module design

- Housing which can be snapped-on to mounting rails
- Ribbon cable connector (X1):
  - 8 pins for binary inputs
  - 2 pins for 1P, 1M
- Connector (X2), 2x 8 pin
  - 8 terminals for binary outputs, 24/48 V DC
  - 8 terminals for the NC, contacts
- 1 terminal pair X3: 1P and 1M (power supply on the SIMADYN D)
- 1 terminal pair X4: 2P, 2M (power supply on the plant/system side)
- Double test socket X5: 1P(+), 1M(G)
- LED displays for diagnostic purposes
- Optocoupler to provide electrical isolation between the input and output

Power supply on the SIMADYN D side

The SIMADYN D power supply is connected at terminal X3:

Terminal X3	Voltage on the SIMADYN side
1P	+24 V
1M	0 V

To connect the power supply use accessory SM11 power supply connector for interface modules (Order No. 6DD1680-0BB0)

The maximum conductor cross section is 2,5 mm².

Green LED The SIMADYN D side power supply is displayed using a green LED (P).

Red LED The SIMADYN D side power supply (1P, 1M) is short-circuited (fault condition).

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8.8.1 Signals

Power supply, plant/system side

The 24/48 V DC power supply voltage for the plant/system side signals is connected at terminal block X4:

Terminal X4	Voltage, plant/system side
2P	+24/48 V
2M	0 V

To connect the power supply use accessory SM11 power supply connector for interface modules (Order No. 6DD1680-0BB0)

The maximum conductor cross section is 2,5 mm².

Connectors

To connect the power supply to the terminals X3 and X4 use accessory SM11 power supply connector for interface modules (Order No. 6DD1680-0BB0). The maximum conductor cross section on terminals X3 and X4 is 2,5 mm².

Test socket

The SIMADYN D power supply is available at the double test socket X5 (G; +):

Double test socket X5		Voltage, SIMADYN D side
+	(1P of X3)	+24 V
G	(1M of X3)	0 V



WARNUNG

Explosion Hazard

No connections are to be made to X5 unless the area is known to be non-hazardous.

Yellow LED

The status of the 8 signals is displayed using a yellow LED for each of these signals (1...8).

Terminal block for binary signals

There are two screw connections on terminal strip X2 for each signal:

- Terminals 1 to 8 for binary outputs, 24/48 V DC
- Terminals 51 to 58 as reference point

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8.8.2 Application information

The interface module has a ribbon cable connector X1 to connect the output signals of the SIMADYN D system (refer to the Chapter Plug in cables), as well as a terminal strip X2 to connect the plant/system signals.

The interface module may **only be mounted vertically** due to the power loss which must be dissipated.

Other information Further information on EMC and ambient conditions, refer to Section "General technical data“!

CAUTION No more than three binary outputs may be simultaneously short-circuited due to the maximum permissible power loss per interface housing.

The following diagram shows a typical application:

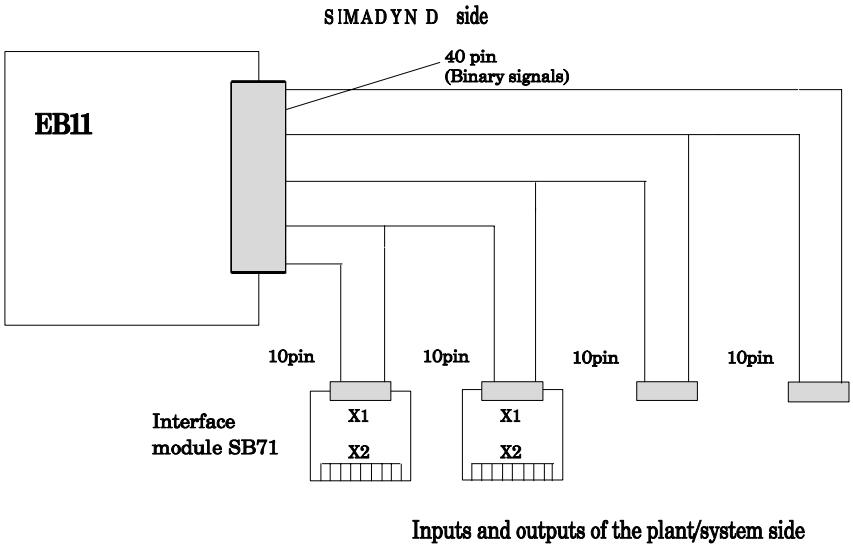


Fig. 8-15 Application example for interface module SB71 at binary input-, output module EB11

8

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8.8.3 Technical data

General data

Mounting system	Housing can be snapped onto mounting rails
Dimensions (W x H x D)	45 x 129 x 160 mm
Weight	approx. 0.32 kg

ambient temperature

ambient temperature for approbations	max. 40° C

Power supply

	SIMADYN D	Plant/system side 24 V DC	Plant/system side 48 V DC
Power supply voltage (V_V)	24 V DC	24 V DC	48 V DC
Permissible range	20 V to 30 V DC	18 V to 60 V DC	18 V to 60 V DC
Briefly t<500 ms	1.5 x U_{rated}	1.5 x V_{rated}	1.5 x V_{rated}
Current drain at the nominal value	55 mA	300 mA	360 mA

The maximun current on connector X3 is 1 A, if this is th power supply for several interface modules. The maximun current on connector X4 is 2 A, if this is th power supply for several interface modules.

Binary outputs

		System/plant side, 24 V DC	System/plant side 48 V DC
No.		8	8
Output voltage for 1 signal			
	for 0 mA output current	(V_V-0.6 V)	(V_V-1.2 V)
	for 20 mA output current	(V_V-2.1 V)	(V_V-2.0 V)
	for 30 mA output current	(V_V-2.7 V)	(V_V-2.9 V)
Max. output current for 1 signal System/plant side <20,4 V DC		20 mA	-
Output voltage for 0 signal		0 V	0 V
Max. output current (for 1 signal)		30 mA [1)]	30 mA [2)]

[1)] The binary outputs are continuously short-circuit proof.

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8.8.4 Connector assignment

flat connector X1

To connect the interface module to the SIMADYN D / SIMATIC TDC / S7-400 FM 458- components use cable SC62 or SC64 (for further informations see the documentation of the SIMADYN D / SIMATIC TDC / S7-400 FM 458- components).

Binary outputs, terminal strip X2

Terminal	Designation
1	Binary output 1
2	Binary output 2
3	Binary output 3
4	Binary output 4
5	Binary output 5
6	Binary output 6
7	Binary output 7
8	Binary output 8
51	0 V, binary output 1
52	0 V, binary output 2
53	0 V, binary output 3
54	0 V, binary output 4
55	0 V, binary output 5
56	0 V, binary output 6
57	0 V, binary output 7
58	0 V, binary output 8

Table 8-9 Assignment of binary outputs of interface module SB71

Conductor cross section

The minimun conductor cross section for the terminal block X2 is 0,2mm², the maximum conductor cross section is 2,5 mm².

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8.8.5 Block diagram

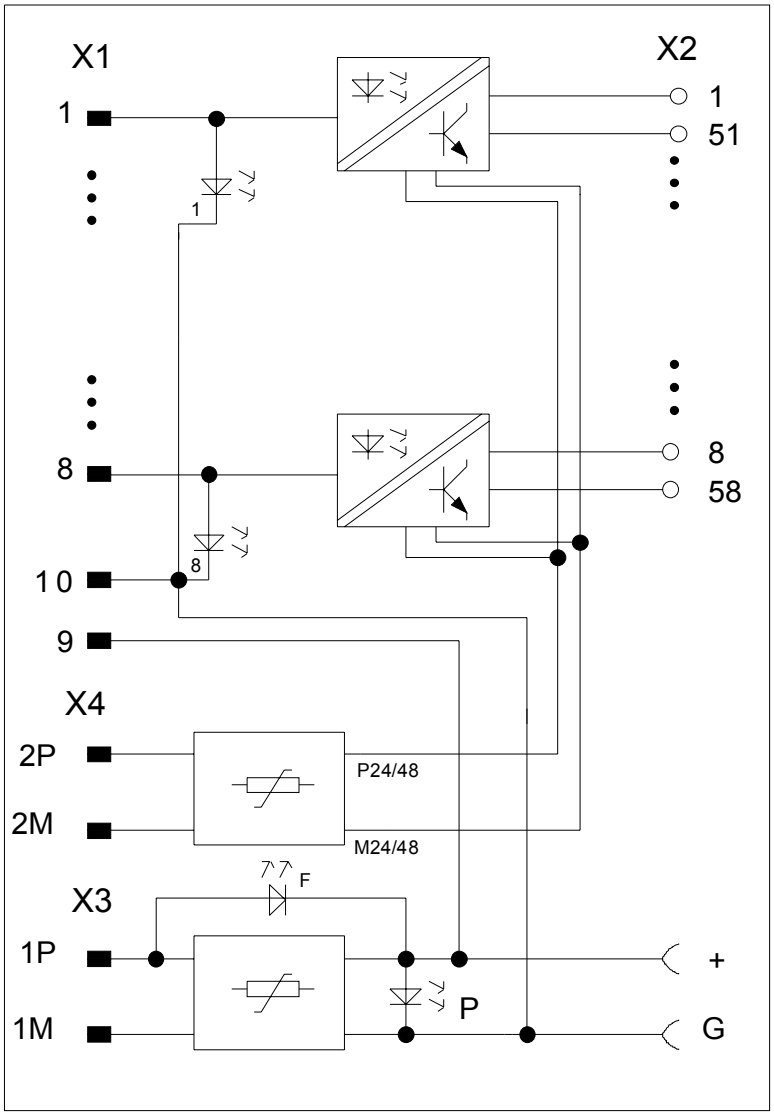


Fig. 8-16 Block diagram of the SB71 interface module

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8.9 Interface modules SU10, SU11, SU12, SU13

Order No.

SU10	6DD1681-0FG0
SU11	6DD1681-0EA1
SU12	6DD1681-0AJ1
SU13	6DD1681-0GK0

General

SU10	SU11	SU12	SU13
The interface module SU10 is a 26-pin terminal block. This is used to code analog or binary signals of a 26 pin ribbon cable connector (SIMADYN D side) on screw/plug-in terminals (plant/system side).	The interface module SU11 is a 20-pin terminal block. This is used to code analog or binary signals of a 20 pin ribbon cable connector (SIMADYN D side) on screw/plug-in terminals (plant/system side).	The interface module SU12 is a 10-pin terminal block. This is used to code analog or binary signals of a 10 pin ribbon cable connector (SIMADYN D side) on screw/plug-in terminals (plant/system side).	The interface module SU12 is a 10-pin terminal block. This is used to code 50 signals of a 50pin sub-D socket connector (SIMADYN D side) on screw/plug-in terminals (plant/system side).

Module design

SU10	26 screw/plug-in terminals (X2) • 25 screw terminal connections for plant/system side analog or binary signals • 1 unassigned screw terminal connection 26 core ribbon cable X1
SU11	24 screw/plug-in terminals (X2) • 20 screw terminal connections for plant/system side analog or binary signals • 4 unassigned screw terminal connections 20 core ribbon cable for connector X1
SU12	16 screw/plug-in terminals (X2) • 10 screw terminal connections for plant/system side analog or binary signals • 6 unassigned screw terminal connections 10 core ribbon cable for connector X1. ribbon cable, 10-core SIMADYN D-side analog- and binary signals
SU13	50 screw/plug-in terminals (X2) • 50 signals are connected • no electronic conversion 50 core screened round cable for connector X1.

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8.9.1 Function description

A 1:1 connection from the SIMADYN D-side ribbon cable connector X1 to the plant/system-side screw terminal block X2 is established by using the interface modules SU10 and SU11.

A 1:1 connection from the SIMADYN D-side connector X1 to the plant/system-side spring-cage terminal block X2 is not established for all signals by using the interface modules SU12 and SU13.

The following terminals have a fuse (0,5A slow-blow, internal resistance 0,25Ω) in the following signal lines:

Interface modules	Terminal block X2
SU12	pin 1 – 8
SU13	pin 8, 17 – 23, 26 – 33, 36 – 43, 46 – 48

The following terminals have a protection diode (Schottky- diode, BAT46 by Vishay) for the 24V power supply of the binary outputs in the following signal lines:

Interface modules	Terminal block X2
SU12	pin 10
SU13	pin 10

The following terminals have a ptc resistor (internal resistance 0,9Ω, e.g. B59910-C120-A70 by Epcos) as short circuit protection for the 24V power supply of the binary outputs in the following signal lines:

Interface modules	Terminal block X2
SU12	pin 9
SU13	pin 9

Process signals

The interface modules are designed so that signals can flow from both sides. The process signals are coded without any additional electrical isolation and signal processing.

Voltage range	The maximum allowable voltages of the modules, on which the interface modules are connected, are to comply.
Current range	max. 0.5 A

Table 8-10 Maximum permissible voltage- and current values for signal processing

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8.9.2 Supplementary components

Cables for

The following cables are required to connect the interface modules to the modules:

SU10

Cable	Module	Plug connector
SC49	IT41	X6/X7
	IT42	X8
SC50	IT42	X6
SC51	IT42	X7

Table 8-11 Modules and signal cables as supplementary components for SU10

SU11

Cable	Module	Plug connector
SC55	EB11	X5
SC55	EB11	X6
SC12	EA12	X6

Table 8-12 Modules and signal cables as supplementary components for SU11

SU12

Cable	Module	Plug connector
SC54	IT41	X6, X7
	IT42	X8
SC13	EB11	X5, X6
SC7	PM5	X5
	PM6	X5
SC64	FM458-1 DP	X2
SC62	EXM438-1	X3

Table 8-13 Modules and signal cables as supplementary components for SU12

SU13

Leitungstyp	Baugruppen	Steckverbinder
SC63	EXM 438-1	X1, X2, X3

Table 8-14 Modules and signal cables as supplementary components for SU13

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8.9.3 Application information

The interface modules can be mounted **vertically and horizontally**. They are snapped onto a mounting rail, .

Other information

Further information on EMC and ambient conditions, refer to Section, General technical data“

8.9.4 Pin/terminal assignment X1/X2

The screw terminal numbers of X2 are identical with the ribbon cable connector numbering corresponding to the pin arrangement.

Conductor cross section

Interfacemodule	Minimum conductor cross section for the terminal block X2	Maximum conductor cross section for the terminal block X2
SU10, SU11, SU12	0,2 mm²	2,5 mm².
SU13	0,2 mm²	1,5 mm².

SU10

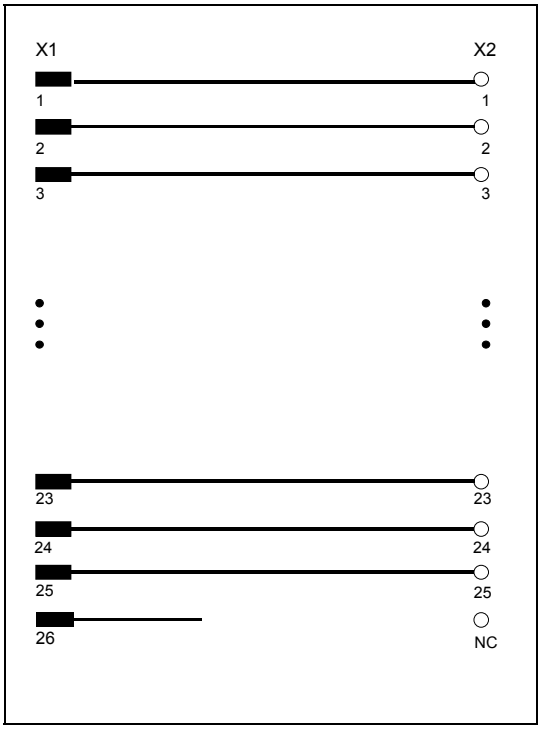


Fig. 8-17 Circuit diagram, SU10

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SU11

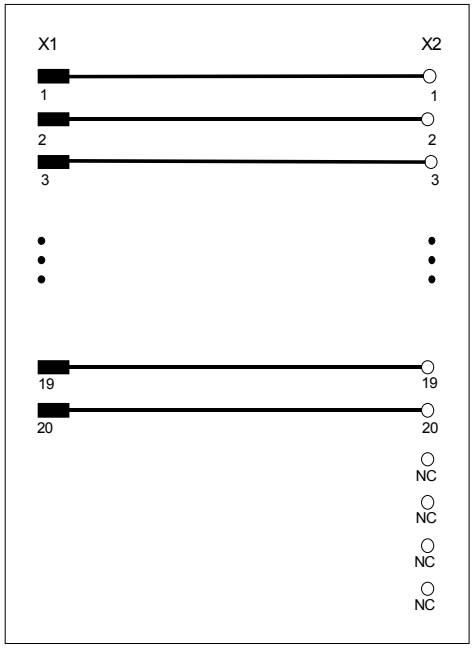


Fig. 8-18 Circuit diagram, SU11

SU12

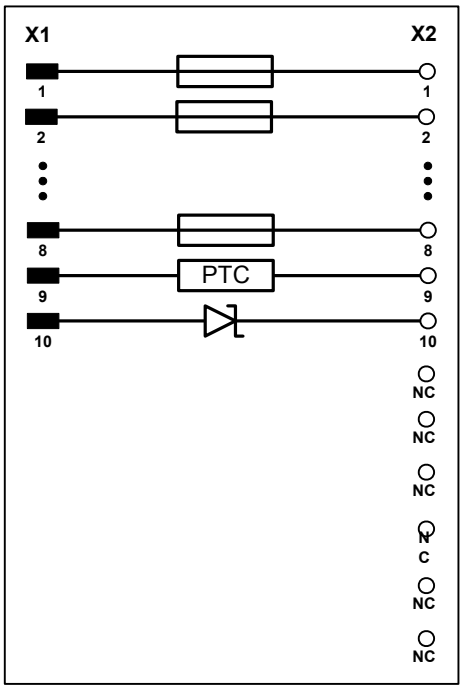


Fig. 8-19 Circuit diagram, SU12

The components are described in chapter 8.9.1.

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SU13

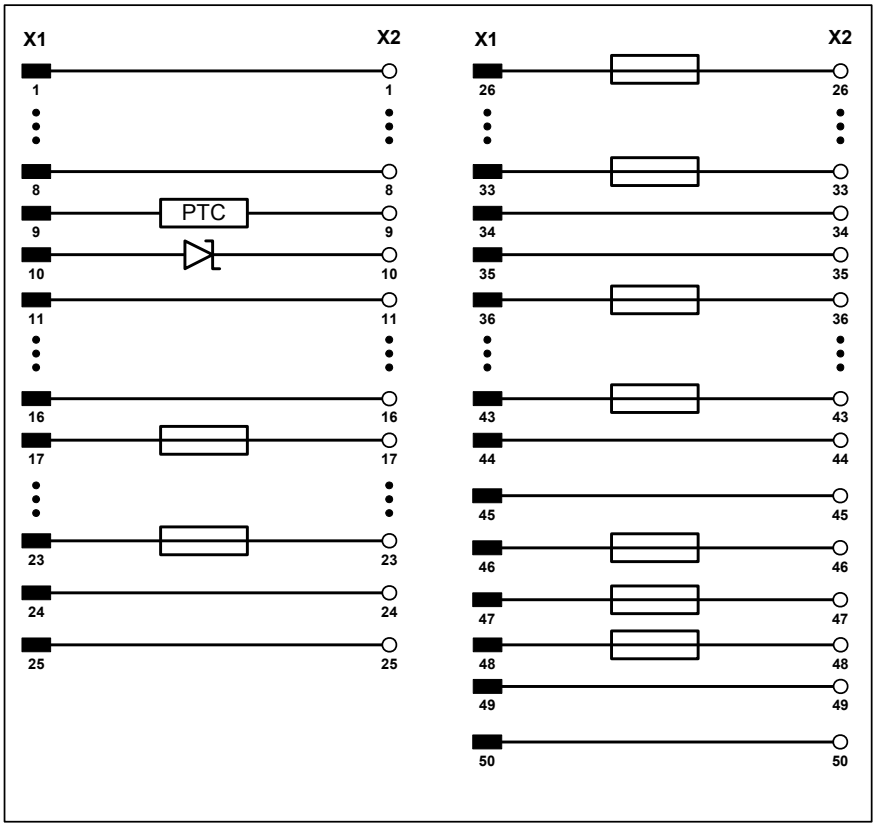


Fig. 8-20 Circuit diagram, SU13

The components are described in chapter 8.9.1.

8.9.5 Technical data

General data

Dimensions (W x H x D)	45 x 129 x 160 mm
Weight	Approx. 0.28 kg

Ambient temperature

ambient temperature for approbations for interface modules	The maximum allowable ambient temperatures of the modules, on which the interface modules are connected, are to comply.

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9 Plug-in cables

Overview

9.1	General information	9-2
9.2	Cable types	9-4

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9.1 General information

Description

The ribbon- and round cables are used to connect the following components:

- CPU modules to interface modules
- input/output- and expansion modules with interface modules
- ITDC expansion module with SITOR thyristor sets

General technical data

Insulation group	According to VDE 0110, degree of pollution 2
Permissible operating peak voltage	300 V, conductor with respect to ground
Permissible operating voltage	32 V, conductor to conductor
Max. current per cable	1 A
Max. resistance	220 Ohm/km
Cable width (ribbon cable)	Core number x 1.27 mm

Table 9-1 General technical data

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Cable overview with connection possibilities

Module	Connector	Cable	Partial connector designation	Cable conversion	Interface module which can be connected
IT41	X6	SC49	A	50 pin to 2*26 pin	SU10
			B		SU10
		SC54	A	50 pin to 5*10 pin	SU12, SB10, SB70, SB71
			B		SU12, SB10, SB70, SB71
			C		SU12, SB10, SB60, SB61
			D		SU12, SB10, SB60, SB61
			E		SU12
IT41	X7	SC49	A	50 pin to 2*26 pin	SU10
			B		SU10
		SC54	A	50 pin to 5*10 pin	SU12, SB10, SB70, SB71
			B		SU12, SB10, SB70, SB71
			C		SU12, SB10, SB60, SB61
			D		SU12, SB10, SB60, SB61
			E		SU12
IT42	X6	SC50		15 pin to 26 pin.	SU10
IT42	X7	SC51		25 pin to 26 pin.	SU10
IT42	X8	SC49	A	50 pin to 2*26 pin	SU10
			B		SU10
		SC54	A	50 pin to 5*10 pin	SU12, SB10, SB70, SB71
			B		SU12, SB10, SB70, SB71
			C		SU12, SB10, SB60, SB61
			D		SU12, SB10, SB60, SB61
			E		SU12
EB11	X5	SC55	A	40 pin to 2*20 pin	SU11
			B		SU11
		SC13	A	40 pin to 4*10 pin	SU12, SB10, SB70, SB71
			B		SU12, SB10, SB70, SB71
			C		SU12, SB10, SB60, SB61
			D		SU12, SB10, SB60, SB61
EB11	X6	SC55	A	40 pin to 2*20 pin	SU11
			B		SU11
		SC13	A	40 pin to 4*10 pin	SU12, SB10, SB70, SB71
			B		SU12, SB10, SB70, SB71
			C		SU12, SB10, SB60, SB61
			D		SU12, SB10, SB60, SB61
EA12	X6	SC12		20 pin to 20 pin.	SU11
PM5/6	X5	SC7		10 pin to 10 pin.	SU12
ITDC	X7	SC17.2		50 pin to 50 pin.	SITOR interface
ITDC	X7	SC31.2		50 pin to 50 pin.	SITOR interface
PM5/6	X4	SC57			Monitor/diagnostics PC
SS4	X5	SC57			Monitor/diagnostics PC

Table 9-2 Modules and the interface modules which can be connected

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9.2 Cable types

SC7

Ribbon cable SC7	10 pin
Application	Connects the 10-pin connector strip of a CPU module with the 10-pin plug connector strip of an interface module.
Features	Unscreened ribbon cable 2 socket connectors, 10 pin (1:1) connection, can be inserted from any direction
Cable ends	Plug connectors according to DIN 41651 with strain relief at both ends.
Length	2 m
Order No.	6DD1684-0AH0

Table 9-3 Ribbon cable SC7

SC12

Ribbon cable SC12	20 pin, twisted pairs
Application	Connects the 20 pin plug connector of an input/output module with the 20 pin plug connector of an interface module.
Features	• unscreened ribbon cable • twisted pairs • two 20-pin socket connectors • (1:1) connection • can be inserted from any direction
Cable ends	Plug connectors according to DIN 41651 with strain relief at both ends.
Length	2 m
Order No.	6DD1684-0BC0

Table 9-4 Ribbon cable SC12

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SC13

Ribbon cable SC13	40 pin / 4 x 10 pin
Application	Connects the 40-pin plug connector of an input/output module with the 10-pin plug connectors of four interface modules.
Features	• unscreened ribbon cable • one 40-pin socket connector • four 10-pin socket connectors with partial connector labeling, A to D and the assignment A: Pins 1 to 10 B: Pins 11 to 20 C: Pins 21 to 30 D: Pins 31 to 40 of the 40-pin socket connector
Cable ends	Plug connectors according to DIN 41651 with strain relief at both ends.
Length	2 m
Order No.	6DD1684-0BD0

Table 9-5 Ribbon cable SC13

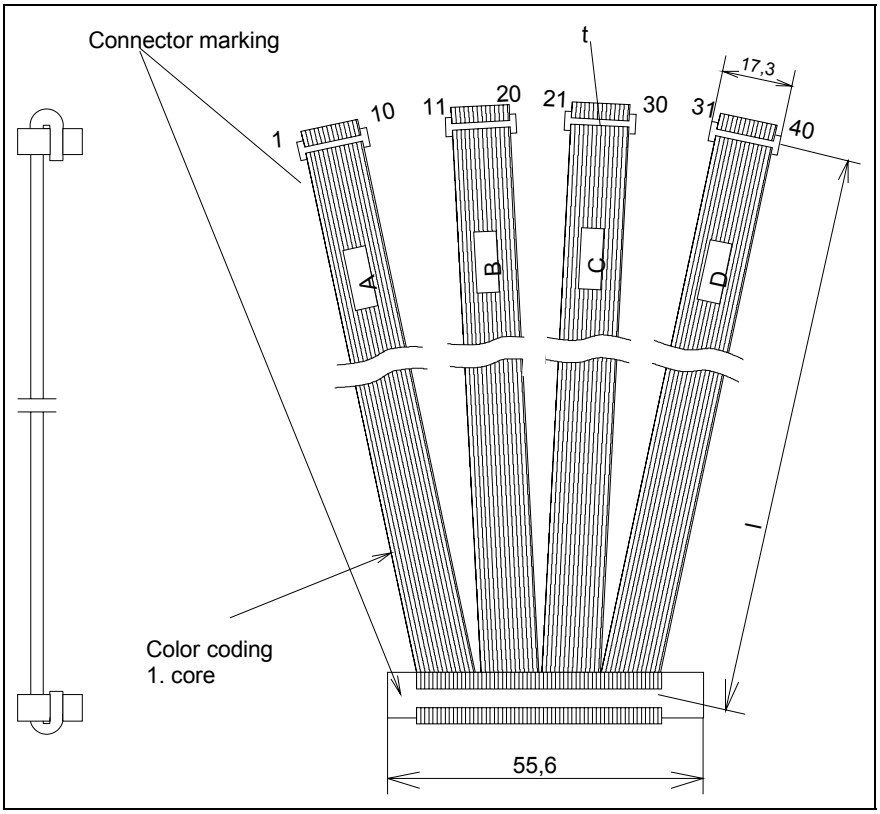


Fig. 9-1 Ribbon cable SC13

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SC17.2

Ribbon cable SC17.2	50 pin
Application	Connects the SITOR interface of an expansion module with the SITOR interface of a SITOR thyristor set or an SE20.2 interface module.
Features	• screened round cable • twisted pairs • 50-pin SUB-D plug connector • 50-pin SUB-D socket connector • (1:1) connection
Cable ends	SUB-D plug connectors according to DIN 41652 are provided at both ends
Length	2 m
Order No.	6DD1684-0BH2

Table 9-6 Ribbon cable SC17.2

SC31.2

Ribbon cable SC31.2	50 pin
Application	Connects the SITOR interface of an expansion module with the SITOR interface of a SITOR thyristor set or an SE20.2 interface module.
Features	• screened round cable • twisted pairs • 50-pin SUB-D plug connector • 50 pin SUB-D socket connector • (1:1) connection
Cable ends	SUB-D plug connectors according to DIN 41652 are provided at both ends
Length	10 m
Order No.	6DD1684-0DB2

Table 9-7 Ribbon cable SC31.2

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SC49

Round cable SC49	50 pin / 2 x 26 pin
Application	Connects the 50-pin SUB-D socket connector of an expansion module with the 26-pin plug connectors of 2 interface modules.
Features	• screened round cable • 50-pin SUB-D plug connector • two 26-pin socket connectors with partial connector labeling A and B with the assignment A: Pins 1 to 25 B: Pins 26 to 50 of the 50-core ribbon cable
Cable ends	Expansion board: SUB-D plug connector according to DIN 41652 Interface module: Plug connector according to DIN 41651 with strain relief.
Length	2 m
Order No.	6DD1684-0EK0

Table 9-8 Ribbon cable SC49

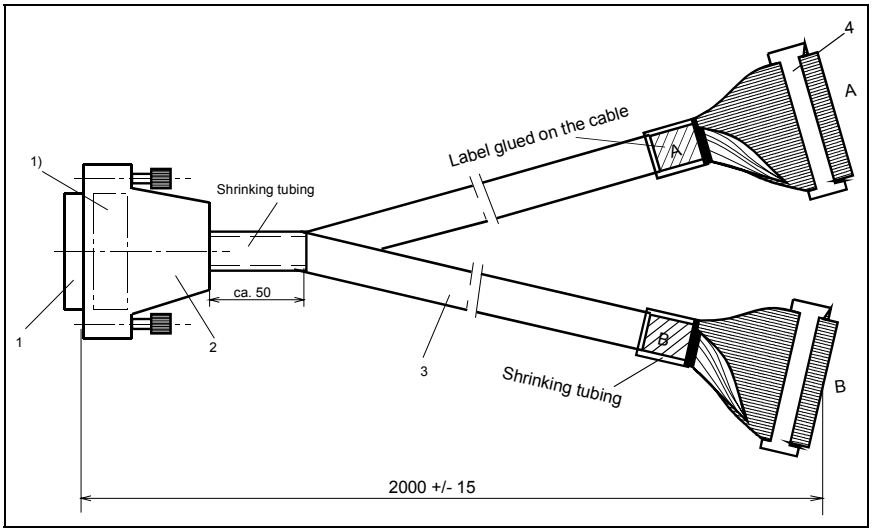


Fig. 9-2 Ribbon cable SC49

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SC50

Round cable SC50	15 pin / 26 pin
Application	Connects the 15-pin SUB-D socket connector of an expansion module with the 26-pin plug connector of an interface module.
Features	• screened round cable • 15-pin SUB-D plug connector • 26-pin socket connector • (1:1) connection, pins 16 to 26 of the socket connector are not assigned
Cable ends	Expansion module: SUB-D plug connector according to DIN 41652 Interface module: Plug connector according to DIN 41651 with strain relief.
Length	2 m
Order No.	6DD1684-0FA0

Table 9-9 Ribbon cable SC50

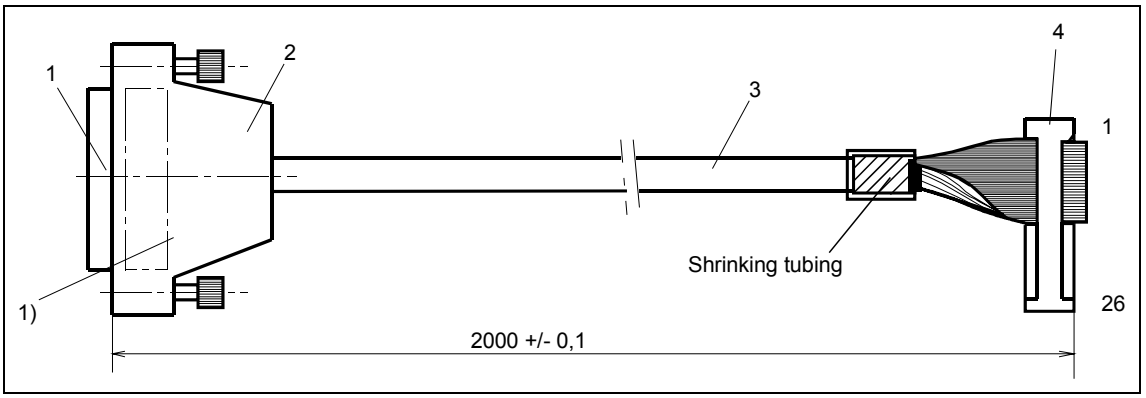


Fig. 9-3 Ribbon cable SC50

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SC51

Round cable SC51	25 pin / 26 pin
Application	Connects the 25 pin SUB-D socket connector of an expansion module with the 26-pin plug connector of an interface module.
Features	• screened round cable • 25-pin SUB-D plug connector • 26-pin socket connector • (1:1) connection, pin 26 of the socket connector not assigned
Cable ends	Expansion module: SUB-D plug connector according to DIN 41652 Interface module: Plug connector according to DIN 41651 with strain relief.
Length	2 m
Order No.	6DD1684-0FB0

Table 9-10 Ribbon cable SC51

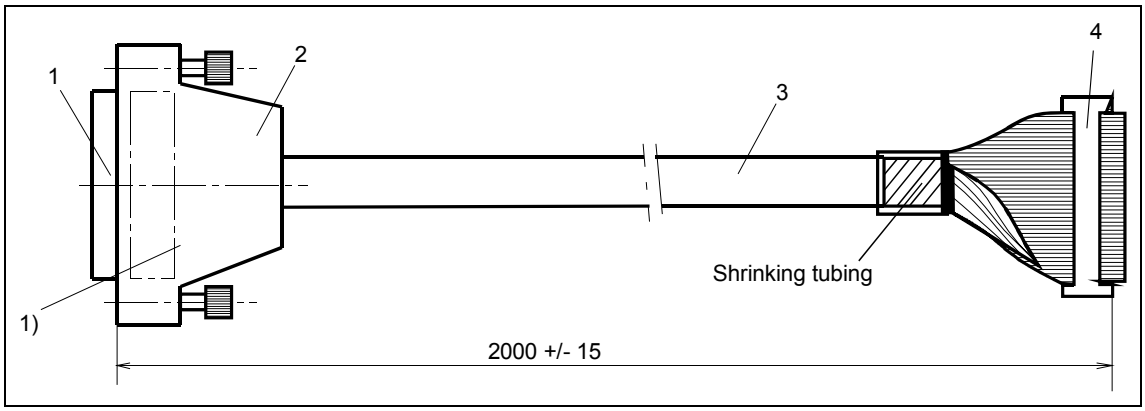


Fig. 9-4 Ribbon cable SC51

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SC54

Round cable SC54	50 pin / 5 x 10 pin
Application	Connects the 50-pin SUB-D socket connector of an expansion module with the 10-pin plug connectors of 5 interface modules.
Features	• screened round cable • 50-pin SUB-D plug connector • 5, 10-pin socket connectors with printed partial connector designations A to E with the assignment A: Pins 1 to 10 B: Pins 11 to 20 C: Pins 21 to 30 D: Pins 31 to 40 E: Pins 41 to 50 of the 50-pin plug connector
Cable ends	Expansion module: SUB-D plug connector according to DIN 41652 Interface module: Plug connector according to DIN 41651 with strain relief.
Length	2 m
Order No.	6DD1684-0FE0

Table 9-11 Ribbon cable SC54

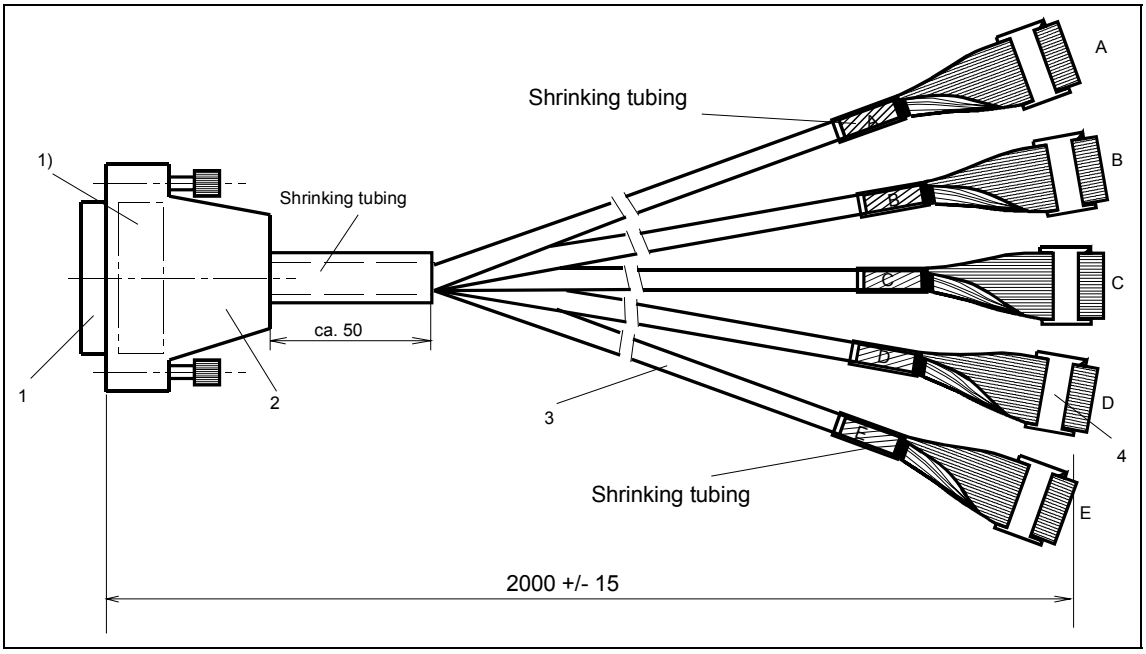


Fig. 9-5 Ribbon cable SC54

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Sub-D connector	Plug connector	Sub-D connector	Socket connector
	Partial connect. A		**Partial connector D**
1	1	11	1
34	2	44	2
18	3	28	3
2	4	12	4
35	5	45	5
19	6	29	6
3	7	13	7
36	8	46	8
20	9	30	9
4	10	14	10
	Partial connect. B		**Partial connector E**
37	1	47	1
21	2	31	2
5	3	15	3
38	4	48	4
22	5	32	5
6	6	16	6
39	7	49	7
23	8	33	8
7	9	17	9
40	10	50	10
	Partial connect. C		
24	1		
8	2		
41	3		
25	4		
9	5		
42	6		
26	7		
10	8		
43	9		
27	10		

Table 9-12 Ribbon cable SC54

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SC55

Ribbon cable SC55	40 pin / 2 x 20 pin
Application	Connects the 40-pin plug connector of an input/output module with the 20-pin plug connectors of two interface modules.
Features	• unscreened ribbon cable • 1, 40-pin socket connector • 2, 20-pin socket connectors with partial connector designations A and B with the assignment A: Pins 1 to 20 B: Pins 21 to 40 of the 40-pin socket connector
Cable ends	Connectors according to DIN 41651 with tension relief at both ends.
Length	2 m
Order No.	6DD1684-0FF0

Table 9-13 Ribbon cable SC55

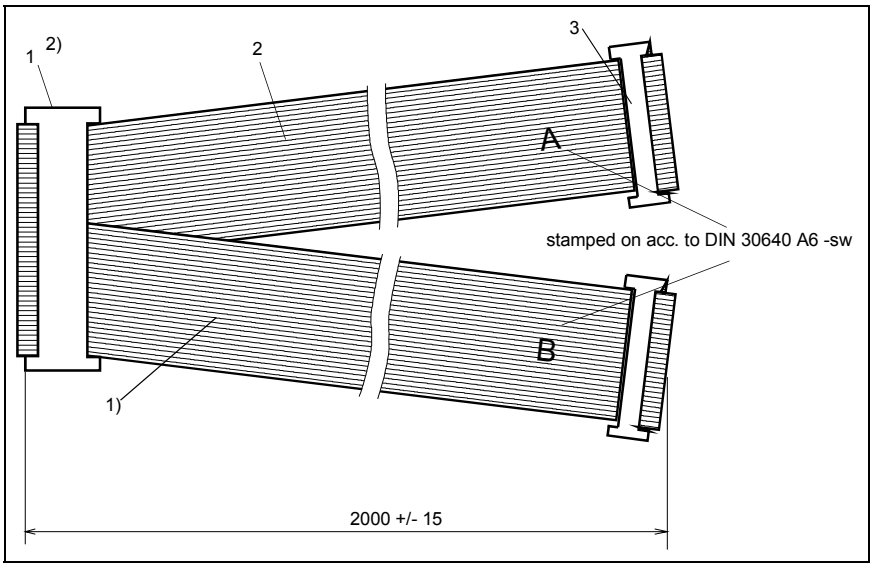


Fig. 9-6 Ribbon cable SC55

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SC57

Round cable SC57	9 pin / 9 pin with 9-pin to 26-pin adapter
Application	Connects a PC (COM 1 / 2, RS 232) with the serial interface of a CPU module with **cable 1, 10m** or a SS4 communications module (on CS7) with **cable 1 and 2 (adapter), 10m + 0.5m**
Features	• screened round cable • twisted pairs • 26-pin SUB-D plug connector • 9-pin SUB-D socket connector
Cable ends	SUB-D plug connectors according to DIN 41652 are located at both ends
Length	10 m, with adapter 0.5 m
Order No.	6DD1684-0FH0

Table 9-14 Ribbon cable SC57

SC57 adapter for CS7/SS4

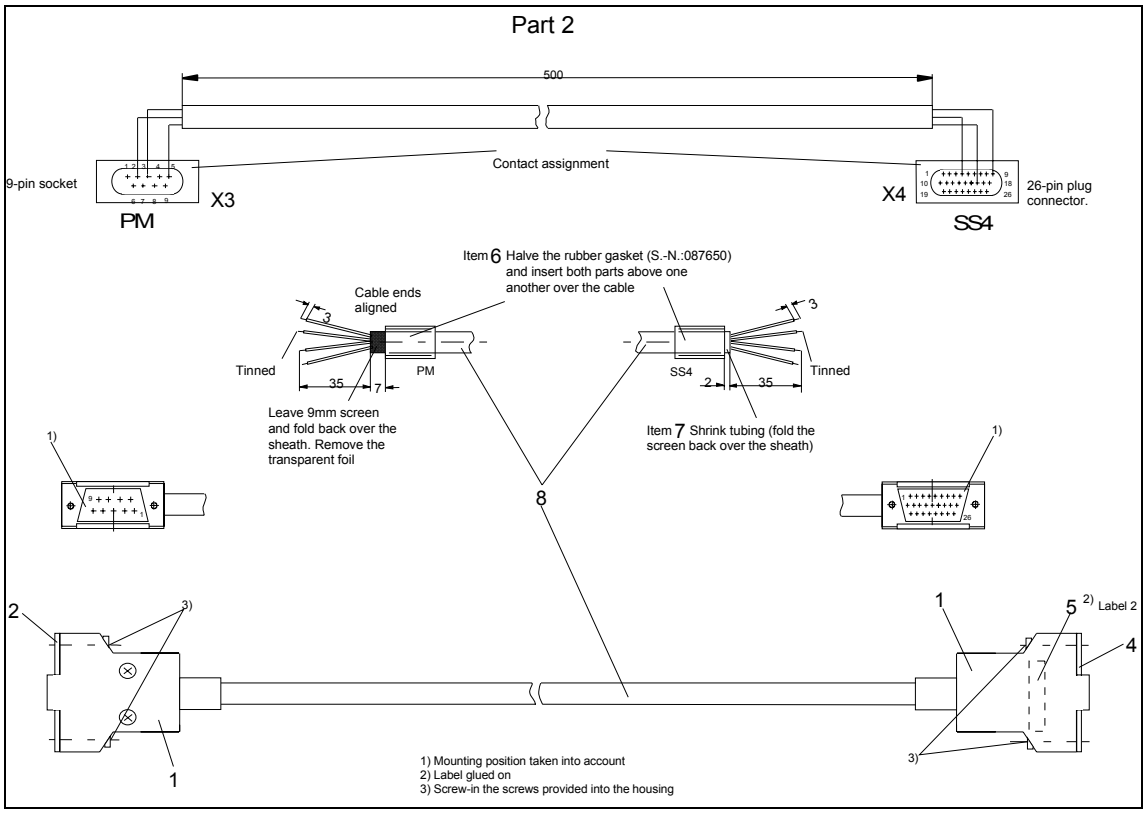


Fig. 9-7 Ribbon cable SC57

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SC57
cables 1 and 2

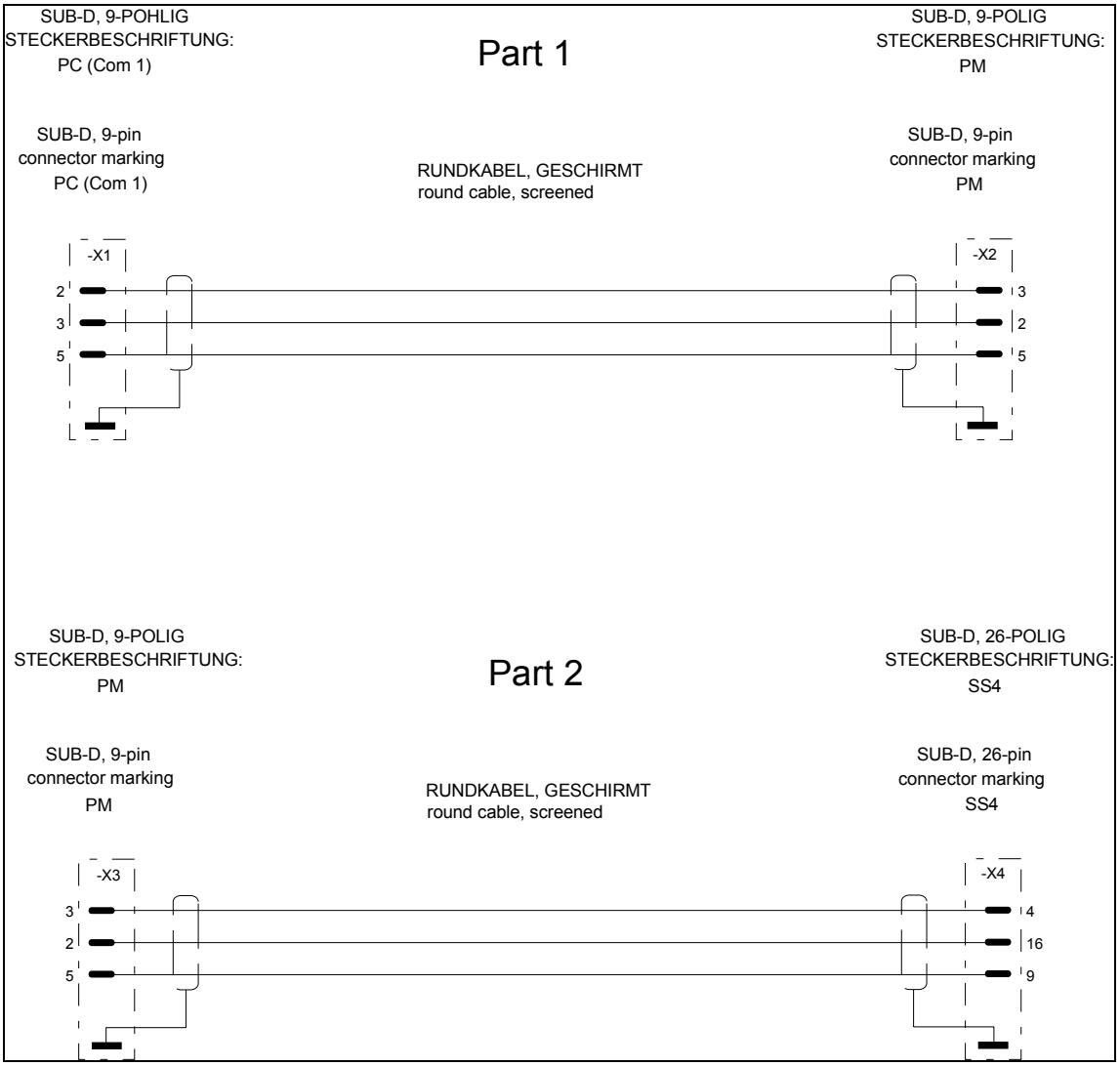


Fig. 9-8 Ribbon cable SC57

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10 Operator control panel OP2

Overview

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10.1 Function overview

The OP 2 is an operator control device for the SIMADYN D system. It offers the following functionality:

MSG

Process data handling

Displays and processes up to 24 process data. 2 process data are always displayed.

BIN

Binary value processing

Displays and processes up to 32 binary values

MSG

Message system

Autonomous message system for P32 messages from SIMADYN D. Messages are saved, sorted according to the time they were received, and can be deleted. Only one message is displayed at any one time (max. 80 characters).

SYS MSG

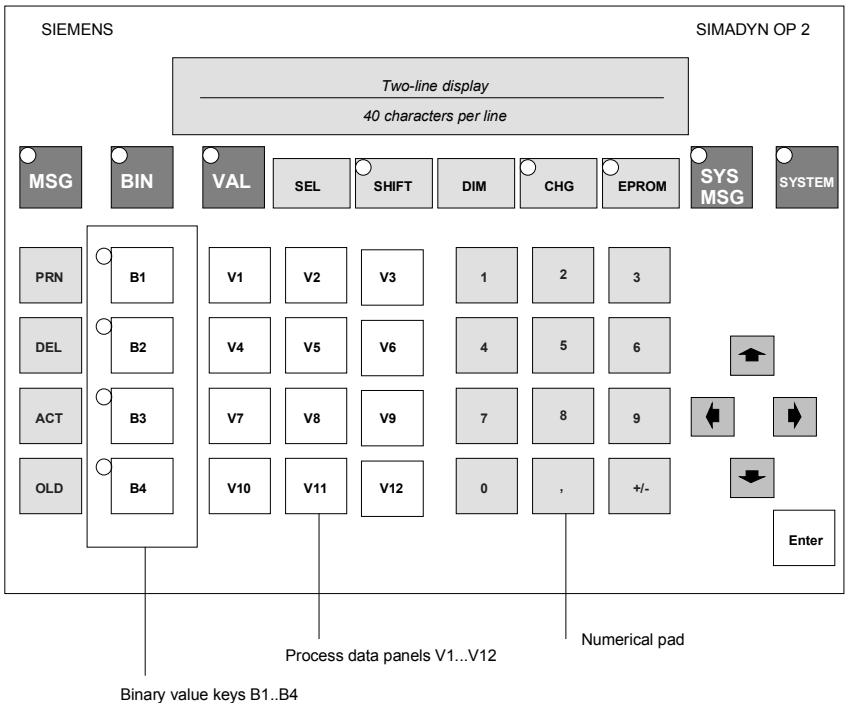
System message

Messages which come directly from OP2

SYSTEM

System operation

Changing and saving the basic function



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10.2 Process data handling

VAL key

Process data handling is selected using the VAL key. The LED in the key is lit if process data handling has been selected (the VAL key).

10.2.1 General information

Process data

Two of a total of 24 process data can be simultaneously displayed (upper and lower display line). The 24 values are sub-divided into two panels (V1..V12 + SHIFT) for easier selection.

The sub-division of the two panels according to setpoints and actual values can be configured as required (for instance, 20 actual values can be configured or just 3). The sub-division according to setpoints and actual values is exclusively configured in SIMADYN D.

The selected process data values are always displayed normalized, in accordance with the pre-setting (default) together with dimension and name. If a name has not been configured, then the „VALUE xy“ (xy = 1 ..24) designator is displayed as default value.

If a non-configured process data is selected, then operating message No. 14 („**NO MEASURED VALUE INITIALIZED**“) is displayed. This text is displayed for 3 seconds, and then the previous value is re-displayed.

ACCESS	**=**	**-0.123456789012345**	**Rev/min**
VALUE 24	**=**	**-17.365195745 E-55**	**POUNDS**

Designator — Value — Dimensions % data

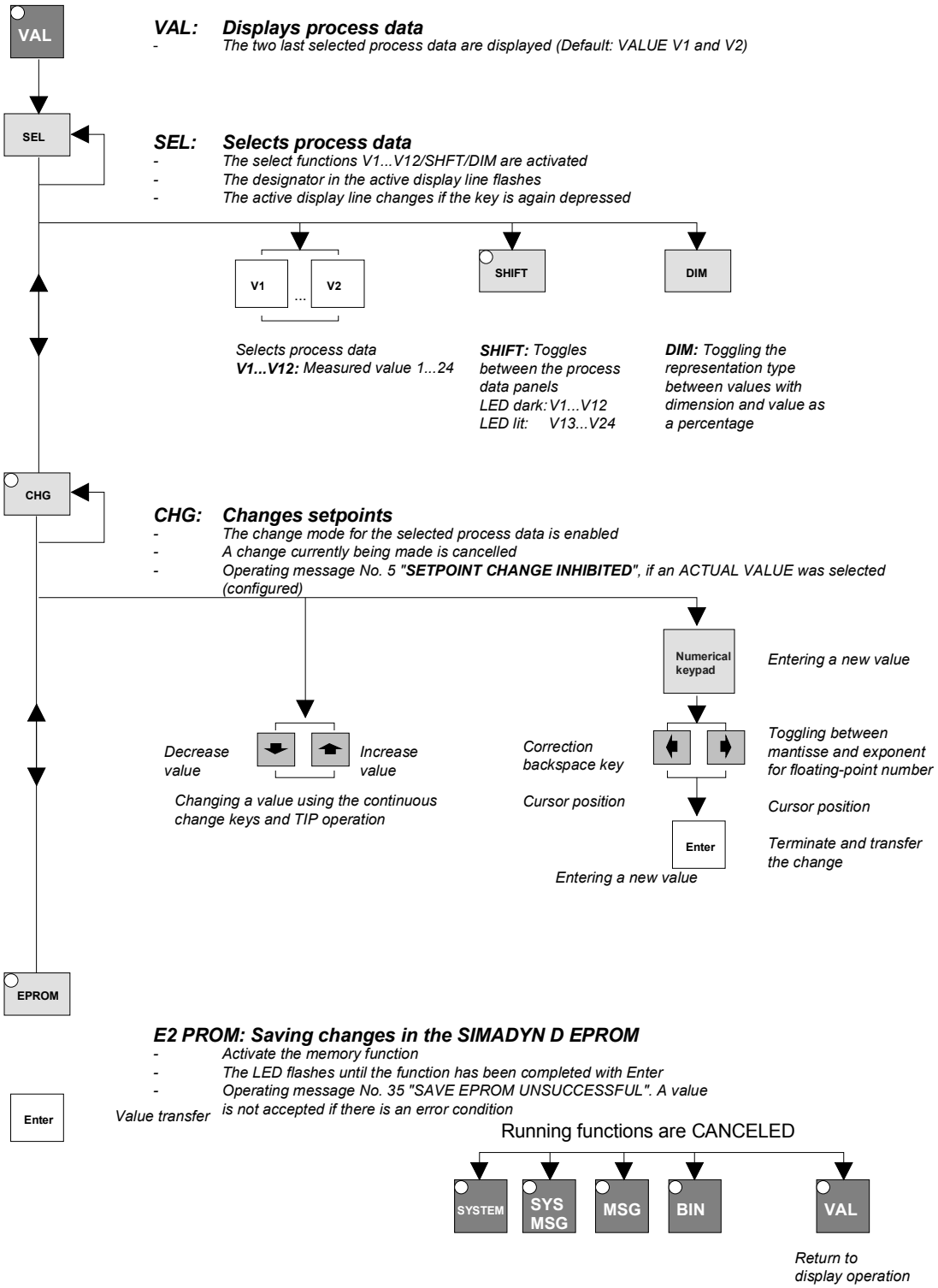
10.2.2 Behavior at run-up

The OP2 automatically goes into the process data handling mode after it has been initialized. The last selected values are displayed again. At first run-up, the first two configured values are displayed (normally V1 and V2). If only one process data has been configured, then operating message No. 14 is displayed in the lower display line („**NO MEASURED VALUE INITIALIZED**“).

If no process data have been configured at the SIMADYN D side, the OP2 goes into the basic message system processing function. If process data handling is selected at a later time, then operating message No. 14 is displayed in the upper line („**NO MEASURED VALUE INITIALIZED**“). The text is displayed until another basic function is selected.

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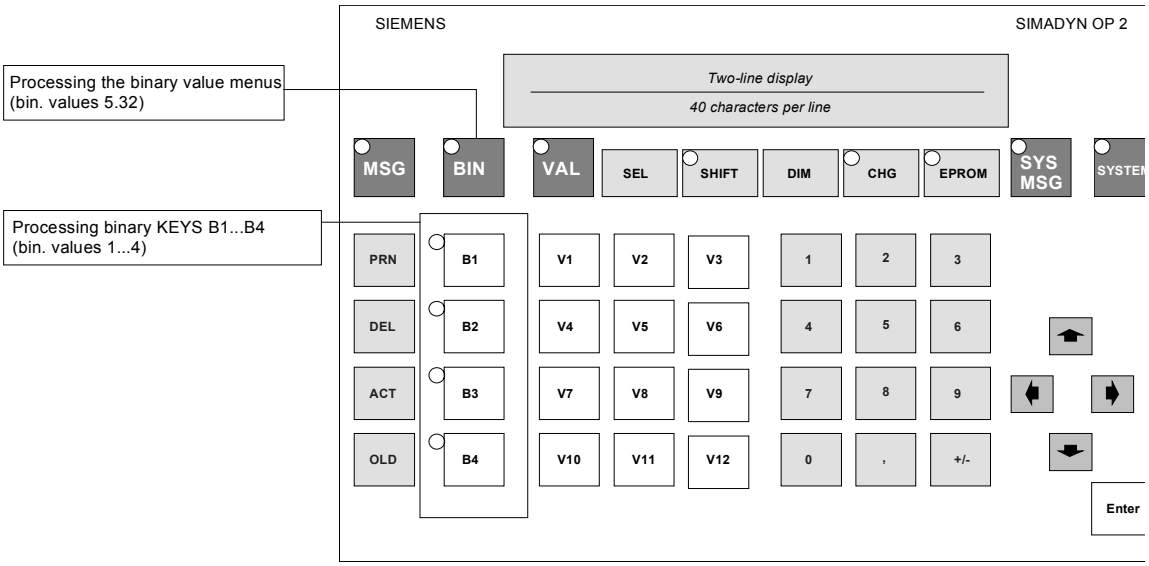
10.2.3 Operator control overview for process data handling



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10.3 Binary value processing

Overview



Up to 32 binary values can be processed. (BIN and B1..B4). The binary values cannot be saved in the SIMADYN D EPROM. If this is required, then the binary values should be configured as process data in SIMADYN D.

Binary values are processed using two mechanisms:

Binary keys B1 - B4

Keys B1 - B4 can always be selected, unless system processing has been selected (SYSTEM).

The LED in the four binary keys indicates whether the appropriate binary value is „0“ (LED is dark) or „1“ (LED is lit). The status is inverted when depressed.

Each time the KEY is depressed, the LED flashes until SIMADYN D acknowledges the change.

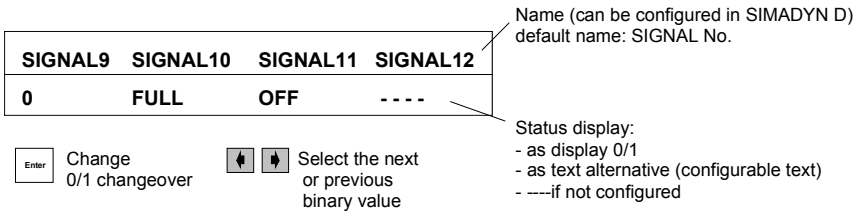
If the binary values were not configured on the SIMADYN D side, then the LEDs in keys B1 to B4 remain dark (i. e. the keys have no effect).

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Binary value processing

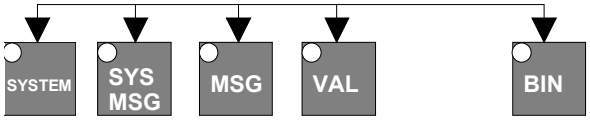
BIN

Starts the binary value menu / binary values B5 to B32 are processed.



The status display flashes after each action until SIMADYN D acknowledges the change.

Running functions are cancelled



No function

10.3.1 Message system processing

The OP2 combines all of the incoming messages into its own message system which can administer up to 30 messages (save). If more messages are received, then the first messages are overwritten (ring buffer mechanism) and an overflow message is entered into the buffer. Operating message No. 15 („**NUMBER OF LOST MESSAGES: xx**“), xx specifies the number of messages which have been overwritten.

Only one message can be displayed at any one time. OP2 sorts all of the received messages into chronological order.

Evaluating the message class areas

An OP2 does not have to administer all messages, transmitted from SIMADYN D. Message classes are allocated, which are specified when parameterizing the OP2, which are then used as selection criterion as to which messages should be administered by OP2. All messages can be permitted, or 1, 2 or 3 message class areas.

The message classes are defined in SIMADYN D when configuring the message system (refer to the system software and configuring D7-SYS; message class = prefix).

Operator control overview for message processing

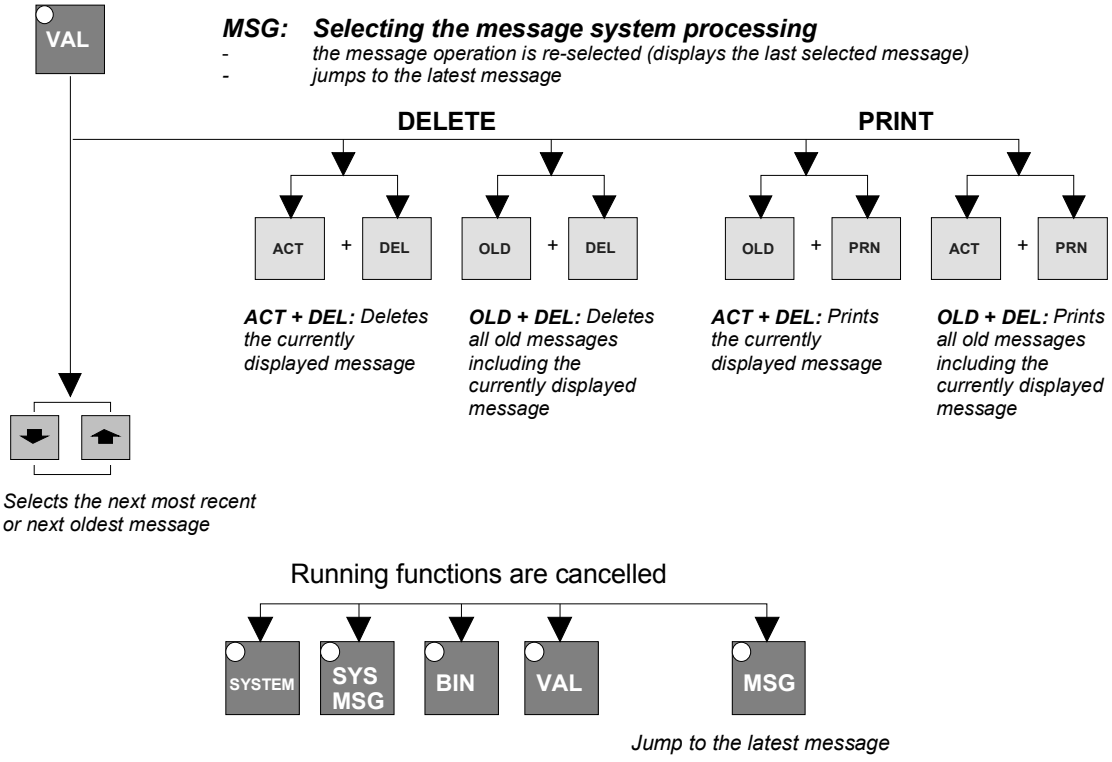
The message system processing is selected via the MSG key. After being selected, the key LED is lit (bright). If OP2 hasn't received any messages, then after selection, operating message No. 16 is displayed (**„NO MESSAGES AVAILABLE“**). The text remains until either a message is received, or another function is selected (e. g. VAL key).

If the OP2 has received new messages from SIMADYN D (since the last time that message system processing was selected), then the MSG-key LED flashes if the message system processing is **not** selected.

When the message system processing is re-selected, the last selected message is displayed again. When the key is repeatedly depressed, the latest message is displayed. You can scroll through the selected OP2 message system using the raise/lower keys.

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The sequence for depressing the various keys for all functions in the message processing are now listed. OP2 rejects illegal key combinations with an appropriate message.



10.3.2 Message on the display

Messages on the display

OP2 displays messages in two different message formats. The two message formats are:

- **ASCII-text messages:** They consist of:
  Date/time, message type, message text and process data/dimensions
- **Prefix/suffix messages:** They consist of:
  Date/time, message type, prefix, suffix and process data/dimension

Date/time consist of day, month, year, hour, minute, seconds and milliseconds.

Message types: Warning, fault, communications error and system error. The syntax/representation types of the message system must be used.

Process data/dimensions are optional information in a message and are exclusively dependent on the software configured in SIMADYN D.

The configuring engineer decides, on the SIMADYN D side, which format is displayed, when configuring the message system.

Further information
is provided in the User Documentation for the SIMADYN D system software and configuring D7-SYS.

The OP2 displays the messages configured in SIMADYN D as follows:

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Possible message formats		
Prefix/suffix	**Text**	**Evaluation and display on the OP2**
no	no	Message is not administered.
yes	no	The prefix is evaluated as message class. If the message class is permissible, the message is administered (stored) in the prefix/suffix format.
no	yes	Messages without prefix/suffix, with text, are always administered in the OP2.
yes	yes	Prefix is evaluated as message class. If it is valid, the message is administered (stored) in the text format.

ASCII text message

If process data (with dimensions) is included in a message, then the OP2 „cuts“ the message text after 28 characters if it is longer (independent as to whether a dimension is available or not). The message text may be up to 56 characters long if there is no process data.

If the message text is shorter than the maximum length, then the remaining characters are filled with „blanks“; i. e. the display stays „dark“ at these positions. Thus, the following message format is provided at the display (2x40 characters) (d=day, m=month or minutes, y=year, h=hours, z=milliseconds, T=message type (warning, fault etc.):

1) **Message with process data (and dimension): *Max. 28 message characters***

```
dd.mm.yy hh:mm:ss.zzz T A MAX. OF
28 CHARACTERS ARE HERE!!-999.12345678 E+99
DIMENSION
```

2) **Message without process data: *Max. 56 message characters***

```
dd.mm.yy hh:mm:ss.zzz T A MAX. OF
56 CHARACTERS COME FROM SIMADYN D!!!!
```

***Example** for a message in the ASCII text format with measured value (without dimension):*

```
01.10.94 00:00:05:167 W THE MOTOR RUNS
WITH UE CURRENT -99999.1234567 E+99
```

Prefix/suffix message

For the „prefix/suffix“ format, the following message formats can be displayed on the OP2 display (d=day, m=month or minute, y=year, h=hour, z=milliseconds, T=message type (warning, fault etc.):

1) **Message with process data (and dimension):**

```
dd.mm.yy hh:mm:ss.zzz T P:54321 S:54321
-999.12345678 E+99 DIMENSION
```

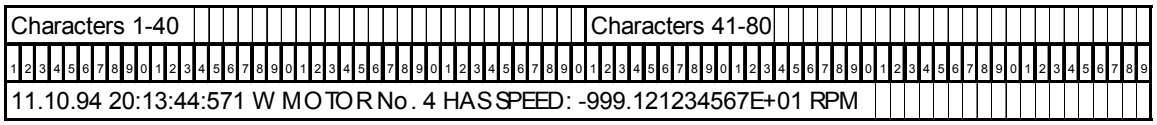
2) **Message without process data:**

```
dd.mm.yy hh:mm:ss.zzz T P54321 S:54321
```

10.3.3 Message print-out

The OP2 defines the message format at the printer, so that 2 display lines (i. e. a complete message) are combined to form a printer line. OP2 automatically inserts a line break after each message. A message is therefore always 80 characters long; the character length at the printer should be appropriately set. OP2 does not change the message structure.

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Print control

The user can print-out all of the acquired messages using the PRINT/OLD or PRINT/ACT keys (the two keys should be simultaneously depressed).

For OLD/PRINT, all of the messages including the presently displayed message, are printed. For ACT/PRINT, that message is printed, which is being currently displayed.

Deleting messages

The messages are **not** automatically deleted after having been printed. Messages are printed using the DEL key.

Automatic printing

When parameterizing OP2, it should be specified as to whether messages should be printed immediately after they have been received in the OP2 (refer to "Parameterizing for the message system processing")

If YES is entered, then the messages are printed-out immediately after the message telegram has been received. With this type of print-out, there is no guarantee that the messages are printed-out in the correct chronological sequence.

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10.4 System operation

In system operation, the basic settings (operating parameters) for the OP2 are defined. The settings are permanently saved in the OP2 flash memory.

Selection



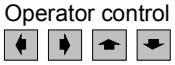
Depress the SYSTEM key for longer than 3 sec.

10.4.1 Function overview

The following menu appears in system operation:

MESSAGE	**VALUE**	**USS-INTERFACE**
PRINTER	**END**	**DISPLAY-OPTIONS**

Operator control



CURSOR
Select the function

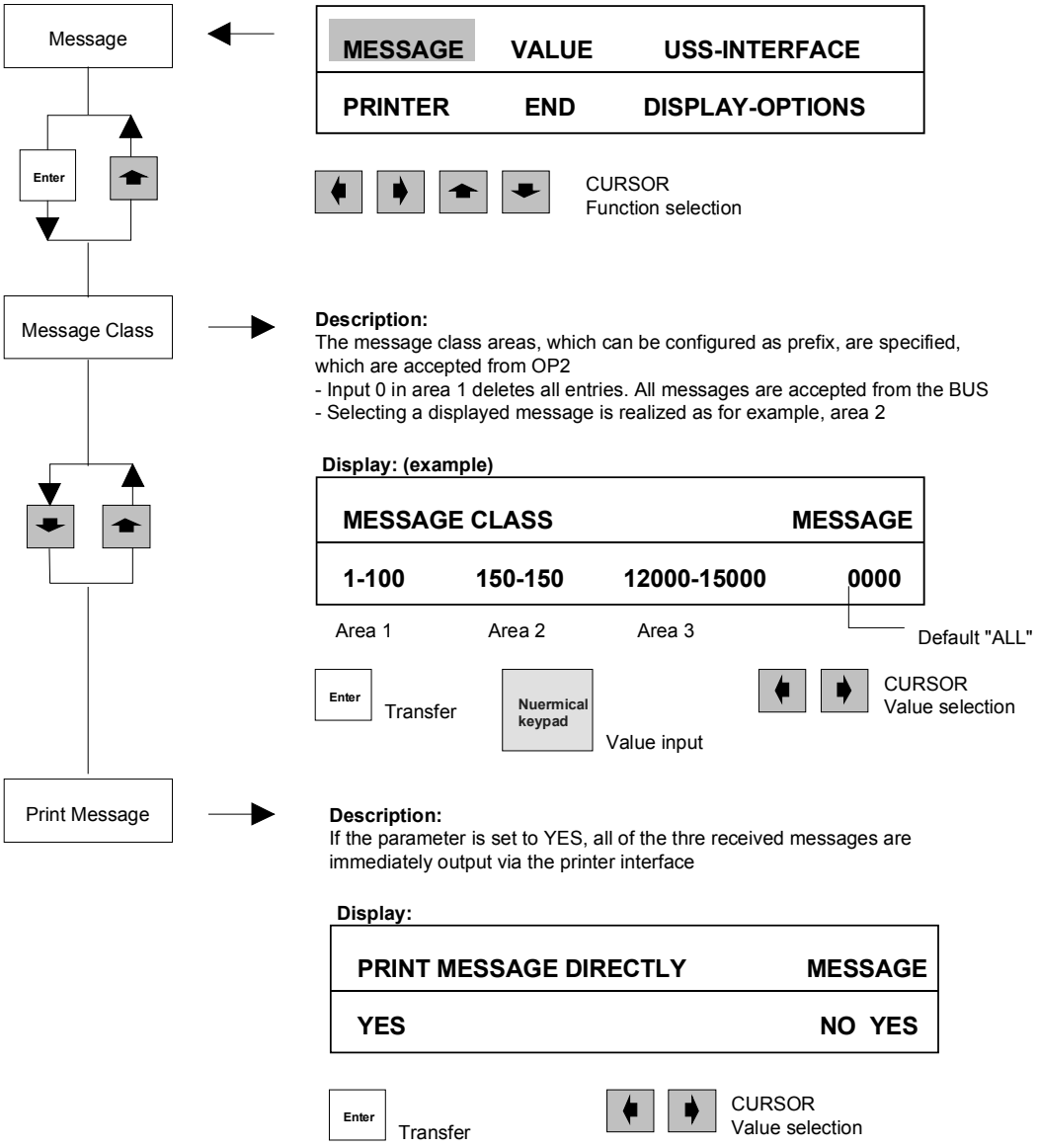


Start the function

Function	Definition
MESSAGE	Parameterization for message system processing
VALUE	Parameterization for process data processing
USS-INTERFACE	Parameterizing the USS interface to SIMADYN D
PRINTER	Parameterizing the printer interface
DISPLAY-OPTIONS	Selecting the language for all OP2 messages

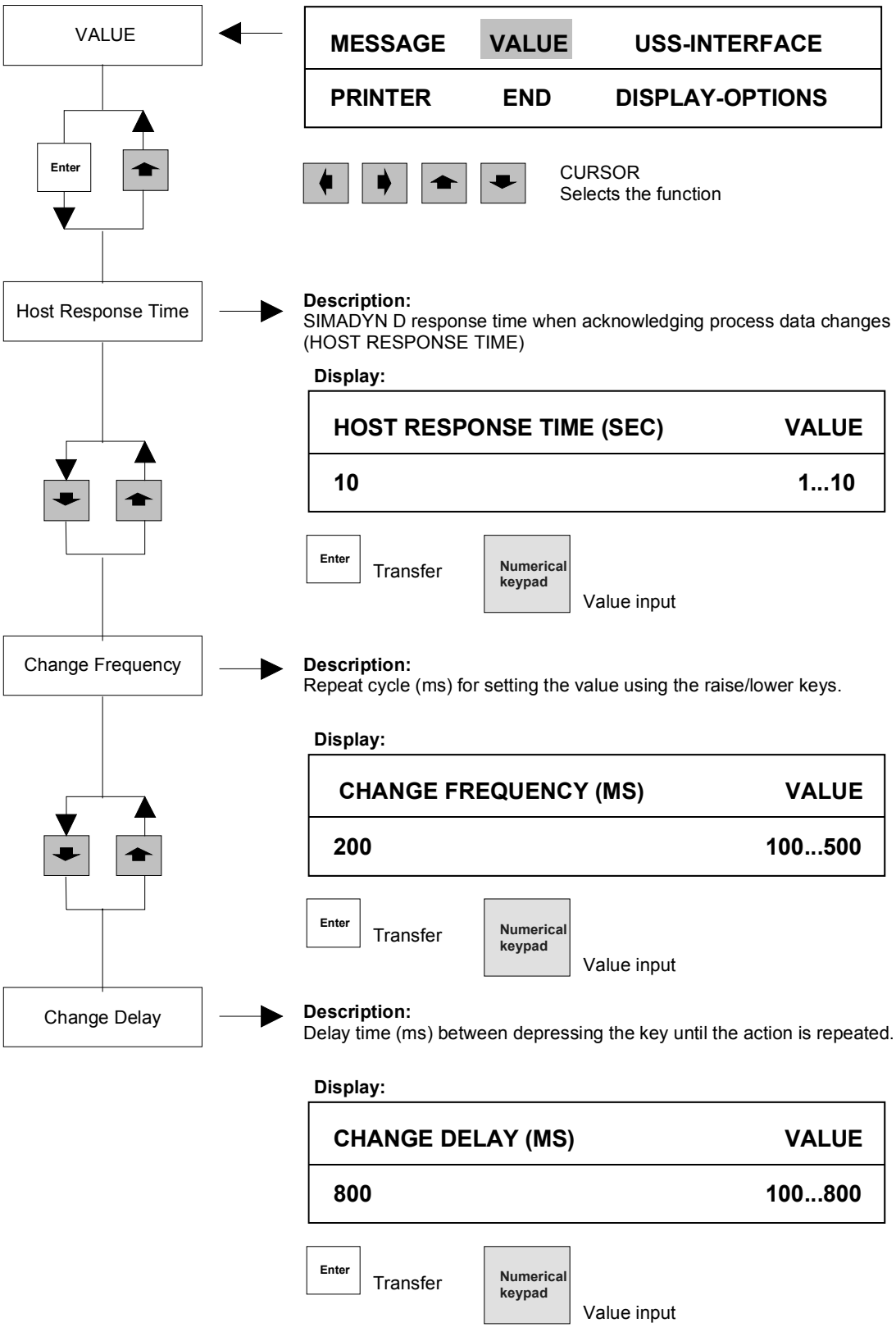
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10.4.2 Parameterizing the message system processing



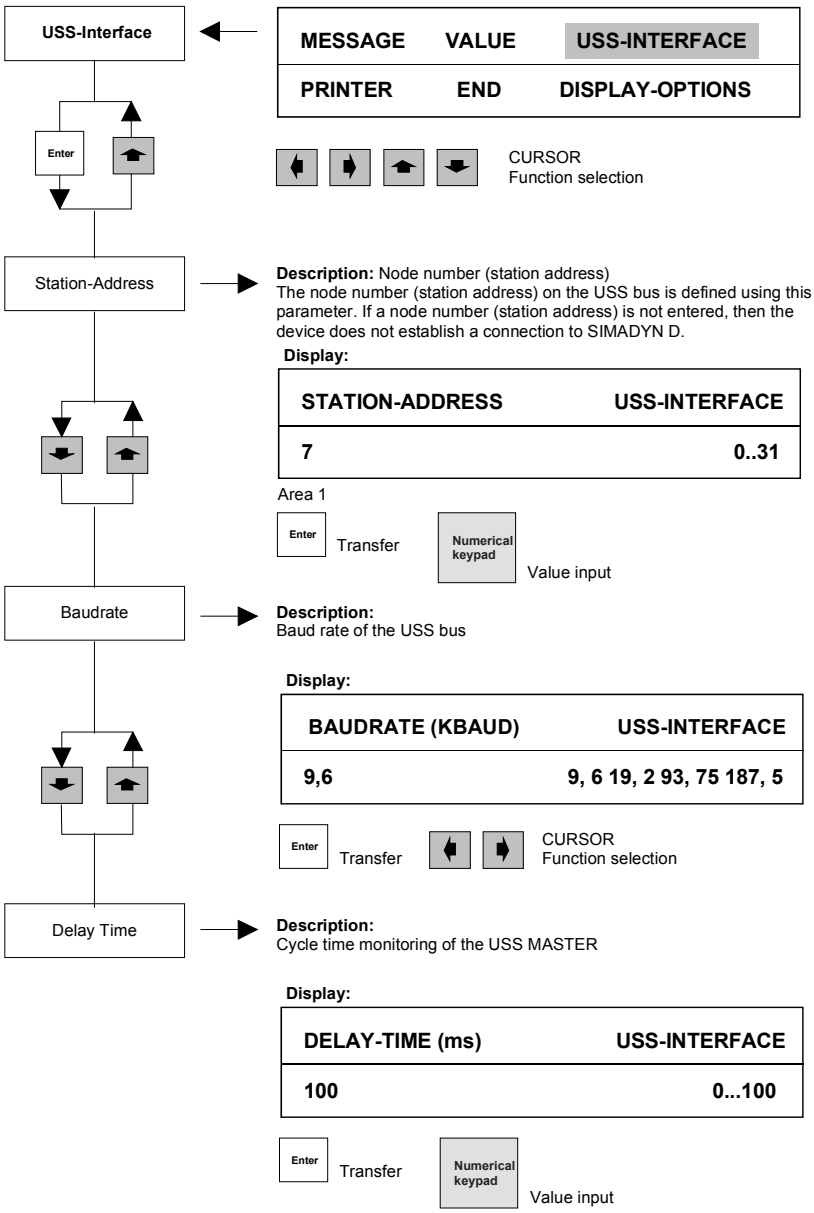
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10.4.3 Parameterizing for process data



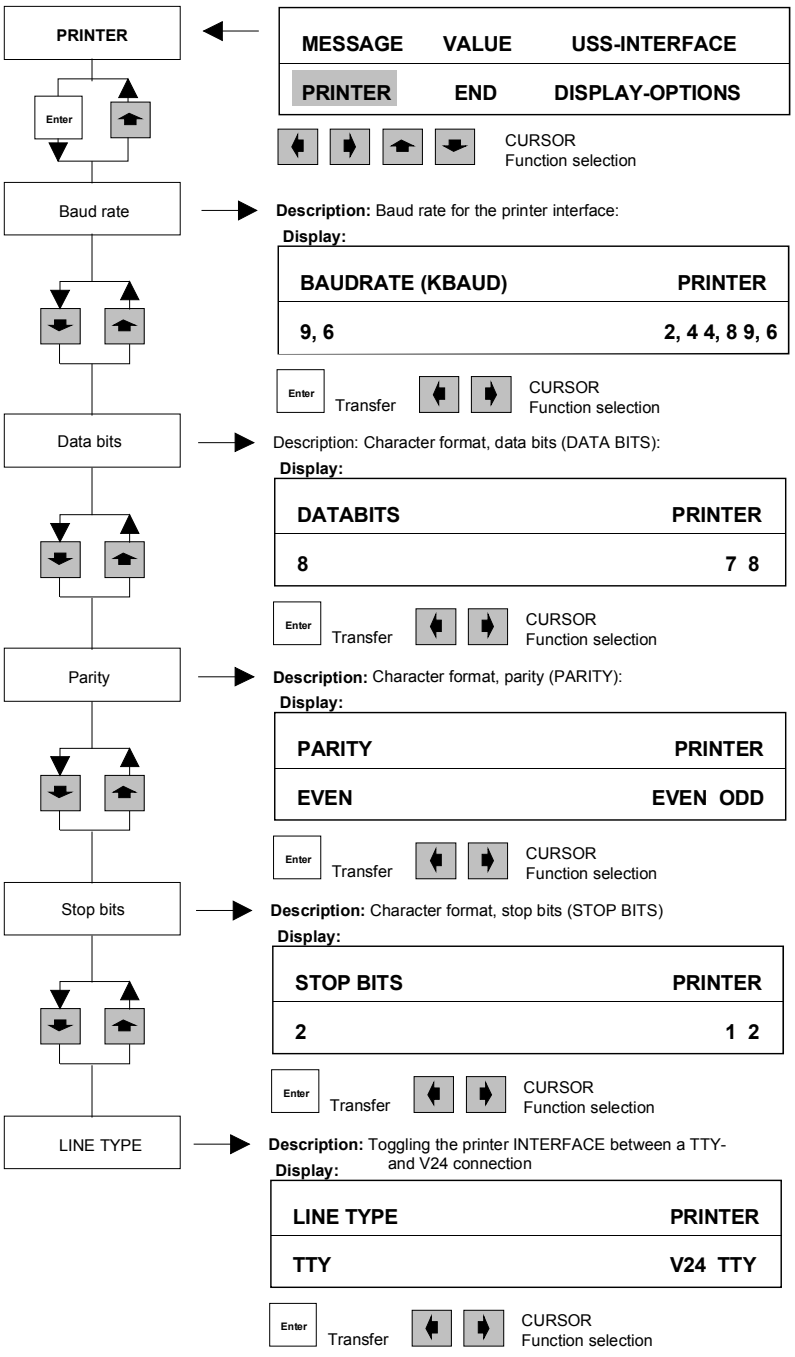
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10.4.4 Parameterizing for the USS interface



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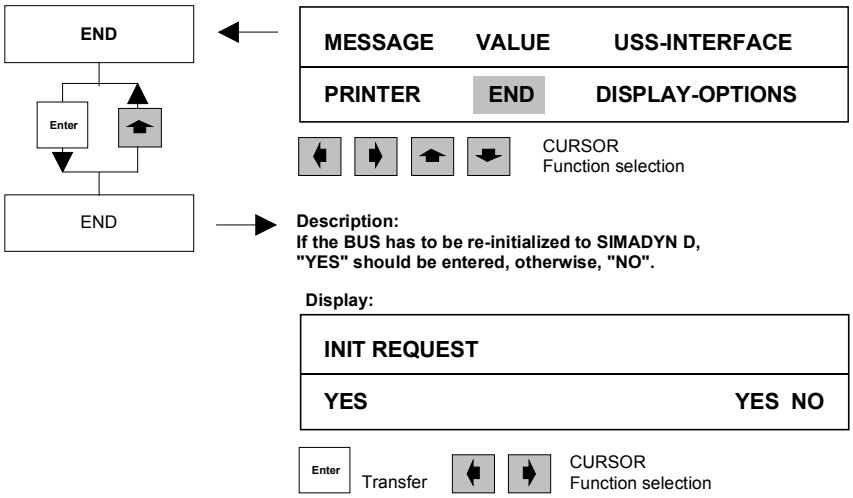
10.4.5 Parameterization for the printer



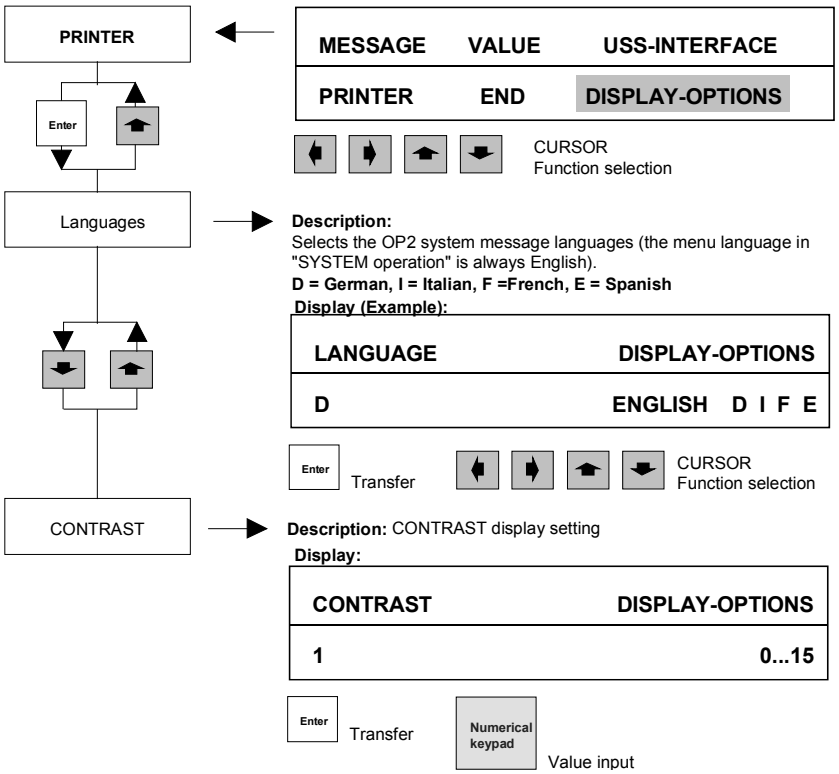
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10.4.6 End of system operation

SYSTEM operation is terminated by selecting END and depressing the ENTER key.



10.4.7 Parameterizing the display options



10.4.8 Self-test

The user can test all of the OP2 sub-components using the self-test. The self-test function can only be accessed from system operation.

10

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Starting the self-test

System operation is selected by depressing the SYSTEM key (longer than 3 seconds). The self-test is started by simultaneously depressing the  keys. The particular function is selected using the cursor keys and acknowledged with ENTER.

The test menu is displayed:

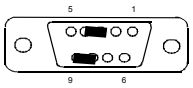
DISPLAY	**USS-INTERFACE**	**KEYBOARD**
PRINTER-INTERFACE	**END**	**HARDWARE**

DISPLAY TEST

Various test patterns are continuously written into the display. Display errors can be identified by visually checking these optical patterns on the screen. The test is terminated with ENTER.

USS INTERFACE TEST

Cyclic data are transmitted via the USS bus, and they are simultaneously received and checked. The USS interface can be checked using a short-circuit plug connector. During the test, the following message is shown on the upper display line: „USS-INTERFACE TEST -> ENTER FOR END“. After the test has been terminated, the following message is indicated on the lower display line: „USS-INTERFACE OK“ or „USS-INTERFACE ERROR“ (the test is terminated with ENTER). The short-circuit plug-connector assignment is:



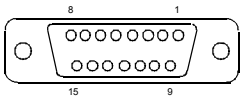
PIN	RS 485	Selbsttest
1		
2		
3	Data P	TxD+
4		RxD+
5	GND	GsND
6	+5V	+5V
7		
8		TxD-
9	Data N	RxD-

PRINTER INTERFACE TEST

A test telegram is output at the printer via the printer port. The printer port can be checked using a short-circuit plug connector. The test is terminated with ENTER.

Assignment of the short-circuit plug connector:

Port assignment SS 1 and SS 2 A



PIN	General	V.24	TTY
1	Screen		
2			RxD-
3		RxD	
4		TxD	
5		CTS	
6			TxD+
7			TxD-
8	Screen		
9			RxD+
10		RTS	
11			+20mA
12	GND		GND
13			+20mA
14	+5V		
15	GND		

The test is terminated with ENTER.

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Hardware

The OP2 tests the internal memory. The OP2 shows the operating status in the upper display line „**RAM-EPROM-FLASH-TEST**“.

The actual test step is displayed in the lower line. When errors occur, OP2 stays at that particular test step and issues the message „**TEST ERROR**“. If no errors are detected, OP2 returns to the self-test menu after the test has been completed. The test takes approximately two minutes.

Message texts during testing:

WRITE READ TEST OF RAM
CALCULATE CHECK SUM OF EPROM
WRITE READ TEST OF FLASH

END

End of the self test and the OP2 returns to the SYSTEM mode.

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10.5 System run-up

Power-on

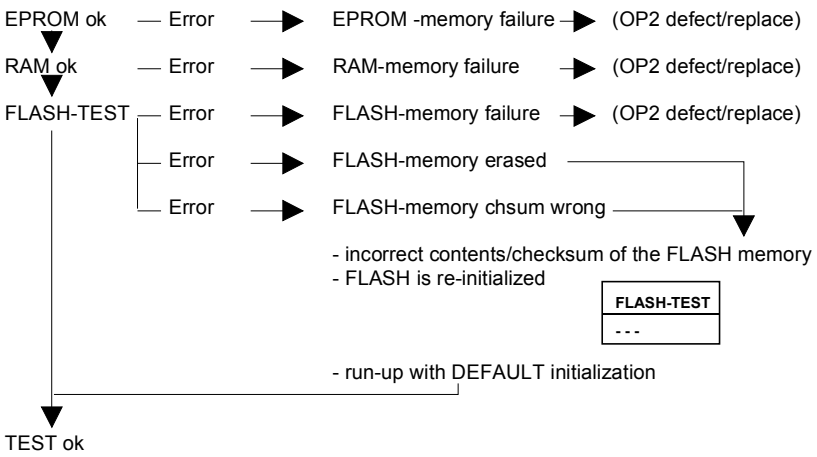
OP2 is powered-up by switching-on the +24V power supply voltage. All of the connections must be correct to ensure perfect functioning of the unit:

- USS connecting cable to SIMADYN D
- printer cable (if a printer is connected).
- power supply cable

After being powered-up, the „**OP2 Version V1.0**“ message is displayed for approximately 5 seconds (the actual firmware version is displayed).

Hardware test

OP2 then goes into an automatic hardware test routine. The following messages occur one after the another during this test routine:



The OP2 then automatically establishes a communications link to SIMADYN D.

10.5.1 Establishing a communications link to SIMADYN D

After a successful self-test, OP2 establishes a communications link to the SIMADYN D subracks.

This procedure can either be initiated by SIMADYN D or by the OP2. This is realized as follows

- SIMADYN D: After resetting or powering-up the subrack power supply.
- OP2: After powering-up the OP2 power supply voltage or, optionally, when exiting the SYSTEM mode (for menu item „INIT REQUEST“ in the main menu „END“).

Establishing the communications link

When OP2 starts to establish the link, the following message is displayed „INITIALIZATION REQUESTED“ (upper display line). After the first data have been exchanged with SIMADYN D, the process values are automatically initialized (message in the lower display line: „PROCESS DATA INITIALIZATION“) and then the binary value initialization (message in the lower display line: „BINARY VALUE INITIALIZATION“).

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If all of the initialization data have been completely loaded into the OP2, OP2 automatically goes into the process data display mode (refer to the Chapter "Process data processing").

OP2 remains in the particular initialization step until it has been completed. Depending on the particular configured software, it can take up to a minute to establish the communications link. This link can only be established after the SIMADYN D subrack has run-up.

If an attempt is made to select operating modes, process data- or binary value display while the link is being established, OP2 ignores this attempt. However, received message telegrams are processed.

Errors when establishing the link

If errors occur when establishing a communications link, an appropriate system message is generated and the LED in the key SYSMSG starts to flash. The message can then be read-out by depressing the SYSMSG key.

OP2 waits until the error has been rectified.

The following errors can occur:

- **No activity on the USS bus** (S24 system message). This message is set once when OP2 runs-up, and disappears as soon as the first telegram is transferred along the bus.
  - SIMADYN D subracks are not powered-up or are running-up.
  - BUS coupling is not available or faulted, cable not inserted.
  - baud rate incorrectly set.
- **No SCAN telegram with node number (station number) of the OP2 after the protocol monitoring time has expired** (system message S25).
  - the incorrect BUS address is set in OP2
  - SIMADYN D configuring incorrect.
- **Transfer error** (system message S4). The message only appears until the correct telegram has been received.
  - line fault, incorrect baud rate.
- **Erroneous INIT data** The received data are logically erroneous.
  - cable fault, incorrect baud rate.
  - check the configured software.

The errors must be rectified. The OP2 can then be re-initialized, initiated via the system mode.

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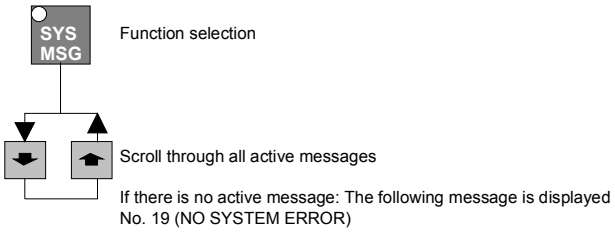
10.6 Handling OP2 errors

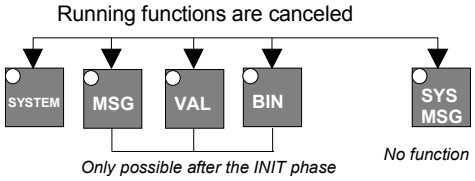
OP2 has two types of error messages:

- **System messages:** The messages can be analyzed using the SYSMSG key. (refer to Chapter "OP2 error handling).
- **Operating messages:** The messages are displayed for approx. 3 seconds and then automatically disappear. (refer to Chapter "Operating messages").

10.6.1 System messages

If OP2 identifies an error during parameterization, initialization or in cyclic operation, an appropriate error message is entered into the system error field and the LED in the SYSMSG key starts to flash.





The message can be displayed using the SYSMSG key. All of the error messages and associated error causes and corrective actions are now subsequently described. The errors cannot be acknowledged.

The cause must be removed, otherwise error-free operation is not possible.

These are the system messages:

No	Text	Description /cause/ corrective action	Reference (Chapter)
10	INITIALIZATION ERROR MEASURED VALUE NO.	INIT telegram error for a process data. Repeat initialization. Check configuring.	2.2.1
18	NO PRINTER BUFFER FREE	The printer cannot print-out a message fast enough. Messages are lost. Check the printer and printer connection.	1.4.6
19	NO SYSTEM ERROR	System mode: There are no active error messages	3
23	DATA TRANSFER ERROR, CHECK HARDWARE,	Data transfer errors occur on the USS bus: - faults on the cable - incorrect baud rate - BUS conflict on the USS bus	2.2

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No	Text	Description /cause/ corrective action	Reference (Chapter)
		- defective BUS cable	
24	SYSTEM ERROR	Device not able to function. Critical faults/errors in the electronics.	General information
25	INIT. ERROR, NO MEASURED VALUE INIT. DATA	Process data haven't been completely initialized. OP2 expects additional process initialization data. OP2 is not ready. Check the BUS structure and configuring.	2.3
26	INIT. ERROR, NO BINARY VALUE INIT. DATA	Process data haven't been completely initialized. OP2 expects additional process initialization data. OP2 is not ready. Check the BUS structure and configuring.	2.3
27	INIT. ERROR, MEASURED VALUE INIT. DATA	The initialization data for the process data are erroneous. The OP2 is not ready. Check the BUS structure and configuring	2.3
28	INIT.ERROR, BINARY VALUE - INIT. DATA	The initialization data for the process data are erroneous. The OP2 is not ready. Check the BUS structure and configuring.	2.3
29	MEASURED VALUE CHANGE ERROR	Error when changing the process data. Changing process data in the VAL/CHANGE mode was unsuccessful. Repeat the function, if required check configuring.	1.2.3
30	INITIALIZATION ERROR, DELAY	Initialization time monitoring (watchdog) exceeded. OP2 not ready. Check the BUS structure and configuring.	2.3.2
31	INTERRUPTION TO THE HOST CONNECTION	No USS telegrams are received. Check the BUS connection/cable.	2.2
32	NO BUS CONNECTION, INCORRECT STATION ADDRESS	No telegrams with their own particular station address received. Configuring error or BUS address incorrectly set.	2.2 + 1.5.4
33	PRINTER NOT READY OR NOT CONNECTED	OP 2 does not print. The printer does not respond. Check the printer and printer cable.	1.4.6
35	EPROM SAVE UNSUCCESSFUL	Saving the VAL/CHG/ mode in the EPROM unsuccessful, check configuring.	1.2.3
36	TELEGRAM ERROR, NO BUS CIRCULATION	Check the BUS structure, check the configuring, master is not transmitting SCAN telegram with the OP node number.	2.2

10.6.2 Operating messages

Information texts, alarms (warnings) and fault/error messages are displayed as operating messages for approximately three seconds, in order to support the operator resolve problems.

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No	Text	Description /cause/ corrective action	Reference (Chapter)
1	MEASURED VALUE NOT INITIALIZED	A process data number V1..V24 was selected which was not configured in SIMADYN D	1.2
2	FUNCTION NOT PERMISSIBLE	This function is not permissible in this mode.	General information
3	UPPER LIMIT EXCEEDED	The configured upper limits were exceeded when a setpoint was entered or changed.	1.2
4	LOWER LIMIT FALLEN BELOW	The configured lower limit was fallen below when entering a setpoint or changing it	1.2
5	SETPOINT CHANGE INHIBITED	When selecting the change mode for a process data, SIMADYN D did not enable the change. Presently occupied/changed by another OP or, was configured as ACT value.	1.2
6	LAST CHANGE STILL NOT ACCEPTED	SIMADYN D did not accept the last process data change. Repeat the function or check the configuring.	1.2
7	DELAY TIME EXPIRED	SIMADYN D has still not accepted the actual process data change. The monitoring time (watchdog) exceeded. Repeat the function or check the configuring.	1.2
8	FUNCTION NOT POSSIBLE	A key was depressed which is not possible in the current mode.	General info
9	INCORRECT INPUT	An invalid value has been entered	General info
11	INITIALIZATION RUNNING	OP2 waits for general INIT DATA. OP2 not ready, if required, check BUS structure and configuring.	2.2.1
12	MEASURED VALUE INITIALIZATION	OP2 waits for process data initialization. OP2 not ready, if required check BUS structure or configuring.	2.2.1
13	BINARY VALUE INITIALIZATION	OP2 waits for BINARY VALUE initialization. OP2 not ready, if required, check BUS structure or configuring.	2.2.1
14	NO MEASURED VALUE INITIALIZED	No process data were initialized and configured, VAL function is not possible	1.2
15	NUMBER OF LOST MESSGES:	Message processing overflow message. This message is entered into the message buffer as the latest message. The most recent messages overwrite the oldest messages. The number of lost messages is incremented until messages are deleted using DEL.	1.4
17	NO FURTHER MESSAGES PRESENT	The end of the messages has been reached when scrolling through the message buffer.	1.4

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No	Text	Description /cause/ corrective action	Reference (Chapter)
20	RAM-TEST UNSUCCESSFUL, REPLACE THE UNIT	OP2 has an electronics defect and is not functioning: Self-test message	2.1.2
21	FLASH TEST UNSUCCESSFUL, REPLACE THE UNIT	OP2 has an electronics defect and is not functioning: Self-test message	2.1.2
22	EPROM-INCORRECT EPROM CHECKSUM, REPLACE THE UNIT	OP2 has an electronics defect and is not functioning: Self-test message	2.1.2
34	INITIALIZATION REQUESTED	OP2 waits for initialization data	2.3
35	EPROM SAVE UNSUCCESSFUL	VAL/CHG/ save mode unsuccessful in the EPROM Check configuring.	1.2.3
37	PRINTER INTERFACE OK	Self-test message	
38	DEFECTIVEW PRINTER INTERFACE	Self-test message	
39	CALCULATING EPROM CHECKSUM	Self-test message	
40	RAM READ/WRITE TEST	Self-test message	
41	FLASHRAM READ/WRITE TEST	Self-test message	
42	TEST OK	Self-test message	

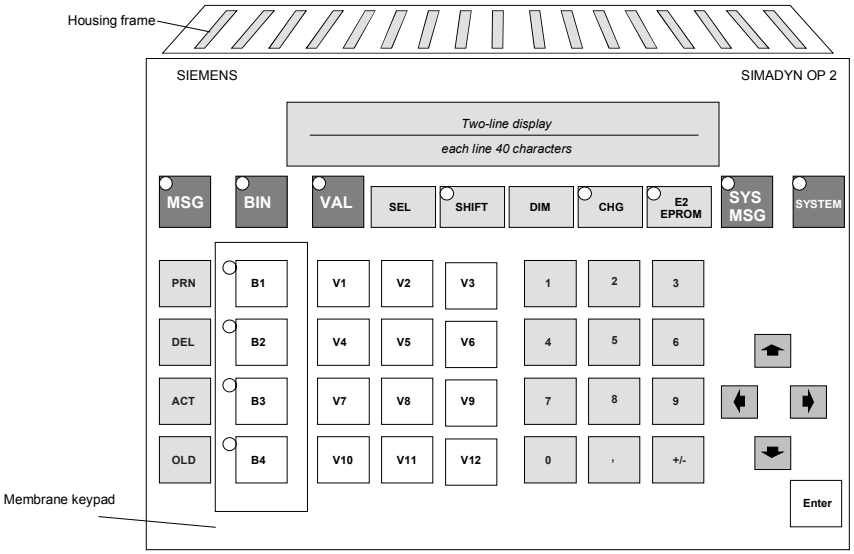
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10.7 Front panel

OP2 has a two-section aluminum housing, consisting of an extruded housing frame and a rear cover panel. At the front, the unit has degree of protection IP65, and at the rear, IP20. OP 2 has ventilation slots at the top and bottom.

The housing frame includes:

- slots to accept labeling strips (for example to label the function keys)
- the front panel with membrane keypad and LEDs



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10.8 Unit dimensions and mechanical mounting

OP2 can be mounted in cabinets or control desks:

- mounting cut-out: 230 x 158 mm
- mounting depth: 40 mm
- max. front panel thickness: 16 mm

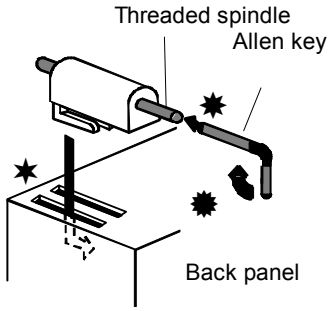
NOTE

The following points must be observed when mounting the OP:

- sufficient space for protruding connectors must be provided below the mounting cut-out (a minimum of 20 mm when using standard cables)!
- check that the seal is correctly located!
- the tabs of the labeling strips must not be clamped behind the front panel!
- the ventilation air slots in the housing may not be covered when the unit is mounted!
- OP2 must be protected from direct solar radiation!

Mounting measures:

- insert the unit in the cut-out and ensure that it doesn't fall until it has been screwed into place.
- the labeling strip tabs may not be clamped-in.



- Mount the unit using the screw tensioners in the front panel; insert the screw tensioners in the OP housing and rotate the threaded spindles against the front panel.

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10.9 Battery change

The lithium battery is used to back-up the operating data in the static RAM and to supply the CMOS clock module when the power supply is off.

NOTE The battery may only be changed with the power supply voltage powered-up in order to prevent data loss!

Changing the battery:

1. Remove the battery cover and remove the battery from its holder.
2. Remove the battery connector from the cable
3. Insert the new battery in the reverse order

Observe the EMC guidelines and the safety-related information.

Ordering spare parts:
Siemens AG, Gerätewerk-Karlsruhe
Lithium battery 3.6 V, 1800 mAh, Order No.: W79084-E-1001-B2

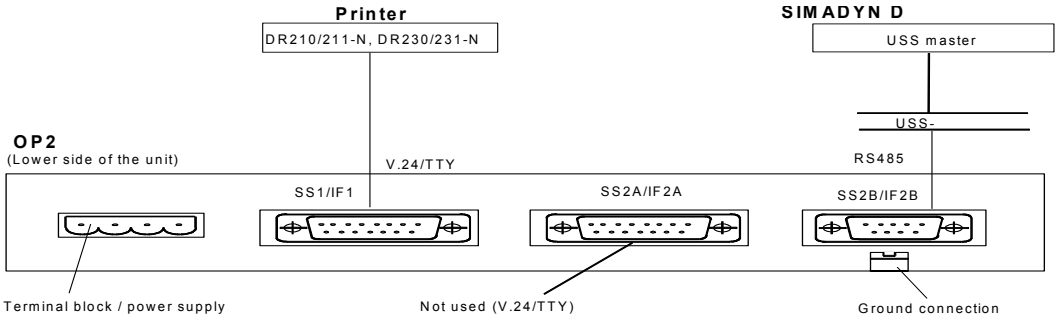
WARNING

- For safety reasons, it is not permissible that lithium batteries are in the equipment when it is transported unless the battery manufacturer permits this expressly using an appropriate declaration.

DANGER

- When the equipment is stored and shipped, the batteries must be individually and separately packed in a non-conductive material.
- There is a danger of explosion if they are not correctly handled. We can accept no liability for incorrectly handled batteries.
- Used batteries must be disposed of in compliance with national and European legislation and regulations.
- The lithium batteries must be removed from the battery holder before the subrack or power supply is disposed of.

10.10 Connecting elements

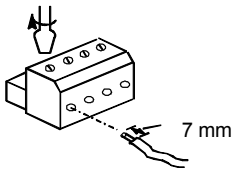


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10.11 Power supply

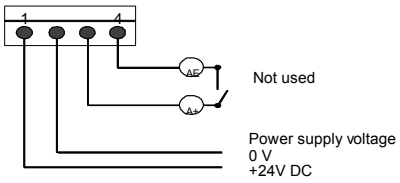
The 4-pole terminal block is used to connect the power supply voltage and the authorization input. The authorization input is not used.

Connecting the individual conductors



Conductor cross-section: 0.5 ...2.5mm

Terminal block connections



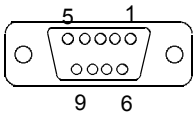
10.12 Baud rates

OP2 can be used on the USS bus with the following baud rates: 9.6 / 19.2 / 93.75 / 187.5 kbaud.

10.13 Cables and connectors

Connector assignment

OP2 is always connected to interface SS2B (RS-485 / USS-BUS).



PIN	RS 485
1	
2	
3	Data B
4	
5	GND
6	+5 V
7	
8	Data A
9	

Fig. 10-1 Assignment SS 2B

NOTE

When connecting to an **RS-485 bus** (e. g. SS4 communications module):

Data B = RS485**+**

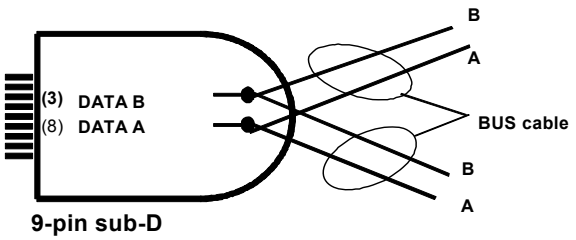
Data A = RS485**-**

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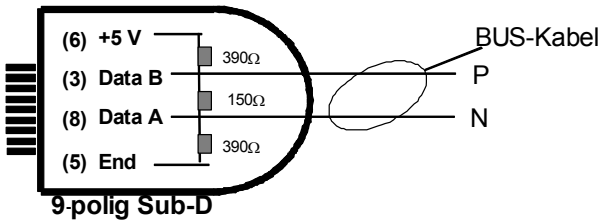
Bus connection and cable

The connection is realized via a 9-pin sub-D connector with the following circuit configuration:

A) Connection as a node (station) at the center of the BUS



B) Connected as node at the end of the BUS (with bus termination):



A **bus terminating resistor network** must be installed in connector 4 (refer to the appropriate information specified with communications module SS4)

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10.14 Using a printer with OP2

10.14.1 Configuring the printer

The OP2 printer interface at the unit can be parameterized in two settings:

1. XON/XOFF protocol; formatted message texts are transferred to a printer, whereby OP2 specifies the formatting.
2. XON/XOFF protocol with ETX/ACK; formatted message texts are transferred to a printer, whereby OP2 specifies the formatting. After each message, OP2 transmits an ETX (End of Text), which is acknowledged by the printer (e. g. Mannesmann Tally printer) with ACK (acknowledge). Only then can OP2 transmit a new message.

10.14.2 Printer connection

A printer is always connected at interface SS1 of the OP2.

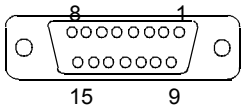
Pre-assembled cables are available for Siemens printers DR210-N / DR211-N / DR230-N / DR231-N:

- 6XV1 440-2B... for TTY data transfer
- 6XV1 440-2C... for V.24 data transfer

...= length code, refer to Catalog ST80

These cables can also be used for PT 88/89/90 printers. If required you must assemble a different cable for other printers.

NOTE Siemens AG accepts no liability for incorrect functioning and damage which are caused by using self-assembled cables or cables from third-parties!



PIN	General	V.24	TTY
1	Screen		
2			RxD-
3		RxD	
4		TxD	
5		CTS	
6			TxD+
7			TxD-
8	Screen		
9			RxD+
10		RTS	
11			+20mA
12	GND		
13			+20mA
14	+5V		
15	GND		

Fig. 10-2 Assignment SS 1 and SS 2

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10.15 Labeling and replacing the labeling strips

The function keys of the OP2 are labeled with B1 to B4 and V1 to V12 when they are shipped from the factory. A set of (4 x) unlabeled strips are provided with the OP2 so that customers can make their own key labels. When these labels are used, they cover the standard labels.

CAUTION Before inserting the labeling strips, the labeling must be **smear proof**, as a membrane keyboard, cannot be cleaned inside. The front panel can only be replaced by a service workshop incurring considerable costs.

If necessary, remove old labeling strips at the tabs.
Carefully insert label strips with **smear-proof labeling**.

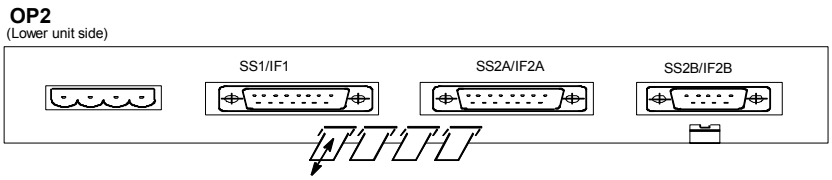


Fig. 10-3 Lower side of the unit showing the labeling strips

If the OP2 is already mounted, we recommend that the screw tensioners are released and the unit is carefully raised towards the front out of the cut-out.

NOTE Do not suspend the OP 2 at its connecting cables!

The following dimension drawing shows the individual labeling strips and the visible fields (which can be used for labeling):

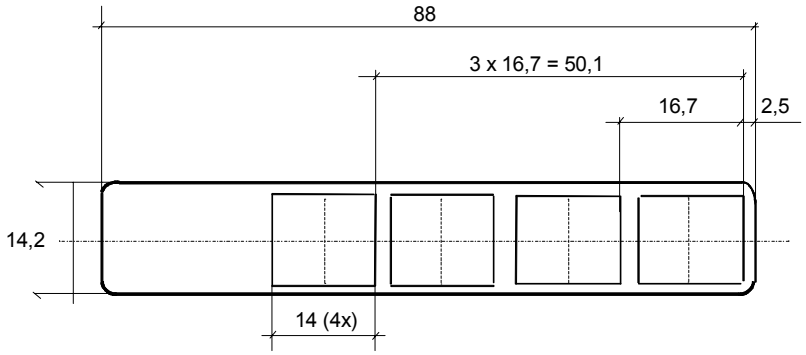


Fig. 10-4 Dimension drawing, labeling strips

If you make your own labeling strips using the dimension drawing above, observe that they should not be more than 0.1 mm thick!

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