SIEMENS

Process Automation

SIPART Controllers and Software

Catalog
MP 31

Edition
2019

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SIPART Controllers and Software

Process Automation

Catalog MP 31 · 2019

SIPART DR product family

Introduction
SIPART DR process controllers at a glance

You can download all instructions, catalogs and certificates for positioners free of charge at the following Internet address:
www.siemens.com/process-controllers

SIPART DR product family

Introduction

1

■ Overview

<u>SIPART DR process controllers at a glance</u>

A suitable controller is available for every area of application - from fixed setpoint control all the way to complex control tasks.

The SIPART DR controllers are characterized by high reliability in addition to simple operation. Functional extensions are possible quickly and easily through plug-in option modules.

Compact controllers are ready-to-use control devices for many applications which can do more than just control thanks to comprehensive functions. Despite all this flexibility, they also impress with their simple handling.

	Area of application	Device description	Catalog page	Software for parameterization
Process controllers				
	For all standard tasks, with comprehensive display functions	**SIPART DR21** Process controller in 72 × 144 mm format, ideal for standard tasks with comprehensive display functions. Various control functions and status messages. • Good trend recognition through analog display of x and w • Designed by default as C-controller (0/ 4 ... 20 mA) and S controller (relay, DQ)	2/2	SIMATIC PDM
	For complex controls	**SIPART DR22** Process controller for complex control tasks, as single- or dual-channel controller, with additional computing functions in the input area. • Up to 2 independent control loops • Freely interconnectable input area, comprehensive function library • Up to 11 analog inputs or 9 analog outputs	3/2	SIMATIC PDM
	Freely configurable control and computing unit for complex control tasks	**SIPART DR24** Process controller for complex control tasks, as single- or dual-channel controller, with additional computing functions in the input area. • Up to 4 independent control loops • Freely configurable via function library • Up to 11 analog inputs or 9 analog outputs	4/2	SIPROM DR24

■ Supplied product documentation on DVD and safety instructions

The scope of delivery of the Siemens products for process instrumentation includes a multilingual instruction sheet with **safety instructions** as well as a uniform **mini DVD – Process Instrumentation and Weighing Systems**.

SIPART DR21 process controller
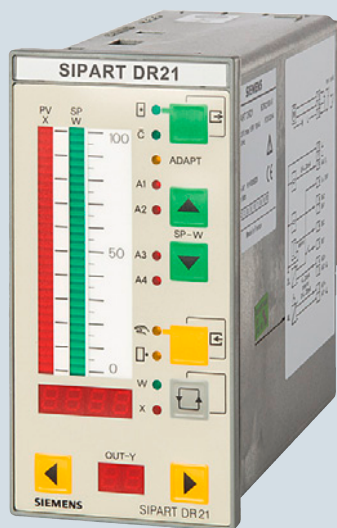
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SIPART DR21 process controller

Product overview

Overview
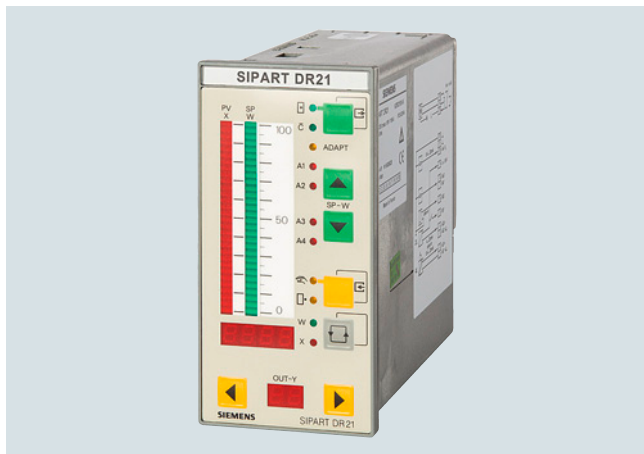
The SIPART DR21 process controller is a digital controller. It offers a large number of prepared functions in its program memory for controlling engineering processes that the user can easily use as a basis without programming experience or other tools.

Application

The SIPART DR21 controller is very flexible in its use and can be easily and quickly adapted to the respective task. An adaptation method is installed by default.

The SIPART DR21 controller can be used as:

- Fixed-setpoint controller for control of one, two or three components, optionally also with two setpoints
- DDC fixed-setpoint controller for control of one, two or three components
- Slave controller, synchronous controller or SPC controller, optionally with internal or external switchover
- Fixed or guided ratio controller with internal/external switchover
- Master and manual control system, process indicator or setpoint sensor. The control algorithm is turned off here.

Design

SIPART DR21 has a modular structure, is easy to convert and retrofit and is therefore service-friendly. The basic unit is already fully functional with numerous features. To expand the range of application, additional modules can be inserted into the slots on the back of the closed device.

Slot assignment:

- Slot 1: Analog input 3 (AE3)
- Slot 2: Analog input 4 (AE4)
- Slot 3: Binary inputs and outputs (BE/BA)
- Slot 4: Interface module

The basic unit consists of:

- Front module (operator control and display unit with main circuit board and CPU)
- Rear panel module
- Polycarbonate enclosure with clamping elements for installation in control panels, consoles or machines
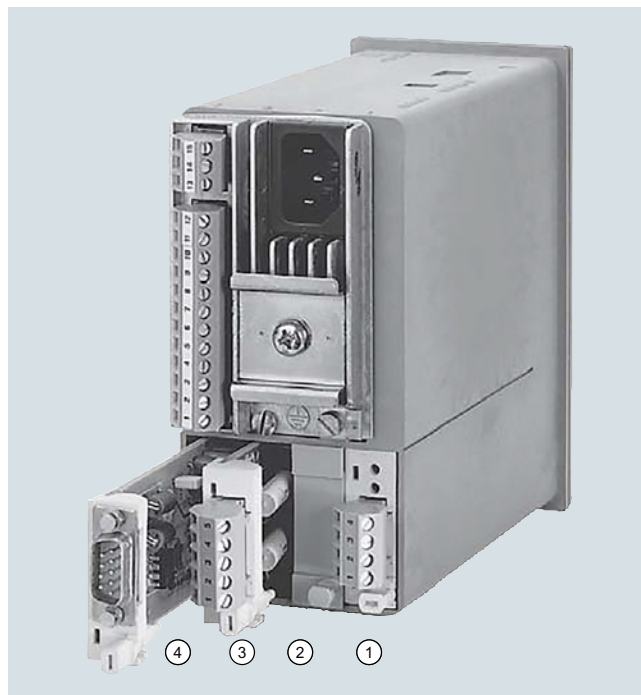
SIPART DR21 process controller, rear view, slots

2

Mode of operation

A large number of functions for controlling process plants is stored in the memory of the SIPART DR21. By means of configuration - setting parameters and configuring switches - users themselves can select the desired functions for their task.

The device is configured either via the front display or using a PC with the SIMATIC PDM software. Settings are saved permanently.

The SIPART DR21 process controller can be operated as P, PD, PI or PID controller.

Adaptation method

The SIPART DR21 process controller has a strong adaptation method that significantly simplifies commissioning even of critical controlled systems.

The controller hereby determines the control parameters independently on request without requiring the user to have prior knowledge about the process behavior. The applied method is suitable for systems with compensation and acyclic settling behavior. Dead times are also taken into account.

Analog input area

The SIPART DR21 process controller has a total of 4 analog inputs, of which 2 are already contained in the basic unit; the other inputs can be added as an option.

In each analog input channel, a first-order filter to suppress external interferences and a root-extracting element can be added.

A linearizer with 13 grid points can be assigned to one of the analog inputs.

Controller manipulated variables

C-controller (continuous output)

With this controller structure, the manipulated variable is output as a standardized current signal. The signal range (0 to 20 mA or 4 to 20 mA) is specified by structuring.

S-controlling (switching output)

The two floating relay contacts should preferably be used to output the manipulated variable. These are provided with a protective circuit which is designed for contactor coils.

The relay contacts are mutually interlocked. This interlock can be removed for a universal binary output.

Two-point controller

The manipulated variable y is output as sampling ratio with adjustable time period. As a two-point controller with heating/cooling outputs, a different time period can be assigned to each output. The sampling ratio 0 to 100 % is run through in each section. The dead zone between heating/cooling is parameterizable.

Main application of this controller type. Temperature controller which switches electrical power for heating or cooling or opens and closes a solenoid valve, for example.

One of the outputs for heating/cooling can optionally be output as analog signal 0/4 to 20 mA.

Binary input and output area

For structuring of the controller, the two binary inputs and outputs present in the basic unit are assigned to the binary functions needed for the respective application.

They are non-isolated and act in a normal or inverted manner depending on the configuration.

The binary outputs are active. They return a DC voltage signal.

The number of binary inputs or outputs can be increased using option modules.

Furthermore, a coupling relay module can be clipped to a mounting rail on the back of the controller. This additional module can contain either two or four relays with one changeover contact each for 250 V AC, 8 A, which can be controlled from the binary outputs.

The following functions are available for assignment to the binary inputs and outputs:

Binary inputs	
CB	Computer readiness
He	Manual mode, external
N	Tracking
Si	Safety mode
P	P-operation of the controller
tS	Disabling the setpoint ramp time
±yBL	Direction-dependent blocking of the manipulated variable
BLB	Blocking of the input level
BLS	Blocking of structuring
BLPS	Blocking of parameter assignment and structuring
tSH	Holding the setpoint ramp

Binary outputs	
RB	Computer readiness
RC	Computer operation
H	Manual mode
N_W	Follow-up mode setpoint
A1,2,3,4	Alarm limit monitor A1, A2, A3, A4
MUF	Transmitter fault
±Δw	Incremental w adjustment

Display technology

Equipping the SIPART DR21 process controller with displays is convenient and complies with NAMUR requirements.

The controller has one analog display each for the actual value x and the setpoint w, one digital display which can be switched between x and w, one digital display for the manipulated variable y, as well as message and status displays.

The two analog displays are designed as vertical LED bar graphs. Because the actual value and setpoint displays are arranged next to one another, a setpoint/actual value comparison for a dynamic trend display can easily be performed.

The red digital display for the actual value and the setpoint has four digits and can be configured as a physical unit or a percentage.

There are 11 LEDs on the front of the device for displaying operating states and alarms.

In the configuring levels, some of these displays and operator controls have a different meaning.

SIPART DR21 process controller

Technical description

■ Function

Additional functions

Additional configurable functions that increase the convenience and reliability of the SIPART DR21 process controller operation:

- Transmitter monitoring
- Setpoint limitation
- Setpoint ramp
- *x* tracking
- Filter and response threshold of the control deviation
- Adjustment of the direction of action
- Special features of the control algorithm:
  Switchover from PI(D) to P(D) control takes place based on a control signal. Switchover from automatic to manual mode and vice versa as well as switchover from all other operating modes to automatic mode is harmonious.
- Limitation of manipulated variable
- Limit monitor
- Restart conditions:
  Brief interruptions of the operating voltage are bridged depending on the current load of the device by the storage effect of the power supply unit.
  In the event of a longer power failure, the configured parameters and structures are retained in a non-volatile user program memory. The last operating mode, the last setpoint and the last manipulated variable are also loaded into a non-volatile memory.
  On voltage return after power supply interruptions or after reclosing, the controller starts autonomously with the structured operating modes, setpoint and manipulated value. Optical signaling on voltage return after power failure is possible.
- Self-diagnostics:
  Comprehensive monitoring routines check the internal data traffic cyclically or after a POWER ON or watchdog reset.
  If a fault is detected, an error message is automatically output on the w/x digital display which indicates the cause of the error and options for resolving it.
- Communication with higher-level systems

Signal converters (additional modules)

The hardware features of the basic unit can be expanded for specific requirements. A range of modules are available for this purpose and can be ordered as accessories.

The modules are inserted in the slots on the back of the controller. The slots are coded against incorrect insertion.
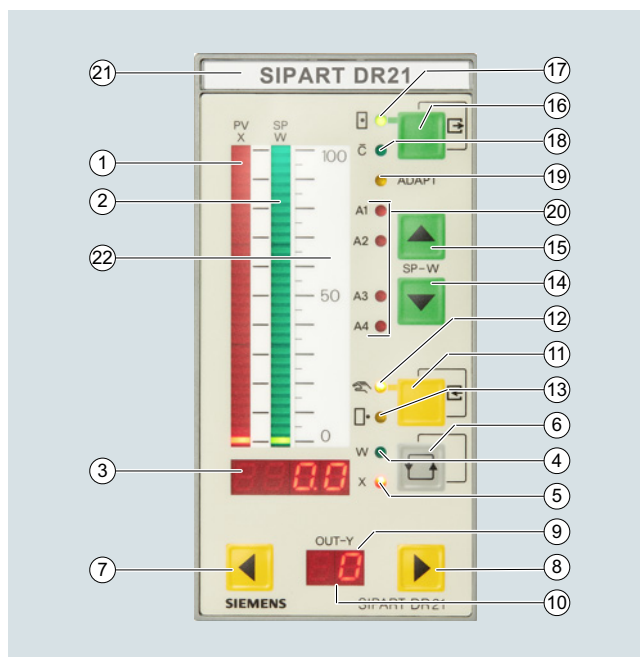
SIPART DR21 process controller, front operator control and display

1 Analog display actual value x

2 Analog display setpoint w

3 w/x digital display (other values can be displayed)

4 Indicator light w - lights up when w is displayed

5 Indicator light x - lights up when x is displayed

6 Switchover button for w/x digital display, acknowledgment button for flashing after power return and entry button to the selection level

7 Button for changing the manipulated value - closed (open)

8 Button for changing the manipulated value - open (closed)

9 y digital display

10 Indicator lights of the Δy binary outputs on the S-controller

11 Switchover button manual/automatic and "Enter" button from the selection level to the configuration level

12 Indicator light manual mode

13 Indicator light y external operation

14 Button "setpoint falling"

15 Button "setpoint rising"

16 Switchover button setpoint internal/external and "Exit" button from the configuring and selection level into the process control level

17 Indicator light setpoint internal

18 Indicator light computer (with w_{ext}) switched off

19 Indicator light adaptation method in progress

20 Indicator lights for "Threshold addressed"

21 Measuring point label

22 Measuring range scale

2

Technical specifications

General data

Mounting position	Any
Climate class according to IEC 721	
• Part 3-1 Storage 1K2	-25 ... +75 °C
• Part 3-2 Transport 2K2	-25 ... +75 °C
• Part 3-3 Operation 3K3	0 ... +50 °C
Degree of protection according to EN 60 529	
• Front	IP64
• Enclosure	IP30
• Connections	IP20

Device design

Electrical safety
• According to DIN EN 61010-1
• Protection class I according to IEC 536
• Protective separation of line connection and field signals
• Clearance and creepage distances, unless expressly mentioned otherwise, for overvoltage category III and pollution degree 2

CE mark compliance with respect to
• EMC Directive 2014/30/EU
• LVD Directive 2014/35/EU

Interference emission, noise immunity according to DIN EN 61326-1, NAMUR NE21

Weight, basic unit	Approx. 1.2 kg
Color	
• Frame of the front module	RAL 7037
• Front surface	RAL 7035

General data

Material	
• Enclosure and front frame	Polycarbonate, glass-fiber reinforced
• Front film	Polyester
Auxiliary power terminal	
• 115/230 V AC	Polycarbonate, glass-fiber reinforced according to IEC 320/V
• 24 V UC	Two-pin plug
Connection system for process signals	Multi-pin screw terminal blocks, coded, plug-in for conductor cross-section 1.5 mm^2 (AWG 14)
Protective conductor connection	Grounding screw

Furthermore, a coupling relay module can be clipped to a mounting rail on the back of the controller. The mounting rail is included in the scope of delivery of the coupling relay module.

The connection plugs for the auxiliary power and the screw terminals for the process signals are included in the scope of delivery of the basic unit or for all optionally available modules (options).

Exception:

Interface module 6DR2803-8C and PROFIBUS DP module 6DR2803-8P. The connection plugs must be ordered separately.

Auxiliary power

	230 V AC, switchable	115 V AC, switchable	24 V UC	24 V UC
Nominal voltage				
Operating voltage range	195 ... 264 V AC	97 ... 132 V AC	20 ... 28 V AC	20 ... 35 V DC [1]
Frequency range	48 ... 63 Hz	48 ... 63 Hz	48 ... 63 Hz	–
External current I_{Ext} [2]	200 mA	200 mA	200 mA	200 mA
Power consumption				
Active power/apparent power (capacitive)				
Basic unit				
• Without options, without I_{Ext}	5 W/9 VA	5 W/9 VA	4 W/6 VA	4 W
• With options, without I_{Ext}	11 W/15 VA	11 W/15 VA	8.5 W/12 VA	8.5 W
• With options, with I_{Ext}	15 W/19 VA	15 W/19 VA	12 W/17 VA	12 W
Permissible voltage dips at 0.85 U_N and max. load	≤ 20 ms	≤ 20 ms	≤ 20 ms	≤ 20 ms

[1] Including harmonics.

[2] L+, BA, AA to external consumers of produced current.

SIPART DR21 process controller

Technical specifications

Technical specifications (continued)

Basic unit	
Analog inputs AE1, AE2	
Current	0/4 ... 20 mA
Input resistance	248 Ω
Total operating range	-0.1 ... +22 mA
Filter time constant	10 ms
Transmitter supply _L+_	
Nominal voltage	20 ... 26 V
Load current	≤ 60 mA, short-circuit proof
Short-circuit current	≤ 200 mA, clocked
Binary inputs BE1 and BE2	
Signal state "0"	≤ 4.5 V or open
Signal state "1"	≥ 13 V
Input resistance	≥ 27 kΩ
Binary outputs BA1 and BA2 (with wired OR diodes)	
Signal state "0"	≤ 1.5 V
Signal state "1"	+19 ... 26 V
Load current	≤ 30 mA
Short-circuit current	≤ 50 mA, clocked
Analog output _Iy_	
Nominal signal range	0 ... 20 mA or 4 ... 20 mA
Total operating range	0 ... 20.5 mA or 3.8 ... 20.5 mA
Load voltage	-1 ... +18 V
Max. permissible inductive load	0.1 H
Relay output	
Contact material	Ag-Ni
Contact rating	
Max. switching voltage	250 V AC/DC
Max. switching current	
• Contacts interlocked	8 A
• Contacts unlocked	2.5 A
Max. switching capacity	
• AC	250 VA
• DC	100 W at 24 V, 30 W at 250 V

Basic unit	
Lifetime	
• Mechanical	$2 \cdot 10^7$ switching cycles
• Electr. 230 V AC, ohmic load	10^5 switching cycles
Spark extinguishing element	Series connection of 22 nF with 220 Ω, 420 V varistor in parallel
CPU data	
• Cycle time	100 ms
A/D conversion	
• Process	Successive approximation, per input > 120 conversions and averages within 20 or 16.67 ms
• Resolution	11 bits = 0.06 %
• Zero point error	≤ 0.2 % of measuring span
• Full-scale value error	≤ 0.2 % of measuring span
• Linearity error	≤ 0.2 % of measuring span
Display technology	
Digital _x/w_ indicator	Four digits, red, 7-segment LED display
• Number height	7 mm
• Display range	Beginning and end adjustable
• Number range	-1999 ... +9999
• Decimal point	Can be set as fixed value
• Repeat rate	0.1 ... 9.9 s, can be set
Analog _x_ indicator	LED display, vertical
	30 LEDs (red)
Analog _w_ indicator	LED row, vertical
	30 LEDs (green)
• Display range	0 ... 100 %
• Resolution	1.7 %
Digital _y_ indicator	Two-digit, red, 7-segment LED display
• Number height	7 mm
• Display range	0 ... 100 %
• Resolution	1 %
• Repeat rate	0.1 ... 9.9 s, can be set

Selection and ordering data | Article No.

	Article No.
SIPART DR21 process controller	
Basic unit in 72 × 144 mm format, with • 2 analog inputs • 2 binary inputs • 1 analog output • 2 relay outputs • 2 binary outputs	
Design • For auxiliary power 24 V UC • For auxiliary power 230 V AC, can be switched to 115 V AC	**6DR2100-4** **6DR2100-5**
Accessories (signal converters)	
Module for analog signals • For current 0/4 ... 20 mA or voltage 0/0.2 ... 1 V or 0/2 ... 10 V • For resistance-based sensors (R module) • UNI module for TC/RTD/R/mV signals, programmable • Reference junction terminal for TC, internal (use in connection with UNI module)	**6DR2800-8J** **6DR2800-8R** **6DR2800-8V** **6DR2805-8A**
Module for switching signals • With 5 binary inputs • With 4 binary outputs and 2 binary inputs • With 2 relay outputs	**6DR2801-8C** **6DR2801-8E** **6DR2801-8D**
Coupling relay module • With 4 relays (250 V AC) • With 2 relays (250 V AC)	**6DR2804-8A** **6DR2804-8B**
Documentation	
The entire documentation is available for download free of charge in various languages at: http://www.siemens.com/processin-strumentation/documentation	
SIPART DR21 - Controller 6DR210*-* • German • English	**C73000-B7400-C143** **C73000-B7476-C143**
Serial SIPART 6DR210x bus interface, operating instructions • German, English	**C73000-B7400-C145**

Scope of delivery

The scope of delivery of the SIPART DR21 process controller includes:

• 1 process controller according to the configuration
• 1 device plug according to IEC 320/V with auxiliary power 115/230 V AC or one plug with auxiliary power 24 V UC
• 2 clamping elements, plug-in

Signal converters and accessories

The signal converters/modules are described in Catalog MP 31, section 5.

The software for assigning parameters via PC, coupling to systems and the accessories for coupling (plugs, cable drivers etc.) can be found in catalog section 6.

2

SIPART DR21 process controller

Dimensional drawings

▌ Dimensional drawings

SIPART DR21 process controller and panel cutouts, dimensions in mm

Number of devices	Cutout width
2	140+1
3	212+1
4	284+1
...	...
10	716+1
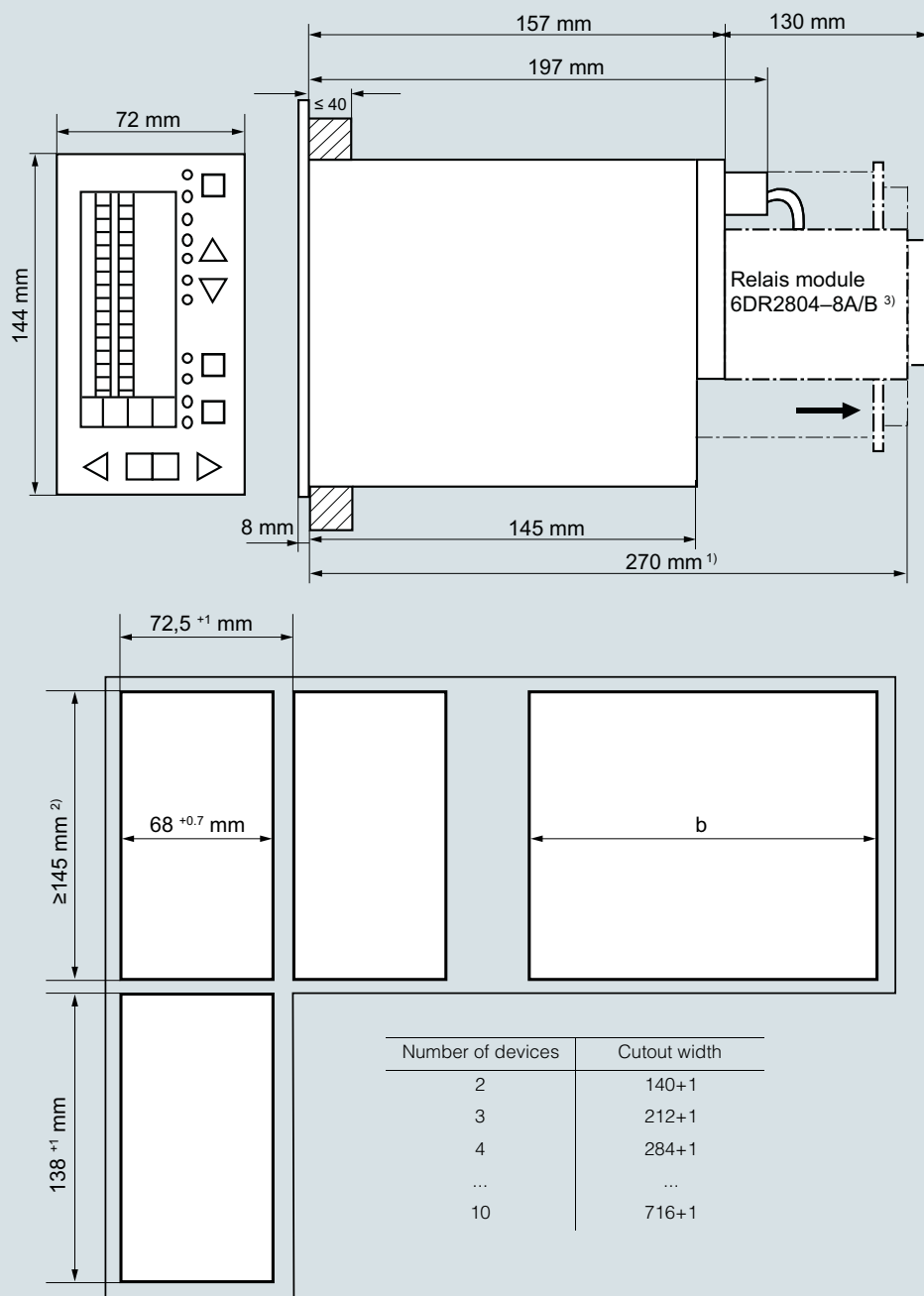
[1] Space requirements for switching the main circuit board and modules.

[2] When mounting closely on top of one another, observe the permissible ambient temperature.

[3] A relay module with 2 or 4 relays (6DR2804-8A/-8B) can be clipped onto the rear of the controller. When this is used, the installation depth is 130 mm greater.

You can download all instructions, catalogs and certificates for positioners free of charge at the following Internet address:
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SIPART DR22 process controller

Overview

The SIPART DR22 process controller is a digital controller with extended functionality. It offers a large number of prepared functions in its program memory for controlling engineering processes that the user can simply call without programming experience or other aids.

In addition and if necessary, you can easily insert function blocks for computing and logic functions in the input range of the controller. This helps you accomplish an optimal adaptation even to complex tasks.

Application

The SIPART DR22 process controller has a sophisticated adaptation method that significantly simplifies commissioning even of critical controlled systems. The controller hereby determines the optimal control parameters independently on request without requiring the user to have prior knowledge about the process behavior. The applied method is suitable for systems with compensation and acyclic settling behavior. Even larger dead times are taken into account.

The SIPART DR22 controller can be used as:

- Fixed-setpoint controller for control of one, two or three components, optionally also with two setpoints
- DDC fixed-setpoint controller for control of one, two or three components
- SPC controller
- Slave controller (synchronous controller), optionally with internal/external switchover
- Fixed or guided ratio controller with internal/external switchover
- Cascade controller (dual controller)
- Ratio cascade controller (dual controller)
- Override controller (dual controller)
- Dual controller with two independent control channels.

Universal use is supported by the comprehensive hardware features of the device; if necessary, the hardware can be easily expanded by a variety of signal converters (e.g. communication over a serial interface with a higher-level system).

The SIPART DR22 process controller is very generously equipped with indicators. There is one analog and one digital indicator each for the controlled variable as well as the setpoint. The manipulated variable is displayed digitally.

The SIPART DR22 controller can be used either as continuous controller with a current output signal or as three-point step controller for connection of electromotive drives. Split range mode of the C-controller can also be configured.

3

Design

The SIPART DR22 process controller has a modular structure. The basic unit consists of:

- Front module with the control and display elements
- Main circuit board with CPU and terminal strips
- Polycarbonate enclosure with connector circuit board and power supply unit

The main circuit board has one 10-pin and one 14-pin plug-in terminal strip via which all inputs and outputs of the basic unit are connected. An additional 5 slots are available for function expansion by means of signal converters (see figure). Connection of field signals to the signal converters takes place per module by means of a dedicated plug-in terminal strip or a plug (SES).
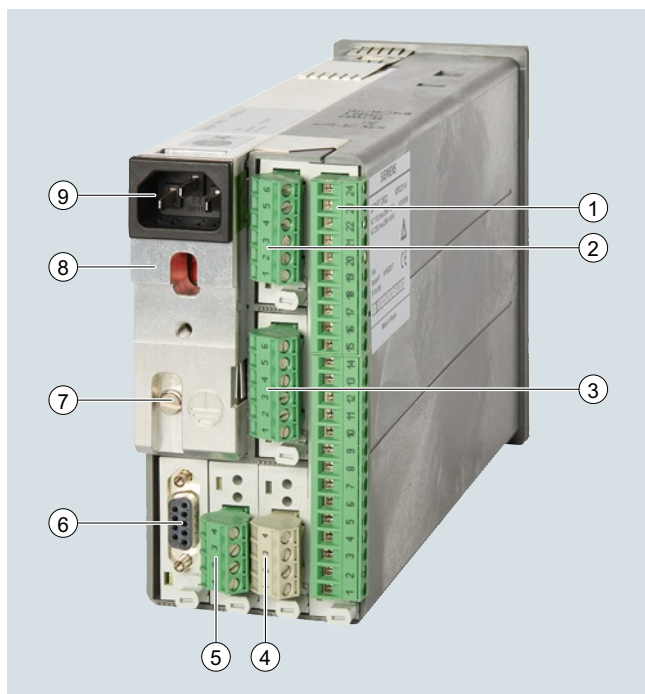
SIPART DR22 process controller, rear view

1   Slot 1, main circuit board
2   Slot 6, fitted with module
3   Slot 5, fitted with module
4   Slot 2, fitted with module
5   Slot 3, fitted with module
6   Slot 4, fitted with module
7   Grounding screw
8   Mounting rail (included in the scope of delivery of the relay module)
9   Power plug

The basic unit has:

- 3 analog inputs for voltage signals (0/0.2 to 1 V or 0/2 to 10 V) or current signals (0/4 to 20 mA). The inputs offer galvanic isolation with high common mode rejection.
- 4 binary inputs 0/24 V and 8 binary outputs 0/24 V which can be assigned various functions and can act in a normal or inverted manner.
- 3 analog outputs, current signal 0 to 20 mA or 4 to 20 mA. The analog outputs can be freely assigned to a wide variety of internal controller variables.
- Short-circuit proof $L+$ output (24 V DC, 100 mA) for supplying transmitters.

The power supply unit is in a completely closed metal enclosure.

Available versions:

- 6DR2210-4 for auxiliary power 24 V UC
- 6DR2210-5 for auxiliary power 230 V AC, can be switched to 115 V AC

The measuring point label and the scale can be exchanged.

The number of inputs and outputs can be expanded by additional modules.

Modules are available for:

- Current or voltage input (U/I)
- UNI module for TC/RTD/R/mV

With adapter plug also mA and V; with galvanic isolation

- Resistance input (potentiometer) (R)
- Analog outputs and binary inputs
- Binary inputs and outputs (BE/BA)
- Relay outputs (Rel)
- Serial interface (SES)
- PROFIBUS DP module

Equipment for functional expansion:
See table "Signal converters for SIPART DR22", page 3/16.

Mode of operation

A large number of interconnected functions for controlling process plants is stored in the memory of the digital SIPART DR22. Users themselves structure the controller according to their task by selecting the desired function by setting so-called configuring switches. To solve complex control tasks, the user can release the fixed interconnection of the analog input area and insert a number of prepared computing or logic functions (see figure, page 3/5).

Configuring the device requires neither special programming knowledge nor a specific programming device. The specifically created program is saved in the device.

The user memory can be replaced.

The SIPART DR22 controller can be structured as P, PD, PI or PID controller.

SIPART DR22 process controller

3

Function

Analog input area

Input area permanently interconnected

During structuring of the device, the analog inputs AE1 to AE11 are assigned freely to the function inputs FE1 to FE12. These function inputs then form the analog input channels of the different controller types.

The meaning of the function inputs FI1 to FI12 is determined by the structured controller type or the output structure of the controller.

Each analog input has a connectable first-order filter to suppress external interferences. In addition, a connectable root-extracting element is contained in each analog input channel.

A function generator (linearizer) with 13 intermediate values for linearizing input signals can be switched into each of the function inputs FI1 and FI3. (The two linearizers can be assigned in any way in the "Freely interconnectable input area").

Freely interconnected input area

In this operating mode, additional computing and logic functions can be inserted between the data sources (analog inputs, parameters, constants) and the data sinks (FI1 to FI 12) (see figure, page 3/5). Like the other structuring of the device, insertion takes place by means of the front module according to a menu-led question/answer procedure or via an interface.

The following data sources/data sinks are contained in the "Freely interconnected input area":

Data sources	
Label	Explanation
AE1.A ... AEb.A	Analog signal input (filter/square root extraction)
P01 ... P15	Parameters (setting in onPA)
-1.0 ... +1.0	Constants
BE01 ... BE09	Binary inputs BE1 to BE9
AE1 ... AE5	Single signal sensor break (alarm message)
AE	Group signal sensor break (alarm message)
A1 ... A4	Alarm A1 to A4
Int1 and Int2	Status message operating mode internal controller 1 / controller 2
SPI 1 and SPI 2	Internal setpoint controller 1 and controller 2
SP1 and SP2	Effective setpoint controller 1 and controller 2
YI and YII	Manipulated variable Y controller 1 and controller 2 (C-controller)
SAA1 ... SAA4	Serial analog input (can only be written via interface)
MQ .4 ... no .4	Outputs of the function blocks defined in FdEF (blocks that are not defined are hidden)

Data sinks	
Label	Explanation
FI01 ... FI08	Function inputs "analog values" for the structured controller or the hardware outputs of the device.
FI09 ... FI12	Function inputs "analog values" for the structured controller or the analog or binary signals for the hardware outputs of the device.
MI .1 ... no .3	Inputs of the function blocks defined in FdEF (blocks that are not defined are hidden)

The following functions can be inserted (see figure, page 3/5):

- 6 arithmetic blocks (Ar1 to Ar6)
  Each of these 6 arithmetic blocks can be occupied by any of the 4 basic computing types or a combination of them.

- 2 function generators (Fu1 and Fu2)
  Each of these two function generators (linearizers) assigns an output variable in the range -199.9 to +199.9 % to each value of its input variable in the range -10 to +110 % via the function entered by the user; Q = f (*I*).
  The function is entered in increments of 10 % using the 13 intermediate values for -10 to +110 % input signal. Parabolas are placed between the intermediate values by the stored computing program which merge with the intermediate values tangentially so that a constant function results.

- 3 function blocks "Max. selection" (MA1/MA2/MA3)
  A maximum selection of 2 or 3 input variables can be made in each of these 3 function blocks. These function blocks can also be used as minimum limits.

- 3 function blocks "Min. selection" (Mi1/Mi2/Mi3)
  A minimum selection of 2 or 3 input variables can be made in each of these 3 function blocks. These function blocks can also be used as maximum limits.

- 1 correction calculator (rE1)
  The correction calculator is used to calculate the flow of gases from the active pressure p depending on the pressure and temperature. Mass flows and volume flows in relation to the operating state as well as volume flows in relation to the standard state can be corrected. The medium must be in a pure phase, i.e. no separation can take place, for example. The following relationship applies to output variable A:

$$A = \sqrt{\Delta p} \cdot \sqrt{f\ (E_2,\ E_3)}$$

$$f\ (E_2,\ E_3) = \frac{(P_E\text{-}P_A)\ E_2 + P_A}{(t_E\text{-}t_A)\ E_3 + t_A}$$

With the correction parameters t_A, t_E, P_A and P_E, the measuring ranges are standardized to the calculation state. t_A and P_A can be set in the range from 0.01 to 1.000, t_E and P_E in the range from 1.000 to 99.99.

- 5 changeover switches for analog values (AS1 to AS5)
- 2 comparators with adjustable hysteresis (Co1, Co2)
- 2 "NAND" logic functions (nA1, nA2)
- 2 "NOR" logic functions (no1, no2)

Analog output area

The 9 analog outputs of the SIPART DR22 controller (3 × basic unit, 6 × option module) output a current signal of 0 to 20 mA or 4 to 20 mA.

The outputs are not assigned to any fixed variables. During structuring of the device, they are assigned to any internal controller variable. This means that split range mode is also possible without any problems.

■ **Function** (continued)

| Data sources | | Data sinks | | Data sources | | Data sinks | |
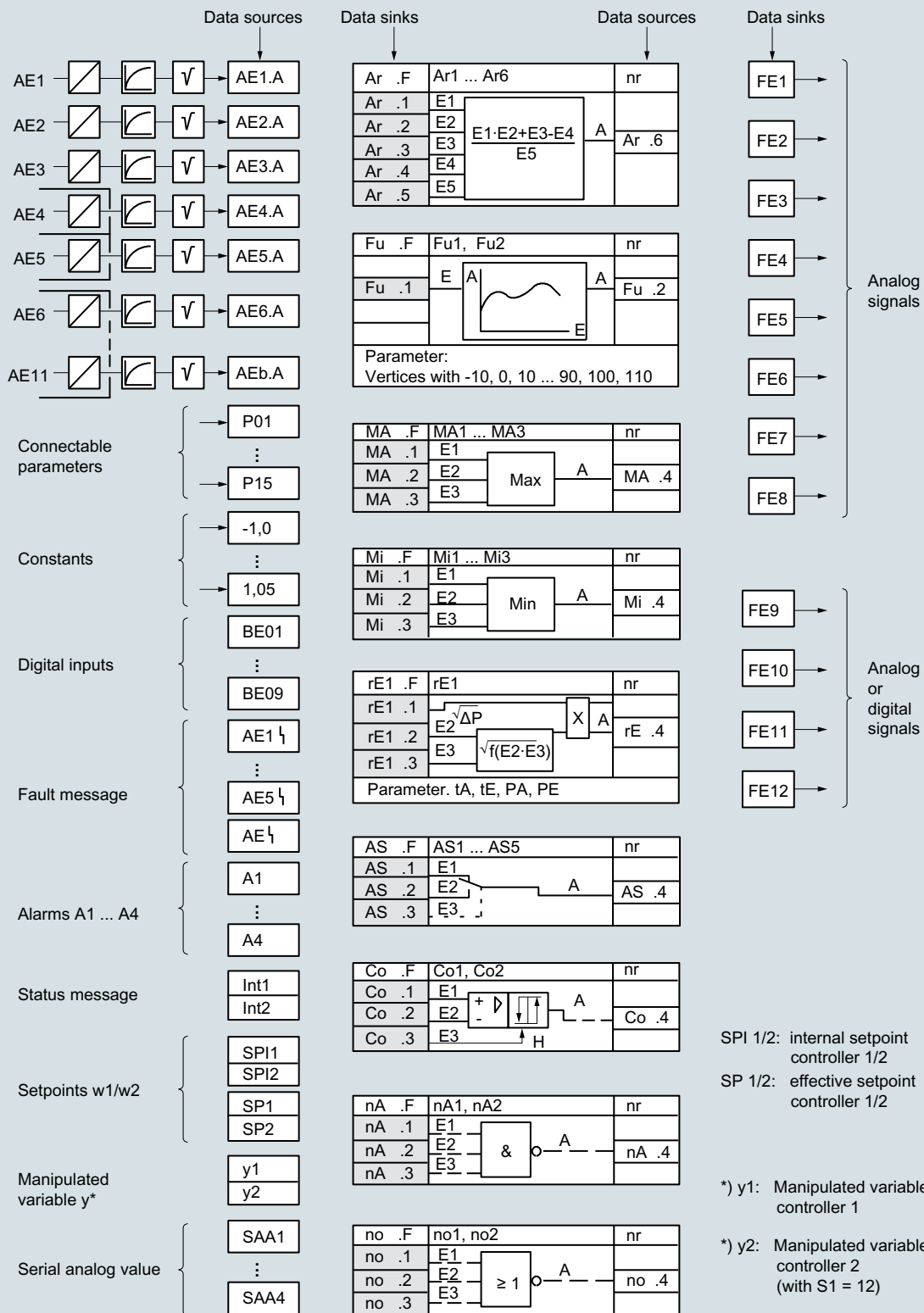
Inserting additional functions in the freely interconnectable input area

SPI 1/2: internal setpoint controller 1/2

SP 1/2: effective setpoint controller 1/2

*) y1: Manipulated variable y controller 1

*) y2: Manipulated variable y controller 2 (with S1 = 12)

SIPART DR22 process controller

■ **Function** (continued)

Binary input and output area

The basic unit has 4 binary inputs BE1 to BE4 and 8 binary outputs BA1 to BA8. During structuring of the controller, these are assigned to the binary functions needed for the respective application. If the number of binary inputs or outputs offered by the basic unit is not sufficient, it can be increased by inserting additional option modules in the controller. Slots 5 and 6 on the back of the controller are provided for this purpose. Depending on the options used, a total of 14 binary inputs or up to 16 binary outputs is possible in this way.

The binary inputs and outputs of the device are non-isolated.

The binary outputs are active. They provide a 24 V DC voltage signal with a current carrying capacity of up to 50 mA per output.

Floating outputs are available when the relay module with 2 binary outputs is used (option).

Furthermore, a coupling relay module can be clipped to a mounting rail on the back of the controller. This additional module can contain either two or four relays with one changeover contact each for 250 V AC, 8 A, which are controlled directly from the binary outputs.

Binary inputs

The following functions are available for assignment to the binary inputs:

CB I/II	Computer readiness (controller 1/controller 2) Depending on the controller type, this binary signal in connection with the internal/external button either initiates a changeover in the setpoint range, also SPC operation, or it starts DDC operation. With SPC and DDC mode, this is the central COMPUTER FAIL cable.
He I/II	Manual mode, external (controller 1/controller 2) This signal blocks the output of the controller and allows direct manual adjustment of the manipulated variable via the front input level.
N I/II	Tracking (controller 1/controller 2) With this signal, the output of the C-controller and the three-point step controller is tracked with external position feedback to the tracking signal y_N.
Si I/II	Safety mode (controller 1/controller 2) With C-controllers and with three-point step controllers with external position feedback, the manipulated variable takes on the configured safety value. In three-point step controllers with internal position simulation, the manipulated variable runs against 0 % or 100 % as defined.
tS I/II	Disabling the setpoint ramp (controller 1/controller 2)
WSL I/II	Switchover of external setpoint analog or via SES (controller 1/controller 2)
BLB	Blocking of operation
BLS	Blocking of structuring
BLPS	Blocking of parameter assignment and structuring
P I	P-operation of the controller I
P II	P-operation of the controller II
PAU	Parameter switchover / Parameter set I of the individual controller can be switched to parameter set II through this binary signal.
$\pm\Delta w$	Incremental setpoint adjustment
$\pm\Delta y$	Incremental manipulated variable adjustment
$\pm\Delta y$BL I/II	Direction-dependent blocking of the manipulated variable (controller 1/controller 2)

Binary outputs

The following functions are available for assignment to the binary outputs:

RB I/II	No computer readiness (controller 1/controller 2)
RC I/II	No computer operation (controller 1/controller 2)
H I/II	Manual mode (controller 1/controller 2)
N I/II	Follow-up mode (controller 1/controller 2)
A1/A2	Alarm 1 and 2
A3/A4	Alarm 3 and 4
MUF	Transmitter fault
Int I/II	Internal mode (slave controller) (controller 1/controller 2)
FI9 ... FI12	Function inputs (data sinks) in freely interconnectable input area

If a three-point step controller has been structured, its manipulated variable outputs $\pm\Delta y$ are specified to the binary outputs BA7 and BA8. In a dual controller, if controller 2 has been structured as step controller, its manipulated variable outputs $\pm\Delta$ are specified to the binary outputs BA5 and BA6. These binary outputs are then no longer available to be assigned freely.

Display technology

Equipping the SIPART DR22 controller with indicators is very convenient. The device has an analog indicator and a digital indicator for both the actual value range and the setpoint range.

The two analog indicators consist of vertical LED bar graphs. 1 or 2 LEDs light up alternately. The center of the indicator field shows the measured value. Because the actual value and setpoint indicators are arranged next to one another, a setpoint/actual value comparison can easily be performed. The analog indicators are intended for a dynamic trend display.

The two digital indicators for the actual value and the setpoint can be structured as a physical unit or a percentage. Actual value displays are always red, setpoint displays always green. This applies to both the analog and the digital indicators as well as the associated operator controls.

The indicators are switched to the relevant measured variables using the switchover button controller I/controller II. This means that a clear and informative display is ensured also with the dual controller functions that can be structured (cascade and override controls, 2 independent control loops).

In addition, there is also a three-digit yellow digital indicator on the front of the device for the manipulated variable, which is always displayed in percent. The associated operator controls are also yellow.

There are also 11 LEDs on the front of the device for displaying operating states and alarms. These LEDs are permanently assigned to the functions.

The described display functions relate to the process control level of the controller. On the selection level and the configuring level, some of these displays have a different meaning (see section "Operator control and display functions", page 3/10).

Function (continued)

Configurable functions

The EPROM of the SIPART DR22 controller contains application circuits for process controllers which are already interconnected and easy to retrieve. In connection with the freely interconnectable input area, this device is suitable for universal use for all control tasks in process engineering.

Below, the device types that can be structured are displayed in function charts and described briefly. For the sake of clarity, only the most important functions are mentioned. Additional structuring possibilities that are valid for all controller types are described in the following section "Functions that can be structured".

The factors and constants c_1 ... c_9 given in the following figures as well as the setpoint ramp tS can be set as parameters.

Using function input FI4 or FI7, an additional disturbance variable can be connected to the manipulated variable either dynamically via the D element or statically.

The function inputs are only displayed in the figures if they have a fundamental function in the operating mode relevant controller type.

Functions that can be structured which increase the convenience and reliability of the SIPART DR22 operation

Display in physical units and linearization of process variables

The process variables that can be displayed by the two 4½-digit digital indicators (controlled variable x and tracking variable w) can be output as percentage or in physical units. The start value, end value and decimal point of the indicators are set as parameters.

For digital display of a non-linear input variable to be possible, it needs to be linearized first. Two function generators (linearizers) are available for this purpose.

Transmitter monitoring

Selectable by means of configuring switches, the analog inputs can be monitored for signals falling below or exceeding the range (< -3 % or > +103 %). In the event of a fault, a message is output via the four-digit digital indicator - selectively for the inputs AE1 ... AE5. A group alarm message can be output via the binary output MUF.

In addition, automatic switchover to manual mode, starting with the last manipulated variable or the safety setpoint, can be structured.

The fault display can be acknowledged with the switchover button (point 12, figure "Control and display elements" in the section "Operator control and display functions", page 3/10).

Setpoint ramp, setpoint limitation and x tracking

In addition to the ramp function, the range within which the setpoint or target ratio can be set can be limited by the parameters SA and SE. The setpoint ramp and setpoint limitation both take effect with internally set and externally provided setpoints.

It is possible to structure tracking. The setpoint of the controlled variable is hereby tracked in manual, tracking and DDC mode as well as with the safety setpoint so that no control deviation can build up during this mode. After switching back to automatic mode, the manipulated variable is applied not only bumplessly, but also without drift. The setpoint ramp has no effect during tracking, but setpoint limitation does.

3

SIPART DR22 process controller

■ **Function** (continued)

Filter and response threshold of the control deviation

All analog inputs have a first-order filter that can be activated. The filter time constants TF1 to TF11 can be set in the range from 0.1 to 1000 s. In addition, the control deviations are routed via adaptive filters TFI and TFII to be able to filter out low-frequency interferences too:

Within a band in which switches frequently occur, changes are detected as faults by the filter and attenuated with the given time constant. Changes outside of the band are immediately forwarded to the control algorithm to achieve fast compensations. If the fault level changes over time, these adaptive filters adapt autonomously to the new level.

If the output of the controller (or both controllers) is settled further, dead zone elements in the control deviation can be activated. This allows a symmetrical range to be hidden as response threshold AHI and AHII.

Adjustment of the direction of action

The basic setting of the controller(s) applies to normally acting systems. With reversing systems, the sign of the proportional gain K_{PI} or K_{PII} must be inverted through structuring. This applies to both the proportional action and the integral action. Independent of this, the D element can work with or against the controller variable.

Special features of the control algorithm

The P(D) and PI(D) control algorithm is implemented as an interaction-free parallel structure for both controllers and has the same type regardless of output structure S or C of the device.

Two different parameter sets can be stored in the device that are assigned to controllers I and II with dual controllers. With structuring as single controllers, switching between parameter set I and parameter set II can take place with the binary signal PAU. Switch from PI to P control takes place through the binary inputs PI and PII.

Switchover from automatic to manual mode and vice versa as well as switchover from all other operating modes to automatic mode is bumpless.

With P-operation, this results in an automatic setting of the operating point y_o. If this is not desired, the operating point can be set between 0.1 and 100 % with the parameters y_{oI} and y_{oII}, optionally also manually, but switchover to automatic mode is then not bumpless. With three-point step controllers, P-operation is permissible only with external position feedback.

Limitation of manipulated variable

With a C output structure and with an S output with external feedback, the manipulated variable can be limited with the parameters y_Q and y_I. This manipulated variable limitation can have an effect either only in automatic mode or in all operating modes. If - depending on the default setting - the manipulated variable reaches one of the limits y_Q or y_I, further integration is prevent in addition to the limitation so that no integral saturation can occur. In this way, a change to the manipulated variable can take place immediately on polarity reversal of the control deviation.

If travel out of the y_A ... y_E range takes place in manual, tracking, safety or DDC mode, the last manipulated variable is applied bumplessly on switch back to automatic mode, but changes are only executed in the direction of the limited range.

In addition to the fixed manipulated variable limitation described, a further direction-dependent manipulated variable limitation is available in the SIPART DR22 controller. In this case, limitation is activated via the binary inputs ±yBL through external signals. This limitation is always active in every operating mode.

Additional analog outputs, split range operation

The total of 9 analog outputs can be assigned to all relevant internal controller variables, e.g. $x(x_v)$, $w(w_v)$, y, (50 % $+x_d$), (50 % $-x_d$), the inputs AE1A to AE11A or the function inputs FE1 to FE12.

If the device is used as C-controller, it is possible to structure split range operation. The output y_1 always works with a rising characteristic curve. A rising or falling characteristic curve can be selected for output y_2. The manipulated variable ranges of y_1 and y_2 are parameterizable. The three-digit manipulated variable indicator shows y_1 or y_2 depending on which output is currently active.
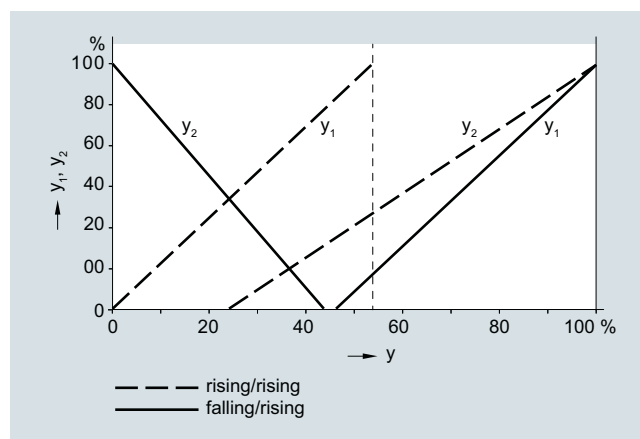
Possibilities of split range operation

Limit monitor

The alarm functions A1/A2 and A3/A4 can be assigned to the internal controller process variables x_d, $x(x_v)$, $w(w_v)$, y, $(y_{1/2})$, the inputs AE1A ... AE11A or the function inputs FE1 and FE12 for monitoring. They can be structured to maximum or minimum monitoring.

High or low limit violations are displayed by the LEDs A1/A2 and A3/A4 (points 5 and 7, figure "Control and display elements", page 3/10) and can be structured to binary outputs for external messages.

The thresholds are normally set in the parameter assignment level. As an option, however, you can also display and set the alarms in the process control level. The hysteresis of the limit monitor can be configured between 0.1 and 10 %.

Parameter control

With the SIPART DR22 controller, the control parameters of the device which are determined at different operating points can be controlled in a targeted manner using the parameter control. In this way, the same control quality can be achieved in the entire load range in non-linear controlled systems or control valves.

The parameters proportional gain K_P, integral time T_n, derivative-action time T_v and response threshold AH, as well as the operating point y_o for the P-controller, are calculated over a straight line made up of 5 grid points, depending on the value of a controlling variable. The grid points are at 10, 30, 50, 70 and 90 % of the controlling variable. Controlling variables can be either one of the internal controller process variables $x(x_v)$, $w(w_v)$, y or $10·lx_d$ or one of the input signals AE1A ... AE11A or the function inputs FE1 ... FE12. The parameters in effect in the grid points should be determined and entered beforehand.

Because both parameter set I and parameter set II can be selected for the control, this method can be applied with the dual controllers in controller I or in controller II. With the single controllers, it is possible to switch back and forth between a fixed and a controlled parameter set using the binary signal PAU.

3

■ **Function** (continued)

Adaptation method

An adaptation method for determining the optimal control parameters based on the tried-and-tested SIEPID method is stored in the SIPART DR22 process controller. The complete controlled system step response is taken up here. Process parameters, system gain, system time constant and system order are calculated using a method for optimum model adaptation. Prior knowledge about the system is not required for this purpose.

The determined control parameters are offered for a PI or PID controller. They can be applied directly or influenced by the user.

Blocking of input level as well as the parameter assignment and structure level

The device offers 3 binary signals with which the following input levels can be blocked:

- The binary function BLB blocks operation of the device
- The binary function BLS blocks switchover to the structuring level. However, in addition to normal process control, online control parameters and adaptation can be set.
- In contrast, the binary function BLPS completely blocks switchover of the device from the process control level. Only the interventions usual in normal process operation, e.g. manual switchovers, are possible.

Restart conditions

Brief interruptions of the operating voltage are bridged depending on the current load of the device by the storage effect of the power supply unit. In the event of a longer power failure, the configured parameters and structures are retained in a non-volatile, plug-in user program memory. The last operating mode, the last setpoint and the last manipulated variable are also loaded into a non-volatile memory.

On voltage return after power supply interruptions or after reclosing, processing starts autonomously with the structured operating modes.

Optical signaling after power failure can be structured.

Self-diagnostics

Comprehensive monitoring routines check the internal data traffic of the microcontrollers between one another and with the memories cyclically or after a POWER ON or watchdog reset.

If a fault is detected, an error message is automatically output by the front indicators which indicates the cause of the error and options for resolving it.

Communication with higher-level systems

By means of an interface module (option), the SIPART DR22 controller can send and receive operating states, process variables, parameters and configuring switch settings. The following interface modules are available:

- PROFIBUS DP module
  - Transmission rate up to 1.5 Mbps
  - Addressing range up to 125
    (Number of possible devices on PROFIBUS is determined by the master interface, the data area of the interface and the amount of configured process data)
- SES module RS 232
  - Transmission rate 9.6 Kbps
  - RS 232 as point-to-point connection
  - RS 485 bus, up to 32 devices

Even when used together with higher-level systems, the advantages of the autonomous SIPART DR22 controller come into effect:

- Problem-free adaptation of every controller to the task
- Operational reliability; When the higher-level system or part of it is switched off or fails, the SIPART DR22 controller continues to operate as an autonomous device under the conditions defined previously
- Flexibility; Changes or expansions to individual control loops are possible even during operation of the overall system
- Both SPC and DDC operation is possible
- Transferring the controller functions to the individual device relieves load on the higher-level system in SPC operation
- Clear overview due to distributed configuration of the plant

SIPART DR22 process controller

Technical description

■ **Function** (continued)

Operator control and display functions

Operation of the SIPART DR22 process controller takes place on 3 main levels:

- Process control level
- Selection level
- Configuration level (parameter assignment and structuring mode)

On these three input levels, some of the buttons and indicators on the front of the device have different functions.
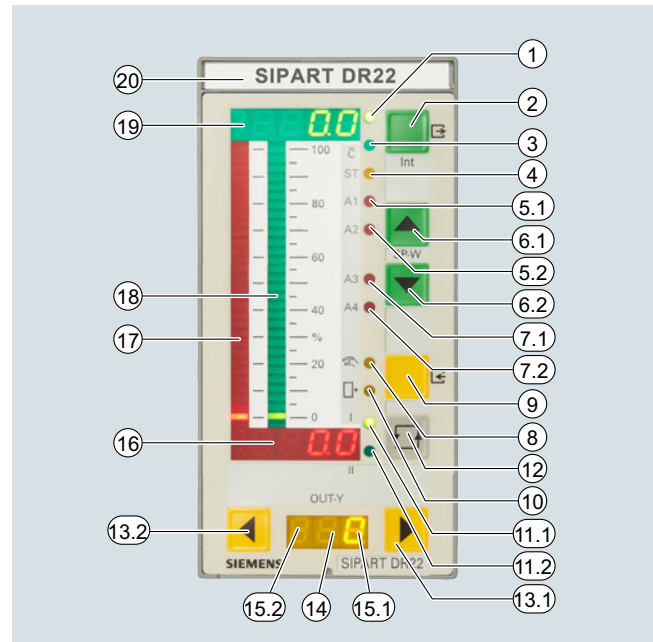
Process control

Thanks to the design and color scheme of the front panel, the control elements and the labeling, operation of the SIPART DR22 controller in process mode is clear and simple.

- **Red** is the color of the actual value:
  The red digital indicator (16) and the red vertical LED bar graph (17) show the actual value.
- **Green** is the color of the setpoint:
  The green digital indicator (19) and the green LED bar graph (18) show the setpoint. The green button (2) switches between internal and external operation. The internal setpoint is set with the green control buttons (6). The green LED (1) signals operation with internal setpoint. LED (3) also lights up green if there is no binary signal CB.
- **Yellow** is the color of the manipulated variable:
  The yellow button (9) switches between manual and automatic mode. The yellow LED (8) signals with continuous and flashing light that a switch to manual operation has taken place. The yellow LED (10) lights up to indicate an external intervention in the manipulated variable, e.g. follow-up mode. The manipulated variable can be set in manual mode with the yellow buttons (13). This is displayed by the yellow digital indicator (14). The yellow LEDs (15) show the output of the setting increments in all operating modes of the S controller.

Violations of high or low thresholds are signaled by LEDs (5) and (7) lighting up. LED (4) signals the progress of parameter optimization during the adaptation process with a continuous or flashing light.

Switchover of the indicators and setpoint buttons in the dual controllers takes place with button (12). This button also allows switching the indicators to different signal levels with the single controllers. The associated LEDs (11) signal the switching state.

The measuring point label (20) can be exchanged. For this purpose, the cover can be opened in the center with a pointed tool and the label can be removed. A screw becomes visible behind it. When this is loosened, the front module can be separated from the controller. The electrical connections between the front module and basic unit are established via a plug-in flat ribbon cable.

SIPART DR22 process controller, control and display elements

1   LED (green), signals "Internal setpoint"

2   Internal/external button / Exit button

3   LED C (green), signals "No computer operation"

4   LED ADAPT (yellow)
       - Flashing light: Adaptation in progress
       - Continuous light: Adaptation finished

5.1   LED A1 (red), signals "Threshold A1 reached"

5.2   LED A2 (red), signals "Threshold A2 reached"

6.1   Button $+\Delta w$: Button for setting the internal setpoint

6.2   Button $-\Delta w$: Button for setting the internal setpoint

7.1   LED A3 (red), signals "Threshold A3 reached"

7.2   LED A4 (red), signals "Threshold A4 reached"

8   LED (yellow)
       - Flashing light: Manual mode, external
       - Continuous light: Manual mode, internal

9   M/A button for selecting between manual/automatic mode / Enter button

10   LED (yellow), lights up in the event of an external y intervention

11.1   LED I (green), operator control/display functions controller
       - Flashing light: Display and effective functions are not identical
       - Continuous light: Display and effective functions are identical

11.2   LED (green), operator control/display functions controller II
       - Flashing light: Display and effective functions are not identical
       - Continuous light: Display and effective functions are identical

12   Switchover button controller I/controller II

13.1   Button $+\Delta y$: Control button for manual manipulated variable

13.2   Button $-\Delta y$: Control button for manual manipulated variable

14   Digital indicator (yellow) for manipulated variable y

15.1   LED $+\Delta y$ (yellow) for display of setting increment output on the S controller

15.2   LED $-\Delta y$ (yellow) for display of setting increment output on the S controller

16   Digital indicator (red) for controlled variable x

17   Analog indicator (red) for controlled variable x

18   Analog indicator (green) for setpoint w

19   Digital indicator (green) for setpoint w

20   Exchangeable measuring point label, with a screw behind it to loosen the front module

Function (continued)
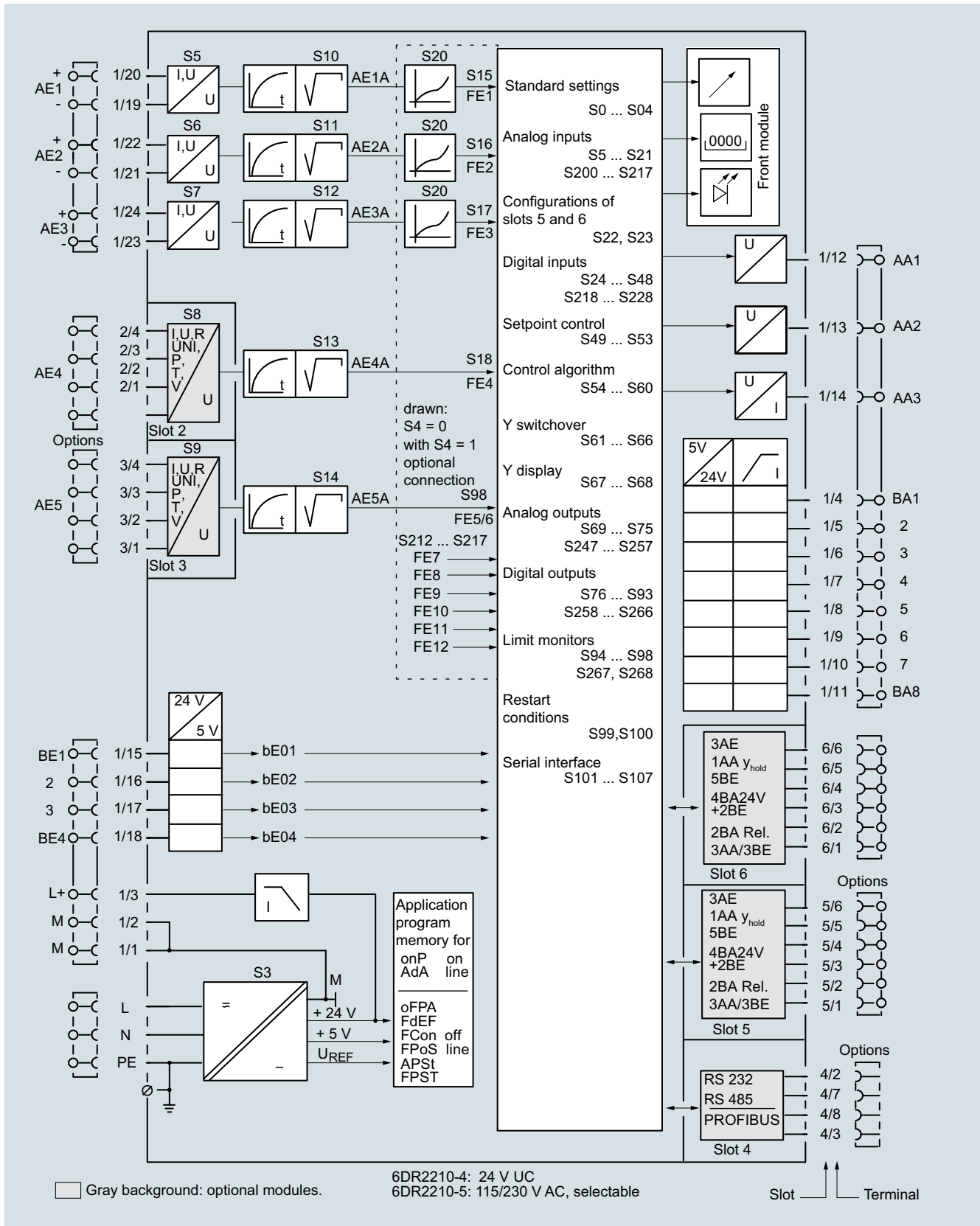
SIPART DR22 process controller, function block diagram

SIPART DR22 process controller

Technical specifications

Technical specifications

General data	
Mounting position	Any
Climate class according to IEC 721	
• Part 3-1 Storage 1K2	-25 ... +75 °C
• Part 3-2 Transport 2K2	-25 ... +75 °C
• Part 3-3 Operation 3K3	0 ... +50 °C
Degree of protection according to EN 60 529	
• Front	IP64
• Enclosure	IP30
• Connections	IP20

Device design

Electrical safety
• According to DIN EN 61010-1
• Protection class I according to IEC 536
• Protective separation of line connection and field signals
• Clearance and creepage distances, unless expressly mentioned otherwise, for overvoltage class III and pollution degree 2

CE mark compliance with respect to
• EMC Directive 2014/30/EU
• LVD Directive 2014/35/EU

Interference emission, noise immunity according to DIN EN 61326-1, NAMUR NE21

General data	
Weight, basic unit without options	Approx. 1.2 kg
Color	
• Frame of the front module	RAL 7037
• Front surface	RAL 7035
Material	
• Enclosure and front frame	Polycarbonate, glass-fiber reinforced
• Front film	Polyester
Auxiliary power terminal	
• 115/230 V AC	Three-pin device plug IEC 320/V
• 24 V AC/DC	Two-pin plug
Connection system for process signals	Multi-pin screw terminal blocks, coded, plug-in for conductor cross-section 1.5 mm^2 (AWG 14)
Protective conductor connection	Grounding screw

A mounting rail can be installed on the PSU rear panel. The mounting rail is included in the scope of delivery of the coupling relay module.

Auxiliary power				
Nominal voltage	230 V AC, switchable	115 V AC, switchable	24 V UC	24 V UC
Operating voltage range	187 ... 276 V AC	93 ... 138 V AC	20 ... 28 V AC	20 ... 35 V DC [1]
Frequency range	48 ... 63 Hz	48 ... 63 Hz	48 ... 63 Hz	–
External current I_{Ext}[2]	450 mA	450 mA	450 mA	450 mA
Power consumption				
Active power/apparent power (capacitive)				
Basic unit				
• Without options, without I_{Ext}	8 W/17 VA	8 W/13 VA	8 W/11 VA	8 W
• With options, without I_{Ext}	13 W/25 VA	13 W/20 VA	13 W/18 VA	13 W
• With options, with I_{Ext}	26 W/45 VA	26 W/36 VA	28 W/35 VA	28 W
Permissible voltage dips [3]				
Basic unit				
• Without options, without I_{Ext}	≤ 90 ms	≤ 70 ms	≤ 55 ms	≤ 30 ms
• With options, without I_{Ext}	≤ 80 ms	≤ 60 ms	≤ 50 ms	≤ 25 ms
• With options, with I_{Ext}	≤ 50 ms	≤ 35 ms	≤ 35 ms	≤ 20 ms

[1] Including harmonics.

[2] Current emitted from $L+$, BA, AA to external consumers.

[3] The load voltage of the analog outputs is hereby reduced to 13 V, $L+$ is reduced to +15 V, and the voltage at the binary outputs drops to +14 V.

■ Technical specifications (continued)

Inputs and outputs, display technology

Analog inputs AE1, AE2, AE3 and AE6 ... AE11 (signal converter 6DR2800-8A)

Voltage

Nominal signal range (0 ... 100 %)	0/199.6 ... 998 mV or 0/2 ... 10 V routable
Total operating range	≤ -4 ... 110 %
Input resistance • Difference • Common mode	 > 200 kΩ > 500 kΩ
Common mode voltage	0 ... +10 V
Filter time constant	50 ms
Zero point error	0.1 % + A/D converter error
Full-scale value error	0.2 % + A/D converter error
Linearity error	See technical specifications "A/D conversion"
Common mode error	0.07 %/V
Temperature influence • Zero point • Full scale value	 0.05 %/10 K 0.1 %/10 K
Static destruction limit	± 35 V

Current

Nominal signal range	0/4 ... 20 mA
Total operating range	-1 ... 22 mA
Input resistance • Difference (load) • Common mode	 49.9 Ω ± 0.1 % > 500 kΩ
Common mode voltage	0 ... +10 V
Filter time constant	50 ms
Zero point error	See technical specifications "A/D conversion"
Full-scale value error	See technical specifications "A/D conversion"
Linearity error	See technical specifications "A/D conversion"
Common mode error	0.07 %/V
Temperature influence • Zero point • Full scale value	 0.05 %/10 K 0.1 %/10 K

Analog outputs AA1 ... AA3

Nominal signal range (0 ... 100 %)	0 ... 20 mA or 4 ... 20 mA
Total operating range	0 ... 20.5 mA or 3.8 ... 20.5 mA
Load voltage	From -1 ... 18 V
No-load voltage	≤ 26 V
Inductive load	≤ 0.1 H
Time constant	1 ms
Residual ripple 900 Hz	≤ 0.05 %
Resolution	12 bits
Load dependence	≤ 0.02 %
Zero point error	≤ 0.05 %
Full-scale value error	≤ 0.2 %
Linearity	≤ 0.05 %
Temperature influence • Zero point • Full scale value	 ≤ 0.1 %/10 K ≤ 0.1 %/10 K
Static destruction limit	-1 ... 35 V

Inputs and outputs, display technology

Transmitter supply L+

Nominal voltage	+20 ... 26 V
Load current	≤ 100 mA, short-circuit proof
Short-circuit current	≤ 20 mA, clocked
Static destruction limit	-1 ... +35 V

Binary inputs BE1 ... BE4

Signal state 0	≤ 4.5 V or open
Signal state 1	≥ 13 V
Input resistance	≥ 27 kΩ
Static destruction limit	± 35 V

Binary outputs BA1 ... BA8 (with wired OR diodes)

Signal state 0	≤ 1.5 V
Signal state 1	+19 ... 26 V
Load current	≤ 50 mA
Short-circuit current	≤ 80 mA, clocked
Static destruction limit	-1 ... +35 V
Cycle time	Adaptive 60 ms to 120 ms (typically 80 ms)

A/D conversion

Process	Successive approximation, per input > 120 conversions and averages within 20 or 16.67 ms
Total operating range	-4 ... 110 %
Resolution	11 bits = 0.06 %
Zero point error	≤ 0.2 %
Full-scale value error	≤ 0.2 %
Linearity error	≤ 0.2 %
Temperature influence • Zero point • Full scale value	 ≤ 0.05 %/10 K ≤ 0.1 %/10 K
D/A conversion	See technical specifications "Analog outputs AA1 ... AA3"

Setpoint and manipulated variable adjustment

Setting	With 2 buttons (more - less)
Speed	Progressive
Resolution wi	1 digit
Resolution y	0.1 %

Parameters

Setting	With 2 buttons (more - less)
Speed	Progressive
Resolution • Linear parameters, % • Linear parameters, physical • Logarithmic parameter	 0.1 % 1 digit 128 values/octave
Accuracy • Time parameters • All others	 ± 1 % Corresponding to resolution, absolute

3

SIPART DR22 process controller

Selection and ordering data

■ Technical specifications (continued)

Inputs and outputs, display technology	
Display technology	
x and w display digital	4½-digit, 7-segment LED
• Color, x indicator	Red
• Color, w indicator	Green
Number height	7 mm
Display range	Beginning and end adjustable
Number range	-1999 ... 19999
Overflow	<--1999: -oFL
	>19999: oFL
Decimal point	Adjustable (fixed point) _.--- to ----
Repeat rate	Adjustable 0.080 … 8.000 s [1]
Resolution	1 digit, but better than A/D converter
Display error	Corresponding to A/D converter and analog inputs
x and w display analog	
• Color, x indicator	Red
• Color, w indicator	Green
Display range	
Overflow	Flashing of first or last LED
Resolution	1.7 %, through alternate lighting of 1 or 2 LEDs, the center of the light field is considered as pointer
Repeat rate	Cyclic
y display (digital)	3-digit, 7-segment LED
Color	Yellow
Number height	7 mm
Display range	0 ... 100 %
Overflow	-10 ... 110 %
Repeat rate	Adjustable 0.080 … 8.000 s [1]
Resolution	1 %

[1] Typical cycle time.

■ Selection and ordering data

	Article No.
SIPART DR22 process controller	
Basic unit in 72 × 144 mm format, with • 3 analog inputs • 3 analog outputs • 4 binary inputs • 8 binary outputs • User program memory	
Design	
• For auxiliary power 24 V UC	**6DR2210-4**
• For auxiliary power 230 V/115 V AC, switchable	**6DR2210-5**
Accessories (signal converters)	
Module for analog signals	
• For current 0/4 ... 20 mA or voltage 0/0.2 ... 1 V or 0/2 ... 10 V	**6DR2800-8J**
• For resistance-based sensors (R module)	**6DR2800-8R**
• UNI module for TC/RTD/R/mV signals, programmable	**6DR2800-8V**
• Reference junction terminal for TC, internal (use in connection with UNI module)	**6DR2805-8A**
Module for switching signals	
• With 5 binary inputs	**6DR2801-8C**
• With 4 binary outputs and 2 binary inputs	**6DR2801-8E**
• With 2 relay outputs	**6DR2801-8D**
Coupling relay module	
• With 4 relays (250 V AC)	**6DR2804-8A**
• With 2 relays (250 V AC)	**6DR2804-8B**
Interface modules	
• For serial communication (SES) via RS 232 or RS 485	**6DR2803-8C**
• PROFIBUS DP module	**6DR2803-8P**
Documentation	
The entire documentation is available for download free of charge in various languages at: http://www.siemens.com/processinstrumentation/documentation	
6DR2210 controller, operating manual • German, English	**C79000-G7400-C154**
Serial SIPART 6DR2210 bus interface, operating instructions • German, English	**C73000-B7400-C155**

Scope of delivery

The scope of delivery of the DR22 controller includes:

• 1 process controller according to the configuration

• 1 device plug according to IEC 320/V with auxiliary power 115/230 V AC or one plug with auxiliary power 24 V UC

• 2 clamping elements, plug-in

Signal converters and accessories

The signal converters/modules are described in Catalog MP 31, section 5.

The software for assigning parameters via PC, coupling to systems and the accessories for coupling (plugs, cable drivers etc.) can be found in catalog section 6.

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■ Dimensional drawings

SIPART DR22 process controller and panel cutouts, dimensions in mm

Panel cut-outs

No. of devices	Cut-out widht b
2	140+1
3	212+1
4	284+1
...	...
10	716+1

3

SIPART DR22 process controller
Accessories

Signal converters for SIPART DR22

■ **Accessories**

Signal converters for SIPART DR22

Modules for analog signals		SIPART DR22					Description on page
		Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	
U/I module	6DR2800-8J	AE4	AE5	-	-	-	**5/4**
3 × U/I module	6DR2800-8A	-	-	-	AE9/10/11	AE6/7/8	**5/5**
R module	6DR2800-8R	AE4	AE5	-	-	-	**5/6**
Pt 100 module	6DR2800-8P	(AE4)[*]	(AE5)[*]	-	-	-	**5/7**
UNI module (TC/RTD/R/U/I)	6DR2800-8V	AE4	AE5	-	-	-	**5/8**
3AA/3BE	6DR2802-8B	-	-	-	AA7/8/9 BE5/6/7	AA4/5/6 BE10/11/12	**5/11**

[*] Preferably use UNI module 6DR2800-8V.

Modules for switching signals		SIPART DR22					Description on page
		Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	
5BE	6DR2801-8C	-	-	-	BE5/6/7/8/9	BE10/11/12/13/14	**5/12**
2BA relay module	6DR2801-8D	-	-	-	BA9/10	BA13/14	**5/13**
4BA/2BE	6DR2801-8E	-	-	-	BA9/10/11/12 BE5/6	BA13/14/15/16 BE10/11	**5/14**

Interface module		SIPART DR22					Description on page
		Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	
SES module	6DR2803-8C						**5/15**
• RS 232		-	-	Yes	-	-	**5/15**
• RS 485		-	-	Yes	-	-	**5/15**
PROFIBUS DP module	6DR2803-8P	-	-	Yes	-	-	**5/16**

Coupling relay module		SIPART DR22	Description on page
Mounting on the back is possible:			
With 4 relays	6DR2804-8A	Yes	**5/17**
With 2 relays	6DR2804-8B	Yes	**5/17**

In connection with the UNI module 6DR2800-8V, the following can be used depending on the application:		Description on page
Reference junction terminal	6DR2805-8A	**5/8**

You can download all instructions, catalogs and certificates for positioners free of charge at the following Internet address:
www.siemens.com/process-controllers

SIPART DR24 multifunction unit

Overview

SIPART DR24 is a process controller as single-channel or dual-channel controller for complex control tasks, with additional computing functions in the input area. The digital controller in 72 × 144 mm format is suitable for all process-specific tasks such as mathematical calculations, logic operations, open-loop controls and time-controlled closed-loop controls.

Application

The SIPART DR24 multifunction unit is used for calculating, open-loop and closed-loop control in process engineering. It can be freely configured to match the respective task. During structuring, the functions stored in the memory are called (see table on page 4/3) and connected through simple assignment to one another as well as with the inputs and outputs and the indicators and buttons of their operator control and display unit.

No programming knowledge is required for this task.

The multifunction unit can be connected to higher-level automation systems, control systems or process computers in analog, parallel connection technology as well as over an addressable serial interface with bus capability.

The multifunction unit is suitable for installation in panels, consoles or cabinets.

Application examples:
- Computer for mathematical equations, chronological processes, logic operations and parallel computation processes
- Programmers (timers) also in connection with closed-loop controllers, calculations and open-loop controllers
- Closed-loop controllers with continuous manipulated variable and/or three-point step controllers; inputs and outputs of the controller blocks can be freely configured, e.g. with computation and control functions; as individual controller or for parallel operation of up to four independent control loops, for selection controllers, cascade controllers, SPC or DDC operation
- Program controllers; up to 8 programs
- Boiler controllers with mathematical evaluation of the process variables (min./max. selection, correction calculator, etc.)
- Burner controllers with control functions
- Thermodynamic process controllers and calculations (enthalpy)
- Furnace and zone controllers with scheduled setpoint control and linearization
- Test bed open-loop and closed-loop control
- Process controllers along conveyor lines (e.g. conveyor belt) with dead time element
- Pump limit controllers
- Transformers of analog and binary process variables from and to serial interface
- Process monitoring (thresholds, failure messages, etc.)
- Dependent and mutual locking as well as override setpoint control
- Multiplexers for process variables and/or setpoints
- Weighted averaging using sampling values

Application (continued)

Functions (basic and complex functions) of the multifunction unit

Mathematical functions	
AbS	Absolute value
Add	Add
AMPL	Differential amplifier
div	Divide, reciprocal value
FUL	Function generator (3)
FUP	Function generator (2)
LG	Logarithm base 10
LinE	Linear equation
Ln	Logarithm base e
MuLt	Multiply, negate
Pot	Potentiate
CPt	P/T correction calculator (2)
root	Square root extraction
SUb	Subtract, negate
SPr	Split range (8)

Time functions	
AFi	Adaptive filter (2)
diF	Differentiate (high-pass)
FiLt	Filter (low-pass)
Ain	Integrator, analog input (4)
bin	Integrator, binary input (6)
tiM	Timer
dti	Dead time element (2)
CLoc	Timer (1)

Comparison functions	
dEbA	Response threshold
LiMi	Limiter
MASE	Maximum selection
MiSE	Minimum selection
AMPL	Differential amplifier
CoMP	Comparator with hysteresis, limit encoder

Control functions	
Ccn	PID controller with continuous output, S controller with internal or external tracking (4)
CSE	PID controller with continuous output, S controller with internal or external tracking (4)
CSi	PID controller with continuous output, S controller with internal or external tracking (4)

Logic functions	
And	AND
dFF	D-Flipflop
Eor	EXCLUSIVE OR
nAnd	NAND, also inverse
nor	NOR, also inverse
or	OR
tFF	T-Flipflop
tiME	Timer
CoUn	Counter
PUM	Pulse width modulation (4)

Switches	
MUP	Measuring point switch (multiplexer) (2)
ASo	Changeover switch for analog variables
bSo	Changeover switch for binary variables
Cnt	Demultiplexer

Memory functions	
AMEM	Analog value memory
dFF	D-Flipflop
Ain	Integrator with analog input, tracked (see above)
bin	Integrator with binary input, tracked (see above)
NAME	Maximum memory
MiME	Minimum memory
tFF	T-Flipflop

Programmers	
CLoc	Timer (see above)

The functions marked with (x) are complex functions that can each be used x times (x = 1, 2 or 3). All other functions are basic functions that can be used in any order and frequency (max. 109 times).

The short names of the functions are displayed during parameter assignment and structuring by the 7-segment indicators of the multifunction unit.

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SIPART DR24 multifunction unit

Technical description

Design

The SIPART DR24 has a modular structure and is therefore service-friendly as well as easy to convert and retrofit. It consists of a basic unit in which additional signal converters can be inserted to expand the range of application. These modules are inserted in the slots on the back of the device (see figure "SIPART DR24 multifunction unit, rear view")

The basic unit consists of:

• Front module with the control and display elements
• Main circuit board with CPU and terminal strips
• Polycarbonate enclosure with connector circuit board and power supply unit

The electrical connections between the individual modules are established via the connector circuit board screwed into the enclosure. The main circuit board is inserted into slot 1 on the back and interlocked. It has one 10-pin and one 14-pin plug-in terminal strip via which all inputs and outputs of the basic unit are connected. Five additional slots can be occupied by option modules if the number of field signal adaptations to the process provided in the basic unit is not sufficient for the intended task.

There is a short-circuit proof L+ output (24 V DC, 100 mA) for supplying transmitters.

The power supply, a galvanically isolated controlled switched mode power supply, is in a closed metal enclosure and is permanently screwed onto the polycarbonate enclosure of the device.

Available versions:

• 6DR2410-4 for auxiliary power 24 V UC
• 6DR2410-5 for auxiliary power 230 V AC, can be switched to 115 V AC

Brief voltage interruptions of the auxiliary power are bridged without affecting the respective device function. All voltage produced by the power supply unit is stabilized and short-circuit proof (thermal fuse and current monitoring).

The input of the power supply unit is protected against overvoltage. A filter ensures that interference pulses cannot enter the devices from the mains and that switching pulses cannot enter the mains supply from the power supply unit.

The output power of the power supply unit can supply multiple consumers referenced to ground (active binary outputs, signal converts) with 24 V (see technical specifications).
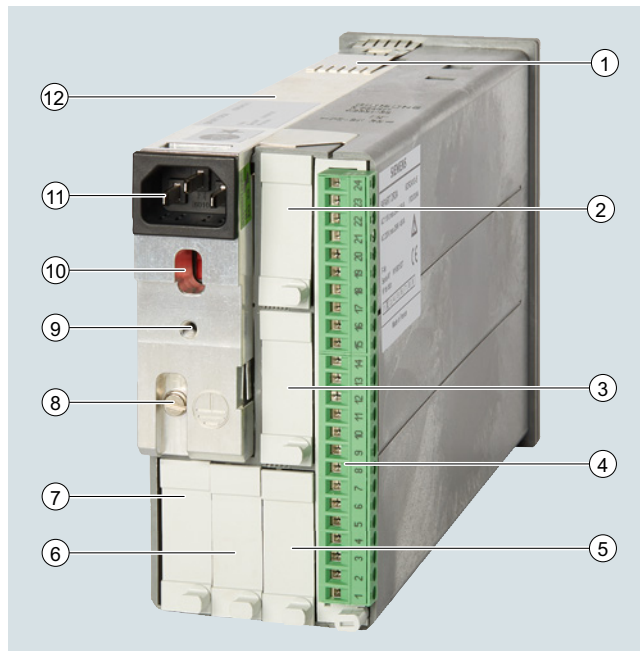
SIPART DR24 multifunction unit, rear view

1   Protective conductor - contact spring
2   Slot 6
3   Slot 5
4   Slot 1 (main circuit board)
5   Slot 2
6   Slot 3
7   Slot 4 (SES: RS 232 / RS 485, PROFIBUS DP)
8   Grounding screw
9   Mounting rail (included in the scope of delivery of the relay module)
10   Changeover switch line voltage
11   Power plug
12   Power supply unit

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■ Mode of operation

The programs created by the user are saved in the processor-controlled SIPART DR24.

Analog input area

The basic unit has 3 analog inputs with galvanic isolation which can be connected either with standard voltage signals (0/0.2 to 1 V or 0/2 to 10 V) or standard current signals (0/4 to 20 mA).

In addition to these 3 analog inputs, a module with 3 further inputs in the same design can be inserted on slot 5 and on slot 6. These can also be switched between 0 V to 10 V and 0/4 mA to 20 mA. For very complex tasks or to connect other input signals, 2 additional input modules can be inserted in slots 2 and 3. This allows not only standard current or voltage signals to be processed, but also the signals of directly connected PT 100 resistance thermometers, thermocouples and potentiometers.

This means that a total of up to 11 analog inputs is available.

Analog output area

The basic unit has 3 analog outputs. In addition, a module with 3 analog outputs and 3 binary inputs can be inserted on slot 5 and on slot 6. The total of 9 analog outputs produce a current signal of 0 to 20 mA or 4 to 20 mA.

Binary input and output area

The basic unit has 4 binary inputs BE1 to BE4 and 8 binary outputs BA1 to BA8. If the number of binary inputs or outputs offered by the basic unit is not sufficient, it can be increased by inserting additional option modules in the controller. Slots 5 and 6 on the back of the controller are provided for this purpose. In each of these two slots, either an expansion module with five binary inputs, an expansion module with four 24 V DC binary outputs or a module with two binary outputs (relays) can be inserted (≤ 35 V UC, ≤ 5 A).

The binary outputs are active. They return a 24 V DC signal.

Floating outputs are available when the relay module with 2 binary outputs is used. Furthermore, a coupling relay module can be clipped to a mounting rail on the back of the controller. This additional module can contain either two or four relays with one changeover contact each which are controlled directly from the binary outputs.

Function area

The function area is located between the input area and the output area. It contains the following: 32 different basic functions that can be used as desired up to 109 times.

15 different complex functions that can be used multiple times. In addition, the function area contains adjustable parameters and a number of constants and alarm messages that can be freely interconnected. The required functions are selected or defined in "Structuring" mode (structuring mode FdEF), interconnected (structuring mode FCon) and positioned in the program sequence for the processing order (structuring mode FPoS).

Example: Add basic function

A=E1+E2+E3
ncon: Inputs not connected
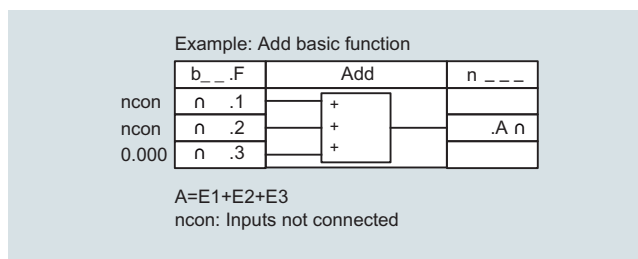
Basic function block, adder; the preassigned inputs (e.g. I3 = 0.000) can simply be overwritten if required

Interconnection is completely permissive. Each data source can be connected to any number of data sinks. Structuring work is minimized by hiding data sources and sinks of undefined function blocks and by hiding unsuitable assignments of sources and sinks (e.g. analog with binary).

Certain parameters can be changed during operation (online parameters). All other parameters (e.g. timer parameters) are set offline in structuring mode.

Arithmetic

The analog variables are processed in floating point arithmetic within a decimal number range from -1019 to +1019.

The input and output variables of the multifunction unit are input or output in the signal range 0/4 to 20 mA or 0 to 10 V, corresponding to 0 to 100 %. These ranges are mapped in arithmetic as calculation values 0 to 1. The computing operations are performed with these number values.

Interconnectable parameters

The linear parameters PL1 to PL40 can be set in 4 digits, the parameters Pd1 to Pd40 - preferably for time constants - can be set in logarithmic ranking over a very wide range. The PL and Pd parameters can be set online in process mode.
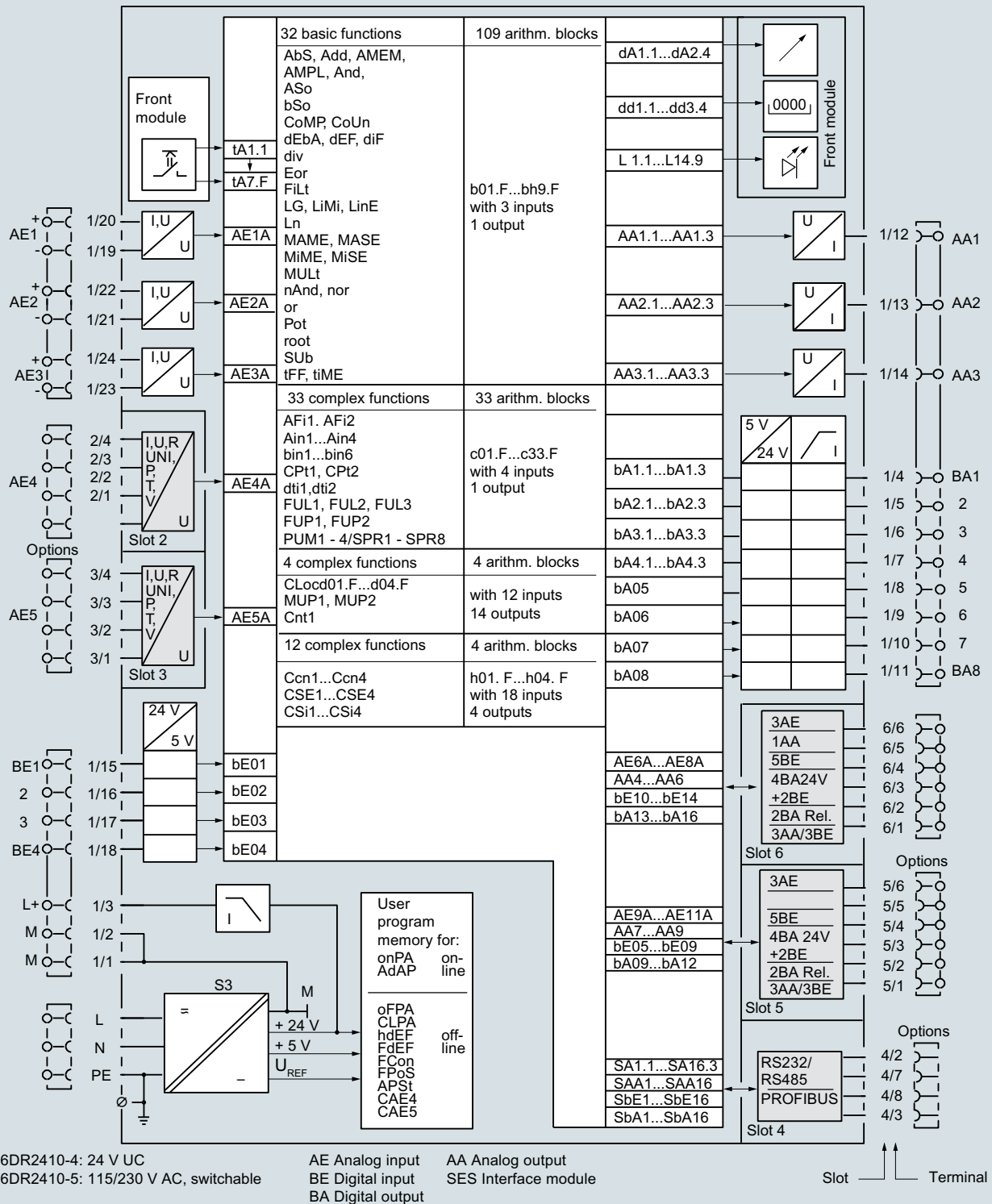
Battery-supported RAM

During a power failure, all instantaneous values of counting, time and memory functions can optionally be secured.

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SIPART DR24 multifunction unit

Technical description

■ Mode of operation (continued)

Blockschaltbild

Front module

32 basic functions
AbS, Add, AMEM, AMPL, And, ASo
bSo
CoMP, CoUn
dEbA, dEF, diF
div
Eor
FiLt
LG, LiMi, LinE
Ln
MAME, MASE
MiME, MiSE
MULt
nAnd, nor
or
Pot
root
SUb
tFF, tiME

109 arith. blocks
b01.F...bh9.F
with 3 inputs
1 output

dA1.1...dA2.4
dd1.1...dd3.4
L 1.1...L14.9

Front module

33 complex functions
AFi1. AFi2
Ain1...Ain4
bin1...bin6
CPt1, CPt2
dti1,dti2
FUL1, FUL2, FUL3
FUP1, FUP2
PUM1 - 4/SPR1 - SPR8

33 arith. blocks
c01.F...c33.F
with 4 inputs
1 output

4 complex functions
CLocd01.F...d04.F
MUP1, MUP2
Cnt1

4 arith. blocks
with 12 inputs
14 outputs

12 complex functions
Ccn1...Ccn4
CSE1...CSE4
CSi1...CSi4

4 arith. blocks
h01. F...h04. F
with 18 inputs
4 outputs

AE1 1/20 +, 1/19 − I,U AE1A
AE2 1/22 +, 1/21 − I,U AE2A
AE3 1/24 +, 1/23 − I,U AE3A

AE4 2/4, 2/3, 2/2, 2/1 I,U,R UNI, P, T, V U AE4A Slot 2
Options
AE5 3/4, 3/3, 3/2, 3/1 I,U,R UNI, P, T, V U AE5A Slot 3

24 V / 5 V

BE1 1/15 bE01
BE2 1/16 bE02
BE3 1/17 bE03
BE4 1/18 bE04

L+ 1/3
M 1/2
M 1/1

S3

L
N
PE ∅

= / − + 24 V, + 5 V, U_REF

M

User program memory for:
onPA   on-line
AdAP
oFPA   off-line
CLPA
hdEF
FdEF
FCon
FPoS
APSt
CAE4
CAE5

AA1.1...AA1.3 U/I 1/12 AA1
AA2.1...AA2.3 U/I 1/13 AA2
AA3.1...AA3.3 U/I 1/14 AA3

5 V / 24 V I
bA1.1...bA1.3 1/4 BA1
bA2.1...bA2.3 1/5 2
bA3.1...bA3.3 1/6 3
bA4.1...bA4.3 1/7 4
bA05 1/8 5
bA06 1/9 6
bA07 1/10 7
bA08 1/11 BA8

AE6A...AE8A
AA4...AA6
bE10...bE14
bA13...bA16

3AE
1AA
5BE
4BA24V
+2BE
2BA Rel.
3AA/3BE
Slot 6

6/6, 6/5, 6/4, 6/3, 6/2, 6/1
Options

AE9A...AE11A
AA7...AA9
bE05...bE09
bA09...bA12

3AE
5BE
4BA 24V
+2BE
2BA Rel.
3AA/3BE
Slot 5

5/6, 5/5, 5/4, 5/3, 5/2, 5/1
Options

SA1.1...SA16.3
SAA1...SAA16
SbE1...SbE16
SbA1...SbA16

RS232/ RS485
PROFIBUS
Slot 4

4/2, 4/7, 4/8, 4/3
Options

6DR2410-4: 24 V UC
6DR2410-5: 115/230 V AC, switchable

AE Analog input
BE Digital input
BA Digital output

AA Analog output
SES Interface module

Slot — Terminal

SIPART DR24 multifunction unit, function block diagram

■ Function

"Basic functions and complex functions" function area

The function blocks are called (defined) in any number and in any order in structuring mode FdEF. The data sinks (inputs) can be connected with any data sources during interconnection (FCon), e.g. with outputs of other blocks, with parameters or with changeable calculation values. The basic functions and their short names are provided in the table "Functions (basic and complex functions) of the multifunction unit".

Communication with higher-level systems

Using an interface module (option), the SIPART DR24 controller can send and receive operating states, process variables, parameters and function interconnections.

The following interface modules are available:

PROFIBUS DP module

- Transmission rate up to 1.5 Mbps
- Addressing range up to 125
  (Number of possible devices on PROFIBUS is determined by the master interface, the data area of the interface and the amount of configured process data)

SES module RS 232 / RS 485

- Transmission rate 9.6 Kbps
- RS 232 as point-to-point connection
- RS 485 bus, up to 32 devices

Monitoring function

The multifunction unit has monitoring routines: The alarm messages are available as data sources. They can activate binary outputs, initiate function sequences or switch analog outputs to safety values, for example.

Self-diagnostics

Comprehensive monitoring routines check the internal data traffic cyclically or after a POWER ON or watchdog reset.

If a fault is detected, an error message is automatically output by the front indicators which indicates the cause of the error and options for resolving it.

Restart conditions

Brief interruptions of the operating voltage are bridged depending on the current load of the device by the storage effect of the power supply unit. In the event of a longer power failure, the configured parameters and structures are retained in a non-volatile, plug-in user program memory. The last operating mode, the last setpoint and the last manipulated variable are also loaded into a non-volatile memory.

Blocking of input level as well as the parameter assignment and structure level

Switchover to the parameter assignment and structuring level can be blocked via binary inputs.

The binary function BLS blocks switchover to the structuring level. However, in addition to normal process control, online control parameters and adaptation can be set.

In contrast, the binary function BLPS completely blocks switchover of the device from the process control level.

The binary function bLB blocks operation of the device

Display technology

The SIPART DR24 multifunction unit is equipped with analog and digital indicators (see figure "SIPART DR24 multifunction unit" under "Overview").

The two analog indicators consist of one red and one green vertical LED chain. 1 or 2 LEDs light up alternately. The center of the indicator field shows the measured value.

The resolution of the two indicators is thus 1.7 %. The LED chain on the right can also be structured as binary indicator. Ten equidistant LEDs can then be controlled with binary signals. Of the three digital indicators, two are 4½-digit and one is 3-digit. All of them can be structured in physical units or in percentages.

There are also 13 LEDs on the front of the device for displaying operating states, alarms etc. All LEDs are freely interconnectable.

Process control

Behind the front panel foil, there are 7 freely interconnectable short-stroke buttons that can be simply operated by pressing on the bulges in the foil (see figure "SIPART DR24 multifunction unit" under "Overview").

All control and display elements (indicators, LED and operating buttons) of the front module can be switched to up to 4 data sources or data sinks for multiple use.

The front panel foil has a slit at the bottom so that an individual label can be inserted.

The measuring point label can be exchanged independent of this.

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SIPART DR24 multifunction unit

Technical specifications

Technical specifications

General data	
Mounting position	Any
Climate class according to IEC 721	
• Part 3-1 Storage 1K2	-25 ... +75 °C
• Part 3-2 Transport 2K2	-25 ... +75 °C
• Part 3-3 Operation 3K3	0 ... +50 °C
Degree of protection according to EN 60 529	
• Front	IP64
• Enclosure	IP30
• Connections	IP20
Device design	

Electrical safety
• According to DIN EN 61 010 Part 1
• Protection class I
• Protective separation of line connection and field signals
• Clearance and creepage distances, unless expressly mentioned otherwise, for overvoltage category III and pollution degree 2

EC Declaration of Conformity No. 691.001

CE mark: Conformity regarding EMC Directive 89/336/EEC and NS Directive 73/23/EEC.

Interference emission, noise immunity according to EN 61 326, NAMUR NE21 8/98

General data	
Weight, basic unit, without options	Approx. 1.2 kg
Color	
• Frame of the front module	RAL 7037
• Front surface	RAL 7035
Material	
• Enclosure and front frame	Polycarbonate, glass-fiber reinforced
• Front film	Polyester
Auxiliary power terminal	
• 115/230 V AC	Three-pin device plug IEC 320/V
• 24 V UC	Two-pin special connector
Connection system for process signals	Multi-pin screw terminal blocks, coded, plug-in for conductor cross-section 1.5 mm^2 (AWG 14)
Protective conductor connection	Grounding screw

A mounting rail can be installed on the PSU rear panel. The mounting rail is included in the scope of delivery of the coupling relay module.

Auxiliary power				
Nominal voltage	230 V AC, switchable	115 V AC, switchable	24 V UC	24 V UC
Operating voltage range	187 ... 276 V AC	93 ... 138 V AC	20 ... 28 V AC	20 ... 35 V DC [1]
Frequency range	48 ... 63 Hz	48 ... 63 Hz	48 ... 63 Hz	–
Peak voltages not periodical according to VDE 160				
• 1.3 ms	≤ 780 V	≤ 390 V	≤ 70 V	≤ 70 V
• 10 µs	≤ 1500 V	≤ 1500 V	≤ 500 V	≤ 500 V
External current I_{Ext}[2]	450 mA	450 mA	450 mA	450 mA
Power consumption				
Active power/apparent power (capacitive)				
Basic unit				
• Without options, without I_{Ext}	8 W/17 VA	8 W/13 VA	8 W/11 VA	8 W
• With options, without I_{Ext}	13 W/25 VA	13 W/20 VA	13 W/18 VA	13 W
• With options, with I_{Ext}	26 W/45 VA	26 W/36 VA	28 W/35 VA	28 W
Permissible voltage dips[3]				
Basic unit				
• Without options, without I_{Ext}	≤ 90 ms	≤ 70 ms	≤ 55 ms	≤ 30 ms
• With options, without I_{Ext}	≤ 80 ms	≤ 60 ms	≤ 50 ms	≤ 25 ms
• With options, with I_{Ext}	≤ 50 ms	≤ 35 ms	≤ 35 ms	≤ 20 ms
Test voltages (1 min)				
• Primary-secondary	1.5 kV AC	1.5 kV AC	500 V AC	500 V AC
• Primary protective conductor	1.5 kV AC	1.5 kV AC	500 V AC	500 V AC
• Secondary protective conductor	700 V DC	700 V DC	700 V DC	700 V DC

[1] Including harmonics.
[2] From $L+$, BA and AA.
[3] The load voltage of the analog outputs is hereby reduced to 13 V, $L+$ is reduced to +15 V, and the voltage at the binary outputs drops to +14 V.

■ **Technical specifications** (continued)

Inputs and outputs, display technology	
Analog inputs **AE1, AE2, AE3 and AE6 ... AE11** **(signal converter 6DR2800-8A)**	
Input signal range	
• Voltage	0/199.6 ... 998 mV or 0/2 ... 10 V
• Current	0/4 ... 20 mA
Input resistance	
• Difference (voltage)	200 kΩ
• Difference (current)	49.9 Ω ±0.1 %
• Common mode	> 500 kΩ
Common mode voltage	0 ... 10 V
Filter time constant	50 ms
Temperature influence on the	
• Zero point	0.05 %/10 K
• Full scale value	0.1 %/10 K
Analog outputs AA1 ... AA3	
Nominal signal range	0 ... 20 mA or 4 ... 20 mA
Total operating range	0 ... 20.5 mA or 3.6 ... 20.5 mA
Load voltage	-1 ... +18 V
Max. permissible inductive load	≤ 0.1 H
No-load voltage	≤ 26 V
Time constant	300 ms
Residual ripple 900 Hz	≤ 0.2 %
Resolution	≤ 0.1 %
Zero point error	≤ 0.3 % of measuring span
Full-scale value error	≤ 0.3 % of measuring span
Linearity error	≤ 0.05 % of measuring span
Load dependence	≤ 0.1 %
Temperature influence on the	
• Zero point	≤ 0.1 %/10 K
• Full scale value	≤ 0.1 %/10 K
Transmitter supply L+	
Nominal voltage	20 ... 26 V
Load current	≤ 100 mA, short-circuit proof
Short-circuit current	≤ 200 mA, clocked
Binary inputs BE1 ... BE4	
Signal state "0"	≤ 4.5 V or open
Signal state "1"	≥ 13 V
Static destruction limit	±35 V
Input resistance	≥ 27 kΩ
Binary outputs BA1 ... BA8 **(with wired OR diodes)**	
Signal state "0"	≤ 1.5 V
Signal state "1"	+19 ... 26 V
Load current	< 50 mA
Short-circuit current	< 80 mA, clocked
Cycle time	> 60 ms depending on user program

Inputs and outputs, display technology	
A/D conversion	
Process	Successive approximation, per input > 120 conversions and averages within 20 or 16.67 ms
Resolution	11 bits = 0.06 %
Zero point error	≤ 0.2 % of measuring span
Full-scale value error	≤ 0.2 % of measuring span
Linearity error	≤ 0.2 % of measuring span
Temperature influence on the	
• Zero point	≤ 0.05 %/10 K
• Full scale value	≤ 0.1 %/10 K
Parameters	
Set	with tA 2/3 (more – less)
• Speed	Progressive
Accuracy	
• Time parameters	≤ ± 0.05 % across the entire temperature range
• All others	corresponding to resolution, absolute
Display technology	
Digital displays dd1, dd2	4½-digit, 7-segment LED display
• Color dd1	green
• Color dd2	red
Number height	7 mm
Display range	Beginning and end adjustable
Number range	-1999 ... 19999
Decimal point	adjustable
Repeat rate	1 ... 100 cycles/display
Resolution	1 digit, but not better than A/D converter
Display error	According to A/D converter and analog inputs
Digital display dd3	three digits, 7-segment LED display
Color	yellow
Number height	7 mm
Display range	Beginning and end adjustable
Number range	-199 ... 999
Decimal point	adjustable
Repeat rate	1 ... 100 cycles/display, adjustable
Resolution	1 digit, but not better than A/D converter
Display error	According to A/D converter and analog inputs
Analog displays dA1, dA2	
• Color dA1	red
• Color dA2	green
Display range	LED chain with 30 LEDs
Signal range	-199.9 ... 199.9 %, adjustable
Overflow	< -0.85 % of display range, 1st LED flashes
	> 100.85 % of display range, 30th LED flashes
Resolution	1.7 % of display range, through alternate lighting of 1 or 2 LEDs, the center of the light field is considered as pointer
Repeat rate	Cyclic

4

SIPART DR24 multifunction unit

Selection and ordering data

Selection and ordering data	Article No.
SIPART DR24 multifunction unit	
Basic unit in 72 × 144 mm format, with • 3 analog inputs • 3 analog outputs • 4 binary inputs • 8 binary outputs • User program memory	
Design • For auxiliary power 24 V UC	**6DR2410-4**
• For auxiliary power 230 V/115 V AC, switchable	**6DR2410-5**
Accessories (signal converters)	
Module for analog signals • For current 0/4 ... 20 mA or voltage 0/0.2 ... 1 V or 0/2 ... 10 V	**6DR2800-8J**
• For resistance-based sensors (R module)	**6DR2800-8R**
• UNI module for TC/RTD/R/mV signals, programmable	**6DR2800-8V**
• Reference junction terminal for TC, internal (use in connection with UNI module)	**6DR2805-8A**
• With 3 analog outputs 0/4 ... 20 mA and 3 binary inputs	**6DR2802-8B**
• With 3 analog inputs 0/4 ... 20 mA or 0/0.2 ... 1 V or 0/2 ... 10 V	**6DR2800-8A**
Module for switching signals • With 5 binary inputs	**6DR2801-8C**
• With 4 binary outputs and 2 binary inputs	**6DR2801-8E**
• With 2 relay outputs	**6DR2801-8D**
Coupling relay module • With 4 relays (250 V AC)	**6DR2804-8A**
• With 2 relays (250 V AC)	**6DR2804-8B**
Interface modules • For serial communication (SES) via RS 232 or RS 485	**6DR2803-8C**
• PROFIBUS DP module	**6DR2803-8P**
Documentation	
The entire documentation is available for download free of charge in various languages at: http://www.siemens.com/processin-strumentation/documentation	
SIPART DR24 - 6DR2410 controller, operating instructions • German, English	**C79000-G7400-C153**
SIPART DR22 / DR24 - 6DR2210-4/-5 and 6DR2410-4/-5 controllers, installation and operating manual • German, English	**C79000-M7474-C38**
Serial SIPART DR24 - bus interface, operating instructions • German, English	**C73000-B7400-C135**

Scope of delivery

The scope of delivery of the SIPART DR24 multifunction unit includes:

• 1 process controller according to the configuration
• 1 device plug according to IEC 320/V with auxiliary power 115/230 V AC or one plug with auxiliary power 24 V UC
• 2 clamping elements, plug-in

Signal converters and accessories

The signal converters/modules are described in Catalog MP 31, section 5.

The software for assigning parameters via PC, coupling to systems and the accessories for coupling (plugs, cable drivers etc.) can be found in catalog section 6.

■ Dimensional drawings

No. of devices	Cut-out width b
2	140+1
3	212+1
4	284+1
...	...
10	716+1
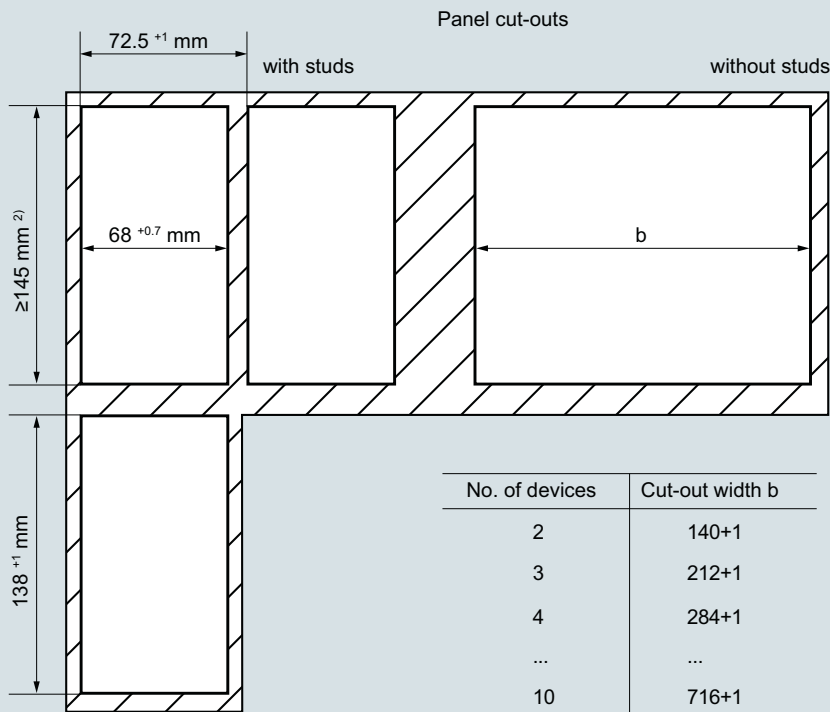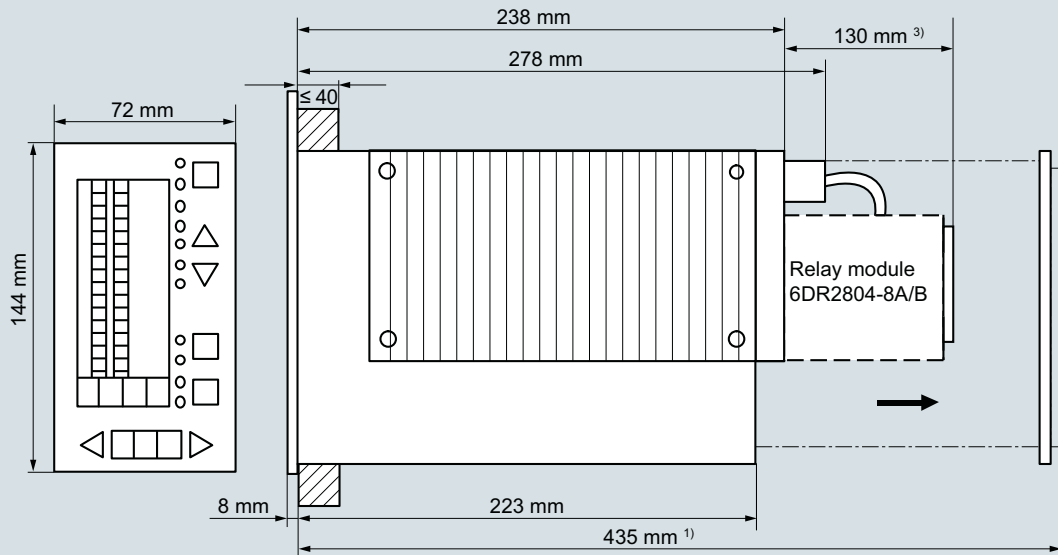
SIPART DR24 multifunction unit and panel cutouts, dimensions in mm

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SIPART DR24 multifunction unit

Accessories

Accessories

Signal converters for SIPART DR24

Modules for analog signals		SIPART DR24					Description on page
		Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	
U/I module	**6DR2800-8J**	AE4	AE5	-	-	-	**5/4**
3 × U/I module	**6DR2800-8A**	-	-	-	AE9/10/11	AE6/7/8	**5/5**
R module	**6DR2800-8R**	AE4	AE5	-	-	-	**5/6**
Pt 100 module	**6DR2800-8P**	(AE4)[*]	(AE5)[*]	-	-	-	**5/7**
UNI module (TC/RTD/R/U/I)	**6DR2800-8V**	AE4	AE5	-	-	-	**5/8**
3AA/3BE	**6DR2802-8B**	-	-	-	AA7/8/9 BE5/6/7	AA4/5/6 BE10/11/12	**5/11**

[*] Preferably use UNI module 6DR2800-8V.

Modules for switching signals		SIPART DR24					Description on page
		Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	
5BE	**6DR2801-8C**	-	-	-	BE5/6/7/8/9	BE10/11/12/13/14	**5/12**
2BA relay module	**6DR2801-8D**	-	-	-	BA9/10	BA13/14	**5/13**
4BA/2BE	**6DR2801-8E**	-	-	-	BA9/10/11/12 BE5/6	BA13/14/15/16 BE10/11	**5/14**

Interface module		SIPART DR24					Description on page
		Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	
SES module	**6DR2803-8C**						**5/15**
• RS 232/SIPART bus		-	-	Yes	-	-	**5/15**
• RS 485		-	-	Yes	-	-	**5/15**
PROFIBUS DP module	**6DR2803-8P**	-	-	Yes	-	-	**5/16**

Coupling relay module		SIPART DR24	Description on page
Mounting on the back is possible:			
With 4 relays	**6DR2804-8A**	Yes	**5/17**
With 2 relays	**6DR2804-8B**	Yes	**5/17**

In connection with the UNI module 6DR2800-8V, the following can be used depending on the application:		Description on page
Reference junction terminal	**6DR2805-8A**	**5/8**

SIPART DR signal converters

You can download all instructions, catalogs and certificates for rocess controllers free of charge at the following Internet address: www.siemens.com/process-controllers

SIPART DR signal converters

Introduction

Overview
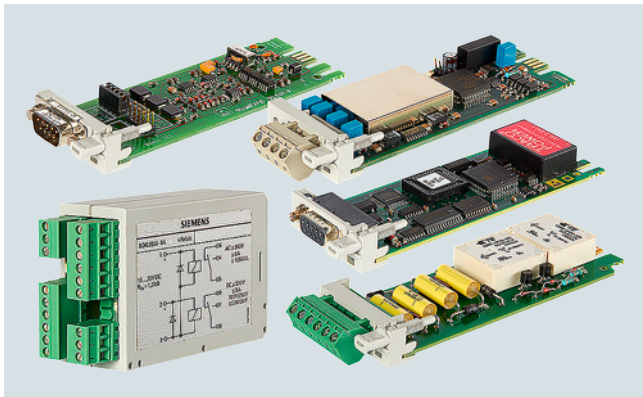
The modular structure of the process controllers enables the
basic unit to be converted and retrofitted with signal converters
with various functions. The option modules are inserted into slots
on the back of the closed device and thus expand the range of
application of the SIPART controller.

■ **Overview** (continued)

Range of application of the SIPART DR signal converters

The following tables provide a detailed overview of the range of application of the different signal converters on the SIPART devices:

Modules for analog signals		SIPART DR21	SIPART DR22	SIPART DR24	Description on page
		Slot	Slot	Slot	
U/I module	6DR2800-8J	1/2	2/3	2/3	5/4
3 × U/I module	6DR2800-8A	-	5/6	5/6	5/5
R module	6DR2800-8R	1/2	2/3	2/3	5/6
Pt 100 module	6DR2800-8P	1/2	2/3	2/3	5/7
UNI module	6DR2800-8V	1	2/3	2/3	5/8
3AA/3BE	6DR2802-8B	-	5/6	5/6	5/11

Modules for switching signals		SIPART DR21	SIPART DR22	SIPART DR24	Description on page
		Slot	Slot	Slot	
5BE	6DR2801-8C	3	5/6	5/6	5/12
2BA relay module	6DR2801-8D	3	5/6	5/6	5/13
4BA/2BE	6DR2801-8E	3	5/6	5/6	5/14

Interface module		SIPART DR21	SIPART DR22	SIPART DR24	Description on page
		Slot	Slot	Slot	
SES module	6DR2803-8C				5/15
• RS 232/SIPART bus		4	4	4	5/15
• RS 485		4	-	-	5/15
PROFIBUS DP module	6DR2803-8P	4	4	4	5/16

Coupling relay module		SIPART DR21	SIPART DR22	SIPART DR24	Description on page
Mounting on the back of the following controllers is possible:					
With 4 relays	6DR2804-8A	Yes	Yes	Yes	5/17
With 2 relays	6DR2804-8B	Yes	Yes	Yes	5/17

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SIPART DR signal converters
Modules for analog signals

U/I module (6DR2800-8J)

■ Overview
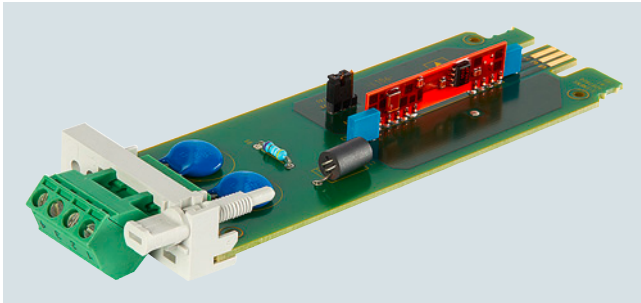
U/I module for current and voltage input

A current or voltage signal can be connected with this signal converter. The signal converter is used to expand the analog inputs and offers galvanic isolation by means of a differential amplifier with high common mode rejection.

Switchover between the current and voltage input takes place via coding jumpers on the module and through different wiring.

The 0 to 20 mA, 4 to 20 mA, 0 to1 V, 0.2 to 1 V, 0 to 10 V or 2 to 10 V signal range and assignment to the function inputs are defined by configuration in the controller.

When used as current input, the input resistance is 49.9 Ω. Due to the high common mode rejection, multiple inputs or other consumers can be connected in series.

When used as voltage input, the input resistance is 200 kΩ.

■ Technical specifications

U/I module 6DR2800-8J	Current	Voltage
Measuring range start	0 or 4 mA	0 or 0.2 V or 2 V
Measuring range end	20 mA	1 V or 10 V
Total operating range	-0.8 ... 23 mA	-4 % ... 115 %
Input resistance		
• Difference	49.9 Ω ± 0.1 %	200 kΩ
• Common mode	500 kΩ	≥ 200 kΩ
Permissible common mode voltage (rated range)	0 ... +10 V	0 ... +10 V
Filter time constant ± 20 %	50 ms	50 ms
Error without A/D conversion		
• Zero point	≤ 0.3 %	≤ 0.2 %
• Gain	≤ 0.5 %	≤ 0.2 %
• Linearity	≤ 0.05 %	≤ 0.05 %
• Common mode	≤ 0.07 %/V	≤ 0.02 %/V
Influence of temperature without A/D conversion		
• Zero point	≤ 0.05 %/10 K	≤ 0.02 %/10 K
• Gain	≤ 0.1 %/10 K	≤ 0.1 %/10 K

■ Circuit diagrams

5
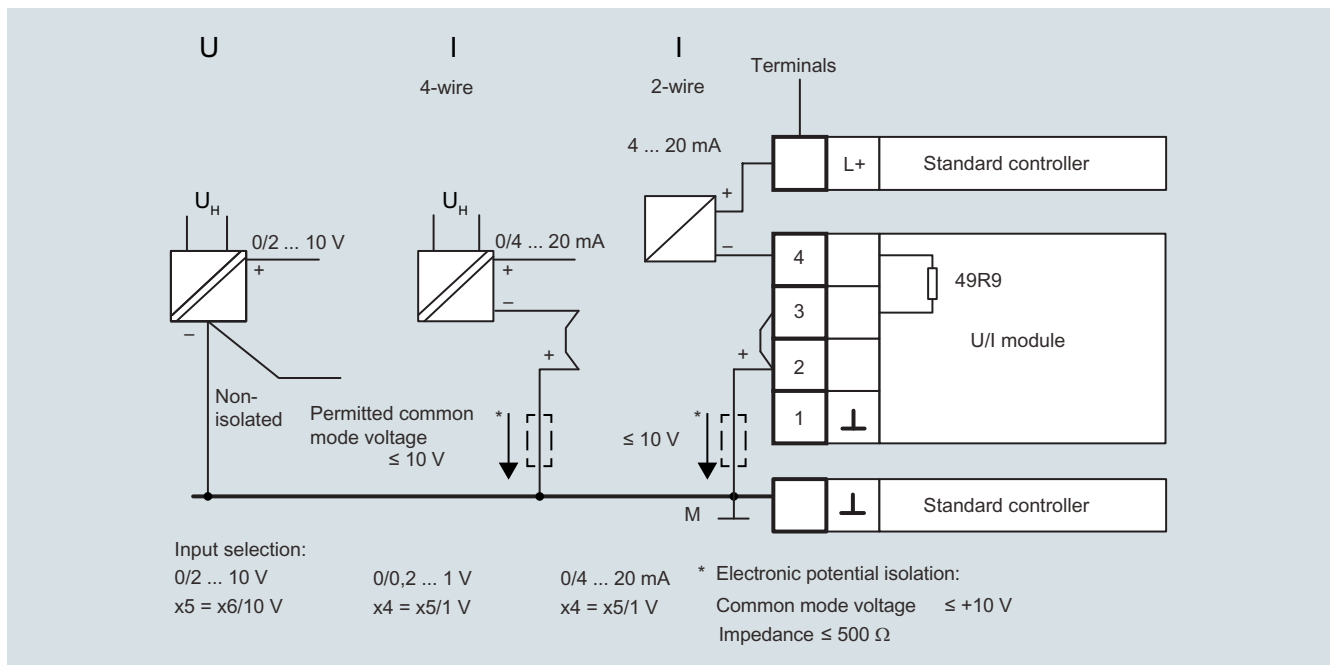
Wiring of U/I module 6DR2800-8J

Overview
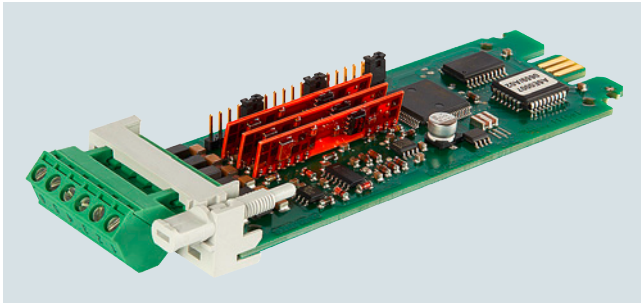
3 × U/I module for current and voltage input

This signal converter has 3 channels (inputs) for connecting current or voltage signals. The signal converter is used to expand the analog inputs in the SIPART DR22 process controller or in the SIPART DR24 multifunction unit and offers galvanic isolation by means of differential amplifiers with high common mode rejection.

Switchover between the current and voltage input is possible separately for each channel and takes place via coding jumpers on the module itself. In addition, the wiring is different for I and for U signals.

The signal range 0 to 20 mA, 4 to 20 mA, 0 to1 V, 0.2 to 1 V, 0 to 10 V or 2 to 10 V and the assignment to the function inputs is defined by configuration in the controller.

When used as current input, the input resistance is 49.9 Ω. Due to the high common mode rejection, multiple inputs or other consumers can be connected in series.

When used as voltage input, the input resistance is 200 kΩ.

The plug-in screw terminal is included in the scope of delivery.

Technical specifications

3 × U/I module 6DR2800-8A	Current	Voltage
Measuring range start	0 or 4 mA	0 or 0.2 V or 2 V
Measuring range end	20 mA	1 V or 10 V
Total operating range	-0.8 ... 23 mA	-4 % ... 115 %
Input resistance		
• Difference	49.9 Ω ± 0.1 %	200 kΩ
• Common mode	500 kΩ	≥ 200 kΩ
Permissible common mode voltage (rated range)	0 ... +10 V	0 ... +10 V
Filter time constant ± 20 %	50 ms	50 ms
Error without A/D conversion		
• Zero point	≤ 0.3 %	≤ 0.2 %
• Gain	≤ 0.5 %	≤ 0.2 %
• Linearity	≤ 0.05 %	≤ 0.05 %
• Common mode	≤ 0.07 %/V	≤ 0.02 %/V
Influence of temperature without A/D conversion		
• Zero point	≤ 0.05 %/10 K	≤ 0.02 %/10 K
• Gain	≤ 0.1 %/10 K	≤ 0.1 %/10 K

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Circuit diagrams

Wiring of 3 × U/I module 6DR2800-8A

SIPART DR signal converters
Modules for analog signals

R module (6DR2800-8R)

Overview
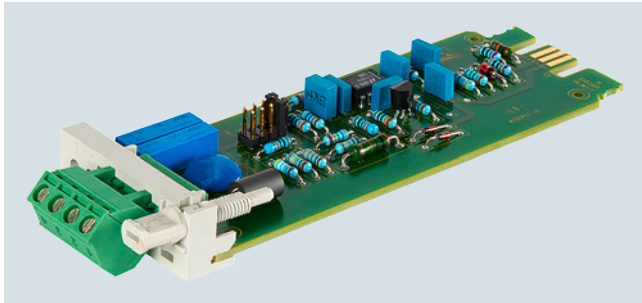
R module for resistance input (potentiometer)

A potentiometer with a nominal resistance between 80 and 1200 Ω can be connected with this signal converter. The signal range is selected by routing (80 to 220 Ω, 200 to 500 Ω or 470 to 1200 Ω) on the signal converter.

With an inserted module, fine adjustment for the start of scale value and full scale value takes place using a potentiometer on the back of the module.

Assignment to the function inputs is defined by structuring in the controller.

This module can also be routed as a current input. This function is preferably used if the start and end values of the current signal do not correspond exactly to the standard signal ranges and are to be adjusted. The input resistance is then 49.9 Ω.

The input is non-isolated.

The plug-in screw terminal is included in the scope of delivery.

Technical specifications

R module 6DR2800-8R	
Measuring range start	0 Ω
Span, min.	$\Delta R \geq 0.3 \bullet R$
Max. zero point suppression	$R_A \leq 0.2 \bullet R$
End	$R_A + 1.1 \bullet R$
	R can be set in 3 spans 200 - 500 - 1000 Ω
Total operating range	-5 % ... 105 %
Supply current	5 mA ± 5 %
Cable resistances R_i	
• Two-wire system	< 10 Ω
• Three-wire system	< 10 Ω
• Four-wire system	< 10 Ω
Filter time constant ± 20 %	50 ms
Error without A/D conversion	
• Zero point	≤ 0.2 %
• Gain	≤ 0.2 %
• Linearity	≤ 0.2 %
Influence of temperature without A/D conversion	
• Zero point	≤ 0.1 %/10 K
• Gain	≤ 0.3 %/10 K

5

Circuit diagrams
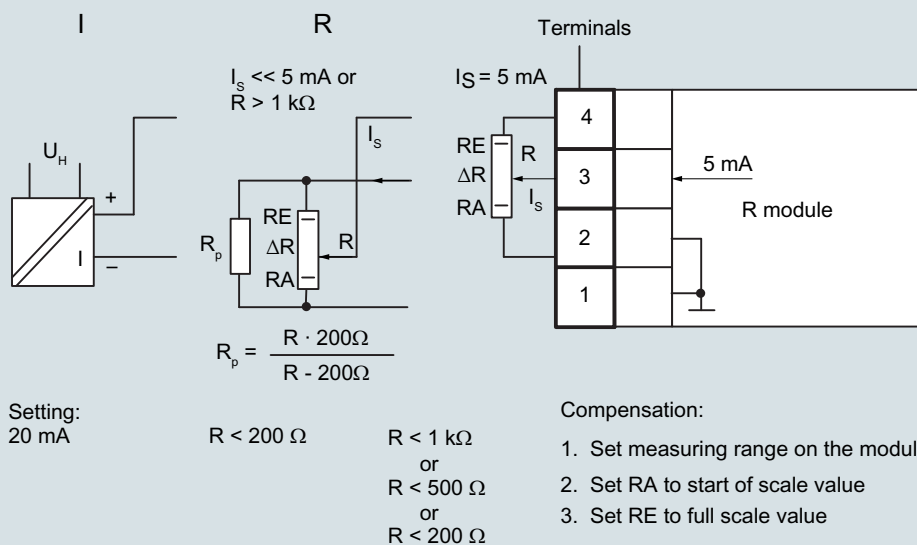
Wiring of R module 6DR2800-8R

Overview
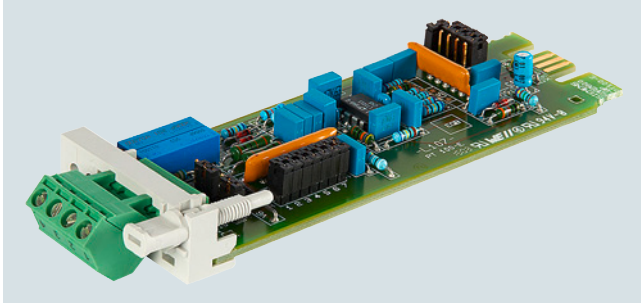
Pt 100 module for Pt 100 resistance thermometer

A Pt 100 resistance thermometer (RTD) can be connected via the signal converter.

Note:

The connection type (two-wire, three-wire or four-wire system) and the start of scale value and full scale value are selected by means of routing on the signal converter module.

With an installed module, fine adjustment for the start of scale value and full scale value takes place using a potentiometer on the back of the module.

The output signal is temperature-linear.

The plug-in screw terminal is included in the scope of delivery.

Technical specifications

Pt 100 module 6DR2800-8P	
Measuring range start	$R_{tA} \geq 80.25\ \Omega\ (T_A \geq -50\ °C)$
Span, min.	$\Delta R = 19\ \Omega\ (\Delta t = 50\ °C)$
Max. zero point suppression	$R_{tA} \leq 5 \bullet \Delta R$
End	$R_{tE} \leq 390.26\ \Omega\ (t_E \leq 850\ °C)$
Total operating range	-5 % ... 105 %
Supply current	100 mV/ΔR
Cable resistances R_i	
• Two-wire system	$R_{L1} + R_{L2} \leq 10\ \Omega$
• Three-wire system	$R_{L1} = R_{L2} = R_{L3} \leq 50\ \Omega$
• Four-wire system	$R_L \leq 80\ \Omega$
Filter time constant ± 20 %	50 ms
Error without A/D conversion	
• Zero point	≤ 0.1 %
• Gain	≤ 0.1 %
• Linearity	≤ 0.3 %
Influence of temperature without A/D conversion	
• Zero point	≤ 0.2 %/10 K
• Gain	≤ 0.3 %/10 K

Circuit diagrams
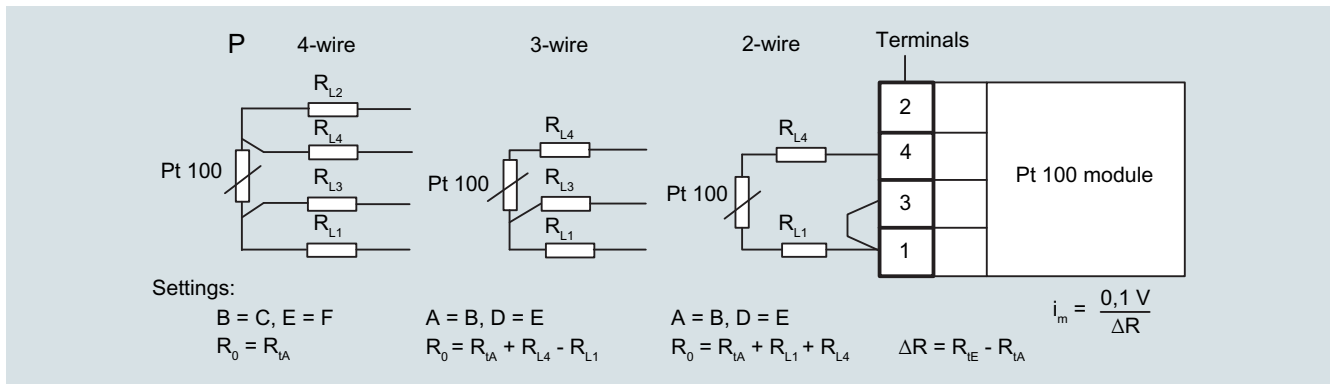
Wiring of Pt 100 module 6DR2800-8P

SIPART DR signal converters
Modules for analog signals

UNI module (6DR2800-8V)

Overview
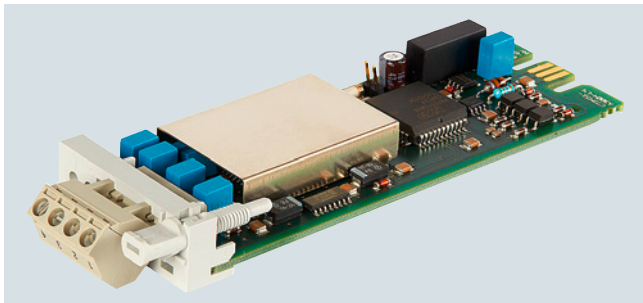
UNI module (6DR2800-8V)

The UNI module 6DR2800-8V is used to connect the following sensors:

- Pt 100 resistance thermometer (RTD)
  in 2-wire, 3-wire or 4-wire system
- Thermocouples (TC)
  with internal or external reference junction. A reference junction terminal 6DR2805-8A is required for connection to thermocouples with internal reference junction.
- mV sensor
- Resistance-based sensor (potentiometer) (R)
  in 2-wire system
- U/I input (10 V/20 mA)[1]

This signal converter has galvanic isolation.

The module is suitable for use in the SIPART DR21, SIPART DR22 and SIPART DR24 process controllers. The module is structured and set in the configuring level StrS (configuring switch) and CAE (calibrating analog input) of these controllers. Settings on the module are not required.

The plug-in screw terminal is included in the scope of delivery.

Reference junction terminal (6DR2805-8A)

This terminal is used in connection with the UNI module for temperature measurement with thermocouples with an internal reference junction. It consists of a temperature sensor that is pre-mounted on a terminal block and protected with lacquer to prevent mechanical damage.

[1] 20 mA and 10 V signals via an additional measuring range connector 6DR2805-8J

■ Technical specifications

UNI module 6DR2800-8V

Pt 100 resistance thermometer (RTD)

Wire resistance	
• Two-wire system	$R_{Ab} = R_{L1} + R_{L4}$ parameterizable or automatic adjustment by configuration
	$R_{L1} + R_{L4} \leq 50\ \Omega$
• Three-wire system	No adjustment necessary if $R_{L1} = R_{L2} = R_{L4}$
	$R_{L1},\ R_{L2},\ R_{L4} \leq 50\ \Omega$
• Four-wire system	$R_{L1} ... R_{L4}$, each $\leq 100\ \Omega$
Measuring current	400 µA
Measuring range, parameterizable	
• Start	mA ≥ -200 °C
• End	mA ≤ +850 °C
Min. recommended span	10 k
Characteristic	Temperature-linear
Filter time constant	< 2 s adaptive
Galvanic isolation	
• Permissible common mode voltage	≤ 50 V UC
Test voltage	500 V AC

Thermocouples (TC)

Thermocouples, can be structured according to DIN IEC 584 Part 1		Type
	Cu-CuNi	T
	Fe-CuNi	J
	NiCr-Ni	K
	NiCr-CuNi	E
	Pt10Rh-Pt	S
	Pt13Rh-Pt	R
	Pt30Rh-Pt6Rh	B
	NiCrSi-NiSi	N
According to DIN 43 710	Cu-CuNi	U
	Fe-CuNi	L

Reference junction compensation	
• Internal	Reference junction terminal 6DR2805-8A required
• External	Temperature of the external reference junction is parameterizable
Wire resistance	≤ 300 Ω
Measuring range, parameterizable	
• Start	≥ -175 mV
• End	≤ +175 mV
Min. recommended span	5 mV
Characteristic, configurable	Voltage-linear or temperature-linear
Filter time constant	< 2 s adaptive
Input current	
Galvanic isolation	
• Permissible common mode voltage	≤ 50 V UC
• Test voltage	500 V AC
Static destruction limit between the inputs	± 35 V

UNI module 6DR2800-8V

Voltage mV

Measuring range, parameterizable	
• Start	≥ -175 mV
• End	≤ +175 mV
Min. recommended span	5 mV
Wire resistance	≤ 1 kΩ
Characteristic	Voltage-linear
Input current	≤ 1 µA
Galvanic isolation	
• Permissible common mode voltage	≤ 50 V UC
• Test voltage	500 V AC
Static destruction limit between the inputs	± 35 V

Resistance-based sensor R

	Measuring range	
Measuring range, parameterizable measuring range limits including cable resistance	$R_{tot} \leq 600\ \Omega$	$R_{tot} \leq 2.8\ k\Omega$
Min. recommended span	30 Ω	70 Ω
Supply current	400 µA	140 µA
Linearity error	± 60 mΩ	± 0.2 mΩ

Current mA

With additional measuring range connector 6DR2805-8J, with integrated load for smart devices

Measuring range, adjustable	
• Start	0/4 mA ≅ 0/20 mV
• End	20 mA ≅ 100 mV
Transmission error	± 0.3 %
Input resistance	50 Ω
Input resistance smart	250 Ω
Galvanic isolation	
• Permissible common mode voltage	UC ≤ 50 V
Static destruction limit between the inputs	± 40 V

Voltage 10 V

With additional measuring range connector 6DR2805-8J

Measuring range, parameterizable	
• Start	0/2 V ≅ 0/20 mV
• End	10 V ≅ 100 mV
Transmission error	± 0.2 %
Input resistance	90 kΩ
Galvanic isolation	
• Permissible common mode voltage	UC ≤ 50 V
Static destruction limit between the inputs	± 100 V

5

SIPART DR signal converters

Modules for analog signals

UNI module (6DR2800-8V)

■ **Circuit diagrams**
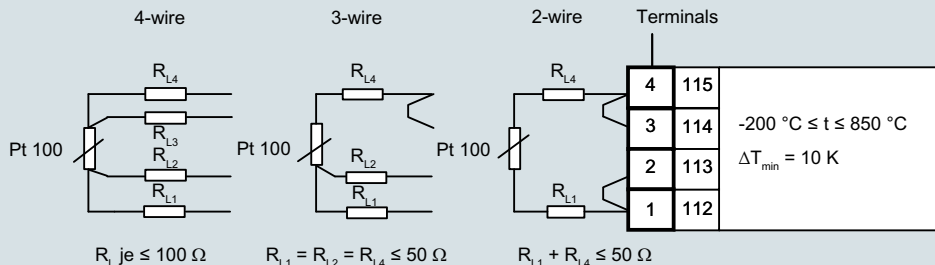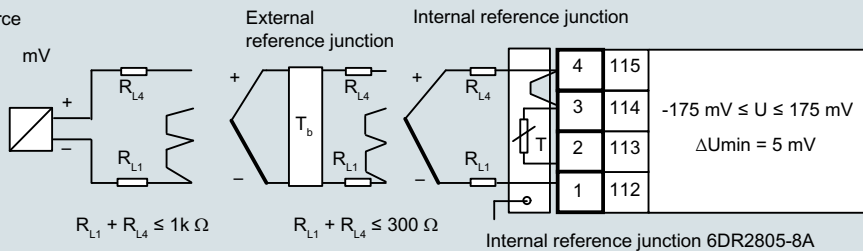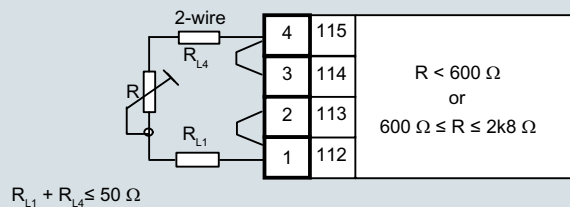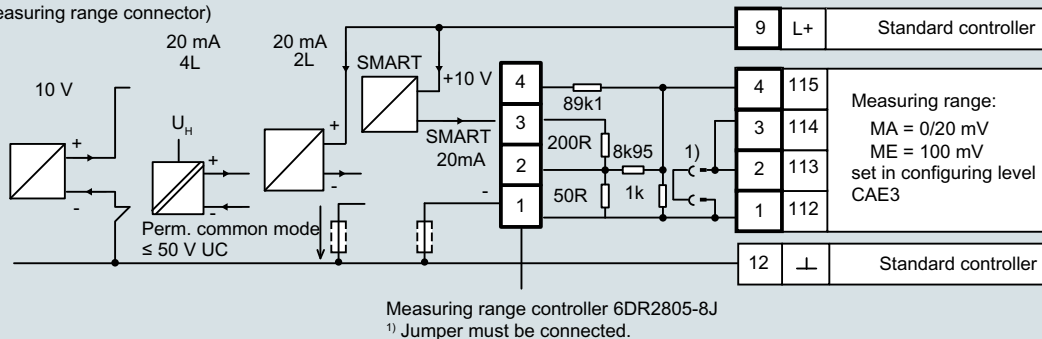
Wiring of UNI module 6DR2800-8V

■ Overview
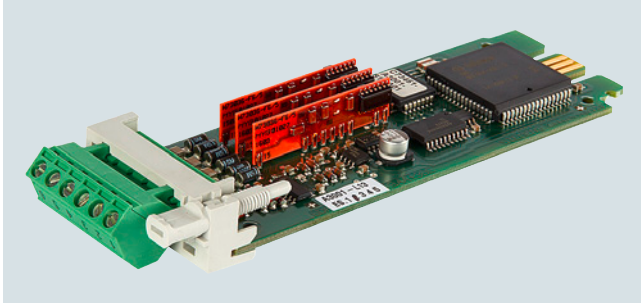
3AA/3BE module for expanding analog outputs and binary inputs

The 3AA/3BE module is suitable for use in the SIPART DR22 and DR24 controllers.

The functions and the direction of action are assigned by means of settings in the controller.

The plug-in screw terminal is included in the scope of delivery.

■ Technical specifications

3AA/3BE module 6DR2802-8B	
Analog outputs	
Nominal signal range (0 ... 100 %)	0 ... 20 mA or 4 ... 20 mA
Total operating range	0 ... 20.5 mA or 3.8 ... 20.5 mA
Load voltage	From -1 ... 18 V
No-load voltage	≤ 26 V
Inductive load	≤ 0.1 H
Time constant	10 ms
Residual ripple 900 Hz	≤ 0.2 %
Resolution	10 bits
Load dependence	≤ 0.1 %
Zero point error	≤ 0.3 %
Full-scale value error	≤ 0.3 %
Linearity	≤ 0.05 %
Binary inputs	
Signal state "0"	≤ 4.5 V or open
Signal state "1"	≥ 13 V
Input resistance	≥ 27 kΩ
Static destruction limit between the inputs	± 35 V

■ Circuit diagrams
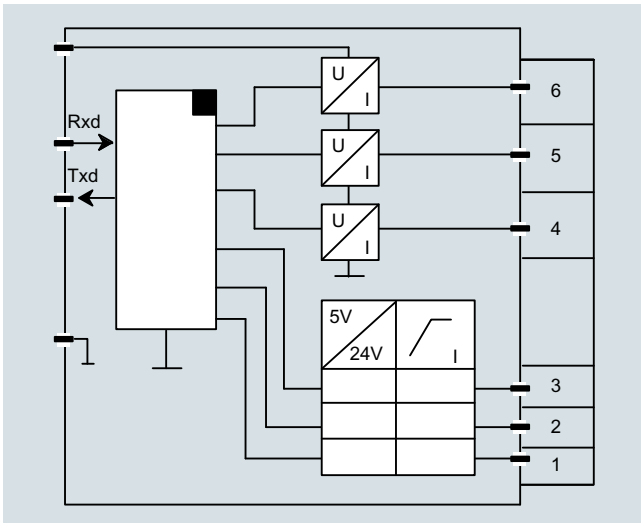
Wiring of 3AA/3BE module 6DR2802-8B

Assignment of terminal to the analog outputs (AA) and the binary inputs (BE); depending on the slot

Terminal	SIPART DR22 and DR24	
	Slot 5	Slot 6
	Analog output	
6	AA9	AA6
5	AA8	AA5
4	AA7	AA4
	Binary input	
3	BE7	BE12
2	BE6	BE11
1	BE5	BE10

5

SIPART DR signal converters
Modules for switching signals

5BE module (6DR2801-8C)

■ Overview
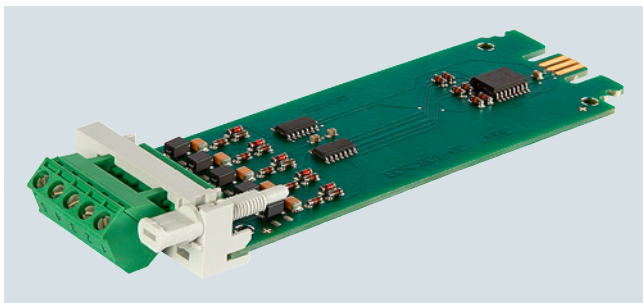
5BE module for expanding the binary inputs

Module with 5 binary inputs.

The functions and the direction of action are assigned by means of configuring switches in the controller.

The plug-in screw terminal is included in the scope of delivery.

■ Technical specifications

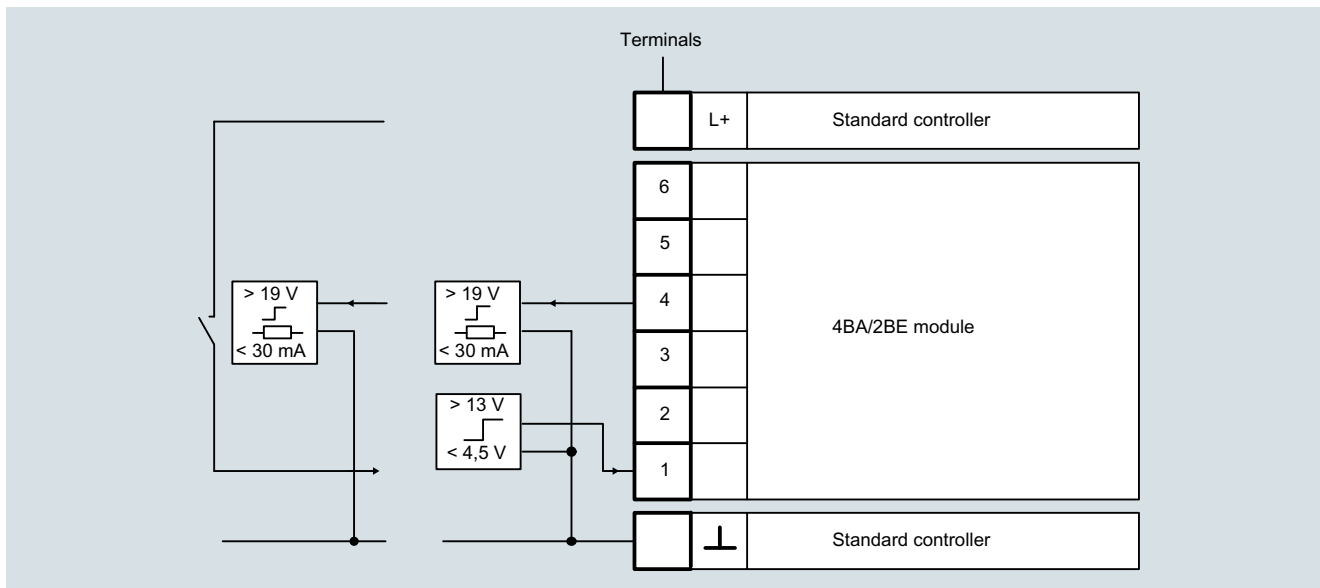| 5BE module 6DR2801-8C	
Binary inputs	
Signal state "0"	≤ 4.5 V or open
Signal state "1"	≥ 13 V
Input resistance	≥ 27 kΩ
Static destruction limit between the inputs	± 35 V

■ Circuit diagrams
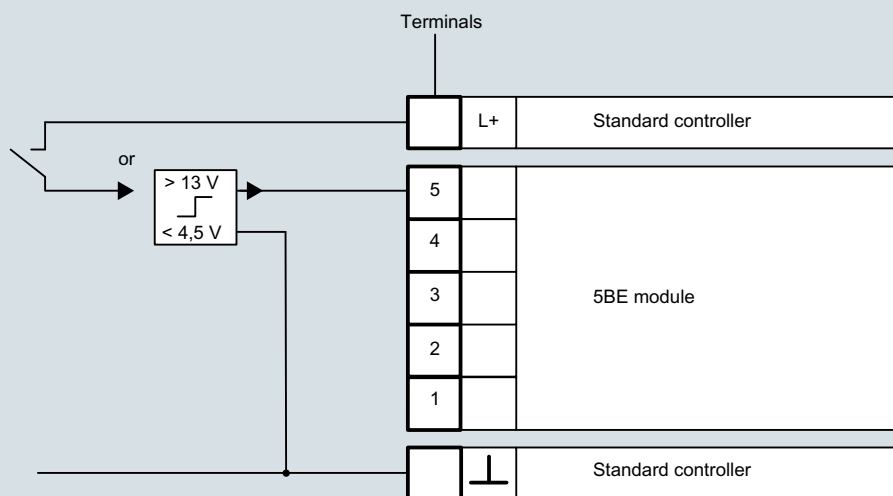
Wiring of 5BE module 6DR2801-8C

Assignment of terminals to binary input (BE); depending on the device variant and slot

Terminal	SIPART DR21	SIPART DR22 and DR24	
		Slot 5	Slot 6
5	BE7	BE9	BE14
4	BE6	BE8	BE13
3	BE5	BE7	BE12
2	BE4	BE6	BE11
1	BE3	BE5	BE10

5

Overview
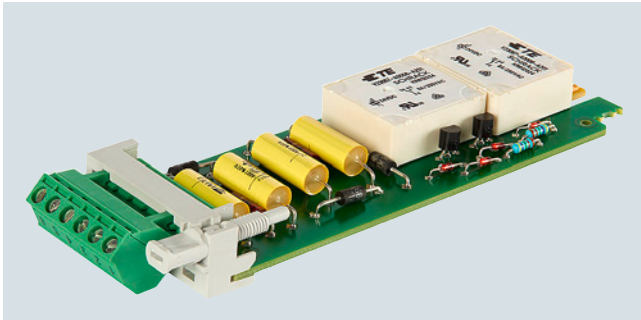
2BA relay module for expanding the binary outputs

Relay output module for 2 binary outputs. Floating changeover contact, withstands loads up to 35 V.

The functions and the direction of action are assigned by means of configuring switches in the controller.

The RC combinations of the spark extinguishing elements are each parallel to the normally closed and normally open contact. In the case of AC consumers with very low power, the current flowing with open contact over the spark extinguishing capacitor (1 mF) can cause a problem (e.g. holding current in contactors). In this case, the capacitors should be replaced by capacitors with low capacity values or removed.

The 68 V suppressor diodes in parallel to the contacts also take effect and limit the induced voltage.

The plug-in screw terminal is included in the scope of delivery.

Technical specifications

2BA relay module 6DR2801-8D		
Contact material	Ag/Ni	
Contact rating	AC	DC
• Max. switching voltage	$\leq$ 35 V	$\leq$ 35 V
• Max. switching current	$\leq$ 5 A	$\leq$ 5 A
• Max. switching capacity	$\leq$ 150 VA	$\leq$ 150 W at 24 V
		$\leq$ 80 W at 30 V
Lifetime		
• Mechanical	$2 \cdot 10^7$ switching cycles	
• Electr. 24 V, 4 A, ohmic load	$2 \cdot 10^6$ switching cycles	
• Electr. 24 V, 1 A, inductive	$2 \cdot 10^5$ switching cycles	
Spark extinguishing element	Series connection of 1 µF with 22 Ω, 68 V suppressor diodes in parallel	

Circuit diagrams
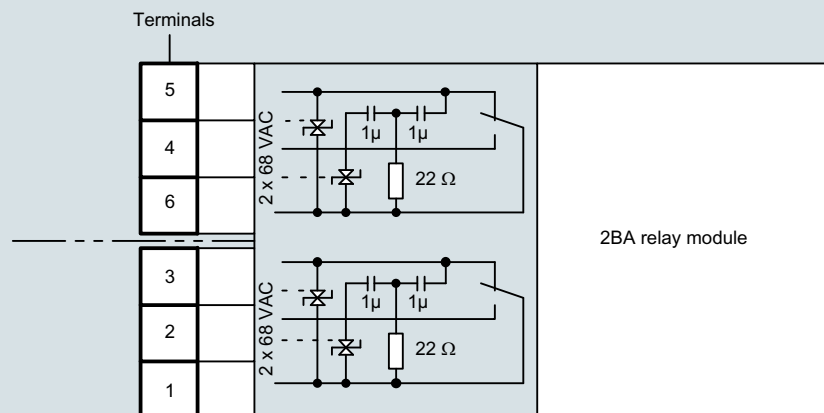
Wiring of 2BA relay module 6DR2801-8D

Assignment of terminals to binary output (BA); depending on the device variant and slot

Terminals	SIPART DR21	SIPART DR22 and DR24	
		Slot 5	Slot 6
4, 5, 6	BA4	BA10	BA14
1, 2, 3	BA3	BA9	BA13

SIPART DR signal converters
Modules for switching signals

4BA/2BE module (6DR2801-8E)

Overview
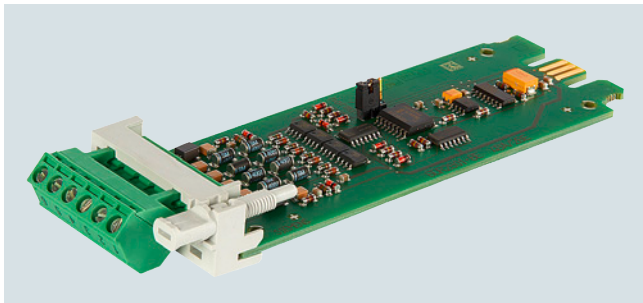
4BA/2BE module for expanding the binary inputs and binary outputs

Module with 2 binary inputs and 4 active binary outputs.

The functions and the direction of action are assigned using configuring switches.

The plug-in screw terminal is included in the scope of delivery.

Technical specifications

4BA/2BE module 6DR2801-8E	
Binary inputs	
Signal state "0"	≤ 4.5 V or open
Signal state "1"	≥ 13 V
Input resistance	≥ 27 kΩ
Static destruction limit between the inputs	± 35 V
Binary outputs	
Signal state "0"	≤ 1.5 V
Signal state "1"	19 ... 26 V
Load current	≤ 30 mA
Short-circuit current	≤ 50 mA
Static destruction limit between the inputs	-1 V or + 35 V

Circuit diagrams

Wiring of 4BA/2BE module 6DR2801-8E

Assignment of terminals to binary input (BE) and binary output (BA); depending on the device variant and slot

Terminals	SIPART DR21	SIPART DR22 and DR24	
		Slot 5	Slot 6
6	BE4	BE6	BE11
5	BA6	BA12	BA16
4	BA5	BA11	BA15
3	BA4	BA10	BA14
2	BA3	BA9	BA13
1	BE3	BE5	BE10

[1] BLPS = Block, parameterize and structure.

Overview
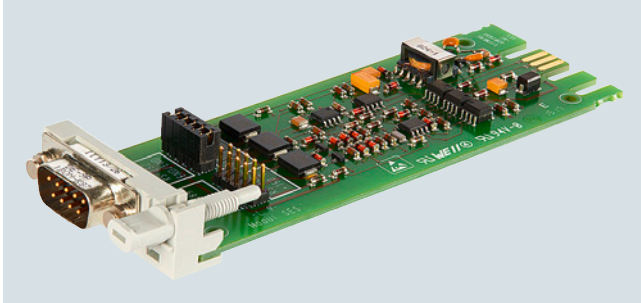
SES module (serial interface for RS 232 and RS 485)

All process variables can be sent via the interface module and all operating states, setpoints, manipulated variables, parameters and configurations can be sent and received.

Serial interface traffic can take place over RS 232 as point-to-point connection.

With use in SIPART DR21, DR22 and DR24 controllers, data traffic is also possible over RS 485 as serial databus.

Switchover between RS 232 and RS 485 takes place by means of jumper plugs on the module.

A detailed technical description of the frame traffic is available per controller type for creation of specific coupling software.

The interface module offers galvanic isolation between the individual controllers and the higher-level system.

Technical specifications

SES module 6DR2803-8C	
Transmittable signals	RS 232 or RS 485
Transmittable data	Operating state, process variables, parameters and configuring switches
Transmission procedure	According to DIN 66 258 A or B
Character format	10 bits (start bit, ASCII characters with 7 bits, parity bit and stop bit)
Transmission speed	300 ... 9600 bit/s
Transmission	Asynchronous, half-duplex
Addressable stations	32
Time monitoring of the data traffic	1 ... 25 s or none
Galvanic isolation	Up to 50 V UC
RS232 point-to-point	
Cable capacitance[1]	≤ 2.5 nF
Guideline value cable length • Flat ribbon cable without shield • Round cable with shield	≤ 50 m ≤ 25 m
RS485 bus	
Cable capacitance[1]	≤ 200 nF
Guideline value cable length • Flat ribbon cable without shield • Round cable with shield	≤ 1200 m ≤ 600 m

[1] The cable capacitance limits the permissible cable length.

Circuit diagrams
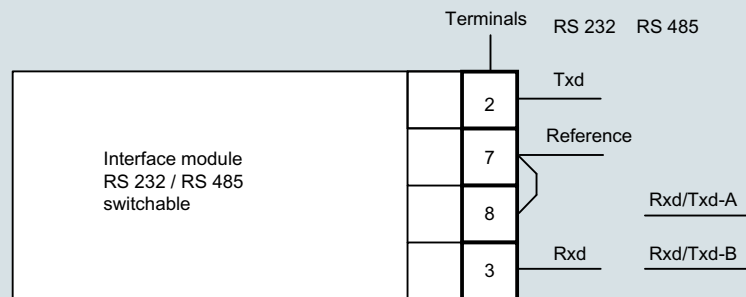
Wiring of SES module 6DR2803-8C

SIPART DR signal converters
Interface modules

PROFIBUS DP interface (6DR2803-8P)

Overview
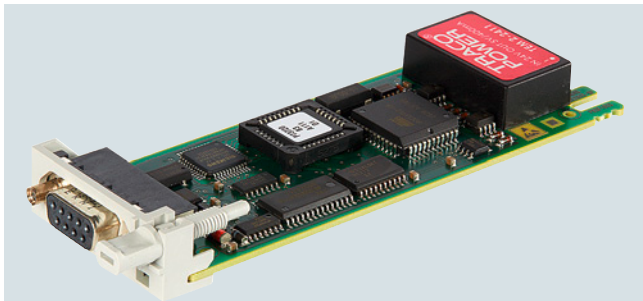
Module 6DR2803-8P
(PROFIBUS DP interface for SIPART DR)

The PROFIBUS DP interface for SIPART DR controllers is designed as a plug-in option module. It can be inserted in all SIPART DR controllers supplied to date in the slot provided for the SES interface.

The interface module complies directly (without additional cable driver) with PROFIBUS DIN 19245, Part 1 and Part 3.

The module has a 9-pin D-sub socket for connection to PROFIBUS DP. Standardized PROFIBUS plugs can be inserted here.

Data is transmitted via a twisted RS 485 two-wire line. Auxiliary power supply of the module takes place internally directly from the controller.

The firmware of the controllers SIPART DR21, DR22 and DR24 was expanded to the address range 0 to 125 for delivery as of 6/96. Older controllers of these types (address range 0 to 31) can easily be converted.

The SIMATIC driver program (function blocks) is offered to connect the SIPART DR controllers via PROFIBUS DP to the SIMATIC S5/S7.

The GSD (generic station description) file is required to connect the SIPART DR controllers to any systems. Parameters are assigned to the DP master interface with this file.

Technical specifications

Module 6DR2803-8P	
Transmittable signals	RS 485, PROFIBUS DP protocol
Transmittable data	Operating state, process variables, parameters and configuring switches
Transmission procedure PROFIBUS DP protocol	According to DIN 19 245 Part 1 and Part 3
Certification by the PROFIBUS User Organization e.V.	Certificate no. Z00177 dated September 16, 1996
Transmission speed	9.6 Kbps ... 1.5 Mbps
Station no.	0 ... 125 (pay attention to software version of the controller)
Galvanic isolation between Rxd/TxD - P/-N and the device	Max. 50 V UC common mode voltage
Test voltage	500 V AC
Repeater control signal CNTR-P	5 V -0.4 V/+0.2 V, short-circuit proof
Cable lengths, at 1.5 Mbps per segment	200 m; for additional information, see ET 200 manual 6ES5 998-3ES12

Circuit diagrams
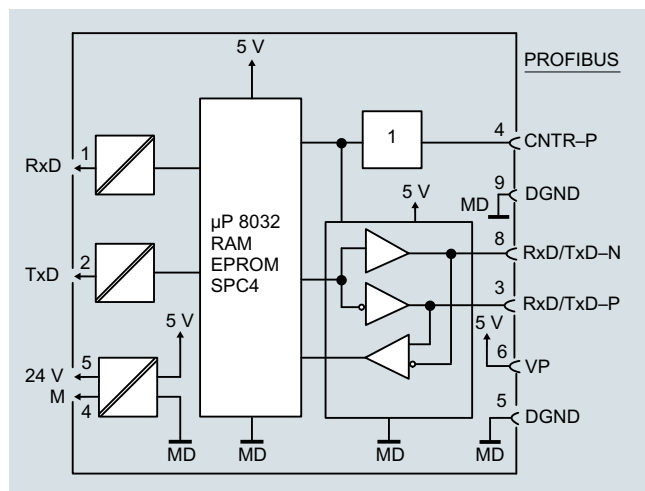
Wiring of module PROFIBUS DP 6DR2803-P

More information

The operating instructions on the PROFIBUS interface are available for download free of charge in various languages at:

http://www.siemens.com/processinstrumentation/documentation

The connection plug or connection cable must be ordered separately (e.g. from the Siemens Catalog IK PI, also with integrated terminating resistor).

Coupling relay with 4/2 relays (6DR2804-8A, 6DR2804-8B)

Overview
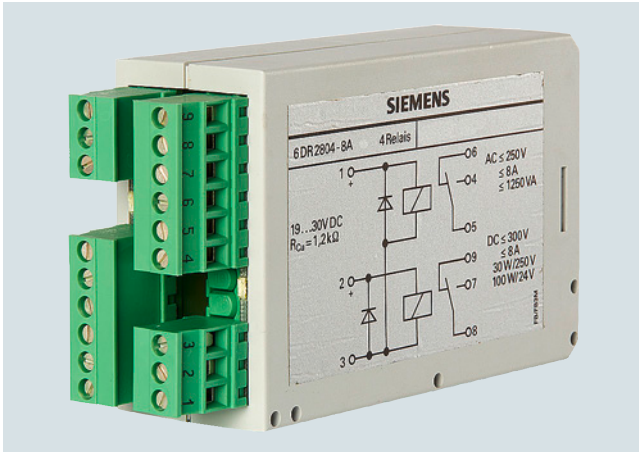
Coupling relays 230 V (4/2 relays) for snapping on to the back of the controller

The coupling relays can be clipped onto a mounting rail on the back of the SIPART DR21, SIPART DR22 or SIPART DR24 controllers. The mounting rail is included in the scope of delivery of the coupling relays.

The coupling relay 6DR2804-8A contains 4 relays. Two terminal strips with 9 terminals each are then available for wiring.

Notice:

Observe the max. switching voltage. (Resonance peaks with phase shifter motors)

Technical specifications

Coupling relays 6DR2804-8A, 6DR2804-8B (4/2 relays)		
Design of relays	One changeover contact each with spark extinguishing element	
Contact material	Silver cadmium oxide	
Contact rating	AC	DC
• Max. switching voltage	≤ 250 V	≤ 250 V
• Max. switching current	≤ 8 A	≤ 8 A
• Max. switching capacity	≤ 1 250 VA	≤ 100 W at 24 V
		≤ 30 W at 250 V
Lifetime		
• Mechanical	$2 \bullet 10^7$ switching cycles	
• Electr. 230 V AC, ohmic load	$2 \bullet 10^6$ switching cycles	
Spark extinguishing element	Series connection of 22 µF with 220 Ω, 420 V varistor in parallel	
Excitation winding[1]		
• Voltage	+19 ... 30 V	
• Resistance	1.2 kΩ ± 180 Ω	
Degree of protection EN 60529		
• Enclosure	IP50	
• Connectors inserted	IP20	
Enclosure material	Polyamide 66	
Mounting rail mounting, on	NS 35/7.5 DIN EN 50022	
	NS 35/15 DIN EN 50035	
	NS 32 DIN EN 50035	

[1] Safe separation between excitation winding and contacts through reinforced insulation according to DIN/VDE 0106 Part 100 (Nov. 1986). Air and creepage distances for overvoltage category III and pollution degree 2 according to DIN/VDE 0110 Part 1 January 1989. Safe separation between contact and relay module contact through reinforced insulation according to DIN/VDE 0106 Part 100 (Nov. 1986). Clearance and creepage distances for overvoltage category II and pollution degree 2 according to DIN/VDE 0110 Part 1 January 1989.

5

Circuit diagrams
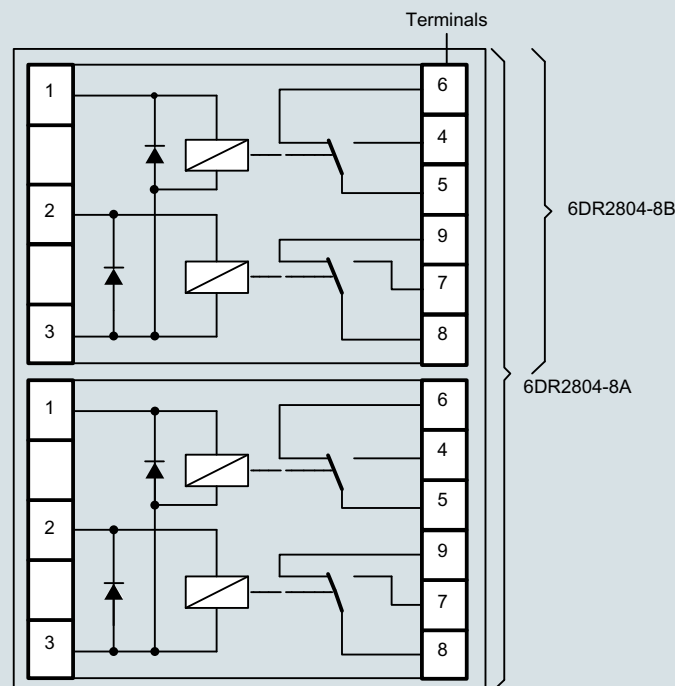
Wiring of coupling relays 6DR2804-8B and 6DR2804-8A

SIPART DR signal converters

Selection and ordering data

Selection and ordering data	Article No.
Modules for analog signals	
U/I module	
For current 0/4 ... 20 mA or voltage 0/0.2 ... 1 V or 0/2 ... 10 V	**6DR2800-8J**
3 × U/I module	
With 3 analog inputs 0/4 ... 20 mA or 0/0.2 ... 1 V or 0/2 ... 10 V (only SIPART DR24)	**6DR2800-8A**
R module	
For resistance-based sensors	**6DR2800-8R**
Pt 100 module	
For resistance thermometer Pt 100	**6DR2800-8P**
UNI module	
For TC/RTD/R/mV signals, programmable (SIPART DR21 only)	**6DR2800-8V**
3AA/3BE module	
For expanding analog outputs and binary inputs	**6DR2802-8B**
Modules for switching signals	
5BE module	
With 5 binary inputs	**6DR2801-8C**
2BA relay module	
With 2 relay outputs	**6DR2801-8D**
4BA/2BE module	
With 4 binary outputs and 2 binary inputs	**6DR2801-8E**
Interface modules	
SES module	
For serial communication (SES) via RS 232/RS 485	**6DR2803-8C**
2BA relay module	
With 2 relay outputs	**6DR2801-8D**
4BA/2BE module	
With 4 binary outputs and 2 binary inputs	**6DR2801-8E**
Coupling relay module	
Coupling relay	
• With 2 relays (250 V AC)	**6DR2804-8B**
• With 4 relays (250 V AC)	**6DR2804-8A**
Accessories	
Reference junction terminal	
For TC, internal (use in connection AE1 with UNI module)	**6DR2805-8A**

5
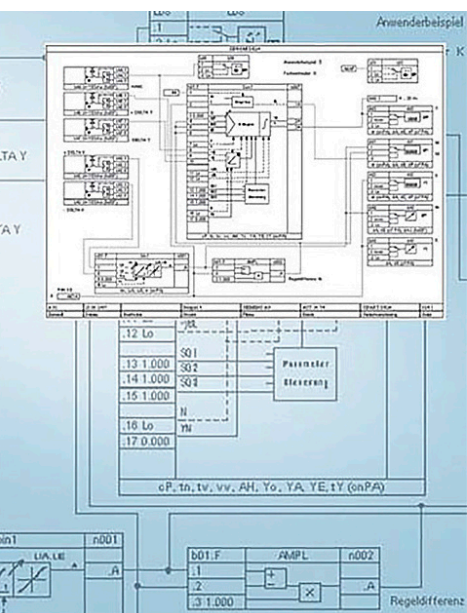
Notes:
Parameterization and configuration
of the controllers DR21 and DR22 with
SIMATIC PDM software!
For detailed information about
SIMATIC PDM see catalog FI 01.

The whole programs mentioned in this
catalog section are class B software
products. The "Agreement concerning the
use of software products with a unique
payment" is valid for these programs.

Software

■ Overview

The SIPART DR compact controllers are microprocessor-controlled, autonomously operating devices. They can be used to reliably automate processes. Process control and monitoring as well as parameter assignment and structuring are performed using the front module of these controllers.

In addition to their function as individual devices in stand-alone operation, the compact SIPART DR controllers also offer serial communication with automation systems or PCs for central operator control and monitoring or parameter assignment and structuring. For this purpose, the controllers are equipped with an RS 232/485 or PROFIBUS DP interface module.

■ Application

The RS 232/485 interface module 6DR2803-8C features galvanic isolation between the individual controllers and the higher-level system. Up to 32 SIPART DR devices can be connected in any combination by means of the addressable interfaces.

Connection takes place in RS 232 operation as point-to-point connection. The SIPART DR controllers (see overview of SIPART DR signal converters) communicate with higher-level systems using RS 485 technology.

The PROFIBUS DP interface module 6DR2803-8P enables the connection of max. 122 controllers as so-called slaves to master modules in one programmable logic controller, e.g. SIMATIC S5 or S7. The controllers are connected using one common cable (2-wire copper or fiber-optic cable). The PROFIBUS accessories can be found in Catalog IK PI.

◼ Design

RS 232 operation as point-to-point connection is preferably used for parameter assignment and structuring using a PC. The connection between the controller and PC is established directly using a point-to-point connection cable (e.g. 6DR2902-8AB/-8AC).

In RS 485 operation[1], the controllers are connected directly to the central unit or an interface converter (figure "Serial coupling with RS 485").

In PROFIBUS DP operation, the controllers are connected one after another with a DP master module using a two-wire copper cable (figure "Serial coupling with PROFIBUS DP"). To bridge greater distances, SIMATIC NET Repeaters or Optical Link Modules (OLM) are required (see Catalog IK PI).
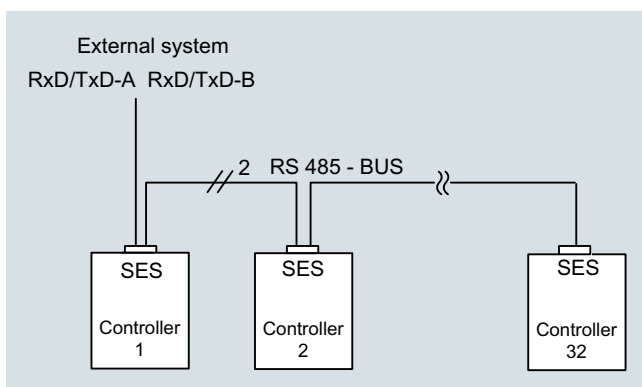
Serial coupling with RS 485
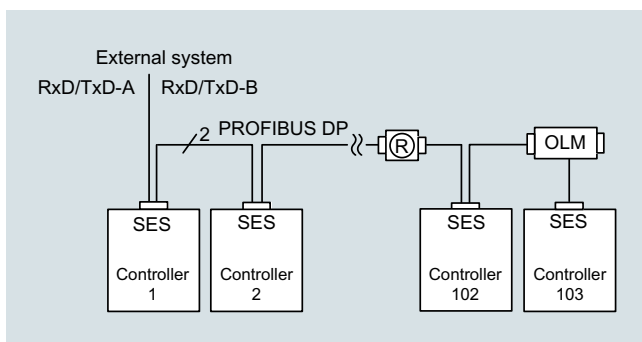
Serial coupling with PROFIBUS DP

Hardware components

Serial interface (SES)

For connecting the bus cable, the interface module is equipped with a 9-pin subminiature connector. It is possible to select between RS 232 operation (point-to-point) or RS 485 operation on the interface module using coding plugs.

The terminating resistor in RS 485 operation is already present on the interface module.

PROFIBUS DP interface

The interface module complies directly (without additional bus driver) with PROFIBUS DIN 19245, Part 1 and Part 3.

The module has a 9-pin D-sub socket for connection to PROFIBUS DP. Standardized PROFIBUS plugs (see Catalog IK PI) can be inserted here.

Connection cables

• Connection of SIPART DR21/DR22/DR24 controller to third-party system via RS 485

Connection via the RS 485 interface to the control system takes place in 2-wire operation. The 9-pin female connector for round cables should preferably be used for the connection.

• Controller-PC connection as point-to-point connection

Connection is made using a cable with 9-pin female connector (e.g. COM 1/2 with standard PC) and a 9-pin female connector to the controller.

• Controller-PROFIBUS DP connection

PROFIBUS offers a comprehensive range of bus components for electrical and optical transmission technology (see Catalog IK PI). Various connection cables (point-to-point) are available for configuring the controllers via PROFIBUS DP.

[1] See overview of the SIPART DR signal converters

Software

Graphical configuring with SIPROM DR24

■ Overview
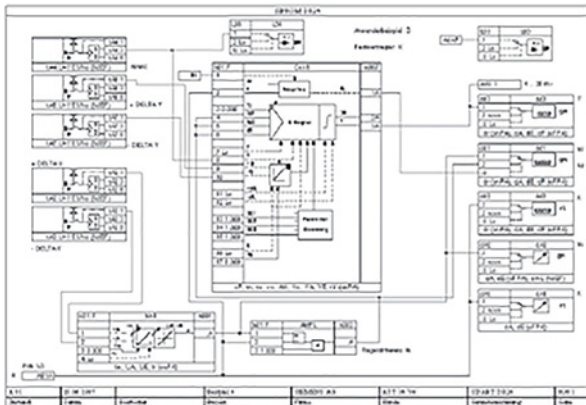
The SIPROM DR24 program is used for graphical programming of the SIPART DR24 multifunction unit. It comprises the entire configuration and parameter assignment of the multifunction unit via a graphical user interface (Microsoft Windows).

■ Function

SIPROM DR24 can be used on PCs and SIMATIC PG programming devices under the Microsoft Windows operating system.

Core functions of SIPROM DR24 are:

- Back documentation of complete user programs in the SIPART DR24 in tabular form. The device data can be changed, saved and sent to the DR24 again in the PC.
- Function library with all function elements of the SIPART DR24
- Positioning of elements with a mouse click on up to 100 sheets. Positioning can be made within a sheet or by means of a page overview (FDEF)
- Connection of function blocks from data source to data sink (FCON), whereby analog and binary signals are differentiated by color
- Positioning (FPOS) of the function blocks, which means the order of software processing is determined automatically. It can be changed at any time with the click of a mouse
- Parameter input (ONPA, OFPA, CLPA) via tables
- Transfer of the complete graphical configuration to the SIPART DR24, to the printer and to disk or hard drive
- Duplication of user programs. The program stored in the user program memory is read out and then copied from the PC to other SIPART DR24 multifunction units.
- Documentation of the complete multifunction unit: Front assignment, back including all inputs and outputs
- Moving blocks without deleting the connections
- Inserting text strings at any point
- Drawing assistance through grid points (can be switched on or off)
- Choice of graphical or tabular configuration

- Layout control over two pages
- Saving and loading of partial circuits page-by-page
- Multiple use of constants
- Undo last editing action (UNDO/can be switched on and off)
- Zooming in or out is possible when editing a graphical interconnection
- Device data generated with previous software versions of SIPROM DR24 can be edited.

System requirements

Hardware:

- PC with Microsoft Windows XP operating system
- Hard disk space from 500 MB
- Work memory from 64 MB
- CD ROM drive
- DP master module
  - CP 5611: 6GK1 561-1AA00 (for PCs)
  - CP 5511: 6GK1 551-1AA00 (for laptops)
- SIMATIC PG with installed MPI interface
- Serial interface in SIPART DR24
  - RS 232: 6DR2803-8C
  - PROFIBUS DP: 6DR2803-8P

Software:

- Operating system Microsoft Windows XP or Microsoft Windows 95/98 (only 32-bit version), 2000, NT 4
- PROFIBUS DP driver "Softnet DP" as of version 2.2 for PCs/PGs, order no. 6GK1 704-5DW61-3AA0[1]

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[1] Required drivers are not included in the scope of delivery of a SIMATIC programming device.

■ Selection and ordering data   Article No.

SIPROM DR24	
Program for SIPART DR24 controller, German/English	**6DR1127-1BA00**
Software update for SIPROM DR24	**6DR1127-1BA00-0UD3**

Update information

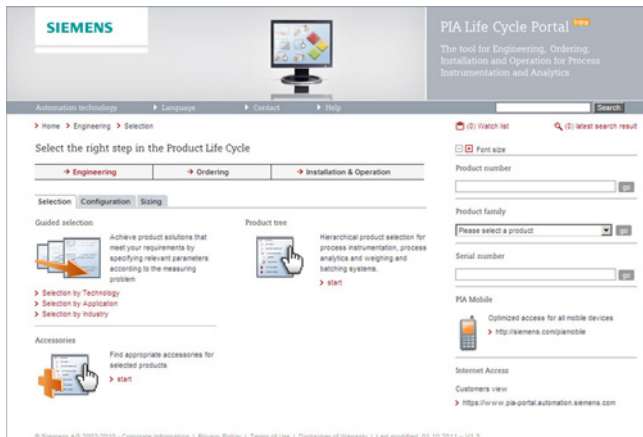To order an update, proof of an older complete single license is required.

7

Appendix

Appendix
PIA Life Cycle Portal

Engineering, Ordering, Installation and Operation Tool

■ Overview

The PIA Life Cycle Portal provides the appropriate functionality in all stages of the Product Life Cycle for products of Process Instrumentation, Process Analytics and Weighing Technology.

The application guides you through Engineering & Selection, supports you at the Order and provides tools and information for Installation and Operation.

- **Phase 1:** Selection & Planning
- **Phase 2:** Ordering
- **Phase 3:** Installation & Operation
- **Additional features:** e. g. PIA Mobile

Phase 1: Selection & Planning

Selection

Achieve product solutions that meet your requirements by specifying relevant parameters according to the measuring point by using the *guided selection* or select the product directly in the *product and accessories tree*.

Configuration

Configure a selected product step by step and use the integrated configuration knowledge to avoid errors.
Product configurations which cannot be ordered are blocked.

Sizing & calculation

Sizing & calculation tools for Gas Analyzers, Weighing and Batching Systems and Flow measurement instruments.

Phase 2: Ordering

Bulk upload

Verify several part numbers in one step by uploading a simple text file.

Watchlist & projects

Collect products in a *watch list* and save it as a *project* for later use.

Interface to the Industry Mall

Order the selected products with the ordering system for Siemens' automation and drive solutions.

Phase 3: Installation & Operation

Spare parts

Find appropriate *spare parts* for selected products or corresponding product families.

After sales support

Go to the *Service and Support Portal* to access manuals, certificates and further information concerning service & support.

Device information and history

Serial number specific product information for installed devices

Additional features
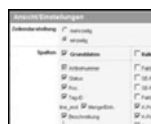
Personalize

Register in order to customize the application to your personal needs.

PIA Mobile

Use the product *selection, configuration and device information and history* with the version optimized for mobile devices.
www.siemens.com/piamobile

Product details

Find all relevant product information at a single glance: commercial and technical data, certificates, images and documents etc.

■ More information

PIA Life Cycle Portal
Ostliche Rheinbrückenstraße 50
76187 Karlsruhe, Germany
Tel.: +49 (721) 595 2114
E-Mail: support.pia-portal@siemens.com
www.siemens.com/pia-portal

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■ **Overview**

Partner at Siemens
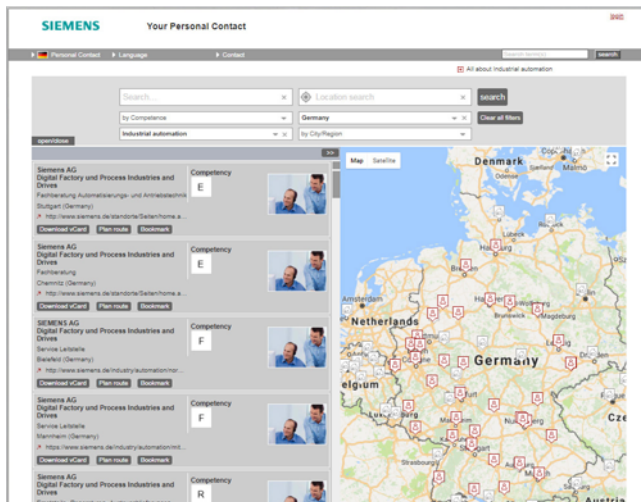
At your service locally, around the globe for consulting, sales, training, service, support, spare parts on the entire portfolio of Digital Factory and Process Industries and Drives.

Your partner can be found in our Personal Contacts Database at:
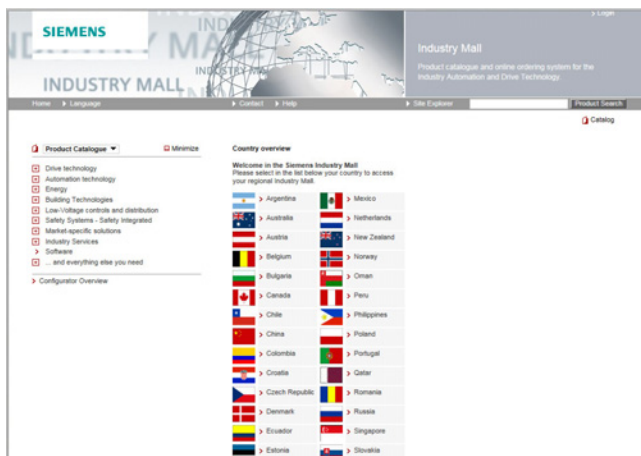www.siemens.com/automation-contact

You start by selecting

- the required competence,
- products and branches,
- a country and a city

or by a

- location search or free text search.

Easy product selection and ordering in the Industry Mall and with the Interactive Catalog CA 01

Industry Mall

The Industry Mall is a Siemens Internet ordering platform. Here you have a clear and informative online access to a huge range of products.

Powerful search functions make it easy to select the required products. Configurators enable you to configure complex product and system components quickly and easily. CAx data types are also provided here.

Data transfer allows the whole procedure, from selection through ordering to tracking and tracing, to be carried out online. Availability checks, customer-specific discounts and bid creation are also possible.

www.siemens.com/industrymall

Interactive Catalog CA 01 - Products for Automation and Drives

The Interactive Catalog CA 01 combined with the Siemens Industry Mall unites the benefits of offline and online media in one application – the performance of an offline catalog with the availability of manifold and up-to-date information on the Internet.

Select products and assemble orders with the CA 01, determine the availability of the selected products and track & trace via the Industry Mall.
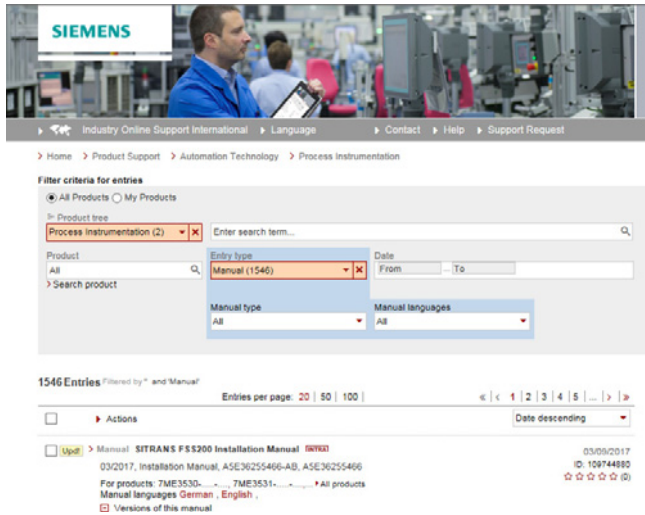
More information and download:
www.siemens.com/automation/ca01

Appendix
Product documentation

Product documentation on SIOS

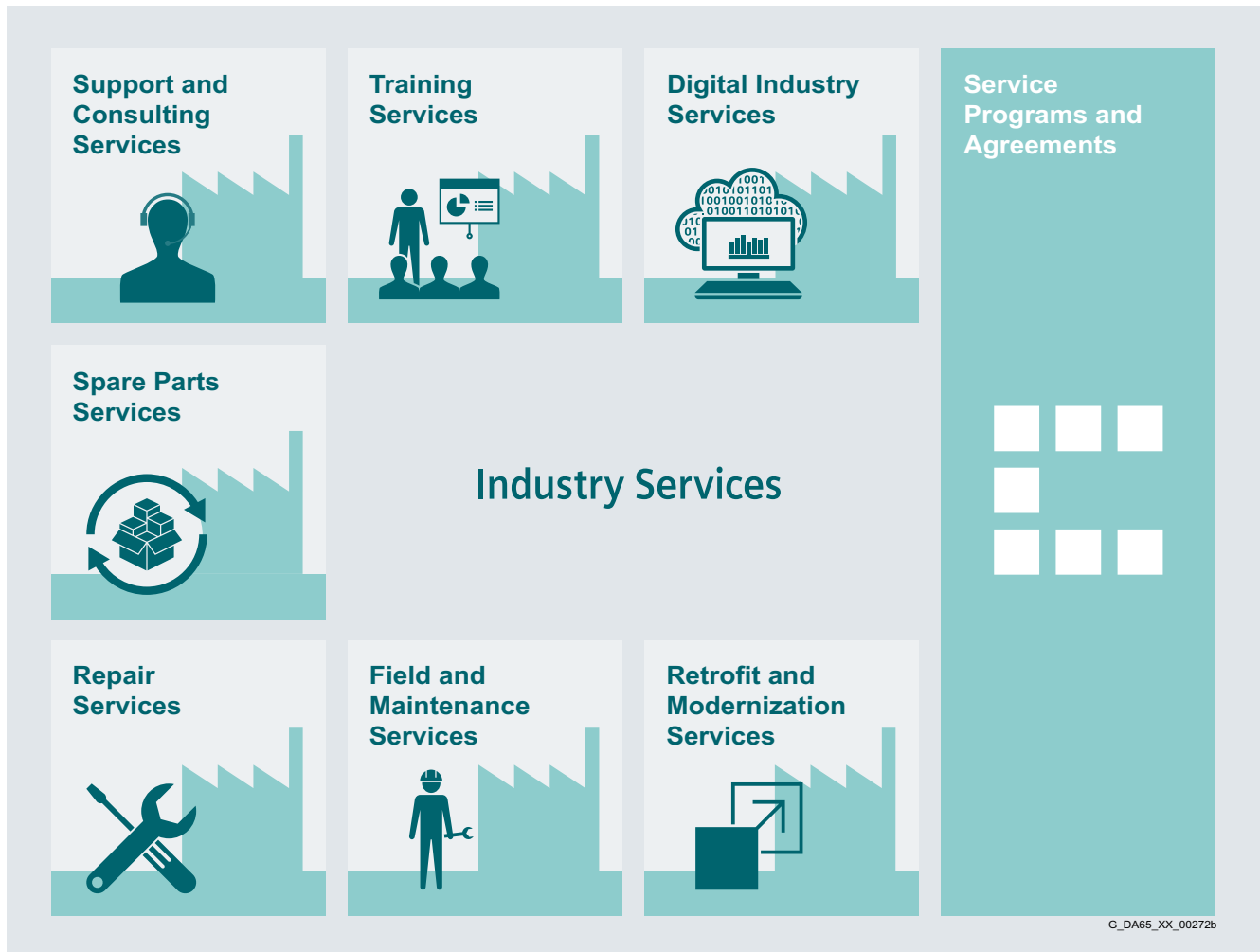### ■ Siemens Industry Online Support Portal (SIOS)

For the complete portfolio, customers can download product documentation for free using the following links to our Siemens Industry Online Support Portal (SIOS):

http://www.siemens.com/processinstrumentation/documentation

By entering the product names as **Search term** and selecting the field **Entry type,** you can find all operating instructions, certificates, product software (EDDs, calculation tools), product notes and other useful information.

■ Overview

Support and Consulting Services

Training Services

Digital Industry Services

Service Programs and Agreements

Spare Parts Services

Industry Services

Repair Services

Field and Maintenance Services

Retrofit and Modernization Services

G_DA65_XX_00272b

Keep your business running and shaping your digital future – with Industry Services

Optimizing the productivity of your equipment and operations can be a challenge, especially with constantly changing market conditions. Working with our service experts makes it easier. We understand your industry's unique processes and provide the services needed so that you can better achieve your business goals.

You can count on us to maximize your uptime and minimize your downtime, increasing your operations' productivity and reliability. When your operations have to be changed quickly to meet a new demand or business opportunity, our services give you the flexibility to adapt. Of course, we take care that your production is protected against cyber threats. We assist in keeping your operations as energy and resource efficient as possible and reducing your total cost of ownership. As a trendsetter, we ensure that you can capitalize on the opportunities of digitalization and by applying data analytics to enhance decision making: You can be sure that your plant reaches its full potential and retains this over the longer lifespan.

You can rely on our highly dedicated team of engineers, technicians and specialists to deliver the services you need – safely, professionally and in compliance with all regulations. We are there for you, where you need us, when you need us.

www.siemens.com/industryservices

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Appendix
Industry Services

Industry Services – Portfolio overview

Overview

Digital Industry Services

Digital Industry Services make your industrial processes transparent to gain improvements in productivity, asset availability, and energy efficiency.

Production data is generated, filtered and translated with intelligent analytics to enhance decision-making.

This is done whilst taking data security into consideration and with continuous protection against cyber-attack threats.
https://www.siemens.com/global/en/home/products/services/industry/digital-services.html
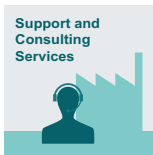
Training Services

From the basics and advanced to specialist skills, SITRAIN courses provide expertise right from the manufacturer – and encompass the entire spectrum of Siemens products and systems for the industry.

Worldwide, SITRAIN courses are available wherever you need a training course in more than 170 locations in over 60 countries.
https://support.industry.siemens.com/cs/ww/en/sc/2226

Support and Consulting Services

Industry Online Support site for comprehensive information, application examples, FAQs and support requests.

Technical and Engineering Support for advice and answers for all inquiries about functionality, handling, and fault clearance. The Service Card as prepaid support for value added services such as Priority Call Back or Extended Support offers the clear advantage of quick and easy purchasing.

Information & Consulting Services, e.g. SIMATIC System Audit; clarity about the state and service capability of your automation system or Lifecycle Information Services; transparency on the lifecycle of the products in your plants.
https://support.industry.siemens.com/cs/ww/en/sc/2235

Spare Parts

Spare Parts Services are available worldwide for smooth and fast supply of spare parts – and thus optimal plant availability. Genuine spare parts are available for up to ten years. Logistic experts take care of procurement, transport, custom clearance, storage and order management. Reliable logistics processes ensure that components reach their destination as needed.

Since not all spare parts can be kept in stock at all times, Siemens offers a preventive measure for spare parts provisioning on the customer's premises with optimized **Spare Parts Packages** for individual products, custom-assembled drive components and entire integrated drive trains – including risk consulting.

Asset Optimization Services help you design a strategy for parts supply where your investment and carrying costs are reduced and the risk of obsolescence is avoided.
https://support.industry.siemens.com/cs/ww/en/sc/2110

Repair Services

Repair Services are offered on-site and in regional repair centers for fast restoration of faulty devices' functionality.

Also available are extended repair services, which include additional diagnostic and repair measures, as well as emergency services.
https://support.industry.siemens.com/cs/ww/en/sc/2154

Field and Maintenance Services

Siemens specialists are available globally to provide expert field and maintenance services, including commissioning, functional testing, preventive maintenance and fault clearance.

All services can be included in customized service agreements with defined reaction times or fixed maintenance intervals.
https://support.industry.siemens.com/cs/ww/en/sc/2265

Retrofit and Modernization Services

Provide a cost-effective solution for the expansion of entire plants, optimization of systems or upgrading existing products to the latest technology and software, e.g. migration services for automation systems.

Service experts support projects from planning through commissioning and, if desired over the entire extended lifespan, e.g. Retrofit for Integrated Drive Systems for an extended lifetime of your machines and plants.
https://support.industry.siemens.com/cs/ww/en/sc/2286

Service Programs and Agreements

A technical Service Program or Agreement enables you to easily bundle a wide range of services into a single annual or multi-year agreement.

You pick the services you need to match your unique requirements or fill gaps in your organization's maintenance capabilities.

Programs and agreements can be customized as KPI-based and/or performance-based contracts.
https://support.industry.siemens.com/cs/ww/en/sc/2275

■ **Overview**

Online Support – fast, intuitive, whenever you want, wherever you need

Web
support.industry.siemens.com

App

Scan the QR code for information on our Online Support app.

FAQ / Application examples

Information about industrial products, programming and configuration as well as application examples

Technical information

Videos, documentation, manuals, updates, product notes, compatibility tool, certificates, planning data such as dimensional drawings, product data, 3D models

Forum

Exchange information and experience with other users and experts

Online Support for Siemens Industry Products

Siemens Industry and Online Support with some 1.7 million visitors per month is one of the most popular web services provided by Siemens. It is the central access point for comprehensive technical know-how about products, systems and services for automation and drives applications as well as for process industries.

In connection with the challenges and opportunities related to digitalization you can look forward to continued support with innovative offerings.

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Appendix
SITRAIN – Digital Industry Academy
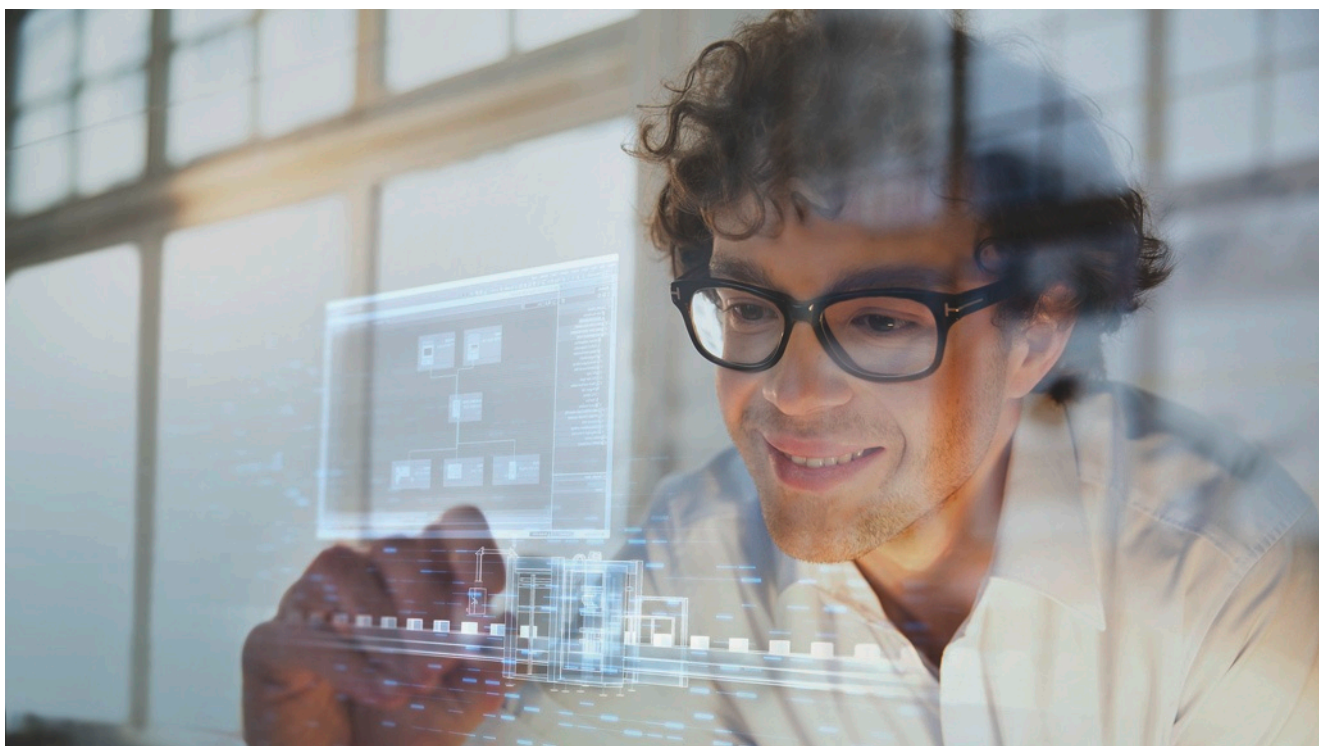
Time for learning

Today's demands on our knowledge are every bit as diverse and dynamic as our profession itself. We keep learning more and longer – for our work, for our career and for ourselves. Advancing digitalization entails new topics and is also changing the way we absorb and process knowledge. SITRAIN – Digital Industry Academy offers the right source of knowledge here, which we can use anytime in just the way we need it. The time for learning is now.
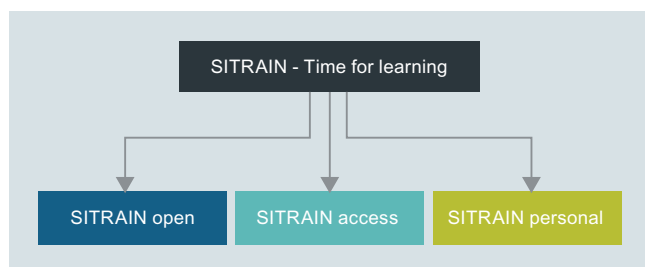
Knowledge for every need

With its three areas – SITRAIN open, SITRAIN access and SITRAIN personal – SITRAIN offers you an all-encompassing range of options for an ongoing expansion of your knowledge and skills, suited for every type of learner. And SITRAIN uses advancing digitalization to continuously expand content and offer new training methods.

Knowledge you can always find

SITRAIN open bundles useful information, worthwhile data and up-to-date expert knowledge about Siemens products for industry. Search it anytime, find anything – and always the right stuff.

Knowledge that gets you ahead

SITRAIN access is learning in the digital age. It offers you individualized ways to build your knowledge and access to exclusive digital training courses. Take advantage of sustainable learning success with a wide range of learning methods. Improve your skills – whether working in groups with others, or by yourself. Whenever, wherever and however you need to.

Knowledge you can experience

We all want to learn from the best. And SITRAIN personal's training courses let you benefit from our well-practiced trainers' expert knowledge, along with direct access to our training equipment. That's the best way to convey knowledge – whether at your company or in our training classrooms.

Find your local offer here

***SITRAIN – Digital Industry Academy
Customer Support Germany***

Tel.: +49 911 895-7575
E-Mail: sitrain.digital.industry.academy.de@siemens.com

SITRAIN – Digital Industry Academy

www.siemens.com/sitrain
- SITRAIN open:
  www.siemens.com/sitrain-open
- SITRAIN access:
  www.siemens.com/sitrain-access
- SITRAIN personal:
  www.siemens.com/sitrain-personal

■ Course offer

	Course suitable for				
	Planning	Reali-zation	Operation	Duration/Medium	Course code
Basic Service Training for Process Instruments	✔	✔	✔	5 days	SC-PI-BST
Introduction into Process Instrumentation and Process Analytics (for Siemens employees)	✔	✔	✔	2 days	SC-TP-GS1
Advanced Training Pressure, Temperature and Positioner (for Siemens enployees)	✔	✔	✔	3.5 days	SC-PI1-ADV
Pressure, Temperature Measurement and Electropneumatic Positioners - Technology and Sales	✔	✔	✔	4.5 days	SC-PI1-T1S
Flow Measurement - Technology and Sales	✔	✔	✔	4 days	SC-PI3-T1S
Level Measurement - Technology and Sales	✔	✔	✔	4.5 days	SC-PI2-T1S
Combining Engineering and Operation of SIMATIC PCS 7 with PI Process Instrumentation Devices	✔	✔	✔	2 days	SC-PI-PCS7
Service for SIMATIC PDM and Process Periphery		✔	✔	3 days	SC-PI-PDM
Recorder SIREC D		✔	✔	1 day	SC-PI-SIRE
Origination, Description, Execution and Evaluation of Diagnostics of the SIPART PS2 Positioner		✔	✔	1 day	SC-PS2-DIA
Siemens Weighing Technolgy Basic Training (for Siemens employees)	✔	✔	✔	2 days	SC-WT-BAS
Static Weighing Technology	✔	✔	✔	3 days	SC-WT-STAT
Introduction in Weighing Electronics WP251		✔	✔	3 days	SC-WT-WP25
Dynamic Weighing Technology	✔	✔	✔	3 days	SC-WT-DYN
SIWAREX Sensor System and Electronics FTC-L		✔	✔	3 days	SC-WT-FTCL
Weighing Technology, Belt Scales, Weighfeeder		✔	✔	3 days	SC-WT-BELT

■ Custom and tailor-made training

Additionally to our standard technical, industry and sales training we offer our customers the possibility of custom and tailor-made training out of our broad range of options.

We deliver training worldwide either in one of our training centers around the world or at a custom location on-site.

Be it a service training delivering the needed skills for commissioning, diagnosing, or repairing parts of our product portfolio, a general introduction into our portfolio including showcasing applications, use cases and serviced industries, or a deep dive into specific technologies with experts that know every nut, bolt and screw of our products and their applications - it is your wishes and needs we want to serve!

Feel free to contact us with your wishes!

■ More information

You will find further informationen on the Internet at:

https://www.sitrain-learning.siemens.com/DE/en/catalog/44AAAAN/chapter/44AAGIF/index.do?hash=941eb67244fc5d9b5c07841ff15a1043
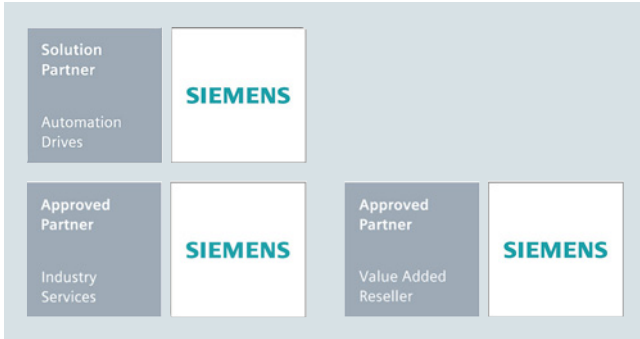
Appendix
Partners at Siemens

Siemens Partner Program

■ **Overview**

Siemens Solution and Approved Partner – Partners for your success

Highest competence in automation and drive technology

Siemens works closely together with selected partner companies around the world in order to ensure that customer requirements for all aspects of automation and drives are fulfilled as best as possible – wherever you are, and whatever the time.

We place great value on our customers acting in accordance with the same ideals which characterize Siemens as a whole: Competence, professionalism and quality. That is why continuous development through qualification and certification measures in line with global standards is a central aspect of our Partner Program. This means that with our partners, you benefit from the same high quality standards all over the world. The partner emblem is the symbol for tried and tested quality.

The partner network for industry

The Siemens Partner Program offers you expertise and experience close at hand.

Within our global network, we distinguish between Solution Partners and Approved Partners. We currently work with more than 1,500 Solution Partners around the world. Our network of over 150 Approved Partners continues to grow. In more than 80 countries worldwide

Siemens Solution Partner – Automation Drives

At present we are working with more than 1,500 Solution Partners worldwide. They are characterized by extensive application, system and sector knowledge, as well as proven project experience, and are able to implement future-proof tailored solutions of the highest quality, based on our product and system portfolio.

Siemens Approved Partner – Value Added Reseller

With their detailed technical knowledge, Siemens Approved Partners – Value Added Resellers offer a combination of products and services that range from specialist technologies and customized modifications to the provision of high-quality system and product packages. They also provide qualified technical support and assistance.
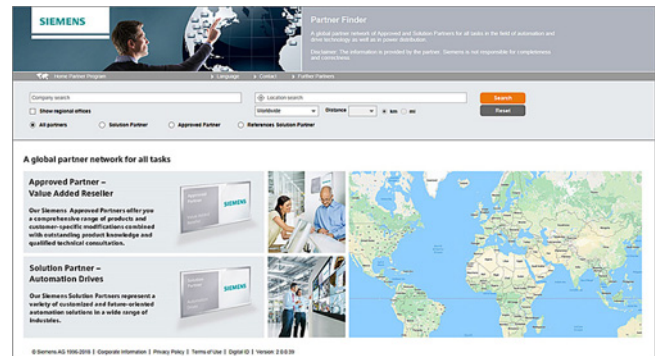
Siemens Approved Partner – Industry Services

Siemens Approved Partner – Industry Services put their unique expertise entirely at the service of enhancing your productivity and can be instrumental in ensuring the availability of your plants.

Partner Finder

The ideal partner for your task is just a mouse click away!

In the Siemens global Solution Partner program, customers are certain to find the optimum partner for their specific requirements – with no great effort. The Partner Finder is basically a comprehensive database that showcases the profiles of all our partners.

Easy selection:
Set filters in the search screen form according to the criteria that are relevant to you. You can also directly enter the name of an existing partner.

Skills at a glance:
Gain a quick insight into the specific competencies of any particular partner with the reference reports.

Direct contact option:
Use our electronic query form:

www.siemens.com/partnerfinder

Additional information of the Siemens Parners for industry is available online at:

www.siemens.com/partnerprogram

■ **Overview**

Software types

Software requiring a license is categorized into types.
The following software types have been defined:

• Engineering software
• Runtime software

Engineering software

This includes all software products for creating (engineering) user software, e.g. for configuring, programming, parameterizing, testing, commissioning or servicing.

Data generated with engineering software and executable programs can be duplicated for your own use or for use by third-parties free-of-charge.

Runtime software

This includes all software products required for plant/machine operation, e.g. operating system, basic system, system expansions, drivers, etc.

The duplication of the runtime software and executable programs created with the runtime software for your own use or for use by third-parties is subject to a charge.

You can find information about license fees according to use in the ordering data (e.g. in the catalog). Examples of categories of use include per CPU, per installation, per channel, per instance, per axis, per control loop, per variable, etc.

Information about extended rights of use for parameterization/configuration tools supplied as integral components of the scope of supply can be found in the readme file supplied with the relevant product(s).

License types

Siemens Industry Automation & Drive Technologies offers various types of software license:

• Floating license
• Single license
• Rental license
• Rental floating license
• Trial license
• Demo license
• Demo floating license

Floating license

The software may be installed for internal use on any number of devices by the licensee. Only the concurrent user is licensed. The concurrent user is the person using the program. Use begins when the software is started.
A license is required for each concurrent user.

Single license

Unlike the floating license, a single license permits only one installation of the software per license.

The type of use licensed is specified in the ordering data and in the Certificate of License (CoL). Types of use include for example per instance, per axis, per channel, etc.

One single license is required for each type of use defined.

Rental license

A rental license supports the "sporadic use" of engineering software. Once the license key has been installed, the software can be used for a specific period of time (the operating hours do not have to be consecutive).
One license is required for each installation of the software.

Rental floating license

The rental floating license corresponds to the rental license, except that a license is not required for each installation of the software. Rather, one license is required per object (for example, user or device).

Trial license

A trial license supports "short-term use" of the software in a non-productive context, e.g. for testing and evaluation purposes. It can be transferred to another license.

Demo license

The demo license support the "sporadic use" of engineering software in a non-productive context, for example, use for testing and evaluation purposes. It can be transferred to another license. After the installation of the license key, the software can be operated for a specific period of time, whereby usage can be interrupted as often as required.

One license is required per installation of the software.

Demo floating license

The demo floating license corresponds to the demo license, except that a license is not required for each installation of the software. Rather, one license is required per object (for example, user or device).

Certificate of License (CoL)

The CoL is the licensee's proof that the use of the software has been licensed by Siemens. A CoL is required for every type of use and must be kept in a safe place.

Downgrading

The licensee is permitted to use the software or an earlier version/release of the software, provided that the licensee owns such a version/release and its use is technically feasible.

Delivery versions

Software is constantly being updated.
The following delivery versions

• PowerPack
• Upgrade

can be used to access updates.

Existing bug fixes are supplied with the ServicePack version.

PowerPack

PowerPacks can be used to upgrade to more powerful software. The licensee receives a new license agreement and CoL (Certificate of License) with the PowerPack. This CoL, together with the CoL for the original product, proves that the new software is licensed.
A separate PowerPack must be purchased for each original license of the software to be replaced.

Upgrade

An upgrade permits the use of a new version of the software on the condition that a license for a previous version of the product is already held.
The licensee receives a new license agreement and CoL with the upgrade. This CoL, together with the CoL for the previous product, proves that the new version is licensed.
A separate upgrade must be purchased for each original license of the software to be upgraded.

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Appendix
Software licenses

■ Overview

ServicePack

ServicePacks are used to debug existing products. ServicePacks may be duplicated for use as prescribed according to the number of existing original licenses.

License key

Siemens Industry Automation & Drive Technologies supplies software products with and without license keys.

The license key serves as an electronic license stamp and is also the "switch" for activating the software (floating license, rental license, etc.).

The complete installation of software products requiring license keys includes the program to be licensed (the software) and the license key (which represents the license).

Software Update Service (SUS)

As part of the SUS contract, all software updates for the respective product are made available to you free of charge for a period of one year from the invoice date. The contract will automatically be extended for one year if it is not canceled three months before it expires.

The possession of the current version of the respective software is a basic condition for entering into an SUS contract.

You can download explanations concerning license conditions from www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf

1. General Provisions

By using this catalog you can purchase products (hardware, software and services) described therein from Siemens Aktiengesellschaft subject to the following Terms and Conditions of Sale and Delivery (hereinafter referred to as "T&C"). Please note that the scope, the quality and the conditions for supplies and services, including software products, by any Siemens entity having a registered office outside Germany, shall be subject exclusively to the General Terms and Conditions of the respective Siemens entity. The following T&C apply exclusively for orders placed with Siemens Aktiengesellschaft, Germany.

1.1 For customers with a seat or registered office in Germany

For customers with a seat or registered office in Germany, the following terms and conditions apply subordinate to T&C:

- for products, which include specific terms and conditions in the description text, these specific terms and conditions shall apply and subordinate thereto,

- for installation work the "General Conditions for Erection Works – Germany"[1] ("Allgemeine Montagebedingungen – Deutschland" (currently only available in German)) and/or

- for stand-alone software products and software products forming a part of a product or project, the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or registered Office in Germany"[1] and/or

- for consulting services the "General Terms and Conditions for Consulting Services of the Division DF – Germany"[1] and/or

- for other supplies and/or services the "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry"[1].
  In case such supplies and/or services should contain Open Source Software, the conditions of which shall prevail over the " General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry "[1], a notice will be contained in the scope of delivery in which the applicable conditions for Open Source Software are specified. This shall apply mutatis mutandis for notices referring to other third party software components.

1.2 For customers with a seat or registered office outside Germany

For customers with a seat or registered office outside Germany, the following terms and conditions apply subordinate to T&C:

- for products, which include specific terms and conditions in the description text, these specific terms and conditions shall apply and subordinate thereto,

- for services the "International Terms & Conditions for Services"[1] supplemented by "Software Licensing Conditions"[1] and/or

- for consulting services the "General Terms and Conditions for Consulting Services of the Division DF – Germany"[1] and/or

- for other supplies of hard- and software the "International Terms & Conditions for Products"[1] supplemented by "Software Licensing Conditions" [1]

1.3 For customers with master or framework agreement

To the extent our supplies and/or services offered are covered by an existing master or framework agreement, the terms and conditions of that agreement shall apply instead of T&C.

2. Prices

The prices are in € (Euro) ex point of delivery, exclusive of packaging.

The sales tax (value added tax) is not included in the prices. It shall be charged separately at the respective rate according to the applicable statutory legal regulations.

Prices are subject to change without prior notice. We will charge the prices valid at the time of delivery.

To compensate for variations in the price of raw materials (e.g. silver, copper, aluminum, lead, gold, dysprosium and neodym), surcharges are calculated on a daily basis using the so-called metal factor for products containing these raw materials. A surcharge for the respective raw material is calculated as a supplement to the price of a product if the basic official price of the raw material in question is exceeded.

The metal factor of a product indicates the basic official price (for those raw materials concerned) as of which the surcharges on the price of the product are applied, and with what method of calculation.

An exact explanation of the metal factor can be downloaded at:

www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf

To calculate the surcharge (except in the cases of dysprosium and neodym), the official price from the day prior to that on which the order was received or the release order was effected is used.

To calculate the surcharge applicable to dysprosium and neodym ("rare earths"), the corresponding three-month basic average price in the quarter prior to that in which the order was received or the release order was effected is used with a one-month buffer (details on the calculation can be found in the explanation of the metal factor).

3. Additional Terms and Conditions

The dimensions are in mm. In Germany, according to the German law on units in measuring technology, data in inches apply only to devices for export.

Illustrations are not binding.

Insofar as there are no remarks on the individual pages of this catalog – especially with regard to data, dimensions and weights given – these are subject to change without prior notice.

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[1] The text of the Terms and Conditions of Siemens AG can be downloaded at
www.siemens.com/automation/salesmaterial-as/catalog/en/terms_of_trade_en.pdf

4. Export Regulations

We shall not be obligated to fulfill any agreement if such fulfillment is prevented by any impediments arising out of national or international foreign trade or customs requirements or any embargoes and/or other sanctions.

Export may be subject to license. We shall indicate in the delivery details whether licenses are required under German, European and US export lists.

Our products are controlled by the U.S. Government (when labeled with "ECCN" unequal "N") and authorized for export only to the country of ultimate destination for use by the ultimate consignee or end-user(s) herein identified. They may not be resold, transferred, or otherwise disposed of, to any other country or to any person other than the authorized ultimate consignee or end-user(s), either in their original form or after being incorporated into other items, without first obtaining approval from the U.S. Government or as otherwise authorized by U.S. law and regulations.

The export indications can be viewed in advance in the description of the respective goods on the Industry Mall, our online catalog system. Only the export labels "AL" and "ECCN" indicated on order confirmations, delivery notes and invoices are authoritative.

Products labeled with "AL" unequal "N" are subject to European / national export authorization. Products without label, with label "AL:N" / "ECCN:N", or label "AL:9X9999" / "ECCN: 9X9999" may require authorization from responsible authorities depending on the final end-use, or the destination.

If you transfer goods (hardware and/or software and/or technology as well as corresponding documentation, regardless of the mode of provision) delivered by us or works and services (including all kinds of technical support) performed by us to a third party worldwide, you must comply with all applicable national and international (re-)export control regulations.

If required for the purpose of conducting export control checks, you (upon request by us) shall promptly provide us with all information pertaining to the particular end customer, final disposition and intended use of goods delivered by us respectively works and services provided by us, as well as to any export control restrictions existing in this relation.

The products listed in this catalog may be subject to European/German and/or US export regulations. Any export requiring approval is therefore subject to authorization by the relevant authorities.

Errors excepted and subject to change without prior notice.

Easy product selection and ordering: Industry Mall and Interactive Catalog CA 01
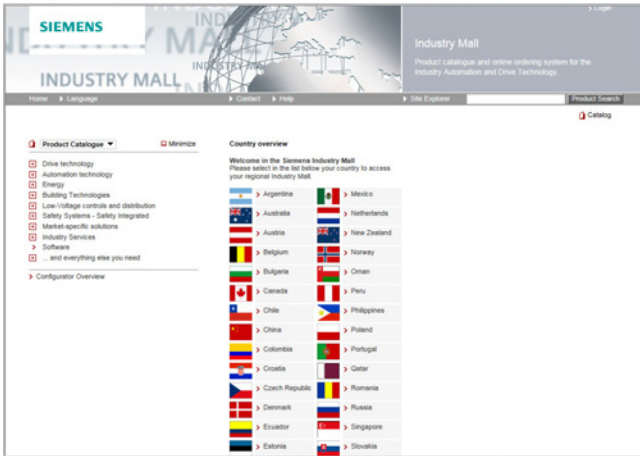
Industry Mall

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Data transfer allows the entire procedure, from selection through ordering to tracking and tracing, to be carried out online. Availability checks, individual customer discounting, and quotation preparation are also possible.

www.siemens.com/industrymall

#### Interactive Catalog CA 01 – Products for automation and drives

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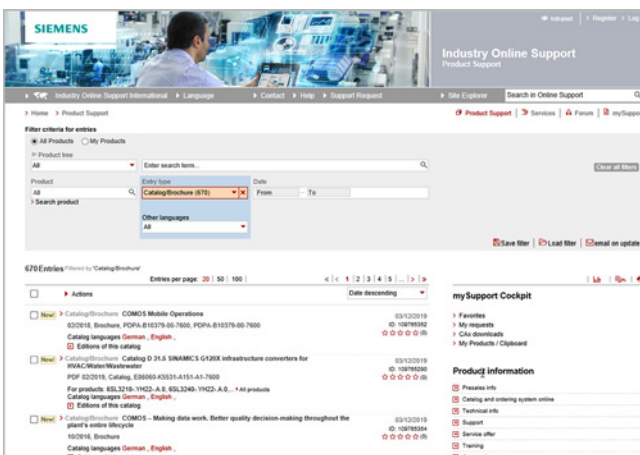
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Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

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Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

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