Data Sheet

ENA10/62-6.17 EN

Multi-loop process controller P700

(Protrenic 700)

with powerful PLC functionality,
extensible with hardware modules

- **1...4 channel fixed-value, ratio, override and cascade controller**
  - with P, PI, PD or PID characteristic
- **Dead time algorithm (Smith predictor)**
- **Spray-water protected front panel IP 65**
- **Clearly laid-out LCD**
  - analog displays for process variable, set point and controller output
- **Color change (red/green) at P700**
- **Basic unit with 2 analog inputs, 1 analog output and 4 digital inputs/outputs**
- **Universal input for temperature sensor**
- **Filtering, linearization and square-rooting of the input signal**
- **Ramp rate for set point and output signal**
- **Programmer and program controller**
- **High and low limitation for set point and output signal**
- **Preconfigured input signal connection**
- **Analog or switching controller output**
- **Self-setting of parameters and parameter control**
- **Access bar for 'Parameter setting' and 'Configuration' by means of password or digital input**
- **Additional plug-in modules**
  - for analog and digital inputs and outputs
- **Serial interface**
  - for parameter setting and configuration as standard
- **Buscapable interfaces**
  - for Laterale Kommunikation (RS485-LATCOM), optional
- **Buscapable interfaces**
  - for MODBUS (RS 485) or PROFIBUS for connection to higher_level systems, optional
- **Rapid lateral data exchange via interface module**
- **Data storage in Flash-EPROM**
  - optionally on memory card
- **Custom configuration with function block diagram or instruction list**

PROFI BUS PROCESS FIELD BUS

Intelligent,
compact and efficient

ENA Control

Description

The 1...4 channel process controller P700 (Protrenic 700) are universally usable models of the Protrenic series.
They can be operated as process specific single units or in a system network with other Protrenic controllers or in conjunction with higher-level systems.

The non-upgradable P100 (Protrenic 100) is visually identical to the P700 (Protrenic 700), described in Data Sheet 10/62_6.11 EN.

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P700 (Protrenic 700)
This front panel distinctly shows the current measured values and operating modes, from a long distance, in illuminated displays. For operation, all information is clearly presented on an LC display.

The basic model has ...

... a universal input. Without modification of the unit hardware, thermocouples, Pt100 resistance thermometers, and also standard signals 0/4...20 mA can be connected. When non-linearized temperature transmitters are used, linearization is carried out in the controller. The linearization tables for all standard sensors are stored in the unit.

... an mA input, which is usable as a disturbance variable or set point input. In step controllers this input can be used for position feedback signal.

... an mA output for the positioning signal or other values, e.g. for set point and actual value.

... four binary inputs/outputs. These inputs/outputs are user-configurable as inputs or outputs. They are therefore optionally usable as controller outputs or alarm value outputs, but also as inputs for switchover in the controller (e.g. manual/automatic).

... a front-panel TTL interface for connection of a parameter setting and configuration PC. This facilitates the necessary adjustments during commissioning.

Hardware extensions
... 7 module slots for expansion of the functions
...a rear-panel Buscapable interfaces (RS485)
for Lateralen Kommunikation
... 1 slot for memory card (front panel)

Front control panel

The front control panel gives information on the state of the process and permits specifically-targeted intervention in the process sequence. Illuminated displays, which can also be seen from a distance, indicate the process state. Digital displays and clear-text information permit precise reading and accurate setting of set point and correction values.

Programmer

Every unit has a configurable programmer which provides a time-dependent set point. Up to 10 programs with 15 segments each can be stored in the unit.

Controller outputs

Two-position controller, PID characteristic without or with leading contact for high/low/off levelling.

Controller for heating/off/cooling, optionally with two switching or one continuous and one switching output.

Step controller for motorised valve control.

Continuous controller, optionally also split-range output with two continuous positioning signals.

Parameter setting

After entering a password, the user accesses the parameter setting level by means of a menu key. At the parameter setting level parameters for the available functions, such as controller gain K_P or time constants, can be set.

Configuration

Configuration can be effected in two ways:

List configuration
The menu key accesses the password protected configuration level. There the standard functions are selected from a list provided in the unit. As an alternative to the user keyboard, the selection can also be made by way of the PC program **IBIS-R**.
This especially simplifies the setting procedure if several units are to be set at the same time (see Data Sheet ENA10/62-6.70 EN).

Free configuration
Appropr. prepared models allow for customer-specific configuration, i.e. functions beyond the standard functions of the controller.

The PC program **IBIS-R** enables a graphical programming with function block diagrams for realising any special calculation or PLC functions.

Retrofitting the plug-in Confi IC allows subsequent free configurability.

Technical data

Inputs

Common data:
without electronical isolation
Resolution ≤ 0.01 %
Accuracy (referred to nominal range) ≤ 0.2 %
Temperature effects ≤ 0.2 %/10 °C
Hardware input filter limit frequency 7 Hz

Permissible common-mode voltage against device ground
≤ ± 4 V DC

Permissible differential-mode voltage U_{ss} (50 Hz):
50 mV

Analog:
Universal input AI01

used for standard signal
0/4...20 mA at 50 Ω ±1 %

Overcurrent/polarity reversal protection
up to ± 40 mA

Linearization, square-rooting
configurable

at 4...20 mA
Line break monitoring with configurable reaction

used for thermocouples

Types	Temperature range	Voltage range	Typical accuracy
J	-200...1200 °C	77.43 mV	≤ 0.2 %
E	-200...1000 °C	85.18 mV	≤ 0.2 %
K	-200...1400 °C	61.53 mV	≤ 0.2 %
L	-200...1000 °C	78.21 mV	≤ 0.2 %
U	-200... 600 °C	40.00 mV	≤ 0.3 %
R	0...1700 °C	20.22 mV	≤ 0.5 %
S	0...1800 °C	18.72 mV	≤ 0.5 %
T	-200... 400 °C	26.47 mV	≤ 0.4 %
B	0...1800 °C	13.24 mV	≤ 0.6 %
D	0...2300 °C	36.92 mV	≤ 0.4 %

Reference junction compensation
internal or external: 0, 20, 50 or 60 °C

Internal reference junction

Error limit	± 1 °C/10 K
Reference temperature	22 °C ± 1 °C
Ambient temperature	0...50 °C

Sensor break monitoring
with configurable reaction

Used for resistance thermometer Pt100 DIN

Measuring range
-200.0...+200.0 °C
-200.0...+800.0 °C

Measuring current
≤ 1 mA

Measuring circuit
2-wire circuit
to 40 Ω line resistance, Line balancing by software

3-wire circuit
for symmetrical lines up to 3 x 10 Ω

4-wire circuit
sensor short-circuit and break monitoring with configurable reaction

used for resistance teletransmitter (potentiometer)

Measuring ranges
75...200 Ω; 750...2000 Ω

Measuring current
≤ 1 mA

other data as resistance thermometer

Analog input 2 (AI02)
Input for mA signals, technical data as AI01, but without electronical isolation. 0...10 V as option (see Code No. 310).

Binary:
4 binary inputs/outputs
Direct/reverse function configurable

Input DIN 19240	Rated signal V DC	Voltage range (V)	Current range
Rated level	24	20.4...28.8	approx. 1 mA
1-signal	24	13.0...30.2	approx. 1 mA
0-signal	0	- 3.0... 5.0	< 0.2 mA

Output DIN 19240	Rated signal V DC	Voltage range (V)	Current range
Rated level	24 ext.	20.4...28.8	100 mA
1-signal	24	13.0...30.2	0...max. mA
0-signal	0	- 3.0... 5.0	0...0.15 mA

Switches off in case of overload. Switching frequency ≤ 8 Hz

Outputs

Analog:
Control output or retransmission
0/4...20 mA at max. 750 Ω, short-circuit and open-circuit proof

Control range
0...≥ 21 mA

Load-dependency
0.1 %/100 Ω

Resolution
≤ 0.01 %

Binary:
see inputs

Transmitter feed

Output voltage
20...24 V DC, 100 mA, short-circuit proof

Load monitoring
Output automatically cuts off on overload

Programmer

10 programs can be stored
each program:
15 segments
Set point in physical units
Segment time 0...99:59:59 hours, four digital tracks

Serial interfaces

TTL interface accessible after removing front panel module for connection to PC via TTL/RS 232 converter (Catalog Number 62695-0346270)
with fixed telegram format matching parameter setting and configuration program IBIS-R (see Data Sheet ENA10/62-6.70 EN). Bus capable RS 485 interface retrofittable (see modules).

Bus capable interface (RS485)

Connectors at the devices rear panel provide lateral communication (Latcom). Additional bus capable interfaces are available (see section modules).

CPU data

Measured value and correction value resolution
≤ 0.01 %

Cycle time
Protrenic 700 ≥ 15 ms (master setting without add. modules)

Data backup
Flash-EPROM; optionally on memory card

Power supply

115 to 230 V AC (90...260 V), 47...63 Hz

Power consumption:	
Protrenic 700 without modules	9 VA (6 W)
Max. component mounting	+ 12 VA (9 W)
Power failure bridging	≥ 150 ms at ≥ 180 V AC

24 V UC

24 V DC	-25...+30 %, Residual ripple ≤ ± 3 Vss
24 V AC	-15...+10 %, 47...63 Hz
Power consumption:	
Protrenic 700 without modules	10 VA (7 W)
Max. component mounting	+ 13 VA (9 W)
Power failure bridging	≥ 20 ms at 0.85 x U_{Nenn}

Power factor
cosφ = 0.7

Safety
The device needs no external safety of power supply

Environmental conditions

Climatic class
3K3 to EN 60721-3-3

Ambient temperature
0...50 °C

Storage and transport temperature
-20...+70 °C

Relative humidity
< 85 %, short-term to 95 %, no condensation

Minimum atmospheric pressure
80 kPa

Electromagnetic compatibility

Meets protection requirements of EMC directive 89/336/EEC, 5/89
Interference resistance EN 61326, May 2004
Interference emission EN 61000-6-3, June 2005
(referred to: EN 55011, August 2003, class B)
Industry standard to NAMUR NE 21, February 2004
Maximum immunity if assembled in metallic plant

Connection, case, safety

Degree of protection to DIN EN 60529

Front panel:	IP 65
Case:	IP 20
Terminals:	IP 20

Electrical safety

Meets requrements to EN 61010-1 (VDE 0411, part 1), August 2002
Class of protection1

Clearances and creepage distances as per EN for overvoltage category 3, degree of contamination 2

All inputs and outputs, including the interface and the transmitter feed are functional extra-low voltage circuits to DIN VDE 0100, part 410

Mechanical stress features

to EN 60068-2-27, March 1995 and EN 60068-2-6, May 1996
Shock 30 g/18 ms
Vibration 2 g/0.15 mm/5...150 Hz

Case dimensions
Front panel 72 mm x 144 mm
Installed depth 272 mm

Panel cutout
68 mm x 138 mm to DIN IEC 61554

Mounting
in panel
Horizontal high-density construction possible
Vertical spacing 36 mm
Fixing with straining screws at top and bottom

Electrical connections

Plug-in screw terminals
for wire or stranded wire to 1.5 mm^2, coded

Power supply
2.5 mm^2

No shielded cables required - except for interface leads

Mounting orientation
any

Weight
1 kg without modules
each module approx. 40 g,
Relay module approx. 80 g

Scope of supply and delivery

2 straining screws, operating manual and
plug-in screw terminals

Modules

With few exceptions, the modules can be run at all slots (see table page 11). The controllers identify the inserted modules automatically.

Analog inputs

Module AE4_MA for standard signals

4 inputs
0/4...20 mA with electronical isolation

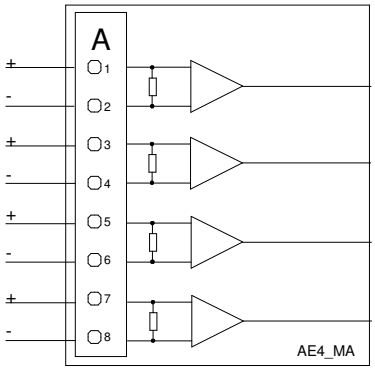
Input resistance
approx. 50 Ω

Signal resolution
≤ 0.01 % for 20 mA

Permissible common-mode voltage
≤ ± 4 V against device ground

Permissible differential-mode voltage
50 mV_{ss}

Destruction proof
Input current < 50 mA
Voltage between input and ground ± 50 V



Module AE4_MA-MUS
for mA or V signals, integrated transmitter feed
(pay attention to maximum power consumption, page 11)

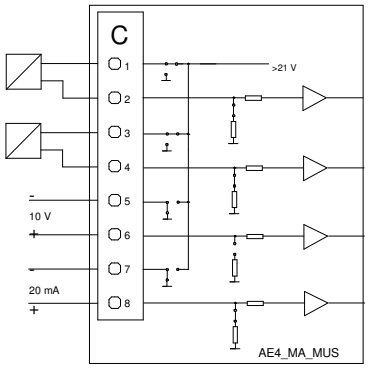
4 inputs
0/4...20 mA, indiv. switchable to 0/2...10 V with common ground

Input resistance at
mA input: approx. 50 Ω; 10 V input: 20 kΩ

Transmitter feed: 20 V, 82 mA

Other data as module 4_MA

Example of an input configuration



Module 4_MV for thermocouples

4 inputs
-10...80 mV, with electronical isolation

Signal resolution: 20.000 for -10...80 mV

Input resistance: approx. 5 MΩ

Permissible common-mode voltage: ≤ ± 4 V against device ground

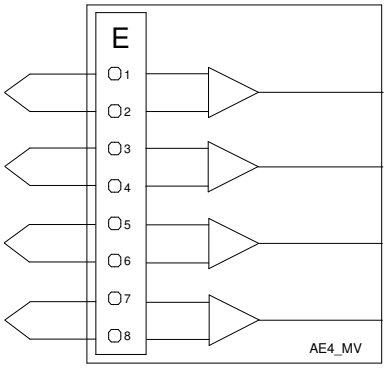
Permissible differential-mode voltage: 50 mV_{ss}

Destruction proof
Voltage at one input ± 10 V
Voltage between input and ground ± 50 V

Break monitoring
configurable reaction

Reference junction compensation
configurable, internal or external 0, 20, 50 or 60 °C

Linearization configurable like AI01



Module AE2_MA/MV-TR
for mA signals or thermocouple with electrical isolation

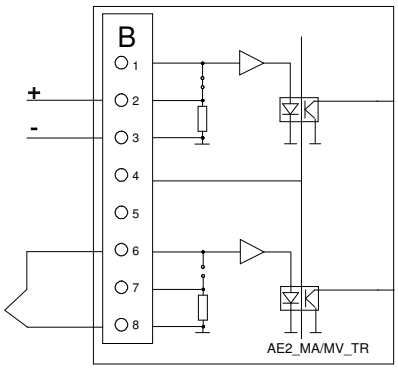
2 inputs with electrical isolation
0/4...20 mA or -10...80 mV (changeable by means of jumpers)

Input resistance at
20 mA: 25 Ω; -10...80 mV: approx. 5 MΩ

Dielectric strength of input and output leads against each other and against grounded conductor:

Test voltage	500 V AC
Continuous operation	45 V AC

Technical data as modules 4_MV or 4_MA



Module AE4_PT_2L for RTD 2-wires

4 inputs
for Pt100 in 2-wire circuit without electrical isolation

Range
0...400 Ω

Permissible differential mode voltage
100 mV_{ss}

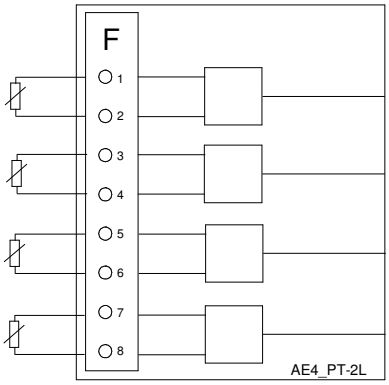
Signal resolution
≤ 0.01 % for 400 Ω

Measuring current
≤ 1.5 mA

Measuring range configurable
-200.0...+200.0 °C
0.0...+450.0 °C
-200.0...+800.0 °C

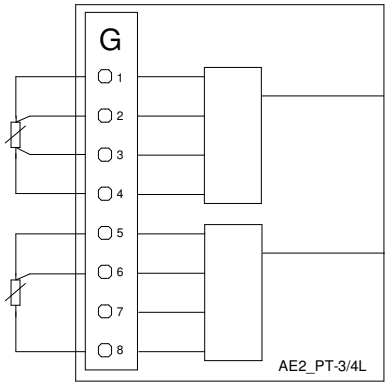
Line balancing by software

Sensor break and short-circuit monitoring
configurable reaction



Module AE2_PT-3/4L for RTD 3-/4-wires

2 inputs
for Pt100 in 3- or 4-wire circuit or potentiometer



Technical data for Pt100 as module AE4_PT_2_L

Potentiometer R150
0...150 Ω

Series resistance
0...500 Ω

Measuring current
< 1.5 mA

Potentiometer R1500
0...1500 Ω

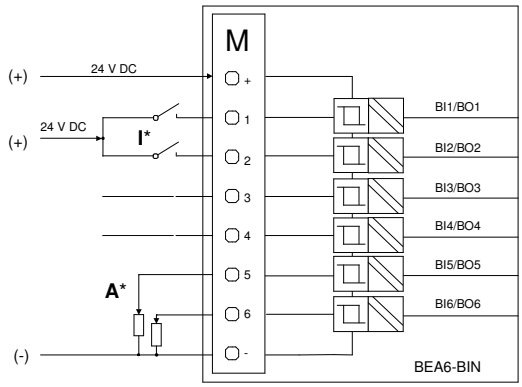
Series resistance
0...1500 Ω

Measuring current
< 0.5 mA

Binary inputs/outputs

Module BEA6-BIN

6 binary inputs/outputs, electrical isolation
Function configurable as input or output, direct or reverse action



*) Connection example: I = binary inputs; O = binary outputs

Input DIN 19240	Rated signal V DC	Voltage range (V)	Current range
Rated level	24	20.4...28.8	approx. 3 mA
1-signal	24	13.0...30.2	approx. 3 mA
0-signal	0	-3.0...5.0	≤ 0.1 mA

Output DIN 19240	Rated signal V DC	Voltage range (V)	Current range
Rated level	24 ext	20.4...28.8	100 mA
1-Signal	24	13.0...30.2	0...max. mA
0-Signal	0	-3.0...5.0	0...0.1 mA

Real time clock
Module BEA4_RTC

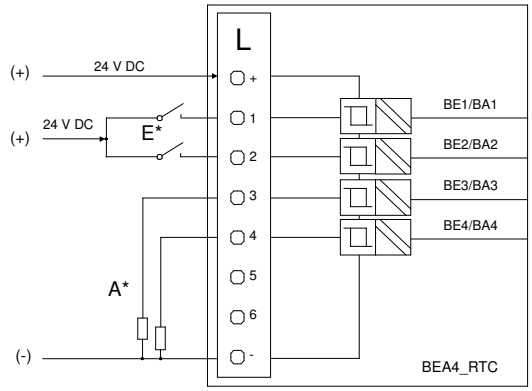
Real time clock with date, weekday and time

Daylight saving time and leap year switching

Synchronisation by digital input

Battery buffer or capacitor buffer (> 72 h)

4 digital I/O, galvanical isolated, function configurable as inputs or outputs (technical data see Module BEA6-BIN)



*) Connection example: I = binary inputs; O = binary outputs

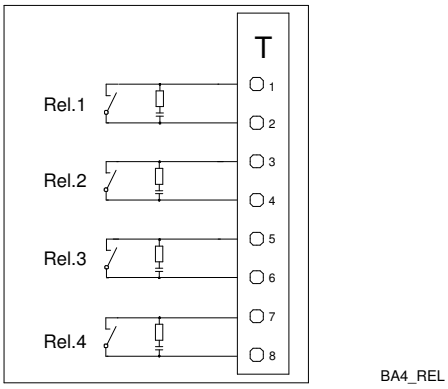
Module BA4_REL (only usable at slot 6 and 7)

4 relays
with NO contact for max. 250 V AC, 1 A resistive load

Built-in spark-quenching
0.022 µF + 100 Ω

For max. 250 V
max. 1 A at cosφ = 0.9

Contact material
AgCdO



Module AE4_F

4 inputs for:
Frequency (1/4 inputs)

Range 1 input	0...20 kHz
Range 4 inputs	0...10 kHz
Signal resolution	1 Hz

Periode (1-4 inputs)

Range	0...20 s
Signal resolution	1 ms

Impulses (1-4 inputs)/incremental angle (2 inputs)
Range: 0...20.000 impulses
min. impulse length: 50 µs max. 1kHz

Absolute incremental angle (1 input)
Range: 0...20.000 impulses
min. impulse length: 50 µs max. 1kHz

Types of input signals:
Max. 2 Namur inputs according to DIN 19234

Open circuit voltage	U_i = 9.5 V
Internal resistance	R_i = 1 kΩ
Signal range	L = 0...1.2 mA/H = 2.1...4.0 mA

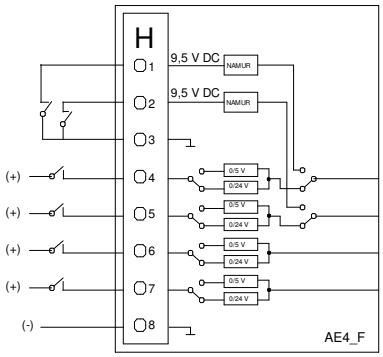
Max. 4 digital inputs according to DIN 19240 (0/24 V DC)

Input resistance	R_E > 6 kΩ
Signal range	L = -3...5 V/H = 13...20.2 V

Max. 4 digital inputs TTL (0/5 V DC)

Input resistance	R_E > 6 kΩ
Signal range	L = 0...0.8 V/H = 3.5...24 V

Accuracy
± 0.1 %



Analog outputs

Module AA3_MA

(pay attention to maximum power consumption, page 10)

Triple current output

0/4...20 mA at 750 Ω

Signal resolution

≤ 0.02 % for 20 mA

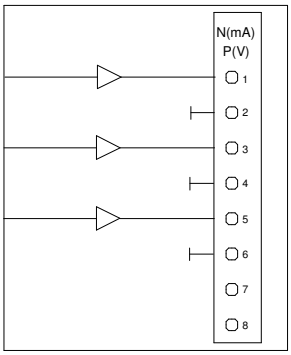
Load dependency

0.1 %/100 Ω

Output monitoring, reaction configurable

Module AA3_V

Triple voltage output 0/2...10 V ≥ 5 kΩ



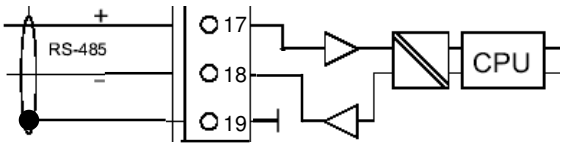
AA3-V
AA3_MA

Interface modules

Module RS 485-Latcom

(can only be used in Slot A, connectors 17, 18, 19)

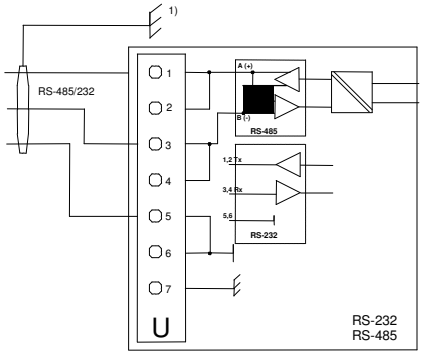
The RS 485 module also allows rapid, direct data exchange for lateral communication between up to 6 devices. Thus it is possible to expand the basis for inputs/outputs and also realise redundancy with to controllers in simple fashion.
Transmission rate up115,2kBaud / 375 kBaud.
(productspecific, unpublished protocol for lateral communication between several controllers)



Module RS 485 or RS 232

(can only be used in slot 2)

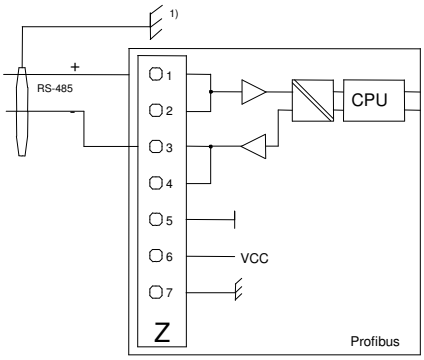
Interface module in accordance with RS 485 or RS 232 specification. Electrically isolated. Not dependent on protocol (the protocol used is configured in the controller. Standard protocol: MODBUS RTU.
The RS 485 module also allows rapid, direct data exchange for lateral communication. Transmission rate by MODBUS RTU up to 38,4 kBaud, by Latcom up to 115,2 kBaud.



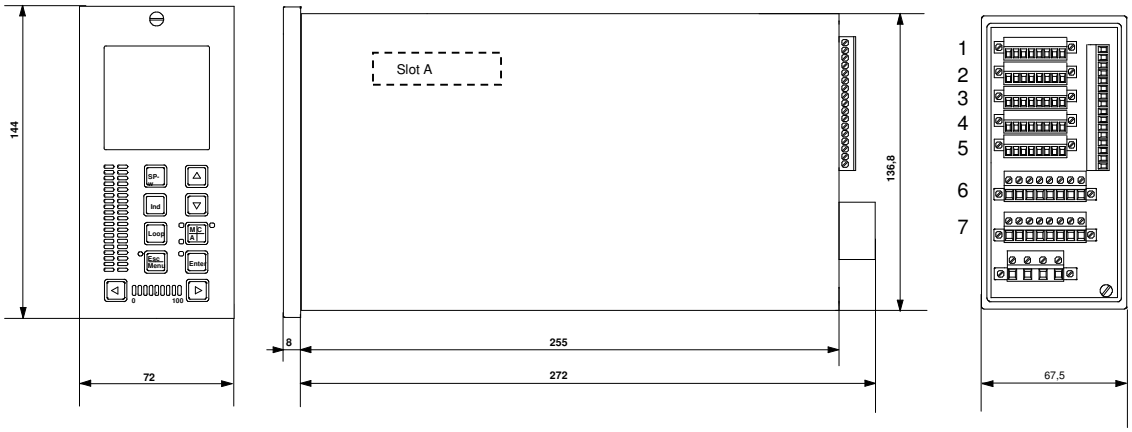
Module PROFIBUS-DP/DPV1 (Slave)

Can be used in all slots 1...7. Module with the full functional capabilities of DIN 19245, parts 1 to 4. Maximum 1 module can be used in the device. Transmission rate up to 1.5 MBaud.

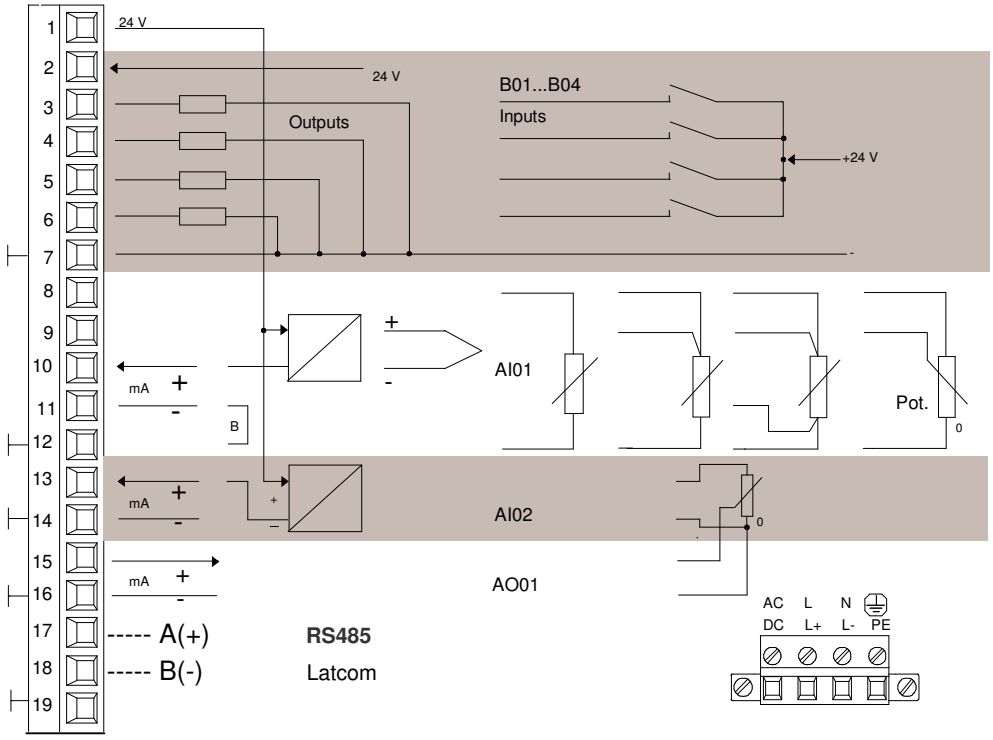
Bus terminating adapter is possible as accessory, Catalog number 62619-0346488.



Dimensional drawings



Connection diagrams of basic models



Connection diagram

AI01	Universal input
AI02	Additional current input
B01...B04	Binary inputs or outputs, function configurable
AO01	Analog output 1 (20 mA)
24 V	Feed for 2-wire transmitter and/or binary inputs and outputs
B	Jumper only if transmitter feed from terminal 1 is used

From the basic models, by configuration and, as appropriate, installation of modules, all functions can be realized (for units with memory card see page 9).

The freely configurable units can be functionally expanded specific to customer requirements with the configuration program IBIS-R. The functions and functional modules available in the configuration program comply with IEC 1131-3.

Ordering information

	Catalog No.								Code		
Standard model without modules pre-configured as single-channel continuous controller	**V62617A-**				**1**	**1**	**1**				
Model P700 (Protrenic 700)		1									
Power supply 115-230 V AC 24 V UC			1 4								
Freely configurable with				1							
Front colours Grey, RAL 7032 with keys in yellow, green and grey								3			
configuration entered at position of current order									301		

Special features

	Code		
Input 1 (AI01) for 0/2...10 V instead of Multifunktions-AI, used PIN 9-10 (mV)	309		
Input 2 (AI02) for 0/2...10 V instead of 0/4...20 mA	310		
User manual in German and English included on CD; no specification required; Documentation on the configuration is in German, other languages on request!			

Ordering information

Modules (add-on)
When fitting or planning the module equipment of the controller, it is neccessary to ensure that the sum of the individual module power parameters does not exceed 220. The project verification of the process controller or the hardware editor in IBIS-R monitors the power limit and prevents an overload.

Accessories				
Part	**Designation**	Catalog No.		
GSD	Device master data file for PROFIBUS DP, diskette	62695-3601109		
Bus terminating adapter PROFIBUS DP		62619-0346488		

Type of modules	**Designation**	Mod. power para.	Code	**available slots** 1	2	3	4	5	6	7	Catalog No.		
Input													
AE4_mV	4fold thermocouple	0	E	x	x	x	x	x	x	x	62619-0346280		
AE2_mA/mV_TR	2fold thermocouple or mA with electrical isolation	0	B	x	x	x	x	x	x	x	62619-0346250		
AE4_PT_2L	4fold Pt100 in 2-wire circuit	0	F	x	x	x	x	x	x	x	62619-0346255		
AE2_PT_3/4L	2fold Pt100 in 3/4-wire circuit	0	G	x	x	x	x	x	x	x	62619-0346281		
AE4_F	4fold frequency input	50	H	x	x	x	x	x	x	x	62619-0346444		
AE4_mA_MUS	4fold 0/4…20 mA / 0/2…10 V with transmitter feed	84	C	x[1)]	x[1)]	x[1)]	x [1)]	x [1)]	x [1)]	x [1)]	62619-0346441		
AE4_mA	4fold 0/4…20 mA with electrical isolation	0	A	x	x	x	x	x	x	x	62619-0346254		
Binary inputs/outputs													
BEA6_BIN	6fold binary inputs/outputs	0	M	x	x	x	x	x	x	x	62619-0346282		
Real time clock BEA4_RTC-B[2)]	Real time clock with battery 4fold binary input/output	0	L	x	x	x	x	x	x	x	62619-0318634		
Outputs													
AA3_mA	3fold 0/4...20 mA	73	N	x[1)]	x[1)]	x[1]	x[1)]	x[1)]	x[1)]	x [1)]	62619-0346252		
AA3_V	3fold 0/2...10 V	3	P	x	x	x	x	x	x	x	62619-0346253		
BA4_REL	4fold relays	27	T						x	x	62619-0346263		
Interface													
RS 485	RS 485, not dependent on protocol, bus compatible baud rate up to 187500 bd.	0	U		x						62619-0346257		
RS 232	RS 232, not dependent on protocol, not bus compatible	0	Y		x						62619-0346456		
PROFIBUS[2)]	PROFIBUS DP/DPV1 (Slave)	80	Z	x[1)]	x[1)]	x[1)]	x[1)]	x[1)]	x[1)]	x[1)]	62619-0346470		
RS-485 Latcom	115,2 kBaud/375 kBaud	0	--	A, connectors 17, 18, 19							62619-9760244		

[1)] Pay attention to the sum of power parameters (≤ 220)
[2)] Maximum 1 module can be used in the device

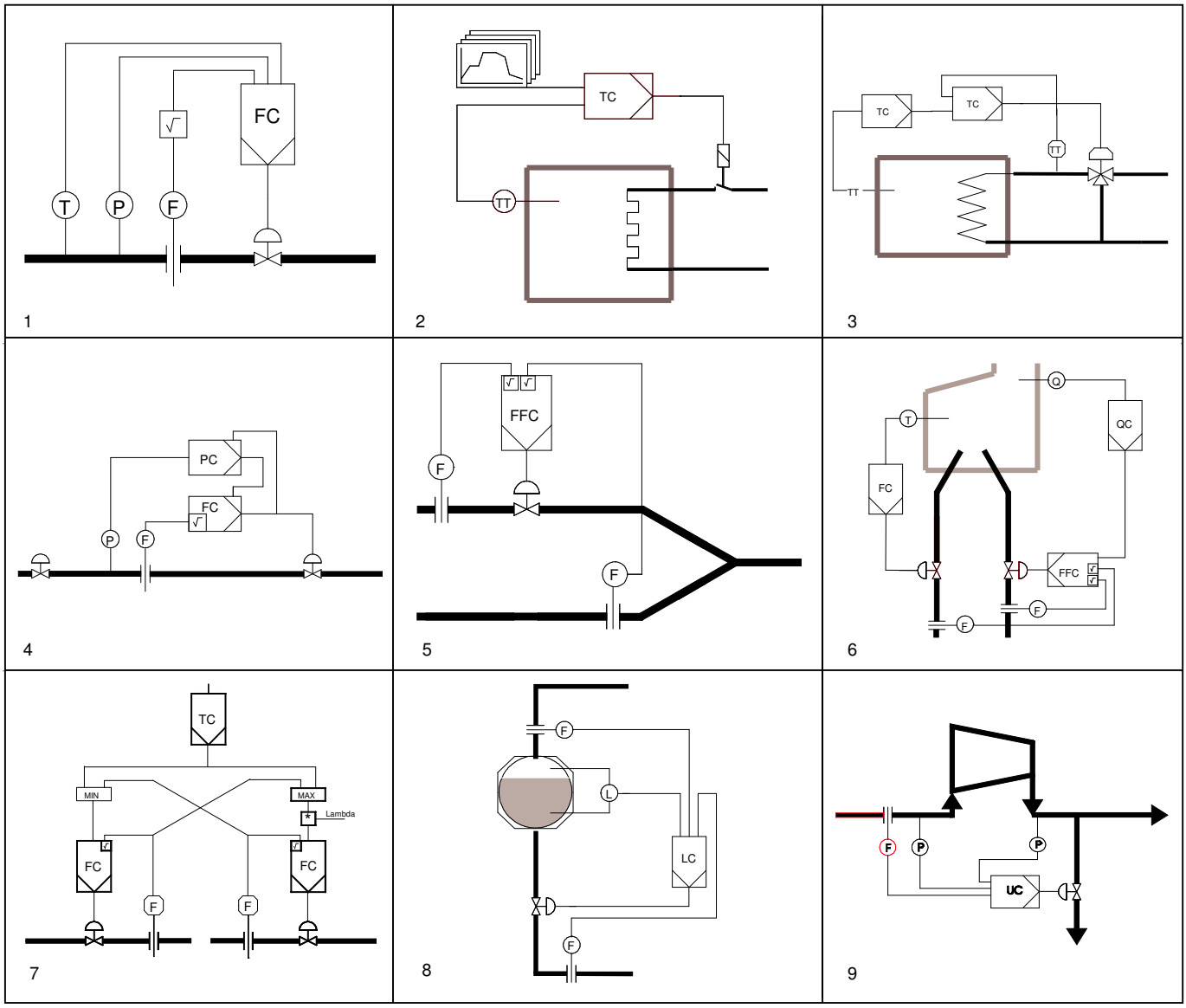
Ordering information

	Catalog No.								Code		
Configuration	**V62677A-**			**0**	**0**	**0**	**0**	**3**			
Customer-specific configuration as separate item (please enclose task definition in clear text)											
Configuration											
List configuration	1										
Free configuration (price according to time and expense) Adopted	2										
from previous order (see Code No. 302)	3										
Delivery											
Stored in unit (see Code No. 301)		1									
Disk 3,5"		2									
Memory card		3									
by E-Mail		4									
Configuration											
Entered at position of current order (clear text)									301		
Adopted from order number and position of previous order (clear text)									302		

Documentation on the configuration is in German (1 copy is provided);
other languages on request!

Special features	Catalog No.	Code
Accessories		
GSD Device master data file for PROFIBUS DP, diskette	62695-3601109	
Bus terminating adapter PROFIBUS DP	62619-0346488	
Memory card	61619-0745753	
Mounting kit for remote display	62608-0337860	
Spare parts		
CPU circuit board with backplane	62619-9760243	
Power supply 230 V AC	62608-0346474	
Power supply 24 V UC	62608-0346475	
Display unit P100, P700 (Protrenic 100, 500) (Grey, RAL 7032, with keys in green, yellow and grey)	62619-9760225	
Case	62608-0346285V	
Firmware-Update (P700/D700, CD incl. Downloader) via PC cable 62695-0346270	62619-9760245	
(Further spare parts on request)		

Applications



1 Fixed value control, e.g. flow control, optionally with flow compensation
2 Program control with up to 10 programs
3 Cascade control
4 Override control
5 Ratio control
6 Air/fuel control
7 Load control
8 Drum water level 3 element control
9 Anti surge control, usually requires additional configurations

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