

Versatile controller 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 LC display with color change red/green**
- **Basic unit with 2 analog inputs, 1 analog output, 2 binary inputs/outputs and 2 relays**
- **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
- **Custom configuration with function block diagram or instruction list**
- **Serial interface**
 - for parameter setting and configuration as standard
- **Buscapable RS 485 interface**
 - for Modbus or PROFIBUS for connection to higher-level systems, optional
- **Rapid lateral data exchange (187.5 kBaud)**
 - between up to 6 controllers via the interface module
- **Data storage in Flash-EEPROM**



Intelligent,
compact and efficient

ENA Control

Description

The industrial controller D700 is a 1...4 channel compact controller used for complementing single control loops and for automating small and medium-sized processes in control engineering. It is universally applicable and suitable for accomplishing simple and complex control tasks.

Basic version

1 Universal input for the controlled variable. Without having to modify the hardware, thermocouples, the resistance thermometer Pt100, teletransmitters and standard signals 0/4...20 mA can be connected. If non-linearized temperature transmitters are used, linearization is effected in the controller. Linearization tables for all standard sensors are stored in the device.

1 input for mA and teletransmitter. It can be used as a transmitter for disturbance variable or set point input. In step controllers this input can be used for position feedback signalling.

1 mA output for the actuating signal or other values, e.g. for set point or actual values.

2 binary inputs/outputs. These inputs and outputs can be configured by the user. These can thus not only be used optionally as controller or alarm outputs but also as inputs for switching over the controller (e.g. manual/automatic).

2 relays for the actuating signal or alarm outputs and for fault reporting.

...a rear TTL interface to connect a parameterisation and configuration PC. This makes the setting work in connection with commissioning easier.

Hardware extension

4 module slots for extending the input and output levels.

Front control panel

The front control panel gives information on the state of the process and permits specifically-targeted intervention in the process sequence. 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 (adjustable acc. to configuration list)

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 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 ENA62-6.70 EN).

Free configuration

Appr. 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.

Inputs

Common data:

without electrical isolation
Resolution $\leq 0.01\%$
Accuracy (referred to nominal range) $\leq 0.2\%$
Temperature effects $\leq 0.2\%/10\text{ }^\circ\text{C}$
Hardware input filter limit frequency 7 Hz

Permissible common-mode voltage against device ground

$\leq \pm 4\text{ V DC}$

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

Analogue:

Universal input AI01

used for standard signal

0/4...20 mA at $50\ \Omega \pm 1\%$

Overcurrent/polarity reversal protection

to $\pm 40\text{ mA}$

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	$\leq 0.2\%$
E	-200...1000 °C	85.18 mV	$\leq 0.2\%$
K	-200...1400 °C	61.53 mV	$\leq 0.2\%$
L	-200...1000 °C	78.21 mV	$\leq 0.2\%$
U	-200... 600 °C	40.00 mV	$\leq 0.3\%$
R	0...1700 °C	20.22 mV	$\leq 0.5\%$
S	0...1800 °C	18.72 mV	$\leq 0.5\%$
T	-200... 400 °C	26.47 mV	$\leq 0.4\%$
B	0...1800 °C	13.24 mV	$\leq 0.6\%$
D	0...2300 °C	36.92 mV	$\leq 0.4\%$

Technical data

Reference junction compensation

internal or external: 0, 20, 50 or 60 °C

Internal reference junction

Error limit $\pm 1\text{ °C}/10\text{ K}$
 Reference temperature $22\text{ °C} \pm 1\text{ °C}$
 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

$\leq 1\text{ mA}$

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

150 Ω , (75...200 Ω); 1.5 k Ω (0.75...2 k Ω)

Measuring current: $\leq 1\text{ mA}$

other data as resistance thermometer

Analog input 2 (AI02)

Input for mA signals and teletransmitter, technical data as AI01, but without electrical isolation. 0...10 V as option (see Code No. 310).

binary:

2 binary inputs/outputs (B01/B02)

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

Switching frequency $\leq 8\text{ Hz}$

Outputs

Analog:

Control output or retransmission

0/4...20 mA at max. 750 Ω , short-circuit and open-circuit proof

Control range

0... $\geq 21\text{ mA}$

Load-dependency

0.1 %/100 Ω

Resolution: $\geq 0.01\text{ %}$

binary: see inputs

2 relays with NO contact (B03/B04)

for max. 250 V AC, 1 A $\cos\varphi = 0.9$

for min. $\geq 12\text{ V AC}$, $\geq 100\text{ mA}$

built-in spark quenching feature 0.022 $\mu\text{F} + 100\text{ }\Omega$

Contact material AgCdO

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...99:99:9 hours, four digital tracks

Serial interfaces

TTL interface for coupling to PC to match parameter setting and configuration program IBIS-R (see Data Sheet ENA62-6.70 EN).

For adapter cable see ordering information.

Buscapable RS 485 interface retrofittable (see modules)

CPU data

Measured value and correction value resolution

$\leq 0.01\text{ %}$

Cycle time

$\geq 20\text{ ms}$ (master setting without modules)

Data backup

Flash-EPROM

Power supply

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

Power consumption:

D700 without modules 9 VA (6 W)
 Max. component mounting + 7.4 VA (5 W)
 Power failure bridging $\geq 150\text{ ms}$ at $\geq 180\text{ V AC}$

24 V UC

24 V DC

-25...+30 %, residual ripple $\leq \pm 3\text{ V}_{SS}$
 -15...+10 %, 47...63 Hz

24 V AC

Power consumption:

D700 without modules 10 VA (7 W)
 Max. component mounting + 8.2 VA (5.5 W)
 Power failure bridging $\geq 20\text{ ms}$ at $0.85 \times U_{nom}$

Power factor $\cos\varphi = 0.7$

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

Electromagnetic compatibility

Meets protection requirements of EMC directive 89/336/EEC, 5/89

Interference resistance EN 61326, May 2004

Interference emission EN 50061000-6-3, June 2005
(referred to: EN 55011, August 2003, class B)

Industry standard to NAMUR NE 21, February 2004

Connection, case, safety**Degree of protection to DIN EN 60529**

Front panel: IP 65

Case: IP 30

Terminals: IP 20

Electrical safety

Meets requirements to EN 61010 -1 (VDE 0411, part1, August 2002)

Class of protection 1

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 but excepting all relay outputs 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 96 mm x 96 mm

Installed depth 200 mm

Panel cutout

92 mm x 92 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 mm², coded**Power supply**2.5 mm²

No shielded cables required - except for interface leads

Mounting orientation

any

Weight

approx. 800 g without modules

each module approx. 40 g

each relay module approx. 80 g

Scope of supply and deliveryController including mounting material and
Operating Manual**Modules**

With few exceptions, the modules can be run at all slots (see table page 10).

The controllers identify the inserted modules automatically.

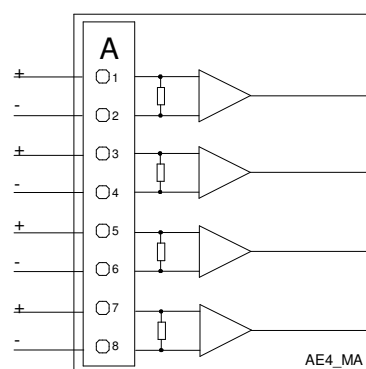
Analog inputs**Module AE4_MA for standard signals****4 inputs**

0/4...20 mA with electrical 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 10)**4 inputs**

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

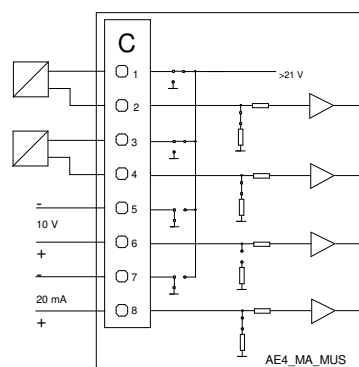
Input resistance at

mA input: approx. 50 Ω; 10 V input: 200 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 electrical isolation

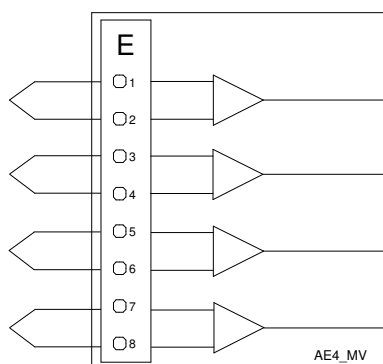
Signal resolution: 20.000 for -10...80 mV**Input resistance:** approx. 5 M Ω **Permissible common-mode voltage:** $\leq \pm 4$ V against device ground**Permissible differential-mode voltage:** 50 mV_{ss}**Destruction proof**Voltage at one input ± 10 VVoltage between input and ground ± 50 V**Break monitoring**

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

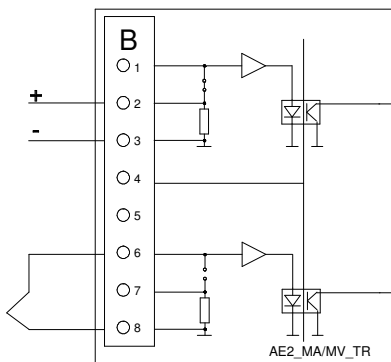
0/4...20 mA or -10...80 mV (changeable by means of jumpers)

Input resistance at20 mA: 25 Ω ; -10...80 mV: approx. 5 M Ω **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**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**

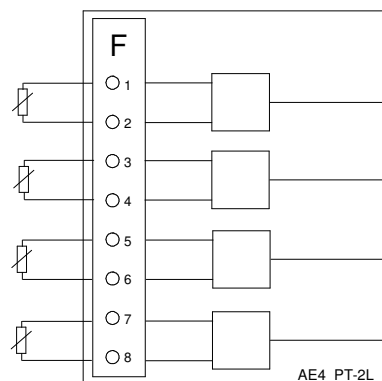
-200.0...+200.0 °C

0.0...+450.0 °C

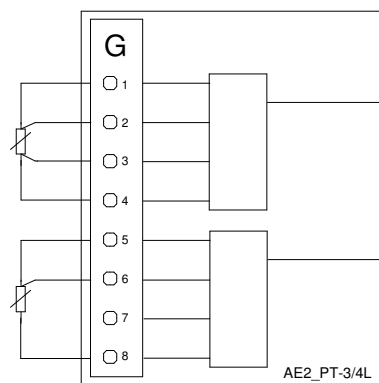
-200.0...+800.0 °C

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

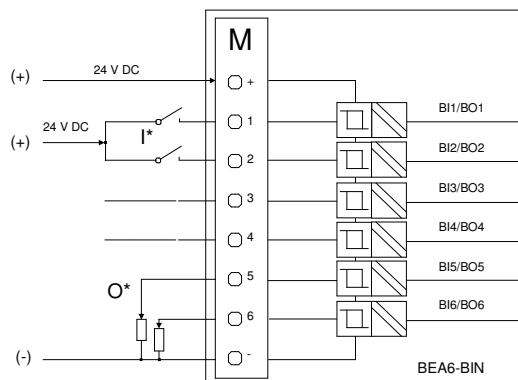
Measuring current < 0.5 mA

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

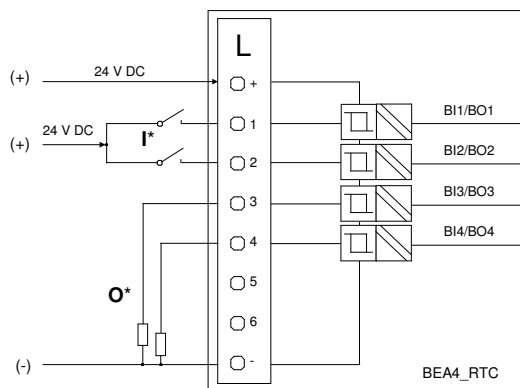
Real time clock with date, weekday and time

Daylight saving time and leap year switching

Synchronisation by digital input

Battery buffer or capacitor buffer (> 72 h)

4 digital I/O, electrical 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 1)

4 relays

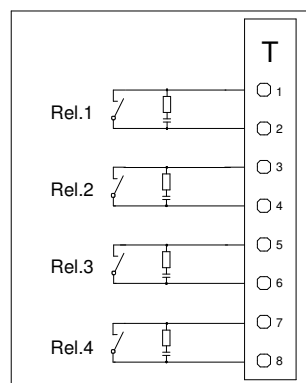
with NO contact for max. 250 V AC, 1 A resistive load

Built-in spark-quenching

0.022 μF + 100 Ω

For max. 250 V, max. 1 A at cosφ = 0.9

Contact material AgCdO



BA4_REL

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)

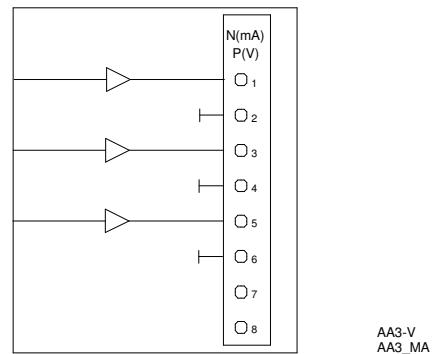
Range	0...20 s
Signal resolution	1 ms

Impulses (1-4 inputs)/incremental angle (2 inputs)

Range: 0...20.000 impulses	
min. impulse length: 50 µs	max. 1 kHz

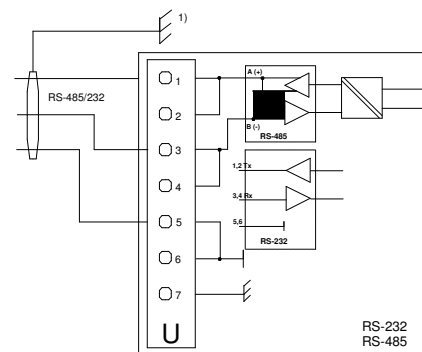
Absolute incremental angle (1 input)

Range: 0...20.000 impulses	
min. impulse length: 50 µs	max. 1 kHz

**Interface modules****Module RS 485 or RS 232**

(can only be used in slot 4)

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 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 up to 187.5 kbaud.

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

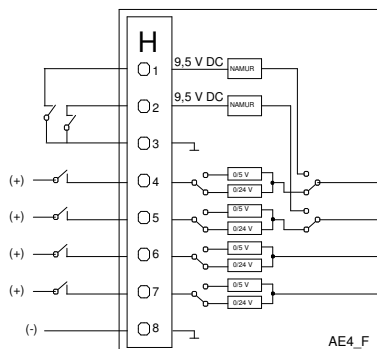
Open circuit voltage	$U_i = 9.5 \text{ V}$
Internal resistance	$R_i = 1 \text{ k}\Omega$
Signal range	$L = 0...1.2 \text{ mA/H} = 2.1...4.0 \text{ mA}$

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

Input resistance	$R_E > 6 \text{ k}\Omega$
Signal range	$L = -3...5 \text{ V/H} = 13...20.2 \text{ V}$

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

Input resistance	$R_E > 6 \text{ k}\Omega$
Signal range	$L = 0...0.8 \text{ V/H} = 3.5...24 \text{ V}$

Accuracy: $\pm 0.1 \%$ **Analog outputs****Module AA3_MA**

(pay attention to maximum power consumption, page 10)

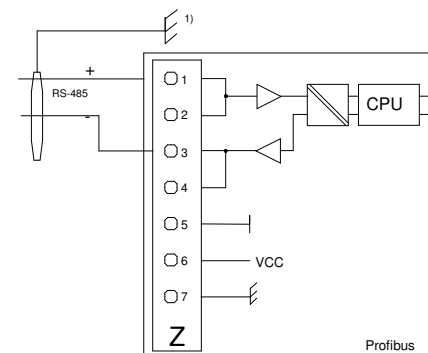
Triple current output 0/4...20 mA at 750 Ω Signal resolution $\leq 0.02 \%$ for 20 mALoad dependency 0.1 %/100 Ω

Output monitoring, reaction configurable

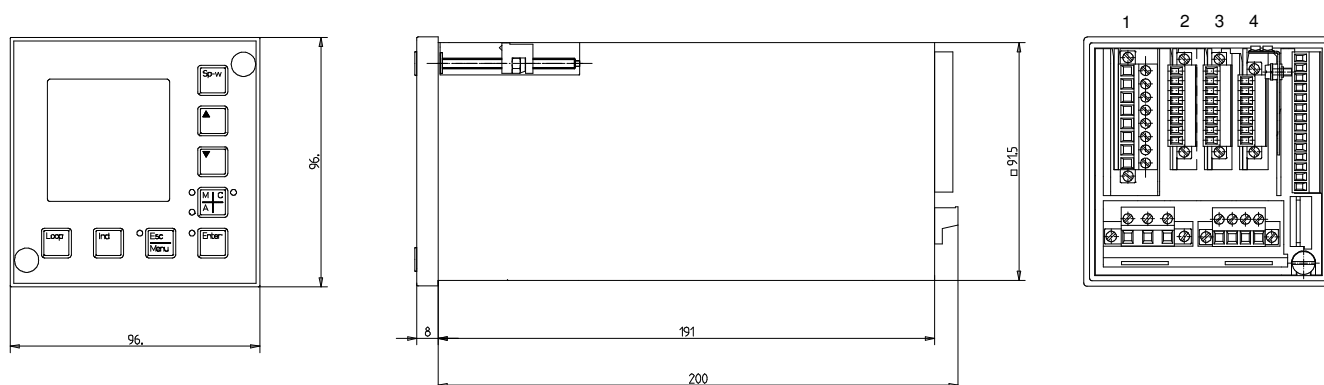
Module AA3_VTriple voltage output 0/2...10 V $\geq 5 \text{ k}\Omega$ **Module PROFIBUS DP/DPV1 (Slave)**

Can be used in all slots 1...4. 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.

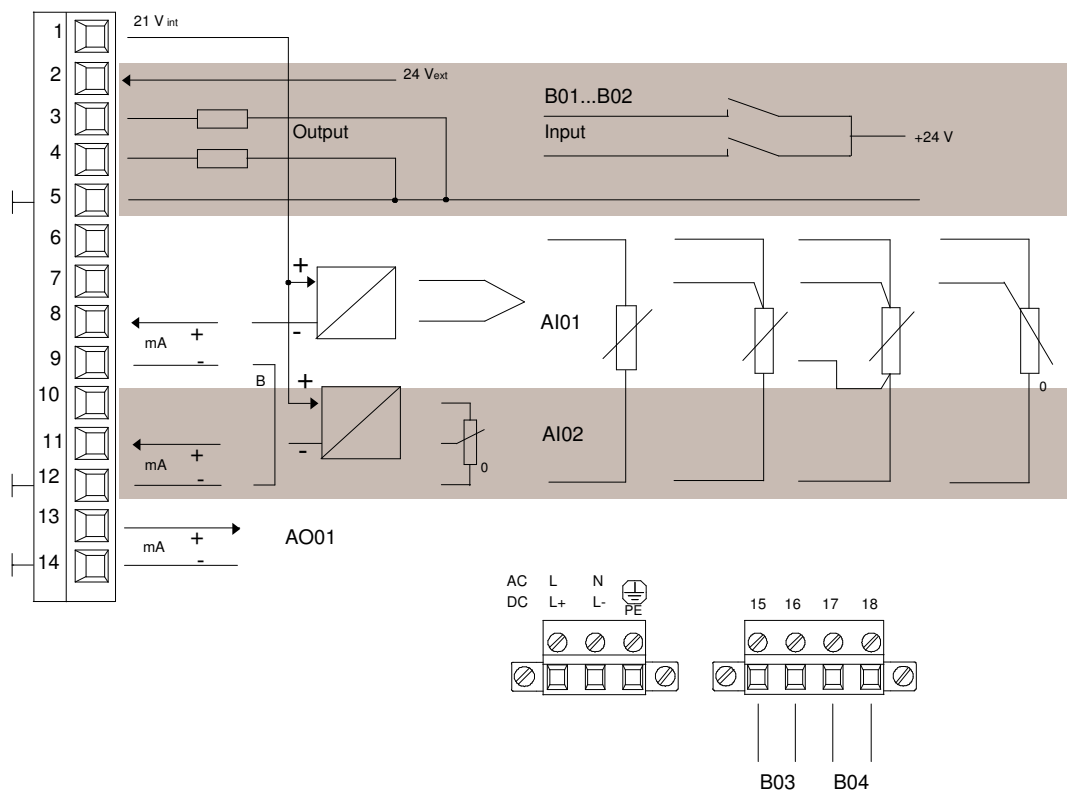
Bus terminating adapter see accessories on page 10



Dimensional drawings



Connection diagrams of basic models



Connection diagram

AI01	Universal input
AI02	Additional current input (0/4...20 mA) and teletransmitter
B01...B02	Binary inputs or outputs, Function configurable
AO01	Analog output 1 (0/4...20 mA)
21 V	Feed for 2-wire transmitter and/or binary inputs and outputs
B	Jumper required only if power feed to transmitter from terminal 1 and connection to AI01
B03...B04	Relay outputs (NO contact) max. 250 V AC/1 A

Ordering information

	Catalog No.							Code		
Standard model Digitrenic 700 without modules, including bus backplane pre-configured as single-channel continuous controller	V61617A-			0	0	0	0			
Digitrenic 700 acc. to list and freely configurable¹⁾ 115-230 V AC 24 V UC		1 2	2 2							
Front colours Black, RAL 9005 with grey keys								3		
Configuration entered at position of current order Input 2 (AE02) for 0/2...10 V instead of 0/4...20 mA								301 310		

From these basic models, by configuration and, as appropriate, installation of modules, all function can be realized.

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.

¹⁾ Explanation see page 2

Ordering information

Modules (add-on)																	
The bus backplane is required once per device and need not be ordered if device already contains a module.																	
When fitting or planning the module equipment of the controller, it is necessary to ensure that the sum of the individual module power parameters does not exceed 170.																	
The project verification of the controller or the hardware editor in IBIS-R monitors the power limit and prevents an overload.																	
Accessories																	
Part		Designation						Catalog No.									
Bus backplane								61619-0346840									
GSD		Device master data file for PROFIBUS DP, disk						62695-3601109									
Bus terminating adapter PROFIBUS DP								62619-0346488									
Type of modules		Designation				Module power param.	Code	available slots 1 2 3 4				Catalog No.					
Inputs																	
AE4_mV		4fold thermocouple				0	E	x	x	x	x	62619-0346280					
AE2_mA/mV_TR		Dual thermocouple or mA with galvanical isolation				0	B	x	x	x	x	62619-0346250					
AE4_PT_2L		4fold Pt100 in 2-wire circuit				0	F	x	x	x	x	62619-0346255					
AE2_PT_3/4L		2fold Pt100 in 3-/4-wire circuit				0	G	x	x	x	x	62619-0346281					
AE4_F ¹⁾		4fold frequency input				50	H	x ₁₎	x ₁₎	x ₁₎	x ₁₎	62619-0346444					
AE4_mA_MUS ¹⁾		4fold 0/4...20mA / 0/2...10V with transmitter feed				84	C	x ₁₎	x ₁₎	x ₁₎	x ₁₎	62619-0346441					
AE4_mA		4fold 0/4...20mA with electrical isolation				0	A	x	x	x	x	62619-0346254					
Binary inputs/outputs																	
BEA6_BIN		6fold binary input/output				0	M	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	62619-0318634					
						0	L	x	x	x	x	62619-0318635					
Outputs																	
AA3_mA ¹⁾		Triple 0/4...20 mA				73	N	x ₁₎	x ₁₎	x ₁₎	x ₁₎	62619-0346252					
AA3_V		Triple 0/2...10 V				3	P	x	x	x	x	62619-0346253					
BA4_REL ²⁾		4fold relay				27	T	x				62619-0346263					
Interfaces																	
RS 485		RS 485, not dependent on protocol, bus compatible baud rate up to 187.500 bd.				0	U					x	62619-0346257				
RS 232		RS 232, not dependent on protocol, not bus compatible				0	Y					x	62619-0346456				
PROFIBUS ^{1) 2)}		PROFIBUS DP/DPV1 (slave)				80	Z	x ₁₎	x ₁₎	x ₁₎	x ₁₎	62619-0346470					

¹⁾ Pay attention to the sum of power parameters (≤ 170)

²⁾ Maximum 1 module can be used in the device

Ordering information

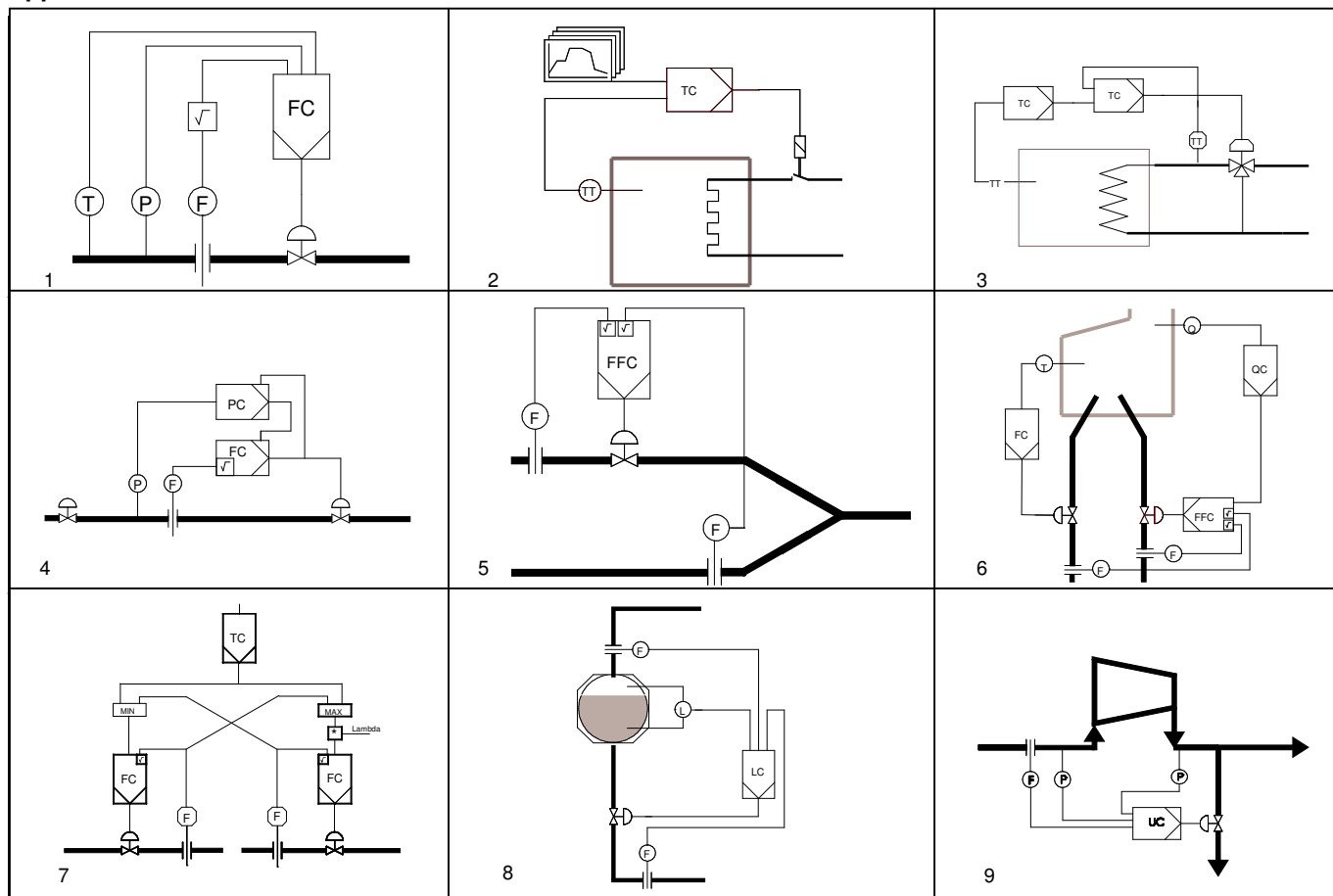
	Catalog No.	Code		
Configuration	V61677A-			
Customer-specific configuration as separate item (please enclose task definition in clear text)				
Configuration				
List configuration	1			
Free configuration (price according to time and expense) Adopted	2			
from previous order (see Code No. 302)	3			
Delivery				
Stored in unit (see Code No. 301)	1			
Diskette 3.5 inch.	2			
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				
IBIS-R PC program for setting parameter and configuration (see Data Sheet ENA10/62-6.70 EN)				
PC cable with adapter for connection to the serial interface	62695-0346270			
TTL interface				
Adapter without PC cable	62695-0346267			
Spare parts Digitrenic 700				
CPU board	61619-9760246			
Power supply 230 V AC	61608-0346857			
Power supply 24 V UC	61608-0346858			
Case with integrated front panel module (black, RAL 9005)	61619-9760232			
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, requires additional configurations

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ENAControl has Sales & Customer Support

The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.

Printed in the Fed. Rep. of Germany (01.2007)

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