Protronic 100/500/550

Controllers for Process engineering

Installation manual   42/62-50011 EN   Rev. 06

ABB

ABB

Protronic 100/500/550
Controllers for process engineering

Installation manual

Document No. 42/62-50011 EN

Edition: 08.02
Revision: 06

Manufacturer:

ABB Automation Products GmbH
Hoeseler Platz 2

42579 Heiligenhaus
Germany

Phone: +49 2056 12-5181
Fax: +49 2056 12-5081

ABB

Inhalt . . . . Seite

ABB

ABB

Preliminary remarks

The documentation for the Protronic 100/500/550 includes the following parts:

General safety instructions

Important instructions!
Please read and observe!

The instrument
– has been designed and tested in accordance with EN 61 010-1 = IEC 1010-1 = DIN VDE 0411 Part 1
  "Protective measures for electrical, logic control and laboratory measuring instruments",
– is CE-certified,
– has been supplied in a safe condition.

In order to retain this condition and to ensure correct and safe operation of the Protronic 100/500/550 you must take care for appropriate transportation and storage, expert installation and commissioning as well as correct operation and meticulous maintenance.

Only those persons conversant with the installation, commissioning, operation and maintenance of similar apparatuses and who possess the necessary qualifications are allowed to work on the Protronic 100/500/550.

Please take note of
– the contents of this Operating Manual,
– the safety regulations affixed to the Protronic 100/500/550 and
– the safety regulations pertaining to the installation and operation of electrical systems.

The directives, norms and guidelines mentioned in this Operation Manual are applicable in the Federal Republic of Germany. When using the Protronic 100/500/550 in other countries, please observe the national regulations prevailing in the respective country.

If more information is required or you want personal guidance, please contact the ABB Service Department.

1   Description and use

The Protronic 100/500/550 process controllers are instruments in the Protronic range which can be used universally. They can be operated as individual instruments under local control as well as with other Protronic controllers in system interconnection with other Protronic controllers, or interconnected to overlayed systems. Protronic 100 and Protronic 500/550 differ in their complementation, Protronic 100/500 differ in respect of their front panels.

Protronic 100/500
This front panel indicates the current measured values and the operating modes qualitatively by LEDs from a long distance. All information is displayed clearly on an LC display for operating purposes.

Protronic 550
Protronic 550 has a graphical front panel. Large volumes of different information can be displayed on a graphics display with 108 x 240 dots. A parallel display of several control channels or the changes with time of measured variables can be selected with keys.

The basic models of Protronic 100/500/550 have...
... an universal input. Thermocouples, Pt100 resistance thermometers, as well as 0/4 to 20 mA standard analog signals, can be connected without changing the hardware of the unit. Linearization is performed in the controller if non-linearizing temperature transmitters are used. The linearization tables for all standard sensors are stored in the unit.

... a mA input, which can be used as disturbance variable or set point input. With step controllers, this input can be used for the position feedback signal.

... a mA output for the positioning signal or other values such as for set point or actual value.

... four binary inputs/outputs. These inputs/outputs can be configured by the user as inputs or outputs, so that they can be used optionally as controller outputs or alarm outputs, as well as inputs for transfers in the controller, such as from manual to automatic.

... a front-panel TTL interface for connecting a parameter-setting and configuring PC. This reduces the setting work during commissioning.

The basic model of Protronic 100 has...
... 1 Module slot for taking up the interface module.

The basic models of Protronic 500/550 have...
... 7 Module slots for expanding the function.
... 1 slot for a MEMORY-Card (front panel).

Front panel
The front panel provides information on the status of the process and makes possible selective intervention into the process action. Luminous pointers on the screen indicate the status of the process from a distance. Numerical displays and clear text information permit precise readout and setting of set point and correction values.

1.1   Programmer

Every device includes a configurable programmer to preset a time-dependent set point. The Protronic can save up to 10 programs with 15 sections for each program.

1.2   Controller outputs

Z1   2-point PID controller action with or without preliminary contact for strong-weak-off control.
Z2   Controller for heat-off-cool optionally with two switching or one continuous and one switching output.
S   Step controller.
C   Continuous controller, also optionally split-range output with two continuous positioning signals.

1.3 Parameter setting

The parameter-setting level is reached via the <Menu> key after entering a password. At this level it is possible to set parameters such as controller gain Gp or time constants for the existing equipment functions.

1.4 Configuration

Configuration can be performed in two ways:

1.4.1 List configuration

The password-protected configuration level is reached via the <Menu> key, and standard functions are selected at this level from a list available in the equipment. Alternatively to using the operator keyboard, it is also possible to make the selection via the **IBIS_ R** PC program. In this case the setting is particularly simplified if several units are to be set at one time (see Data Sheet 62-6.70 EN). The configuration of a Protronic 100 is acceptable by Protronic 500/550.

1.4.2 Free configuration (not Protronic 100)

Duly prepared Protronic 500/550 units permit customer-specific configuration, i.e. functions which go beyond the standard functions of the controller.

By adding binary inputs/outputs using the function plan editor (PC program **IBIS_ R**+, see Data Sheet 62-6.70 EN) it is for example possible to set up an additional logic control in the controller, which intervenes in both the controller and the process.

2   Installation

Front view

| Protronic 100/500 | Protronic 550 |
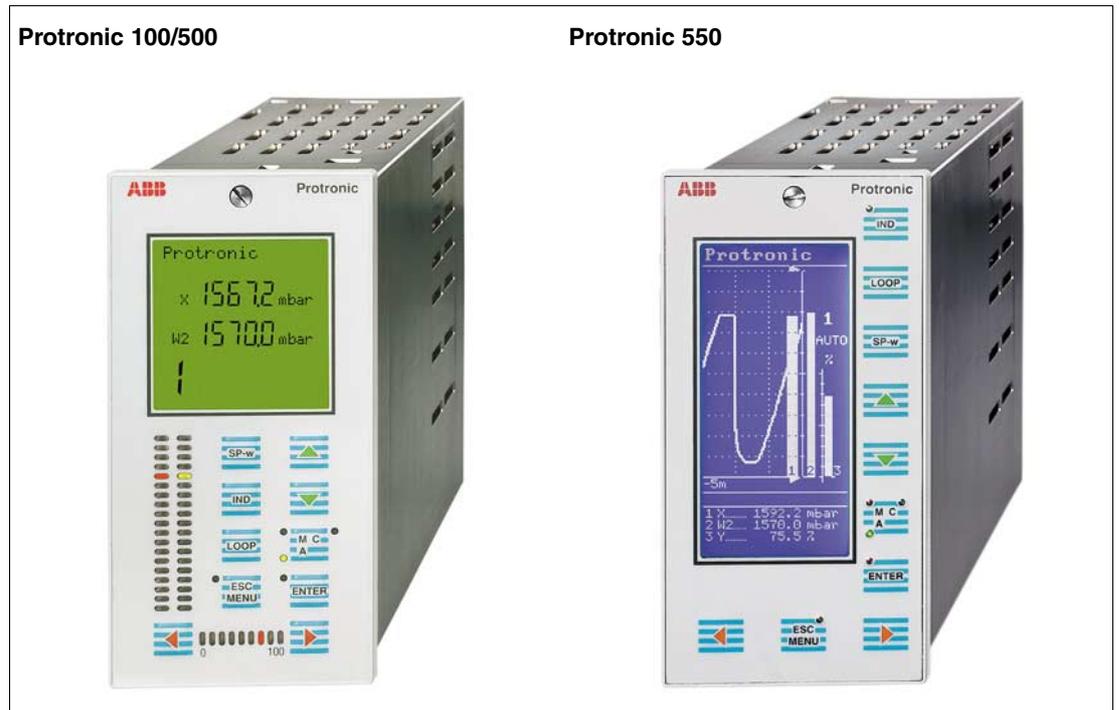
Fig. 2-1   Front view

2.1   Identification of the model

The rating plate is used to identify the model. It is located on the side of the case.

2.2   Installation site

The Protronic 100/500/550 is suitable for front mounting in control rooms, control cabinets and machines.

It must be ensured when selecting the installation site that the limits of climatic and mechanical capability defined in the section 4 "Technical data" on page 23 and following pages are not exceeded.

Caution
To maintain protection against shocks, the device may only be operated when fully installed.

2.3 Mounting

1. Panel cutout to DIN 43 700
   $68 \,^{+0,7}$ mm $\times 138 \,^{+1}$ mm.
   With close-packed mounting
   $((n-1) \times 72 + 68) \,^{+1} \times 138 \,^{+1}$ mm.
   A space of at least 36 mm top and bottom between the units must also be maintained.
   Note
   The space between the units is required for ventilation and must therefore not be encroached upon by wiring.

2. Slide the unit into the panel cutout from the front

   ⚠ **Caution**

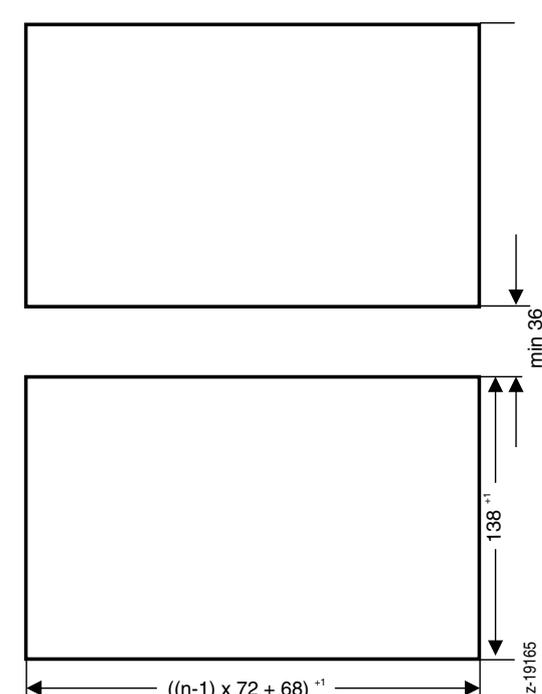   **Take care not to damage the spring contacts Fwhen installing (or dismantling).**
   and

3. Affix with the screw brackets supplied in such way that conduction takes place between the case, screw brackets and panel via the spring contacts.
   Note
   The connected conductor serves to safeguard the EMC characteristics of the device.

Fig. 2-2   Panel cutout (dimensions in mm)
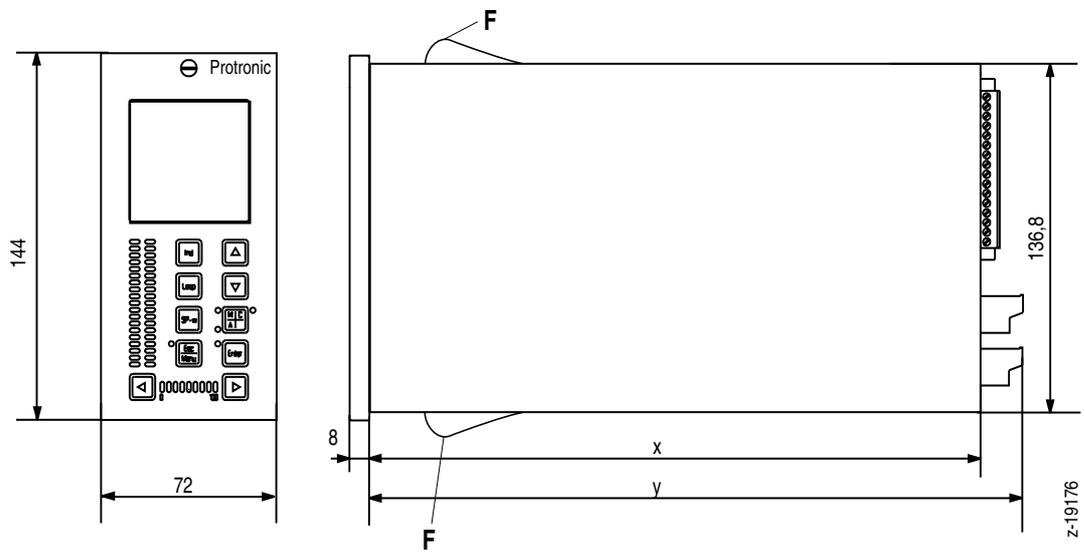

Fig. 2-3   Dimensional drawing (dimensions in mm)
Protronic 500, 550, 100 long version (up to Q2/2002)   x = 255 mm, y = 272 mm
Protronic 100 short version (up to Q2/2002):   x = 193 mm, y = 210 mm
F spring contacts

2.4 Connection

Note

After the device has been switched on, some internal checks take place. These checks take about 15 s and are displayed.

2.4.1 Signal connections, basic model

Note
After the device has been switched on, some internal checks take place. These checks take about 15 s and are displayed.

Connect with plug-in screw terminals for solid or stranded wire. Conductor cross-section up to 1.5 mm^2

1) Note
Protronic 100 in short version (210 mm) has an analog output AO01 which is opto-isolated.
Pin 16 is not connected to ground!
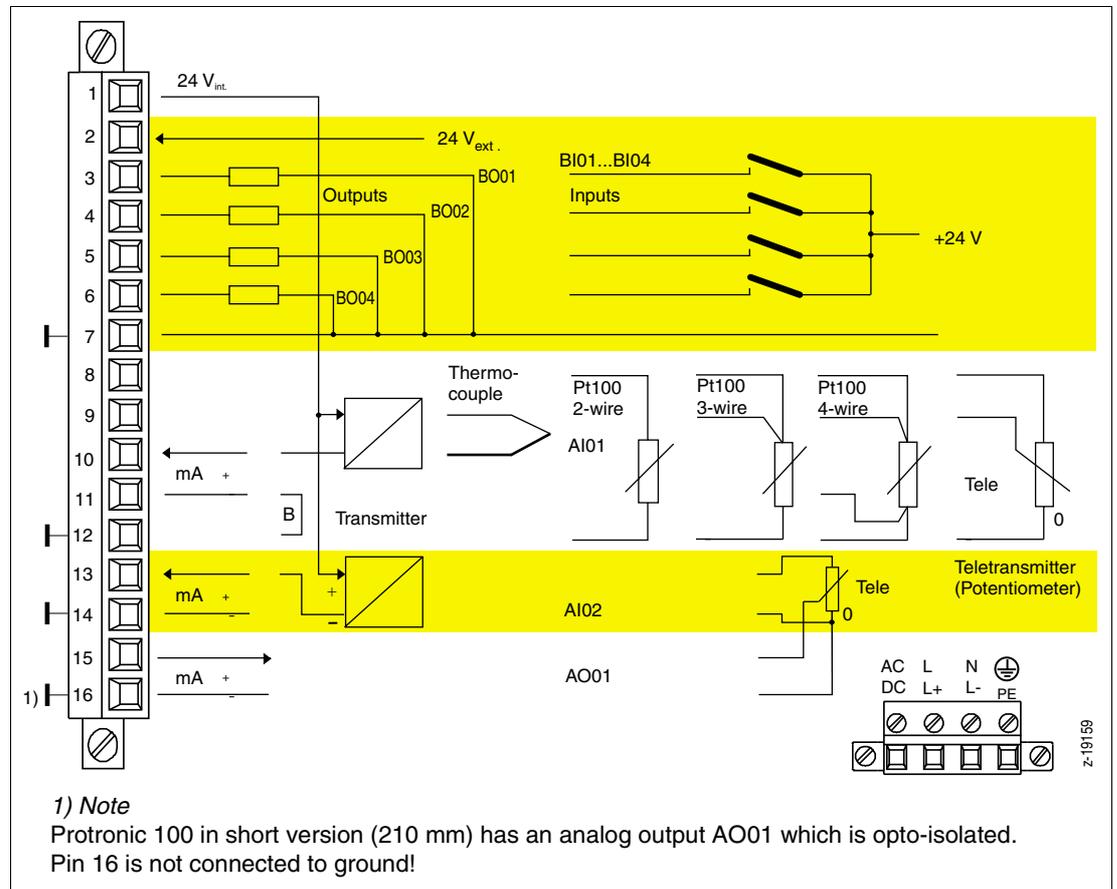
Fig. 2-4   Signal connections, basic model

1	24 V int
2	Input of power supply for binary outputs
3	Binary port 1 (a binary port can be used as binary input or binary output)
4	Binary port 2
5	Binary port 3
6	Binary port 4
7	Zero potential
8	Analog input 1
9	Analog input 1
10	Analog input 1
11	Analog input 1
12	Analog input 1
13	Analog input 2
14	Analog input 2
15	Analog output 1
16	Analog output 1
AA01	Analog output 1 (20 mA)
AE01	Universal input
AE02	Additional current input
B	Jumper in case transmitter is supplied by terminal 1
B01...B04	Binary inputs or outputs
Tele	Teletransmitter connection (e.g. position feedback)
24 V int.	Power supply for 2-wire transmitter and/or binary inputs and outputs
24 V ext.	External power supply

Note
In Protronic 500 and 550 can be mounted up to 7 add-on I/O modules,
in Protronic 100 only 1 add-on module (PROFIBUS, RS 232, RS 485).

2.4.2   Signal connections, modules

(At Protronic 100 only interface modules!)

Overview

Fig. 2-5   Protronic 100, rear view with terminal strips
1   Module slot
8   Signal connections basic model
          (1...16: terminals)
AK   Stop catch
K   Twist screw
KS   Cable clamps (for connecting
          the cable shielding)
U_H Power supply connection

Fig. 2-6   Protronic 500/550, rear view with terminals
1...7   Module slots (1...8: terminals)
8   Signal connections basic model
          (1...16: terminals)
AK   Stop catch
K   Twist screw
S   Shielding connection plate
U_H Power supply connection

PC connection frontside (configuration interface)
1.   Loosen screw on the frontside.
2.   Tilt the front forward and downward.

The PC interface can now be accessed.

2.4.3   Modules (retrofittable)

The Protronic 100 can only be equipped with one module.
This module can be inserted in slot 1. The module to be equipped can be: RS 232, RS 485 or PROFIBUS.

In the following table you can find fitting of the Protronic 500/550..

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.

Type of modules	Designation	Mod. power parameter	Code	available slots							see Fig. on page	Catalog No.
				1	2	3	4	5	6	7		62619-
Inputs												
AE4_MV	4fold thermocouple	0	E	x	x	x	x	x	x	x	13	0346280
AE2_MA/MV_TR	2fold thermocouple or mA with electrical isolation	0	B	x	x	x	x	x	x	x	13	0346250
AE4_PT_2L	4fold Pt100 2-wire circuit	0	F	x	x	x	x	x	x	x	14	0346255
AE2_PT_3/4L	2fold Pt100 3/4-wire circuit	0	G	x	x	x	x	x	x	x	14	0346281
AE4_F [1]	4fold frequency input	50	H	x	x	x	x	x	x	x	15	0346444
AE4_MA_MUS [2]	4fold 0/4...20 mA; 0/2...10 V with transmitter feed	84	C	x^2	x^2	x^2	x^2	x^2	x^2	x^2	13	0346441
AE4_MA	4fold 0/4...20 mA with electrical isolation	0	A	x	x	x	x	x	x	x	13	0346254
Binary inputsToutputs												
BEA6_BIN	6fold binary inputs/outputs	0	M	x	x	x	x	x	x	x	14	0346282
Real time clock												
BEA4_RTC-B [3,4]	Real time clock with battery 4fold binary inputs/outputs	0	L	x	x	x	x	x	x	x	15	0346917
BEA4_RTC-C [3,4]	Real time clock with capacitor 4fold binary inputs/outputs	0	L	x	x	x	x	x	x	x	15	0346920
Outputs												
AA3_MA [2]	3fold 0/4...20 mA	73	N	x^2	x^2	x^2	x^2	x^2	x^2	x^2	16	0346252
AA3_V	3fold 0/2...10 V	3	P	x	x	x	x	x	x	x	16	0346253
BA4_REL	4fold relays	27	T								15	0346263
Interfaces												
RS 485	RS 485, not dependent on protocol, bus compatible baud rate up to 187500 Baud	0	U		x						17	0346257
RS 232	RS 232, not dependent on protocol, not bus compatible	0	Y		x						17	0346456
PROFIBUS [1,3]	PROFIBUS DP / DPV1 (Slave)	80	Z	x^2	x^2	x^2	x^2	x^2	x^2	x^2	17	0346470

Table 2-1   Module overview
1 can only be used with devices from firmware version 01.190 (DPV1 from 1.200)
2 Pay attention to the sum of power parameters($\leq$ 220)
3 Maximum 1 module can be used in the device
4 can only be used with devices from firmware version 1.200

Analogeingänge

Module AE4_MA:
Analog input module for standard signals 4 × mA
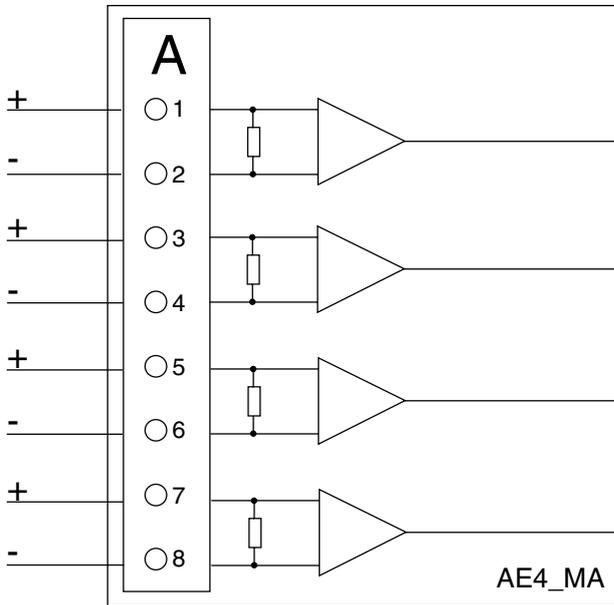4 inputs 0/4...20 mA with electronical isolation

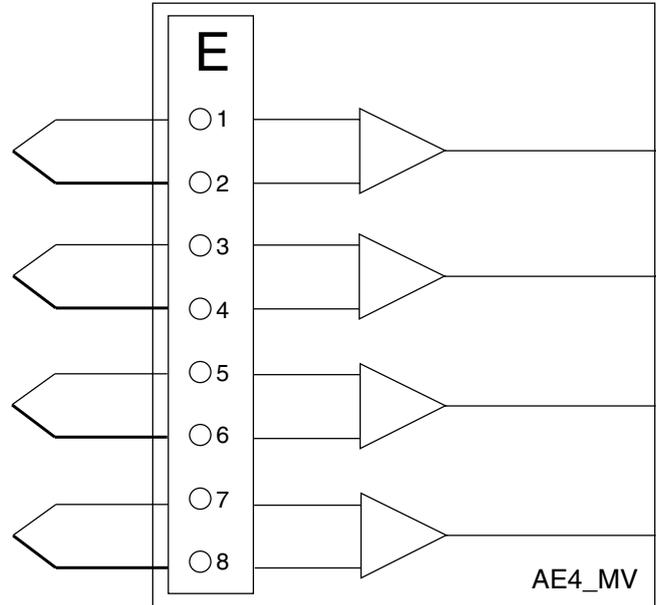

Fig. 2-7   Analog input module 4 × mA

Module AE4_MA-MUS:
Analog input module 4 × mA with transmitter feed
4 inputs 0/4...20 mA, indiv. switchable to 0/2...10 V with common ground

Fig. 2-8   Analog input module 4 × mA with transmitter feed

Module AE4_MV:
Analog input module 4 × thermocouple

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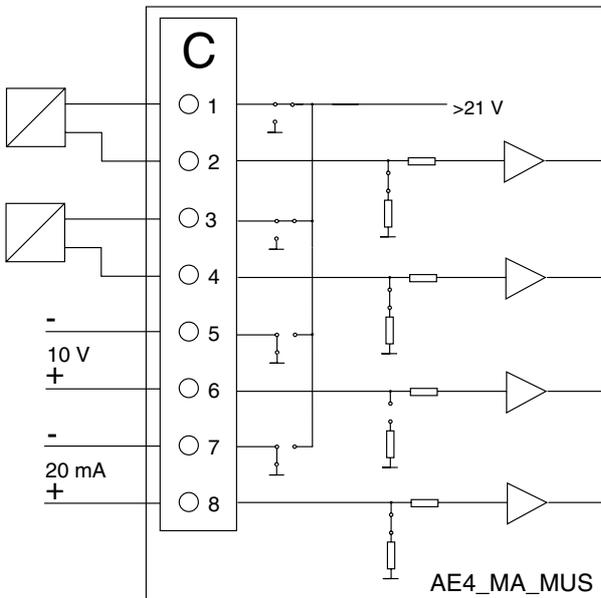

Fig. 2-9   Analog input module 4 × thermocouple

Module AE2_MA/MV-TR:
Analog input module 2 × mA or thermocouple or mV
2 inputs with electrical isolation 0/4...20 mA or -10...80 mV (changeable by means of jumpers)
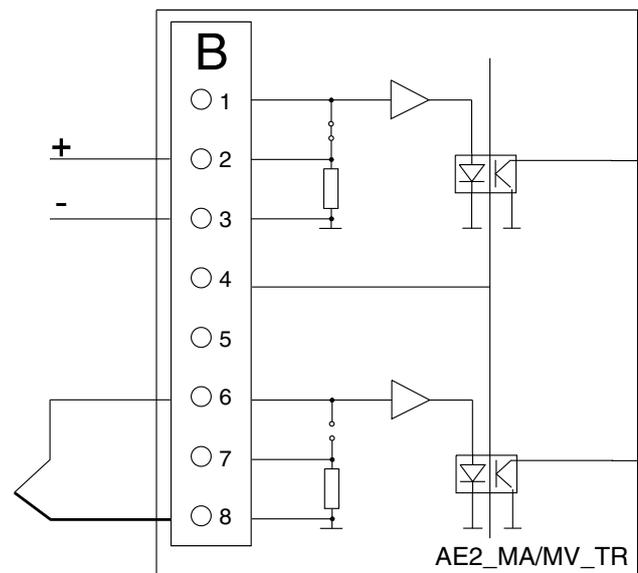

Fig. 2-10 Analog input module 2 × mA or thermocouple or mV

Module AE4_PT_2L:
Analog input module 4 × Pt 100 for RTD 2-wires

4 inputs for Pt 100 in 2-wire circuit without electrical isolation
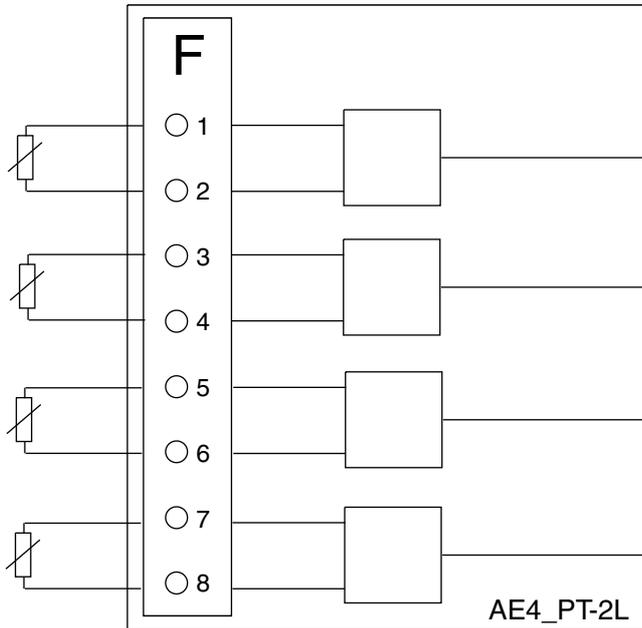

Fig. 2-11   Analog input module 4 × Pt 100 in 2-wire circuit

Module AE2_PT-3/4L:
Analog input module 2 × Pt 100 for RTD 3-/4-wires

2 inputs for Pt 100, in 3- or 4-wire circuit or potentiometer
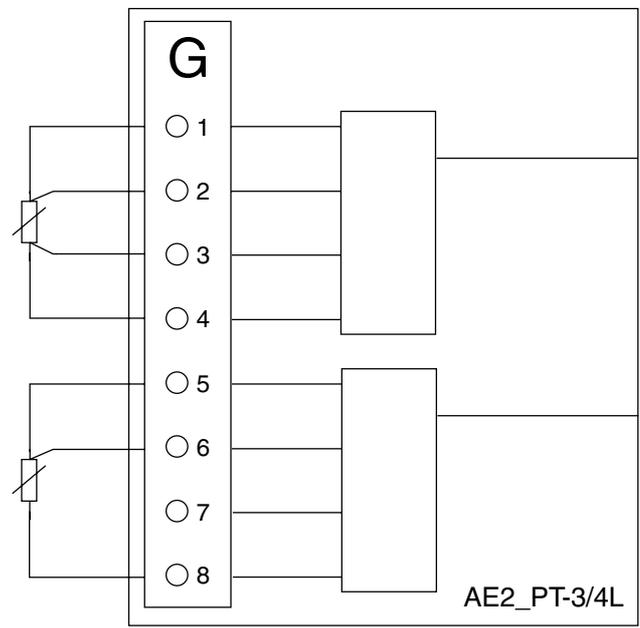
Fig. 2-12   Analog input module 2 × Pt 100 in 3-/4-wire circuit

Binary inputs/outputs

Module BEA6-BIN:
Binary input/output module (with electrical isolation)

6 binary inputs/outputs, electrical isolation, function configurable as input or output, direct or reverse action
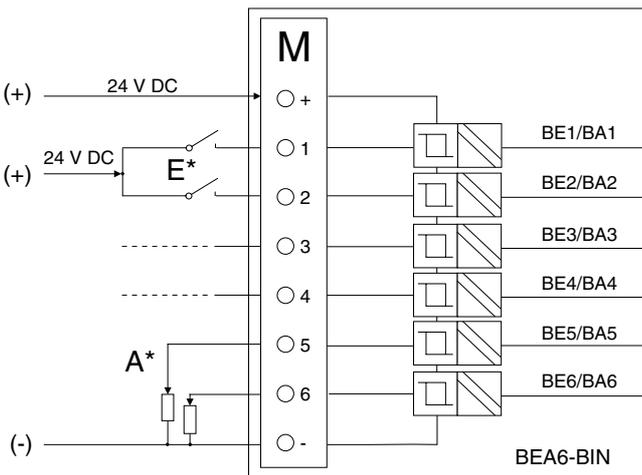
Fig. 2-13 Binary input/output module (with electrical isolation)
*) Connection example:
E = binary inputs , A = binary outputs

Input DIN 19240	Rated signal V DC	Voltage range (V)	Current range
Rated level	24	20.4...28.8	ca. 3 mA
1-signal	24	13.0...30.2	ca. 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

Module BEA4_RTC:
Real time clock with binary I/O

Real time clock with date, weekday and time
Daylight saving time and leap year switching
Year2000 compatible
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)

Requirement: firmware and software library IBIS-R+ 3.6

Fig. 2-14 Real time clock
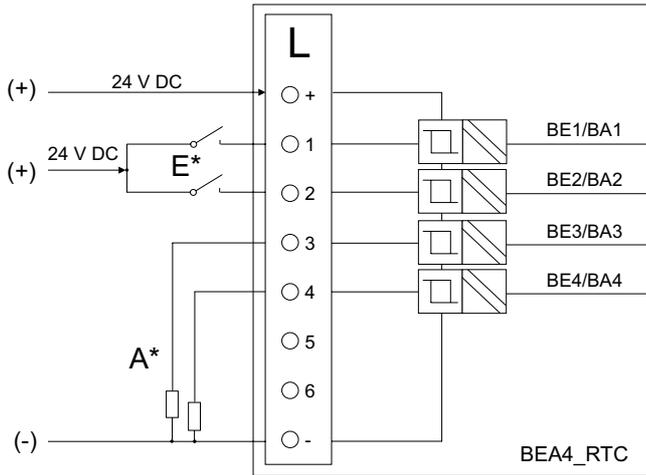 *) Connection example:
  E = binary inputs , A = binary outputs

Module AE4_F:
Frequency input module 4 × F
4 inputs for
  Frequency (1 - 4 inputs)
  Periode (1 - 4 inputs)
  Impulses (1 - 4 inputs)/incremental angle (2 inputs)
  Absolute incremental angle (1 input)

Fig. 2-15 Frequeny input module 4 × F

All four inputs of one module can only be operated under the same measuring task.
With incremental measurement, the direction of rotation/movement is recognized. For this, two inputs are linked to form one input.
With incremental measurement with zero recognition, the direction of rotation/movement is recognized and the measurement input is set to zero via a third input, if this input is set. Thus, an absolute displacement/angular position measurement is possible.
For this, three inputs are linked to form one input. In this case, the fourth input can not be used.

Module BEA4_REL:
Binary output module 4 × Relays
Only usable at slot 6 and 7.
4 Relays with NO contact

Fig. 2-16 Binary output module 4 × Relays
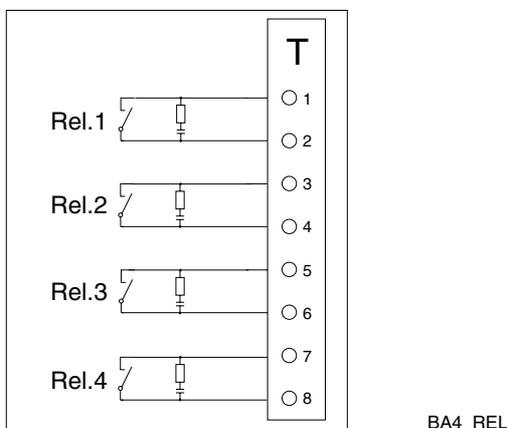
⚠ **Caution**

Maximum voltage 250 V AC, maximum current 1 A, cos φ = 0,9.
If small safety low voltages (≤ 50 V) and mains voltages (≥ 100 V) are to be switched on the same module, one relay must remain disconnected to comply with the creepage distances and clearances between different circuits called for in EN 61 010-1.

Analog outputs

Module AA3_MA: **Analog- output module 3 × mA**	Module AA3_V: **Analog output module 3 × V**
3 current outputs 0/4...20 mA at 750 Ω, short-circuit and open-circuit-proof	3 voltage outputs 0/2...10 V

N(mA)
P(V)
○ 1
○ 2
○ 3
○ 4
○ 5
○ 6
○ 7
○ 8
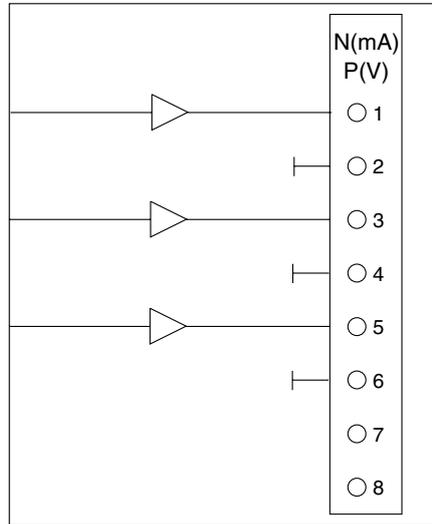
AA3-V
AA3_MA

Fig. 2-17   Analog output module 3 × mA
Analog output module 3 × V

Interface modules

Module RS 485 or RS 232:
Interface module with electrical isolation
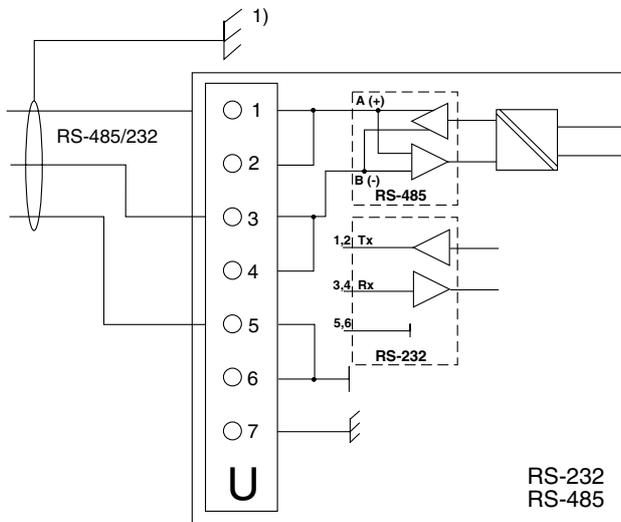Can only be used in slot 2 (at Protronic 500/550)!

Fig. 2-18   Interface module with electrical isolation
1) at Protronic 500 must be connected with shielding connection plate

RS 232
Connection 9-pole SUB-D plug

SUB-D plug	Interface module RS 232
Pin 2 RxD	Pin 1 TxD
Pin 3 TxD	Pin 3 RxD
Pin 5 Gnd	Pin 5 PEN

RS 485
Jumpers are only necessary if the interface line is not to be brocken when plug is withdrawn.
Connection 9-pole SUB-D plug

SUB-D plug	Interface module RS 485
Pin 3 RxD	Pin 1 R+
Pin 8 RxD	Pin 3 R-
Pin 5 Gnd	Pin 5 PEN

Notes
A shielded, minimum three-core cable with a twisted-core pair for signal transmission and an additional conductor for potential equalization between the "module zero" connection and all further electrically-isolated bus subscribers, is used as bus cable.

The shield of the data cable is necessary for compliance with the radio interference limits, and increases the interference immunity of the interface. For Protronic 100 connection is to the cable clamps *KS* (see Fig. 2-5 on page 11) at the rear of casing, for Protronic 500 and 550 attachment is to the shielding connection plate *S* (see Fig. 3-3 on page 21).

The additional insulated conductor in the data cable can only produce the potential equalisation necessary for the functioning of the interface, if all other bus subscribers (apart from the PC for example) are also electrically isolated.

An additional potential equalisation conductor of sufficiently large cross-section is normally required in parallel with the data cable for operation by non-electrically isolated bus subscribers.

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.
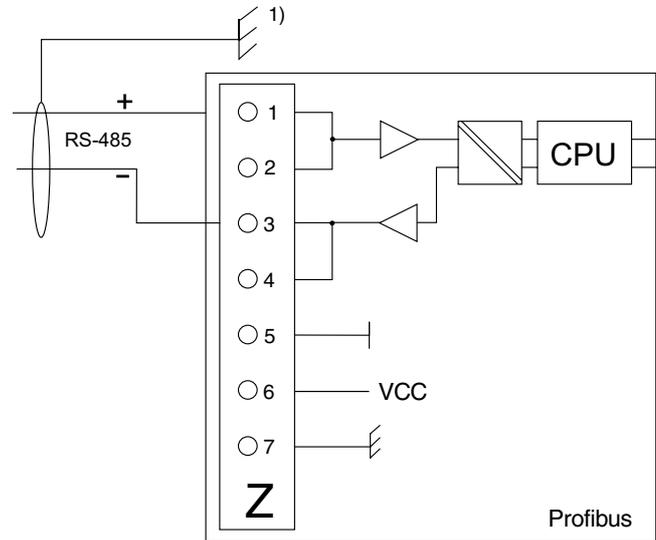Transmission rate up to 1.5 MBaud.

Fig. 2-19   Interface module PROFIBUS-DP/DPV1
1) at Protronic 500 must be connected with shielding connection plate
Additional information see Operating Instructions 42/62-50050.

2.4.4   Connection power supply

Power supply 115/230 V AC

L   N   PE

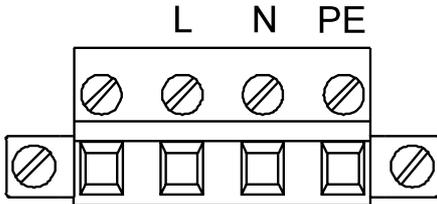Fig. 2-20   Connection of the 115/230 V AC power supply
Z-19160   L   Live conductor
                    N   Neutral conductur
                    PE   Grounding conductor

Power suuply 24 V UC

L/L+ N/L- PE
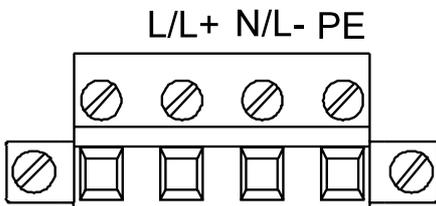
Fig. 2-21   Connection of the 24 V UC power supply
Z-19162   DC   Plus to L+
                              Zero to L-
                    AC   L and N
                    PE   Grounding conductor

⚠ 🛑 **Caution**

When selecting the lead material as well as when instal-ling and connecting the power leads, the specifications for in-stallation of power current systems with rated volta-ges up to 1000 V (DIN VDE 0100) are to be observed.

Before any other connection is made the protective grounding conductor (PE) shall be connected to a suita-ble protective ground terminal as protection against elec-tric shock.
Note
It is also necessary to connect the grounding conductor (PE) when using a 24 V power supply.

Connection of power supply

⚠ 🛑 **Caution**

Switch off all voltages hazardous to touch (mains voltage at the power supply and at plug-in relay modules) before opening the device.

The input voltage for the unit is on the rating plate printed on the side of the case.

⚠ **Caution**

The 24 V UC version may only be connected to a power supply with safety extra-low voltage.

According to EN 61 010-1, Section 6.12.2, it must be possible to switch off the unit using an externally assigned isolating de-vice which must be installed.
The live mains connection "L" or "L/L+" is protected internally. The device does not require any external protection through fusing.
Connection with plug-in screw terminals for solid or stranded wire. Conductor cross-section up to 2.5 mm^2.

⚠ **Caution**

Before switching on the apparatus make sure it is set to the voltage of the power supply.
The input voltage for the unit is on the rating plate printed on the side of the case.

Note
After switching on the device, some internal checks take pla-ce. These checks take about 15 s and are displayed.

3   Upgrading/Modification

3.1   Security advice according to DIN VDE

Caution
When the apparatus is connected to its supply, terminals may be live, and the opening of covers or removal of parts, except those to which access can be gained by hand, is likely to expose live parts. Interfaces may also be live.

The apparatus shall be disconnected from all voltage sources before it is opened for any operations. Operations on the opened apparatus under voltage must only be performed by an expert who is aware of the hazard involved.

Capacitors inside the apparatus may still be charged even if the apparatus has been disconnected from all voltage sources.

Whenever it is likely that protection has been impaired, the apparatus shall be made inoperative and be secured against any unintended operation.
It must be assumed that protection has been impaired when
– the apparatus has visible signs of damage;
– the apparatus no longer functions;
– the apparatus has been stored in unfavorable conditions for a long time;
– the apparatus has been subjected to adverse transport conditions.

3.2   Installing modules

Caution
All voltages hazardous to touch (mains voltage for the power supply and at relay plug-in modules, i.a. signal current circuits) must be disconnected before installing modules.

The sub-assembly must be slid into the case and interlocked with the twist srew during operation.

The supplied (and plugged) isolating plate must be installed between slots 6 and 7, if either a module is installed in slot 6 or 7 or in both slots. The supplied (and plugged) isolating plate below slot 7 must always be installed.

Fig. 3-1   Rear view (here: Protronic 500/550)
Z-19183   1...7   slots
           8   Signal connections to standard module
                   (1...16: terminals)
           AK   Stop catch
           K   Twist srew
           S   Shielding connection plate
           U_H Power supply

1. Release sub-assembly: rotate twist screw K a quarter turn anti-clockwise to positon ⦙⦙ .
2. Press top stop catch downwards and slowly withdraw sub-assembly backwards until it engages.
    The sub-assembly can be pulled out completely if required.
    To do so, press the two stop catches inwards and withdraw the sub-assembly completely.
3. Insert or remove module (slots see). When inserting the module, it must be ensured that it is carefully slid in up to the limit.

    Note
    When installing an interface module, the shielding connection plate supplied with the interface module must also be installed (see next page).

4. Slowly slide back sub-assembly until it engages in the case.
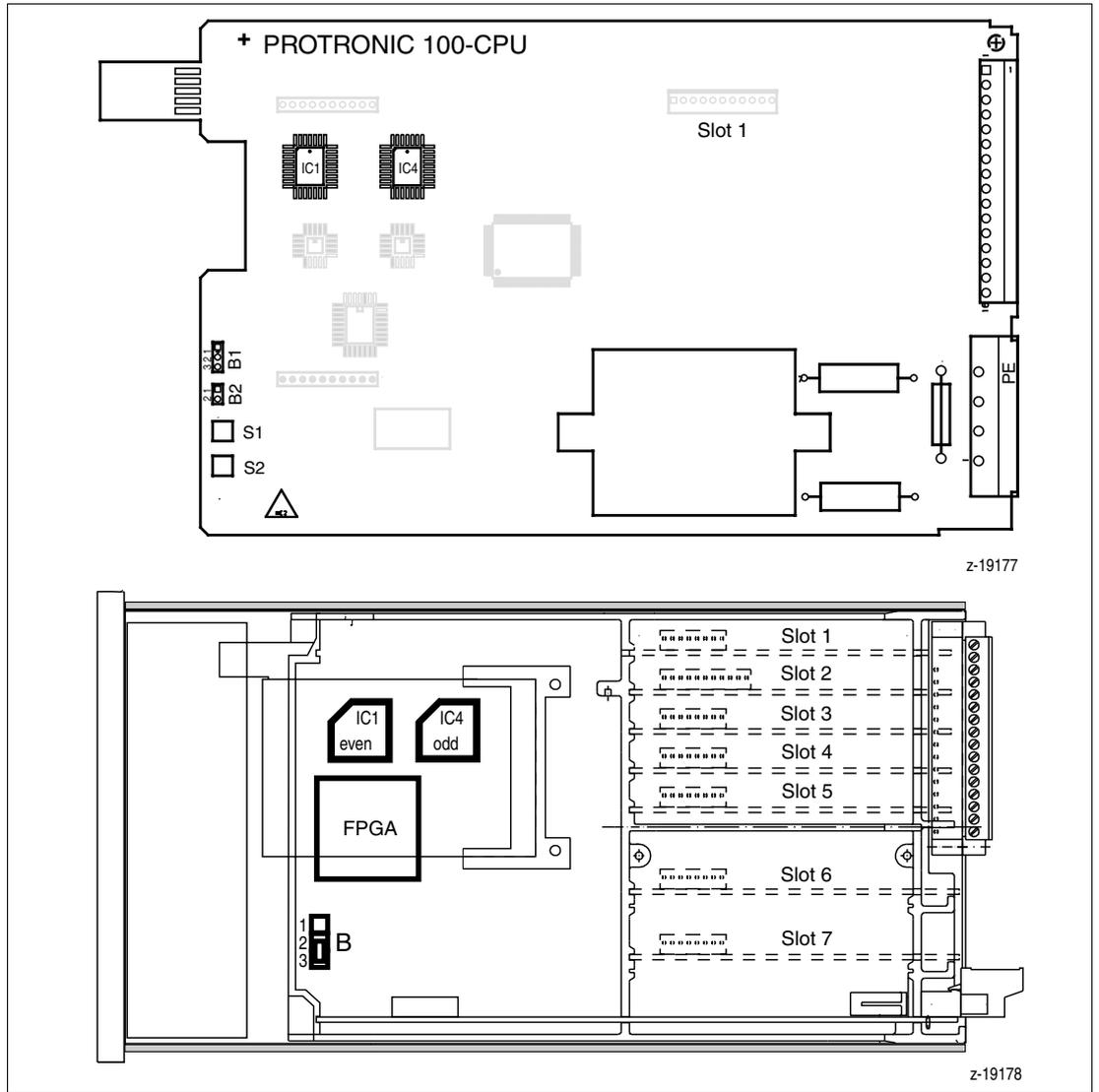5. Lock sub-assembly: rotate twist screw K clockwise a quarter turn to postion ⊖ .

Fig. 3-2   above   Protronic 100: Motherboard
             below   Protronic 500/550: Motherboard with slots

3.2.1 Installaling the shielding connection plate

(not Protronic 100)

Fig. 3-3   Shielding connection plate with interface cable
G   Housing
I   Cable without insulation
K   Cablel
KB   Cable straps
M   Sub-assembly
RS-232,
RS-485   Interface module
S   Shielding connection plate

1. Clip shielding connection plate S (part of the supplied interface module) onto upper side of the module rack M.
2. About 10 cm before end of cable, remove the insulation to a length of about 15 mm.
3. Firmly attach the bare part of the cable with the two supplied cable straps onto the shielding connection plate, in such manner that the shielding is well contacted to the plate.
4. If the shielding has an extra wire, connect this to grounding screw of the shielding connection plate.
5. Connect the cables to the interface terminals.

3.3   Modification of modules

3.3.1   Analog input modul 2 × mA or thermocouple (mV)

2 inputs 0/4...20 mA or thermocouple (-10...80 mV) electrical isolation
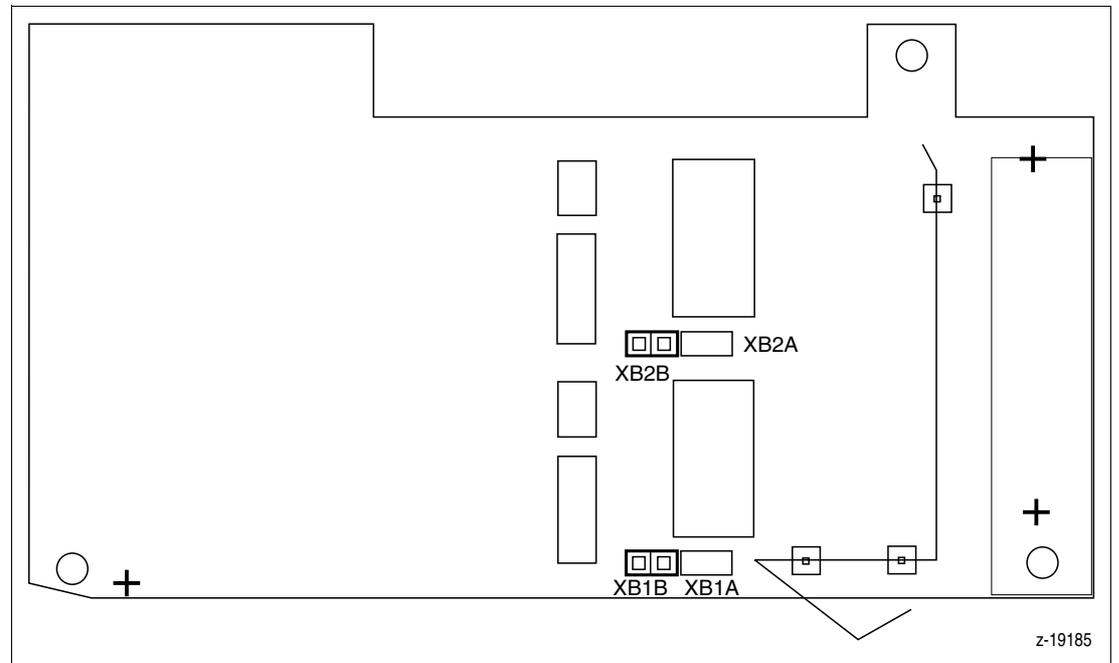
Fig. 3-4   Analog input module 2 × mA or thermocouple (mV)

Input 1:			Input 2:		
mA	XB1A	bridged	mA	XB2A	bridged
mV	XB1B	bridged	mV	XB2B	bridged

3.3.2 Analog input module 4 × mA with transmitter power supply
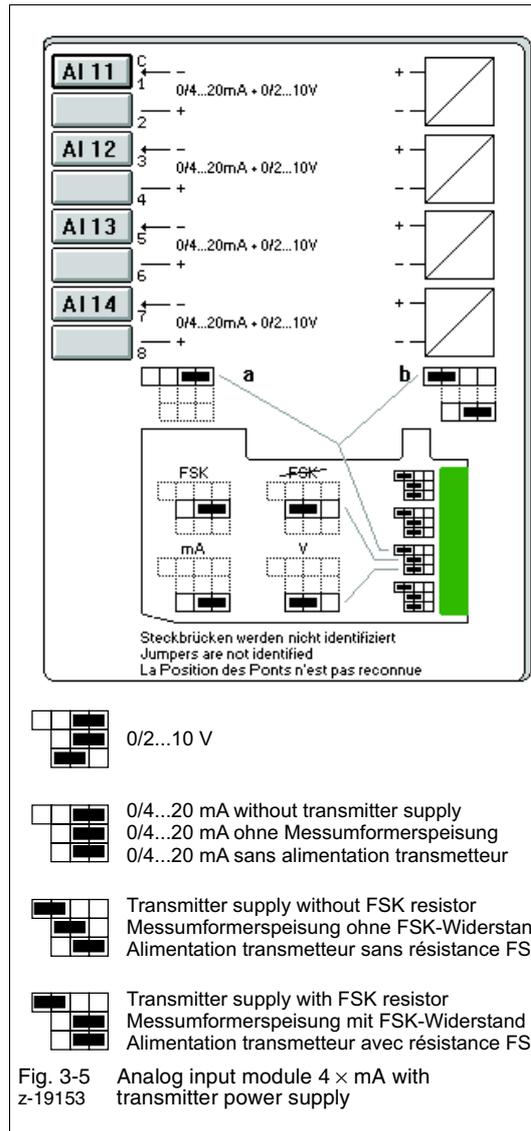
Fig. 3-5 Analog input module 4 × mA with
z-19153 transmitter power supply

The input module AE4_MA-MUS can be matched to various measuring tasks by using plug-in jumpers:

Bridge	Function
a	The measuring signals come in as external current or voltage signals.
b	The transmitters are supplied from the input module.
FSK	In the mA-input of the module is a resistor active, which prevents FSK signals from being short-circuited.
~~FSK~~	The protective resistor is short-circuited
mA	Input 0/4...20 mA
V	Input 0/2...10 V

Fig. 3-6 Measuring tasks

4   Technical data

4.1   Technical data Protronic 500/550

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$_{ss}$

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 62-6.70 EN).

Bus capable RS 485 interface retrofittable (see modules)

CPU data

Measured value and correction value resolution
   ≤ 0.01 %
Cycle time
   Protronic 500 $\geq$ 45 ms (master setting without add. modules)
   Protronic 550 $\geq$ 50 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:
   Protronic 500 without modules 9 VA (6 W)
   Protronic 550 without modules 12 VA (9 W)
   Max. component mounting   + 12 VA (9 W)
   Power failure bridging $\geq$ 150 ms at $\geq$ 180 V AC
24 V UC
   24 V DC   -25...+30 %,
                                 Residual ripple $\leq \pm 3$ V_{ss}
   24 V AC   -15...+10 %, 47...63 Hz
   Power consumption:
   Protronic 500 without modules 10 VA (7 W)
   Protronic 550 without modules 13 VA (9 W)
   Max. component mounting   + 13 VA (9 W)
   Power failure bridging $\geq$ 20 ms at 0.85 x U_{Nenn}
Power factor $\cos\varphi = 0.7$
Fusing
   The device does not require any external fusing.

Environmental conditions

Climatic class
   3K3 to EN 60721-3-3 (KWF to DIN 40040)
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 50082-2, March 1995 (i.a. IEC 801)

Interference emission EN 50081-1, 1/92
   (referred to: EN 55011, class B)

Industry standard to NAMUR NE 21 T.1, May 1993

Maximum immunity if assembled in metallic panel.

Connection, case, safety

Degree of protection to DIN EN 60529
   Front panel: IP 65
   Case: IP 20
   Terminals: IP 20

Electrical safety

Class of protection 1 to EN 61010 T.1 (VDE 0411 T.1, March 1994)

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. The safe isolation of these circuits meets the requirements to DIN VDE 0106, part 101.

Mechanical stress features

to DIN IEC 68, part 2-27 and 68-2-6
   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 43700
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. 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 $\leq \pm 4$ 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 $\leq \pm 4$ 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 galvanical isolation

2 inputs with galvanical 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

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, galvanical isolation
  Function configurable as input or output, direct or reverse action

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

Year2000 compatible

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)

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 $\cos\varphi = 0.9$
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/cycletime
  min. impulse length: 50 µs

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

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

Triple current output 0/4...20 mA at 750 Ω
Signal resolution $\leq$ 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 $\geq$ 5 kΩ

Interface modules

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 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 (ABB-specific, not published protocol). In case of Modbus RTU up to 38.44 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 available as accessory with Order No. 62619-0346488.

4.2 Technical data Protronic 100

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_{ss}

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
> 150 Ω, (75...200 Ω);
> 1500 Ω (750...2000 Ω)

Measuring current: ≤ 1 mA
other data as resistance thermometer

Universal input 2 (AI02)
Input for mA signals, technical data as AI01, but without
electrically isolation.

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

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 %

Only short version (210 mm):
> Analog output is electrically isolated

binary:
see inputs

Transmitter feed

Output voltage
> 20...24 V DC, 50 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, 4 control signal tracks

CPU data

Measured value and correction value resolution
≤ 0.01 %

Cycle time
≥ 100 ms

Data backup
Flash-EPROM

Power supply

Long version (270 mm) until Q2/2002

AC power supply units

230, 115, 24 V AC:	+10 %...-15 %; 47...63 Hz
Power failure bridging	≥ 20 ms at U ≥ 0.85 x U_{Nenn}
Power consumption	14 VA (10 W)
Power factor	cosφ = 0.7

UC power supply units

24 V AC	+10 %...-15 %; 47...63 Hz
24 V DC	+33 %...-25 %;
	Residual ripple ≤ 3 V_{ss}
Power failure bridging	≥ 20 ms at U ≥ 0.85 x U_{Nenn}
Power consumption	max. 11 VA (8 W)

Safety
The device needs no external safety of power supply

Short version (210 mm) after Q2/2002

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

Power consumption	max. 15.5 VA (12.5 W)
Power failure bridging	≥ 120 ms at ≥ 180 V AC

24 V UC

24 V DC	-25 %...+30 %; 47...63 Hz
	Residual ripple ≤ 3 V_{ss}
24 V AC	-15 %...+10 %; 47...63 Hz
Power consumption	max. 17.6 VA (13.7 W)
Power failure bridging	≥ 20 ms at U ≥ 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 (KWF to DIN 40040)

Ambient temperature
0...50 °C

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

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

Minimum air pressure
80 kPa

Electromagnetic compatibility

Meets protection requirements of EMC directive 89/336/EEC, 5/89
Interference resistance and interference emission acc. to
  EN 61326-1/A1/01.98. (referred to: EN 55011, class B)
Industry standard to NAMUR NE 21 T.1, 08.98.
Maximum immunity if assembled in metalic panel

Connection, case, safety

Degree of protection to DIN EN 60529

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

Electrical safety

Class of protection 1 to EN 61010 T.1 (VDE 0411 T.1, March 1994)

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

All inputs and outputs, including the interface are functional extra-low voltage circuits to DIN VDE 0100-410. The safe isolation of these circuits meets the requirements to DIN EN 61140.

FCC certificate for 115 V AC power supply with or without RS 485 (long version).

Mechanical stress capabilities
to DIN IEC 68, part 2-27 and 68-2-6
  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 long version: 272 mm
  Installed depth short version: 210 mm

Panel cutout
  68 mm x 138 mm to DIN 43700

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;
  interface module approx. 40 g

Scope of supply and delivery
  2 straining screws, operating manual and
  plug-in screw terminals

Serial interfaces

TTL interface accessible after removing front panel module for connection to PC via TTL/RS 232 converter (Catalog No. 62695-0346270) with fixed telegram format matching parameter setting and configuration program **IBIS-R+** (see Data Sheet 62-6.70 EN).

Interface module

Modul RS 485 or RS 232
  Interface module as per RS 485 or RS 232 specification. Electrically isolated. The used protocol is MODBUS-RTU or ABB-specific.

Module PROFIBUS

Module with the full functionality acc. to DIN 19245, parts 1 to 4

4.3   Accessories

Accessories see Tabelle 2-1 auf Seite 12 and Data Sheets 10/62-6.11 (Protronic 100) and 10/62-6.15 (Protronic 500/550).

5   Packaging for transport

If the original packing is no longer available the Protronic 100/ 500/550 must be wrapped in an insulating air foil or corrugated board and packed in a sufficiently large crate lined with shock absorbing material (foamed material or similar) for the transportation. The amount of cushioning must be adapted to the weight of the unit and to the mode of transport.

The crate must be labelled "Fragile".

For overseas shipment the unit must additionally be sealed airtight in 0.2 mm thick polyethylene together with a desiccant (e.g. silica gel). The quantity of the desiccant must correspond to the packing volume and the probable duration of transportation (at least 3 months). Furthermore, for this type of shipment the crate should be lined with a double layer of kraft paper.