

UNIFLEX CI 45

Universal transmitter

- Compact design**
- Display & operating functions**
- Communication features**
- High resolution**
- Fast cycle times**
- Universal input & universal output**
- Two relay outputs**
- Customer-specific linearization**
- Measurement value correction**
- Min/max indicator ('slave pointer')**

rail line

FEATURES

- Compact design, only 22,5 mm wide
- Clips onto top-hat DIN rail
- Plug-in screw terminals or spring-clamp connectors
- Dual-line LC display with additional display elements
- Process values always in view
- Convenient 3-key operation
- Direct communication between rail-mounted transmitters
- Universal input with high signal resolution (>15 bits) - also reduces stock keeping
- Universal output with high resolution (14 bits) as combined voltage/current output
- Quick response; only 100 ms cycle time, i.e. also suitable for fast signals
- One or two relay outputs
- Customer-specific linearization
- Measurement value correction (offset or 2-point)
- Min/max indicator ('slave pointer')
- Logical linking of digital outputs, e.g. for common alarms
- Preset for output value

APPLICATIONS

- ⊕ Measurement, scaling, and separation of electrical signals, e.g. for:
 - ⊕ Heat treatment plants
 - ⊕ Drying equipment
 - ⊕ Furnace builders
 - ⊕ Metallurgy
 - ⊕ Kilns
 - ⊕ General machine building
 - ⊕ Research and development
 - ⊕ etc.

DESCRIPTION

UNIFLEX CI 45 transmitters are designed to give precise and cost-effective signal detection and processing tasks.

Every CI 45 has at least one universal input, one universal output and a relay.

Optionally, the transmitter can be fitted with an additional relay.

Galvanic isolation is provided between inputs and outputs as well as from the supply voltage and the communication interfaces.

Mounting

The compact CI 45 is clipped onto a top-hat DIN rail, and can also be unmounted very simply.

All connections are of the plug-in type, so that a transmitter can be replaced very quickly without disturbing the wiring.

Display and operation

The two-line LC display permits simultaneous indication of the measured value and all of the unit's operating functions.

Moreover, a LED and 4 other display elements give a reliable indication of operating status, operating mode, and error messages.

The user-configurable engineering unit of the measured value can be included in the display. By means of the extended Operating Level, it is possible to show any signal or parameter in the 2nd display line.

Interfaces and Engineering Tools

The transmitter settings are also configurable by means of an Engineering Tool.

Via the BlueControl® software, including the transmitter simulation and especially the convenient connection via the BluePort® front interface, the user can solve the task in hand without having to work through operating instructions.

Of course, practically all settings can also be made from the device front.

Moreover, the CI 45 can exchange data with superordinate systems and PCs via an optional RS 485 interface with MODBUS RTU protocol that is fitted into the top-hat DIN rail.

Password protection
If required, unauthorized access to the various Operating Levels can be prevented with a password, or an entire level can be blocked.

TECHNICAL DATA

INPUTS

Survey of inputs

Input	Purpose
INP1	X1 (process value 1), universal input
di1	Operation disabled; Reset of stored alarms; Reset of min/max indicator.

UNIVERSAL INPUT INP1

Resolution:	> 15 bits
Decimal point:	0 to 3 decimals
Digital input filter:	adjustable 0.0...999.9 s
Scanning cycle:	100 ms
Linearization:	31 segments, adaptable with BlueControl®
Measurement value correction:	2-point or offset
Limiting frequency:	1,7 Hz

Thermocouples (Table 1)

Input resistance:	≥ 1 MΩ
Influence of source resistance:	1 μV/Ω
Input circuit monitor:	sensor break, polarity

Cold-junction compensation

Internal:	for INP1
External:	0 ... 100 °C
Additional error:	
typ.	≤ ± 0,5 K
max.	≤ + 2,4 K

Break monitoring

Sensor current:	≤ 1 μA
Operating sense configurable	

Resistance thermometer (Table 2)

Connection technique:	3 or 4-wire
Lead resistance: (max. at range end)	max. 30 Ω
Input circuit monitoring:	break and short circuit

Table 1: Thermocouple input

Thermocouple type		Measurement range		Error	Typical resol.
L	Fe-CuNi (DIN)	-100...900°C	-148...1652°F	≤ 2K	0,05 K
J	Fe-CuNi	-100...1200°C	-148...2192°F	≤ 2K	0,05 K
K	NiCr-Ni	-100...1350°C	-148...2462°F	≤ 2K	0,1 K
N	Nicrosil/Nisil	-100...1300°C	-148...2372°F	≤ 2K	0,1 K
S	PtRh-Pt 10%	0...1760°C	32...3200°F	≤ 2K	0,1 K
R	PtRh-Pt 13%	0...1760°C	32...3200°F	≤ 2K	0,1 K
T	Cu-CuNi	-200...400°C	-328...752°F	≤ 2K	0,03 K
C	W5%Re-W26%Re	0...2315°C	32...4199°F	≤ 3K	0,2 K
D	W3%Re-W25%Re	0...2315°C	32...4199°F	≤ 3K	0,2 K
E	NiCr-CuNi	-100...1000°C	-148...1832°F	≤ 2K	0,05 K
B*	PtRh-Pt6%	0(400)...1820°C	32(752)...3308°F	≤ 3K	0,2 K
	Special	-25 ... 75 mV		≤ 0,1%	0,005%

* Values apply from 400°C upwards.

Table 2: Resistive inputs

Type	Sensor current	Measurement range		Error	Typical resol.
Pt100 ***	≤ 0,25mA	-200...100 (150)°C	-328...212 (302)°F	≤ 1 K	0,05 K
Pt100		-200...850°C	-328...1562°F	≤ 1 K	0,05 K
Pt1000		-200...850°C	-328...1562°F	≤ 2 K	0,05 K
KTY 11-6*		-50...150°C	-58...302°F	≤ 2 K	0,05 K
Special*		0...4500 Ω**		≤ 0,1%	0,005%
Special		0...450 Ω**		≤ 0,1%	0,005%
Potentiom.		0...160 Ω**		≤ 0,1%	0,005%
Potentiom.		0...450 Ω**		≤ 0,1%	0,005%
Potentiom.		0...1600 Ω**		≤ 0,1%	0,005%
Potentiom.		0...4500 Ω**		≤ 0,1%	0,005%

* Default setting is the characteristic for KTY 11-6 (-50...150°C)

** Including lead resistance

*** up to 150 °C at reduced lead resistance (max. 160 Ω)

Table 3: Current and voltage input

Measurement range	Input resistance	Error	Typical resol. ()
0...10 V	110 kΩ	≤ 0,1 %	0,3 mV
-10...10 V	110 kΩ	≤ 0,1 %	0,6 mV
-5...5 V	110 kΩ	≤ 0,1 %	0,3 mV
-2,5...115 mV*	> 1 MΩ	≤ 0,1 %	4 μV
-25...1150 mV*	> 1 MΩ	≤ 0,1 %	40 μV
-25...90 mV*	> 1 MΩ	≤ 0,1 %	4 μV
-500...500 mV*	> 1 MΩ	≤ 0,1 %	40 μV
-200...200 mV*	> 1 MΩ	≤ 0,1 %	20 μV
0...20 mA	20 Ω	≤ 0,1 %	0,8 μA

* For INP1: high-impedance, without break monitoring

Current and voltage measurement (Table 3)

Span start and span:	anywhere within the measurement range
Scaling:	freely selectable -1999...9999
Input circuit monitoring (current):	12,5% below span start (2 mA)

Measurement span

The BlueControl® software enables the internal characteristic curve for the KTY 11-6 temperature sensor to be adapted.

Physical measurement range: 0...4500 Ω

CONTROL INPUT DI1

Configurable as direct or inverse switch or contact!

Connection of potential-free contact that is suitable for switching 'dry' circuits.

Switched voltage: 5 V
Switched current: 1 mA

OUTPUTS

SURVEY OF OUTPUTS

Output	Purpose
OUT1 OUT2 (relay)	Limit contact, alarms *
OUT3 (logic)	Same as OUT1 and OUT2
OUT3 (continuous)	Analog output (display value, INP1) Transmitter supply 13 V / 22 mA

* All logic signals can be "OR-linked".

RELAY OUTPUTS OUT1, OUT2

Type: 2 NO contacts with a common terminal

Max. contact rating: 500 VA, max. 250 V, max. 2 A at 48...62 Hz, resistive load

Min. contact rating: 6V, 1 mA DC

Service life (electrical): 800.000 switching cycles at max. rating

Note:

If the relays OUT1 and OUT2 operate external contactors, these must be fitted with RC snubber circuits to manufacturer specifications to prevent excessive voltage peaks at switch-off.

OUT3 AS UNIVERSAL OUTPUT

Galvanically isolated from the inputs. Parallel current/voltage output with common 'minus' terminal (combined use only in galvanically isolated circuits).

Freely scalable

Resolution: 14 bits

Dynamic response (step change of input signal) T90: Output follows the input: ≤ 540 ms

Tracking error I/U: ≤ 2 %

Residual ripple: $\leq \pm 1$ % (rel. to range end)

0...130 kHz

Current output

0/4...20 mA, configurable.
short circuit proof
Dynamic range: -0,5...23 mA

Load: $\leq 700 \Omega$
Load effect: $\leq 0,02\%$
Resolution: $\leq 1,5 \mu\text{A}$
Error: $\leq 0,1\%$

Voltage output

0/2...10V, configurable
not continuous short-circuit proof
Dynamic range: -0,15...11,5 V
Load: $\geq 2 \text{ k}\Omega$
Load effect: $\leq 0,06\%$
Resolution: $\leq 0,75 \text{ mV}$
Error: $\leq 0,1\%$
Additional error when using simultaneously the current output: $\leq + 0,09\%$

OUT3 as transmitter supply

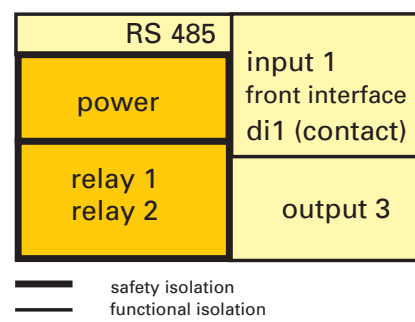
Output: 22 mA / $\geq 13 \text{ V DC}$

OUT3 as logic signal

Load $\leq 700 \Omega$ 0/ ≤ 23 mA
Load $> 500 \Omega$ 0/ > 13 V

Galvanic isolation (see fig. 1)

Fig. 1: Galvanic isolation



permissible voltages:

safety isolation $\leq 300 \text{ Vrms AC}$ against earth
functional isolation $\leq 30 \text{ Vrms AC}$ against earth

FUNCTIONS

Signal processing

The selected input signal is converted into an analog output signal or is accessible at the interface. Depending on the selected sensor type, the following options are provided for manipulating the input signal:

- Measurement value correction (offset and 2-point)
- Scaling

- 1st-order filter with adjustable parameters (bandwidth, see below)
- Linearization with 31 segments
- \sqrt{x} , with $\sqrt{-x} = 0$
- x^2

Behaviour on sensor break/short circuit

- Response of the analog output is selectable (upscale / downscale)
- Preset substitute input value, can be disabled

Min/max indicator (slave pointer)

The minimum and maximum input values are stored in the CI 45, and can be displayed by means of the keys \blacktriangledown (minimum) and \blacktriangle (maximum). The values are resettable.

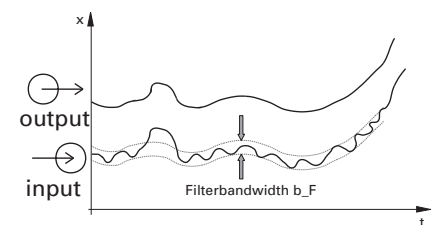
Display of engineering units

The engineering unit for the measured value can either be selected from a predefined list of standard units, or it can be defined by the user (BlueControl®). The unit appears in the second line of the display.

FILTER

The transmitter contains a 1st-order mathematical filter with adjustable time constant and bandwidth. The bandwidth is the adjustable tolerance range within which the filter is active above and below the process value. Measurement value changes in excess of the adjusted bandwidth are not filtered.

Fig. 2: Filter function



LIMIT VALUE FUNCTIONS

Max, Min or Max/Min monitoring with adjustable hysteresis.

Monitored signals

- Process value
- Input 1

Functions

- Input value monitoring
- Input value monitoring with storage
- Signal changes / with storage
- Reset via front panel or digital input
- Alarm discriminator adjustable from 0...9999 seconds

Several limit values and alarm messages can be logically "OR-linked".

ALARMS

Sensor break / short circuit

Depending on the selected input type, the input circuit is monitored for break, short circuit, and reversed polarity.

MAINTENANCE MANAGER

Display of error messages, warnings, and stored limit value messages in the error list. Messages are stored, and can be reset manually.

Possible elements in the error list:

- Sensor break, short circuit, incorrect polarity
- Stored limit values
- e.g. re-calibration warning (message is generated when a predefined operating time is reached)
- e.g. maintenance interval for a switching device (message is generated when a predefined number of switching cycles is reached)
- Internal fault (RAM, EEPROM, ...)

DISPLAY AND OPERATION

Display

LCD:

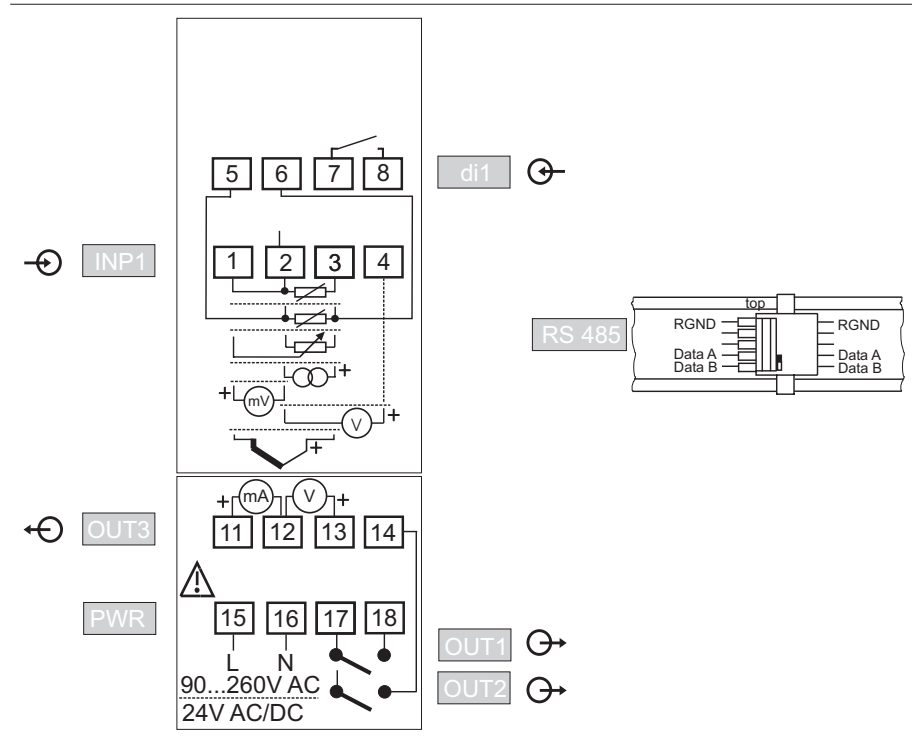
dual-line plus additional display elements

Upper line:

4 digits, 7-segment LCD

- for process value

Fig. 3: Connecting diagram CI 45



Lower line:

5 digits, 14-segment LCD; configurable contents (via BlueControl®)

- Engineering unit
- Parameters
- Extended Operating Level

Additional display elements

4 display elements (bars in the lower line of the LCD, identified as 1, 2, F, E)

- Bars 1 and 2: OUT1/OUT2 active or INP1/INP2 active
- Bar F: Function active (planned)
- Bar E: Entry has been made in the error list

Dual-color indicator LEDs:

- Green = OK
- Red = limit value Lim1 triggered
- Red blinking = internal fault

Operating functions

Only three keys at the front of the CI 45 are used to operate process values, parameters, and configuration data. Different Operating Levels and selected parameters can be disabled by means of BlueControl®.

POWER SUPPLY

Depending on ordered version:

AC supply

Voltage:	90...260 V AC
Frequency:	48...62 Hz
Consumption:	approx. 7 VA max.

Universal supply 24 V UC

AC supply:	18...30 V AC
Frequency:	48...62 Hz
DC supply: 1	8...31 V DC
Consumption:	approx. 3 VA / W max.

Supply only from safety electrical low voltage (SELV).

Behaviour with power failure

Configuration and parameter settings: Permanent storage in EEPROM

BLUEPORT® FRONT INTERFACE

Connection to the transmitter front via a PC adapter (see 'Accessories'). The BlueControl® software enables the CI 45 to be configured, parameters set, and operated.

BUS INTERFACE (OPTIONAL)

RS 485

Connection via bus connector fitted in the top-hat rail. Screened cables should be used.

Galvanically isolated

Type:	RS 485
Transmission speed:	2400, 4800, 9600, 19.200, 38.400 bits/sec
Parity:	even, uneven, none
Address range:	1...247
Number of transmitters per bus segment:	32

Protocol

- MODBUS RTU

ENVIRONMENTAL CONDITIONS

Protection mode

Front panel:	IP 20
Housing:	IP 20
Terminals:	IP 20

Permissible temperatures

For specified accuracy:	-10...55°C
Warm-up time:	< 20 minutes
Temperature effect:	≤ 0,05% / 10 K
add. influence to cold junction compensation:	≤ 0,75 K / 10 K

Operating limits:	-20...60°C
Storage:	-30...70°C

Humidity

Max. 95%, 75% yearly average, no condensation

Shock and vibration

Vibration test Fc (DIN EN 60068-2-6)

Frequency:	10...150 Hz
Unit in operation:	1g or 0,075 mm
Unit not in operation:	2g or 0,15 mm

Shock test Ea (DIN EN 60068-2-27)

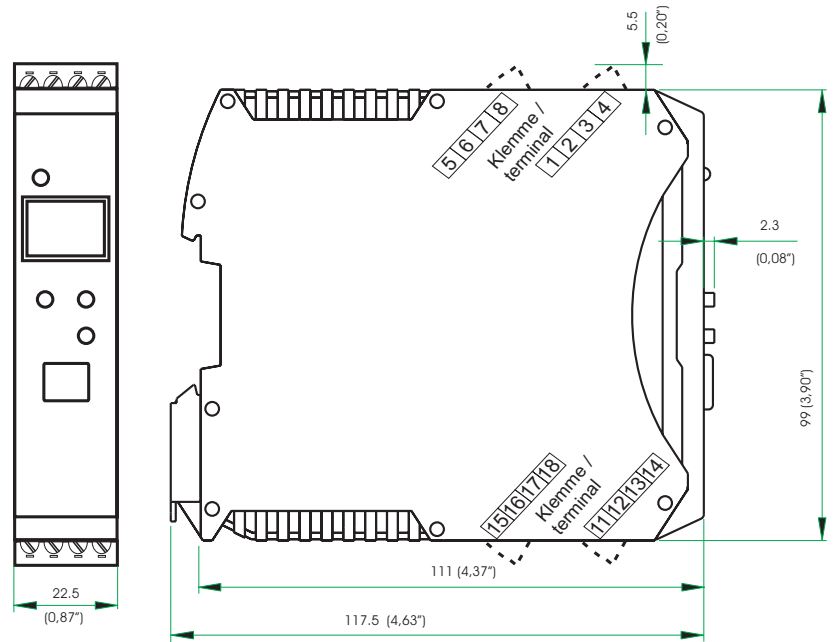
Shock:	15 g
Duration:	11 ms

Electromagnetic compatibility

Complies with EN 61 326-1

- Meets the interference immunity regulations for continuous, unattended operation.

Fig. 4: Dimensions CI 45



- Meets the interference radiation regulations of Class B for residential areas.

For 24 VAC devices high surge inferences on mains cables can lead to a device initialization.

GENERAL

Housing front

Material:	Polyamide PA 6.6
Flammability class:	V0 (UL 94)

Connecting terminals

Material:	Polyamide PA
Flammability class:	V2 (UL 94) for screw terminals V0 (UL 94) for spring-clamp terminals bus connector

Electrical safety

Complies with EN 61010-1:
Over-voltage category II
Contamination degree 2
Protection class II

Electrical connections

Plug-in connector strips with terminals for lead cross-sections from 0,2 to 2,5 mm². Choice of screw terminals or spring-clamp terminals.

Mounting method

Clip-on rail mounting (35 mm top-hat rail to EN 50 022). Locked by means of metal catch in housing base. Close-packed mounting possible.

Mounting position: vertical

Weight:

0,18 kg

Standard accessories

- Operating instructions
- With 'Interface' option: bus connector for fitting into top-hat rail

ACCESSORIES

BlueControl® (Engineering Tool)

PC program for configuring, parameter setting, and operating (commissioning) the CI 45 transmitter. Moreover, all settings are saved and can be printed, if required.

Depending in version, a powerful data acquisition module with trend graphics is available.

Show/hide function

The BlueControl® software enables any number of parameters and configuration setting to be shown/hidden. This ensures that only permitted parameters & settings can be changed in the transmitter. Safety-relevant parameters are not displayed.

Simulation function

The built-in simulation serves to test the settings.

Import function

Engineerings of UNIFLEX CI/CB created by engineering tool ET/Uniflex can be read and transformed if possible.

Software requirements:

Windows 95/98/NT/2000/XP

Configuration settings made only via the BlueControl® software (not via the transmitter's front keys)

- Customer-specific linearization
- Enable forcing for inputs and outputs
- Setting the limits for operating hours and switching cycles
- Switch-over to 60 Hz mains frequency
- Blocking operator functions, Operating Levels, and password definition

Fig. 5: Interface parameters hidden, only address visible

Name	Description	Visible
othr	Other	<input checked="" type="checkbox"/>
bAud	baudrate	<input type="checkbox"/>
Addr	address	<input checked="" type="checkbox"/>
PrtY	parity	<input type="checkbox"/>
dELV	answer delay [ms]	<input type="checkbox"/>
D.Un	display unit	<input checked="" type="checkbox"/>
O2	parameter unit for O2	<input checked="" type="checkbox"/>
Unit	unit	<input checked="" type="checkbox"/>
dP	decimal points	<input checked="" type="checkbox"/>
SEGm	display segment assignment	<input checked="" type="checkbox"/>
C.dEL	modem delay [ms]	<input checked="" type="checkbox"/>

Hardware requirements:

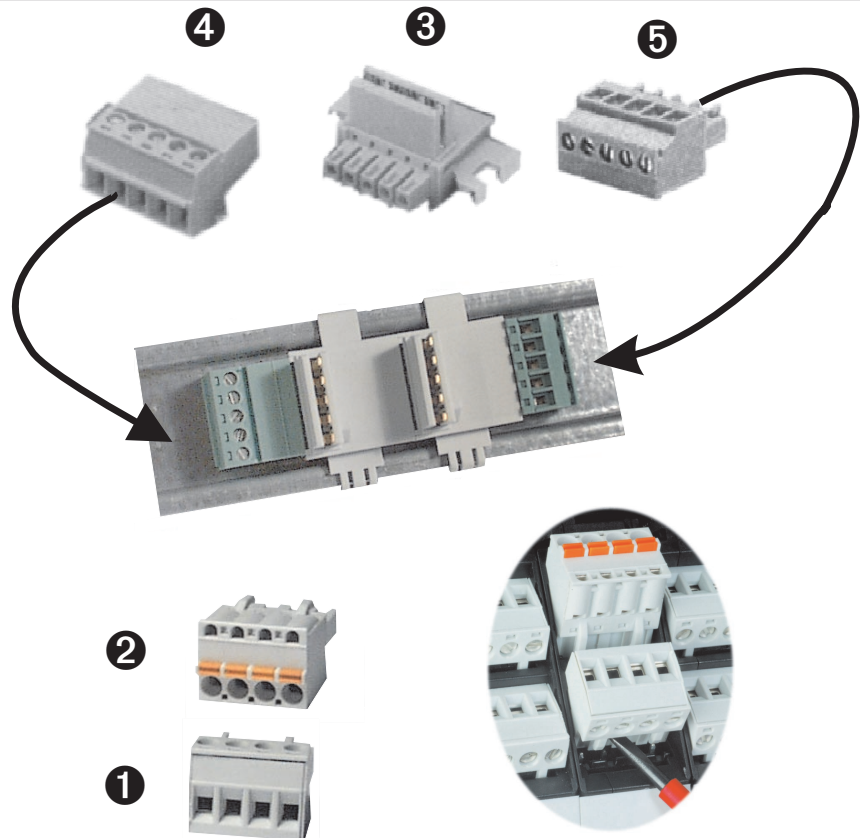
A special PC adapter (see 'Accessories') is required for connecting to the transmitter.

Updates and demo software from:
www.pma-online.de

BlueControl®, versions und functions:

Functionality	Mini	Basic	Expert
parameter and configuration setting	yes	yes	yes
download: writes an engineering to the transmitter	yes	yes	yes
online-mode / visualisation	SIM only	yes	yes
creation of user defined linearizations	yes	yes	yes
configuration of extended operation level	yes	yes	yes
upload: reads an engineering from the transmitter	SIM only	yes	yes
basic diagnosis function	no	no	yes
saves files and engineering data	no	yes	yes
printer function	no	yes	yes
online documentation / help system	yes	yes	yes
measurement correction (calibration procedure)	yes	yes	yes
data acquisition and trend function	SIM only	yes	yes
net- / multi licence	no	no	yes
personal assistant function			

ACCESSORY PARTS



ACCESSORIES

Description	Quantity	Order no.
① Connector set with screw terminals	4 pieces	9407-998-07101
② Connector set with spring-clamp terminals	4 pieces	9407-998-07111
③ Bus connector for fitting in top-hat rail	1 piece	9407-998-07121
④ Plug for bus connection, connections at left, horizontal cable entry	1 piece	9407-998-07131
⑤ Plug for bus connection, connections at right, vertical cable entry	1 piece	9407-998-07141

ORDERING INFORMATION

Universal transmitter CI 45

C I 4 5 - 1 - 0 0 0 -

1 universal-input, control-input
with display and BluePort®-interface

no plug-in connectors

with screw-terminal plug-in connectors

90..260V AC, mA/V/logic +1 relay

18...30VAC/18..31VDC, mA/V/logic +1 relay

90..260V AC, mA/V/logic +2 relay

18...30VAC/18..31VDC, mA/V/logic +2 relay

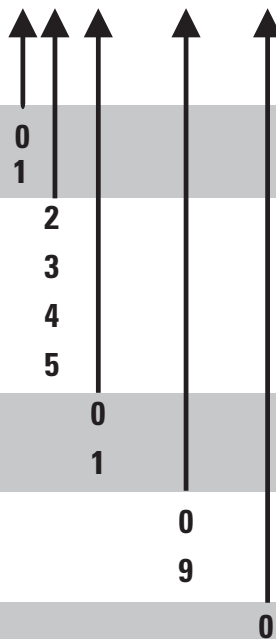
no option

RS 485 / MODBUS - protocol

Standard configuration

Configuration to order

Standard (CE-certified)



ADDITIONAL ACCESSORIES

Description	Language	Order no.
PC adapter for the BluePort® front interface		9407-998-00001
USB serial adaptor (USB to RS 232)		9407-998-00081
Converter RS 232 to RS 422/485	galv. isolated	ADAM-4520-D
Operating instructions for CI 45	German	9499-040-71718
Operating instructions for CI 45	English	9499-040-71711
Interface description for Modbus rail line	German	9499-040-72018
Interface description for Modbus rail line	English	9499-040-72011
BlueControl® Mini	German/English	www.pma-online.de
BlueControl® with Basic license rail line	German/English	9407-999-12001
BlueControl® with Expert license rail line	German/English	9407-999-12011

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