Operating Manual
42/18-401 EN

Universal Measurement Computers

FCU200-T, FCU200-W, FCU400-G, FCU400-S, FCU400-P
(SensyCal)

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Operating manual

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1 About this document

1.1 Symbols

Observe the warnings, cautions, notices and important information marked with the symbols listed below to ensure optimum use of this operating manual and safe, operation and maintenance of the device.

Symbol	Signal Word	Definitions
	**DANGER**	DANGER indicates an **imminently hazardous** situation which, if not avoided, **will result** in death or serious injury. (High level of risk.)
	**WARNING**	WARNING indicates a **potentially hazardous** situation which, if not avoided, **could result** in death or serious injury. (Medium level of risk.)
	**CAUTION**	CAUTION indicates a **potentially hazardous** situation which, if not avoided, **could result** in minor or moderate injury. (Low level of risk.)
	**NOTICE**	NOTICE indicates a **potentially harmful** situation which, if not avoided, **may result** in damage of the product itself or of adjacent objects. (Damage to property)
	**IMPORTANT**	IMPORTANT indicates useful hints or other special information which, if not observed, could lead to a decline in operating convenience or affect the functionality. (Does not indicate a dangerous or harmful situation.)

In addition to the warnings, cautions and useful hints in this operating manual, observe all relevant safety instructions and regulations for the prevention of accidents.

If the information contained in this operating manual should not be sufficient for your application, our customer service will gladly be at your disposal for further information.

Please read this manual carefully prior to installation and commissioning.

1.2 Writing conventions

<Key> Key indicated in the display.
If not otherwise specified, descriptions like "on the right", "on the left", "at the top", or "at the bottom" always refer to the device seen from the front side.

1.3 In case of questions

If you cannot find the appropriate information concerning your technical questions or malfunctions in this operating manual, please apply to one of our external service points or contact our technical user assistance hotline directly.

Hotline +49 800 111 4411	Tel: +49 6023 92-3426 Fax: +49 6023 92-3210 E-mail: sensyCal.deapr@de.abb.com

2 Proper use, general safety instructions

2.1 Proper use, range of applications

The device is designed to be used as a universal measurement computer for various industrial measurement and automation applications.

2.1.1 Explosion protection

The measurement computer must be installed outside the hazardous area. The signals from the hazardous area are transmitted via intrinsically safe analog inputs. Intrinsic safety is achieved by using explosion-proof isolating power supplies (e.g. Contrans I).

2.1.2 Safety specifications

Electromagnetic compatibility (EMC)

Immunity to EMI/RFI	to EN 50082-2 (EN 6100-4-2, -3, -4, -5,6) and to EN 1434-4 (Class C)
RFI suppression	to EN 50081-2 (EN 55011 Class A)

Power specifications

Power supply	230 V AC; 115 V AC; 24 V AC/DC	
Power consumption	24 V	1...10 VA depending on option module(s)
	115 V	2...10 VA depending on option module(s)
	230 V	3...10 VA depending on option module(s)
DC voltage	24 V ± 20 %	
AC voltage	24 V, 110 V, 230 V -15...+10 %, 48...62 Hz	

2.1.3 Brief description

Analog and binary input signals are linked following a programmed algorithm. The result is indicated on the display or is output as an analog or binary signal.

The device is designed for handling even complex applications.

For universal use in the field or control room; electrically isolated I/Os; mA inputs with transmitter supply; active mA outputs; M-BUS, MODBUS, PROFIBUS (via converter), infrared communication; high-resolution back-lit graphic display.

Versatile device appropriate for verification, for various applications, with PTB certificate and international approvals.

Application examples:
- Flow measurement and thermal output calculation for water, appropriate for verification
- Flow measurement and thermal output (heat and cold) calculation for brine
- Flow and energy calculation for steam and saturated steam
- Gas state correction, gas converter
- 2-channel flow, volume flow and energy meter
- High-precision differential temperature measurement
- Summation, maximum output calculation
- Conversion of various I/O signals to M-BUS, MODBUS, PROFIBUS (via converter)

2.2 General safety instructions

2.2.1 Safe operation

The device is state of the art.
It has been produced and tested in accordance with DIN VDE 0411 Part 1 "Safety Requirements for Electronic Measurement Apparatus" (based on IEC Publication 348) and has left the factory in a safe condition. To maintain this state and guarantee safe operation, all safety instructions in this operating manual marked with "**Warning**", "**Caution**" or "**Notice**" must be observed! Otherwise, persons might be endangered and the measurement computer itself or other devices and equipment could be damaged.

Prerequisites for safe operation

This operating manual contains important information about the safe and proper operation of the equipment. Observing these instructions is mandatory for safe operation.
Failure to observe these instructions can cause danger to the user's life and limb or property damages of the device or the entire system.

Proper and safe operation of the device requires proper transportation and storage, installation and by qualified personnel, operation within its design limits, and careful maintenance observing all information in this manual.

Qualification of personnel

Only personnel familiar with the installation, commissioning, and maintenance of similar devices and having the required qualifications for their tasks are allowed to work on the device.

Operator

The operator of the plant is fully and solely responsible for proper and workmanlike and, thus, safe operation.

The operator must make sure that the instructions in this operating manual have been understood by the target audience.

A copy of the operating manual must be stored in a suitable place at the usage location of the device at all times.

Read this operating manual prior to commissioning, decommissioning, maintaining, or repairing a device.

National regulations

The regulations, standards, and guidelines mentioned in this operating manual are valid for Germany. When using the devices in other countries, the appropriate and valid national regulations must be observed.

Instructions and regulations to be observed

Observe
– the contents of this operating manuals and all cross-references to other documents and their contents
– the labels and instructions attached to the device
– the specifications in the calibration certificate
– the relevant safety regulations and standards for the installation and operation of electrical systems
– the relevant safety regulations and standards for handling gases
– the standards and regulations pertaining to explosion protection

During operation

The operator must commission a qualified electrician to inspect and examine the system at defined intervals. The examination intervals must be chosen in such a way that any damages that can be expected can be recognized in time.
The examinations must be performed at least every three years.
The examinations can be skipped if the electrical system is continuously monitored by a responsible engineer.

The operator is bound to
– maintain the system in a proper condition,
– continuously monitor the system,
– execute required maintenance and repair work immediately and
– take the required safety measures.
If the devices are used in areas where dusts can cause explosion hazards, clean the devices frequently.

Use genuine parts, only.

3 Installing and commissioning

3.1 Installation site

The installation site and mounting orientation must be in accordance with the following specifications:

Operating conditions, environmental capabilities

Ambient temperature	-5...55 °C
Storage temperature	- 25...+ 70 °C
Climate class	ambient temperature class C to EN 1434-1
Relative humidity	tested to EN 1434-4, IEC 62-2-30
Condensation	permissible
Protection class	IP 65
Resistance to shock during operation (at 20 °C)	to IEC 68-2-6 or 68-2-27
Vibration	2g/10...150 Hz
Shock	30g/11 ms/ 3 shocks

Electromagnetic compatibility (EMC)

Immunity to EMI/RFI	to EN 50082-2 (EN 6100-4-2, -3, -4, -5,6) and to EN 1434-4 (Class C)
RFI suppression	to EN 50081-2 (EN 55011 Class A)

Test type	Standard	Inspection level	Influence
Surge to AC supply com diff.	EN 61000-4-5	 2 kV 1 kV	 no effect no effect
Burst to supply lines	EN 61000-4-4	2 kV	< 0.2 %
Burst to signal lines	EN 61000-4-4	1 kV	< 0.2 %
Electrostatic discharge, contacts	EN 61000-4-2	6 kV	< 0.2 %
Radiated emissions (80-1000 MHz)	EN 61000-4-3	10 V/m	< 0.2 %
Conducted immunity (150 kHz - 80 MHz)	EN 61000-4-6	10 V	met
Mains failure / variation	EN 61000-4-411		
RFI suppression	Limit class met		
Noise voltage on supply line	EN 55022	A	
Intensity of noise field	EN 55022	B	

The device is designed for panel mounting and for mounting on 35 mm top hat rails.

3.2 Mounting

3.2.1 Panel mounting

1. Prepare a 139 mm × 69 mm panel cutout.
2. Remove the small covers (2) (see Fig. 3-2 on page 9) on the left and right hand side to be able to access the fastening screws (1) (see Fig. 3-1 on page 9).
3. Insert the device in the operator panel from the front.
4. Fasten the screws (1) to fix the device in the panel.
5. Replace the covers (2).

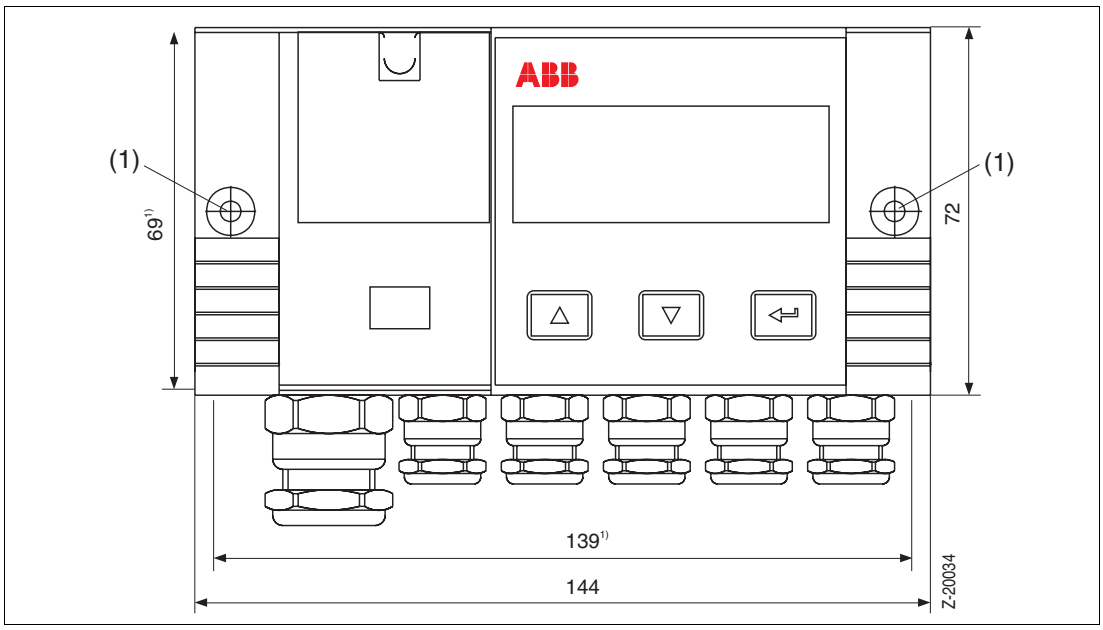

Fig. 3-1 Dimensional drawing, front view, covers removed (all dimensions in mm)
(1) Fastening screws
[1)] Panel cutout

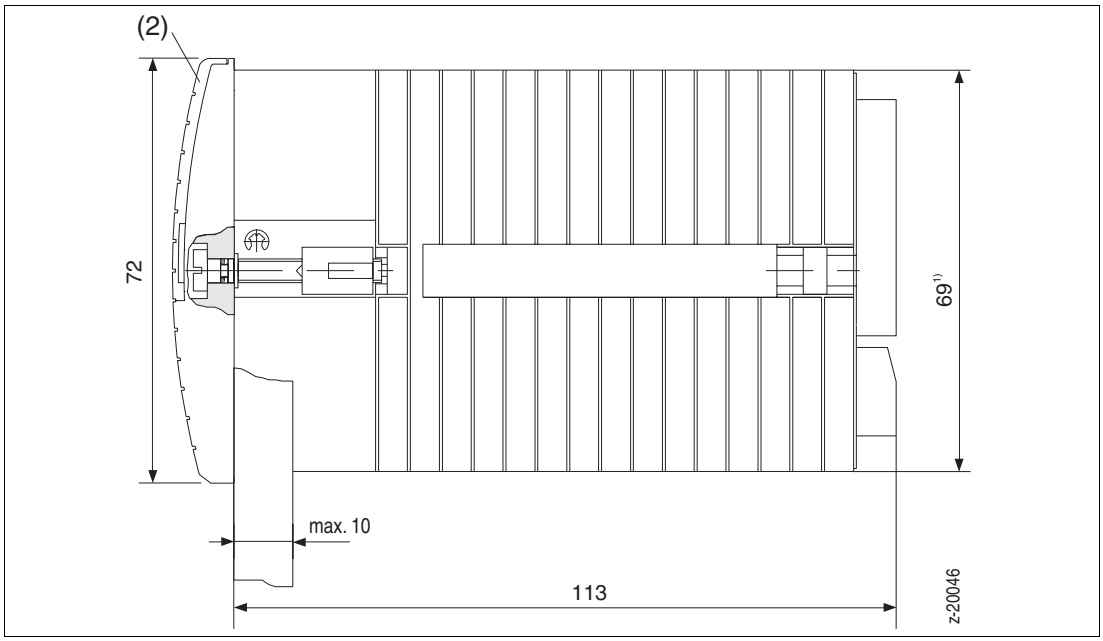

Fig. 3-2 Dimensional drawing, side view, rear part of the housing removed (all dimensions in mm)
(2) Covers
[1)] Panel cutout

3.2.2 Wall mounting (on 35 mm top hat rail)

1. Snap rear housing (4) (see Fig. 3-3 on page 10) onto the 35 mm top hat rail.
2. Insert the signal cable and the power cable through the PG cable gland into the rear housing (4) (free cable length in rear housing approx. 50 mm)
3. Fasten the cable glands to ensure a tight joint.
4. Mount the plug-in terminals.
5. Connect the plug-in terminals.
6. Insert the rear fastening screws (3) from the front.
7. Fasten the device to the rear housing (4) using the screws (3).

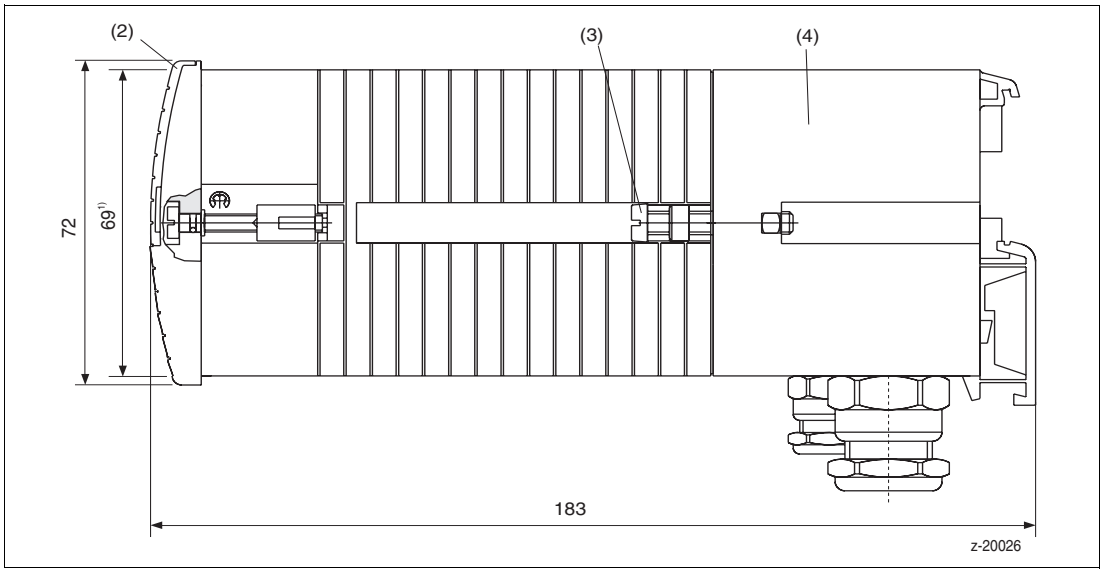

Fig. 3-3 Dimensional drawing, side view, rear housing (all dimensions in mm)
(2) Covers
(3) Rear fastening screws
(4) Rear housing
[1)] Panel cutout

Fig. 3-4 Device with rear housing

3.3 Electrical connection

DANGER
Observe the applicable national standards and regulations for the set-up of power installations up to 1000 V, especially for the choice of the insulating materials and for the installation procedure.

Provide a mains switch with sufficient breaking capacity within the reach of the installation site of the device to ensure disconnection of all poles from the mains if required. The switch must not void the protective effect of the protective ground conductor.

When powering the device with 24 V UC, exclusively use a power source with separated extra low voltage (to DIN VDE 0106).

Make sure that the rated current of the overvoltage protector on the installation side does not exceed 16 A.

Connection
Connect the signal and power cables according to the connection diagrams below.

3.3.1 Signal terminal assignment, basic device

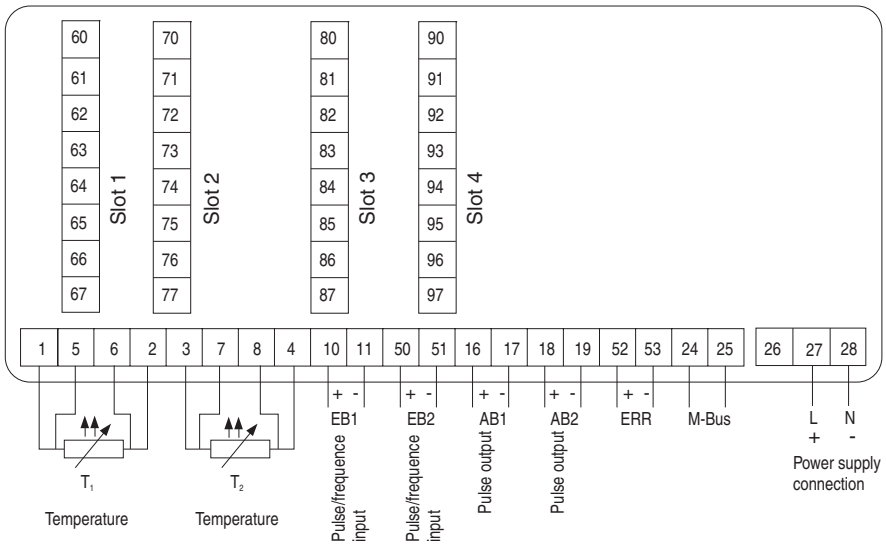

Fig. 3-5 Signal terminals, main board

1	IT_1+	Power current feed for T_1
2	IT_1-	Power current feedback for T_1
3	IT_2+	Power current feed for T_2
4	IT_2-	Power current feedback for T_2
5	T_1+	Temperature sensor for T_1
6	T_1-	Temperature sensor for T_1
7	T_2+	Temperature sensor for T_2
8	T_2-	Temperature sensor for T_2
10	EB1+	Pulse/frequency input
11	EB1-	Pulse/frequency input, reference potential
16	AB1+	Pulse output
17	AB1-	Pulse output, reference potential
18	AB2+	Pulse output
19	AB2-	Pulse output, reference potential
24	MBUS	M-Bus interface
25	MBUS	M-Bus interface
27	L	Conductor
28	N	Zero conductor
50	EB2+	Pulse/frequency input
51	EB2-	Pulse/frequency input, Reference potential
52	ERR+	Error output
53	ERR-	Error output, reference potential

3.3.2 Terminal assignment of FCU200-W (SensyCal W)

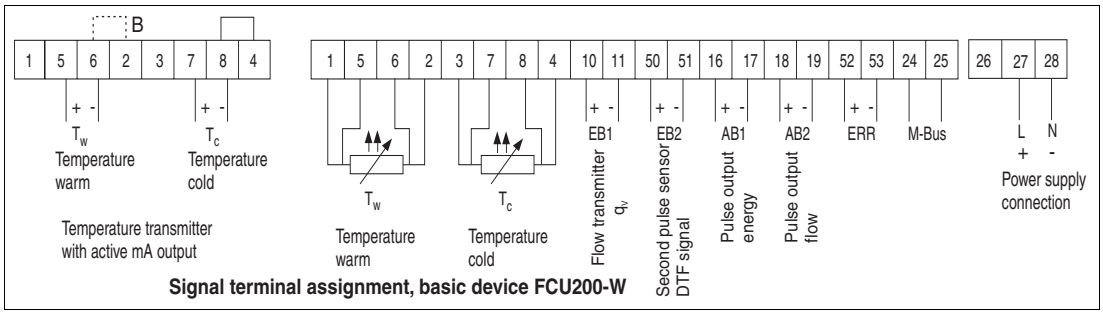

Fig. 3-6 Signal terminal assignment, basic device, FCU200-W (SensyCal W)
B = jumper

Notice
If the temperature transmitters are electrically connected, jumper B (between terminals 6 and 2) is not required.

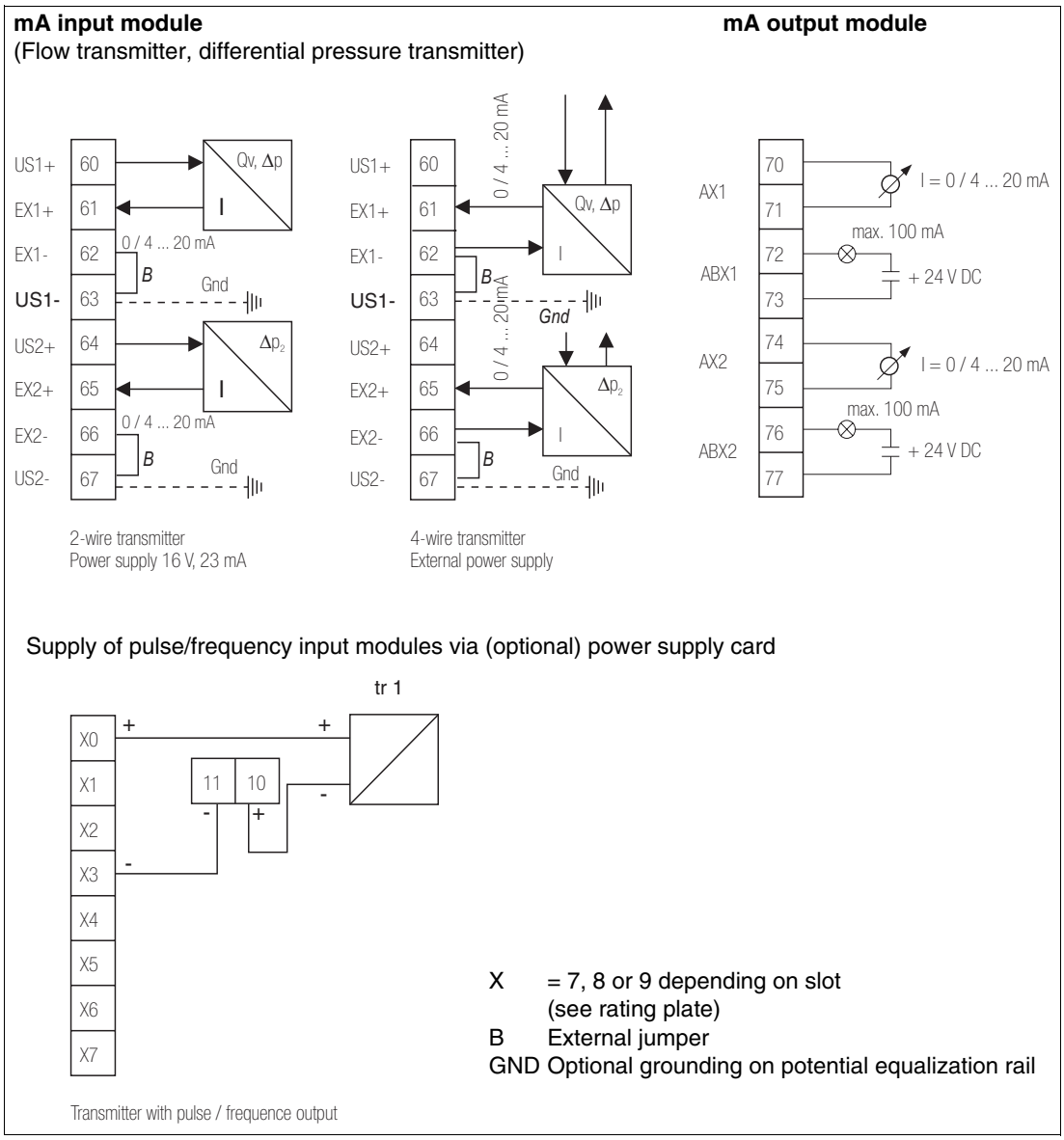

Fig. 3-7 Terminal assignment, option modules

3.3.3 Terminal assignment of FCU400-G, FCU400-S (SensyCal S, G)

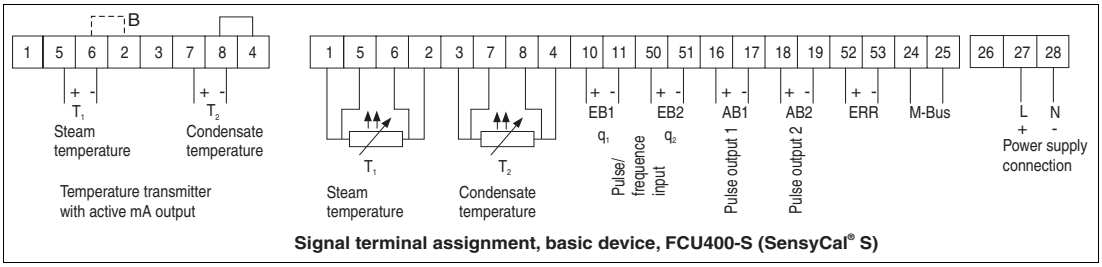

Fig. 3-8 Signal terminal assignment, basic device, FCU400-S (SensyCal S), B = jumper

Notice
If the temperature transmitters are electrically connected, jumper B (terminals 6 and 2) is not required.

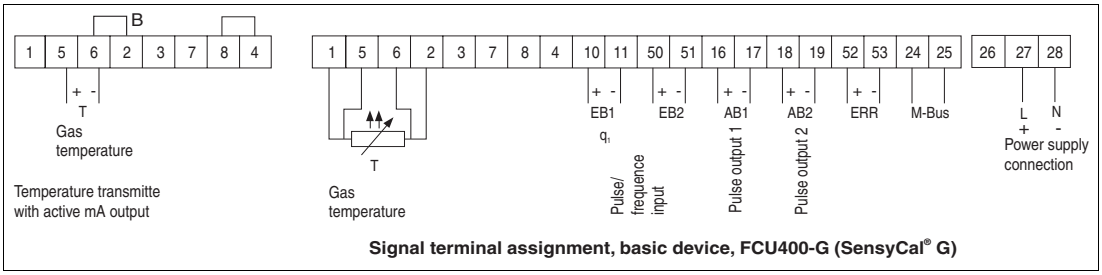

Fig. 3-9 Signal terminal assignment, basic device, FCU400-G (SensyCal G), B = jumper

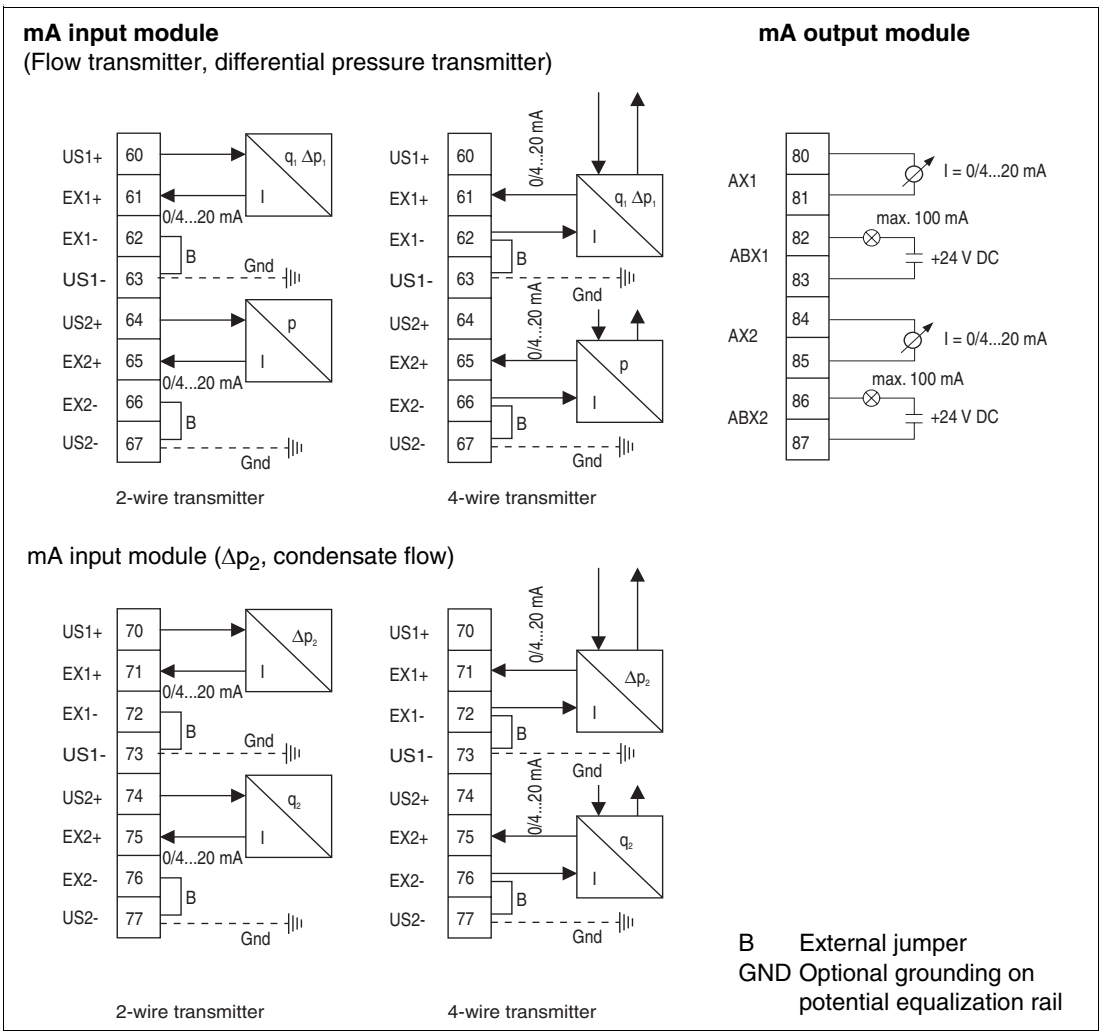

Fig. 3-10 Terminal assignment, option modules

3.3.4 Terminal assignment of FCU200-T (SensyCalT)

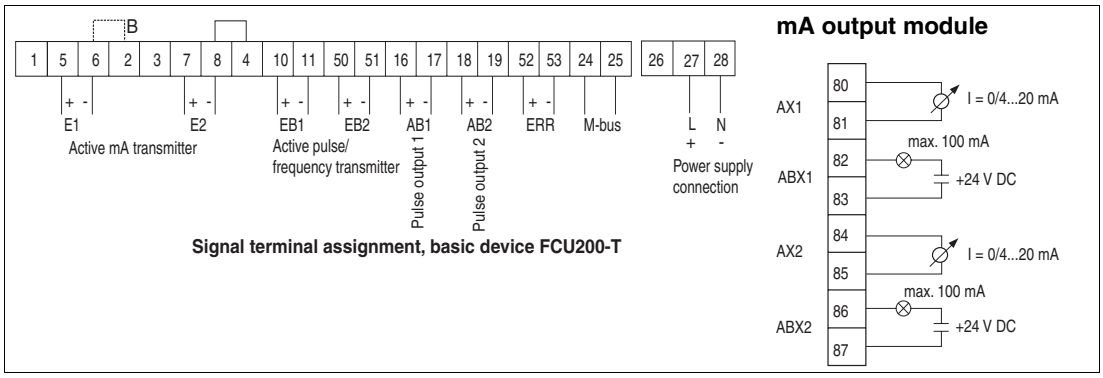

Fig. 3-11 Terminal assignment of FCU200-T (SensyCal T), B = jumper

Notice
If the mA transmitters are electrically connected, jumper B (between terminals 6 and 2) is not required.

3.3.5 Power supply of the 2-wire transmitters

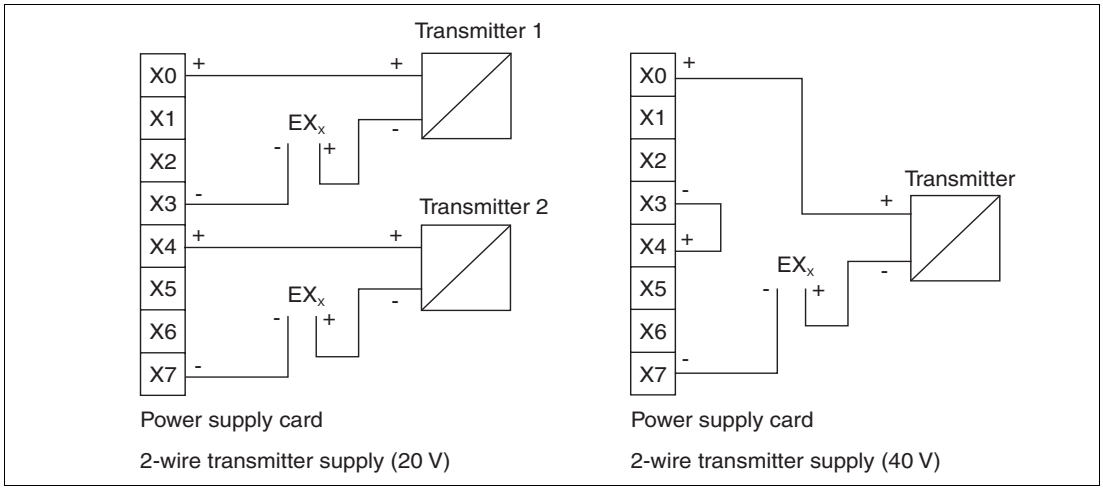

Fig. 3-12 Power supply of 2-wire transmitters through (optional) power supply card

3.3.6 Interface terminal assignment

Terminal assignment of the RS 485/RS 232 interface
Connection via the (optional) RS 485/RS 232 card

X0	GND RS 232	SubD 5
X1	TxD RS 232	SubD 2
X2	RxD RS 232	SubD 3
X3	+B RS 485 (termination)	
X4	RS 485 +TxD/RxD	SubD 3
X5	RS 485 - TxD/RxD	SubD 8
X6	-B RS 485 (termination)	
X7	GND RS 485	SubD 5

X = 7, 8 or 9, depending on the slot position

3.4 Switching the device on

Caution

Prior to switching the device on, make sure that supply voltage set on the device is identical with the local mains voltage.

Immediately after switch-on, the device automatically starts operation.

Important information

The date and time must be set in the commissioning phase, to enable the data logger to save the process variables with date and time. (See Section 4.2.5 “Main menu 4 "Date/Time"” on page 23 for details about date and time setting.)

4 Operating and configuring the device

4.1 Operator panel

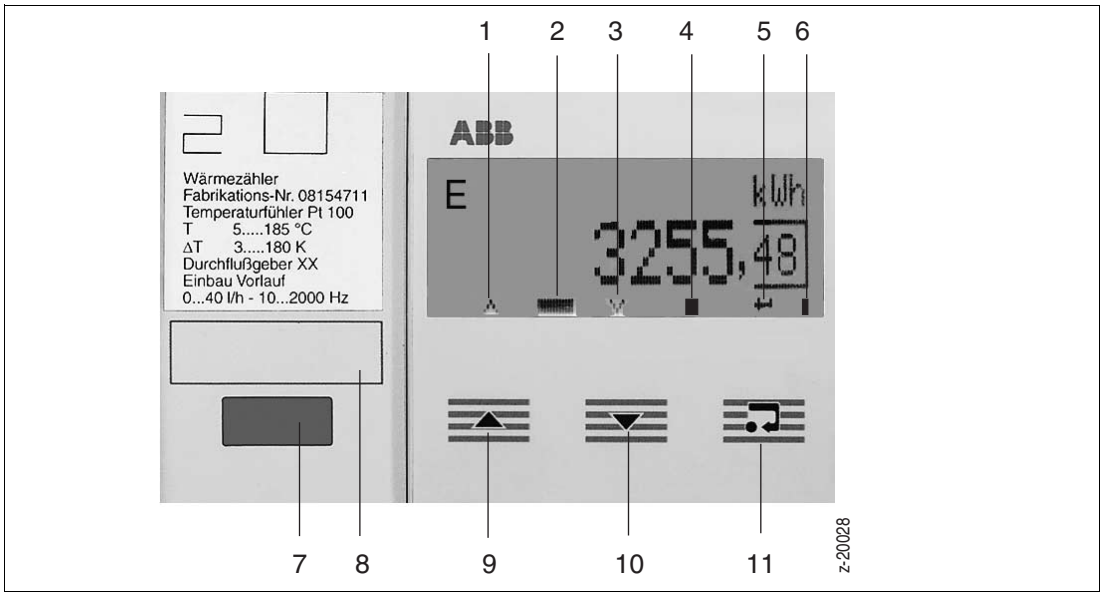

Fig. 4-1 Operator panel

Display

Refer to the "Menus" section of this manual for details about the individual displays.
The symbols in the bottom part of the display have the following meaning:

No.	Symbol	Description
1	^	Key < ▲ > (increment) is active.
2	▮	Changing width means that the device is working.
3	/	Key < ▼ > (decrement) is active.
4	■	Error message is present.
5	↵	Key < ↵> (Enter key) is available
6	▮	EEPROM write action (bottom right part of the display).

Operating elements

Keys

No.	Key	Function
9	<▲>	Previous / increment. Returns to the previous menu item. Increments to the next digit.
10	<▼>	Next / decrement Changes to the next menu item. Decrements to the previous digit
11	< ↵ >	Enter key. Changes over from a main menu item to a submenu. Enables changes of the value. Switches to the next value Exits the submenu

Note

Pressing and holding a key will repeat the respective function (with time delay for< ↵ > .

Optical interface

7 Optical interface for infrared or read head (opto-head)
8 Inscription field (use waterproof pens)

4.2 Main menus

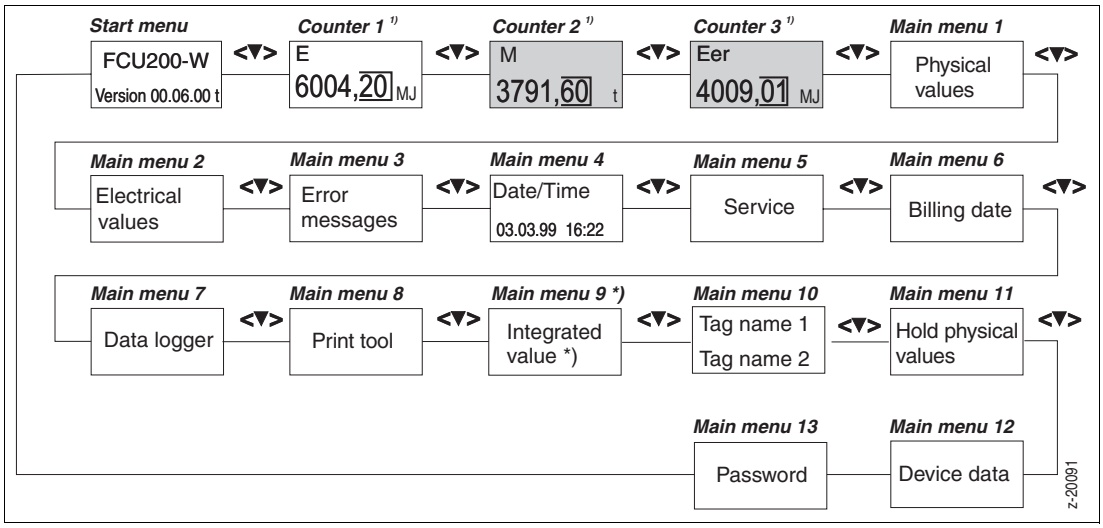

Fig. 4-2 Main menus
Items highlighted gray depend on the application.
1) The number of counters depends on the application.
*) Main menu "Filling quantity" is only available with FCU200-T (SensyCal T)

Navigation
- Press <▼> or <▲> to select a main menu item.
- Press < ↵> (Enter key) to select the first submenu of that main menu item.
- Press <▼> or <▲> to select other submenus.

Changing values
In some of the submenus, values can be edited or entered, e.g. the password, date, etc. Proceed as described below to make the data entries:

Entering values

Step	Action
1.	Press < ↵ > to select the first digit and enable modification. The first digit starts flashing.
2.	Press <▲> to increment or <▼> to decrement the displayed value.
3.	Press < ↵ > to confirm the new value of this digit and call the next digit. The next digit starts flashing.
4.	Press <▲> to increment or <▼> to decrement the displayed value. And so on...
5.	After setting the last digit, press <↵ > to terminate data setting.
6.	Press <▼> to select the next or <▲> to select the previous submenu (if no other digit is flashing), and so on.
7.	Press <▼> or <▲> to select the last submenu ("End submenu").
8.	Press < ↵> to return to the main menu.

Notice
Safety instruction for devices with verification seal (FCU200-W)
To be able to change data relevant for verification, the verification seal must be removed, and jumper J (see Fig. 6-1 on page 36) must be set . (Also refer to Section 4.2.6 “Main menu 5 "Service"” on page 24.)

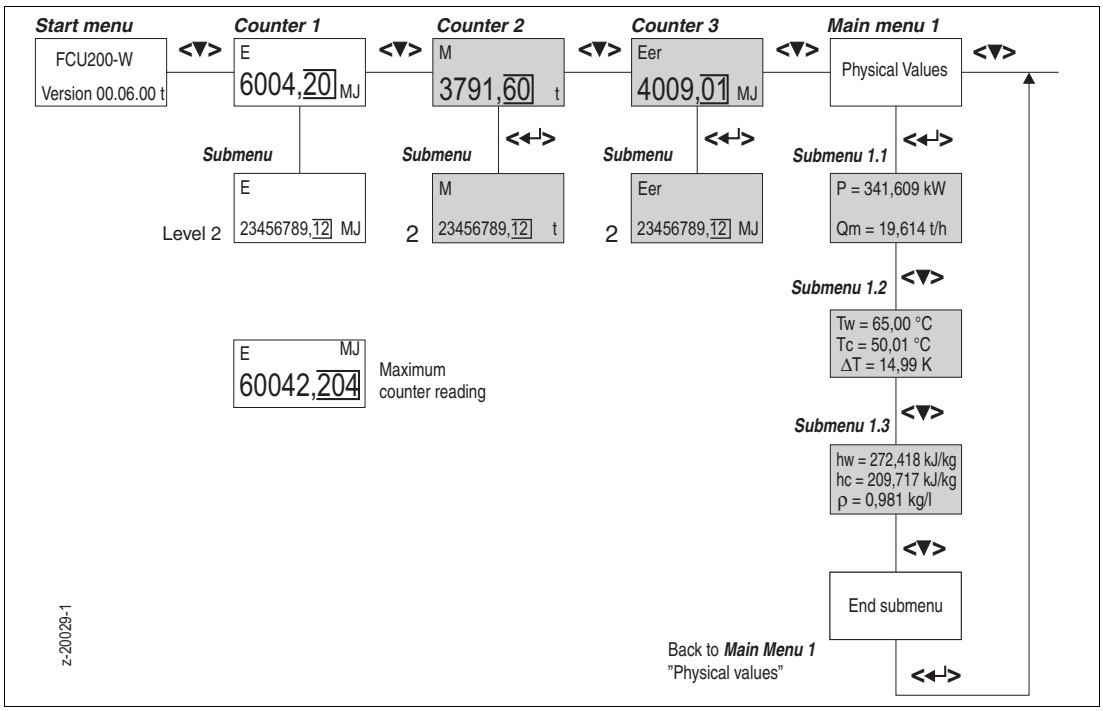

Fig. 4-3 Menus, part 1: ***Start menu, counters, main menu 1 "Physical values"***
Items highlighted gray depend on the application.

4.2.1 Start menu

After switch-on, the ***Start menu*** is indicated in the display (Fig. 4-3 on page 18):
Device name:
"FCU200-W"
and software revision No.
"Version xx.xx.xx"
Press <▼> to scroll through the main menu items from the left to the right side, and <▲> to scroll from the right to the left side.

4.2.2 Counters and main menu 1 "Physical values"

Counters

The number and the type of counters depend on the respective application (Fig. 4-3 on page 18):
up to 3 counters for FCU200-W (SensyCal W),
up to 5 counters for FCU400-S (SensyCal S),
up to 1 counter for FCU400-G (SensyCal G),
1 counter per channel for FCU200-T (SensyCal T).
Specific customized programs may have up to 6 counters.

Note (useful information for counters)

A maximum of 12 digits can be displayed, up to 9 to the left and up to 6 to the right of the decimal point. Digits to the right of the decimal point are indicated in a frame. The setting can be modified by using the configuration program.

In case of values with many digits the display is automatically switched to small-size digits (see Fig. 4-3 on page 18, counter "*Submenus*").
The display can also be switched to small-size digits by pressing < ⮓> .

In order to achieve optimal usage of the display field, the device can be configured in such a way that the unit is indicated in the first line (see Fig. 4-3 on page 18 "Max. counter reading").

Main menu 1 *"Physical values"*

The number and contents of the "Submenus" depend on the application program. (Refer to Fig. 4-3 on page 18, where 4 "*submenus*" are seen.)

All physical input and output variables and all calculated process variables (e.g. density, enthalpy, differential temperature, etc.) are indicated.

A maximum of 3 lines can be shown in the display.

"Counters" and "Physical values" for the different models and application programs:

FCU200-W (SensyCal W)

Counters

Counter 1 = E = Energy
Counter 2 = V or M = volume or mass
Counter 3 = Options counter
For the FCU200-W measurement computer appropriate for verification the counters and their respective engineering units are displayed in a single line.

Physical variables

Press the < ↵ > key to access the submenu level.

Submenus

P	power
Qm	Mass flow
Qv	Volume flow
Tw	Temperature, warm
Tc	Temperature, cold
ΔT	Differential temperature
hw	Enthalpy, warm
hc	Enthalpy, cold
ρ	Density
Cpc	Specific heat capacity = f(Tc), for brine/oil, only
Cpw	Specific heat capacity = f(Tw), for brine/oil, only
Δp1	Differential pressure (only for Δp measurement)
Δp2	Differential pressure (only for Δp measurement)

FCU400-S (SensyCal S)

Counters

Counter 1 = E1 = Steam energy
Counter 2 = M1 = Steam mass
Counter 3 = ΔE = Energy balance (steam - condensate)
Counter 4 = E2 = Energy condensate
Counter 5 = M2 = Mass condensate

Physical values

Submenus

P1	Steam power
Qv1	Steam volume flow
Qm1	Steam mass flow
T1	Steam temperature
P1a	Absolute steam pressure
h1	Steam enthalpy
ρ1	Steam density = f(P1a, T1)
Δp1	1st. differential pressure transmitter (only for Δp measurement)
Δp2	2nd. differential pressure transmitter (only for Δp measurement)

P2 Condensate power
ΔP Power balance (steam - condensate)
Qm2 Condensate mass flow

Qv2 Condensate volume flow
T2 Condensate temperature

h2 Condensate enthalpy
ρ2 Condensate density = f(T2, p=const.)

Lcor Expansion (e) correction factor (only for Δp measurement)
Ccor Flow (C) correction factor (only for Δp measurement)

FCU400-G (SensyCal G)

Counters

Counter 1 = Vn = Volume under standard conditions

Physical values

Submenus

Qn Volume flow under standard conditions
Qv Volume flow under operating conditions
T Gas temperature

p Gas pressure
Δp1 Differential pressure transmitter 1 (only for Δp measurement)
Δp2 Differential pressure transmitter 2 (only for Δp measurement)

Z Compressibility factor = f(p,T)
Lcor Expansion correction factor (only for Δp measurement)
Ccor Flow correction factor (only for Δp measurement)

FCU200-T (SensyCal T)

Counters

Counter 1 = Channel 1 = f(E1)
Counter 2 = Channel 2 = f(E2)

Physical values

Submenus

E1 Input variable, channel 1
E2 Input variable, channel 2

4.2.3 Main menu 2: "Electrical values"

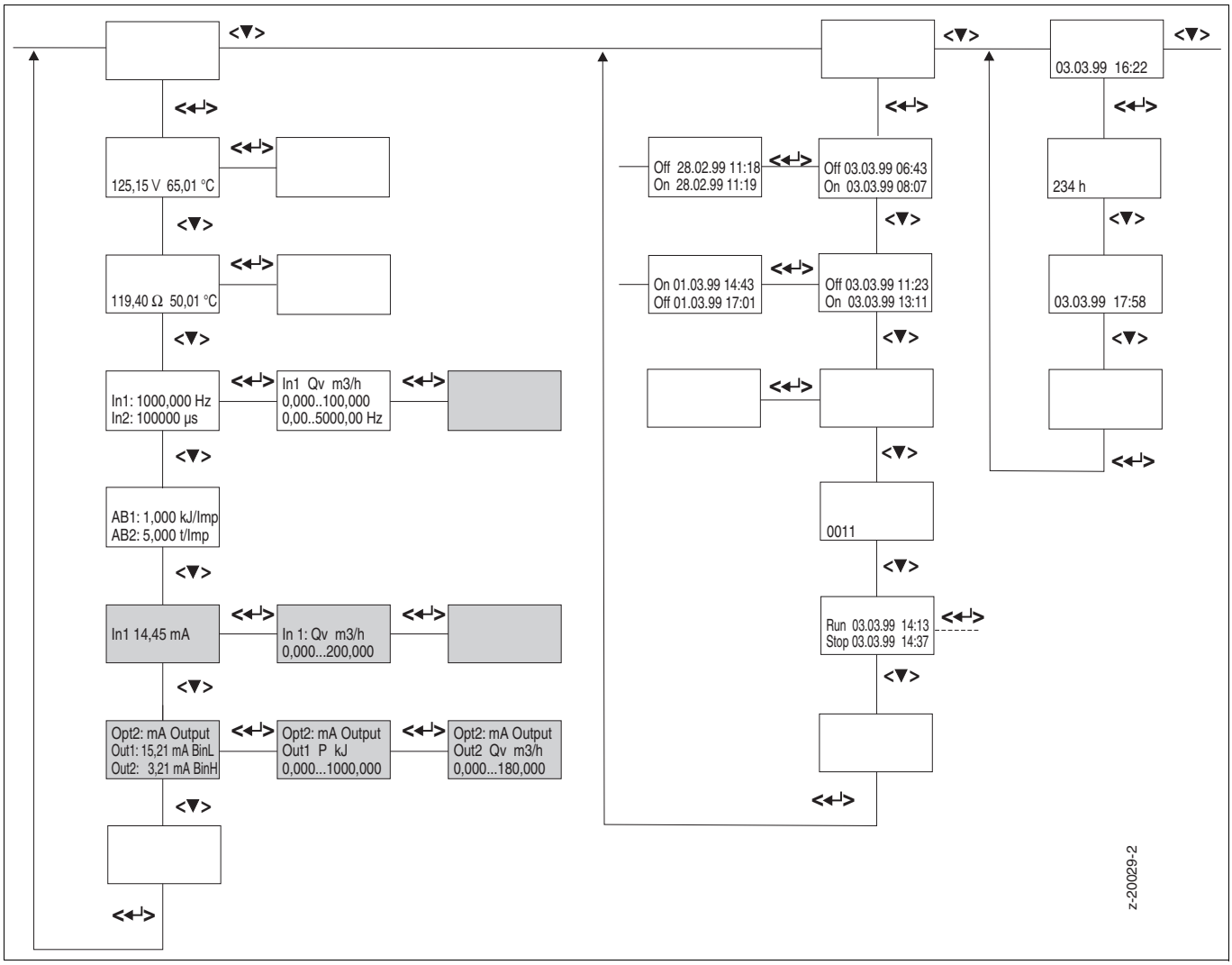

Fig. 4-4 Main menus 2 to 4: ***"Electrical values, "Error messages", "Date/Time"***
Items highlighted gray depend on the application.

The number and contents of the submenus (see Fig. 4-4 on page 21) depend on the application program. All input and output signals are indicated. A maximum of 3 lines can be shown in the display.

Press the < ↵> key to access the submenu level.

Submenu 2.1
T1 warm Pt 100 input 1

Submenu 2.2
T2 cold Pt 100 input 2
Pressing in the *submenus 2.1 and 2.2* the key < ↵> (Enter key) calls up the measuring range settings in the submenus *2.1.1 and 2.2.1*.

Submenu 2.3
Binary input
In1 EB1 input in Hz or s
In2 EB2 input in Hz or s
Pressing the < ↵> key (Enter key) calls up the measuring range settings in *submenus 2.3.1 and 2.3.2*.

Submenu 2.4

Pulse value
AB1 Pulse valency of binary output 1
AB2 Pulse valency of binary output 2

Submenu 2.5

Opt1 (slot1): Type of option card (e.g. mA input, if it exists)
In1 16,235 mA
In2 15,687 mA
Pressing the < ↵> key (Enter key) calls up the measuring range settings *in submenus 2.5.1 and 2.5.2*.

Submenu 2.6

Opt2 (slot2): Type of option card (e.g. mA output, if it exists)
Out1 16,235 mA BIN L
Out2 15,687 mA BIN H
Pressing the < ↵> key (Enter key) calls up the measuring range settings in *submenus 2.6.1 and 2.6.2*.

4.2.4 Main menu 3 "Error messages"

(See Fig. 4-4 on page 21 and Section 5 “Error messages” on page 35)

Press the < ↵> key to access the submenu level.

Submenu 3.1

Power supply 01/10 last power failure
Off Date Time
On Date Time
Press < ↵> to display the last (up to 10) power failures, *submenus 3.1.1...*

Submenu 3.2

Last process error
Indicates the time when the last process error occurred and, if applicable, the time when it was eliminated.
On Date Time (Start)
Off Date Time (End)
Press < ↵> to display the last (up to 10) process errors, submenus 3.2.1...

Submenu 3.3

Process errors delete?
Delete the "process error" record.

Submenu 3.3.1

Safety inquiry prior to deletion of the "process error" record.

Submenu 3.4

Device error

Submenu 3.5

Counter stoppage
The last counter stoppage is indicated.
Counter1 01/10
Run Date Time (Counter stoppage)
Press < ↵> to display the last (up to 10) counter stoppages.

Press <▼> to reach the End submenu.
Press < ↵ > to return to ***main menu 3.***

4.2.5 Main menu 4 "Date/Time"

The current date (note: number of years only with two digits) and time are indicated.
The date and time are stored for ≥ 3 days by the built-in super-capacitor.

Press the < ↵> key to access the submenu level.

Submenu 4.1
Total running time in h
1050 h

Submenu 4.2
Setting date/time
Date Time

Setting the time
e.g. 22.06.02 18:06
Press < ↵ > to select the first digit and
then <▲> to increment or
<▼> to decrement the values.
Press < ↵ > to activate the next digit.
After setting the last digit, press < ↵ > to terminate data setting.

Press <▼> to reach the End submenu.
Press < ↵ > to return to ***main menu 4.***

4.2.6 Main menu 5 "Service"

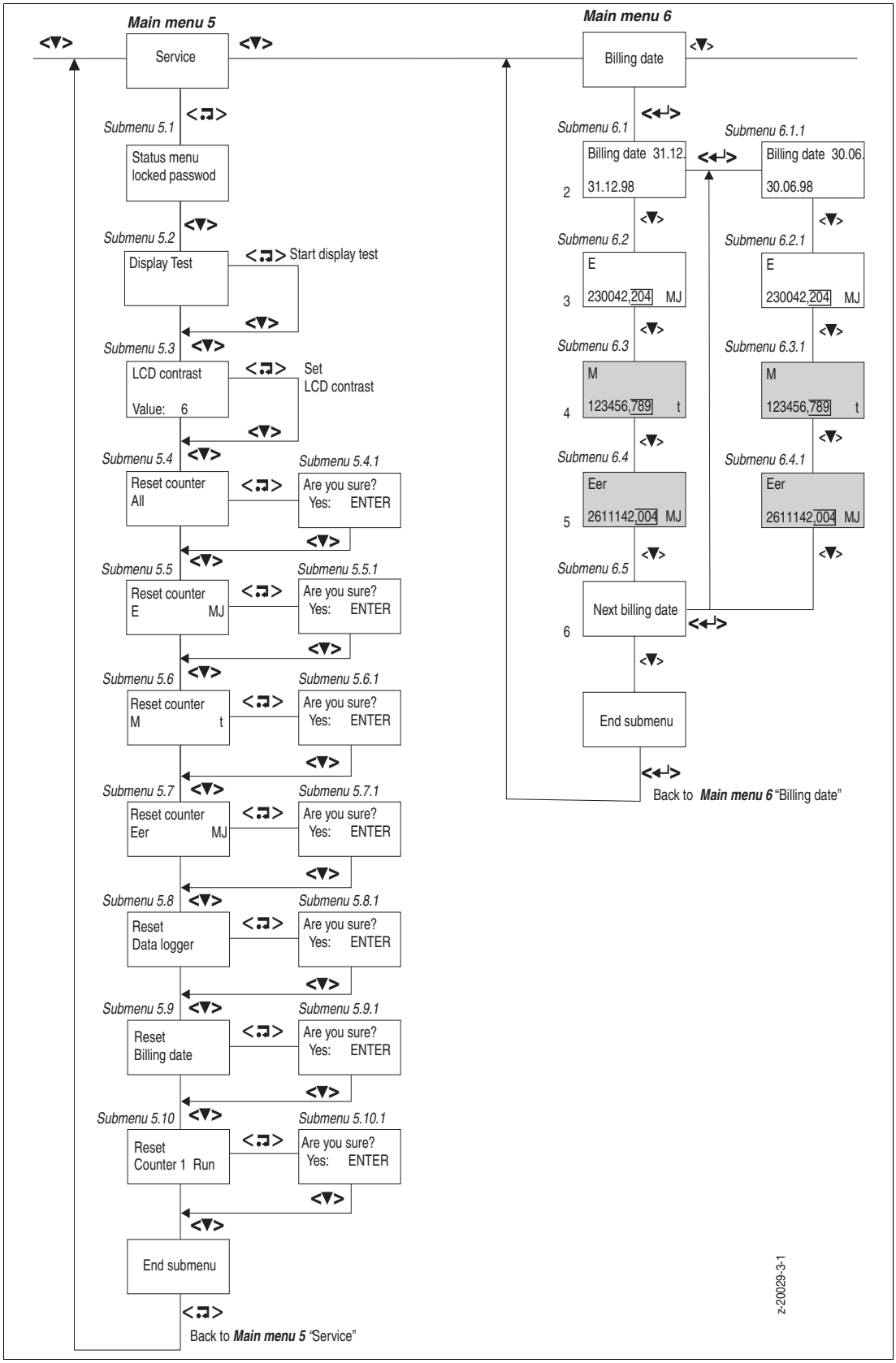

Fig. 4-5 Main menus 5 and 6: ***"Service" and "Billing date"***
Items highlighted gray depend on the application.

Press the < > key to access the submenu level.

Submenu 5.1

Status menu

"Unrestricted"	All customer-relevant submenus are accessible and can be edited.
"Manufacturing"	Like "Unrestricted", but with additional submenus that are only accessible to the Manufacturing or Service department.
"Password lock"	All customer-relevant submenus are accessible. However, they can only be edited upon password entry.
"Verification lock"	All customer-relevant submenus are accessible. However, none of the data relevant for verification can be changed.

Notice

Safety instruction for devices with verification seal (FCU200-W)

To be able to change data relevant for verification, the verification seal must be broken, and jumper J (see Fig. 6-1 on page 36) must be set .

Submenu 5.2

Display test

Press < > to activate the display test.

Submenu 5.3

LCD contrast

The LCD contrast can be changed with < >.

Press < > to set the contrast value between 1 (low) and 15 (high).

Press <▼> to return.

Submenus 5.4 to 5.8

Reset counters or data logger.

They can be reset alltogether or individually.

The reset will only be performed if the safety inquiry is answered with "Yes".

Submenus 5.9 and 5.10

Reset key date and Counter 1 Run

The reset will only be performed if the safety inquiry is answered with "Yes".

Press <▼> to reach the End submenu.

Press < > to return to ***main menu 5.***

4.2.7 Main menu 6 "Billing date"

(see Fig. 4-5 on page 24)

On the billing dates (up to two) defined here, the counter counts are saved together with the respective date.

Press the < ⮒> key to access the submenu level.

Submenu 6.1
Billing date 1 with billing date and current date

Press < ⮒ > to select the 2nd. billing date.
Press < ⮒ > to return to billing date 1.

Submenu 6.1.1
Billing date 2

Submenu 6.2
Counter count E on the 1st. billing date.

Submenu 6.2.1
Counter count E on the 2nd. billing date.

Submenu 6.3
Counter count M on the 1st. billing date (depending on the application).

Submenu 6.3.1
Counter count M on the 2nd. billing date (depending on the application).

Submenu 6.4
Counter count Eer on the 1st. billing date (depending on the application).

Submenu 6.4.1
Counter count Eer on the 2nd. billing date (depending on the application).

Press < ⮒ > to call up the next billing date.
The number of counters depends on the application program.

Press <▼> to reach the End submenu.
Press < ⮒ > to return to ***main menu 6.***

4.2.8 Main menu 7 "Data logger"

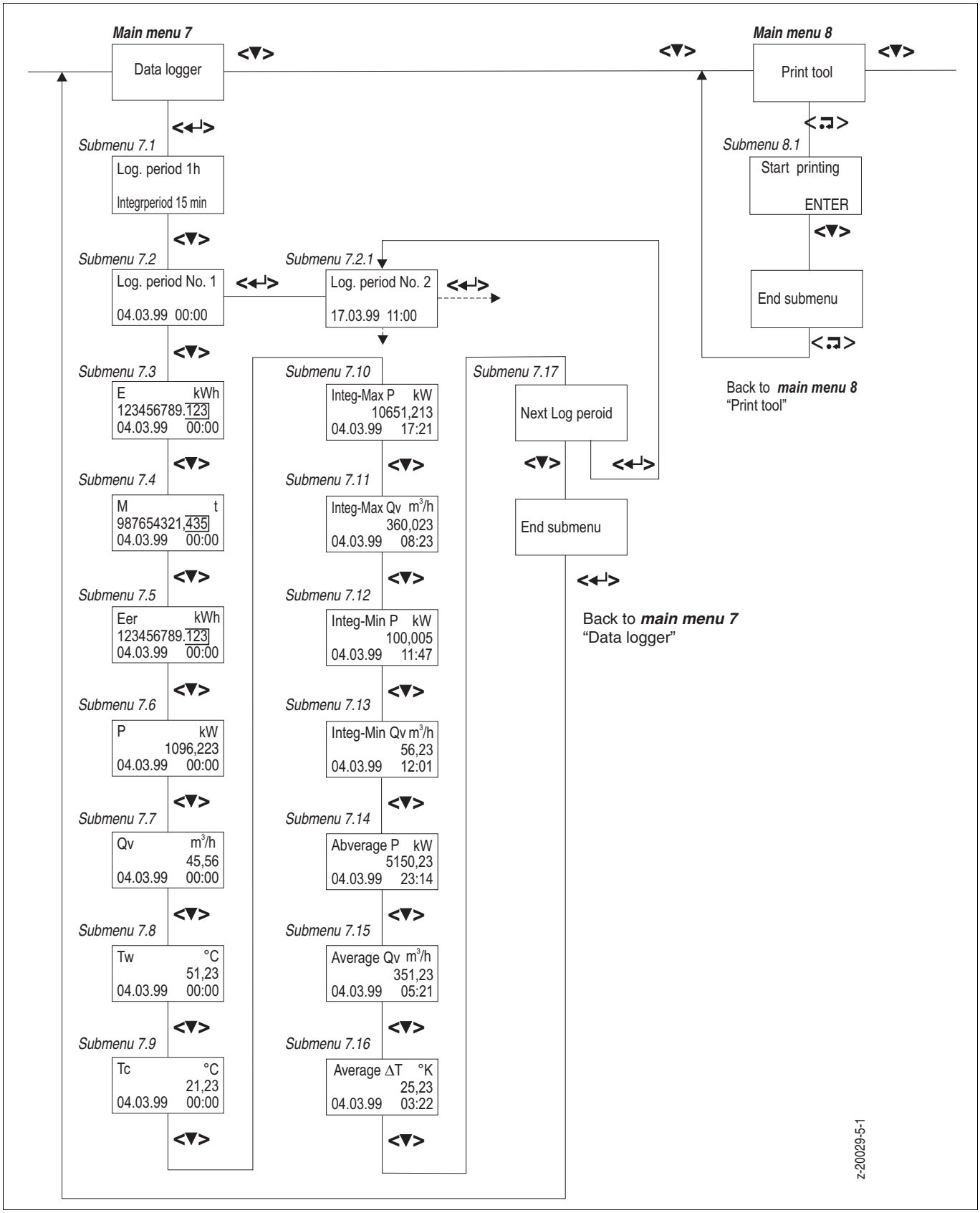

Fig. 4-6 Main menus 7 and 8: ***"Data logger"*** and ***"Print tool"***

The data logger records various process variables with the date and time.

The logging periods depend on the application:

FCU200-W, FCU400-S (SensyCal W, S) 128 periods,

FCU200-T, FCU-400G (SensyCal T, G) 200 periods

Logging periods between 1 hour and 3 months can be configured.

Press the < ↵> key to access the submenu level.

Submenu 7.1
The set logging period and the integration time for the minimum and maximum values and mean values are indicated here.
The value settings can be changed in ***main menu 12*** "Device data".

Submenu 7.2
Logging period 1
Display of the logging period with number, date, and time.

Press < ↵ > to call the next logging period (period 2 ...) until reaching logging period 128 or 200, depending on the application).

Press <▼>to reach the ***submenus 7.3 ...7.17***
The recorded data and the respective logging period can be displayed.

The data recorded in one logging period depend on the application:

Momentary values of	all values
Maximum and minimum values of	selected data
Mean values of	selected data

4.2.9 Main menu 8 "Print tool"

(See Fig. 4-6 on page 27.)

The following parameters can be output via the infrared interface and the hand-held printer:
- the serial number
- the date and time
- the tag names
- the counters
- the physical variables

Press < ↵ > to update the values and select ***submenu 8.1***.

Submenu 8.1
Press ENTER to start printing.

Press <▼> to reach the End submenu.
Press < ↵ > to return to **main menu 8** *"Print tool".*

4.2.10 Main menu 9*) "Integrated Value"

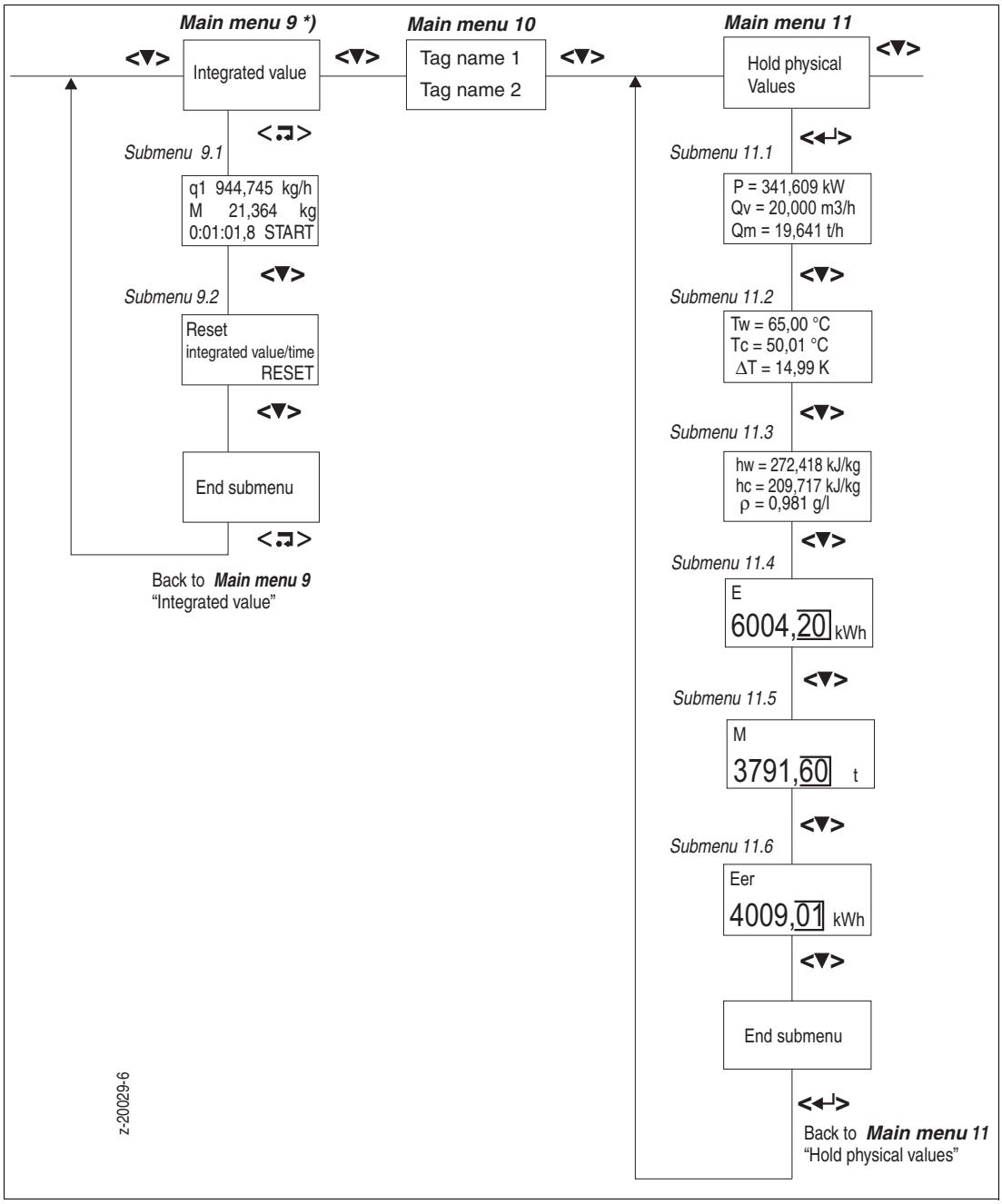

Fig. 4-7 Main menus 9*), 10 and 11: ***"Integrated Value", "Tag name" and "Hold physical values"***
*) only for version FCU200-T (SensyCal T)

Main menu 9 "Integrated value" exclusively exists for version FCU200-T (SensyCal T).
Display of the counter's momentary value for flow q1.

Press < ⮓ > to update the values and select submenu 9.1.

Submenu 9.1
Display of the counter's momentary value for flow q1,
integrated value and
summation time
Press < ⮓ > = "Start" or "Stop" the measurement.
Press <▼> to reach the next submenu.

Submenu 9.2

RESET the counter.
The integrated value and summation time are reset to zero.
The display switches back to the previous ***submenu 9.1***.

Press <▼> to reach the End submenu.
Press < ↵ > to return to ***main menu 9 "Integrated Value".***

4.2.11 Main menu 10 "Tag name"

(See Fig. 4-7 on page 29.)

2 text lines of up to 20 characters can be entered here as the tag name. Note that this text can only be entered or edited by using the configuration program (see Fig. 4-7 on page 29).

4.2.12 Main menu 11 "Hold physical values"

(See Fig. 4-7 on page 29)

When selected, the process variables are held at the current value.
This enables the user to check the functionality and calculations of the device at the current time and, if required, note the values down.

Refer to Fig. 4-7 on page 29 for an example.
Press the < ↵> key to access the submenu level.

Submenu 11.1

P	Power (e.g. in kW)
Qm	Mass flow (e.g. in t/h)
Qv	Volume flow (e.g. in m^3/h)

Submenu 11.2

Tw	Temperature, warm (e.g. in °C)
Tc	Temperature, cold (e.g. in °C)
ΔT	Differential temperature (e.g. in K)

Submenu 11.3

hw	Enthalpy, warm (e.g. in kJ/kg)
hc	Enthalpy, cold (e.g. in kJ/kg)
ρ (rho)	Density (e.g. in kg/m^3)

Submenu 11.4

Energy counter E (e.g. in kWh)

Submenu 11.5

Flow counter M (e.g. in t)

Submenu 11.6

Options counter Eer (e.g. in kWh)

Press <▼> to reach the End submenu.
Press < ↵ > to return to ***main menu 11 "Hold physical values".***

4.2.13 Device data

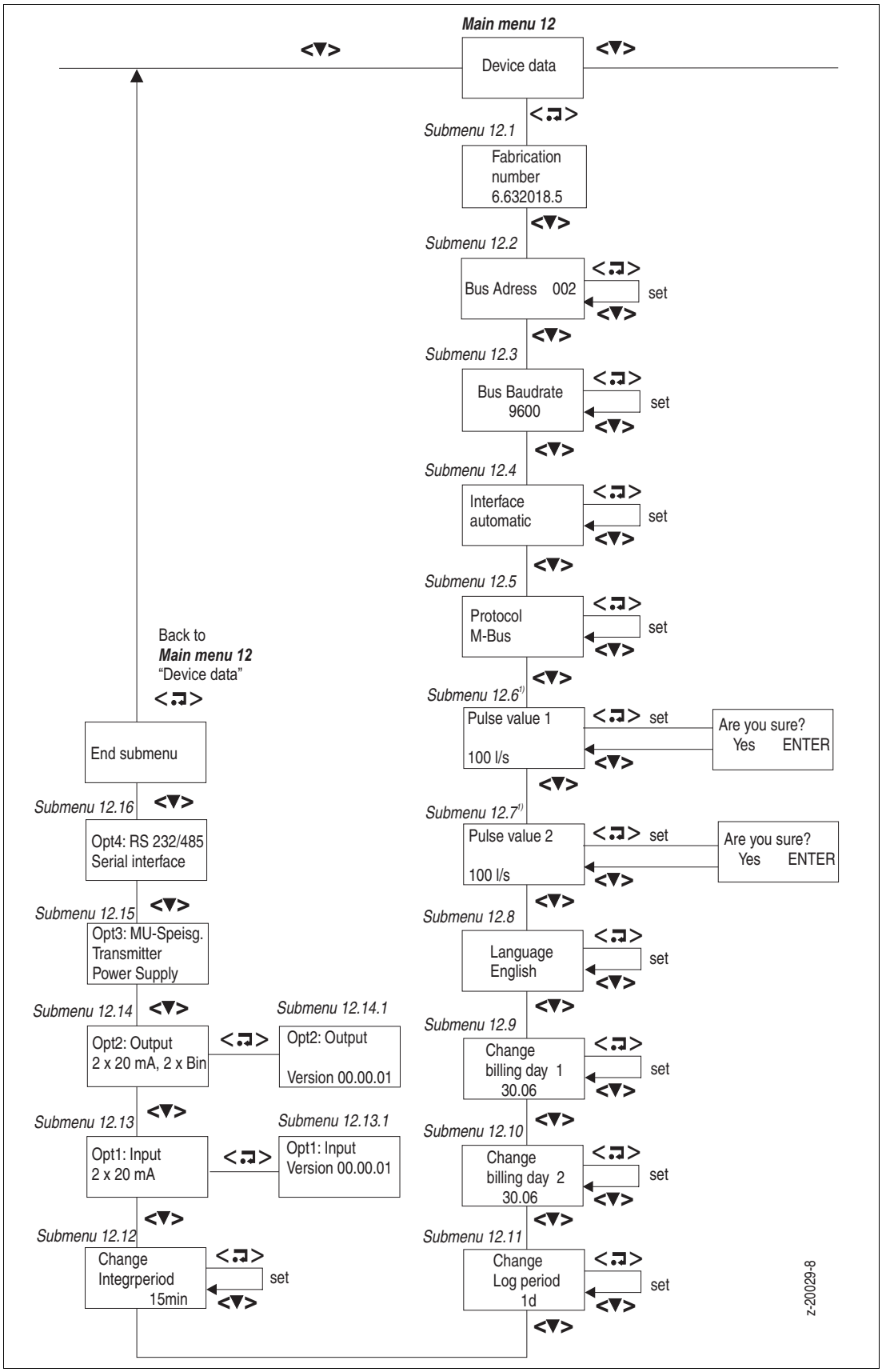

Fig. 4-8 Main menu 12 ***"Device data"***
1) only for version FCU200-W

In the ***main menu 12 "Device data"*** all hardware and software settings as well as the slot assignments are indicated (see example in Fig. 4-8 on page 31).

Press the < ⮓> key to access the submenu level.

Submenu 12.1
Serial number

Submenu 12.2
Bus address
Press < ⮓ > to change the bus address; it can be set to a value between 0 and 250.

Submenu 12.3
Bus baudrate (data transfer rate)
Press < ⮓ > to change the baud rate; it can be set to 300, 600, 1200, 2400, 4800, 9600 19200 or 38400 bauds.

Submenu 12.4
Interface
Opto-head / automatic / M-Bus repeater / RS 232 / RS 485
Press the < ⮓ > key to toggle.
Press <▼> to call the next submenu.

Submenu 12.5
Protocol
M-Bus / Modbus / Modbus (Pair of reg)
Press < ⮓ > to toggle.
Press <▼> to call the next submenu.

Only for active pulse inputs:
For measurement computers with pulse input (**not for calibrated devices**), the pulse valency of the pulse inputs can be changed in **main menu 12 "Device data",** in ***submenus 12.6 and 12.7*** .

Submenu 12.6
Pulse value of input EB1
Press < ⮓ > to change.
Changing is only possible if the safety inquiry is answered accordingly!

Submenu 12.7
Pulse value of input EB2
Press < ⮓ >to change.
Changing is only possible if the safety inquiry is answered accordingly!

Submenu 12.8
Language
Here your can select the language:
German, English, French
Press < ⮓ > to toggle.
Press <▼> to call the next submenu.

Submenu 12.9
Change billing day 1
Here you can change billing day 1.
Press < ⮓ > to change.

Submenu 12.10
Change billing day 2
Here you can change billing day 2.
Press < ⮓ > to change.

Submenu 12.11

Logging period
Here you can select the logging period:
1 / 2 / 3 / 4 / 6 / 8 / 12 hours
1 / 2 / 3 / 4 / 5 / 6 / 7 / 10 days
1 / 2 / 3 months
Press < ↵ > to change.
Press <▼> to call the next submenu.

Submenu 12.12

Integration period
Here you can select the integration time for minimum and maximum value calculation:
0 / 15 / 30 / 45 / 60 / 75 / 90 / 105 / 120 min
Press the < ↵ > key to change.
Press <▼> to call the next submenu.

Submenu 12.13

Opt 1: Option card in slot 1
Press < ↵ > to display the hardware and software revision numbers of the extension card plugged in, see submenu 12.13.1.

Submenu 12.14

Opt 2: Option card in slot 2
Press < ↵ > to display the hardware and software revision numbers of the extension card plugged in, see submenu 12.14.1.

Submenu 2.15

Opt3 (slot 3): Type of option card (e.g. power supply card, if it exists)
Opt3: Transmitter power supply

Submenu 2.16

Opt4 (slot 4): Type of option card (e.g. RS232/RS485 card, if it exists)
Opt4: RS232 / RS485
Serial Interface
Press <▼> to reach the End submenu.
Press < ↵ > to return to ***main menu 12 "Device data".***

4.2.14 Main menu 13 "Password"

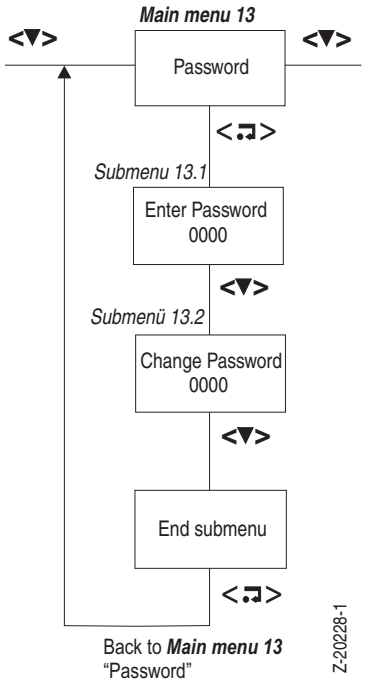

Fig. 4-9 Main menu 13 ***"Password"***

Main menu 13
Password
Entering or changing a password

Submenu 13.1
Password entry
0000 = enabled

Submenu 13.2
Here you can change the password.
4-digit password: XXXX

Press <▼> to reach the End submenu.
Press < ↵ > to return to ***main menu 13*** *"Password"*

The device can be protected with a password.

When the password protection is enabled, the device settings can be changed only upon entering the password.

When any changes are made, the password must be re-activated,
– either by entering the password again or
– by setting the "Password lock" parameter in **main menu 5 "Service"** accordingly**.**

5 Error messages

5.1 Process errors

Process errors, i.e. errors that have a direct impact on counting or computing, are indicated by the message "Error" flashing in the display. A plain text description of the error with date and time stamp can be called in the "Error messages" menu (see Section 4.2.4 “Main menu 3 "Error messages"” on page 22). The error messages depend on the application.

No.	Error message	Description
1	Tw out of range	The measured temperature Twarm is out of the configuredi temperature range.
2	Tc out of range	The measured temperature Tcold is out of the configured temperature range.
3	Tw sensor break	The measured temperature Twarm is out of the defined temperature range (0... 250 °C): Check for sensor break.
4	Tc sensor break	The measured temperature Tcold is out of the defined temperature range (0... 250 °C): Check for sensor break.
5	Tw < Tc	The measured temperature Twarm is lower than the measured temperature Tcold.
6	Flow sensor malfunction	The pulse or frequency input is out of the defined measuring range (0...11 kHz).
7	Flow out of range	The measured flow is out of the configured measuring range.
8	mA-Out < min. value	The value calculated for one of the mA outputs is below the configured minimum value.
9	mA-Out > max. value	The value calculated for one of the mA outputs is above the configured maximum value.

Fig. 5-1 Error message table for FCU200-W (SensyCal W), example

5.2 Device errors

Device error messages are binary-coded. They are indicated in the display as a 4-digit number.

0	0	0	0	No error
0	0	0	1	Parameter definition error, physical/electrical max. value < min. value
0	0	0	2	Parameter definition error, unit
0	0	0	4	Parameter definition error, display parameter
0	0	1	0	Flow sensor type error
0	0	2	0	Critical process error
0	1	0	0	Option card 1 error
0	2	0	0	Option card 2 error
0	4	0	0	Option card 3 error
0	8	0	0	Option card 4 error

If required, the individual error codes are added up, i.e if several errors occur at the same time, the codes are added up for every single digit.

Examples:

Display	0004	Error:	Parameter definition, display parameter
	0801		Option card 4 and parameter definition, physical/electrical max. value < min. value
	0534		Option cards 1 and 3 (1+4 added in the 3rd. digit), Flow sensor type error, critical process error and error of the display parameter definitions.

6 Retrofitting

DANGER
When opening covers or removing parts, energized parts may be exposed, except if this is possible without using a tool. Also, exposed connections may be live.

Prior to working on an open device, always disconnect the device from all power sources. Operations on the open device in which personnel may come into contact with energized parts may only be performed by experts trained in the maintenance of electrical equipment and who are fully aware of the risks involved.

Capacitors in the device may still be charged, even if the device is disconnected from all power sources.

Do not use any other fuses than those of the specified type and rated current to replace defective fuses. Do not "repair" nor use "repaired" fuses. Do not shorten the fuse holder.

If it must be assumed that safe operation is no longer ensured, the device must be put out of service immediately and must be secured against being accidentally put back to service.

It must be assumed that safe operation is no longer possible if the device
- **has visible damage**
- **does no longer work**
- **has been stored over a longer time under bad conditions**
- **has been exposed to harsh transport conditions.**

6.1 Retrofitting option modules

Notice
Safety instructions for devices with verification seal:
Prior to installing the option modules, break the verification seal.

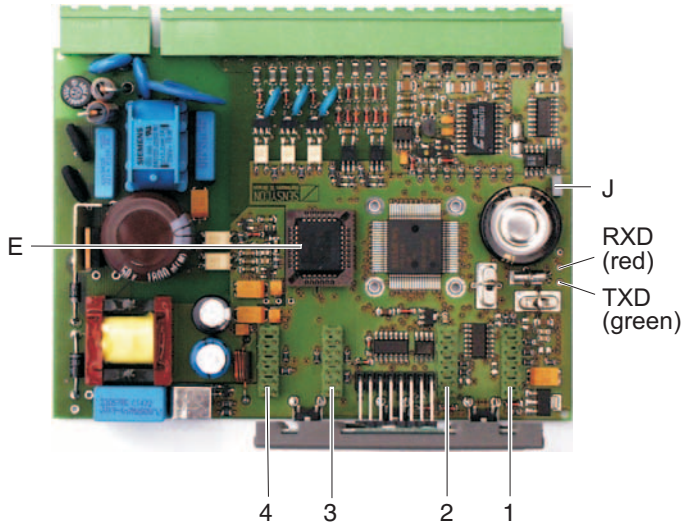

Fig. 6-1 Main board

1	Slot 1	E	Flash
2	Slot 2	J	Jumper
3	Slot 3	RXD,	
4	Slot 4	TXD	connections for RS 232/RS 385

Step	Action
1.	Dismount or disassemble the device (see Section 3 “Installing and commissioning” on page 8", Section 3.2 “Mounting” on page 9 and Section 3.3 “Electrical connection” on page 11).
2.	Remove the rear housing (if applicable) and the back panel.
3.	Remove the main board.
4.	Plug the option module onto the main board. Connect Module 1 (Fig. 6-2 on page 37) (current input board) to Connector 1. Connect Module 2 (Fig. 6-3 on page 37) (current output board) to Connector 2, 3 or 4 (depending on the application).
5.	Prepare the appropriate cutout in the back panel.
6.	Plug in the main board.
7.	Mount the back panel and the rear housing (if applicable).
8.	Mount and connect the device (see Section 3 “Installing and commissioning” on page 8", Section 3.2 “Mounting” on page 9 and Section 3.3 “Electrical connection” on page 11).

The two signal lines of the RS 232/RS 485 card (option board 105) must be soldered to the RXD and TXD connection points (see Fig. 6-1 on page 36) on the main board.

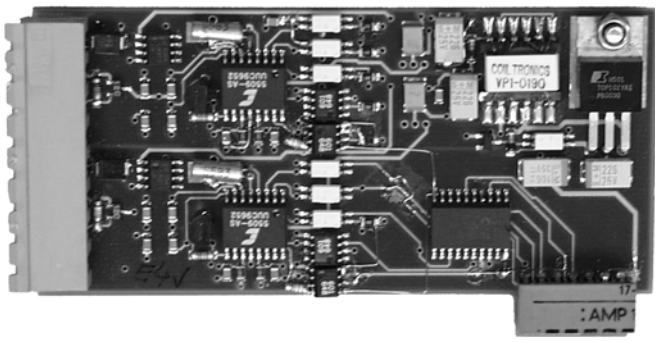

Fig. 6-2 Two 4...20 mA inputs and two transmitter power supplies

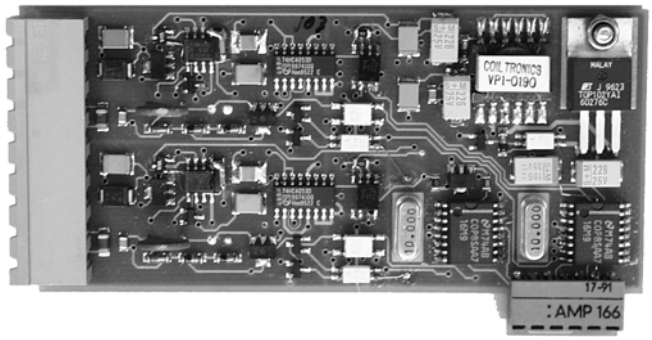

Fig. 6-3 Two 4...20 mA outputs and two binary inputs or outputs

6.2 Changing data relevant for verification

(See Fig. 6-1 on page 36)

Notice

Safety instruction for devices with verification seal (FCU200-W)
To be able to change data relevant for verification, the verification seal must be broken.

1. Dismount or disassemble the device (see Section 3 “Installing and commissioning” on page 8", Section 3.2 “Mounting” on page 9 and Section 3.3 “Electrical connection” on page 11).
2. Remove the rear housing (if applicable) and the back panel.
3. Remove the main board.
4. Set jumper J.
5. The data relevant for verification can now be changed.
6. Plug in the main board.
7. Mount the back panel and the rear housing (if applicable).
8. Mount and connect the device (see Section 3 “Installing and commissioning” on page 8", Section 3.2 “Mounting” on page 9 and Section 3.3 “Electrical connection” on page 11).

7 Maintenance

7.1 Safety instructions

DANGER
When opening covers or removing parts, energized parts may be exposed, except if this is possible without using a tool. Also, exposed connections may be live.

Prior to working on an open device, always disconnect the device from all power sources. Operations on the open device in which personnel may come into contact with energized parts may only be performed by experts trained in the maintenance of electrical equipment and who are fully aware of the risks involved.

Capacitors in the device may still be charged, even if the device is disconnected from all power sources.

Do not use any other fuses than those of the specified type and rated current to replace defective fuses. Do not "repair" nor use "repaired" fuses. Do not shorten the fuse holder.

If it must be assumed that safe operation is no longer ensured, the device must be put out of service immediately and must be secured against being accidentally put back to service.

It must be assumed that safe operation is no longer possible if the device
- **has visible damage**
- **does no longer work**
- **has been stored over a longer time under bad conditions**
- **has been exposed to harsh transport conditions**

7.2 Replacing fuses

Notice
Safety instruction for devices with verification seal (FCU200-W)
To be able to replace the fuse, the verification seal must be broken.

Fig. 7-1 Main board
S Fuse

Step	Action
1.	Dismount or disassemble the device (see Section 3 “Installing and commissioning” on page 8", Section 3.2 “Mounting” on page 9 and Section 3.3 “Electrical connection” on page 11).
2.	Remove the rear housing (if applicable) and the back panel.
3.	Remove the main board.
4.	Replace fuse S: 230 V 0.16 A 115 V 0.315 A 24 V 0.8 A
5.	Plug in the main board.
6.	Mount the back panel and the rear housing (if applicable).
7.	Mount and connect the device (see Section 3 “Installing and commissioning” on page 8", Section 3.2 “Mounting” on page 9 and Section 3.3 “Electrical connection” on page 11).

8 Application description

8.1 FCU200-W (SensyCal® W) – Caloric energy computer

The FCU200-W caloric energy computer is designed for determining industrial heat balances.
It is used for recording heat, cold or flow rates of liquid media, e.g. in the field of remote heating systems or for calibrated accounting for hot water systems.

The device is state of the art, meets all requirements of modern microelectronics and complies with the relevant current standards (DIN EN 1434-1...6 as of April 1997 and OIML75).

This measurement computer is used together with all marketable flow meters, e.g. orifices or ultrasound meters, MID vortex flow meters, etc. transmitting a pulse (also NAMUR), frequency or mA signal.
Precise temperature measurement is ensured by connecting 4-wire Pt 100 transmitters. Due to its modern microprocessor technology and the integrated data logger, FCU200-W provides for reliable, traceable recording of operating data.

Operating principle
The heat quantity is calculated from the volume or mass flow and the temperature of the warm (T_w) and cold (T_c) water at a given pressure, using the following formula:

$$q_m = q_V \times \rho(T,p)$$

$$P = q_m \times [h_w(T_w,p) - h_c(T_c,p)]$$

$$V = \int_0^t q_V \, dt$$

$$E = V \times \rho(T,p) \times [h_w(T_w,p) - h_c(T_c,p)]$$

E	Heat quantity
V	Volume
P	Power
q_V	Volume flow
q_m	Mass flow
ρ	Current operating density
h_w	Enthalpy in warm water flow
h_c	Enthalpy in cold water flow
T_w	Temperature of warm water
T_c	Temperature of cold water
p	Pressure

The temperatures T_w and T_c are measured with Pt100 resistance thermometers.

Measurement appropriate for verification, for accounting purposes
When a measuring circuit for accounting purposes is set up, all devices used in the circuit must have a PTB approval to meet the requirements of verification.

Caloric energy computer
FCU200-W (SensyCal® W)

Flow meter
Swirl meter, ultrasound flow meter, MID, Woltmann hydrometric vane, orifice

Temperature sensor
Pt 100, pair

Prior to starting the measurement, the setup can be tested and approved by the Weights and Measures Office in charge, if desired. For a rated power of more than 10 MW the measurement is not subject to verification or legal control, respectively.

8.2 FCU400-S (SensyCal S) – Steam computer

FCU400-S is a steam, flow and heat capacity computer for industrial volume flow, heat balance and accounting measurement.
It is designed as a flow computer and/or caloric energy computer for overheated or saturated steam, with or without condensate reflux .
This measurement computer is used together with all marketable flow meters, e.g. orifices or swirl meters, vortex flow meters or ultrasound meters etc. transmitting a pulse (also NAMUR), frequency or mA signal.

The split range procedure, flow coefficient, and expansion rate correction are possible with the standard program for orifice measurement.

Process signals from the transmitters listed below can be processed with the standard program:

- Flow meter in steam
- Pressure transmitter in steam
- Temperature sensor (Pt 100 or transmitter) in steam
- Flow meter in condensate
- Temperature sensor (Pt 100 or transmitter) in condensate

Up to 5 counters can be used in the standard program.

Operating principle
The mass flow is calculated from the volume flow rate and the density. For flow measurement following the differential pressure (ΔP) measuring principle, the mass flow is calculated by using the ratio of the operating density to the rated density for which the measurement has been calculated (design density) as a reference. The heat quantity is calculated from the mass flow and from the enthalpy (internal energy of steam or water).
The density and enthalpy of steam and water are a function of pressure and temperature, and the density and enthalpy of saturated steam are a function of pressure or temperature.

$$q_m = q_v \times \rho(T_s P_s)$$

$$P = q_m \times h_s(T_s, p_s)$$

$$E = \int_0^t P \, dt$$

The following formulas are valid for steam in the heat flow and for condensate in the return (cold) flow:

$P_{steam} = q_m \times h_s(T_s, p_s)$ $\quad$ $P_{condensate} = q_m \times h_c(T_c, p_c = \text{Const})$

$P_{balance} = P_{steam} - P_{condensate}$

E	Heat quantity	h_s	Enthalpy of steam
P	Power	h_c	Enthalpy of condensate
q_V	Volume flow	T_s	Temperature of steam
q_m	Mass flow	T_c	Temperature of condensate
ρ	Current operating density	p	Pressure

Measurement appropriate for verification, for accounting purposes
In Germany, accounting measurement for steam is not subject to legal control and verification. Upon special request, all devices required for measurement and accounting are available in a version appropriate for verification. In this case, a special verification through the German Weights and Measures Office is ordered.

8.3 FCU400-G (SensyCal G) – Gas flow computer, gas translator

FCU400-G is a gas flow computer and translator for industrial gas flow calculation and gas accounting measurement.
This measurement computer is used together wil all marketable flow meters, e.g. orifices or swirl meters, vortex flow meters or ultrasound meters etc. transmitting a pulse (also NAMUR), frequency or mA signal.

The split range procedure as well as compressibility factor, flow coefficient and expansion rate correction are provided in the standard program for flow measurement with orifices.

Process signals from the transmitters listed below can be processed with the standard program:

- Flow meter
- Pressure transmitter
- Temperature sensor (Pt 100 or transmitter)

The physical state correction or flow translation is calculated in accordance with EN ISO 5167-1 or VDI/VDO 2040.

Operating principle
The standard volume flow is calculated from the volume flow, the operating density, and the standard density. The operating density can be calculated from the operating pressure and temperature and from the standard density in the normal state. For flow measurement following the differential pressure (ΔP) measuring principle, the standard volume flow is calculated by using the ratio of the operating density to the rated density for which the measurement has been calculated (design density) as a reference

$$Q_n = Q_V \times \frac{\rho}{\rho_n}$$

$$\rho = \rho_n \times \frac{p}{p_n} \times \frac{T_n}{T} \times \frac{Z_n}{Z}$$

For differential pressure (ΔP) measurement:

$$Q_n = Q_{n,measured} \times \sqrt{(\rho / \rho_{,A})} \times \frac{C}{C_{,A}} \times \frac{\varepsilon}{\varepsilon_{,A}}$$

$$\rho = f(p, T, Z)$$

Q_n	Standard volume flow
Q_v	Operating volume flow
ρ	Operating density
ρ_n	Standard density
T	Temperature
p	Pressure
Z	Compressibility factor
C	Flow coefficient
ε	Expansion rate
p_n	Standard pressure (1.01325 bar)
T_n	Standard temperature (273.15 K)
Z_n	Flow coefficient at standard temperature and pressure
,A	Orifice design values

8.4 FCU200-T (SensyCal T) – Curent/pulse converter

FCU200-T is a two-channel

energy, mass flow and volume counter,
current-pulse converter
pulse/frequency-current converter

Operating principle
The device is designed to convert either a direct current to a proportional pulse frequency or a proportional pulse frequency to a direct current.

The following process signals can be processed with the standard program:

- 2 active mA signals or
  2 active pulse/frequency signals
- 2 pulse output signals
- signals via M-BUS interface

A mA output card, a power supply card, and an RS 485/RS 232 card are optionally available.

8.5 FCU400-P (SensyCal P) – Signal combination

The device is used for signal combination, high-precision ΔT measurement, summation, etc.

Operating principle
(e.g. high-precision ΔT measurement)

Exact, high-precision differential temperature measurement is the basis for heat balances used for further process optimization.
The FCU400-P system consists of an FCU400-P measurement computer and 2 high-quality, high-precision paired Pt 100 sensors. With this system a deviation of less than 100 mK is ensured, even in the lower part of the measuring range (ΔT = 1...5 K). If required, the system can be calibrated and certified in our in-house DKD calibration lab.

Inputs
2 x Pt 100, 4-wire

Output
M-BUS

Options
Analog outputs and RS 485/RS 232 card for
MODBUS protocol

Please contact us for information about other applications (e.g. summation) and technical details of the devices.

9 Configuration and communication program

9.1 Configuration program

The standard PC configuration software FCOM200 for the measurement computers used for configuring the standard applications can be installed and run on all usual commercial PCs.

The PC configuration software FCOM200 for special applications is designed for configuring customer-specific applications.
It can be installed and run on all usual commercial PCs.

The link between the PC/laptop and the measurement computer can be established in two different ways (see Fig. 9-1 on page 43):

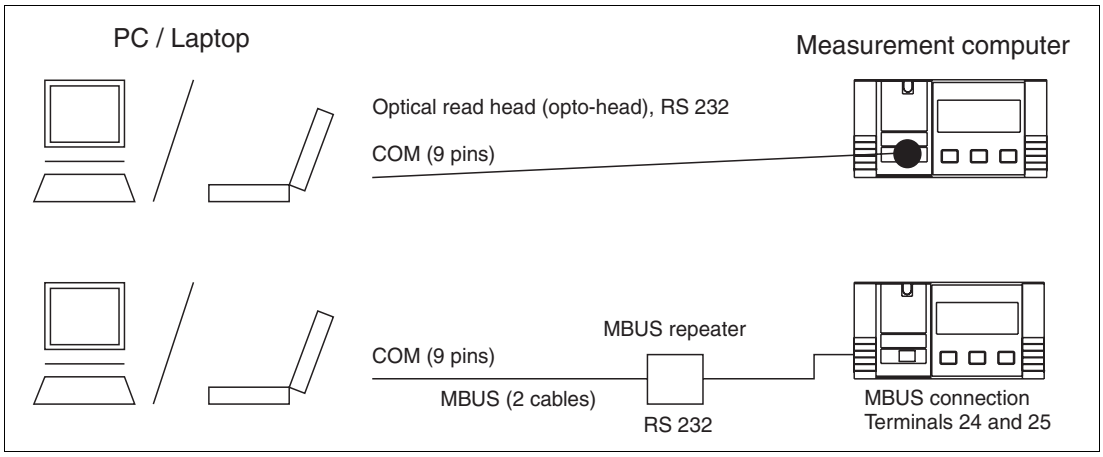

Fig. 9-1 Possible links between a PC/laptop and the measurement computer
Top Optical read head (opto-head), RS 232
Bottom M-Bus repeater, RS 232

Useful hint for communication
The following PC and device settings must fully match to enable proper communication:

Bus address		
Baud rate		
Interface		
Interface:	with opto-head	opto-head/automatically
	with M-Bus repeater	M-Bus repeater

Infrared printer
Measurement computer data can be printed on the portable infrared printer type "HP82240B Infrared Printer" that connects to the infrared interface. The printer can be ordered under catalog number 7962882 (see price list 70/18.2 EN).

10 Technical data

Measurement computer – Operating principle and system design

The measurement computer consists of a basic unit with four slots for the extension modules.

The basic unit includes:
- Power supply unit
- Graphic display with background light
- Processing electronics
- 2 analog 4-wire temperature inputs (Pt 100 with constant current source)
- 2 digital inputs, electrically isolated, for pulse or frequency, which can also be used as digital inputs for control purposes.
- 3 digital outputs (electrically isolated) for pulse output and error signalling
- M-BUS interface
- Optical interface on the front panel, which can be operated in accordance with the IRDA or ZVEI standard, as required.

The four slots are designed for plugging in the extension modules. The following module combinations are possible:

- Current input module with transmitter supply
- Current output module with alarm signalling units
- RS 485/RS 232 module for MODBUS communication
- Power supply card for 2-wire transmitter supply.

Input

2 x temperature inputs

2 x Pt 100 IEC

Measuring range
-200...850 °C; 20-bit resolution ≅ 0.0012 K

2 digital inputs EB1, EB2

Electrically isolated, 24 V, passive (optocoupler)
configurable (in acc. with DIN 19240) as

Pulse input	0.001 s^{-1}...3000 s^{-1}
Frequency input	0.001 Hz...10 kHz
Logical signal input	Hi / Low

Output

3 digital outputs, AB1, AB2 and Err

Open collector, passive

Electrically isolated through optocoupler

External power supply	VDE 2188 Category 2
Max. load	24 V (± 25 %), < 100 mA
Max. separation voltage	500 V (peak-peak)

R_i in conducting state < 20 Ω

AB1: Pulse output
AB2: Pulse output
Err: Error output

Interfaces

Communication using the M-bus protocol
acc. to EN 1434-3, IEC 870-5

Optical interface on the front panel
Operating mode configurable
- Opto-head (ZVEI) standard IEC EN 61107
300... 2400 (9600) bauds

Interface on the terminal strip

2-wire M-Bus interface	300...38400 bauds
RS 232/Rs 485	300...38400 bauds

Configuration of device via configuration software (M-Bus).
Reading of data (operating variables, data logger, etc.) via the M-Bus or MODBUS.

Extension modules

101
2 current inputs EX1, EX2
0/4...20 mA, R_E = 50 Ω; 16-bit resolution ≈ 0.3 µA
Max. permissible input current ± 40 mA
Electrical isolation

+ 2 transmitter power supplies U_{s1}, U_{s2}
Each 16 V, 25 mA, short-circuit-proof
Electrical isolation

107
4 voltage inputs EX1, EX2, EX3, EX4
0...2500 mV, R_E > 1MΩ; 16-bit resolution
Max. permissible input voltage + 5 V

108
4 current inputs EX1, EX2, EX3, EX4
0/4...20 mA, R_E = 50 Ω; 16-bit resolution ≈ 0.3 µA
Max. permissible input current ± 40 mA

102
2 analog outputs AX1, AX2

Signal range	0/4...20 mA
Load	max. 500 Ω

Open permitted, short-circuit-proof

+ 2 alarm signalling outputs, ABX1, ABX6
Open collector, passive
Electrically isolated via optocoupler

External power supply	VDE 2188 Category 2
Max. load	24 V (+25 %), < 100 mA
Max. separation voltage	500 V (peak-peak)

105
RS 485/RS 232 card
For Modbus communication

106
+ 2 transmitter power supplies U_{s1}, U_{s2}
Each 20 V, 25 mA, short-circuit-proof
Electrical isolation

Performance characteristics

Temperature inputs

Deviation
Temperature
0.3 % of upper range value

Error limits for ΔT:

3...20 K	< 1.0 % of measured value
20...250 K	< 0.5 % of measured value

Current inputs

Influence of ambient temperature	< 0.01 %/K
Calibration error	< 0.2 % of final value
Max. linearity error	< 0.005 % FSR

Accuracy class of calculating unit
EN 1434-1/OIML 75 Class 2

Mechanical construction

Design/dimensions

DIN rail mounting and wall mounting

Dimensions	144 mm x 72 mm x 183 mm
Weight	approx. 0.7 kg
Material	polycarbonate

Panel mounting

Dimensions	144 mm x 72 mm x 117 mm
Weight	approx. 0.5 kg
Material	polycarbonate
Panel cutout	139 mm x 69 mm

Human interface

Display

Graphic display
120 x 32 pixels, multi-line, background light

Data logger and key date recording

Tow key dates for storage of all counts
Settable date and time

Data logger
Storage e.g. of 14 operating variables over 200 periods.
The number of variables and periods may vary, depending on the application

Error messages and error output

Recognition of internal errors through regular self-diagnostic.

Display
Critical device errors, e.g. memory failure
Process errors with date and time
Last 10 power failures, last 10 counter stoppages

Storage of up to 10 process errors
Plain text display with time stamp

Error output
Open collector, passive (s. output) display

Power specifications

Power supply
230 V AC; 115 V AC; 24 V AC/DC

Power consumption

24 V	1...10 VA depending on extension
115 V	2...10 VA depending on extension
230 V	3...10 VA depending on extension

DC voltage
24 V ± 20 %

AC voltage 24, 110, 230 V
-15...+10 %, 48...62 Hz

Certificates and approvals

The measurement computer has the following certificates:
VDE certificate (electric safety)
PTB certificate for systems subject to legal control
to EN 1434, Supplement 22 (FCCU200-W SensyCal® W)
CSA-NRTL-C certificate
GOST certificate

11 Packaging for transport or return to manufacturer

If the original packaging material is no longer available, wrap the device in a padded plastic film or corrugated paper board and place it in a box of sufficient size lined with a shock-absorbing material (e.g. cellular material). The thickness of this material should be in accordance with the device weight and the type of shipment. Attach a "Handle with care" label to the box.

For overseas shipping, add a desiccant bag (e.g. with silica gel) and then weld it in a 0.2 mm polyethylene foil. The required amount of desiccant depends on the packing volume and the approximate transportation time (at least 3 months should be assumed). Additionally line the box with a layer of union paper.

ABB has Sales & Customer Support
expertise in over 100 countries worldwide.

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

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