Data Sheet 10/18-5.22-EN Rev. F

SensyCal FCU200, SensyCal FCU400
Universal Measuring Computer

Multifunctional
Precise
Compact

- Data logger and billing date recording functions
- Electrically isolated inputs and outputs
- Up to 8 active current outputs
- Up to 8 current inputs with transmitter supply
- Up to 12 voltage / current inputs without power supply
- Pulse and frequency inputs
- M-Bus, MODBUS and infrared communication
- Calibratable measurement, for flow, energy accounting and billing
- For liquids, steam, gas and compressed air
- Volume flow, mass flow or energy counter
- High-precision differential temperature measurement (for chemical processes, brine measurement, temperature monitoring)
- Mathematical combination and conversion of all I/O signals and calculating results to M-BUS, MODBUS, PROFIBUS (through converters)
- Universal device for field or control room
- PTB certificate (calibratable), international approvals

Power and productivity
for a better world™

Application

The FCU is a universal measurement computer designed for industrial process signal monitoring and logging. FCU combines modern communication technology with sound know-how gained through years of field metrology experience. A high-resolution multi-line graphic display indicates all physical and electrical process variables, and device data, logged data and key dates.

- FCU200-W – Caloric energy computer for water and brine
- FCU400-S – Computer for superheated and saturated steam – (flow, heat)
- FCU400-G – Computer for gas flow, gas translater
- FCU200-T – Current to pulse converter
- FCU400-P – Signal combination, e.g. high-percision ΔT measurement, summation, etc.
- FCU400-IR – Contactless temperature monitoring

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

The FCU200-W 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 FCU200-W is a state of the art device meeting the requirements of modern microtechnology and complying with the relevant current standards (DIN EN 14341...6 as of April 1997 and OIML75). The FCU200-W can be used with all marketable flow meters, e.g. ultrasound meters, swirlmeters, vortex flowmeters, orifices, etc., transmitting a pulse (also NAMUR), frequency or mA signal. Precise temperature measurement is ensured by connecting 4-wire Pt100 temperature transmitters to the caloric energy computer. Due to its modern microprocessor technology and the integral data logger, it provides for reliable, traceable recording of operating data.

Operating principle

The heat quantity is calculated from the flow and the temperature of the warm (Tw) and cold water (Tc) 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 warm water
T_c Temperature cold water
p Pressure

The temperatures Tw and Tc are measured with the Pt100 resistance thermometer.

Calibrated measurement for accounting puposes

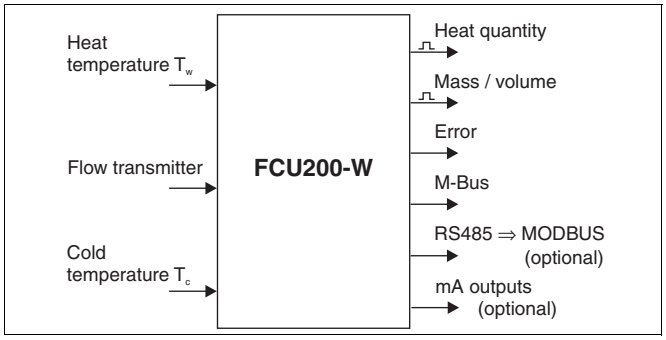
All devices in the circuit must be approved by the PTB to meet the requirements of calibrated measurement.

Caloric energy computer
FCU200-W (SensyCal® W)

Flowmeter
Magnetic, ultrasonic, vortex & swirlmeter, Woltmann hydrometric vane, orifice

Temperature sensor
Pt100, pair

Prior to starting the measurement, the setup can be tested and approved by the Verification Office in charge, if desired. For a rated power of 10 MW and higher the measurement is not subject to legal control.



Billing date recording

Two billing dates for storing all counter readings
Configurable date and time

Data logger

Storage, e. g. of 20 operating variables over 128 time periods:
All counters

Power	instantaneous value,
Flow	min. and max. value over a
Temperature, warm	configured time, average value
Temperature, cold	
Differential temperature	

Counter, storage

Energy counter stops in case of
No flow at all
Pt100 temperature sensor brack or short-circuit in the warm or cold circuit
Temperature of warm flow is less than that in cold flow
Storage of counter readings in case of power failure.

Pulse output

FCU200-W has 2 pulse outputs

Device configuration

FCU200-W can be configured by using the FCOM200 communication program. The configuration can be made in factory or on site through the customer. For factory configuration please fill in the questionnaire attached to this data sheet. When ordering the standard configuration, a default file is downloaded into the device.

Description FCU400-S (SensyCal® S) – computer for steam

FCU400-S is steam computer that can be used to determine thermal output of boiler systems and branch lines by calculating mass flow and thermal balance and for fiscal metering purposes. It is designed for superheated or saturated steam with or without condensate return, as flow computer and / or caloric energy computer.
FCU400-S is used together with all marketable flow meters, e.g. vortex & swirlmeters, wedge flow meters, variable area, DP, etc. transmitting a pulse, frequency or mA signal.

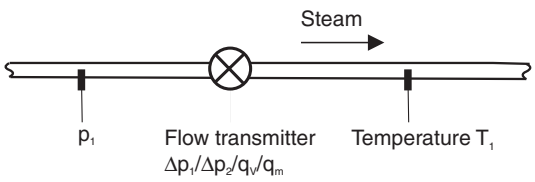
Split range application, flow rate correction, and expansion rate correction are possible with orifice flowmeters.

The following process signals can be connected in the standard program:

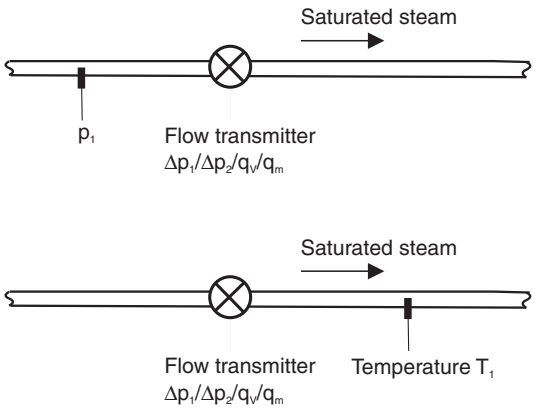
- Flow transmitter in steam
- Pressure transmitter in steam
- Temperature sensor (Pt100 or transmitter) in steam
- Flow transmitter in condensate
- Temperature sensor (Pt100 or transmitter) in condensate

The standard program range includes 5 counters and can be used in the following applications.

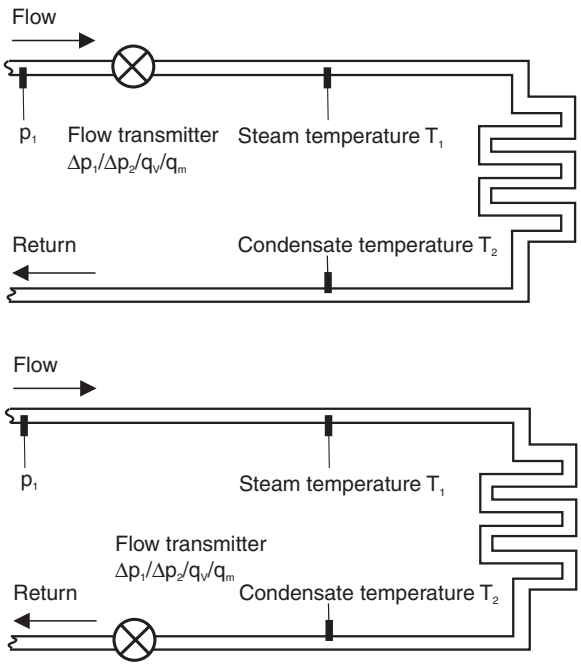
Flow: rate / caloric energy calculation for steam



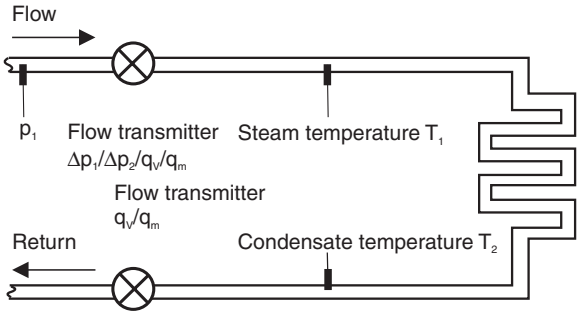
Flow: rate / caloric energy calculation for saturated steam



Heat: steam / saturated steam; return: condensate



Open systems



The density and enthalpy of steam and water are calculated in accordance with the latest industrial standard IAPWS-IF 97.

Precise temperature measurement is ensured by connecting 4-wire Pt100 temperature transmitters to the caloric energy computer. Due to its modern microprocessor technology and the integral data logger, it provides for reliable, traceable recording of operating data.

Operating principle

The mass flow is calculated from the volumetric flow rate and the density. For DP measurement the rated density is used as a reference for correcting the mass flow. 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 or water are a function of pressure and temperature, and the density and enthalpy of saturated steam are a function of pressure or temperature.

$$q_m = q_v \times \rho(T_d, p_d)$$

$$P = q_m \times h_d(T_d, p_d)$$

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

With steam in flow and condensate in return

$$P_{Steam} = q_m \times h_d(T_d, p_d) \qquad P_{Condensate} = q_m \times h_c(T_c, p_c = \text{Const})$$

$$P_{Balance} = P_{Steam} - P_{Condensate}$$

E	Heat quantity
P	Power
q_V	Volume flow
q_m	Mass flow
ρ	Current operating density
h_d	Enthalpy of steam
h_c	Enthalpy of condensate
T_d	Steam temperature
T_c	Condensate temperature
p	Pressure

Calibrate measurement for accounting

In some countries, steam measurement is not subject to legal control. Upon special request all devices required for measurement and accounting are available as calibratable units. In this case a special calibration through the German Verification Office is ordered.

Billing date recording

Two billing dates for storing up to 5 counters
Configurable date and time

Data logger

Storage of up to 27 operating variables over 128 time periods:

5 counters	E1 Steam energy
	M1 Steam mass
	ΔE Energy balance (steam-condensate)
	E2 Energy condensate
	M2 Mass condensate

Instantaneous values of all operating variables
Determination of min. and max. values (over a configured time and average value for 4 process variables (configurable).

Counters, storage

Energy counter stands still at:
No flow at all

Storage of counter readings in case of power failure

Pulse outputs

FCU400-S has 2 pulse outputs

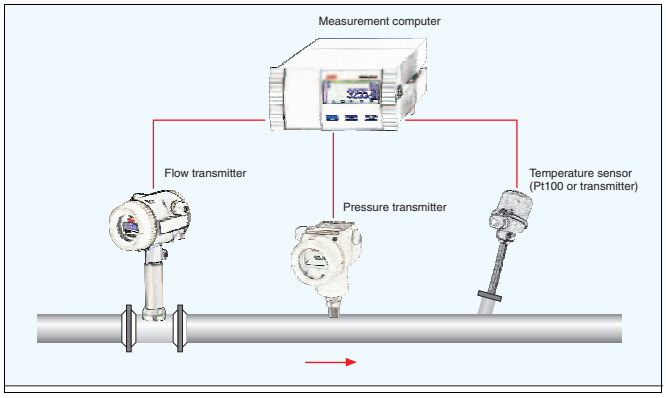
Device configuration

FCU400-S can be configured by using the FCOM200 communication program. The configuration can be made in factory or on site through the customer. For factory configuration please fill in the questionnaire attached to this data sheet. When ordering the standard configuration, a default file is downloaded into the device.

Description 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.
The measurement computer FC U400-G is used with all marketable flow meters, e.g. orifices, swirl meters, vortex flow meters, ultrasound meters, etc.,transmitting a pulse, frequency or mA signal. The split range procedure as well as compressibility factor, flow coefficient and expansion rate correction are possible with the standard program for orifice measurement.
The following process signals can be connected in the standard program:

- Flow transmitter
- Pressure transmitter
- Temperature sensor (Pt100 or transmitter)



The physical state correction or flow translation is corrected in accordance with EN ISO 5167-1 bzw. 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 DP measurement the standard volume flow is corrected by using the ratio of the operating density to the 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 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 Standarcd 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 value

Billing date recording

Two billing dates for storing the counter readings
Configurable date and time

Data logger

Storage up to 19 operating variables over 200 periods:
1 counter
Instantaneous values of all operating variables
Determination of min. and max. values (over a configured time) and average values for 4 process variables (configurable)

Counters, storage

Counter stands still at:
No flow at all

Storage of counter readings in case of power failure

Pulse output

FCU400-G has 2 pulse outputs

Device configuration

FCU400-G can be configured by using the FCOM200 communication program. The configuration can be made in factory or on site through the customer. For factory configuration please fill in the questionnaire attached to this data sheet. When ordering the standard configuration, a default file is downloaded into the device.

Description FCU200-T (SensyCal® T) – Current-to-pulse converter

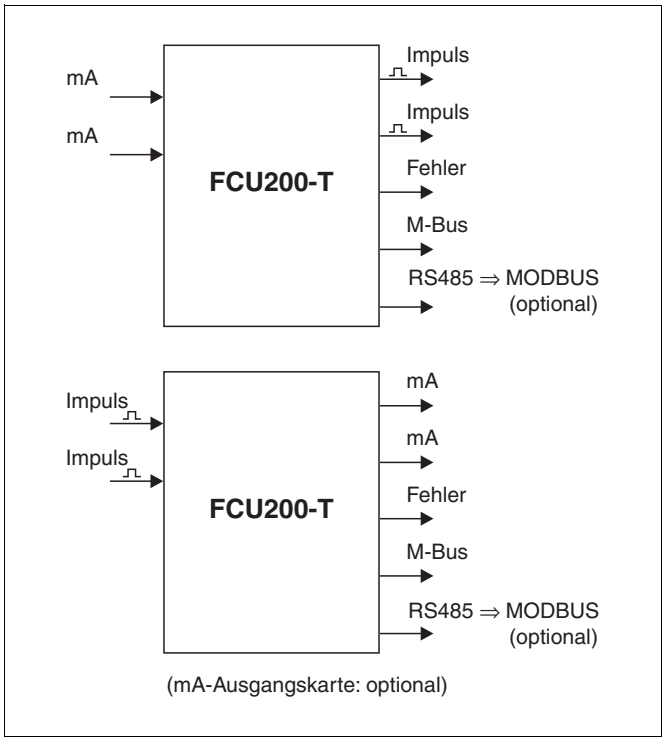
FCU200-T is a two-channel
energy, mass flow and volume counter,
current-to-pulse converter
pulse-to-current converter

Operating principle
The device is designed to convert either direct current to a proportional pulse frequency or a proportional pulse frequency to a direct current.
The following process signals can be connected in the standard program:

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

Optional cards are available for mA output, power supply, and RS485 / RS232.

The following applications can be realized in the standard program:

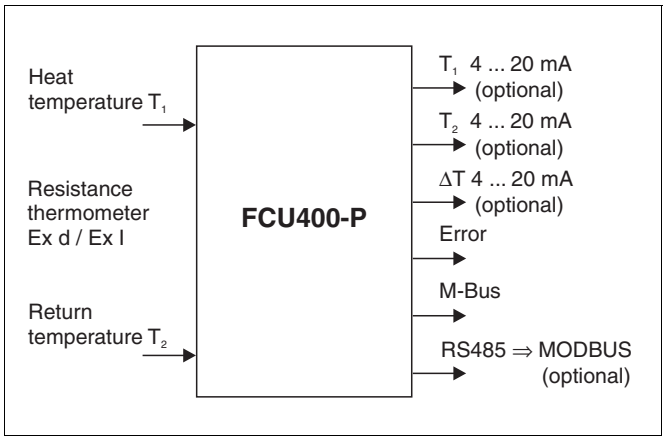


Device configuration
FCU200-T can be configured by using the FCOM200 communication program. The configuration can be made in factory or on site through the customer. For factory configuration please fill in the questionnaire attached to this data sheet. When ordering the standard configuration, a default file is downloaded into the device.

Pulse output
FCU200-T has 2 pulse outputs

Description FCU400-P (SensyCal® P) – Signal combination, e.g. high-precision ΔT measurement, summation, etc.

High-precision differential temperature measurement is the basis for heat balances used for further process optimization.
The FCU400-P system consists of a Sensycal computer and two high-quality, high-precision paired Pt100 sensors.
With this system a deviation of less than 100 mK is allowed, even in the lower part of the measuring range (?T = 1 ... 5 K). If required, the system can be calibrated and certified in our in-house DKD calibration lab.



Inputs
2 x Pt100, 4-wire
Output
M-BUS
Options
Analog outputs and RS485 / RS232 card for MODBUS protocol

Further applications (e.g. summation) and technical details for FCU400-P on request.

Billing date recording
Two billing dates for storing the counter readings
Configurable date and time

Data logger
1 or 2 counters
Storage the operating variables over 200 periods:
Instantaneous values
Determination of min. and max. values (over a configured time) and average values

Storage
Storage of counter readings in case of power failure

Pulse outputs
FCU400-P has 2 pulse outputs

Description FCU400-IR (SensyCal® IR) – Contactless temperature monitoring

FCU400-IR iis a complete system for contactless temperature monitoring of contact points and power switches in MV switchgear. The contact resistance at the contact points between the conductor rails and power switches may increase due to loose screws or corrosion. As a result, power will be converted to heat (power dissipation), and the system may be damaged.

Product features

- Continuous temperature monitoring of live parts
- Monitoring of up to 12 hot spots in a switchgear with only one system
- Freely configurable values for warning and emergency limits
- Analog output for max. temperature value (Option)
- MODBUS output (Option)
- No PVC cables used
- All parts completely shielded against EMI / RFI
- Possible connection of a Pt100 temperature sensor for measuring the ambient temperature
- M-Bus and optical interfaces (IRDA, ZVEI) for data output and configuration
- All relevant parameters locally indicated on a multi-line graphic display
- Indication of all measuring points and maximum temperature values with tag numbers
- Data logger function with real-time clock for all temperature and limit values
- Error is recorded with current date and time when configured limit value is exceeded
- Compact design allows easy retrofitting

User benefits

- Lower cost
  - Eliminate need for manually survey contact points
  - No measuring system maintenance
- Higher plant reliability
  - Prevention of incidents due to rapid online recognition of hot spots and disconnection of the switchgear from power
  - No contact between measuring system and live parts

The system consists of the following basic components

- Infrared pyrometers for hot-spot monitoring in the conductor rail compartment
- Optional Pt100 resistance thermometers for ambient temperature measurement in the conductor rail compartment
- Measurement computer for signal processing, evaluation and indication in the secondary compartment

Technical data

Inputs
max. 12 pyrometers
1 x Pt100 resistancs thermometers, range 0 … 200 °C

Outputs
3 digital outputs, pre-alarm, Alarm and device error
1 MODBUS output (Option) or alternative
1 analog output (Option)
4 … 20 mA signal for highest pyrometer temperature

Optical resolution Sensor
10:1

Cable length between sensor and computer
Standard: 10 m

Response time of the entire system
< 1 second

Reproducibility of temperature measurement
± 0,75 % or ± 0,75 °C of rate (the larger value applies)

Degree of protection
IP 40

Power supply
24 V DC ± 5 %

Max. power
10 VA

Max. ambient temperature

Caloric energy computer:	55 °C
Pyrometer:	70 °C

For technical details about FCU400-IR on request.

Technical data

FCU – Operating principle and system design

The caloric energy computer consists of a basic unit with 4 slots for extension modules.
The basic unit includes:

- Power supply unit
- Graphic display with background light
- Electronics
- 2 analog 4-wire temperature inputs (Pt100) 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 the ZVEI standard, as required
-
- The four slots are designed for plugging in the optional extension modules. The following module combinations are possible:
- Current input module with transmitter supply
- Current output module with alarm signalling units
- RS485 / RS232 module for MODBUS communication
- Power supply card for 2-wire transmitter supply

Input

2 × temperature inputs

2 x Pt100 IEC

Measuring range

-200 ... 850 °C; 20-bit resolution ≅ 0,0012 K

2 digital inputs EB1, EB2

Electrical isolated, 24 V, passive (optocoupler), configurable acc. to DIN 19240 as

Pulse	0,001 s^{-1} ... 3000 s^{-1}
Frequency	0,001 Hz ... 10 kHz
Logical signal input	Hi / Low

Output

3 digital outputs AB1, AB2 and Err

Open collector, passive

Electrical isolation 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

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) Baud

Interface on the terminal strip

– 2-wire M-Bus interface	300 ... 38400 Baud
– RS232 / RS485	300 ... 38400 Baud

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 > 1 MΩ; 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
RS485 / RS232 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

Measuring error

Temperature
0.3 % of upper range value

Errors 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 calculation unit

EN 1434-1 / OIML 75 Class 2

Operating conditions Environmental conditions

Ambient temperature

-5 ... 55 °C

Storage temperature

- 25 ... 70 °C

Climate class

Ambient temperature class C to EN 1434-1

Relative humidity

Tested in accordance with EN 1434-4, IEC 62-2-30

Condensation

permitted

Degree of protection

IP 65 (FCU400-IR IP 40)

Shock resistance in operation (at 20 °C) to IEC 68-2-6 or 68-2-27

Vibration	2 g / 10 ... 150 Hz
Shock	30 g / 11 ms / 3 Shocks

Electromagnetic compatibility (EMC)

EMI / RFI shielding to EN 50082-2 (EN 6100-4-2, -3, -4, -5,6)
Additionally to EN 1434-4 (Class C)
RFI supression to EN 50081-2 (EN 55011 Class A)

Test type	Standard	Level	Influence
Surge to AC supply com diff.	EN 61000-4-5	 2 kV 1 kV	 none none
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	erfüllt
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	

Mechanical construction

Design / dimensions

DIN rail mounting and wall mounting

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

Panel mounting

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

Human interface

Display

Grafic display

120 x 32 pixel, multi-line, background light

Data logger and billing date recording

Two billing dates for storage of all counter readings

Configurable date and time

Data logger

Storage of operatig variables over 128 periods or 200 periods
The number of variables and periods may vary, depending on the application

Error messages and error output

Recognition of internal errors through regularself-diagnostic.

Display

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

Storage up to 10 process errors

Plain display with time stamp

Error output

open collector, passive (see output) display

Power supply

DC voltage

24 V DC ± 20 % (FCU400-IR ± 5 %)

AC voltage (not for FCU400-IR)

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

Power consumption

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

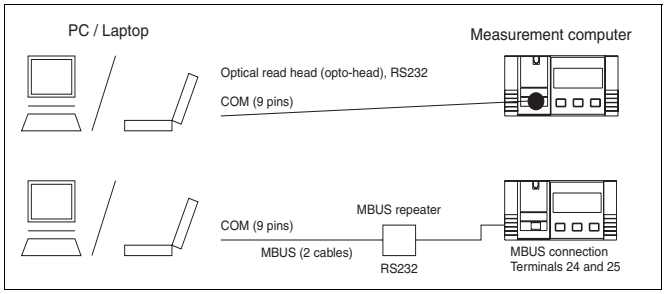
Certificates and approvals

The measurement computer has the following certificates:
VDE certificate (electrical safety)
PTB certificate for systems subject to legal control
to EN 1434, Supplement 22 (FCU200-W - SensyCal® W)
CSA-NRTL-C certificate
GOST certificate

Configuration software

The PC configuration software FCOM200 for flow measurement computers is used for configuring the standard applications.
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 .



Useful hint for communication:
The following PC and device settings must fully match to enable proper communication:
Bus address, baudrate, interface.

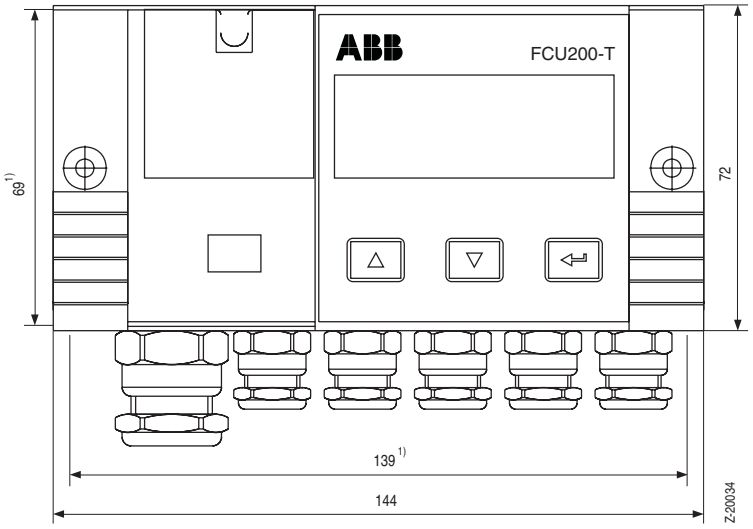
Interface:	for opto-head	opto-head / automatically
	for the M-Bus repeater	M-Bus repeater

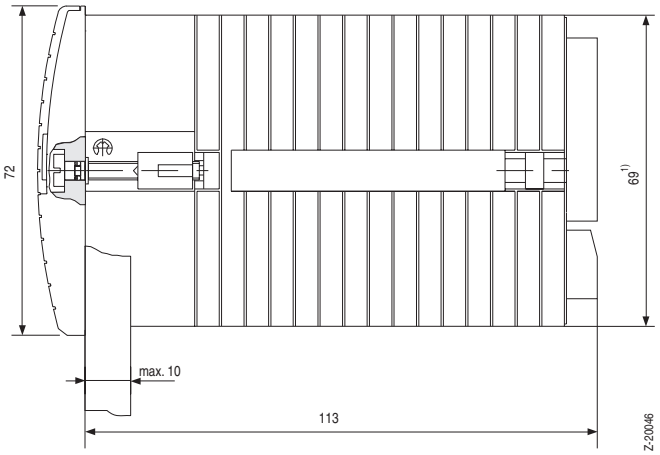
Infrared printer

Measurement computer data can be printed on the portable infrared printer type „HP82240B Infrared Printer“ that connects to the infrared interface.

Dimensional drawing (dimensions in mm)

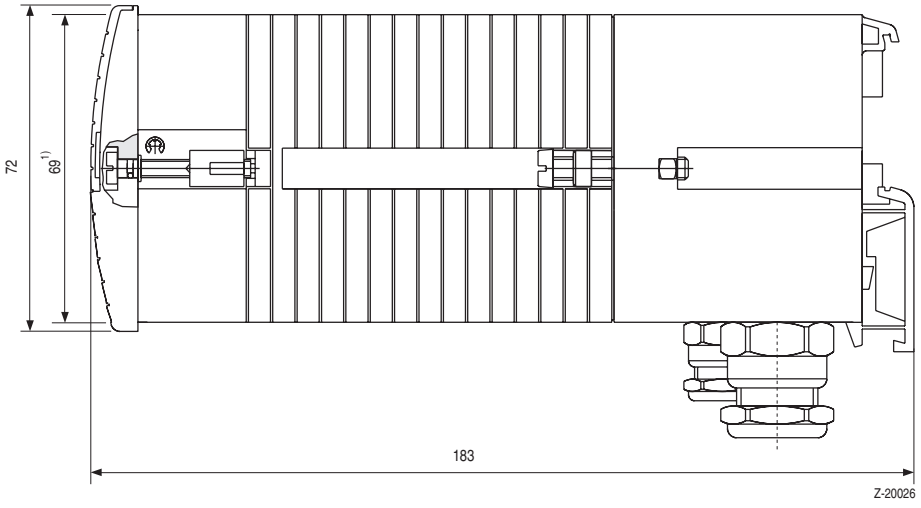
Panel mounting





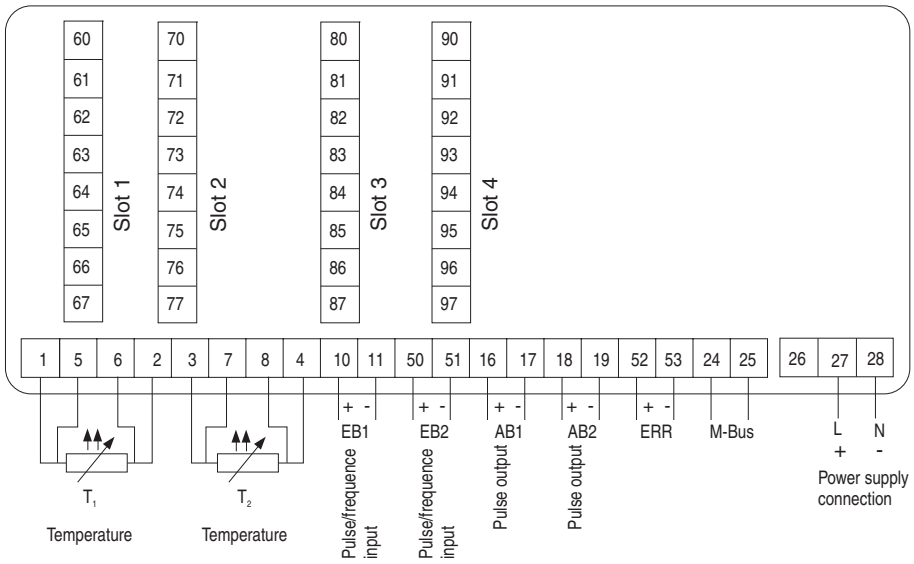
1) Panel cutout

Wall mounting (on 35 mm top hat rail)



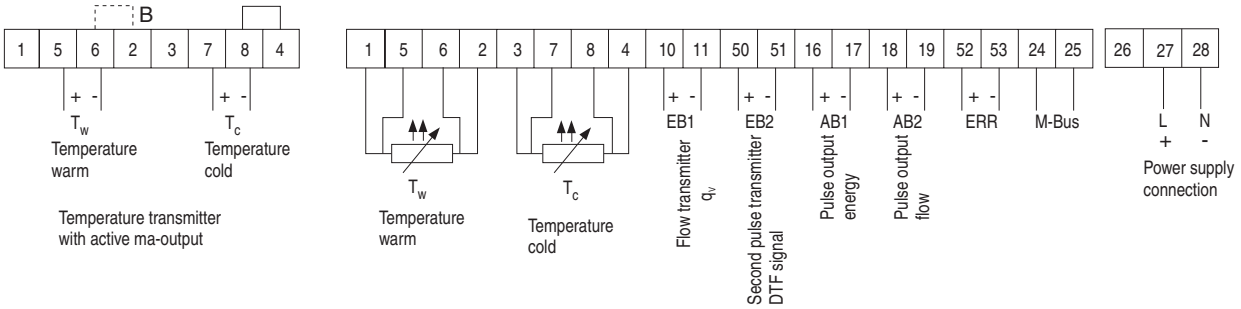
Connecting diagrams

Signal terminal assignment, basic device



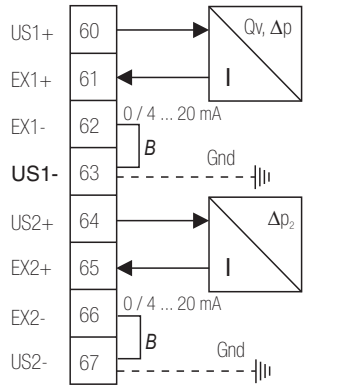
Terminal assigment of FCU200-W

Signal terminal assignment, basic device FCU200-W

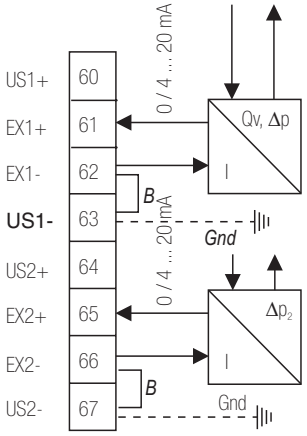


Notice
If the temperature transmitters are electrically connected, jumper B (between terminals 6 and 2) is not required.

Current input module
(Flow transmitter, differential pressure transmitter)

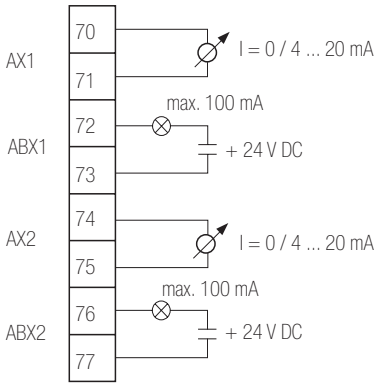


2-wire transmitter
Power supply 16 V, 23 mA

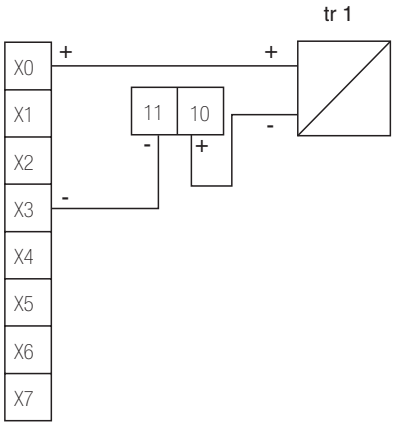


4-wire transmitter
External power supply

Current output module



Supply of pulse / frequency input

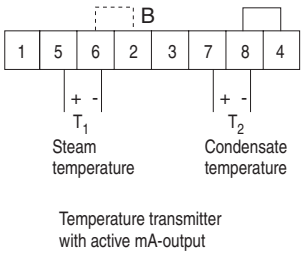


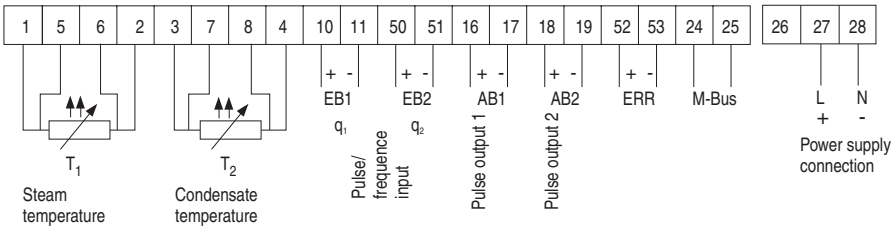
Transmitter with pulse / frequence output

X	7, 8 or 9 depending on slot (see rating plate)
B	external jumper
GND	optional grounding on potential equalization rail

Terminal assignment of FCU400-S, FCU400-G

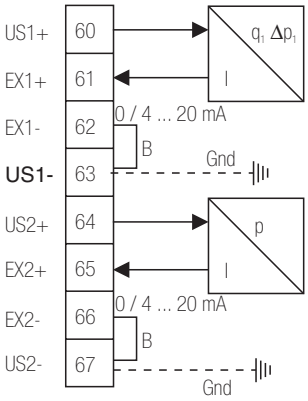
Signal terminal assignment, basic device FCU400-S



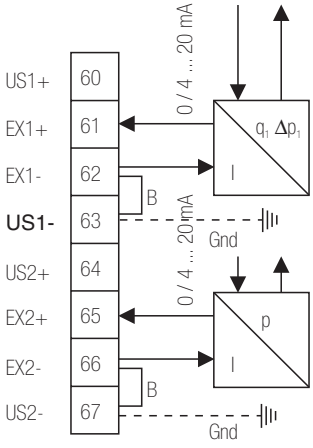


Notice
If the temperature transmitters are electrically connected, jumper B (between terminals 6 and 2) is not required.

Current input module (Pressure and flow transmitter)

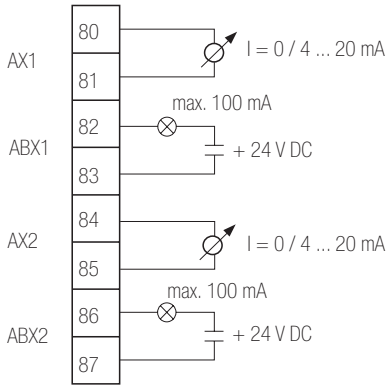


2-wire transmitter

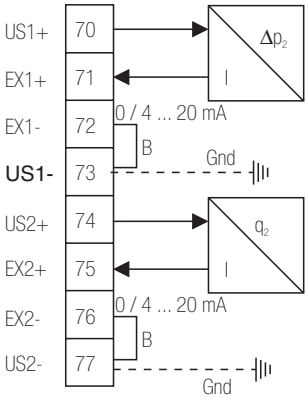


4-wire transmitter

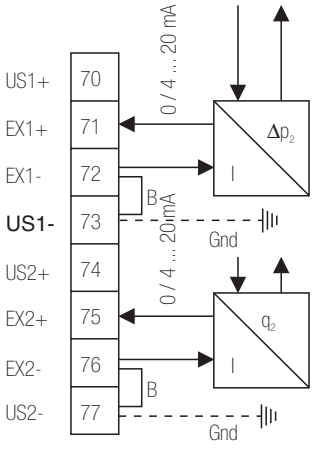
Current output module



Current input module (Δp_2, condensate flow)



2-wire transmitter

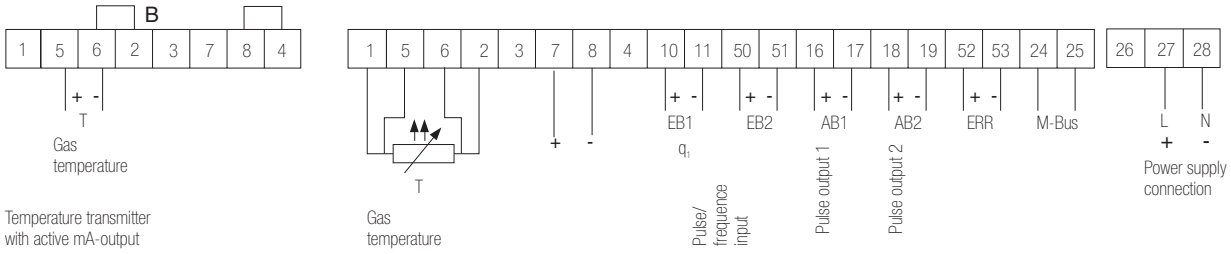


4-wire transmitter

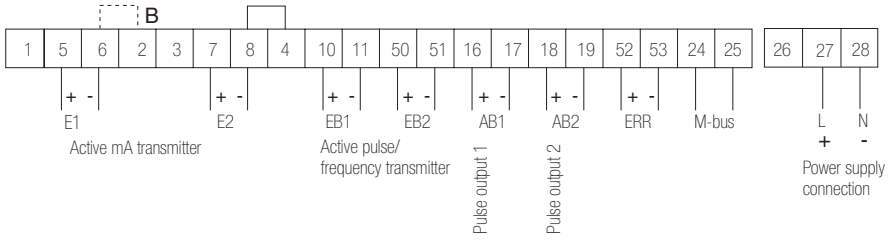
B external jumper
GND optional grounding on potential equalization rail

Terminal assignment of FCU400-G, FCU200-T

Signal terminal assignment, basic device FCU400-G



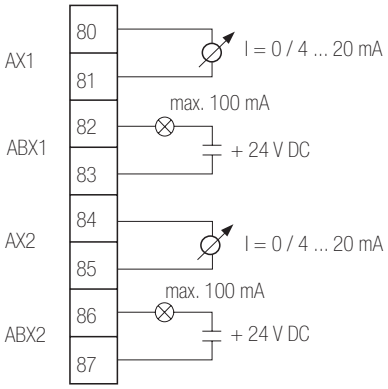
Signal terminal assignment, basic device FCU200-T



B external jumper

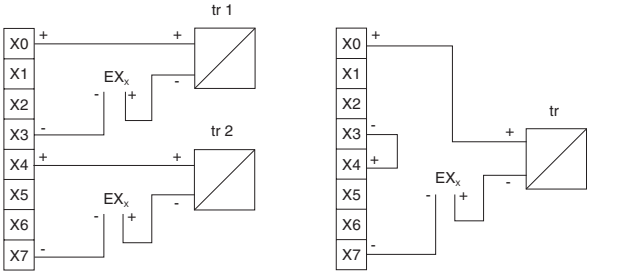
Notice
If the temperature transmitters are electrically connected, jumper B (between terminals 6 and 2) is not required.

mA output module



Power supply of the 2-wire transmitters FCU200-W, FCU400-S, FCU400-G, FCU200-T, FCU400-P

Power supply of the 2-wire transmitters through power supply card (optional)



Terminal assignment of the RS485 / RS232 interface Connection via the RS485 / RS232 card (optional)

X0	GND RS232	SUB-D 5
X1	TxD RS232	SUB-D 2
X2	RxD RS232	SUB-D 3
X3	+B RS485 (termination)	
X4	RS485 +TxD / RxD	SUB-D 3
X5	RS485 - TxD / RxD	SUB-D 8
X6	-B RS485 (termination)	
X7	GND RS485	SUB-D 5

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

Questionnaire FCU200-W

Technical contact person

Tel. / Fax

Person responsible

Tel. / Fax

Tag name (2 x 20 characters) **Language**

Flow transmitter inputs

Pulse **Frequency** **mA**

Pulse value F min [Hz] F max [Hz] 0 ... 20 mA 4 ... 20 mA

qv-max qv-min qv-max qv-min qv-max

Absolute pressure [bar] (operating pressure) Δp-min Δp-max

Flow sensor placed in Warm flow For Δp measurem.: Δp transm. Linear

Cold flow Root extracting

For differential pressure measurement (orifice, nozzle, venturi, pitot tube flow meter) please add calculation.

Temperature inputs

Pt100 direct Transmitter 0 … 20 mA 4 ... 20 mA

Tw min Tw max Tc min Tc max

Pulse output 1

Pulse value

Puls width [ms]

Pulse output 2

Pulse value

Puls width [ms]

Outputs
(Specify physical measuring ranges with units.)

Outputs (select signal)

0 ... 20 mA 4 ... 20 mA (for all outputs)

	A1	A2	A3	A4
Physical value, start value				
Physical value, final value				

Questionnaire FCU400-S

Technical contact person

Tel. / Fax

Person responsible

Tel. / Fax

Tag name (2 x 20 characters) **Language**

Flow transmitter inputs for steam flow

Pulse **Frequency** **mA**

Pulse value F min [Hz] F max [Hz] 0 ... 20 mA 4 ... 20 mA

qv-max qv-min qv-max qv-min qv-max

For Δp measur.: Δp transm. Linear Root extracting Δp-min Δp-max

For differential pressure measurement (orifice, nozzle, venturi, pitot tube flow meter) please add calculation.

Flow transmitter inputs for condensate flow

Pulse **Frequency** **mA**

Pulse F min [Hz] F max [Hz] 0 ... 20 mA 4 ... 20 mA

qv-max qv-max qv-min qv-max

Absolute pressure (bar) (Operating pressure in the condensate)

Pressure transmitter

0 ... 20 mA 4 ... 20 mA

Over / Abs.

bar / MPA

Steam temperature

0 ... 20 mA 4 ... 20 mA

Pt100 direct

°C

Condensate temperature

0 ... 20 mA 4 ... 20 mA

Pt100 direct

°C

Pulse output 1

Counter

Pulse value

Pulse width (ms)

Pulse output 2

Counter

Pulse value

Pulse width (ms)

Counter

3	Energy (steam condensate)
1	Energy steam
2	Mass steam
4	Energy condensate
5	Mass condensate

Outputs (standard: 2 outputs)
(Specify physical measuring ranges with units.)

Outputs (select signal)

0 ... 20 mA 4 ... 20 mA (for all outputs)

	A1	A2	A3	A4
Physical value, start value				
Physical value, final value				

Zero point suppression for flow m³/h kg/h t/h

(applicable for calculating the flow, power, mass, volume, energy)

Questionnaire FCU400-G

Technical contact person

Tel. / Fax

Person responsible

Tel. / Fax

Tag name (2 x 20 characters) **Language**

Flow transmitter inputs

Pulse **Frequency** **mA**

Pulse value F min [Hz] F max [Hz] 0 ... 20 mA 4 ... 20 mA

qv-max qv-min qv-max qv-min qv-max

Δp-min Δp-max

For Δp measur.: Δp transm. Linear Root extracting

For differential pressure measurement (orifice, nozzle, venturi, pitot tube flow meter) please add calculation.

Pressure transmitter

0 ... 20 mA 4 ... 20 mA

Over / Abs.

bar / MPA

Gas temperature

0 ... 20 mA 4 ... 20 mA

Pt100 direct

°C

Pulse output 1

Counter

Pulse value

Pulse width (ms)

Counter

1 Nm^3

Outputs (optional)
(Specify physical measuring ranges with units.)

Outputs (select signal)

0 ... 20 mA 4 ... 20 mA (for all outputs)

	A1	A2	A3	A4
Physical value, start value				
Physical value, final value				

Questionnaire FCU200-T

Technical contact person

Tel. / Fax

Person responsible

Tel. / Fax

Tag name (2 x 20 characters) **Language**

Inputs

Channel 1

Pulse 1 **Frequency 1** **mA, 1**

Pulse value F min [Hz] F max [Hz] 0 ... 20 mA 4 ... 20 mA

Max. value Min. value Max. value Min. value Max. value

Channel 2

Pulse 2 **Frequency 2** **mA, 2**

Pulse value F min [Hz] F max [Hz] 0 ... 20 mA 4 ... 20 mA

Max. value Min. value Max. value Min. value Max. value

Pulse output 1

Pulse value

Pulse width (ms)

Pulse output 2

Pulse value

Pulse width (ms)

Outputs (optional)
(Specify physical measuring ranges with units.)

Outputs (select signal)

0 ... 20 mA 4 ... 20 mA (for all outputs)

	A1	A2	A3	A4
Physical value, start value				
Physical value, final value				

An extension board (Code No. 106 with 2 x 20 V supply)
is available for power supply of the inputs (pulse, frequency or mA).

Ordering information

Universal Measurement Computer	Variant digit No.	1 - 7	8	9	10	11	12	13	Code			
FCU **1)**	Catalog No.	**V18022-**										
Application												
FCU200-W (SensyCal W), caloric energy computer		2)	1									
Standard, water, cooling water, brine, oil			1	0								
Open systems, water (special applications)			1	1								
Others			1	9								
FCU400-S (SensyCal S), steam / saturated steam		2)	2									
Standard, thermal output / flow correction			2	5								
Standard, flow correction			2	A								
Others (special applications)			2	9								
FCU400-G (SensyCal G), Gas		2)	3									
Standard, flow correction (Q_v, p, T)			3	C								
Standard, flow correction (Δp, p, T)			3	D								
Others (special applications)			3	9								
FCU400-P (SensyCal P), process applications		3)	4									
Summation and subtraction (max. 6 inputs)			4	6								
High-precision differential temperature measurement			4	B								
Others			4	9								
FCU200-T (SensyCal T), counting / accounting		4)	5									
Current-to-pulse converter			5	7								
Pulse-to-current converter			5	8								
Others			5	9								
FCU400-IR (SensyCal IR), temperature monitoring			6									
Infrared temperature monitoring		5)	6	0								
Power Supply												
230 V AC					1							
115 V AC					2							
24 V AC / DC (FCU400-IR only with Power Supply 24 V DC)					3							
Approvals												
Without calibration						0						
With certificate from Verification Office for FCU200-W (SensyCal W)						1						
Special certificate for FCU400-S, FCU400-G (SensyCal S, SensyCal G)						2						
Calibration for high-precision differential temperature measurement						4						
Others (special applications)						9						
Configuration												
Without configuration							0					
With customer specific configuration							1					
Housing						6)						
Housing for panel mounting and wall mounting, 144 mm x 72 mm								0				

1) The standard model includes: 2 inputs for connecting Pt 100 (directly) or temperature transmitter with active mA output, 1 passive pulse / frequency input
2) Select code 101 for mA inputs and code 102 for mA outputs.
Select code 106 for supply of passive pulse / frequency input or temperature transmitter
3) 2 inputs are available for mA signals. Select code 108 for more inputs.
Select code 106 for power supply.
4) 2 inputs are available for active mA or pulse / frequency signals, select code 106 for supply of the signals.
5) Only with Power Supply 24 V DC
6) 19" cartridge see accessories

Additional ordering information

FCU	Code			
(Optional) extension modules ordered together with the device (max. 4)				
2 x mA inputs and 2 x transmitter supplies (2 x 16 V, 25 mA)	101			
2 x mA outputs and 2 x alarm contacts	102			
RS 485/RS232 card for MODBUS communication	105			
2 x transmitter supplies (2 x 20 V, 25 mA)	106			
4 x mV inputs (special application)	107			
4 x mA inputs (summation, special application)	108			

Accessories

	Catalog No.			
PC configuration program FCOM200, for FCU200-W, FCU400-S, FCU400-G, FCU200-T	7962875			
Optohead, for connection to a PC via RS 232 interface	7962876			
Optohead, for connection to a PC via USB interface	7962897			
M-Bus micro-master with laptop adapter cable via RS 232 interface, for 10 terminal units (MR 003)	7962877			
M-Bus level transformer with RS 232 C interface for				
3 terminal units, housing for Z rails or wall mounting PW3	7962878			
20 terminal units, housing for Z rails or wall mounting PW20	7962879			
60 terminal units, housing for Z rails or wall mounting PW60	7962880			
250 terminal units, housing for Z rails or wall mounting PW250	7962891			
Handheld printer for infrared communication	7962882			
RS 232 cable (SUB-D 1:1 9-pole socket / plug) 3 m, for M-BUS level transformer	7962895			
Extension module for separate order, independent of the device				
2 x mA inputs and 2 x transmitter supplies (2 x 16 V, 25 mA)	7962870			
2 x mA outputs and 2 x alarm contacts	7962871			
RS 485/RS 232 card for MODBUS communication	7962874			
2 x transmitter supplies (2 x 20 V, 25 mA)	7962869			
4 x mV inputs (special application)	7962881			
4 x mA inputs (special application)	7962868			
Frontplate 19"	7962896			
Infra-red Thermometer Sensytherm IR-CS for FCU400-IR, Temperature Range 0 ... 250 °C, Spectral Sensitivity 8 ... 14 µm, Optical Resolution 10:1, Response Time 200 ms, Measurement Deviation 1.5 % of Reading, Power Supply 12 ... 28 V DC, Connecting Cable 10 m	7962997			
Accessory for FCU400-IR (SensyCal IR) with Sensytherm IR, protection housing against electromagnetic interferences	7962998			

Contact us

ABB Ltd.
Process Automation
Oldends Lane, Stonehouse
Gloucestershire, GL10 3TA
UK
Phone: +44 (0)1453 826661
Fax: +44 (0)1453 829671

ABB Inc.
Process Automation
125 E. County Line Road
Warminster PA 18974
USA
Phone: +1 215 674 6000
Fax: +1 215 674 7183

ABB Automation Products GmbH
Process Automation
Dransfelder Str. 2
37079 Goettingen
Germany
Phone: +49 551 905-534
Fax: +49 551 905-555

www.abb.com

3KXF800000R1001

10/18-5.22-EN Rev. F 01.2011

Power and productivity
for a better world™