Systec Controls

flowcom2

Compensation and energy quantity calculator

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Content

1 General

The concept of the flowcom allows a variety of measurement applications that are usually reserved for process control systems. In addition to the possibility of recording two separate measuring points, the dual-channel design also offers the option of creating a mass and energy balance, e.g. a flow/return measurement at a heat exchanger.

2 Introduction

The flowcom is a compensation and energy quantity calculator. This means that the flow rate of the medium to be measured is calculated as a function of the current density. In addition, the enthalpy of the fluid is calculated and from this the power and heat quantity. This means that the flowcom can be used for applications that would otherwise require a process control system.

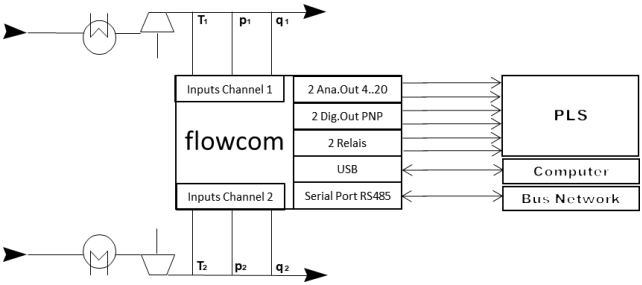
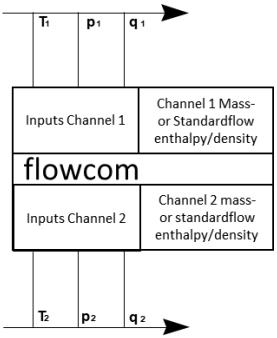


Figure: Inputs and outputs of the flowcom

3 Applications

3.1 Separate channels

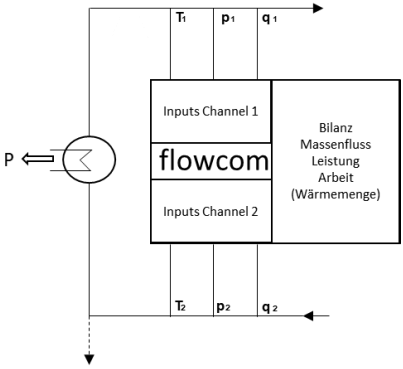
The flowcom can be used for one or two separate lines to compensate a flow measurement with pressure and/or temperature in order to calculate the mass or standard volume flow. In addition to the medium density, the flowcom also calculates the enthalpy of heat transfer fluids and displays the enthalpy flow (power) and the enthalpy sum (work) for separate channels. The outputs of the flowcom can be flexibly assigned to the measured variables or the calculated variables from both channels.



3.2 Pre-return balance

In addition to the measurement of two separate channels, the flowcom also offers the possibility of forming a mass and energy balance from flow and return. In closed systems, only one flow measurement is necessary for this (q1 or q2), in the case of a side discharge (e.g. boiler desalination), flow measurements in the supply and return can be used to determine the side discharge. In a closed system, you can choose to measure the flow in circuit 1 or in circuit 2, the other flow is parameterised as "not activated" and then transferred from the connected circuit.

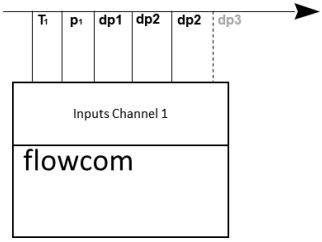
The flow-return balance is often used to determine the pipe, e.g. on heat exchangers or boilers. To determine the pipe, P=P2-P1 applies, i.e. circuit two should be the "warmer" circuit, otherwise a negative pipe is indicated.



3.3 Splitting Range

For flow measurements according to the differential pressure principle, the measuring range or the accuracy is limited by the differential pressure transmitters. The flowcom offers the possibility to use the analogue inputs of the second measuring channel of channel 1 for further differential pressure transmitters cascaded in the measuring range (splitting range). This makes it possible to realise a larger measuring range with better accuracy. The flowcom

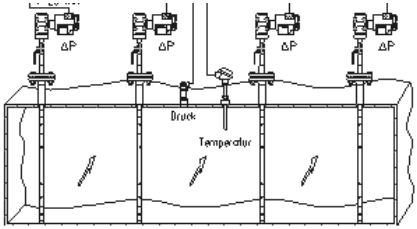
automatically switches to the transmitter whose measuring range can be optimally used at the current flow rate.



Typically, flow measuring ranges of 1:7 (qmin : qmax) are realised with one dp-transmitter, with two or three cascaded dp-transmitters flow ranges of more than 1:30 are representable. A typical cascade would be e.g. dp-transmitter 1 0...5mbar, dp-transmitter 2 0...60 mbar, dp-transmitter 3 0...600mbar. With such a cascade, differential pressures between 0.2 and 600mbar can be measured with a high accuracy, corresponding to a dp measuring range of 1:3000 or a flow range of 1:55.

3.4 Averaging

Similar to Spilling Range, the flowcom also allows the use of several differential pressure transmitters with identical measuring ranges. The flowcom then determines the average value from these transmitters. This operating mode is for the use of several dynamic pressure probes in a line or duct for network measurement. This typically achieves high measuring accuracies with shortened inlet distances.



4 Operation on the flowcom

The flowcom can be operated and parameterised on the device. The large display and the logical menu structure facilitate operation and parameterisation. All important measured and calculated values can be read directly from the display and there are extended diagnostic menus for error analysis and correction.

In addition to parameterisation on the device itself, it is also possible to parameterise the flowcom using the PC software supplied and to transfer the parameters via USB.

4.1 Operating display

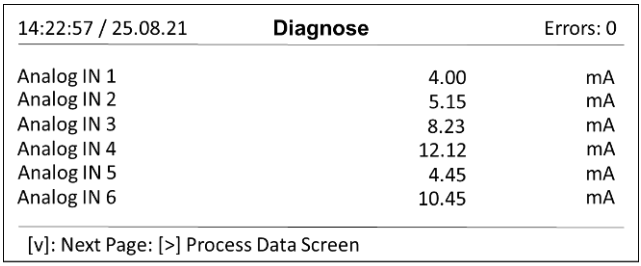
After switching on the flowcom, it shows the operating display after a few seconds. You can scroll through the operating display with the down arrow keys. If you are in another menu, e.g. in the parameterisation or diagnosis menu, you can always reach the operating display by repeatedly pressing the CLEAR key or after switching on the supply voltage again.

14:22:57 / 25.08.21	**Channel 1**	Errors: 0
MASS FLOW	**2334.05**	**kg/h**
Total Mass	125677.64	kg
Abs. Pressure	1.03	bar
Temperature	36.7	°C
Density	1.06	kg/m³
Standrad Volume Flow	1965.22	Nm³/h
[Enter]: Setup, [v]: CH2, [<]: Errors, [>]: Diag [5sec. CLEAR]:zero Total		

The operating display shows all essential measured and calculated variables as well as the time and any errors. In the bottom line you will find information on the key function.

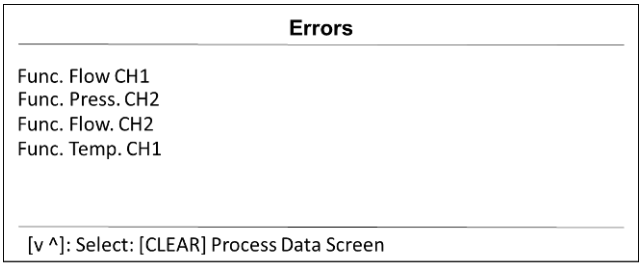
4.2 Extended operating display / diagnosis

You can reach the extended operating display from the operating display by pressing the right key [>]. In the extended operating display. In this menu you will find information on the status of the inputs and outputs.



4.3 Error menu

If there are errors, the operating display shows the number of active errors in the top right-hand corner, e.g. Errors: 4 (there are 4 errors). From the operating display, you can access the error menu by pressing the [<] left arrow key.

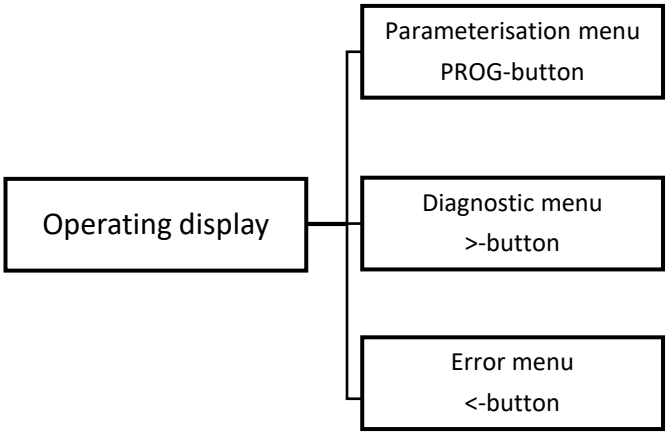


The flowcom can display the following errors - each for channel 1 [CH1] and channel 2 [CH2].

Display	Meaning	Remedy
Func. Flow	The flowcom cannot calculate a flow rate	Check the analogue inputs for flow to see if they are within 3.84 and 20.5 mA.
Func. Press.	The flowcom cannot measure pressure	Check the analogue inputs for pressure if they are within 3.84 and 20.5 mA.
Func. Temp.	The flowcom cannot measure temperature	Check the analogue or resistor inputs for temperature to ensure that they are within 3.84 and 20.5 mA or that the correct resistors are applied. Is the temperature input correctly parameterised?
Func. Density	The flowcom cannot calculate a medium density.	Check whether the pressure and temperature are plausible and whether the medium is in the correct aggregate state for these process parameters. If, for example, steam is parameterised, but p&T are in the range of water, this error message will appear.

4.4 Parameterisation menu

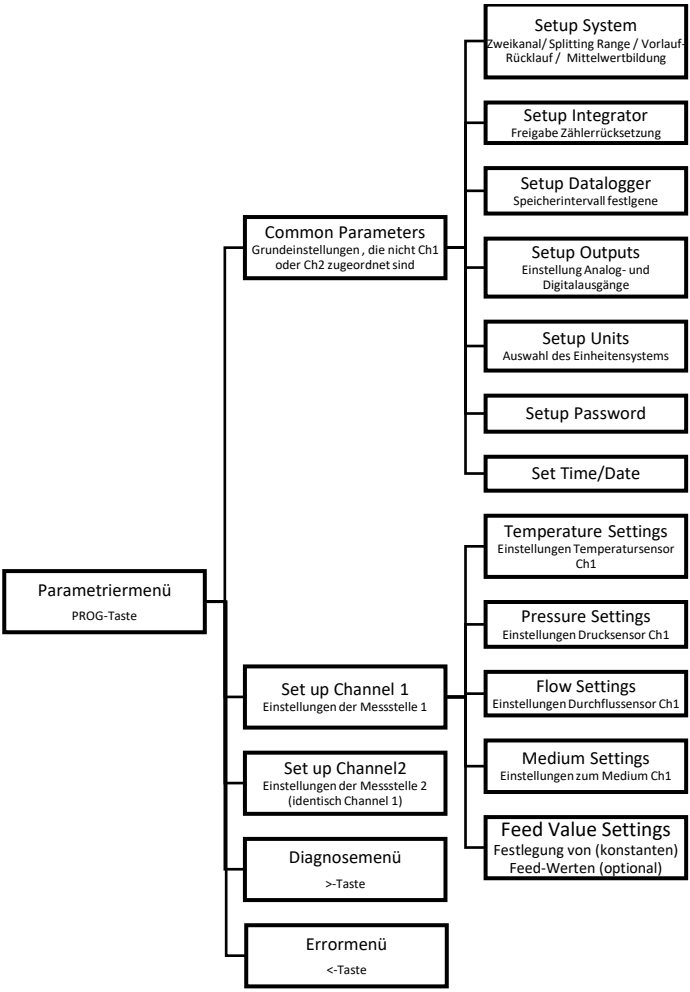
In the parameterisation menu, all necessary settings can be made on the flowcom. In general, it is recommended to parameterise the flowcom using the supplied PC software via USB interface. You can access the parameterisation menu from the operating display by pressing the PROG/ENTER key. Access can be password protected (Common Parameters / Setup Password).



4.4.1 Menu structure

The parameterisation menu has a building structure. There are three main menus on the first level:

- **Common Parameters**: This menu contains all parameters that are used for both circuits and the system settings.
- **Setup Channel 1**: Here you will find the settings for measuring point 1.
- **Setup Channel 2**: This menu is identical to the Setup Channel 1 menu and contains all settings for measuring channel 2. Note: If the option "Splitting Range or Averaging" is activated, channel 2 is omitted because its inputs are used for the tasks in channel 1.

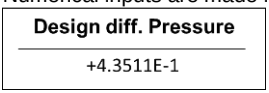


4.4.2 Using the front keys for parameterisation

Operation via the front keys is largely self-explanatory and often commented on in the lower display line. Some notes on this:

1. The parameterisation menu is accessed from the operating display with the [PROG/ENTER] key.
2. Exiting menus back to the operating display is done by (repeatedly) pressing the [EXIT/CLEAR] key.
3. The selection of menu items is done with the [^v] keys
4. Selecting a submenu or switching to the editing menu is done with the [PROG/ENTER] key.
5. Confirmation of a selection or entry is done with the [PROG/ENTER]_key, discarding with the [EXIT/CLEAR]-key.

6. Numerical inputs are made in exponential representation.

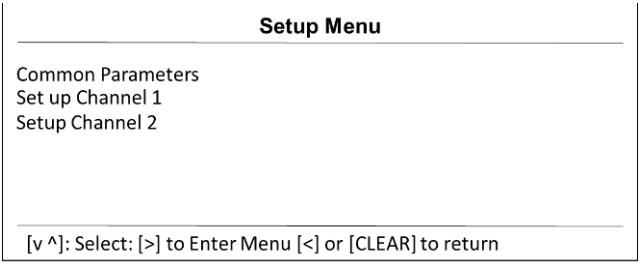


Some examples:

+215,27 +2.1527E+2 -0,3422 -3.4220E-1
277000 +2.7700E+5

The exponential number E indicates the shift of the decimal point to the right (E+) or to the left (E-). E+3 therefore means value x 1000, E-2 means value /100

From the operating display, you reach the parameterisation menu by pressing the [PROG/ENTER] key.



The parameterisation menu has several menu levels. In the upper menu level, you can use the [v ^] keys to select from the following three main menus, the [ENTER] key to select the submenus, and the [CLEAR] key to return to the next higher menu or to exit the parameterisation menu back to the operating display.

4.4.3 Common Parameters menu

In this menu you will find further submenus with settings that cannot be assigned to one channel, but are relevant for both circuits and the flowcom, e.g. the setting of the clock, the units, the analogue outputs, etc.

4.4.3.1 Setup System Menu

In this menu the application is parameterised (see Applications, page 4). You can choose whether you want to measure two separate channels, use the flowcom for a pre-reverse application or realise a splitting range or mean value application.

4.4.3.2 Setup Integrator Menu

This menu determines whether a reset of the counters (totalizer) by the user is allowed or not (function [CLEAR] key in the operating display). If a reset is not allowed and the unit is password protected, unauthorised or accidental deletion can be prevented.

4.4.3.3 Setup Datalogger Menu

This menu determines which data is logged in the internal memory and at what time interval. The data logs can be read out with the USB interface and the flowcom software.

4.4.3.4 Setup Outputs

In this menu, the analogue outputs, the pulse outputs (counter outputs) and the relays are parameterised.

4.4.3.5 Setup Units

Here you can select whether SI units are to be used or user-defined units. The selection of user-defined units (User) can be made in the PC software.

4.4.3.6 Time/Date menu

The time and date are set in this menu. The time stamp is used for the data logs and the error memory.

4.4.3.7 Setup Password

In this menu you can set a password. The password is used to select the parameterisation menu. This prevents accidental or unauthorised changes to the parameters on the flowcom.

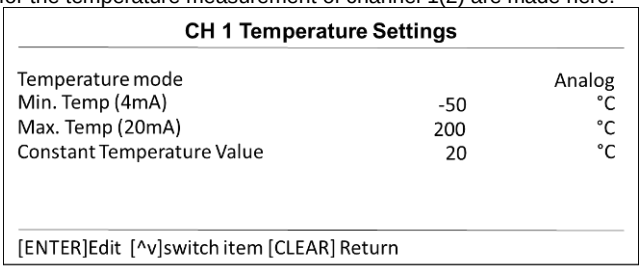
ATTENTION: The loss of the password can only be reversed by resetting the flowcom at the factory at systec Controls.

4.4.4 Setup Channel 1 / 2 Menu

In these menus you parameterise the measuring point, i.e. the settings for medium, flow meter, pressure and temperature sensors.

4.4.4.1 CH1(2)Temperature Settings Menu

The settings for the temperature measurement of channel 1(2) are made here.



Temperature Mode: Here you can select how the temperature is recorded: [Analogue] 4..20mA transmitter, [Const] a constant temperature is specified (no sensor), [Use other Input] the temperature value of the other temperature channel is used, [PT500-3wire], PT500 in 3 wire technology is used, [PT100-3wire] a PT100 in 3 wire technology is used, [PT500-2wire] PT500 in two wire technology is used, [PT100-2wire] PT100 in two wire technology is used.

Min. Temp (4mA) / Max. Temp (20mA): The measuring range of the 4... 20mA sensor is entered here (temperature mode analogue).

Constant Temperature Value: This is the substitute value if no sensor is connected (Temperature Mode Const).

4.4.4.2 CH1(2) Pressure Settings

In this menu the pressure measurement for channel 1(2) is set.

Pressure Mode: Here you can set how the pressure is recorded: [const] A constant pressure is set and no sensor is used. [Abs. Pressure] An absolute pressure sensor is connected. [Gauge Pressure] A gauge pressure transmitter is connected. [Use other Input] The pressure value of the other channel is used.

Min. pressure (4mA) / Max. pressure (20mA): The measuring range of the 4... 20mA sensor is entered here (Pressure Mode Abs. Pressure or Gauge Pressure).

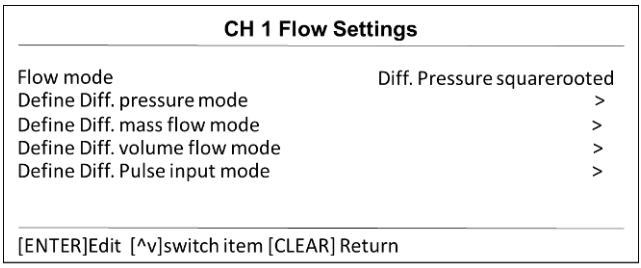
Constant Pressure Value: This is the substitute value when no sensor is connected (Pressure Mode Const).

Ambient Pressure: Average ambient pressure. When using a gauge pressure transmitter (Pressure mode: Gauge Pressure), this value is used by the flowcom to calculate the absolute pressure in the pipe necessary for the density calculation.

Note: For the calculation of medium parameters such as density and enthalpy, a pressure and temperature value is required. The accuracy of these measurands is directly related to the accuracy of the calculated flow and power. With overpressure transmitters, the change in barometric ambient pressure is not recorded, therefore absolute pressure transmitters are preferred, especially for low line pressures.

4.4.4.3 CH1(2) Flow Settings

Most common flow transmitters can be connected to the flowocm. In this menu, the flow type used must first be selected and then the parameters for this type must be set.



Flow Mode:

- [Deactivated]: Channel 1(2) is not used
- [Diff. pressure not squarerooted]: Flow measurement according to the differential pressure principle with a dp transmitter that does not perform squaring (rooting). E.g. pitot tubes, orifices, venturis, nozzles etc.
- [Diff. pressure squarerooted]: Flow measurement according to the differential pressure principle with a dp transmitter that already performs the square root formation in the transmitter. E.g. pitot tubes, orifices, venturis, nozzles etc.
- [Mass flow:] Flow sensor that provides an analogue signal proportional to mass. E.g. thermal flow meters or Coriolis flow meters.
- [Volume flow:] Flow sensor that provides an analogue signal proportional to the volume, e.g. vortex, ultrasonic meter, swirl flow meter.

- [Pulse Input]: Flow meter that provides a frequency signal proportional to the volume, e.g. turbines, quatometers, oval wheel meters and vortex with frequency output. Note: The flowcom counts the pulses / second and calculates the flow rate from this. NF signals are therefore only suitable to a limited extent, because the number of pulses/sec defines the resolution of the displayed flow measurement value.

Define Diff. pressure Mode:

In this menu, the design data of the flow measurement are made according to the differential pressure principle. For differential pressure measurements (orifice plates/venturis, pitot tubes, etc.), design data for a process point (design point) are supplied, on which you can take the following data:

- [Design diff. pressure] Differential pressure at the design point of the differential pressure measurement. The differential pressure transmitter must output this value at 4mA 0 and 20mA.
- [Design flow]: Flow rate at the design point of the dp measuring point
- [Design temperature]: Temperature at the design point of the dp measuring point
- [Design pressure]: Pressure at the design point of the dp measuring point
- [Expansion coeff]: Expansion coefficient Epsilon at the design point of the dp measuring point
- [Dead Band]: Zero point (creeping quantity) suppression. All differential pressures below this setting are set to zero by the flowcom. Typically 1% of [Design diff. pressure].

Define mass flow mode:

In this menu, the design data of a flow measurement with mass proportional analogue signal is made:

- [Min. Flow (4 mA)] Mass flow signal at 4mA
- [Max. Flow (20 mA)] Mass flow signal at 20mA
- [Dead Band] Zero suppression: Flow values below this setting are set to zero by the flowcom.

Define volume flow mode:

In this menu, the design data of a flow measurement with volume-proportional analogue signal is made:

- [Min. Flow (4 mA)] Mass flow signal at 4mA
- [Max. Flow (20 mA)] Mass flow signal at 20mA
- [Temp. corr. const] A correction constant for the thermal expansion of the housing can be entered here. If the expansion is already compensated in the flowmeter itself, the default value must remain 0. If the expansion is to be taken into account by the flowcom, a value >0 can be entered. For stainless steel the value is e.g. 1.7E-5 1/K, for cast iron 1.04 E-5
- [Base temp. of TCC] Reference temperature for the temperature correction constant. This is typically 20°C. The thermal expansion of the enclosure is calculated from the temperature difference between this parameter and the process temperature.
- [Dead Band] Zero suppression: Flow values below this setting are set to zero by the flowcom.

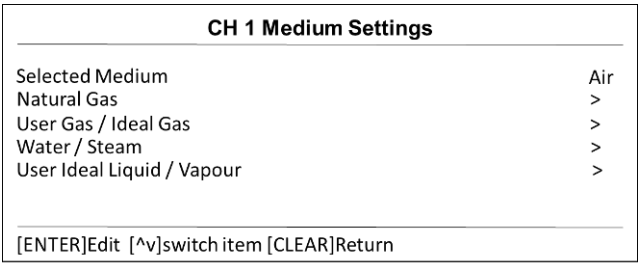
Define pulse input mode:

In this menu, the design data of a flow measurement with a volume-proportional frequency signal is made:

- [K-Factor] Pulse valency of the frequency signal
- [Max. frequency] Maximum frequency of the signal
- [Temp. corr. const] A correction constant for the thermal expansion of the housing can be entered here. If the expansion is already compensated in the flowmeter itself, the default value 0 must remain set. If the expansion is to be taken into account by the flowcom, a value >0 can be entered. For stainless steel the value is e.g. 1.7E-5 1/K, for cast iron 1.04 E-5
- [Base temp. of TCC] Reference temperature for the temperature correction constant. This is typically 20°C. The thermal expansion of the enclosure is calculated from the temperature difference between this parameter and the process temperature.
- [Sensor Type] Selection of the connected transmission type (see also page 44, 7.4.4 Frequency inputs)
  NPN:
  PNP:
  Namur:
  Coil:
  Reed:
  Active:

4.4.4.4 CH1(2) Medium Settings

In this menu, the medium of the application must be defined. In flowcom the most common gases, water, saturated and superheated steam are already stored. In addition, natural gas can be defined according to GERG88 and a modified ideal gas law can be calculated. It is also possible to create user-defined density and enthalpy tables on the PC and transfer them conveniently via the parameterisation software. This is particularly interesting for heat and cold carrier media.



Selected Medium: Setting of the medium used. Air, CO2 (carbon dioxide), Methane, Nitrogen, Ogygene (oxygen). For these gases, no further settings need to be made in the following points. Natural Gas. When selecting natural gas, the analysis data according to GERG 88 must be entered in the menu [Natural Gas >]. User Gas/ Ideal Gas: Calculation according to the ideal gas law. In the submenu [User Gas / Ideal Gas >] the standard and operating data of the gas must be specified. If Water, Saturated Steam or Superheated Steam is selected, further settings must be made in the [Water / Steam >] menu. User Ideal Liquid (incompressible liquid). Further settings must be made in the [User Idel Liquid >] menu. When

User Table is selected, the flowcom accesses density and enthalpy tables that must be previously loaded onto the flowcom with the parameterisation software.

Natural Gas >: In this submenu the upper calorific value (gross cal. value), the standard density (std. density), the CO2 and the H2 mass fraction in the natural gas according to GERG88 must be entered. The flowcom uses this data to determine the density of the natural gas.

User Gas / Ideal Gas >: In this menu the standard density (0°C, 1013.25 hPa) must be entered. In addition, a density of the fluid at the typical operating point can be entered (Density at WC) if this is known and the reference point for this density value must be entered (Reference temp / Reference press). If the fluid density at the operating point is not known, the standard density can also be specified as the reference density and 0°C and 1013.25 hPa as the reference point.

Water / Steam > In this menu item a tolerance temperature (tolerance Temp) can be set. This value is used by the flowcom to accept potential errors of the pressure or temperature sensors at the phase transition between water and steam. I.e. the flowcom allows overheating or undercooling of the fluid beyond the aggregate limit.

5 Parameterisation software

The parameterisation software enables quick and clear parameterisation of the flowcom and also offers additional functions that are not accessible via the front keypad of the flowcom. These are e.g.:

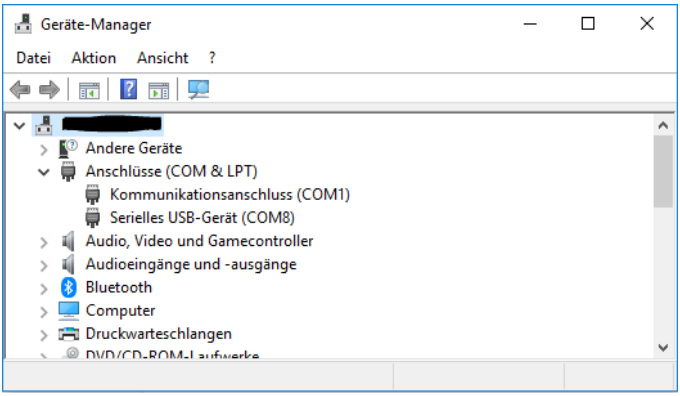
- Selecting non-SI units
- Reading out the data logger
- Parameterising special media
- Reading out the Errors Log
- Display of current measured values
- Printing parameter files

5.1 Online/Offline

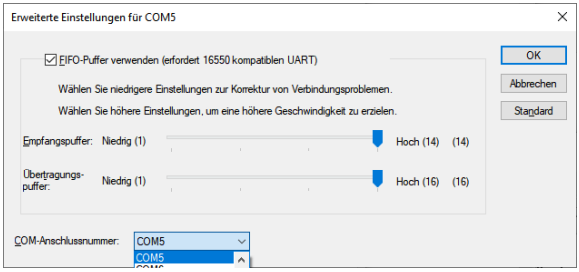
The software offers the possibility to create, save and print parameters offline. The current process data can also be displayed online and data and error logs can be read out from the flowcom.

5.1.1 Go online

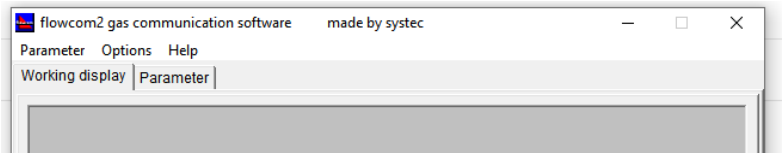
First connect the flowcom to your PC on which you have installed the parameterisation software (included in delivery). A USB cable type USB Mini is required for this. The flowcom is recognised by the PC as a COM interface. Read out the COM interface assigned by the PC in the device settings. To do this, open the Windows software "Device Manager" on the PC. You can find it by clicking on the Windows symbol  in the task bar and entering "Device Manager".



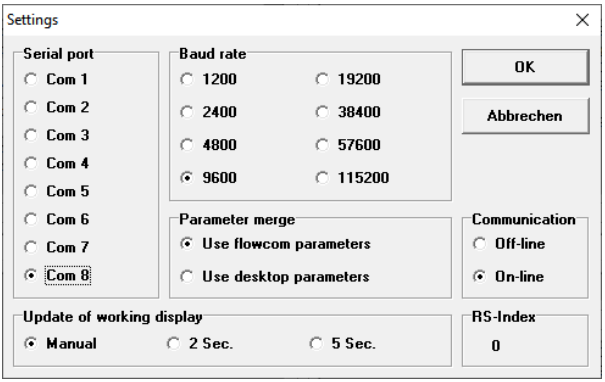
In the "Ports (COM & LPT)" section you will find the flowcom and the assigned COM number under the designation "Serial USB device (COM #)". The COM port number to be assigned must be between 1 and 8. Higher com ports are not supported by the flowcom software. In this case you have to assign the COM port number manually in the PC. (Double-click in the device manager on the port /Connection settings/Advanced



In the flowcmsoftware please select the menu item Options/Settings.



By selecting the option "Communication on-line" you activate the settings.



Attention: As soon as you go online with the flowcom, the parameters between flowcom software and flowcom are synchronised. You therefore overwrite the settings either in the flowcom or in the flowcom software (PC)!

In the settings, please select the assigned port number on the left. The default baud rate for the flowcom is 9600, but you can also select other baud rates via the front keypad.

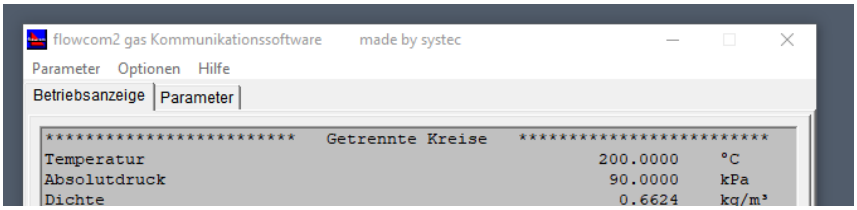
The menu item "Update data" ("Parameter merge") determines which parameters are used as soon as you synchronise the flowcom with the flowcom software by pressing the OK button. When selecting the option "Parameters from flowcom" ("Use flowcom parameters") all entries in the flowcom software are overwritten with the current flowcom settings. When using the option "Use Desktop Parameters", all settings in the flowcom are overwritten.

As soon as flowcom and flowcom software are connected (displays "online" in the footer of the flowcom software), all parameter changes in the software are transferred to the flowcom in real time, i.e. flowcom and flowcom software are synchronous.

Attention! If you are connected to the flowocm and open a parameter file, this will be transferred directly to the flowcom, i.e. the settings in the flowcom will be overwritten!

5.2 Use software

The flowcom software has two main tabs at the top: Working Display and Parameters.



5.2.1 Working Display tab

In the operating display, you can view the current measured values, trend values (data logger) errors and the (integrators) counter values. For the integrators, you can also display the last 8 reset counter readings with start and end time in case an unintentional reset has occurred. The selection and updating of the displayed data is done by clicking on the lower tab:

Alternatively, an automatic update of the data can be set in the menu "options/settings/Update of working display".

The trend values (data logs) (max. 2800 logs) can be exported to a text file. The log file has the displayed ASCII format:

Header:
SerNo;Circle;Date;Temp.[°C];Abs.pressure[kPa];Flow[Nm³/h];MFlow[kg/h]

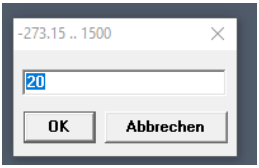
Data:
##########;#;DD.MM.YYYY HH:MM:SS;#####.####(e+#);#####.####(e+#);#####.####(e+#);#####.####(e+#)

The log data is designed in such a way that it can be easily imported into Excel.

5.2.2 Register Parameter

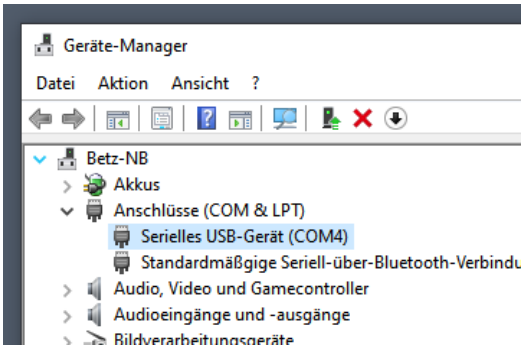
The flowcom can be fully parameterised via the "Parameters" tab. Changing parameters

Parameters are changed in flowcom simply by selecting them or by double-clicking on numerical quantities. Note the physical unit when entering. The input window shows the range limits for the input in the upper area.

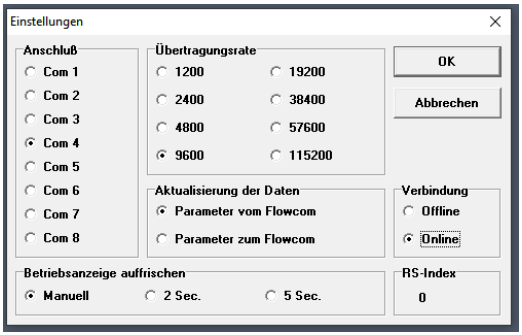


5.3 Transfer parameters to the flowcom

The flowcom is connected to the PC via USB. Windows assigns a COM interface to the flowcom. This is usually done automatically. You can read out the number of the COM interface in the Windows device manager, in the example below it is COM4:



The assigned Como interface must be selected in the flowcom software in the Options/Settings menu:



To do this, select the option "Communication On-line", choose the transmission rate (default 9600) and the Com interface (in this example Com4).

IMPORTANT: The settings "Update data" determine the direction of the synchronisation as soon as you activate the interface! "Parameters from flowcom" means that all data from the flowcom are transferred to the PC software. "Parameters to flowcom" means that all settings in the flowcom are overwritten by the parameters of the PC software.

After the connection has been established, the status in the footer of the flowcom software changes from OFFLINE 

to ONLINE 

.

When the flowcom is ONLINE, all parameters in the flowcom software and in the flowcom are synchronous. Changes in the flowcom software are transmitted immediately and take effect in the flowcom.

6 Parameterisation

The parameterisation of the flowcom is possible both via the front keypad (see chapter 4 Operation on the flowcom) as well as via the supplied PC software via USB (see chapter 5 Parameterisation software). The parameterisation via PC software is described below.

The following procedure is recommended for parameterisation:

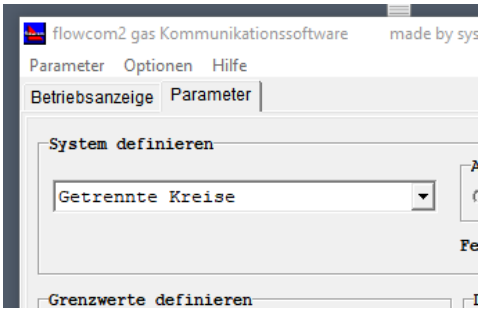
1. Define the application (see Chap. 3 Applications and chap. 6.1 Define application)
2. Parameterise the two measuring circuits 1 and/or 2 (see Chap. 6.2 Parameterise measuring point)
3. Parameterise the outputs (see Chap. 6.3 Parameterise outputs)
4. Make other settings (see Chap. 6.4 Other settings)

6.1 Define application (Define system)

In the register "Parameter/System/Define system", you can define for which application your flowcom is to be used (see Chap. 3 Applications).

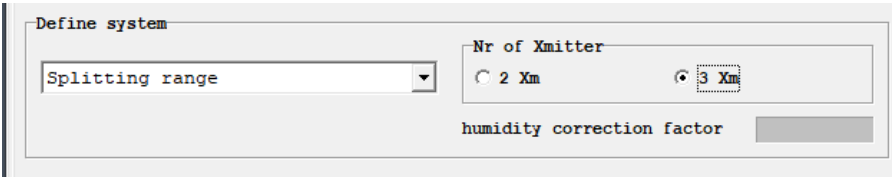
6.1.1 Separate circuits (separate channels) (see Chap. 3.1 Separate channels)

Mostly the flowcom is used for one or two independent lines for pressure and temperature compensation. This option is set as the default value.



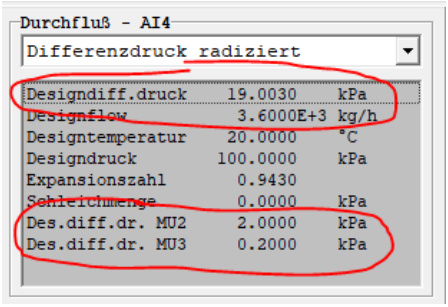
6.1.2 Splitting Range (see Chap. 3.3 Splitting Range)

If this option is selected, the two-channel flowcom becomes a one-channel flowcom - however, several cascaded differential pressure transmitters can then be connected to channel 1 to extend the measuring range. The setting "Number of transmitters" (No of XMitter) defines how many dp-transmitters the measuring range should be divided among (2 or 3).



Splitting Range only works for differential pressure flow measurement. The input of the measuring range of the dp-transmitters takes place in the register Circuit1/Flow:

Differential pressure measurement with 3-fold splitting range



The flowcom then automatically switches to the appropriate differential pressure transmitter. The highest measuring range (transmitter 1) is the design differential pressure (connection AI4), the next smaller measuring range (Des.diff.dr. MU2) is connected to the flow input circuit 2 (AI5), the (optional) third transmitter with the smallest measuring range is connected to the pressure input circuit 2 (AI6).

All transmitters must be set to 0 mbar at 4mA, so the measuring range must start at 0 differential pressure. The range division can be freely selected, but typically the differential pressure transmitters are cascaded 1:10 to 1:30.

Example 1:

Calculated full scale 250mbar, 1:10 cascade with 3 transmitters:

Transmitter 1: 0..250 mbarHighest accuracy 25..250mbar
Transmitter 2: 0..25 mbar Highest accuracy 2.5..250mbar
Transmitter 3: 0..2,5mbar Highest accuracy 0.25..250mbar

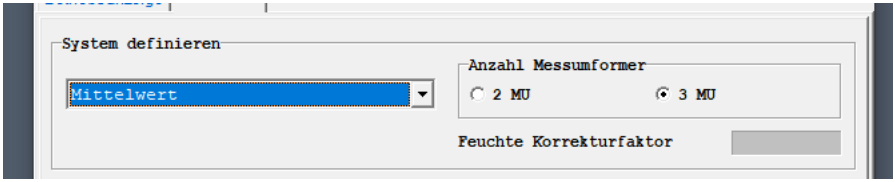
Example 2:

Calculated measuring range 90 mbar, 1:30 cascade with 2 transmitters:

Transmitter 1: 0...90 mbar Highest accuracy 3..90 mbar
Transmitter 2: 0...3 mbar Highest accuracy 0.1..90 mbar
(Transducer 3: 0... 0.1 mbar probably makes no sense, there are hardly any dp-transmitters available for this measuring range)

6.1.3 Averaging (Averaging System)

This option is for the use of several dynamic pressure probes (up to 3) at one measuring point (measuring cross-section), to increase the resolution with disturbed profiles. It is also possible to use several differential pressure taps on one primary element, e.g. a venturi.

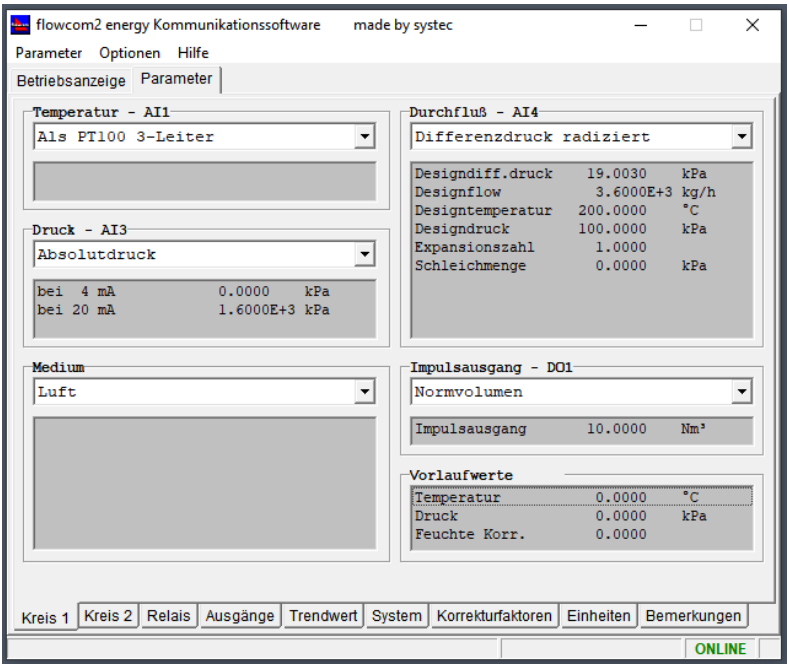


If this system option is selected, the analogue inputs of channel 2 (AI5 and AI6) are assigned to channel 1, so channel 2 is no longer available. The "Number of transmitters" option determines how many differential pressure measurements are connected to channel 1. Again, the following order applies: transmitter 1 AI4, transmitter 2 AI5, transmitter 3 AI6.

Measuring ranges and layout (design data) are identical for all three transmitters with this option. The flowcom calculates the flow rate from the (arithmetic) mean value of the three differential pressures.

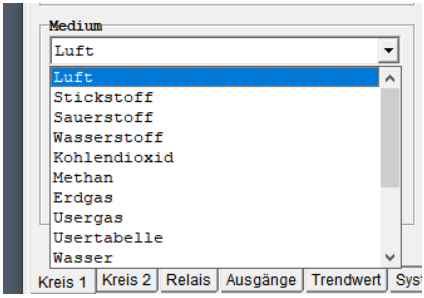
6.2 Parameterise measuring point (Setup Channel 1/2)

In this menu, you make the settings for the measuring point, i.e. the medium, the temperature, the pressure and the flow. Keep the design and setting data of your measurements ready.



6.2.1 Parameterise medium

In the main register Parameter / Circuit 1(2), the fluid of your measuring point must be selected in the area "Medium".



In addition to a number of predefined media, it is also possible to freely define gas mixtures (natural gas), freely definable ideal gases and real media and heat and cold carrier media.

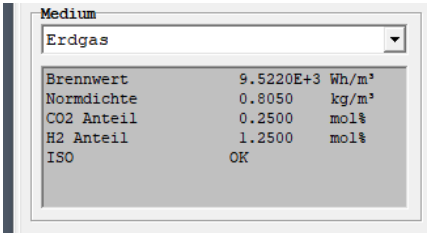
6.2.1.1 Predefined media

In flowcom, the physical data of a variety of media are already predefined. These are: Air, nitrogen, oxygen, hydrogen, carbon dioxide, methane, water, saturated steam and superheated steam. The flowcom has stored the real densities and enthalpies in the wide pressure and temperature range.

Medium	Temperature range	Pressure range
Air	-200 to 750 °C	1 to 500 bar
Hydrogen	-250 to 1750 °C	1 to 600 bar
Carbon dioxide	0 to 750 °C	1 to 500 bar
Nitrogen	-200 to 750 °C	1 to 500 bar
Oxygen	-200 to 750 °C	1 to 500 bar
Methane	-120 to 100 °C	1 to 500 bar
Water	0 to 374 °C	0.5 to 222 bar
Saturated steam	80 to 374 °C	0.5 to 222 bar
Superheated steam	80 to 700 °C	0.5 to 650 bar

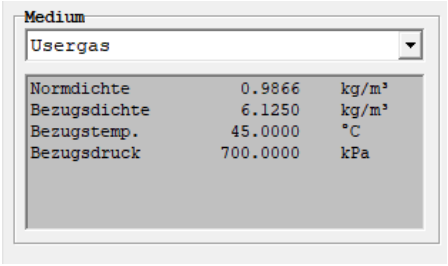
6.2.1.2 Natural gas

When selecting natural gas, the flowcom calculates the density according to the GERG88 method. For this you need the calorific value (Hu), the standard density and the mole fractions Co2 and H2 in the natural gas.



6.2.1.3 General gases (user gases, improved ideal gas law)

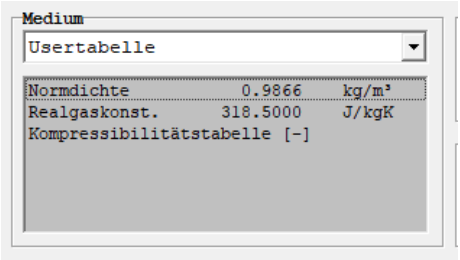
The option "user gas" allows the density calculation according to the (improved) ideal gas law. For this you need the standard density of your gas (density at 0°C and 101.325kPa) and ideally another density (reference density) that is close to your typical operating point.



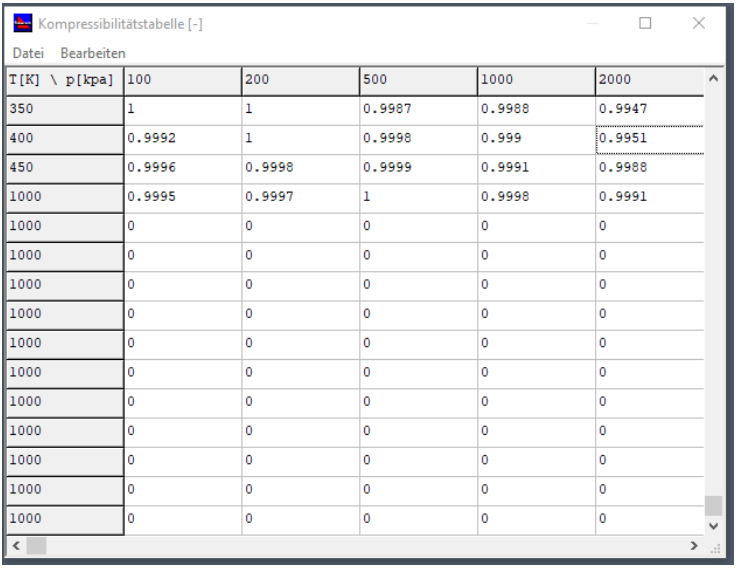
If you do not have any information about a reference density (e.g. from a table book), enter the standard density again as the reference density, 101.325hPa as the reference pressure and 0°C as the reference temperature.

6.2.1.4 General gases with known compressibility (user table)

If a compressibility table of the fluid is available, it can be stored in flowcom for density calculation. In addition to the compressibility table, you need the standard density of the fluid (at 0°C and 101.325 kPa) and the gas constant.



Double-click on "Compressibility table [-]" to open a table editor with a table of 18x15 (Txp) grid points.

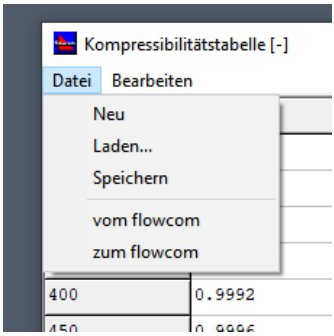


T[K] \ p[kpa]	100	200	500	1000	2000
350	1	1	0.9987	0.9988	0.9947
400	0.9992	1	0.9998	0.999	0.9951
450	0.9996	0.9998	0.9999	0.9991	0.9988
1000	0.9995	0.9997	1	0.9998	0.9991
1000	0	0	0	0	0
1000	0	0	0	0	0
1000	0	0	0	0	0
1000	0	0	0	0	0
1000	0	0	0	0	0
1000	0	0	0	0	0
1000	0	0	0	0	0
1000	0	0	0	0	0
1000	0	0	0	0	0
1000	0	0	0	0	0
1000	0	0	0	0	0

First, the temperature and pressure support points must be defined in increasing order, then the compressibility support points.

The table can also be smaller than 18x15 grid points. Ideally, however, the table should cover the pressure and temperature range of the application. If the measured values p&T of the flowcom lie outside the defined table, the compressibilities are determined by extrapolation.

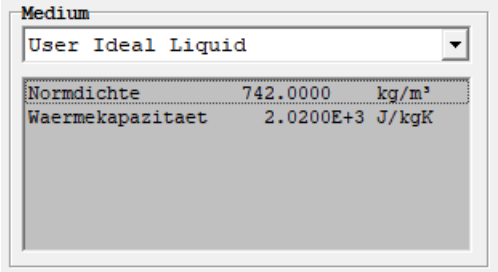
As soon as the table is ready, it must be transferred to the flowcom (file/to flowcom).



The compressibility table can be saved on the PC for later use (File/Save)

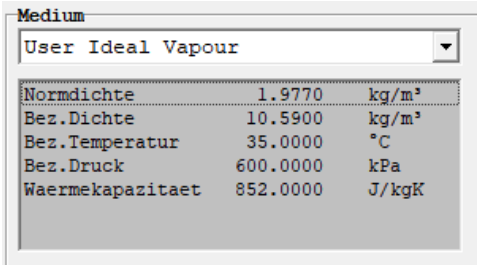
6.2.1.5 Incompressible liquids (user ideal liquid)

If the medium is an incompressible liquid and the thermal expansion is negligible or the temperature range of the application is only small, a constant liquid density and a constant heat capacity can be expected.



6.2.1.6 General Heat Transfer Gas (User Ideal Vapour)

The "User Ideal Vapeur" option supplements the "User gas" setting (6.2.1.3 General gases (user gases, improved ideal gas law)) by a constant heat capacity. This enables the calculation of power and heat quantity.



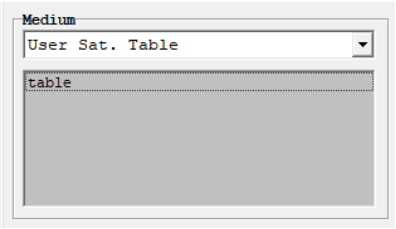
6.2.1.7 General gas or vapour heat transfer medium as table (User Vapour Table)

If the density and enthalpy of a heat transfer medium are available in tabular form, they can be entered via a table editor (for operation see 6.2.1.4 General gases with known compressibility (user table))

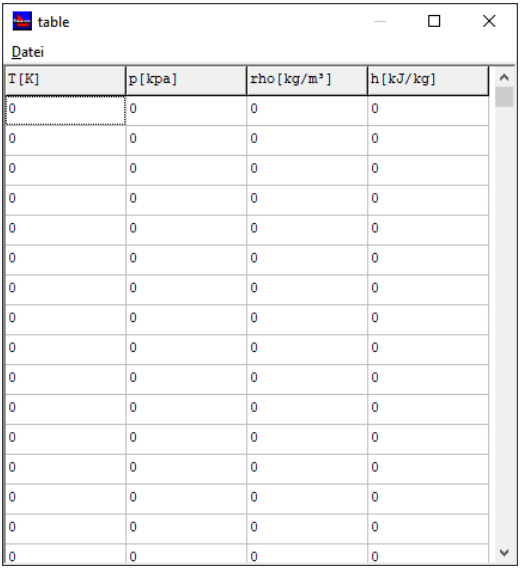
This allows the flowcom to calculate the precise operating density and the precise enthalpy or heat quantity.

6.2.1.8 General saturated steam table (User Sat. Table)

If the medium is a gas at the boiling line (e.g. a refrigerant), a density and enthalpy table along the boiling line can be entered in this option.

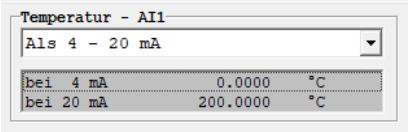


The table editor allows the entry of boiling temperature, pressure and the corresponding values of density and enthalpy.



T[K]	p[kpa]	rho[kg/m³]	h[kJ/kg]
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

6.2.2 Parameterise temperature input



When selecting the temperature input, various options are available. Please note that different jumper settings are necessary at the flowcom depending on the configuration (see Chap. 7.4.3 Temperature inputs).

6.2.2.1 Constant value

The temperature is not measured and a constant temperature value is specified for further calculation.

6.2.2.2 4-20mA

A two-wire measuring transducer 24VDC/4..20mA is connected to the temperature input. The corresponding temperature values must be entered (e.g. 0.. 200°C). Please check the values on your temperature transmitter.

6.2.2.3 PT100/500 2/3-wire

The flowcom allows direct connection of resistance thermometers type PT100 or type PT500 in 2-wire or 3-wire technology.

6.2.2.4 Temperature from circuit 1/2

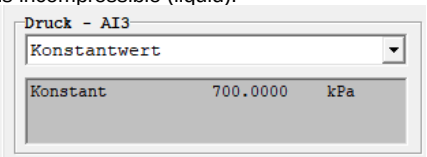
In applications where the temperature is identical to the temperature in the second circuit, the temperature of the other measuring circuit can be transmitted. Then no further temperature measurement is necessary at this measuring circuit.

6.2.3 Parameterise pressure input

Please note that the absolute pressure is used and displayed for density and enthalpy calculations.
The following selection options are available for defining the print input:

6.2.3.1 Constant value:

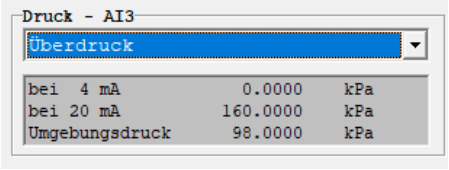
There is no pressure measurement in the measuring circuit, e.g. because the pressure is constant or the medium is incompressible (liquid).



In this case, please enter the process pressure that the flowcom should use for the calculation.

6.2.3.2 Overpressure (relative pressure)

Use this setting if you are using a gauge or relative pressure transmitter 24VDC/4..20mA. Overpressure transmitters provide a current signal proportional to the overpressure in the line compared to the atmosphere.



In addition to the corresponding overpressure values for 4 and 20mA, the average barometer reading at the measuring point must also be specified. the flowcom then calculates the absolute pressure in the line from the measured relative pressure value plus the set ambient pressure.

Relative pressure transmitters can sometimes be recognised by the pressure unit, which has an additional ü (overpressure) or g (gauge) at the end. E.g. 16barü or 6barg. If you are unsure, ask the manufacturer.

Note: Especially in applications with low line pressures, e.g. ambient air or exhaust gas measurements, the use of overpressure transmitters is not recommended, as they do not detect the changes in the barometer reading. The barometer reading can change by +/- 50 mbar in extreme cases (high pressure or low pressure weather conditions), related to 1 bar ambient pressure this is 5% +/- measuring error in the pressure and thus in the density determination.

6.2.3.3 Absolute pressure

When using an absolute pressure two-wire transmitter, this option must be selected. The corresponding measured values of the transducer for 4 and 20mA must be entered.

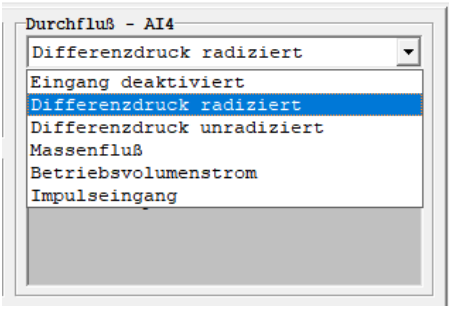
Absolute pressure transmitters can sometimes be recognised by the pressure unit, which has an additional a (absolute) at the end. If you are unsure, ask the manufacturer.

6.2.3.4 Pressure from circuit 1 / 2

In applications where the pressure is identical to the pressure in the second circuit, the pressure of the other measuring circuit can be transmitted. Then no further pressure measurement is necessary at this measuring circuit.

6.2.4 Parameterise flow input

The flowcom can be operated with most flow meters. Both 4.. 20MA signals as well as different frequency inputs can be connected.



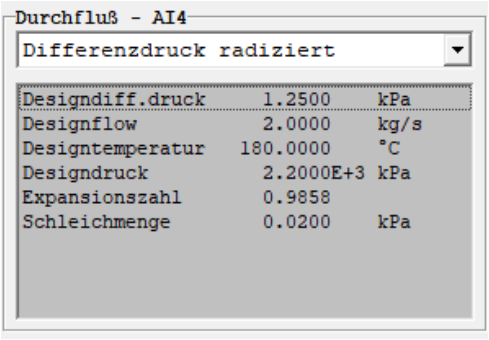
6.2.4.1 Input deactivated

The setting "Flow input deactivated", in the case of the system setting "Flow-return" (see Chap. 3.2 Pre-return balance), the flow signal is taken over from the other measuring circuit. For all other system settings, this setting switches off the channel including all other inputs (p & T).

6.2.4.2 Differential pressure squared

This setting is for flow measurements according to the differential pressure principle, e.g. for primary elements such as orifices, venturis, pitot tubes or nozzles. The input signal is expected to be a two-wire differential pressure transducer, which radicals (roots) the differential pressure signal.

Note: With differential pressure flow measurement, the root must be taken from the differential pressure value when calculating the mass flow. This can be done in the differential pressure transmitter (differential pressure square root) or the flowcom performs the square root (differential pressure unradicalised). If the square root is not taken at any point or if it is taken twice, this will result in a large measuring error! Therefore, please check the settings on your dp transmitter carefully.



The design data refers to the primary element and the set measuring range of the differential pressure transmitter. For this, you need the design sheet of the primary element (probe, nozzle, orifice, venturi...).

Designdiff.pressure: dp end value set at the dp transmitter (4..20mA = 0..Designdiff.pressure)

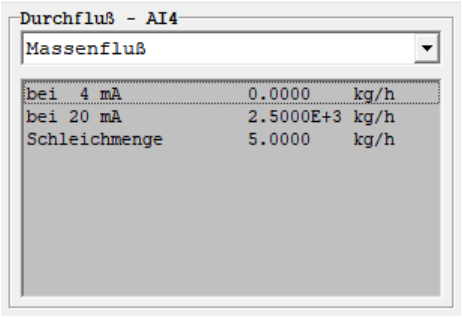
Design flow: Design flow of the primary element (please specify in mass flow, convert if necessary).
Design temperature: Design temperature of the primary element
Design pressure: Design pressure of the primary element
Expansion number: Expansion number at the design point of the primary element (at 100% not at q=2/3), for liquids =1
Creeping flow. Suppresses zero point errors in the flow display of the dp measurement, recommended setting: approx. 0.5-2% of the design differential pressure.

6.2.4.3 Differential pressure unedited

See chapter 6.2.4.2 Differential pressure squared

6.2.4.4 Mass flow

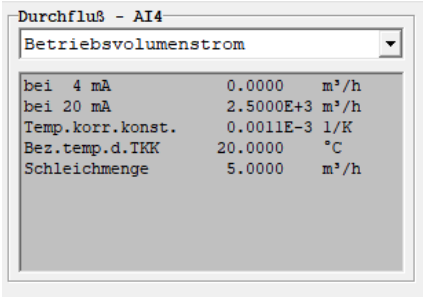
This setting is for flow meters that provide a 4... 20mA output signal that is proportional to the mass flow, e.g. Coriolis flow meters or thermal flow meters.



In addition to the measuring range scaling, a creeping quantity can be specified to suppress the display of very small quantities close to zero flow.

6.2.4.5 Operating volume flow

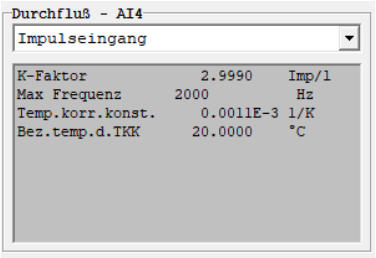
This setting is for volumetric flow meters with 4..20mA output. These are e.g. vortex flow meters, turbines or electromagnetic flow meters (EMF).



Temp.corr.const.: In addition to scaling the volume flow, it is possible to enter a temperature correction for the thermal expansion of the housing. This takes into account the expansion of the measuring cross-section due to temperature changes. If this is not carried out internally, it corresponds to the linear expansion of the housing material (e.g. steel 11+10e-6 1/K).
Ref.temp d. TKK: Reference temperature of the temperature correction constant - temperature from which the expansion is to be calculated (typically 20°C).
Creeping quantity: Minimum quantity suppression below which flows are set to zero.

6.2.4.6 Pulse input

This selection is for volumetric flow meters (similar to chap. 6.2.4.5 Operating volume flow) but with a frequency or pulse output.



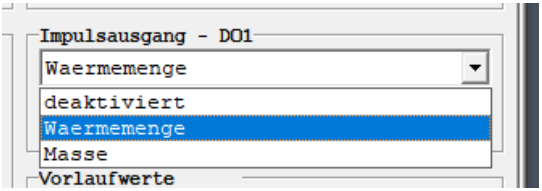
K-factor: Pulse valence
Max frequency: Frequency of the flow meter at the highest flow rate
Temp.corr.const: See Chap. 6.2.4.5 Operating volume flow)
Ref.temp.of TKK: See Chap. 6.2.4.5 Operating volume flow)

6.2.5 Parameterise pulse output

The pulse output for circuit 1 / 2 (DO1 and DO2) are defined in the by entering the pulse value.

The pulse output has a pulse width of 250mSec and a maximum frequency of 1Hz. If the pulse value is too low and a higher frequency than 1Hz is required, the pulse output is automatically deactivated.

Depending on the selection of the medium, the integrated mass, the integrated standard volume or the heat quantity are available as selection variables for the pulse output.



Select the quantity to be output at the pulse output and then define the pulse valence.

6.2.6 Define flow values

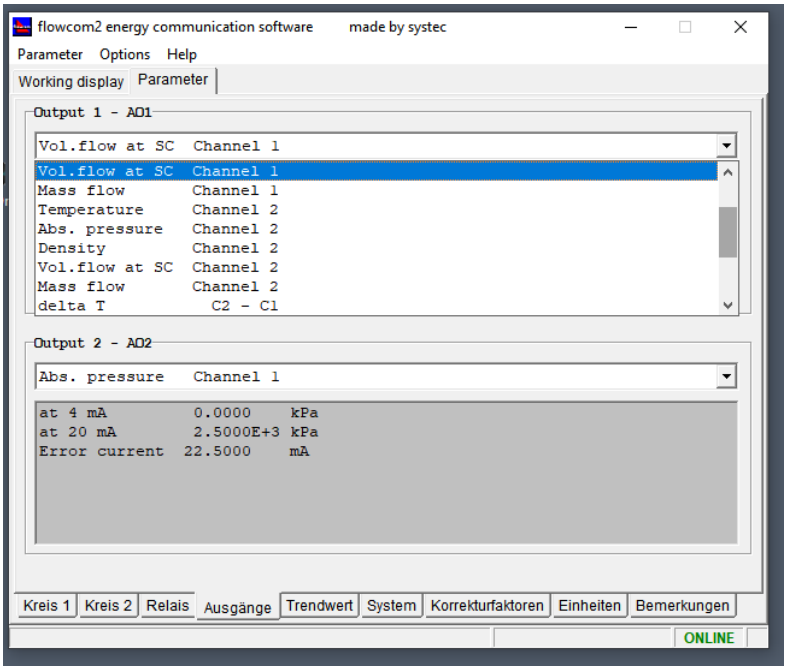
The preliminary values are used to define

6.3 Parameterise outputs

The flowcom has a variety of outputs that can be freely configured.

6.3.1 Parameterise analogue outputs

The flowcom has two analogue outputs 4-20mA which can be assigned to different physical values:



The choice is yours:

- Constant Current: Output of a constant current for checking downstream instruments
- Temperature Channel 1 or 2 or delta T (T2-T1)
- Pressure Channel 1 or 2 or delta p (p2-p1)
- Standard volume flow (Vol.flow at SC) Channel 1 or 2 or delta qV (qV2-qV1) or sum qV (qV2+qV1)
- Mass flow Cannel 1 or 2 or delta qm (qm2-qm1) or sum qm(qm2+qm1)
- Power Channel 1 or 2 or deltaP (P2-P1)
- Density Channel 1 or 2 or deltaRho (Rho2- Rho1)

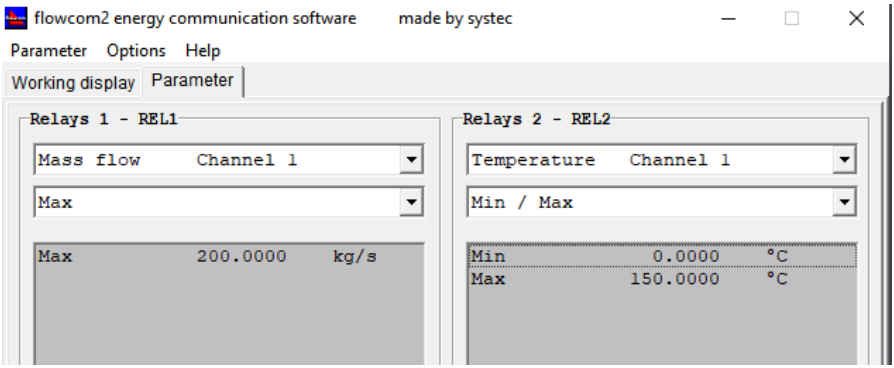
In addition to the range 4..20mA, the error current (<3.6 or >21mA) that is output in the event of an error at the unit can also be entered in the input field.

6.3.2 Parameterise digital / counter outputs (Pulse output)

See 6.2.5 Parameterise pulse output

6.3.3 Parameterise relay

The flowcom has two relays that can be used as function alarms or as limit switches. When used as a limit value, both min-value undershoots and max-value overshoots or both can be used for a switching function of the relay.



In the software, the variable to be monitored can be defined in the upper selection menu in the Parameters/Relay tab, e.g. mass flow rate circuit 1, and the relay function can be defined in the menu below, i.e. Max (relay switches when the set limit value is exceeded) or Min (relay switches when the value falls below the set limit value) or Min/Max (relay switches when the value exceeds or falls below the set limit value).

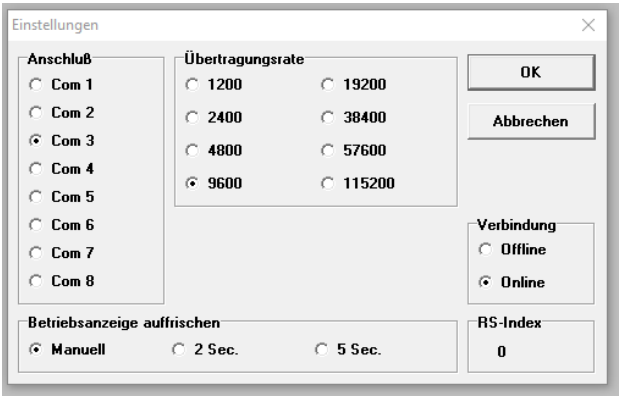
In the picture above, the Relias 1 is set so that the contact switches at a mass flow >200kg/s in circuit 1. The Relias 2 is set so that the relay switches at temperatures below 0°C or above 150 °C in circuit 1.

The following sizes can be selected:

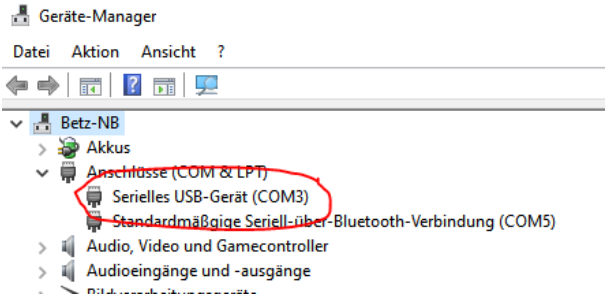
- Malfunction alert: General error on the unit, e.g. cable break on an analogue input.
- Temperature Channel 1 or 2 or delta T (T2-T1)
- Pressure Channel 1 or 2 or delta p (p2-p1)
- Standard volume flow (Vol.flow at SC) Channel 1 or 2 or delta qV (qV2-qV1) or sum qV (qV2+qV1)
- Mass flow Cannel 1 or 2 or delta qm (qm2-qm1) or sum qm(qm2+qm1)
- Power Channel 1 or 2 or deltaP (P2-P1)
- Density Channel 1 or 2 or deltaRho (Rho2- Rho1)
- Power circuit 1 / circuit 2

6.3.4 Parameterise serial interface

The settings of the serial interface (COM port/baud rate) take place in the Options/Settings menu.



The COM interface in the flowcom software must be identical to the assigned COM in the device settings (Windows Device Manager).

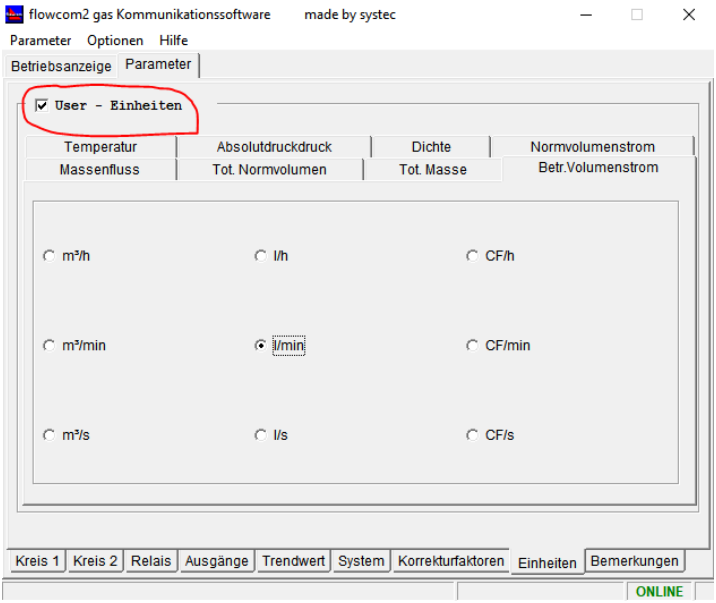


The same applies to the baud rate in the device manager and in the flowcom settings (. It is recommended to leave the 9600 Bps default setting, the overtagging performance is thus sufficiently high.

6.4 Other settings

6.4.1 Set user units

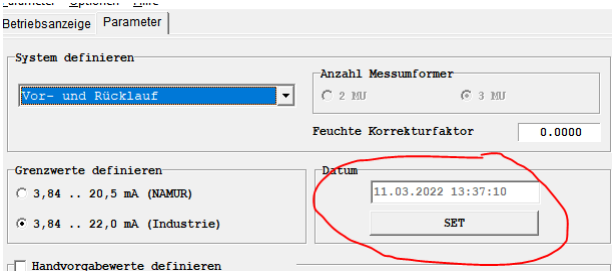
The units displayed on the flowcom are SI units by default. These can be individualised with the operating software. If you are connected to the flowcom (see Chap. 5.1.1 Go online), all entries are automatically converted into the new unit and the indication in the operating display is changed directly.



In the software, select the folder Parameters/Units and activate the selection button "User Units". Then you can select units individually in the subfolders.

6.4.2 Setting the Clock and Date

The date and time can be synchronised in the software with the time on your computer. To do this, select the folder Parameters/System and press the button "SET".



6.4.3 Set password protection

Attention! Make a good note of the password. If you forget your password, a reset is only possible at the factory, and all settings will be lost.

A password can only be set on the unit itself. To do this, press the PROG-Test and go to the menu "gemeinsame Parameter / Common Parameters" and there to the submenu "Setup Password

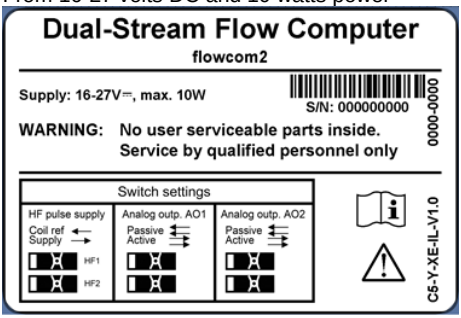
In this menu you can allow or block the reset of the totaliser. After entering a password twice and leaving the setup menu, you can only open it again after entering the correct password.

7 Wiring / Connections

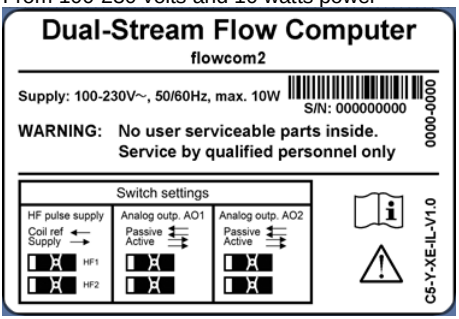
7.1 Supply voltage

The Flowcom2 will be available in two different versions.

1. In a DC voltage version
   From 16-27 volts DC and 10 watts power



2. In an alternating voltage version
   From 100-230 volts and 10 watts power



7.2 Overview of the connections

<table>
<tr><td colspan="3">Power supply 230 volt

P1 : Neutral conductor
P2 : Phase
Earth is connected to the screw
(see chapter 7.4.1)</td><td colspan="3">Power supply 16-27 volt

P1 : - (supply common)
P2 : + (supply plus)
Earth is connected to the screw
(see chapter 7.4.1)</td></tr>
<tr><td colspan="6">Temperature inputs</td></tr>
<tr><td colspan="2">T1: Temperature Pt +
T2: Temperature Sense +
T3: Temperature Pt-</td><td>AI 1</td><td colspan="2">T4: Temperature Pt +
T5: Temperature Sense +
T6: Temperature Pt-</td><td>AI 2</td></tr>
<tr><td colspan="6">Frequency inputs</td></tr>
<tr><td colspan="2">S1: Ground
S2: Signal
S3: Power supply +</td><td>HF1</td><td colspan="2">S4: Signal
S5: Power supply +
S6: Ground</td><td>HF2</td></tr>
<tr><td colspan="6">Analogue inputs</td></tr>
<tr><td>Passive</td><td>Active</td><td></td><td>Passive</td><td>Active</td><td></td></tr>
<tr><td>T8: Ground
T9: Analogue In +</td><td>Analogue In +
Analogue In -</td><td>AI 3</td><td>E3: Ground
E4: Analogue In +</td><td>Analogue In +
Analogue In -</td><td>AI 5</td></tr>
<tr><td>E1: Ground
E2: Analogue In +</td><td>Analogue In +
Analogue In -</td><td>AI 4</td><td>E5: Ground
E6: Analogue In +</td><td>Analogue In +
Analogue In -</td><td>AI 6</td></tr>
<tr><td colspan="6">Digital inputs</td></tr>
<tr><td colspan="2">S8: Digital input</td><td>4</td><td colspan="2">S7: Digital input</td><td>3</td></tr>
<tr><td colspan="6">Digital outputs</td></tr>
<tr><td colspan="2">R1: Digital output -
R2: Digital output +</td><td>DO1</td><td colspan="2">R3: Digital output -
R4: Digital output +</td><td>DO2</td></tr>
<tr><td colspan="6">Analogue outputs</td></tr>
<tr><td>Passive</td><td>Passive</td><td></td><td>Passive</td><td>Passive</td><td></td></tr>
<tr><td>A1: Analogue output -
A2: Analogue output +</td><td>Analogue output -
Analogue output +</td><td>AO1</td><td>A3: Analogue output -A4: Analogue output +</td><td>Analogue output
Analogue output +</td><td>AO2</td></tr>
</table>

Relay			
R5: Relay R6: Relay	REL 1	R7: Relay R8: Relay	REL 2
Communication ports			
C1: Ground C2: RxD C3: TxD	RS232	C4: Ground C5: A C6: B	RS485

Note: The polarity changes for the analogue inputs, this is not the case for all other connections.

7.3 Connection positions of temperature and analogue input

	Standard 2 channel			Other
Pi⇔	**Channel 1**	**Channel 2**		**For mean value and splitting range**
AIn1 (pt or analogue)	T1 (temperature)			T1 (temperature)
AIn2 (pt or analogue)		T2 (temperature)		
AIn3 (Analogue)	P1 (pressure)			P1 (pressure)
AIn4 (Analogue)	dp1 (differential pressure) or Q1: flow rate			dp1,1 Differential pressure upper range
AIn5 (Analogue)		dp2 (differential pressure) or Q2: flow rate		dp1,2 Differential pressure duller or lower range
AIn6 (analogue)		p2 (pressure)		dp1.3 Differential pressure lower range

7.4 Inputs

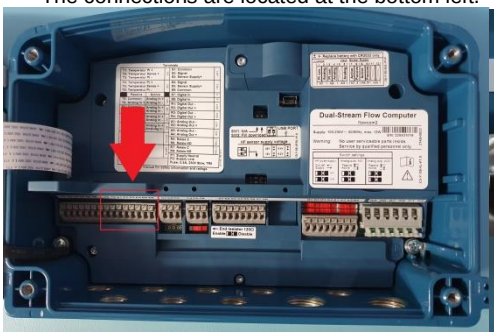
7.4.1 Power supply

Power is supplied via terminals P1 and P2 and the earthing screw.

7.4.2 Analogue inputs

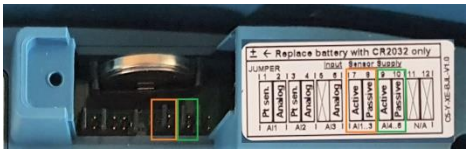
The analogue inputs operate in the range of 4-20mA, these can be operated from both active and passive.

The connections are located at the bottom left.



Passive	Active	
T8: Ground T9: Analogue In +	Analogue In + Analogue In -	AI 3
E1: Ground E2: Analogue In +	Analogue In + Analogue In -	AI 4
E3: Ground E4: Analogue In +	Analogue In + Analogue In -	AI 5
E5: Ground E6: Analogue In +	Analogue In + Analogue In -	AI 6

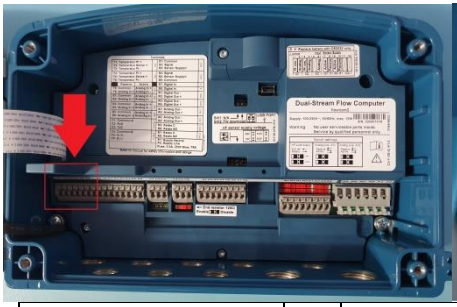
It is important to note that the polarity changes when changing from active to passive.



AI 3 is plugged from active to passive with the jumper in the orange field (in the picture the connection is active).
AI 4; AI 5 and AI 6 are plugged from active to passive with the jumper in the green field (in the picture the connection is active), these connections cannot be individually switched active or passive.

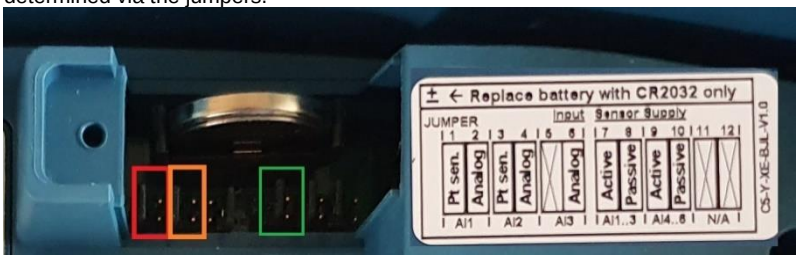
7.4.3 Temperature inputs

The temperature inputs can be operated with PT100 and PT500 as well as via 4-20 mA.



T1: Temperature Pt + T2: Temperature Sense + T3: Temperature Pt-	AI 1	Two- and three-wire sensors can be used for the PT100 and PT500. With three-wire sensors, the third cable must be connected at Sense +.
T4: Temperature Pt + T5: Temperature Sense + T6: Temperature Pt-	AI 2	

Whether the inputs are controlled via PT100/PT500 or via 4-20 mA is again determined via the jumpers.



The jumper in the red rectangle determines the T1-T3 inputs.
The jumper in the orange rectangle determines the T4-T6 inputs.

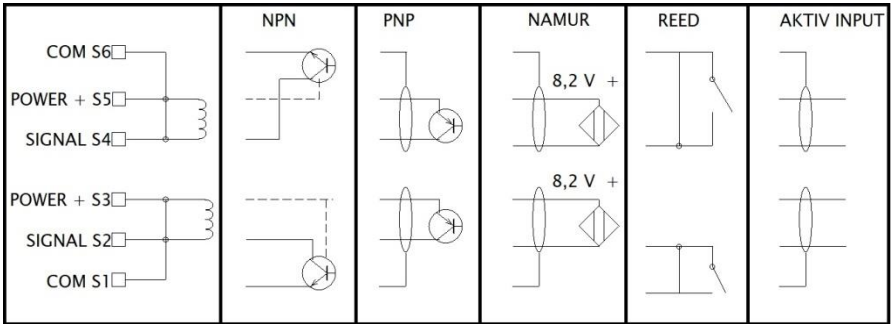
If the jumper is on the left (as in the picture), the inputs are used for the PT sensors, if the jumper is on the right, they are controlled via the 4-20mA.

If the inputs are operated with 4-20mA, the jumper in the green rectangle can be used to determine whether they are switched actively (left) or passively (right).

7.4.4 Frequency inputs

The two frequency inputs can be operated up to 10 kHz.
The following circuits can be made.


S1 S2 S3 S4 S5 S6 S7 S8
End resistor 120Ω
Enable
Disable


COM S6
POWER + S5
SIGNAL S4
POWER + S3
SIGNAL S2
COM S1
NPN
PNP
NAMUR
8,2 V +
8,2 V +
REED
AKTIV INPUT

7.5 Outputs

7.5.1 Analogue outputs

The analogue inputs operate in the range of 4-20mA, these can be operated from both active and passive.

Passive	Passive		The two analogue outputs can be switched from active to passive with the red dip switches directly above the connectors. Left=passive Right=Active
A1: Analogue output - A2: Analogue output +	Analogue output - Analogue output +	AO1	
A3: Analogue output - A4: Analogue output +	Analogue output Analogue output +	AO2	

7.5.2 Digital outputs

The digital outputs operate in the range of 6-27 volts, at a maximum of 100Hz and 100mA.

R1: Digital output - R2: Digital output +	DO1
R3: Digital output - R4: Digital output +	DO2

7.6 USB

The USB port (mini-USB) is used to transfer data created with the Flowcom software.

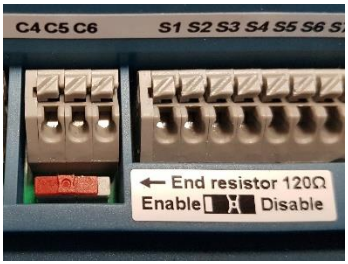
7.7 RS485/Modbus

From firmware revision 1.1.0, the Flowcom2 offers the option of reading out calculated and measured values via Modbus.

7.7.1 General

- Mode: RTU
- ID range: 0..15
- Address range: 40001..40077
- Baud rate: 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200
- Parity bit: none
- Data bits: 8
- Stop bits: 1
- Representation: Big Endian

7.7.2 Terminals



C4: Common C5: A C6: B	RS48

7.7.3 Setup

The settings for the Modbus interface can be made in the "Modbus" menu. The ID and baud rate can be customised to personal requirements here.

7.7.4 Registers

	Gases		Water/Steam	
Slave Address		Unit		Unit
40001	Density CH1	kg/m³	Density CH1	kg/m³
40003	Pressure CH1	kPa	Pressure CH1	kPa
40005	Temperature CH1	°C	Temperature CH1	°C
40007	Mass Flow CH1	kg/h	Mass Flow CH1	kg/h
40009	Standard Volume Flow CH1	Nm³/h	Power CH1	kW
40011	Total Mass CH1	kg	Total Mass CH1	kg
40013	Total Volume CH1	Nm³	Work CH1	kWh
40015..40032	Reserved			
40033	Density CH2	kg/m³	Density CH2	kg/m³
40035	Pressure CH2	kPa	Pressure CH2	kPa
40037	Temperature CH2	°C	Temperature CH2	°C
40039	Mass Flow CH2	kg/h	Mass Flow CH2	kg/h
40041	Standard Volume Flow CH2	Nm³/h	Power CH2	kW
40043	Total Mass CH2	kg	Total Mass CH2	kg

40045	Total Volume CH2	Nm³	Work CH2	kWh
40047..40064	Reserved			
40065	Density CH2-CH1	kg/m³	Density CH2-CH1	kg/m³
40067	Pressure CH2-CH1	kPa	Pressure CH2-CH1	kPa
40069	Temperature CH2-CH1	K	Temperature CH2-CH1	K
40071	Mass Flow CH2-CH1	kg/h	Mass Flow CH2-CH1	kg/h
40073	Standard Volume Flow CH2-CH1	Nm³/h	Power CH2-CH1	kW
40075	Total Mass CH2-CH1	kg	Total Mass CH2-CH1	kg
40077	Total Volume CH2-CH1	Nm³	Work CH2-CH1	kWh

7.8 RS232

Currently not yet in function.

8 Declaration of conformity

EC Declaration of Conformity

For the unit

FLOWCOM2

is hereby confirmed to comply with the essential protection requirements laid down in the following Council Directives on the approximation of the laws of the Member States:

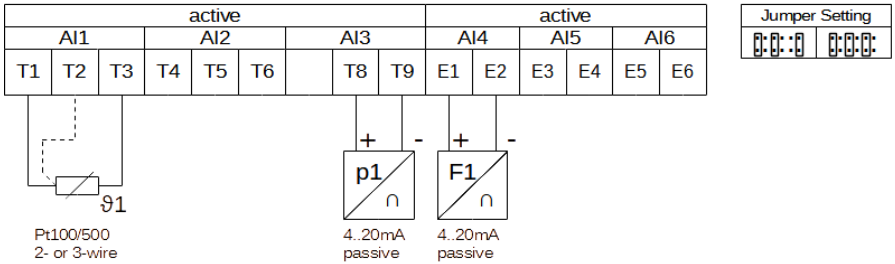
Electromagnetic compatibility	2014/30/EU	EN 61000-6-2:2005 EN 61000-6-3: 2007 /A1:2011 EN 61326-1:2013
RoHS	2011/65/EU	EN 50581:2012 (and current amendments) EN IEC 63000:2018
Low Voltage Directive	2014/35/EU	EN 61010-1:2010/A1:2019

The conformity of the device is ensured

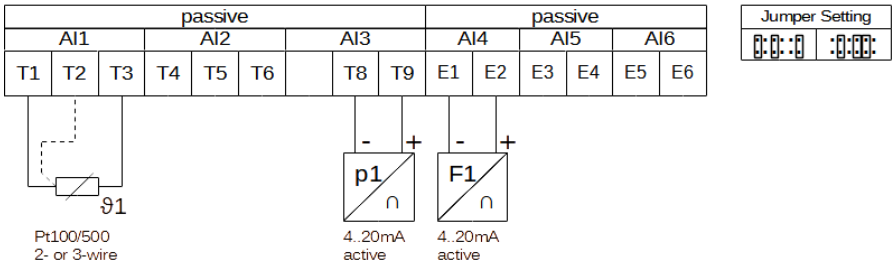
The manufacturer declares sole responsibility:
systec Controls Mess- und Regeltechnik GmbH, Lindberghstraße 4, D - 82178 Puchheim, Germany

Appendix A – Input Configurations

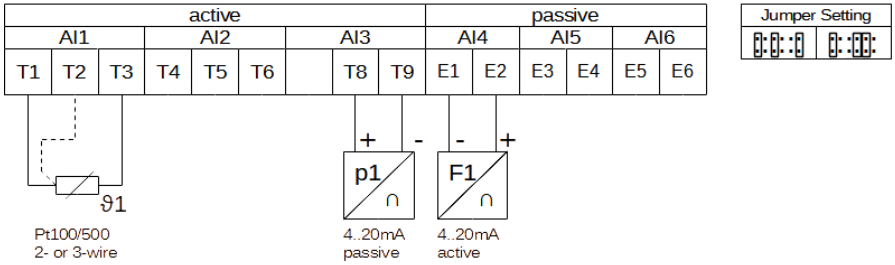
1 Channel – RTD / active inputs



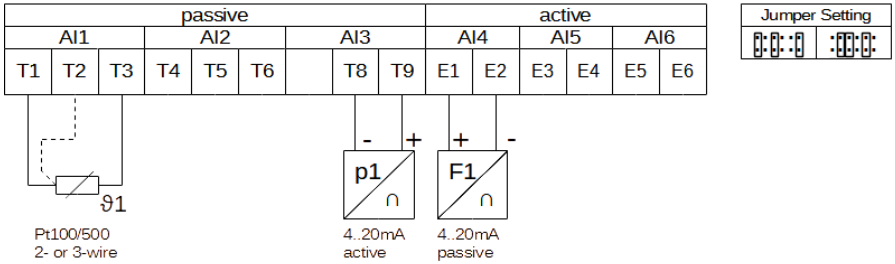
1 Channel – RTD / passive inputs



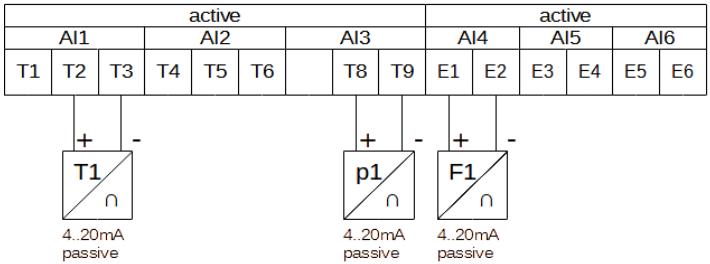
1 Channel – RTD / active and passive inputs

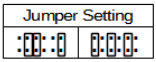


1 Channel – RTD / passive and active inputs

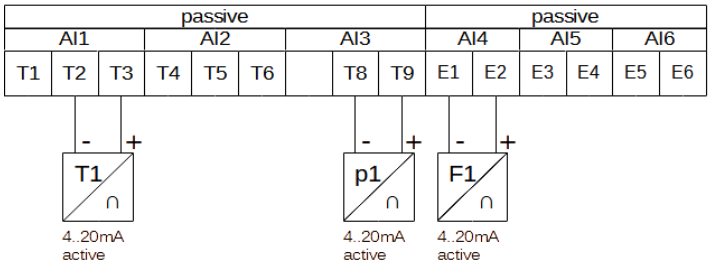


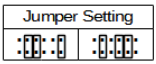
1 Channel – active inputs



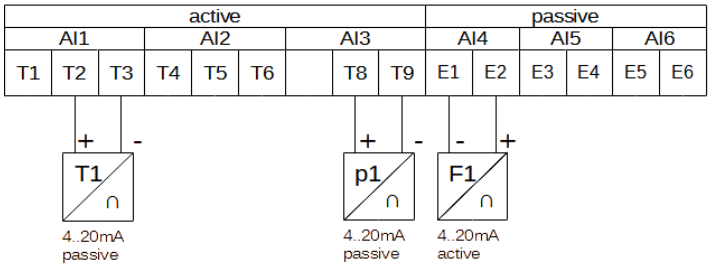


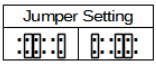
1 Channel – passive inputs



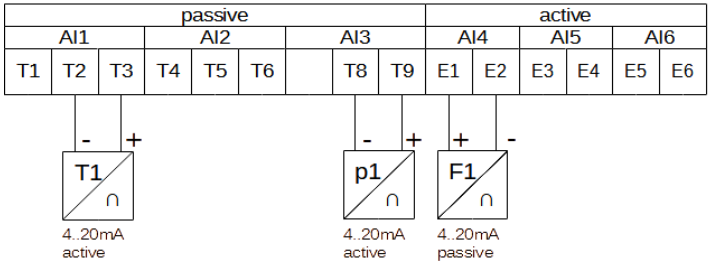


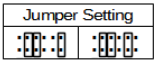
1 Channel – active and passive inputs



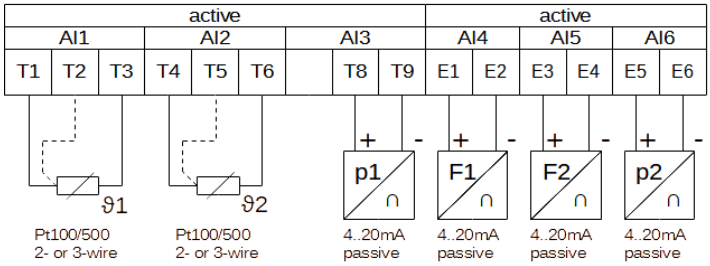


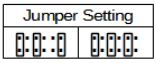
1 Channel – passive and active inputs



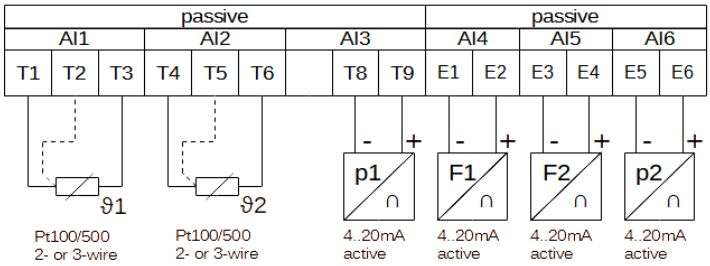


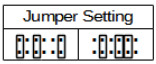
2 Channel – RTD / active inputs



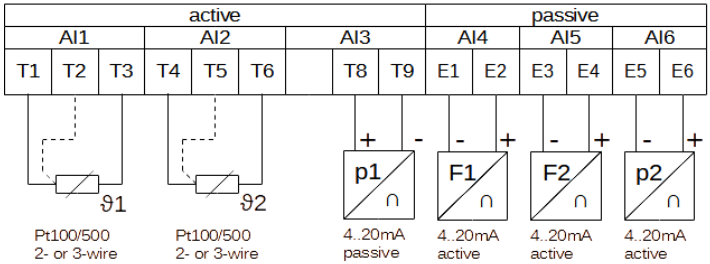


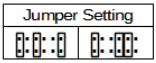
2 Channel – RTD / passive inputs



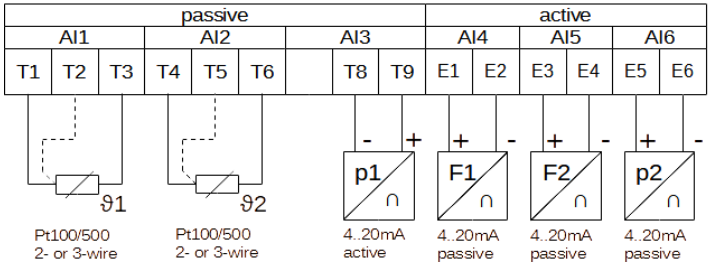


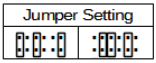
2 Channel – RTD / active and passive inputs



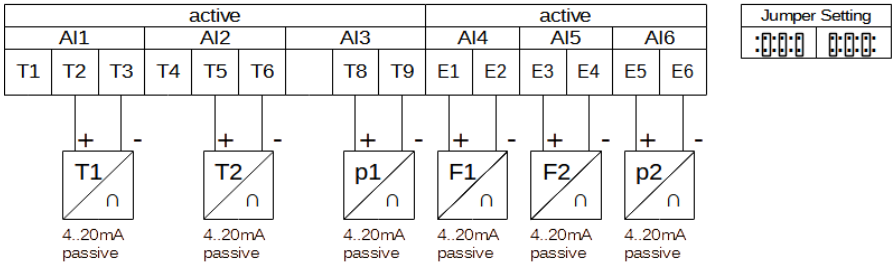


2 Channel – RTD / passive and active inputs

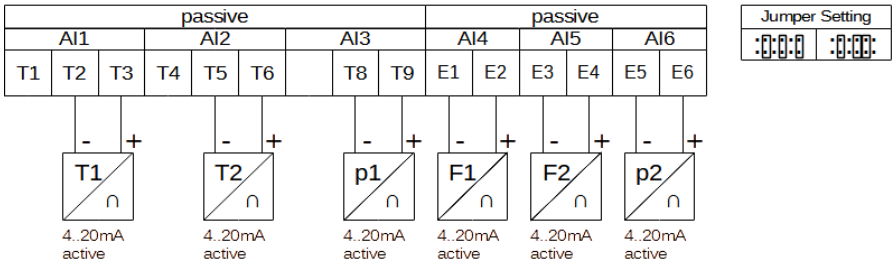




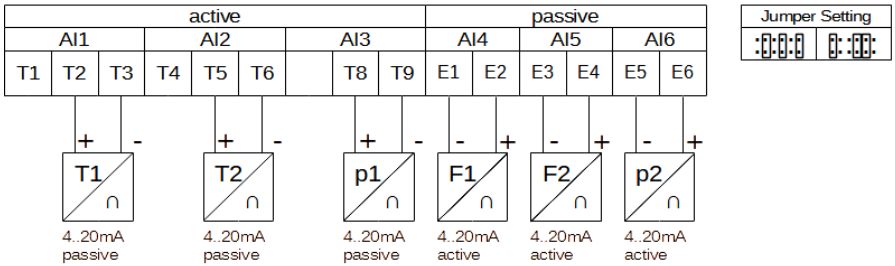
2 Channel – active inputs



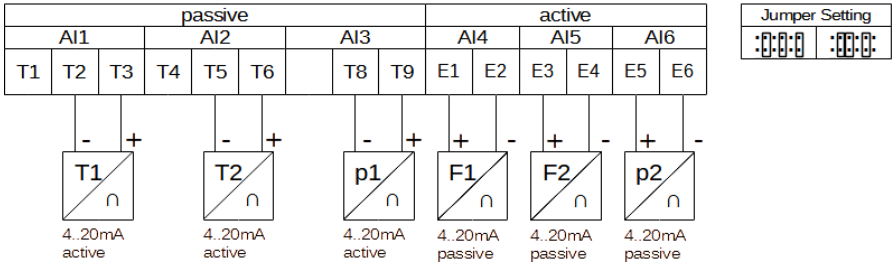
2 Channel – passive inputs



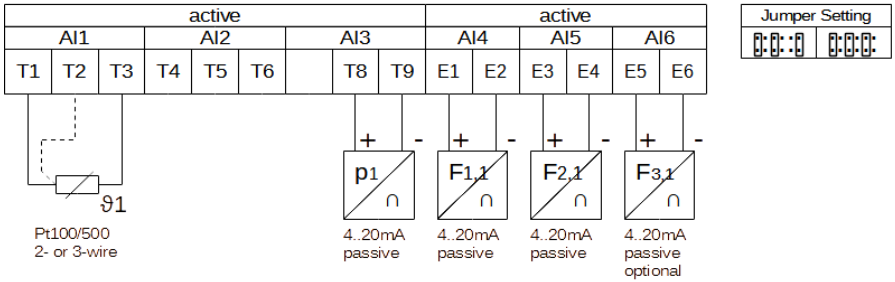
2 Channel – active and passive inputs



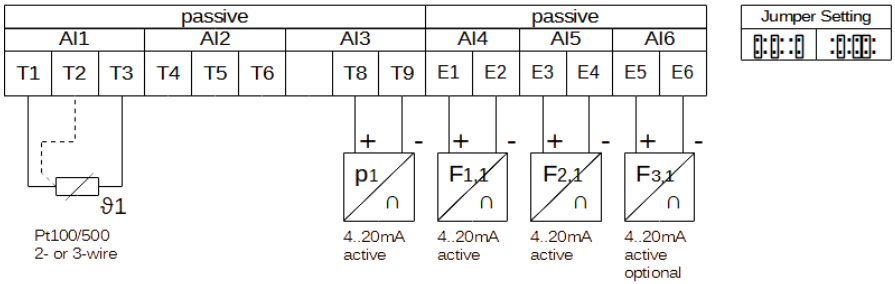
2 Channel – passive and active inputs



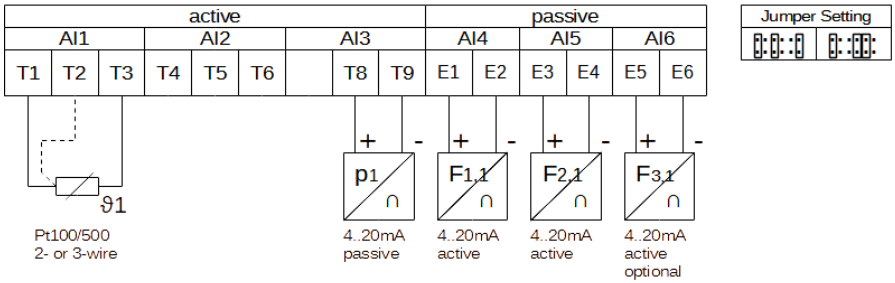
Splitting-Range / Average – RTD / active inputs



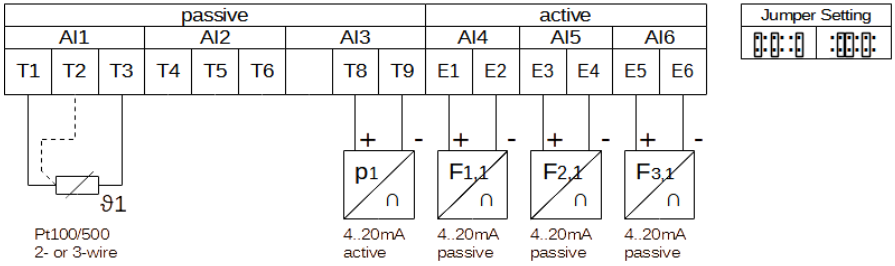
Splitting-Range / Average – RTD / passive inputs



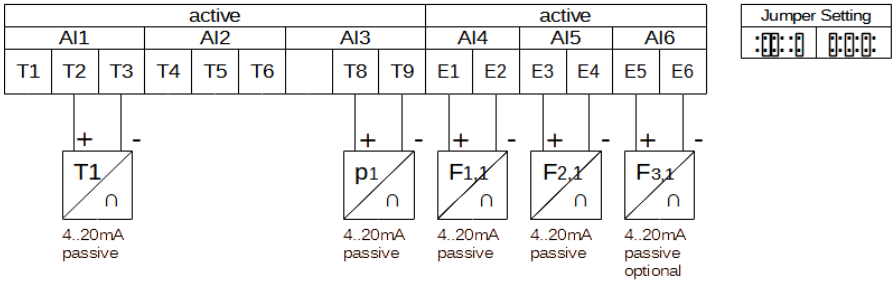
Splitting-Range / Average – RTD / active and passive inputs



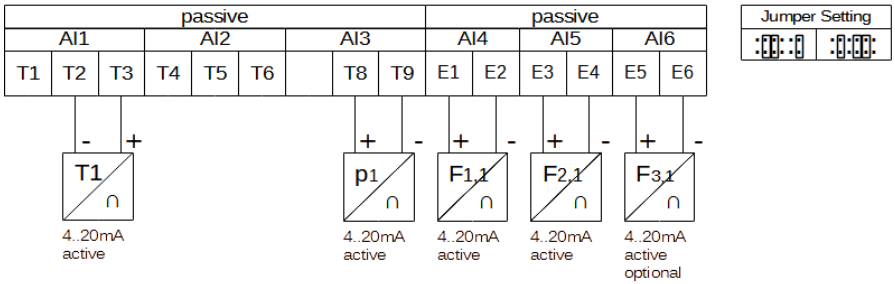
Splitting-Range / Average – RTD / passive inputs



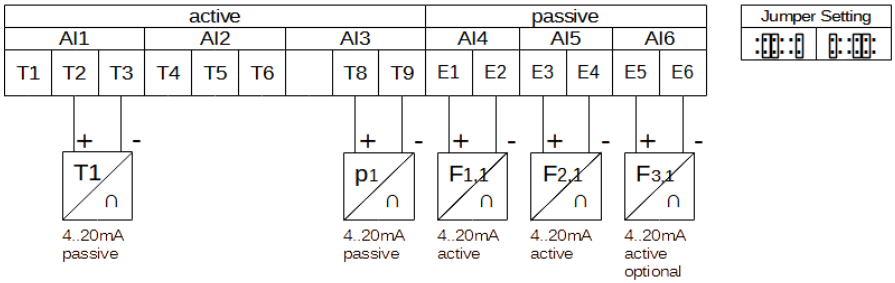
Splitting-Range / Average – active inputs



Splitting-Range / Average – passive inputs



Splitting-Range / Average – active and passive inputs



Splitting-Range / Average – passive and active inputs