



Instructions manual



HART[®]
COMMUNICATION PROTOCOL

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1 INTRODUCTION

The electronic transmitters CP420P ... CH420P are panel mounting modules designed to work with Tecfluid's volumetric counters (series COVOL) and turbines (series TM). The instruments are supplied already configured for the type of input.

The circuit is based on a microprocessor that, in function of the programmed pulses per litre, calculates the flow rate and totalizes the volume that flows through the meter and shows these values on a local indicator. The measuring units can be programmed.

The CH420P differs from CP420P in that it is also HART™ protocol compatible.

2 INSTALLATION

2.1 Electrical connection

For the electrical connection, the CP420P has two screw terminals. In order to make easier the connection, the description of the terminals is marked on the back cover of the equipment.

For the electrical installation it is recommended to use multiple conductor cables with individual cable sections in the order of 0.25 to 0.5 mm² in order to make it easier to connect.

Peel the outside insulation to free the inner cables.



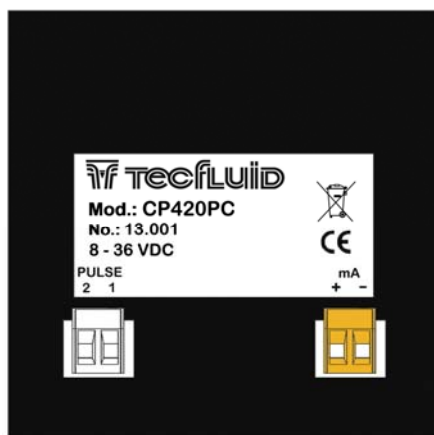
IMPORTANT NOTE: To ensure successful operation, it is recommended to do the connection according the following points:

For output signals, use shielded cable when possible.

Move away the cables from strong sources of noise.

2.2.1 Power supply and current loop

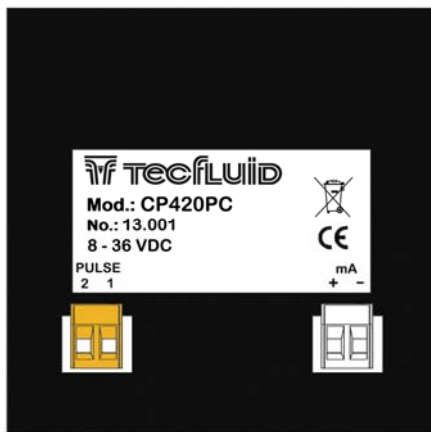
Before connecting the power supply, you must be sure that the supply voltage is the correct for the installation. The power supply voltage is indicated on the label of the transmitter.



The connection is made in the terminal block marked as mA. The positive terminal of the power supply is connected to the position + and the positive terminal of the load in the position -. The negative terminals of the power supply and the load are connected together. The instrument works in a 2-wire system, that is, the supply and signal line is the same.

2.2.2 Pulse input

The connection is made in the terminal block marked as PULSE. Details for this connection are in the point 8.5 of this manual.



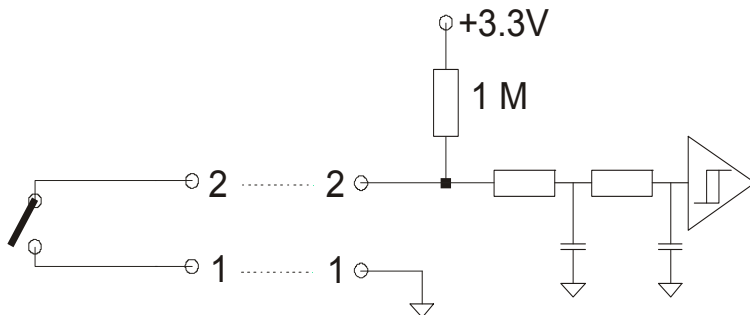
NOTE: The input terminals are not isolated from the 4-20 mA loop. An electrical connection between the 4-20 mA loop and the inputs must NEVER be made. In the event of supplying various transmitters with the same power supply one must make sure that the inputs isolated each other.

Series COVOL input

If the Pulse input is configured for series Covol (jumpers in position 2-3), a potential free contact can be connected between terminals 1 & 2. Terminal 1 is connected to the common of the instrument.

This input has a 1 M Ω pull-up resistor connected to terminal 2 and to the 3.3 V power supply. The input has a hysteresis with the switching points situated at about 1 V & 2.1 V.

If an open collector transistor is to be used as the switching element instead of a COVOL, then the aforementioned parameters must be taken into account.



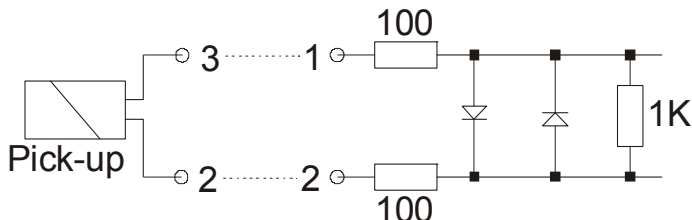
Due to the presence of a filter to avoid the effects of contact bounce, the maximum pulse frequency for the COVOL input is 300 Hz.

The minimum input frequency is 0.06 Hz

Series TM input

If the Pulse input is configured for series TM (jumpers in position 1-2), a coil of a magnetic pick-up can be connected between terminals 1 & 2.

The input impedance is 1,2 K Ω . This input is protected to limit the maximum applied voltage to the circuit. This protection consists of two diodes in parallel and two 100 Ohm resistors.



The maximum voltage that can be applied to the input is 10 Vpp. Higher voltages can cause damage to the equipment.

The maximum input frequency is 5000 Hz and the minimum input voltage is 7 mVpp

3 OPERATION

If the instrument has not been previously programmed or, due to an alteration in the data memory, the instrument recovers the default factory values, then the display will show "PRESET". This indication will disappear when the programming sequence has been completed.

There are four push buttons with the following functions:



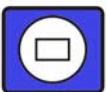
(Left arrow) To change to the next digit.
To change the volume units.
With "Escape", to reset the totalizer.



(Up arrow) to increase the digit.
To change the flow rate units.
With "Enter", to visualize the serial number of the instrument.



(Enter) To validate data.
With "Up arrow", to visualize the serial number of the instrument.



(Escape) To exit from a menu without validating data.
With "Left arrow", to reset the totalizer.

3.1 Programming

In order to obtain a real flow rate and volume, the pulses/litre factor specified in the flow meter must be programmed.

In all the programming screens, the key "Escape" exits the screen without saving the data into the memory, even if changes in the digits have been made or not .

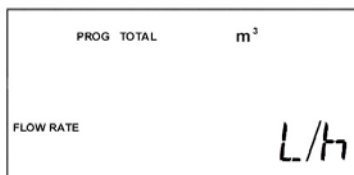
By pushing the key "Enter", the display will change to the programming mode. In this mode there are 7 digits (four whole numbers and three decimals). The value that must be introduced is the pulses per litre factor given on the label of the COVOL or Turbine.



To do this, pressing the key "Up arrow", the blinking digit will increase. If the value reaches 9, by pressing this key the digit returns to zero.

Once the desired value of the digit is achieved, by pressing the key "left arrow", the cursor will pass to the next digit to be modified. On the seventh digit, by pressing this key the cursor will pass to the first digit on the display.

When the value of the pulses per litre is correct, by pushing the key "Enter", the value will be automatically saved into the memory and the units selection screen will appear.



To change the flow rate units, the key "Up arrow" must be pressed. To change the totaled volume units, the key "Left arrow" must be pressed.

The possible flow rate and totaled volume units are the following:

Flow rate:

There are 9 combinations made from 3 volume units and 3 time units.

Volume	/	time
l (litres)	/	s (second)
m3 (cubic meters)	/	m (minute)
ga (US gallons)	/	h (hour)

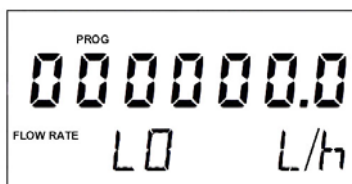
Totalized volume:

There are 3 possible volume units, l (litres), m3 (cubic meters), ga (US gallons)

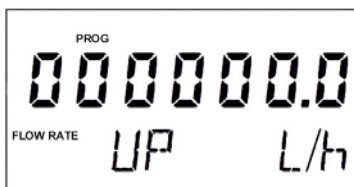
Note: 1ga = 3.785 litres.

With the working units chosen, by pressing the key "Enter", we go to the current loop programming.

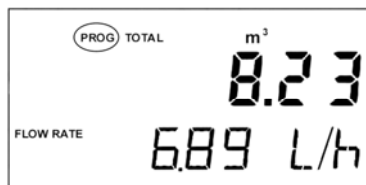
In the first screen we program the flow rate equivalent to 4 mA (lower range). The measuring units will be the ones chosen in the previous screen. The keys have the same function as the pulses per litre programming.



After that, we program the flow rate equivalent to 20 mA (upper range).



In a CH420P, if during the programming sequence we receive a HART™ command that must be attended, the local programming will not be valid and all the data previously programmed will be lost. The screen will return to the normal working model and the word PROG will light on the screen, indicating this event. To remove the word PROG from the display, press key "Up arrow" or "Left arrow".



3.2 Serial number indication

By pressing the keys "Up arrow" and "Enter" at the same time, the display will show the serial number. To return to the usual screen, press any key.

3.3 Reset

By pushing the keys "Left arrow" and "Escape" at the same time, the counter will be set to zero and it will continue to count.

4 MAINTENANCE

No special maintenance is required.

5 MEASUREMENT ERROR CORRECTIONS

The calibration of the mechanical flowmeters is made with water at 20°C to obtain a calibration for a liquid of density 1 kg/l and viscosity of 1 mPa·s. If the flowmeter is used with a liquid of characteristics different than the above mentioned or for reasons of turbulences in the flow, measurement errors can be induced.

To correct these types of errors we can modify the pulses per litre factor programmed in the instrument.

Example 1 - Shortage of volume

If we have a flowmeter body which specifies $i/l = 1.985$, and when we check the volume of a batch, we find that instead of having 100 litres as programmed, we only have 95 litres (5% less), then we must apply the following correction:

i/l	= Original Pulses per litre Factor	= 1.985
V	= Expected Volume	= 100
V_r	= Real Volume	= 95
$i/l\ n$	= New pulses per litre factor	= ? (2.089)

$$i/l\ n = i/l \frac{V}{V_r}$$

Example 2 - Excess of volume

If we have a flowmeter body which specifies $i/l = 1.985$, and when we check the volume of a batch, we find that instead of having 100 litres as programmed, we only have 105 litres (5% more), then we must apply the following correction:

i/l	= Original Pulses per litre Factor	= 1.985
V	= Expected Volume	= 100
V_r	= Real Volume	= 105
$i/l\ n$	= New Pulses per litre Factor	= ? (1.887)

$$i/l\ n = i/l \frac{V}{V_r}$$

6 HART™ COMMUNICATION

The CH420P transmitters have a HART™ communication MODEM.

The details of the characteristics with respect to the HART™ communication are available in the appropriate Field Device Specification.

Resume of the principal communications characteristics:

Manufacturer, Model and Revision	Tecfluid S.A., CH420P, Rev. 0
Device type	Transmitter
HART™ Revision	6.0
Device Description available	No
Number and type of sensors	1, external
Number and type of actuators	0
Number and type of host side signals	1, 4 – 20 mA analog
Number of Device Variables	2
Number of Dynamic Variables	1
Mappable Dynamic Variables	No
Number of Common Practice Commands	13
Number of Device Specific Commands	2
Bits of Additional Device Status	12
Alternative operating modes?	No
Burst mode?	No
Write Protection?	Yes

Analog loop electrical characteristics for communications :

Reception Impedance :

Rx	>	8,5 MΩ
Cx	<	200 pF

7 KEYBOARD INHIBITION AND “WRITE PROTECT”

The transmitter has a jumper situated behind the PCB at the top left corner, which can be used to avoid changes in the configuration. When the jumper is removed, the keyboard is disabled and the HART™ write protect is activated, thus inhibiting any changes in the configuration.

To gain access, remove the frame from the housing and remove the front plate forward.

8 TECHNICAL CHARACTERISTICS

8.1 Power supply

2 wires, by means of the current loop.

The instrument has a protection diode to avoid damage if the power supply is connected with inverted polarity .

Nominal voltage:	8 ... 36 VDC
Power consumption:	≤ 20 mA

8.2 Totalizer

N. of digits:	7
Size of the digit:	8 mm

Reset:	By means of keyboard
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8.3 Flow rate Indication

N. of digits:	5
Size of the digit:	5 mm

8.4 Housing

Ingress protection (once installed in a panel):

Back	IP30
Front	IP50

Silicone sleeves for the front side, for an IP65 ingress protection, are available.

Ambient temperature range:	0 ... +60 °C
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8.5 Input terminals

The pulse input is connected to a screw terminal block marked as Pulse. Numeration is as following.

<u>Terminal n.</u>	<u>Series COVOL</u>	<u>Series TM</u>
1	Common	Live
2	Live	Live

8.6 General

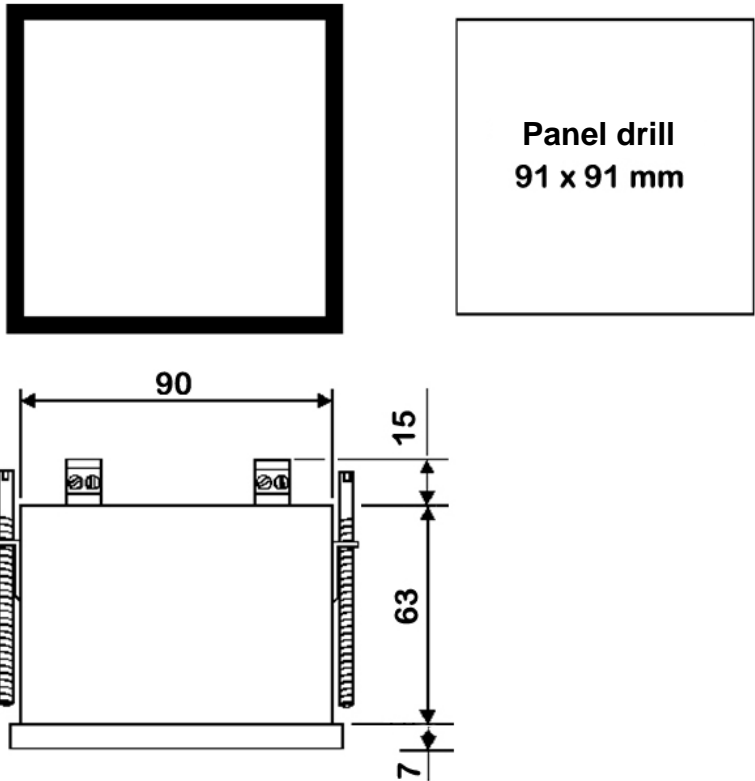
This material conforms with the following directives:

2004/108/EC Electromagnetic Compatibility.

2002/96/EC Waste electrical and electronic equipment.



9 **DIMENSIONS**



10 **MODELS**

C	—	420	—	—	C series COVOL input
				T	series TM input
			L		Local mounting on the flow meter
			R		DIN rail mounting inside a switchboard
			P		Panel mounting
P					Transmitter with analog output
H					Transmitter with analog output and HART™ communication

WARRANTY

Tecfluid S.A. guarantees all the products for a period of 24 months from their sale, against all faulty materials, manufacturing or performance. This warranty does not cover failures which might be imputed to misuse, use in an application different to that specified in the order, the result of service or modification carried out by personnel not authorized by Tecfluid S.A., wrong handling or accident.

This warranty is limited to cover the replacement or repair of the defective parts which have not damaged due to misuse, being excluded all responsibility due to any other damage or the effects of wear caused by the normal use of the devices.

Any consignment of devices for repair must observe a procedure which can be consulted in the website www.tecfluid.com, "After-Sales" section.

All materials sent to our factory must be correctly packaged, clean and completely exempt of any liquid, grease or toxic substances.

The devices sent for repair must enclose the corresponding form, which can be filled in via website from the same "After-Sales" section.

Warranty for repaired or replaced components applies 6 months from repair or replacement date. Anyway, the warranty period will last at least until the initial supply warranty period is over.

TRANSPORTATION

All consignments from the Buyer to the Seller's installations for their credit, repair or replacement must always be done at freight cost paid unless previous agreement.

The Seller will not accept any responsibility for possible damages caused on the devices during transportation.



Instrumentation for fluids

TECFLUID, S.A. design and manufacture instrumentation for flow and level measurement using the most advanced techniques.
May you need more information, please contact us.

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The technical data described in this manual are subject to modification without notification if the technical innovations in the manufacturing processes so require.