



## Instructions manual

### Series CP

CP ... CH420 converters



The art of measuring

## PREFACE

Thank you for choosing a product from Tecfluid S.A.

This instruction manual allows the installation, configuration, programming and maintenance. It is recommended to read it before using the equipment.

## WARNINGS

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## 1 INTRODUCTION

The electronic transmitters CP420L and CH420L are designed to work with flowmeters 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 k factor (pulses per litre) programmed, 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 CH420L differs from CP420L in that it is also HART protocol compatible.

## 2 MODELS

C	-	420	-	-	
				C	COVOL input
				T	TM input
			L		Local mounting on flowmeter (IP65)
			R		DIN rail mounting inside a de un cuadro
P					Transmitter with analog output
H					Transmitter with analog and HART communication

## 3 ELECTRICAL CONNECTION

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 mm<sup>2</sup> in order to make it easier to connect.

In some cases, susceptible to interference, it will be necessary to use shielded cable.

In the model CP ... CH420L, before starting the electrical installation, check that the PG9 cable gland is the right size for the cables to be used. This will guarantee the instrument will stay watertight. The cable gland is for cables with outside diameters between 3.5 and 7 mm.

To connect the cables, peel the outer insulation to free the inner cables. It is recommended to tin the ends of the wires to avoid loose ends. Finally, screw down in the corresponding positions of the terminal strip.

To help in the wiring of the equipment, the description of the terminals is marked on the printed circuit next to each terminal strip.



Before starting the connection of the equipment, check that the supply voltage available is the same as marked on the label of the instrument.

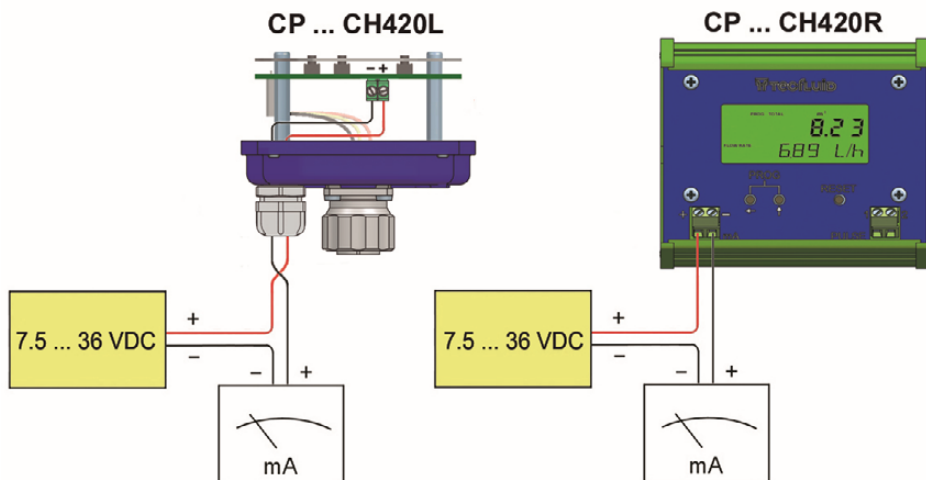
### 3.1 Power supply and analog output

The positive terminal of the power supply is connected to the position + and the positive terminal of the load to the position -. The negative terminals of the power supply and the load are connected together. Since it is a 2-wire instrument, the supply and signal line is the same. It is recommended to use a twisted pair wiring or shielded cable to avoid interferences in the current loop.

In the CP ... CH420L, the 4-20 mA loop is connected to the screw terminal strip located below the keys on the opposite side of the printed circuit board. The terminal on the right is the positive (+) and the terminal on the left is the negative (-).

In the CP ... CH420R, the transmitter is provided with two terminal strips.

The connection of the 4-20 mA loop must be done according to the figure.

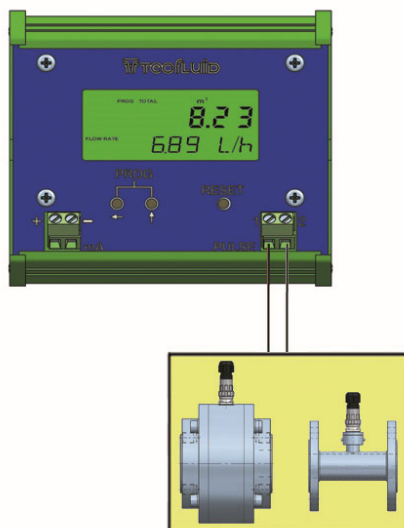


### 3.2 Pulse input

For the CP ... CH420L, sensor connections are the following

Terminal n.	COVOL	TM
1	Common	Ground
2	Live	Live
3	—	Live

For the CP ... CH420R, the connection is made directly from the instrument to the terminals 1 and 2, regardless of the polarity.

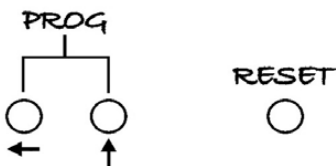


## 4 OPERATION

In order for the instrument indicates an actual flow rate and volume, the k factor specified on the meter must be programmed. To do this, in a CP ... CH420L, the plastic cover must be removed by unscrewing the four screws on the corners. After that, the push buttons will be accessible. In a CP ... CH420R the keys are directly accessible.

If the instrument has not been previously programmed, or due to an alteration in the memory data, the instrument recovers the factory default values. The word "PRESET" appears on the display. This indication disappears when the programming sequence has been completed.

There are three push buttons with the following functions:



### 4.1 Programming

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

By pushing the two push buttons PROG at the same time, the display changes to the programming mode.

#### 4.1.1 k factor (pulses per liter)

On the first screen, the pulses per liter that allow the flow rate calculation can be entered.



In this screen 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 TM.

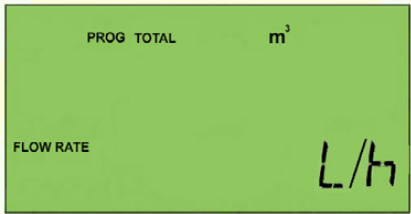
To do this, pressing the push button marked with the arrow pointing upwards, the blinking digit will increase. When it reaches nine it goes back to zero.

With the push button marked with the arrow pointing left, the cursor will pass to the next digit to be modified. On the seventh digit, by pressing this push-button the cursor will pass to the first digit on the display.

Once the k factor is programmed, by pushing the two push buttons PROG at the same time, this value will be automatically saved in the memory and it will appear the units selection screen.

### 4.1.2 Measuring units

In this screen the measuring units can be programmed.



To change the flow rate units, the push button marked with the arrow pointing upwards, must be pushed. To change the totaled volume units, the push button marked with the arrow pointing left must be pushed.

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)
m <sup>3</sup> (cubic meters)	/	m (minute)
ga (US gallons)	/	h (hour)

**Totalized volume:**

There are 3 possible volume units, l (litres), m<sup>3</sup> (cubic meters), ga (gallons)



**Note:** 1ga = 3.785 litres.

With the working units chosen, by pressing the two push buttons PROG, we go to the loop current programming.

### 4.1.3 Current loop

In the first screen we program the flow rate equivalent to 4 mA (lower range).

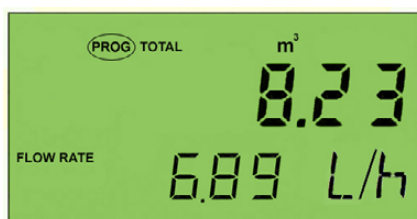


The measuring units will be the ones chosen in the previous screen. The push buttons have the same function as the pulses per litre programming.

After that, the flow rate equivalent to 20 mA (upper range) can be programmed.

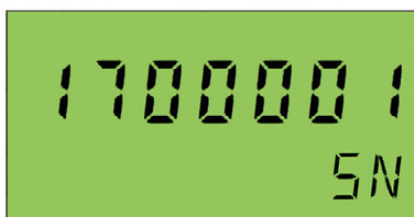


In a CH420L, if during the programming sequence it receives a HART command that must be attended, the local programming will not be valid and all the data previously programmed will be lost. The screen will return to the normal working model and the word PROG will light on the screen, indicating this event. To remove the word PROG from the display, press any of the two PROG push buttons.



#### 4.2 Serial number visualization

By pressing the three push buttons, the display will show the serial number.



To return to the usual screen, press any of the push buttons.

#### 4.3 Reset

By pushing the RESET push button, the counter will be set to zero and it will continue to count .

### 5 MAINTENANCE

No special maintenance is required.



# 6 EXAMPLE OF USEFUL CALCULATIONS

The calibration of the flowmeters is made with water at 20°C. If other characteristics from the above specified are used or for reasons of turbulences in the flow, measurement errors can be induced.

To correct these types of errors, the k (pulses per litre factor) programmed in the instrument can be modified.

## Example - Shortage of volume

If we have a converter which specifies a k factor = 1.985, and when we check the volume of a batch, we find that instead of having 100 litres as programmed, we have 105 litres (5% more), we must apply the following correction:

$F_k$  = k factor (original pulses per litre) = 1.985

V = Expected Volume = 100

V<sub>r</sub> = Real Volume = 105

$F_{k\ n}$  = New k factor = ? (1.887)

$$F_{k\ n} = F_k \frac{V}{V_r}$$

## Example - Excess of volume

If we have a converter which specifies a k factor = 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), we must apply the following correction:

$F_k$  = k factor (original pulses per litre) = 1.985

V = Expected Volume = 100

V<sub>r</sub> = Real Volume = 95

$F_{k\ n}$  = New k factor = ? (2.089)

$$F_{k\ n} = F_k \frac{V}{V_r}$$

# 7 HART COMMUNICATION

The CH420 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., CH420L o R, 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

Numbr 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

## 8 KEYBOARD LOCK AND “WRITE PROTECT”

The transmitter has a jumper situated behind the display on the left hand side which can be used to avoid changes in the configuration. When the jumper is set, the transmitter can be configured by means of the keyboard or through HART communication. When the jumper is removed, the push buttons are disabled and the HART write protect is activated, thus inhibiting any changes in the configuration.

## 9 TECHNICAL CHARACTERISTICS

### Power supply

2 wires, by means of the loop current.

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

Nominal voltage:	7.5 ... 36 VDC
Power consumption:	≤ 20 mA

### Totalizer

N. of digits:	7
Size of the digit:	8 mm
Reset:	By means of push button

### Flow rate Indication

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

### General characteristics

Ingress protection:

CP ... CH420L:	IP65
CP ... CH420R:	IP40

Ambient temperature range: 0°C ... +60 °C

## 9.1 Input characteristics



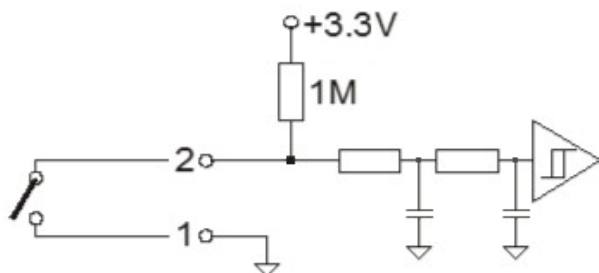
**NOTE:** The input terminals are not isolated from the 4-20 mA loop. Under no circumstances can an electrical connection be made between the 4-20 mA loop and the inputs. In the event of supplying various transmitters with the same power supply one must make sure that the inputs isolated between each other (except the shields of the turbine pick-ups which can be connected together).

### 9.1.1 COVOL input characteristics

This input is designed for a potential free contact between terminals 1 & 2 of the connector. Terminal 1 is connected to the common of the instrument. This input has a  $1\text{ M}\Omega$  pull-up resistor connected to terminal 1 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



### 9.2.2 TM input characteristics

The turbine input is designed for connecting to the coil of a magnetic pick-up.

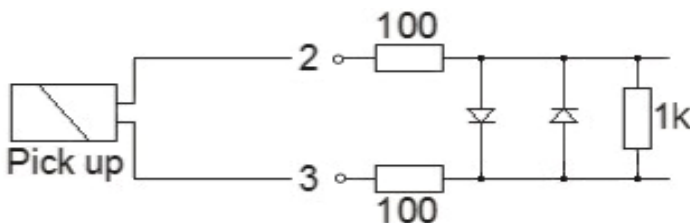
The input impedance is  $1,2\text{ k}\Omega$ . This input is protected to limit the maximum applied voltage to the circuit. This protection consists of two diodes in parallel and two 100 Ohm resistors.

The maximum voltage that can be applied to the input is 10 Vpp. Voltages higher than this can cause damage to the equipment.

The maximum input frequency is 5000 Hz.

The minimum input frequency is 0.06 Hz.

The minimum input voltage is 7mVpp.



## 10 SAFETY INSTRUCTIONS

The converters series CP are in conformity with all essential requirements of all EC directives applicable to them:

- |            |  |
|------------|--|
| 2014/30/EU | Electromagnetic compatibility directive (EMC)  |
| 2012/19/EU | Waste electric and electronic equipment directive (WEEE).  |
| 2011/65/EU | Directive relating restriction of the use of certain hazardous substances in electrical and electronic equipment (ROHS). |



Equipment for hazardous areas:

- |            |   |
|------------|---|
| 2014/34/EU | Directive relating equipment and protective systems intended for use in potentially explosive atmospheres (ATEX). |
|------------|---|



Declarations of conformity EC can be downloaded from the section "Download" of the Tecfluid S.A. website. [www.tecfluid.com](http://www.tecfluid.com)

### 10.1 Certificate of conformity TR CU (EAC marking)

Tecfluid S.A. have subjected the converters series CP to a certification procedure according to the technical regulations of the Customs Union of the Eurasian Economic Union (EEU).



This Certificate is an official document confirming the quality of production with the standards on the territory of the Customs Union, particularly regarding safety requirements and electromagnetic compatibility.

## 11 ADDITIONAL INSTRUCTIONS FOR THE ATEX VERSION

This chapter only applies to equipment intended for use in explosive atmospheres.

### 11.1 Flameproof enclosure

These equipment conform with the directive 2014/34/EU (Equipment and protective systems intended for use in potentially explosive atmospheres) as indicated in the EC-type examination certificate LOM 14ATEX2006 X, LOM 14ATEX2008 X and its marking.

Given that this instrument belong to group II, it is intended for use in places likely to become endangered by explosive atmospheres, but not in mines.

The category is 2GD, that is, it is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours, mists or air/dust mixtures are likely to occur.

#### 11.1.1 Surface temperature

Equipment is certificated as Exd IIC T6.

The maximum possible surface temperature is 85°C.

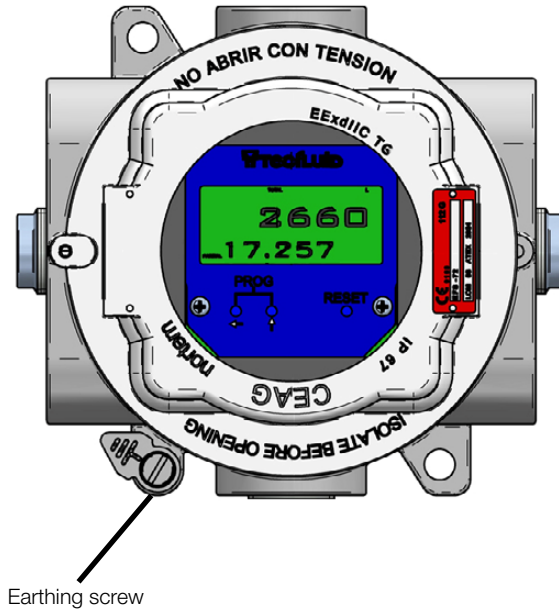


#### **WARNING: RISK OF IMPACT**

Because the housing is made of aluminium, **the equipment must be installed and operated always in locations at low risk of impact.**

### 11.1.2 Connecting conductive parts to earth

When the instrument is not grounded securely through the connection process, it should be grounded through the housing screw, as shown in the figure.



### 11.1.3 Maintenance



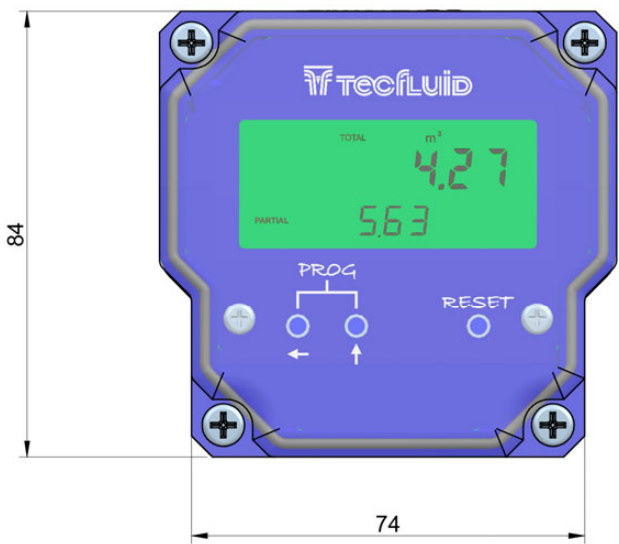
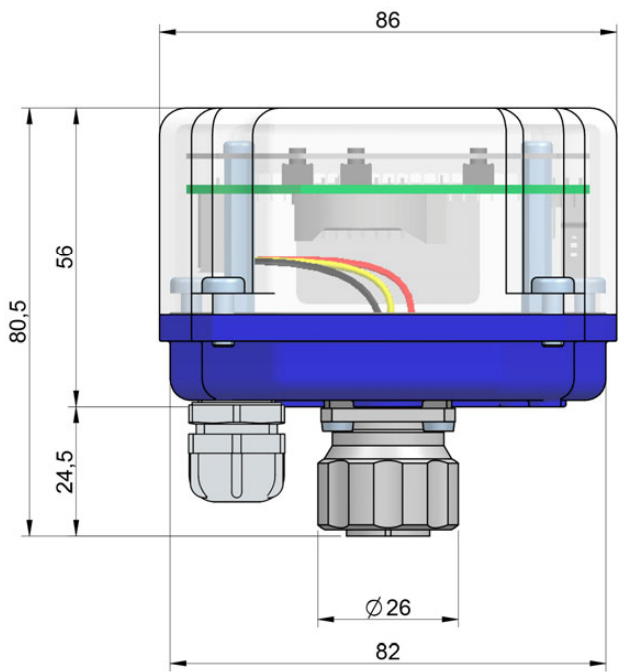
**NOTE:** Before any maintenance that involves opening the flameproof enclosure, **make sure there is no voltage in any of internal components.**

There is no special maintenance for the ATEX version.

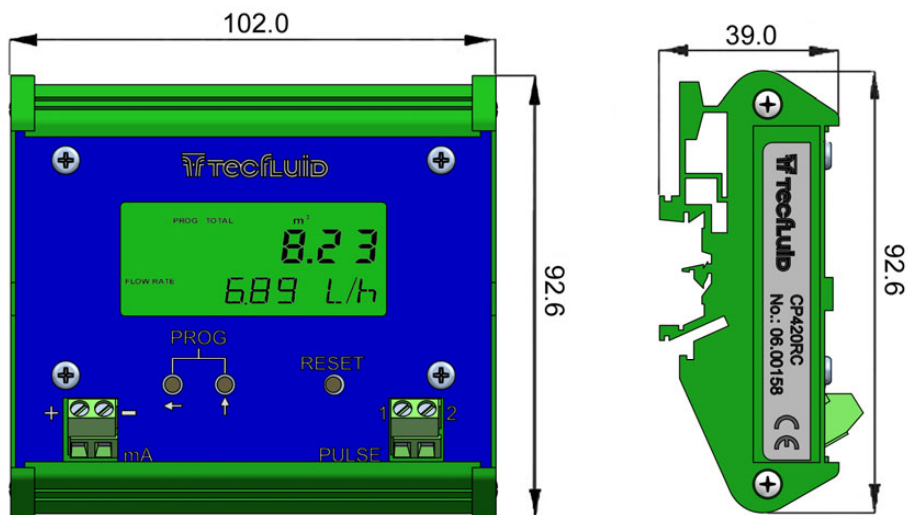
### 11.1.4 Technical characteristics of the ATEX version

They are the same as in the section 9.

12    DIMENSIONS



All dimensions in mm



All dimensions in mm

## WARRANTY

Tecfluid S.A. guarantee 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](http://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.



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Quality Management System ISO 9001 certified by



Pressure Equipment Directive certified by



ATEX European Directive certified by



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