



## technical manual

# ConSensus<sup>®</sup> CCF-02

## current to frequency convertor

### Introduction:

The ConSensus CCF-02 measures an input current in the range 0-20mA and outputs a proportional pulse frequency in the range 0-1000Hz.

It features one very stable, fully isolated current measurement (16 bit ADC), and 3 digitally controlled pulse outputs.

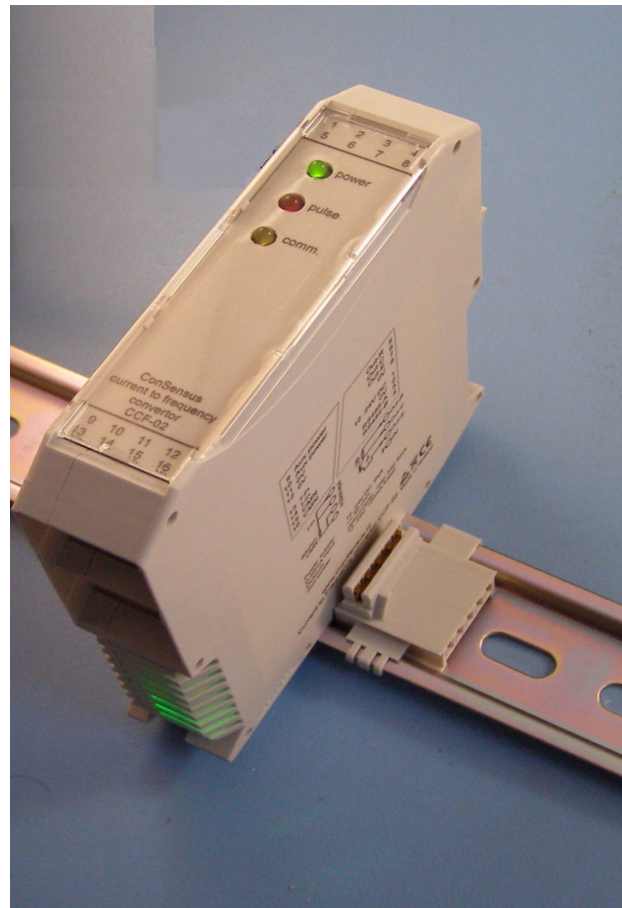
The CCF-02 is a stand-alone device. Optionally, it can be equipped with firmware to communicate with a host controller using the RS485 interface.

### Applications:

- industrial sensor systems.
- calibration systems.
- digital metering.

### Features:

- 0-20mA analog input into 50 ohm, with high resolution AD conversion.
- Input galvanically insulated from power and communication.
- Optocoupler output, max 34V 5mA, galvanically insulated.
- 2 balanced outputs, 3V3.
- Stable output frequency, microprocessor generated from crystal oscillator.
- Wide power supply voltage range: 12..24V DC, low power: 6VA max.
- DIN rail mount.



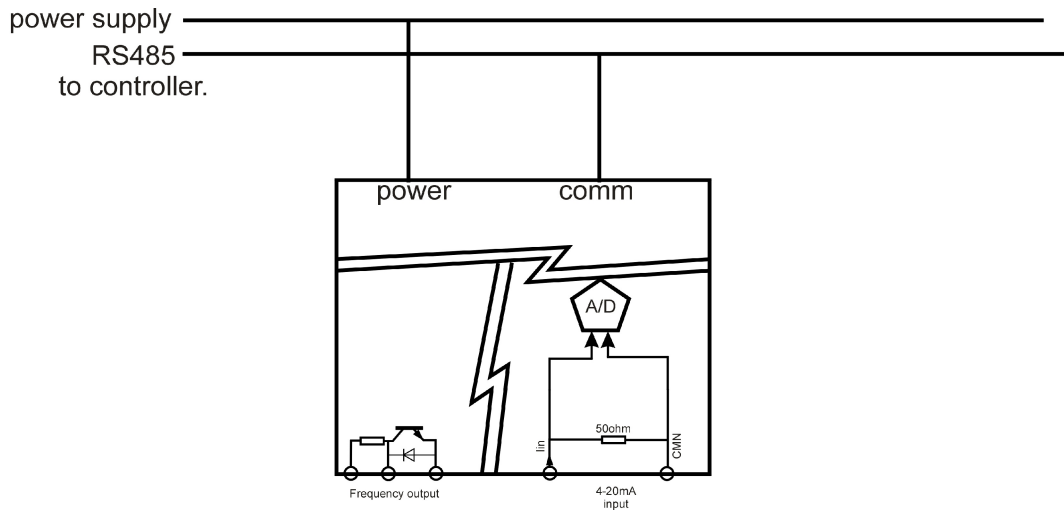
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**General description:**

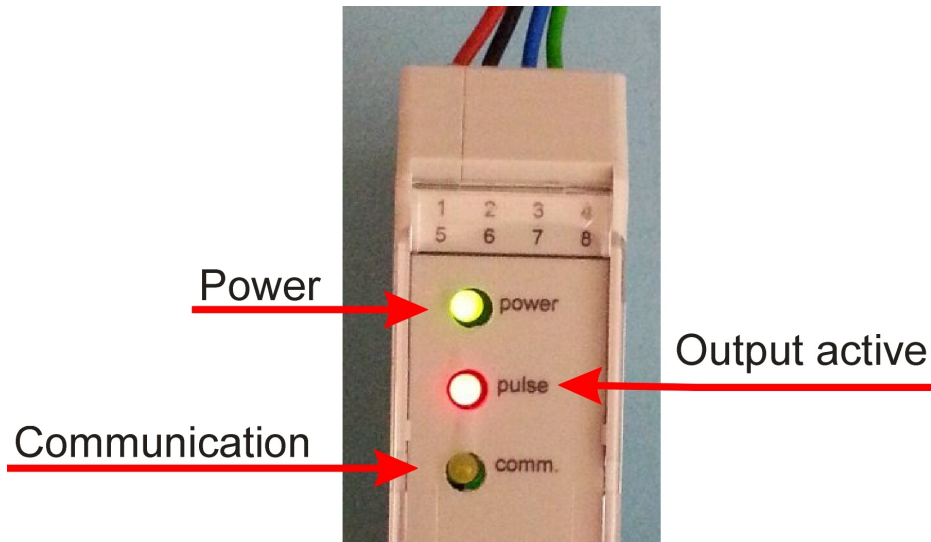
CCF-02 offers a precision conversion of an analog input current to a proportional frequency, to interface analog sensors to digital counter systems such as the ConSensus CPC-02.

**Block diagram:**



The CCF-02 offers a galvanic isolation barrier between the bus side with power and communication, and the analog connection. This barrier consists of magnetically coupled isolators, and a DC/DC convertor to pass the auxiliary power to the input circuitry. The DC/DC convertor supplies power to the analog input that measure 0-20mA.

**LED indicators:**



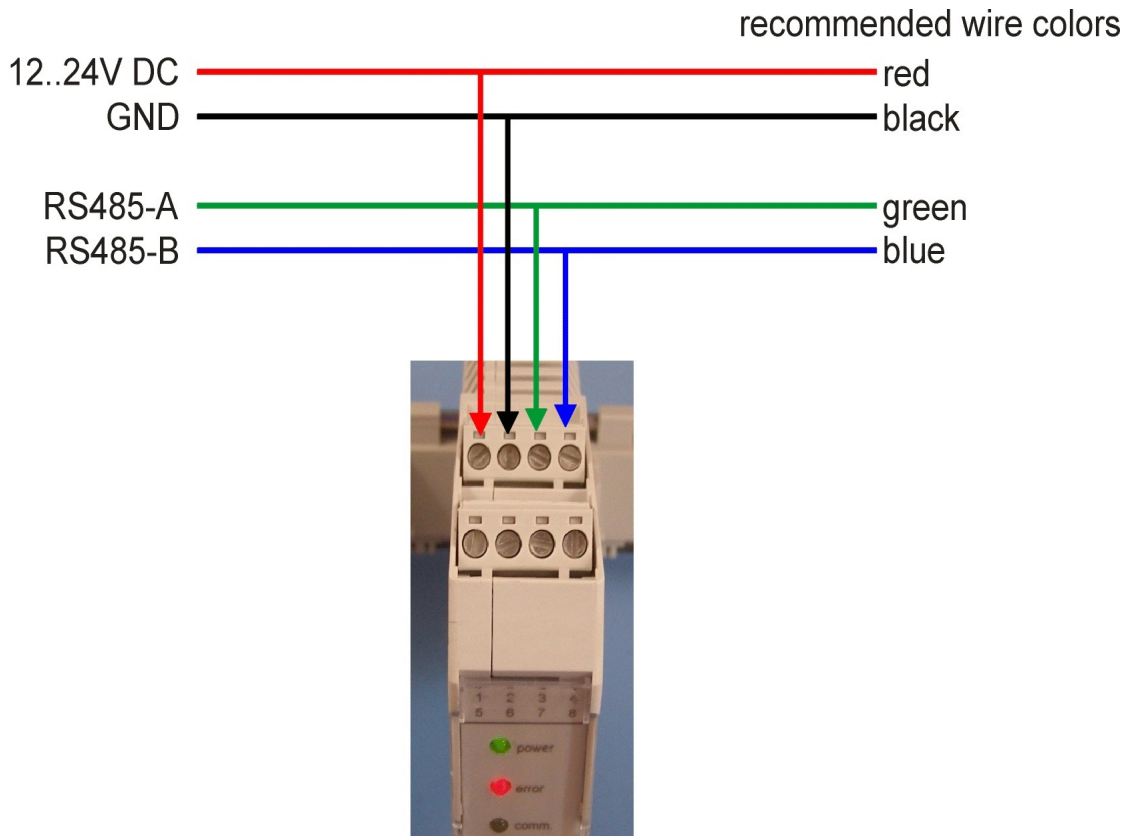
LED	color	function
power	green	Steady: power is OK, system is running. Interrupted: power is low, or internal failure.
pulse	red	Indicator of active output pulses.
comm	yellow	Indicates active communication with PC or system controller.

At power-up, all three LEDs will be lit for about 1 second.

The red Pulse LED will blink at a rate that makes it easy for the human eye to see that there are slow or fast pulses at the output, but that is unrelated to the actual output frequency. This is because any current over 0.7 mA would make the LED blink so quickly that it would appear to be steadily lit.

## Electrical connections:

### Power and communication connections:



Note 1: RS485 is not required for normal operation as current-to-frequency convertor.

Note 2: if the wire length between devices is longer than a meter, it is strongly recommended to use twisted pair wire for the wire pair RS485 A/B.

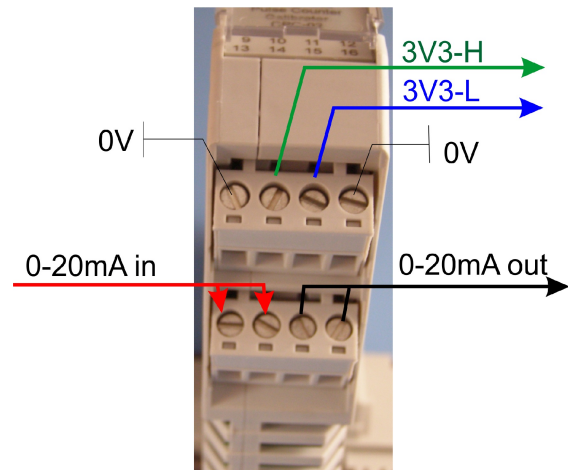
### Analog input:

The analog input of the CCF-02 measures the 0-20mA current through a 50 ohm precision resistor. The input is protected by a slow-blow thermal fuse of 100mA. If an overload condition has occurred, the input will shut off and remain so until the fault condition has been removed. After cooling down, the fuse will automatically reengage.

Nevertheless, the precision current measurement resistor may be damaged by any overload greater than 50mA, or 2,5V.

### **Balanced 3V3 pulse outputs:**

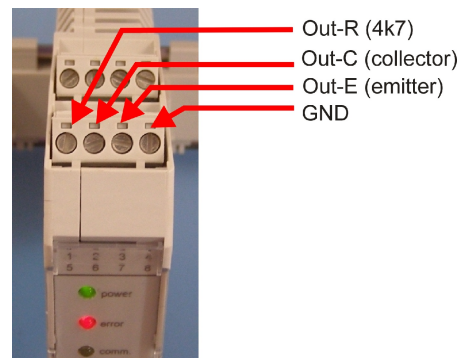
for long distances between interface and target, use the balanced 3V3-H and 3V3-L outputs with a shielded cable to 0V. These outputs generate 3.3V pulses using a RS485 driver chip, allowing transmission lines up to 1km. For very long lines, it is recommended to use 120 ohm cable and apply terminating resistors on both ends of the cable. Note that the 0V is the same as the power supply, so these outputs are not insulated from GND.



### **Pulse output by optocoupler:**

an optocoupler completely isolates the outputs OUT-C (collector) and OUT-E (emitter) from all other electronics. If insulation is not requested, the optocoupler output can be supplied through a 1k5 resistor and GND to generate 12-24V pulses from the power supply:

- connect pin 5 to pin 6.
- connect pin 7 to 8.
- use output signal from pin 5 or 6.



The optocoupler can switch 34V, at a maximum of 5mA.

**Technical specifications:**

Parameter	Min	Typ	Max	Unit
Input sample rate		16		smp/s
Analog input current:	0	20	23	mA
Useful range (note 1):	0.002		23	mA
Analog input resolution:		1		$\mu$ A
Analog input accuracy:		0.2		% FS
Input impedance (note 2):	50		75	ohm
Output frequency	0		1150	Hz
Output duty cycle (0.5-1000Hz)		50		%
Optocoupler output voltage	0.5		34	V
Optocoupler output current			5	mA
Balanced output voltage, with 8mA load	2.4	3.0	3.4	V
Balanced output current			50	mA
Power supply recommended:	12		24	VDC
Power supply range:	9		30	VDC
Power consumption:	1		6	VA
Wire diameter (solid)	0.5		4	mm <sup>2</sup>
Environment temperature	0		55	$^{\circ}$ C
Humidity	10		85	%
Protection		IP40		

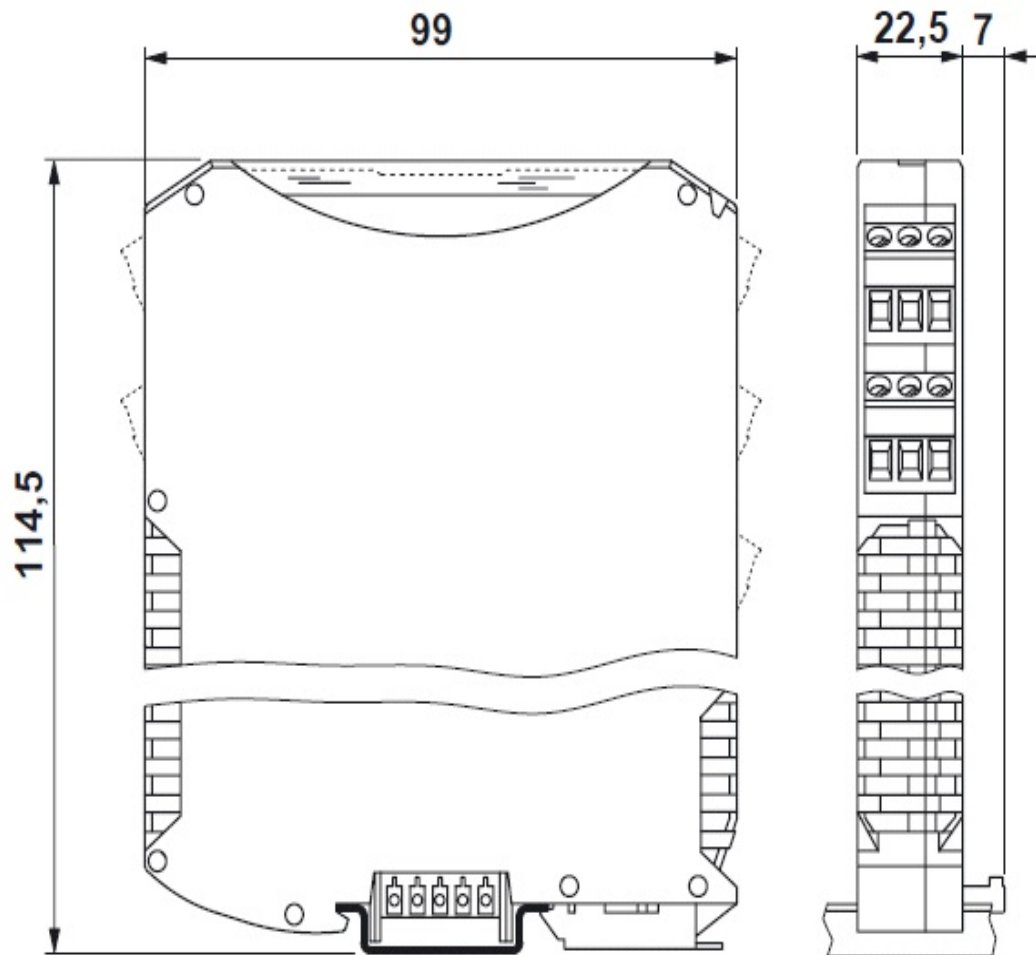
Note 1: for currents less than 2 $\mu$ A, pulses will stop.

Note 2: measurement resistance is 50ohm, but the total input resistance is higher due to the thermal fuse and the resistance of connectors and PCB traces.

**Trouble shooting guide:**

<b>Problem:</b>	<b>Suggestions:</b>
Power LED not lit:	<ul style="list-style-type: none"><li>• Check supply voltage (DC 12..24Volt)</li><li>• Check polarity: pin 1 should be +</li></ul>
Pulse LED does not blink:	<ul style="list-style-type: none"><li>• input current &lt; 2<math>\mu</math>A.</li><li>• polarity reversed.</li></ul>
Comm LED does not blink:	<ul style="list-style-type: none"><li>• normal situation: CCF-02 does not by default support modbus communication.</li></ul>

**Mechanical dimensions:**



**Electrostatic warning:**

The CCF-02 is equipped with internal anti-static protections. Nevertheless, the device should not be subjected to high electrostatic potentials. A grounding strap or similar protective device is strongly recommended when handling or connecting the device. Avoid touching the connections or any other metallic element.

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