

+ CamCor[™] PRO Series Meters

Cost-Effective Coriolis Flow Meters



Separately-mounted transmitter

Equipped with a sophisticated transmitter (including a selfdiagnostics feature, large display, and field configurability via keypad), the Cameron PRO Series are cost-effective processgrade Coriolis flow meters.

FEATURES

- + Extensive self-diagnostic capabilities (cable faults, pipeline vibration, transmitter temperature monitoring, etc.)
- + Configurable via keypad or digital communications
- + Fast response and calculation frequency (approximately 10 ms)
- + Two user-assignable alarms
- + Dual independent pulse outputs, dual independent current outputs, one status output and one status input
- + Enhanced maintenance functions (error logging and downloads, recoverable factory configuration and calibration, etc.)
- + Compatible with Modbus and HART communication protocols

UNITS

The specifications for the PRO Series meters are presented in two sections: U.S. Customary units and Metric units. U.S. customary units are presented beginning on this page. For metric units, see Appendix A: Metric Units, page A-1.

ADDITIONAL INFORMATION

To view available product configurations and to request additional information, see Appendix B: Product Codes and Inquiry Form, page B-1.

GENERAL PERFORMANCE

Mass Flow Rate

Item		Description						
Model		CP006	CP010	CP015	CP025	CP040	CP050	
Flow rate	Guaranteed minimum rate (lb/min)	0.88	2.82	7.05	21.2	70.5	70.5	
	Minimum setting rate (lb/min)	2.2	7.05	17.6	52.9	176	176	
	Maximum service rate (lb/min)	22	70.5	176	529	1764	1764	
	Maximum allowable rate (lb/min)	44.1	141	353	1058	3527	3527	
-	Accuracy	$\pm 0.2\% \pm zero$	stability error (ZS) of reading				
	Repeatability	±0.1% ± 1/2 Z	S of reading					
	Zero stability (lb/min)	0.0033	0.011	0.026	0.079	0.265	0.265	
Density	Metering range	0.3 to 2 g/mL						
(Liquid)	Accuracy (Option)	±0.003 g/mL						
Analog out	tput accuracy	±0.1% of full scale added to each accuracy						

* During testing, zero stability and flow rate during the test should read in the same measurement unit. Zero stability error = $\frac{\text{Zero stability}}{\text{Current flow rate}} \times 100$

VOLUMETRIC FLOW RATE (1)

Item	Descriptio	Description						
Model	CP006	CP010	CP015	CP025	CP040	CP050		
Guaranteed minimum rate (gal/min)	0.106	0.338	0.846	2.54	8.46	8.46		
Minimum setting rate (gal/min)	0.264	0.846	2.12	6.35	21.2	21.2		
Maximum service rate (gal/min)	2.64	8.46	21.2	63.5	212	212		
Maximum allowable rate (gal/min)	5.29	16.9	42.3	127	423	423		

1. Calculations based on water (specific gravity of 1) at 59°F (mass = 62.37 lb/ft3). Actual flow ranges vary with media density. To determine the flow range for your fluid, divide the values above by the fluid's specific gravity.

CamCor is a trademark of Cameron International Corporation ("Cameron"). Modbus is a registered trademark of the Modbus Organization, Inc. HART is a registered trademark of the FieldComm Group. Hastelloy is a registered trademark of Haynes International, Inc.

GENERAL SPECIFICATIONS

Sensor Unit

Item		Description									
Model		CP006	CP010	CP015	CP025	CP040	CP050				
Nominal size (in.))	1/2	1/2	1/2	1	1-1⁄2	2				
Materials	Wetted parts	SUS316L									
	Housing	SUS304									
Process connection		ASME 150, 300	ASME 150, 300, 600 RF; IDF Ferrule								
Applicable fluid		Liquid									
Density range		0.3 to 2.0 g/mL									
Temperature ran	ge (1)	-40°F to 257°F (2)									
Maximum operat	ting pressure	Dependent on process connection									
Flow direction		Bidirectional									
Explosion-proof configuration		CSA (ATEX and IECEx pending) Refer to Explosion-proof Specifications, page 10 for details.									
Dust-tight, water	proof configuration	IP66/67									

1. Refer to Explosion-proof Specifications, page 10. In case of non-explosion-proof model, up to 125°C is permitted.

However, the product must be used within the maximum ambient temperature of 45°C.

2. Cleaning in place (CIP) is permitted within the temperature range.

Transmitter

Item	Description				
Model	PAOK				
Power supply	85 to 264 VAC 5 (Safety rated 10	50/60 Hz or 20 to 30 VDC 0 to 240 VAC 50/60 Hz)			
Power consumption	Maximum 15 W				
Ambient temperature	-40°F to 131°F	(1)			
Transmission length (separate type)	Maximum 5 m ((interconnect cable used)(2)			
Applicable EU directive	EMC Directive:	2004/108/EC, ATEX Directive: 94/9/EC			
Applicable EN standards	"EMC: EN55011 EN60079-0: 20 IECEx : IEC6007	'EMC: EN55011: 1998/A1, 1999/A2: 2002, Group 1, Class B; EN61000-6-2: 2001/EN061326-1: 2006 ATEX: EN60079-0: 2012; EN60079-1: 2007; EN60079-11: 2012 IECEx : IEC60079-0: 2011; IEC60079-1: 2007-04; IEC60079-11: 2011"			
Explosion-proof configuration	CSA (ATEX and	IECEx pending) Refer to Explosion-proof Specifications, page 10 for details.			
Dust-tight, waterproof configuration	IP66/67				
Transmitter configuration	Integral or sepa	rately-mounted			
Finish	Paint type: Bake	ed enamel; Paint color: Light gray (RAL7035)			
Display	LCD display pro	ovided (128×64 dots), backlight (white, orange); Two infrared sensors; Two LEDs (green and red)			
Weight	Integrally-moun	ted model: approx. 7.94 lb; Separately-mounted model: approx. 11 lb			
Communication interface (5)	HART P	Protocol Version 7, Hybrid Bell 202			
	Modbus R	S-485: Baud rate: 9600 bps, 19200 bps, 38400 bps RTU or ASCII response time: 25 to 50 ms			
Damping (default)	Flow rate, 0.8 se	ec.; Density, 4 sec.; Temperature, 2.5 sec.			
Low flow cutoff (default)	Under 1.0% of m	naximum service flow rate			
Pulse output	Open drain (equ 1.5V maximum (Setting range: 0	uivalent to open collector): Minimum 10V to 30V, 50 mADC, ON resistance ≥0.6Ω OR Voltage: (low level), 13V minimum (high level), output impedance: 2.2 kΩ;).1 to 10000 Hz (Maximum 11000 Hz)			
Analog output	4 to 20 mADC (Select two outp	maximum load 600Ω) outs (3) from instant flowrate (mass or volume) temperature, and density.			
Status output	Open drain (equ Select one outp	uivalent to open collector): 30V maximum, 50 mADC, ON resistance ≥0.6Ω; out (4) from error, flow direction, or high/low alarm (default is error)			
Status input	Contact-closure Select one outp	e (Form ""a"" contact) 200 Ω maximum (short), 100 k Ω minimum (open); out from remote zero, total reset, 0% signal lock, or function off (default is function off)			

1. Below -4°F, the display loses its visibility due to weakened contrast. Both the display and infrared sensor may exhibit slow responses below -4°F.

If signal transmission length exceeds the maximum length, consult the factory.
 Of the two analog output systems, only Analog Output 1 is available for HART communication.
 The status output can also be configured to activate when meter zeroing is in process.

5. Electrical noise filtering components are installed in connections between power source, output, communications, and chassis.

DISPLAY



- LCD backlight available in white and orange. Color changes according to the status of flow meter.
- In most cases, the backlight shuts off automatically if the optical sensor does not respond within a userdefined duration.

Display modes

- 1. Mass instant flowrate
- 2. Volume instant flowrate
- 3. Density
- 4. Temperature
- 5. Pulse count 1 (mass or volume)
- 6. Pulse count 2 (mass or volume)
- 7. Total 1 (mass or volume)
- 8. Total 2 (mass or volume)
- 9. Analog 1 (% instant)
- 10. Analog 2 (% instant)
- 11. Status information
- 12. Mode select (parameter setup)

Modbus communication interface displays different contents. For further information, refer to the appropriate communication interface instruction manual.

To select the mode, touch the infrared optical sensor panel through the front glass.

PERFORMANCE

Meter Error



Pressure Loss



How to Determine Pressure Loss*

Find the pressure loss factor "C" for a given parameter from its flow rate (kg/h) and viscosity (mPa·s), then divide "C" by specific gravity "d" ("1" for water) as shown in the following formula:

$$\Delta P = \frac{C}{d}$$
 (MPa)

*For high viscosity liquids not shown in these graphs, calculate the pressure loss using the following formula:

$$\Delta P2 = C \times \frac{\mu 2}{\mu 1} \times \frac{1}{d}$$

where

0.0001 10

- $\Delta P2 = Pressure loss of high-viscosity liquid (MPa)$
- μ 1 = Maximum viscosity shown in the graph (mPa·s)
- μ2 = Viscosity of high-viscosity liquid (mPa·s)
- d = Specific gravity of high-viscosity liquid ("1" for water)

+

C = Pressure loss factor

INTELLIGENT ACTION

Transmitter*: Integrally-mounted

*Pressure-tight packing assembly only provided for explosion-proof models. See Explosion-proof Specifications, page A-9, for details.

Model	Nominal	Nominal ASME			н	h1	h2	Α	Approx.
	size (mm)	150	300	600					Weight (kg)
		L							
CP006	1/2	14.5	14.9	15.4	13.5	3.7	7.56	2.32	16.1
CP010	1/2	16	16.3	16.8	13.4	3.7	7.44	2.32	16.8
CP015	1/2	20.2	20.5	21	17	6.61	8.11	3.58	25.6
CP025	1	23.7	24.1	24.6	16.8	6.89	7.64	3.58	31.3
CP040	1-1/2	26	26.5	27.1	22.8	12.7	7.76	4.92	72.3
CP050	2	26.1	26.6	27.4	22.8	12.7	7.76	4.92	73.2

Model	Ferrule	Approx.		
	Connection (3)	L	D	Weight (kg)
CP006	10A	13.1	1.34	11.5
CP010	15A	15	1.34	13.4
CP015	15A	18.7	1.34	21.8
CP025	25 (ISO), IDF 1S	22	1.99	24.5
CP040	38 (ISO), IDF 1.5S	23.9	1.99	64.6
CP050	51 (ISO), IDF 2S		2.52	

1. Dotted lines show the envelope of models CP040 and CP050.

2. Conduit connections are 3/4-14 FNPT for CSA units and M25 for ATEX units.

3. Process connection: A = mm, S (sanitary) = in.

Transmitter: Separately-mounted

*Pressure-tight packing assembly only provided for explosion-proof models. See Explosion-proof Specifications, page A-9, for details.

Model	Nominal	ASME		h1	h2	Α	Approx.	
	size (mm)	150	300	600				Weight (kg)
		L						
CP006	1/2	14.53	14.9	15.4	11.9	3.7	2.32	10.4
CP010	1/2	16	16.3	16.8	11.7	6.22	2.32	11
CP015	1/2	20.2	20.5	21	15.7	6.61	3.58	19.8
CP025	1	23.7	24.1	24.6	15.1	6.89	3.58	25.6
CP040	1-1/2	26	26.5	27.1	21.1	12.7	4.92	66.6
CP050	2	26.1	26.6	27.4	21.1	12.7	4.92	67.5

Model	Ferrule	Approx.		
	Connection (3)	300	600	Weight (kg)
CP006	10A	13.1	1.34	5.73
CP010	15A	15	1.34	7.72
CP015	15A	18.7	1.34	16.1
CP025	25 (ISO), IDF 1S	22	1.99	18.7
CP040	38 (ISO), IDF 1.5S	23.9	1.99	58.9
CP050	51 (ISO), IDF 2S		2,52	

1. Dotted lines show the envelope of models CP040 and CP050.

2. Conduit connections are 3/4-14 FNPT for CSA units and M25 for ATEX units.

3. Process connection: A = mm, S (sanitary) = in.

Transmitter: Separately-mounted

*Pipe mounting hardware (U-bolts) are furnished as standard accessories. The pipe must be provided by the customer.

REMOTE MEASURING SYSTEM

HART Protocol

- In case of the separate type, the sensor unit and transmitter are connected with exclusive cable.
 Communications via hybrid Bell 202 over HART.
- 3. For detailed information about companion instruments, see respective product catalogs and GS sheets.

Modbus Protocol

1. Sensor unit and separate type transmitter are connected with the exclusive interconnect cable.

2. The transmitter requires a separate power source (AC or DC) for its main power supply.

WIRING DIAGRAMS

Transmitter Power and Input/Output Signal Wiring

Terminal Identification and Description

Item	Label	Description	Remarks			
Signal	A1 (+)	Analog Output 1 (4 to 20 mA)	Maximum load resistance is 600Ω for Analog			
	A1 (–)		Outputs 1 and 2.			
	A2 (+)	Analog Output 2 (4 to 20 mA)				
	A2 (–)					
	P1 (+)	Pulse Output 1	Maximum pulse output (voltage) transmission length:			
	P1 (–)	(voltage/open drain)	+ 10 m @ 10 kHz + 100 m @ 1 kHz			
	P2 (+)	Pulse Output 2	+ 1 km @ 100 Hz			
	P2 (-)	(voltage/open drain)	Minimum conductor size: 18 AWG			
	SI (+)	Status Input (contact)				
	SI (-)		_			
	SO (+)	Status Output (open drain)				
	SO (-)					
	I/O (+)	Expanded Input/Output	For Modbus communications:			
	I/O (–)	(Modbus communication, etc.)	 Maximum transmission length: 1200 m Minimum conductor size: 18 AWG" 			
Power	L (+)	Power (with DC power: +)				
	GND	Earth Ground				
	N (–)	Power (with DC power: -)				

+

WIRING DIAGRAMS

1. Use interconnect cable

Use dedicated interconnect cable and prepare shielded wire as follows.

Transmitter end

- + Bundle shielded wires colored in brown/red, green/white, blue/grey and purple/yellow/orange and cover the wires with a black tube.
- + Connect only one wire to the terminal box (black), taking care to avoid potential contact with the housing or conductive parts.

Sensor end

- + Cover the brown/red shielded wire with a black tube and connect it to the terminal box, taking care to avoid potential contact with the housing or conductive parts.
- + Clip all shielded wires except brown/red as shown in the above figure.

Recommended cable end treatment

0.35 in.	
	11
)/

Use of a crimp pin terminal is not necessary.

INSTALLATION

Typical Installation

- 3. Avoid pipeline stresses on the meter.
- 4. The meter should be supported near each process connection, as shown in the illustration on the right.
- 5. Avoid supporting the meter body directly.
- 6. The pipeline should be arranged such that the meter is constantly filled with the process fluid. However, avoid installing it in a low point in the piping where slurries may build up.
- Provide a valve downstream of the meter to allow zeroing by obtaining a true zero flow. We recommend providing another valve upstream of the meter for servicing or maintenance.

Precautions at Installation

- 1. Locate the meter at least 3.28 feet from large transformers, motors, or other sources of electromagnetic induction. Also avoid installation near sources of excessive vibration, such as motors and pumps.
- In case of measurement of a process fluid which requires heat retention, heat trace may be applied directly to the sensor body. Heat trace should be held below 257°F.
- 3. The sensor unit is of gas-tight construction. To prevent dew condensation inside in a low-temperature application, it is filled with argon gas. To avoid damaging the sensor, do not drop the sensor unit or otherwise subject it to impact shocks.
- 4. In a horizontal run, install the sensor unit with the transmitter up, as shown in the typical installation figure.
- 5. A control valve should be located downstream of the meter. In an arrangement where cavitation may possibly take place, locate it at least 16.4 feet away.

Cavitation Prevention

Cavitation can cause a loss of meter accuracy in measurement. To prevent cavitation, maintain line pressure upstream and downstream of the meter. Avoid opening the line to the atmosphere immediately downstream of the meter. Care must be taken particularly with high vapor pressure liquids. It is recommended that back pressure in the meter (downstream pressure) be kept above the value calculated by the formula below:

 $Pd = 3\Delta P + 1.3Pv$

Where

- Pd = Downstream pressure (psia)
- ΔP = Pressure loss across the meter (psig)
- Pv = Steam pressure of the process fluid at measurement (psia)

Physical Orientation

The unit may be installed in a horizontal or vertical line. Specify physical orientation when ordering.

EXPLOSION-PROOF SPECIFICATIONS CSA

Integral type

- + Transmitter ratings: Class I, Zone 1, Ex d ib IIB T4 Gb Class I, Zone 1, AEx d ib IIB T4 Gb
- + Transmitter and sensor ambient temperature: -40°F to 131°F
- + Fluid temperature: -40°F to 158°F (CP015)
 -40°F to 176°F (Other than CP015)
- + Sensor ratings: Class I, Zone 1, Ex ib IIB T4 Gb Class I, Zone 1, AEx ib IIB T4 Gb
- + Sensor to be connected: CP006 through CP050
- + Communication: HART, Modbus

Separate type

- + Transmitter ratings: Class I, Zone 1, Ex d [ib] IIB T6 Gb Class I, Zone 1, AEx d [ib] IIB T6 Gb
- + Transmitter and sensor ambient temperature: -40°F to 131°F
- Fluid temperature: -40°F to 158°F (CP015)
 -40°F to 176°F (Other than CP015)
- + Sensor ratings: Class I, Zone 1, Ex ib IIB T3, T4 Gb Class I, Zone 1, AEx ib IIB T3, T4 Gb
- + Sensor to be connected: CP006 through CP050
- + Communication: HART, Modbus

Sensor ambient temperature (Separate type only)	-40°F to 140°F	
Fluid temperature	Temperature class: T3	–40°F to 257°F: All models
(Separate type only)	Temperature class: T4	-40°F to 158°F (CP015) -40°F to 176°F (Other than CP015)

Appendix A: Metric Units

GENERAL PERFORMANCE

Mass Flow Rate

Item		Descriptio	Description						
Model		CP006	CP010	CP015	CP025	CP040	CP050		
Flow rate	Guaranteed minimum rate (lb/min)	24	76.8	192	576	1920	1920		
	Minimum setting rate (lb/min)	60	192	480	1440	4800	4800		
-	Maximum service rate (lb/min)	600	1920	4800	14400	48000	48000		
	Maximum allowable rate (lb/min)	1200	3840	9600	28800	96000	96000		
	Accuracy	±0.2% ± ze	ero stability erro	or (ZS) of readin	g				
	Repeatability	±0.1% ± 1/2	2 ZS of reading						
	Zero stability (lb/min)	0.09	0.288	0.72	2.16	7.2			
Density	Metering range	0.3 to 2 g/n	0.3 to 2 g/mL						
(Liquid)	Accuracy (Option)	±0.003 g/n	±0.003 g/mL						
Analog ou	tput accuracy	±0.1% of fu	±0.1% of full scale added to each accuracy						

* During testing, zero stability and flow rate during the test should read in the same measurement unit. Zero stability error = $\frac{\text{Zero stability}}{\text{Current flow rate}} \times 100$

Volumetric Flow Rate

Item	Descriptio	Description									
Model	CP006	CP010	CP015	CP025	CP040	CP050					
Guaranteed minimum rate (ltr/min)	0.400	1.28	3.20	9.61	32.0	32.0					
Minimum setting rate (ltr/min)	1.00	3.20	8.00	24.0	80.1	80.1					
Maximum service rate (ltr/min)	10.0	32.0	80.0	240	801	801					
Maximum allowable rate (ltr/min)	20.0	64.1	160	480	1601	1601					

GENERAL PERFORMANCE

Sensor Unit

Item		Description												
Model		CP006	CP010	CP040	CP050									
Nominal size (in.)		10	15	15	25	40	50							
Materials	Wetted parts	SUS316L												
	Housing	SUS304												
Process connecti	on	ASME 150, 300, 600 RF; IDF Ferrule												
Applicable fluid		Liquid												
Density range		0.3 to 2.0 g/mL												
Temperature rang	je (1)	-40°F to 257°F (2)												
Maximum operati	ng pressure	Dependent on process connection												
Flow direction		Bidirectional												
Explosion-proof c	onfiguration	CSA (ATEX and IECEx pending) Refer to Explosion-proof Specifications, page 10 for details.												
Dust-tight, waterp	roof configuration	IP66/67												

1. Refer to Explosion-proof Specifications, page 10. In case of non-explosion-proof model, up to 125°C is permitted. However, the product must be used within the maximum ambient temperature of 45°C.

2. Cleaning in place (CIP) is permitted within the temperature range.

GENERAL SPECIFICATIONS

Transmitter

Item	Description									
Model	PA0K									
Power supply	85 to 264 VA (Safety rated	85 to 264 VAC 50/60 Hz or 20 to 30 VDC (Safety rated 100 to 240 VAC 50/60 Hz)								
Power consumption	Maximum 15 W									
Ambw	-40°C to 55°	C (1)								
Transmission length (separate type)	Maximum 5 r	m (interconnect cable used) (2)								
Applicable EU directive	EMC Directiv	e: 2004/108/EC, ATEX Directive: 94/9/EC (ATEX certification is pending)								
Applicable EN standards	EMC: EN55011: 1998/A1, 1999/A2: 2002, Group 1, Class B; EN61000-6-2: 2001/EN061326-1: 2006 ATEX: EN60079-0: 2012; EN60079-1: 2007; EN60079-11: 2012 (ATEX certification is pending) IECEx : IEC60079-0: 2011; IEC60079-1: 2007-04; IEC60079-11: 2011 (IECEx certification is pending)									
Explosion-proof configuration	CSA (ATEX a	CSA (ATEX and IECEx pending) Refer to Explosion-proof Specifications, page A-9 for details.								
Dust-tight, waterproof configuration	IP66/67	IP66/67								
Transmitter configuration	Integral or separately-mounted									
Finish	Paint type: Baked enamel; Paint color: Light gray (RAL7035)									
Display	LCD display	provided (128×64 dots), backlight (white, orange); Two infrared sensors; Two LEDs (green and red)								
Weight	Integrally-mo	ounted model: approx. 3.6 kg; Separately-mounted model: approx. 5.0 kg								
Communication interface (5)	HART	Protocol Version 7, Hybrid Bell 202								
	Modbus	RS-485 Modbus Protocol: Baud rate–9600 bps, 19200 bps, 38400 bps RTU or ASCII response time: 25 to 50 ms								
Damping (default)	Flow rate, 0.8	3 sec.; Density, 4 sec.; Temperature, 2.5 sec.								
Low flow cutoff (default)	Under 1.0% c	f maximum service flow rate								
Pulse output	Open drain (1.5V maximu Setting range	equivalent to open collector): Minimum 10V to 30V, 50 mADC, ON resistance ≥0.6Ω OR Voltage: m (low level), 13V minimum (high level), output impedance: 2.2 kΩ; e: 0.1 to 10000 Hz (Maximum 11000 Hz)								
Analog output	4 to 20 mAD Select two or	C (maximum load 600 Ω) utputs (3) from instant flowrate (mass or volume) temperature, and density.								
Status output	Open drain (e Select one ou	equivalent to open collector): 30V maximum, 50 mADC, ON resiatance ≥0.6Ω; utput from error (4) flow direction, or high/low alarm (default is error)								
Status input	Contact-clos Select one ou	ure (Form ""a"" contact) 200 Ω maximum (short), 100 k Ω minimum (open); utput from remote zero, total reset, 0% signal lock, or function off (default is function off)								

Below -4°F, the display loses its visibility due to weakened contrast. Both the display and infrared sensor may exhibit slow responses below -4°F.
 If signal transmission length exceeds the maximum length, consult the factory.

3. Of the two analog output systems, only Analog Output 1 is available for HART communication.

4. The status output can also be configured to activate when meter zeroing is in process.

5. Electrical noise filtering components are installed in connections between power source, output, communications, and chassis.

DISPLAY

- LCD backlight available in white and orange. Color changes according to the status of flow meter.
- In most cases, the backlight shuts off automatically if the optical sensor does not respond within a userdefined duration.

Display modes

- 1. Mass instant flowrate
- 2. Volume instant flowrate
- 3. Density
- 4. Temperature
- 5. Pulse count 1 (mass or volume)
- 6. Pulse count 2 (mass or volume)
- 7. Total 1 (mass or volume)
- 8. Total 2 (mass or volume)
- 9. Analog 1 (% instant)
- 10. Analog 2 (% instant)
- 11. Status information
- 12. Mode select (parameter setup)

Modbus communication interface displays different contents. For further information, refer to the appropriate communication interface instruction manual.

To select the mode, touch the infrared optical sensor panel through the front glass.

PERFORMANCE

Meter Error

Pressure Loss

Transmitter*: Integrally-mounted

*Pressure-tight packing assembly only provided for explosion-proof models. See Explosion-proof Specifications, page A-9, for details.

Model	Nominal	ASME			L	h1	h2	Α	Approx.	
	size (mm)	150 300		600					Weight (kg)	
		L								
CP006	10	369	378	390.5	344	94	192	59	7.3	
CP010	15	406	415	427.5	341	94	189	59	7.6	
CP015	15	512	521	533.5	432	168	206	91	11.6	
CP025	25	601	613	626	426	175	194	91	14.2	
CP040	40	660	673	688.5	578	323	197	125	32.8	
CP050	50	663	676	695	578	323	197	125	33.2	

Model	Ferrule	Approx.		
	Connection (3)	L	D	Weight (kg)
CP006	10A	333	34	5.2
CP010	15A	380	34	6.1
CP015	15A	476	34	9.9
CP025	25 (ISO), IDF 1S	559	50.5	11.1
CP040	38 (ISO), IDF 1.5S	606	50.5	29.3
CP050	51 (ISO), IDF 2S		64	

1. Dotted lines show the envelope of models CP040 and CP050.

2. Conduit connections are 3/4-14 FNPT for CSA units and M25 for ATEX units.

3. Process connection: A = mm, S (sanitary) = in.

Transmitter: Separately-mounted

*Pressure-tight packing assembly only provided for explosion-proof models. See Explosion-proof Specifications, page A-9, for details.

Model	Nominal	ASME			Н	h1	Α	Approx.
	size (mm)	150	300	600				Weight (kg)
		L						
CP006	10	369	378	390.5	301	94	59	4.7
CP010	15	406	415	427.5	298	158	59	5.0
CP015	15	512	521	533.5	389	168	91	9.0
CP025	25	601	613	626	384	175	91	11.6
CP040	40	660	673	688.5	535	323	125	30.2
CP050	50	663	676	695	535	323	125	30.6

Model	Ferrule	Approx.			
	Connection (3)	L	D	Weight (kg)	
CP006	10A	333	34	2.6	
CP010	15A	380	34	3.5	
CP015	15A	476	34	7.3	
CP025	25 (ISO), IDF 1S	559	50.5	50.5	
CP040	38 (ISO), IDF 1.5S	606	50.5	26.7	
CP050	51 (ISO), IDF 2S		64		

1. Dotted lines show the envelope of models CP040 and CP050.

2. Conduit connections are 3/4-14 FNPT for CSA units and M25 for ATEX units.

Process connection: A = mm, S (sanitary) = in.

Transmitter: Separately-mounted

*Pipe mounting hardware (U-bolts) are furnished as standard accessories. The pipe must be provided by the customer.

REMOTE MEASURING SYSTEM

HART Protocol

- In case of the separate type, the sensor unit and transmitter are connected with exclusive cable.
 Communications via hybrid Bell 202 over HART.
- 3. For detailed information about companion instruments, see respective product catalogs and GS sheets.

Modbus Protocol

1. Sensor unit and separate type transmitter are connected with the exclusive interconnect cable.

2. The transmitter requires a separate power source (AC or DC) for its main power supply.

WIRING DIAGRAMS

Transmitter Power and Input/Output Signal Wiring

Terminal Identification and Description

Item	Label	Description	Remarks				
Signal	A1 (+)	Analog Output 1 (4 to 20 mA)	Maximum load resistance is 600Ω for Analog				
	A1 (–)		Outputs 1 and 2.				
	A2 (+)	Analog Output 2 (4 to 20 mA)					
	A2 (–)						
	P1 (+)	Pulse Output 1	Maximum pulse output (voltage) transmission length:				
	P1 (–)	(voltage/open drain)	+ 10 m @ 10 kHz + 100 m @ 1 kHz				
	P2 (+)	Pulse Output 2	+ 1 km @ 100 Hz				
	P2 (-)	(voltage/open drain)	Minimum conductor size: 18 AWG				
	SI (+)	Status Input (contact)					
	SI (-)		_				
	SO (+)	Status Output (open drain)					
	SO (-)						
	I/O (+)	Expanded Input/Output	For Modbus communications:				
	I/O (–)	(Modbus communication, etc.)	 Maximum transmission length: 1200 m Minimum conductor size: 18 AWG" 				
Power	L (+)	Power (with DC power: +)					
	GND	Earth Ground					
	N (–)	Power (with DC power: -)					

+

WIRING DIAGRAMS

1. Use interconnect cable

Use dedicated interconnect cable and prepare shielded wire as follows.

Transmitter end

- + Bundle shielded wires colored in brown/red, green/white, blue/grey and purple/yellow/orange and cover the wires with a black tube.
- + Connect only one wire to the terminal box (black), taking care to avoid potential contact with the housing or conductive parts.

Sensor end

- + Cover the brown/red shielded wire with a black tube and connect it to the terminal box, taking care to avoid potential contact with the housing or conductive parts.
- + Clip all shielded wires except brown/red as shown in the above figure.

Recommended cable end treatment

0.35 in.	
	11
)/

Use of a crimp pin terminal is not necessary.

INSTALLATION

Typical Installation

- 3. Avoid pipeline stresses on the meter.
- 4. The meter should be supported near each process connection, as shown in the illustration on the right.
- 5. Avoid supporting the meter body directly.
- 6. The pipeline should be arranged such that the meter is constantly filled with the process fluid. However, avoid installing it in a low point in the piping where slurries may build up.
- Provide a valve downstream of the meter to allow zeroing by obtaining a true zero flow. We recommend providing another valve upstream of the meter for servicing or maintenance.

Precautions at Installation

- 1. Locate the meter at least 3.28 feet from large transformers, motors, or other sources of electromagnetic induction. Also avoid installation near sources of excessive vibration, such as motors and pumps.
- In case of measurement of a process fluid which requires heat retention, heat trace may be applied directly to the sensor body. Heat trace should be held below 257°F.
- 3. The sensor unit is of gas-tight construction. To prevent dew condensation inside in a low-temperature application, it is filled with argon gas. To avoid damaging the sensor, do not drop the sensor unit or otherwise subject it to impact shocks.
- 4. In a horizontal run, install the sensor unit with the transmitter up, as shown in the typical installation figure.
- 5. A control valve should be located downstream of the meter. In an arrangement where cavitation may possibly take place, locate it at least 16.4 feet away.

Cavitation Prevention

Cavitation can cause a loss of meter accuracy in measurement. To prevent cavitation, maintain line pressure upstream and downstream of the meter. Avoid opening the line to the atmosphere immediately downstream of the meter. Care must be taken particularly with high vapor pressure liquids. It is recommended that back pressure in the meter (downstream pressure) be kept above the value calculated by the formula below:

 $Pd = 3\Delta P + 1.3Pv$

Where

- Pd = Downstream pressure (psia)
- ΔP = Pressure loss across the meter (psig)
- Pv = Steam pressure of the process fluid at measurement (psia)

Physical Orientation

The unit may be installed in a horizontal or vertical line. Specify physical orientation when ordering.

EXPLOSION-PROOF SPECIFICATIONS CSA

Integral type

- + Transmitter ratings: Class I, Zone 1, Ex d ib IIB T4 Gb Class I, Zone 1, AEx d ib IIB T4 Gb
- + Transmitter and sensor ambient temperature: -40°F to 131°F
- + Fluid temperature: -40°F to 158°F (CP015)
 -40°F to 176°F (Other than CP015)
- + Sensor ratings: Class I, Zone 1, Ex ib IIB T4 Gb Class I, Zone 1, AEx ib IIB T4 Gb
- + Sensor to be connected: CP006 through CP050
- + Communication: HART, Modbus

Separate type

- + Transmitter ratings: Class I, Zone 1, Ex d [ib] IIB T6 Gb Class I, Zone 1, AEx d [ib] IIB T6 Gb
- + Transmitter and sensor ambient temperature: -40°F to 131°F
- Fluid temperature: -40°F to 158°F (CP015)
 -40°F to 176°F (Other than CP015)
- + Sensor ratings: Class I, Zone 1, Ex ib IIB T3, T4 Gb Class I, Zone 1, AEx ib IIB T3, T4 Gb
- + Sensor to be connected: CP006 through CP050
- + Communication: HART, Modbus

Sensor ambient temperature (Separate type only)	-40°F to 140°F						
Fluid temperature	Temperature class: T3	–40°F to 257°F: All models					
(Separate type only)	Temperature class: T4	-40°F to 158°F (CP015) -40°F to 176°F (Other than CP015)					

APPENDIX B: PRODUCT CODES AND INQUIRY FORM

Sensor Product Codes

Item Product Codes				_													x						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Description				
Model	С	Ρ																	CamCor PRO Series				
			0	0	6														6mm Sensor / 1/2" Flange (Ferrul	le Connection also available)			
			0	1	0														10mm Sensor / 1/2" Flange (Ferru	ule Connection also available)			
Connec	tion	_	0	1	5														15mm Sensor / 1/2" Flange (Ferru	le Connection also available)			
nomina (mm)	II SIZO	e	0	2	5														25mm Sensor / 1" Flange (Ferrule	e Connection also available)			
(1111)			0	4	0														40mm Sensor / 1.5" Flange (Ferrule Connection also available)				
			0	5	0														50mm Sensor / 2" Flange (Ferrul	e Connection also available)			
Fluid ca	atego	ory				L													Liquid service				
Temper	ratur	e cat	ego	ry (1)			1												Standard (below 125°C)				
Pressu	re ca	tego	ry					1											Standard				
Major p	arts	mate	erial						S										SUS316L				
										В									Ferrule				
										Н									ANSI 150				
Proces	s cor	nect	tion							J									ANSI 300				
										К									ANSI 600				
										Ζ									Special				
Transm	itter	mou	Intin	a (2)	(3)						1								Integrally-mounted				
				5.,							2								Separately-mounted				
Powers	sour	ce										1							20 to 30 VDC				
2										85 to 264 VAC (Safety rated 100 t	o 240 VAC)												
													A						Output 1: Mass Flow	Output 2: Mass Flow			
													В						Output 1: Mass Flow	Output 2: Density			
													C						Output 1: Mass Flow	Output 2: Temperature			
													D						Output 1: Mass Flow	Output 2: Volume Flow (Live)			
Analog	outp	out (4) (5)										E						Output 1: Mass Flow	Output 2: Volume Flow (Fixed)			
-	-												F						Output I: Density	Output 2: Temperature			
													G						Output 1: Volume Flow (Live)	Output 2: Volume Flow (Live)			
													н						Output I: Volume Flow (Fixed)	Output 2: Density			
													J						Output I: Volume Flow (Live)	Output 2: Temperature			
													ĸ	^					Output 1: Volume Flow (Fixed)	None			
														R					Output 1: Volumo Flow (Livo)	None			
														C					Output 1: Volume Flow (Eived)	None			
																			Output 1: Mass Flow	Output 2 : Mass Flow			
														F					Output 1: Mass Flow	Output 2 : Volume Flow (Live)			
Pulse o	utpu	t (4)	(5)											F					Output 1: Mass Flow	Output 2: Volume Flow (Eived)			
														G					Output 1: Volume Flow (Live)	Output 2: Volume Flow (Live)			
														н					Output 1: Volume Flow (Eived)	Output 2: Volume Flow (Eived)			
														1					Output 1: Volume Flow (Live)	Output 2: Mass Flow			
														ĸ					Output 1: Volume Flow (Eixed)	Output 2: Mass Flow			
															0				No output				
Pulse o	utpu	t tvp	е												1				Open collector pulse (standard)				
															2				Voltage pulse				
_																1			HART (Hybrid Bell 202)				
Commu	inica	tion	Inte	rface	•											4			Modbus communication (RS-485	5)			
																	2		ATEX, IECEx (pending)				
Explosi	Explosion-proof rating				4		CSA																
						3	Sensor unit: Temperature class T3 (separately-mounted transmitter only)																
Explosi	on-p	roof	tem	pera	ture	clas	s (1)											4	Sensor unit: Temperature class T4	4			

Explosion-proof specification has restrictions on temperature class.
 If fluid temperature exceeds 176°F (80°C), separately-mounted transmitter must be used.
 Remote Communication cable is included. Length is 5 meters. This is the only length available.
 If "Volume Flow (Fixed Density)" is selected for analog and/or pulse outputs, the volume rate calculation will be based on the fixed (not live) density value.

5. "Volume Flow (Fixed Density)" and "Volume Flow (Live Density)" cannot be used simultaneously on analog and/or pulse outputs. User must choose one or the other.

PRODUCT INQUIRY FORM

Please supply the following information when you inquire

Complete the following form (to the extent possible) by filling in the blanks and checking the applicable boxes. Additional information will be provided during your personal consultation.

1. Model code	CC							
2. Process fluid (1)	Name			Density		Viscosity		
3. Flow range	Max	Norm	Min Minimum Unit (lbm/			obl/hr, etc.)		
4. Fluid temperature	Max	Norm	Min	Unit (°F or	°C)			
5. Operating pressure	Max	Norm	Min	Unit (psi, k	oarg, kPa, kg/c	cm2)		
6. Ambient temperature	Max	Norm	Min	Unit (°F or	°C)			
7. Fluid flow direction	Left to right	□ Right to left		Top to Bottom		 Bottom to top (Orientation: see page 10) 		
8. Nominal size		in. or		mm				
9. Required accuracy	+	% of reading		+		% of full scale		
10. Process connection	Flange type/ra	ating		□ Threaded		Ferrule		
11. Explosion-proof	CSA	🗆 ATEX (pend	ing)	IECEX (pending	g)	Not required		
12. Power supply	AC	DC		□ Volts				
13. Output specifications	Pulse output	Output Form:		Active voltage		Open collector		
		Output 1: Output 2:		☐ Mass rate ☐ Mass rate		Volume rateVolume rate		
		Output 1: Output 2:		Pulses per Pulses per				
	Analog output	Output 1: Output 2:	□ Mass rate □ Mass rate	□ Volume rate □ Temp □ Volume rate □ Temp		ure Density ure Density		
		Output 1: Output 2:	4MADC = 4MADC =	20MAD0 20MAD0				
	Flow damping		Seconds (selectable from 0 to 200 seconds; default is 0.8 seconds)					
	Alarm output	Low =		(g/ml, SG, l	bm/ft3, etc.) D)efault is 0.3 g/ml.		
		High =		(g/ml, SG, I	bm/ft3, etc.) D	efault is 2.0 g/ml.		
14. Communication protocol	□ HART	🗆 Modbus (Sla	ave Address:)					
15. Transmission length	Distance from se Distance from tra	ensor to transmitte ansmitter to recei	er (if remote mo ving device	ounted)	Unit (ft, i Unit (ft, i	m) m)		
16. Receiving device	Totalizer	🗆 Ine	dicator	Record	der	Flow controller		
	Batch controlle	er 🗖 De	ensity compute	r 🗆 Comp	uter	□ Other		
17. Interconnect cable length	For separately-m	nounted transmitt	er: CBP2-		m (Min	iimum: 10 m; Maximum 200 m)		
18. Remote mount bracket	🗆 Remote moun	t bracket for wall	mount or 2" pip	e mount (for remo	te mount trans	smitters only)		
19. Number of units required								
20. Application								
21. Other considerations								

+

1. Special fluids, such as high viscosity fluids or slurries, should be stated precisely and in detail.

+

Add intelligent action to your oil & gas solutions

© Sensia LLC 2021. All rights reserved. 000-ME-0000_PS * Mark of Sensia. Other company, product, and service names are the properties of their respective owners.

