



## Volumetric Counters Serie COVOL



### COVOL Series Volumetric Counters

Working pressure manufacturing according to  
PED 97/23/CE (Lloyd's Register Certificate N° 031)

- Volumetric counter for liquids
- Precision  $\pm 0.8\%$
- Construction in EN 1.4404(SS 316L), PVC, PP, PTFE
- DN 10 to DN100
- Viscosity up to 120.000 mPas.
- It can be easily cleaned and sterilized
- It will work in any position
- Mounting by means of steel PN16 EN 1092-1 standard flanges, ANSI flanges, NPT threads and sanitary connections on demand
- High pressure versions available on demand
- It can be mounted in hazardous areas (intrinsically safe)
- Complete range of electronic equipment available for counting, analog outputs etc.
- It does not need straight sections of pipe

#### Suitable for:

- Filling containers
- Batching and mixing
- Vapour condensation and fuel consumption metering
- Installation:
  - Counter and valves in the work area with protection according to the zone classification
  - Counter in the safe area and valves in the hazardous area
  - Full discharge pipe with air bleed or empty discharge pipe



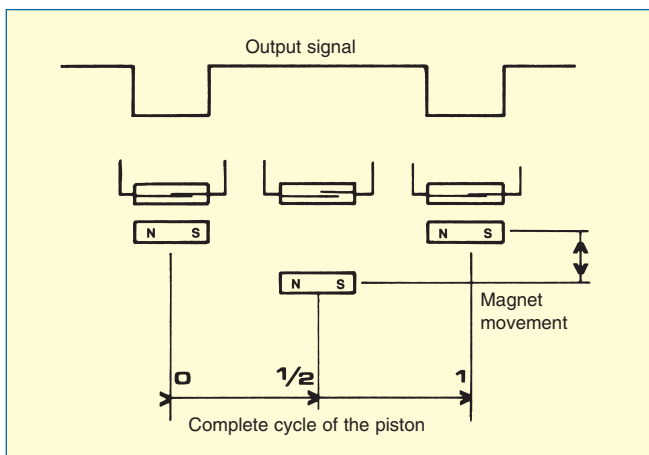
## Principle of Operation

By means of an oscillating piston and an annular metering chamber.

The drawings show how the piston is moved by the liquid as it flows through the metering chamber. The piston contains a magnet which acts on an exterior reed switch once for each complete cycle. The electric pulses are the input for the control equipment (counters, indicators etc.)

## Technical Data

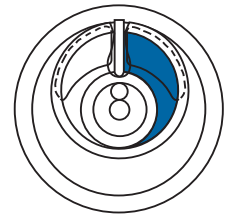
- Pipe connections  
Standard: EN 1092-1 steel flanges for PN16  
On demand: ANSI flanges, BSP threads, NPT, sanitary DIN 11851
- Precision:  $\pm 0,8 \%$
- Repeatability:  $\pm 0,3 \%$
- Measuring range: 30 : 1
- Working temperature:  
EN1.4404(SS 316L) -40°C ..... + 150°C  
PTFE -20°C ..... + 130°C  
PP -10°C ..... + 80°C  
PVC 0°C ..... + 45°C
- Liquid Pressure:  
EN1.4404(SS 316L) PN16 (on demand up to PN250)  
PVC, PP, PTFE PN10
- Reed Switch connector: IP65
- Recommended cable: Shielded cable
- Reed Switch rating: 0,3 A 220 V
- EEx"d" housing on demand
- Body materials: EN1.4404(SS 316L), PTFE, PP, PVC
- Piston materials: PTFE with graphite, PTFE, Aluminium, etc.
- Heated or Refrigerated body on demand



## Operation

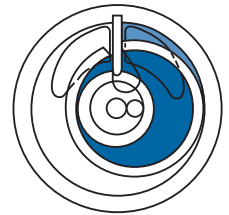
### Position 1

The flow of a liquid through the COVOL volumetric counter exercises a pressure on the piston which starts the metering movement. In this position the liquid is filling the inside of the piston.



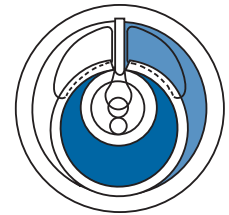
### Position 2

The liquid starts to fill the cavity between the outside of the piston and the metering chamber, and continues to fill the inside of the piston.



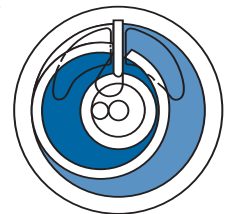
### Position 3

At this point the inside of the piston is totally full, and the liquid continues to fill the outside cavity.



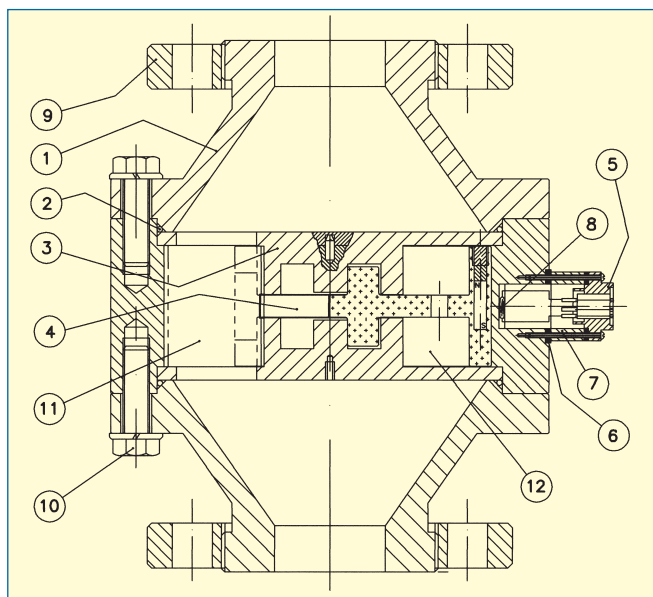
### Position 4

The inside of the piston starts to empty through the outlet. The liquid starts to fill the inside of the piston for the next cycle and continues to fill the outside cavity.



From this point the piston repeats the cycle, moving a **CONSTANT VOLUME** of liquid for each cycle.

## Construction Detail



Cavitation should not occur in the counter, and to avoid this we must follow the A.P.I. 2534 norm, which states that “at the outlet of counters the pressure should be higher than twice the pressure loss of the counter plus 1.25 times the vapour pressure of the liquid or its most volatile component”.

**Important:** The installation of the cable between the COVOL and electronic equipment should not pass near mains or power cables in order to avoid picking up interferences which may influence the electronic counters.

## Density and Viscosity

The COVOL volumetric counters are calibrated using water (density = 1kg/l, viscosity = 1mPa.s) and the pulses per litre are given in the calibration sheet.

## Mounting & Installation

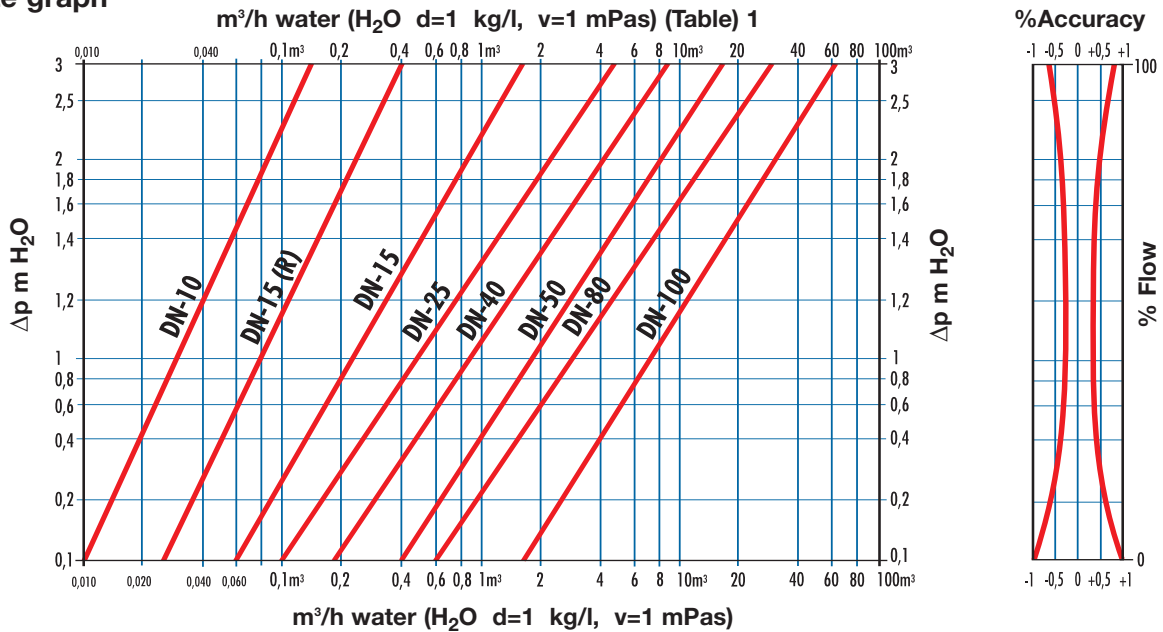
It can be mounted in any position and does not need straight sections of pipe before or after the counter.

A FILTER MUST BE INSTALLED before the COVOL to guarantee correct working and avoid expensive damage. The mesh filter should have 0,1 to 0,2 mm<sup>2</sup> section, depending on the size of the COVOL. With small sizes the mesh should be finer.

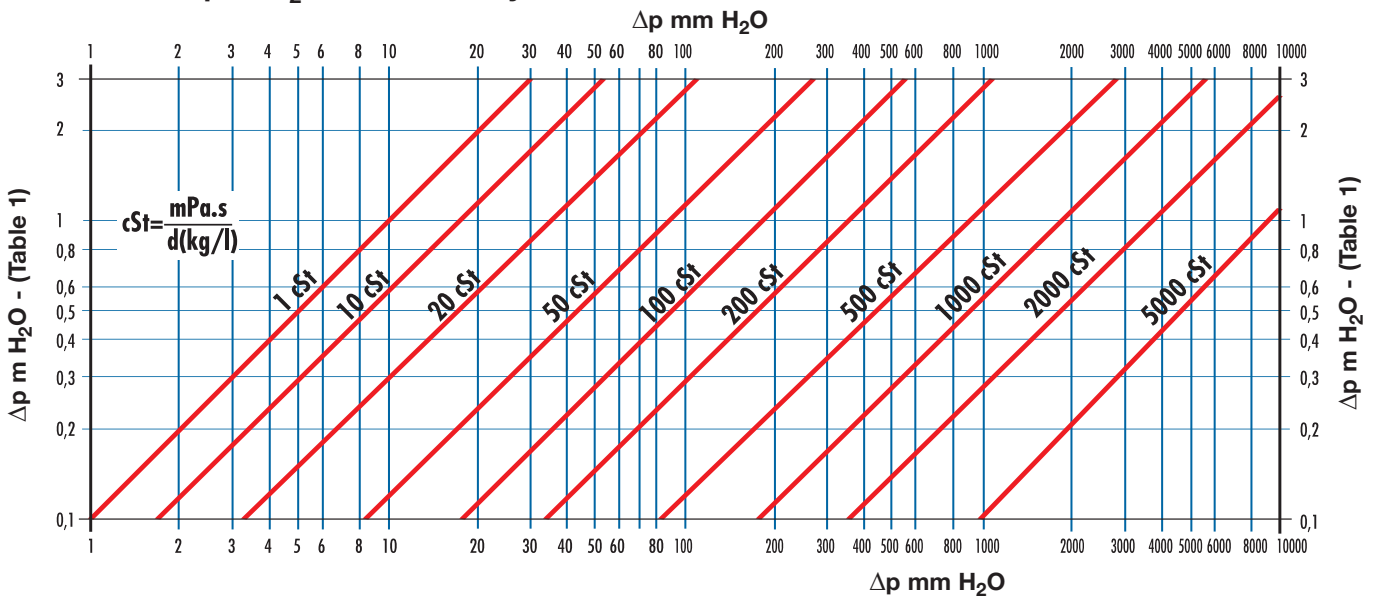
In all processes where air or vapour can be present, an air separator should be installed before the counter to avoid errors.

Materials				
N°	Part Name	INOX	PTFE	PVC / PP
1	Inlet/outlet chambers	EN 1.4404 (SS 316L)	PTFE	PVC / PP
2	Sealing ring	Nitrile Rubber / Viton	Viton / PTFE	Nitrile Rubber / Viton
3	End disc	EN 1.4404 (SS 316L)	PTFE	PVC / PP
4	Piston	PTFE-Graphite	PTFE-Graphite	PTFE-Graphite PVC / PP
5	Reed Connector	Brass / Plastic	Brass / Plastic	Brass / Plastic
6	Sealing washer	Nitrile Rubber	Nitrile Rubber	Nitrile Rubber
7	Connector support	EN 1.4404 (SS 316L)	EN 1.4404 (SS 316L)	EN 1.4404 (SS 316 L)
8	Reed switch	Glass	Glass	Glass
9	Flanges	Steel / EN 1.4404 (SS 316L)	Steel / PTFE	Steel-PVC / PP
10	Screws	EN 1.4404 (SS 316L)	EN1.4404 (SS 316L)	EN 1.4404 (SS 316L)
11	Separator Inlet/outlet	EN 1.4404 (SS 316L)	PTFE	PVC / PP
12	Metering chamber	EN 1.4404 (SS 316L)	PTFE	PVC / PP

## Flow rate graph



## Variations of $\Delta p$ m H<sub>2</sub>O with viscosity



COVOL / INOX + EEx d IIC T6 Enclosure

Variations of viscosity modify the pulses per litre factor of the counter but it does not affect the repeatability.

As a general norm, the variations of density and viscosity only affect the COVOL counters at the beginning of the working range. When the density and viscosity is less than 1 kg/l and 1 mPa.s the flow rate must be higher to start to move the piston, and with the density and viscosity greater than 1 kg/l and 1 mPa.s the flow rate will be lower to start to move the piston.

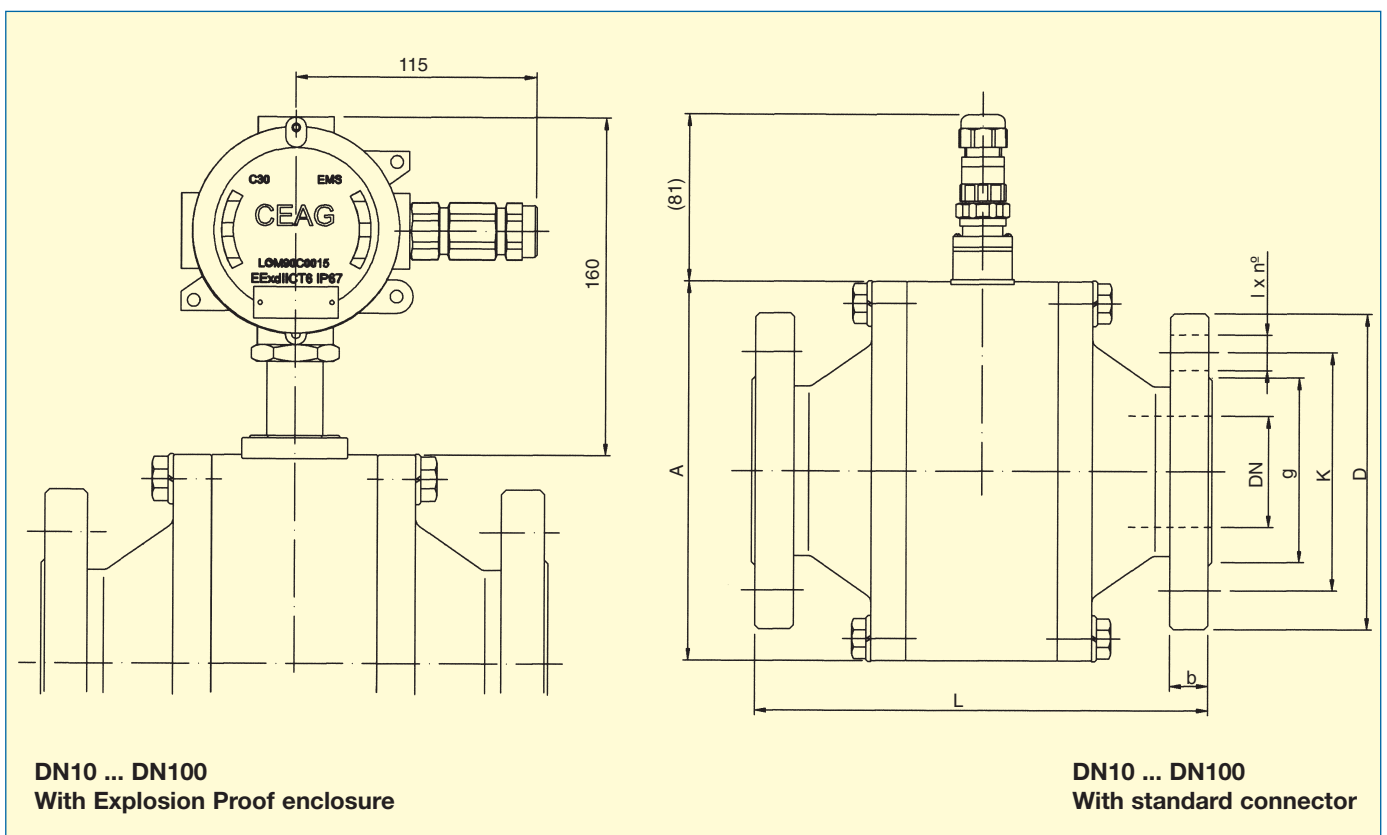
In any case, the variations in density do not produce important changes in the calibration of the counter, these changes are not greater than 5-7% with respect to the values obtained with water.

### Flow rates for H<sub>2</sub>O at 20°C

DN	Min. l/h	Max. m <sup>3</sup> /h	Intermittent Max. m <sup>3</sup> /h
10 / 1/4" (H)	8	0.150	0.5
10	20	0.350	0.8
15	60	1.5	2.7
25	100	4.5	9
40	200	8.5	15.5
50	400	16	28
80	600	28	50
100	800	60	104

DN	Pulses / l ± 10%	cc / pulse ± 10%
10 / 1/4" (H)	100	10
10	100	10
15	20	50
25	10	100
40	4	250
50	2	500
80	1	1000
100	0.2	5000

Pressure loss at Q<sub>max</sub> for all models = 3 m H<sub>2</sub>O

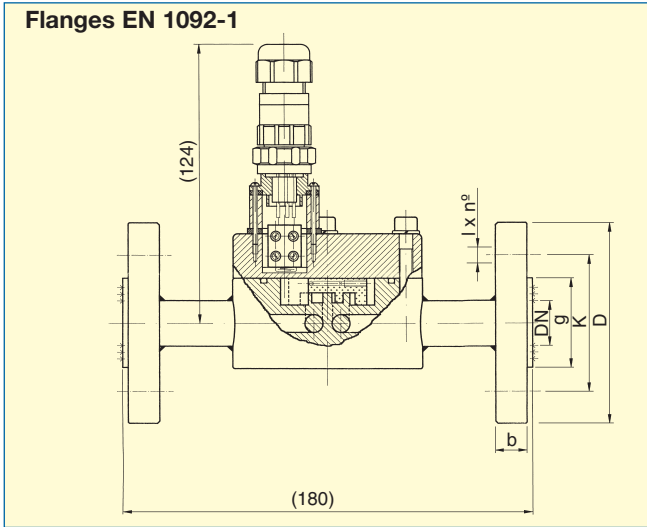


### Dimensions and weights

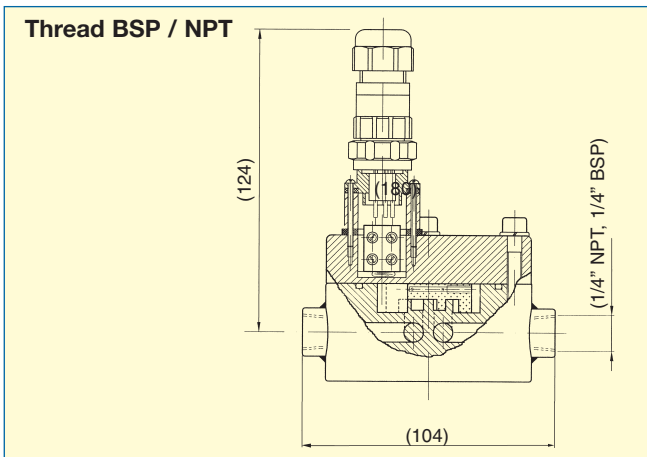
DN	D	k	g	l x n°	b	L		A		Weight kg	
						INOX*	PVC/PTFE	INOX*	PVC/PTFE	INOX*	PVC/PTFE
10	90	60	40	14x4	14	180	210	85	125	6	5
15	95	65	45	14x4	14	180	210	105	140	9	8
25	115	85	68	14x4	16	200	230	140	170	10	9
40	150	110	88	18x4	16	220	250	180	200	18	15
50	165	125	102	18x4	18	240	270	200	230	26	21
80	200	160	138	18x8	20	260	330	250	290	37	30
100	220	180	158	18x8	20	340	450	360	420	92	80

\* EN 1.4404 (SS 316L)

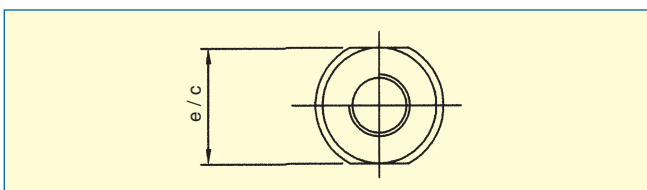
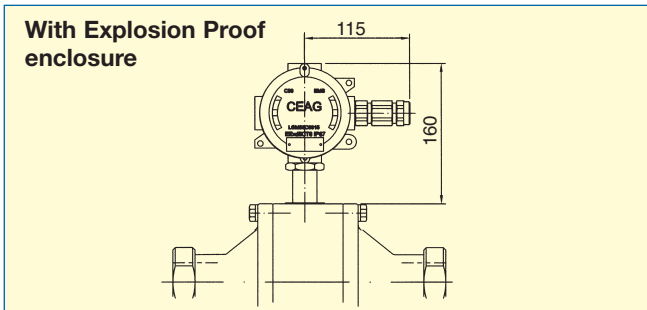
### Dimensions DN10 (Horizontal)



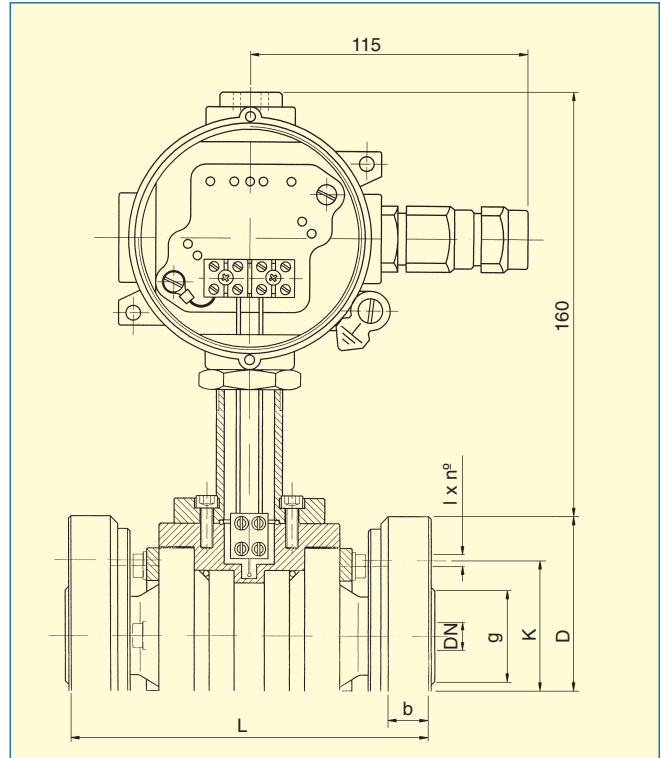
DN	D	k	g	l x n°	b
10	90	60	40	14x4	14



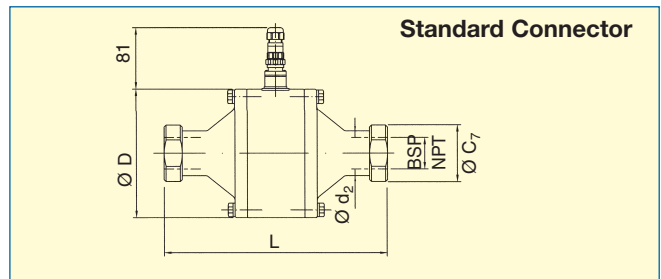
### Thread connection



### Dimensions PVC - PTFE - PP Enclosure (EEx d IIC T6) DN10...DN100

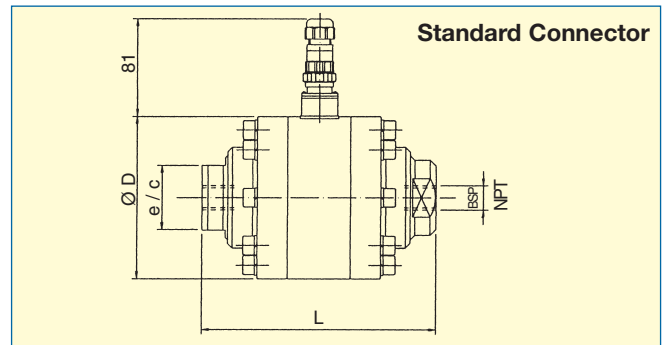
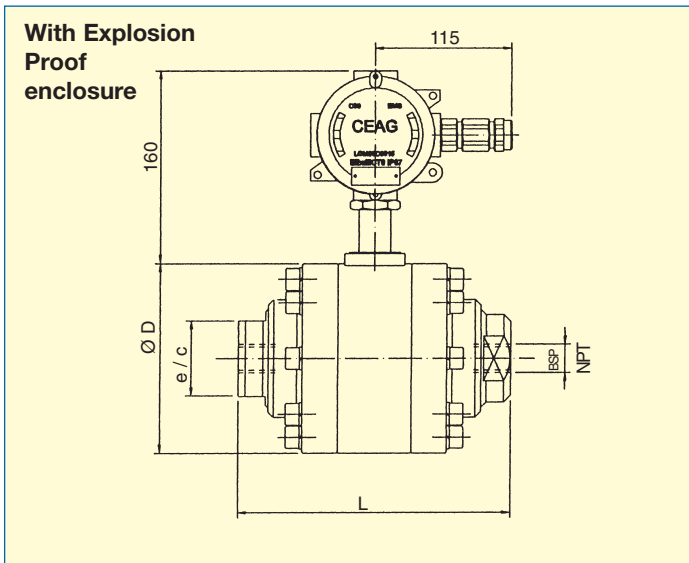


DN	D	k	g	l x n°	b	L
10	95	60	40	M10x4	25	210
15	100	65	44	M12x4	45	210
25	120	85	64	M12x4	45	230
40	150	110	84	M16x4	45	250
50	175	125	98	M16x4	45	270
80	230	160	138	M16x4	55	330
100	250	180	158	M18x8	65	450



DN	10	15	25	40	50	80
Ø C <sub>7</sub>	45	45	65	85	98	125
Ø d <sub>2</sub>	45	35	53	73	86	125
Ø D	79,5	104,5	138	178	198	248
e/c	41	40	55	75	88	115
L	130	180	200	220	240	260

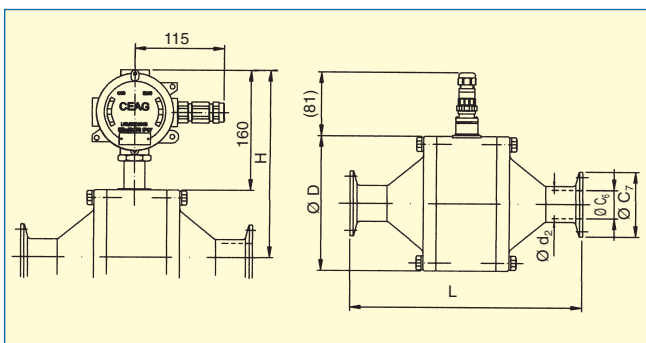
## Thread connection-High Pressure



DN	10	15	25	40	50	80
Ø D	79,5	104,5	138	178	198	248
e/c	41	40	55	75	88	115
L	130	180	200	220	240	260
kg	10	16	30	40	58	76

PN 100

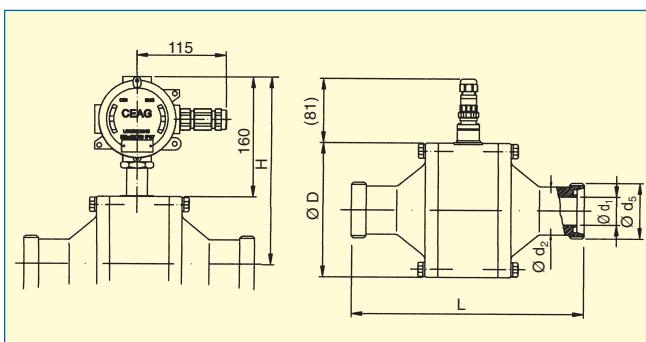
## Sanitary connections, with Explosion Proof enclosure and Standard connections



### CLAMP ISO 2852 : 1993

EN1.4404(SS 316L)

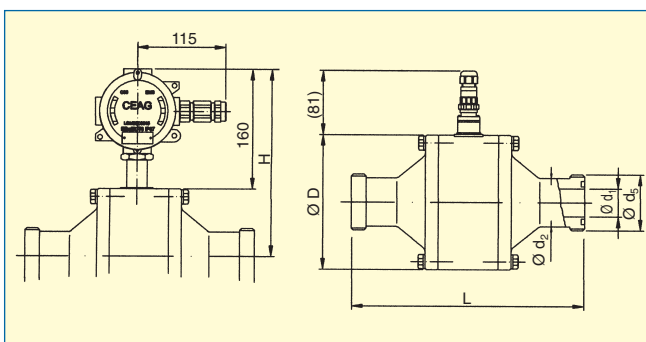
dimensiones de conexión	1/2"	-	1"	1 1/2"	2"	3"
Diametro exterior tubo	12,7	17,2	25	38	51	76,1
Ø C <sub>6</sub>	10,7	15,2	22,6	35,6	48,6	72,9
Ø C <sub>7</sub>	34	34	50,5	50,5	64	91
Ø d <sub>2</sub>	25	25	42	42	55	104
Ø D	79,5	104,5	138	178	198	248
L	130	180	200	220	240	260
H	200	212	230	250	260	285
DIN Equiv.: DN	10	15	25	40	50	80



### DIN 11851

EN1.4404(SS 316L)

Ø d <sub>1</sub>	10	16	26	38	50	81
Ø d <sub>5</sub>	Rd 28 x 1/8"	Rd 34 x 1/6"	Rd 52 x 1/6"	Rd 65 x 1/6"	Rd 76 x 1/6"	Rd 110 x 1/4"
Ø d <sub>2</sub>	24,8	30,8	47,7	60,7	73,7	103,6
Ø D	79,5	104,5	138	178	198	248
L	130	180	200	220	240	260
H	200	212	230	250	260	285
DIN Equiv.: DN	10	15	25	40	50	80



### SMS 1145 : 1957

EN1.4404(SS 316L)

Ø d <sub>1</sub>	22,5	35,5	48,5	72,9
Ø d <sub>5</sub>	Rd 40 x 1/8"	Rd 60 x 1/6"	Rd 70 x 1/6"	Rd 96 x 1/4"
Ø d <sub>2</sub>	35,7	55,7	65,7	93,7
Ø D	138	178	198	248
L	200	220	240	260
H	230	250	260	285
DIN Equiv.: DN	25	40	50	80

## MC-01/MT-02 series Electronic Control Units

The MC-01 and MT-02 series, are panel mounting micro-processor based control instruments for batching control.

### MC-01

#### Applications

- Automated process control in any industry with flow rate

#### Benefits

- Direct interface to Turbines, Covol etc.
- Direct interface for analog inputs
- Fully programmable by user
- Battery back-up stores all data on power failure
- Flow rate readout in l/h and m<sup>3</sup>/h
- Adaptive filter gives stable flow rate readings
- Volume totalizing counter
- Volume partial counter
- Batching relay
- 16 character x 2 line LCD alpha-numeric display
- Optional remote start push button for batching
- Analog output for process control 0...4-20 mA, 0-10V
- Standard DIN 96 x 96 panel mounting
- Plug in connections with screw terminals for easy installation and maintenance
- Optional IP65 front protection
- Power supply 110, 220-240, 24 V ac 50-60 Hz  
12 (not with analog output), 24 Vdc
- Power consumption < 3 VA
- Input signal TM-44 20 mV... 3 V ac, 0...2000 Hz
- Input signal COVOL Reed contact, 0...100 Hz
- Input signal Analog 0-20 mA, 4-20 mA, 0-5 V dc, 0-10 V dc, 1-5 V dc, 2-10 V dc  
By means of a push button
- Remote batch start 0.01% (0.4% analog input)
- Precision -10°C.....60°C
- Temperature range 12 bit resolution
- Analog output 1 A, 250 V ac, 60 VA
- Relay



**MC-01**  
(with optional front protection)

They are fully user programmable and will adapt directly to any TM-44 turbine, COVOL, TTL output, or equivalent pulse generating output transducers.

### MT-02

#### Applications

- Automated process control in any industry with batching or volume control

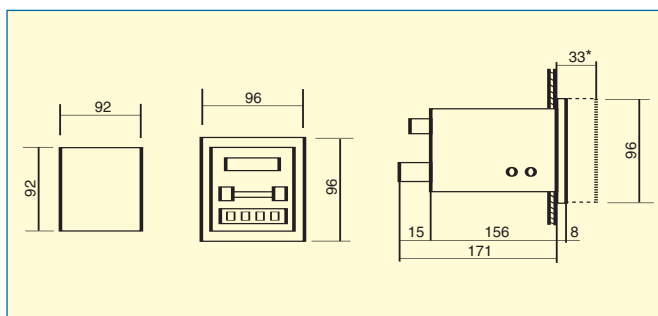
#### Benefits

- Very easy to use
- Bright LED display, 7 digit data, 1 digit mode
- Direct interface to Turbines, Covol etc.
- Fully programmable by user
- Battery back-up stores all data on power failure
- Volume totalizing counter
- Volume partial counter
- Batching relay
- Remote start push button for batching
- Standard DIN 96 x 96 panel mounting
- Plug in connections with screw terminals for easy installation and maintenance
- Dual relay version for fast approximation and slow finish (two control valves)
- Centesimal version for small flowmeters.
- Optional interface with 12 and 5 volt proximity detectors.
- Power supply 110, 220-240, 24 V ac 50-60 Hz  
24 Vdc



**MT-02**

#### Dimensions



\*with optional front protection

## CIP, CIP II Compact mounted Covol volume counter

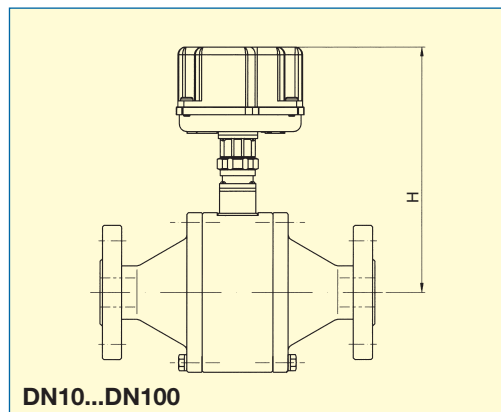
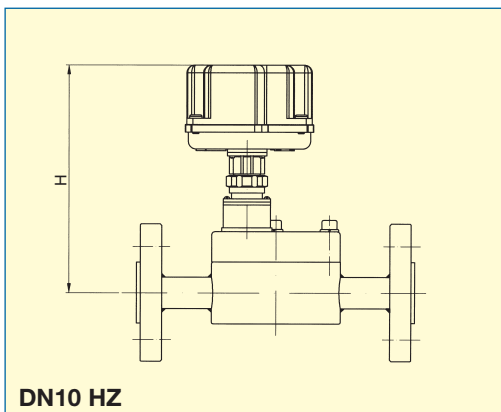
Compact system featuring:

- Covol body and electronic counter mounted together to form a compact unit.
- Same flow rates, pressures and other working conditions as for covol series.
- CIP electronic counter mounted in IP65 housing with an injected aluminium base and U.V. treated polycarbonate cover.
- Programmable pulses/unit factor.
- Button battery power supply lasts for 30.000 hours (3-4 years)
- CIP: 7 digit, 9 mm digit size
- CIP II: 7 digit, 8 mm digit size for totalizer counter  
5 digit, 6 mm digit size for partial counter
- Counter reset by means of internal push button or external magnet (CIP II totalizer counter cannot be reset).

## Covol with CIP, CIP II & CH420L

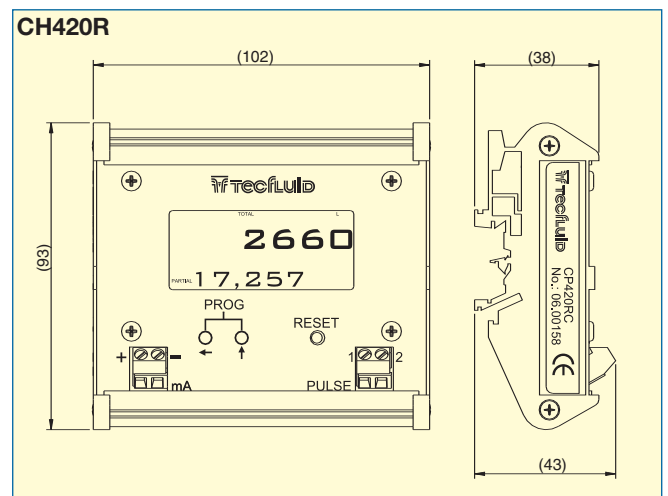
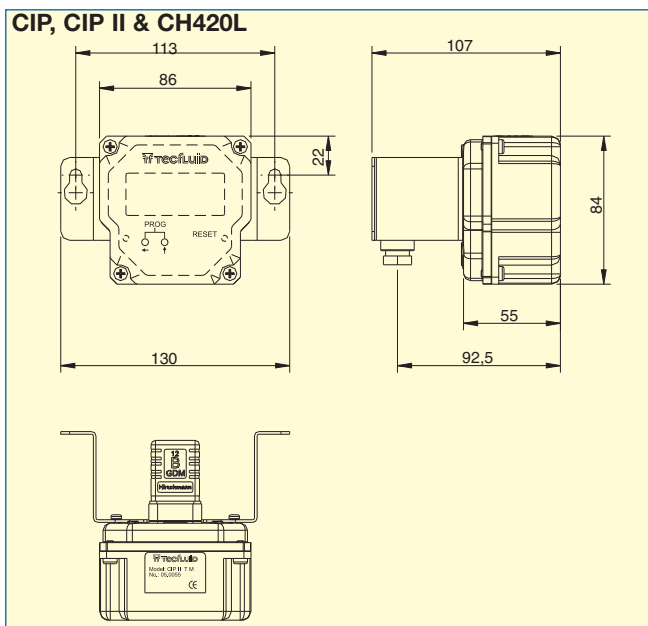


## Dimensions Covol with CIP, CIP II & CH420L



DN	H
DN10	142
DN10	148
DN15	161
DN25	170
DN40	192
DN50	202
DN80	227
DN100	267

## Dimensions



## Flow Transmitters and Volume Counters Series CIP, CIP II, CH420L and CH420R



CH420L

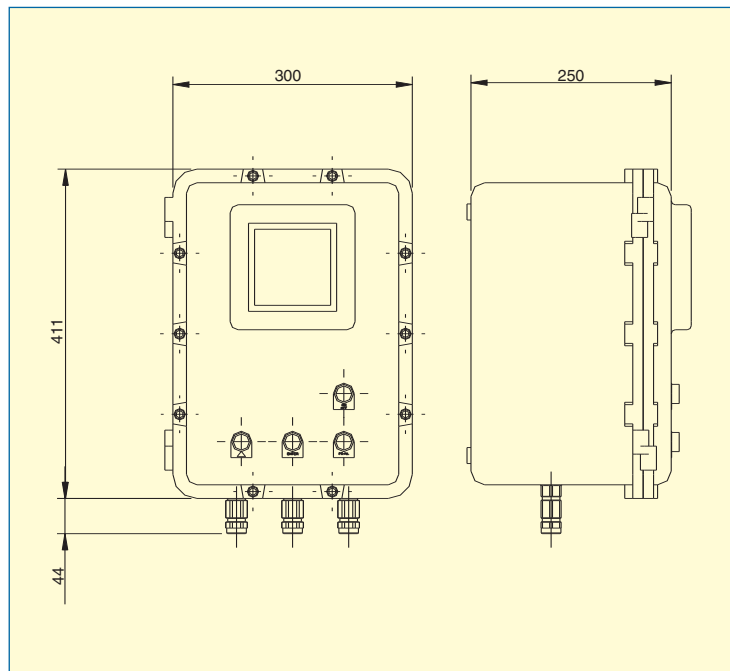


CH420R

### Characteristics

- HART protocol communications, for models CH420L/CH420R
- Connects directly to a COVOL or TM-44 turbine
- CH420L for compact mounting (local)
- CH420R for DIN rail mounting (DIN 46277)
- Programmable pulses/litre
- Programmable beginning and end of analog scale
- Selection of various types of units for flow rate and totalizer.
- Power supply from two wire current loop
- Working voltage: 7,5...36 Vdc
- Current consumption: less or equal to 20 mA
- Totalizer: 7digits, 8 mm digit size
- Flow rate: 5 digits, 6 mm digit size
- Totalizer reset by means of a push button
- Ingress protection: IP65(CH420L)  
IP30(CH420R)
- Ambient temperature: 0...+60°C

### EExd IIC T6 Enclosure



## DFD-2 Series Electronics Frequency Dividers

The DFD-2 Series are rail mounting (DIN 46277) micro-processor based control instruments for frequency division. They are fully user programable and will adapt directly to any TM-44 turbine, COVOL output, or equivalent pulse generating output transducers.

### Applications

- Automater process control in any industry with batching or volume control for interfacing with PLC
- Interface with slow scanning PLC inputs
- Interface with PLC without calculations capacity
- Interface with simple counters
- Interface for electromechanical totalizing counters

### Benefits

- Very simple to use
- Direct interface to Turbines, Covol etc.
- Fullt programable by user
- Standard DIN rail mounting
- Connections with screw terminals for easy installation and maintenance
- No batteries needed, BCD switch programming

### Technical Data

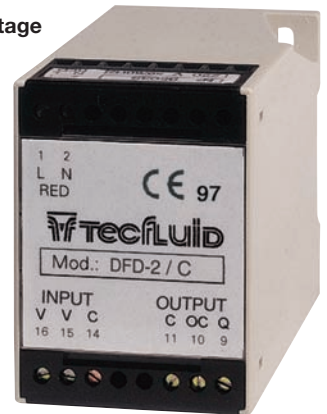
- Power supply 110, 230, 240, 24 V ac 50-60 Hz  
12 V dc
- Power consumption < 1 VA
- Input signal TM-44 20 mV...3 V ac, 0....2000 Hz
- Input signal COVOL Reed contact, 0....100 Hz

- Precision No lost pulses
- Temperature range -10°C.....60°C
- Output / input range 0.00000001.....0.4999
- Output signal Open Collector 0.1 A 40 V  
TTL (5V)
- Output pulse width approx. 50%  
duty circle

### Ordering Information

DFD-2 / a / vv

- a** = **Input Type**
- = 1 COVOL
  - = 2 Turbine Pick-up
  - = 3 TTL
  - = 4 for 12 volt proximity detectors
  - = 5 for 5 volt pulse generators or open collector
- vv** = **Power supply voltage**
- = 110 110 V ac 50/60 Hz
  - = 230 230 V ac 50/60 Hz
  - = 240 240 V ac 50/60 Hz
  - = 024 24 V ac 50/60 Hz
  - = 12d 12 V dc



## CI-420 series Electronic Frequency to Analog Converters

The CI-420 series are rail mounting (DIN 46277) micro-processor based control instruments for frequency to analog conversion. They are fully user programable and will adapt directly to any TM-44 turbine, COVOL output, or equivalent pulse generating output transducers.

### Applications

- Automated process control in any industry with flow rate or volume control for interfacing with PLC and other instruments
- Interface with PLC inputs
- Interface with analog indicators or alarms

### Benefits

- Very simple to use, just select frequency for full scale output
- Direct interface to Turbines, Covol etc.
- Fully programable by user
- No batteries needed, BCD switch programming
- Standard DIN rail mounting
- Connections with screw terminals for easy installation and maintenance
- 0-20 mA, 4-20 mA, 0-10 V, 0-5 V, 2-10 V or 1-5 V output options
- Adaptive filter for stable output

### Technical Data

- Power supply 110, 230, 240, 24 V ac 50-60 Hz  
24 V dc
- Power consumption < 1 VA
- Precision 0.2 % Full Scale

- Temperature range -10°C.....60°C
- Frequency range 0.1.....9999 Hz for full scale
- Cutout frequency 0.04 Hz
- Input signal TM-44 20 mV...3 V ac, 0....2000 Hz
- Input signal COVOL Red contact, 0....100Hz
- Consult Tecfluid for other inputs

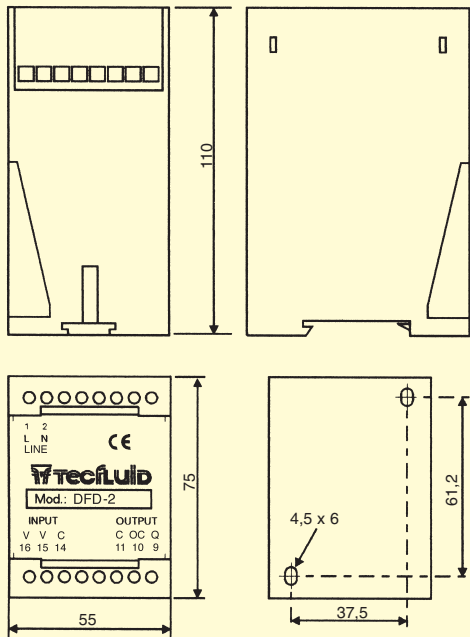
### Ordering information

CI-420/ a / b / vv

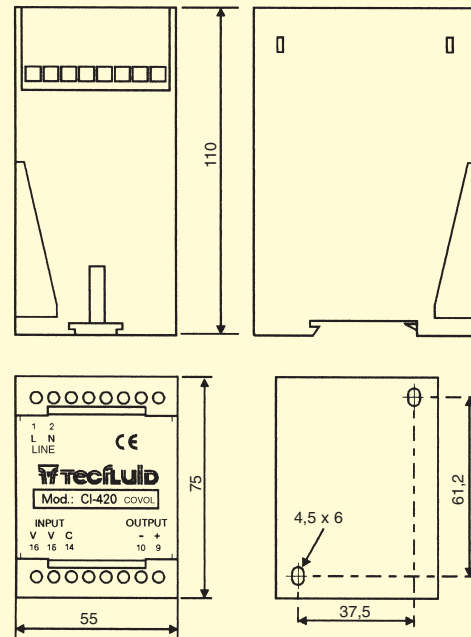
- a** = **Output signal**
- = A 0 - 20 mA
  - = B 4 - 20 mA
  - = D 0 - 5 V dc
  - = E 0 - 10 V dc
  - = F 1 - 5 V dc
  - = G 2 - 10 V dc
- b** = **Input Type**
- = 1 COVOL
  - = 2 Turbine Pick-up
  - = 3 TTL
  - = 4 for 24 volt proximity detectors
  - = 5 for 5 volt pulse generators or open collector
- vv** = **Power supply voltage**
- = 110 110 V ac 50/60 Hz
  - = 230 220-230 V ac 50/60 Hz
  - = 240 240 V ac 50/60 Hz
  - = 024 24 V ac 50/60 Hz
  - = 24d 24 V dc



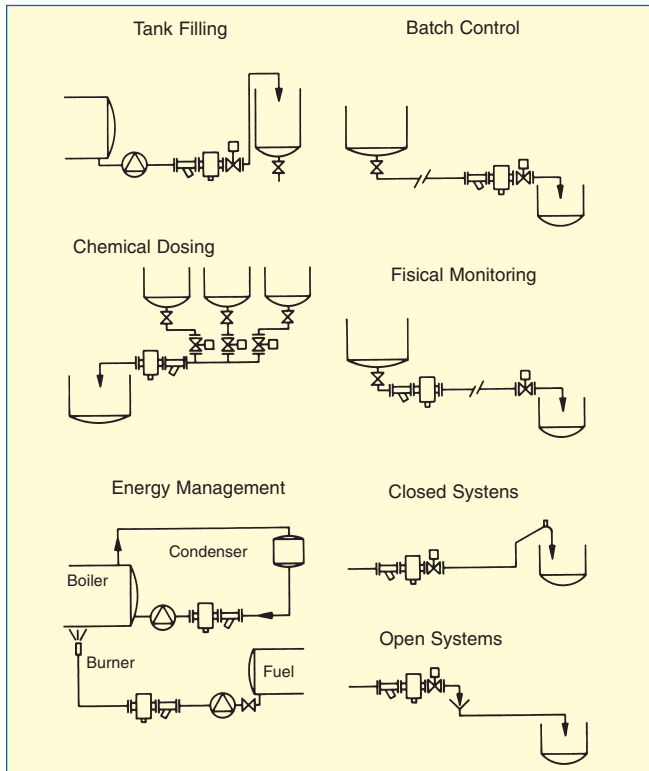
### Dimensions: Series DFD-2 (rail DIN 46277)



### Series CI-420 (rail DIN 46277)



### Covol Volumetric Counter Applications



### Liquids

- |                                   |                           |
|-----------------------------------|---------------------------|
| Acetic Acid                       | Inles                     |
| Acetone                           | Isocyanate                |
| Acrlonitrile                      | Isopropylammine           |
| Alcohol                           | Kerosine                  |
| Ammonia                           | Liquid Helium             |
| Ammonia Liquids                   | Magnesium Sulphate        |
| Ammonium Nitrate                  | Methanol                  |
| Anti-coagulants                   | Methylated Spirits        |
| Benzene                           | Mineral Oils              |
| Butadiene                         | Menomers                  |
| Butane                            | Molten Sulphur            |
| Butene                            | Natural Gas (Liquidified) |
| Chlorates                         | Nitric Acid               |
| Chlorine                          | Nitrochlorobenzene        |
| Condensate                        | Oil & Water               |
| Decalcifiers                      | Oils and Acids            |
| Demineralsed Water                | Organic Products          |
| Dichloroethane                    | Oxigen (Liquidified)      |
| Dimethylammine                    | Oxigenated Water          |
| Diphenoltetrachloride             | Pentane                   |
| Distilate                         | Petrol                    |
| Esters                            | Phosohoric Acid           |
| Ethers                            | Polybutane                |
| Ethiloxide                        | Polyol                    |
| Food products                     | Propane                   |
| (Cream, Syrups, Fruit, Chocolate, | Propylene                 |
| Juicea, Vinegar, Wine)            | Propyloxide               |
| Flocculants                       | Silicates                 |
| Food Oils                         | Sodium                    |
| Freon                             | Solvents                  |
| Gasoline                          | Sulphuric Acid            |
| Gelatine                          | Toluene                   |
| Glycerine                         | Tributyl Phosphate        |
| Glycol                            | Trichloroethane           |
| Hidraulic Oils                    | Vinyl Chlorides           |
| Hydrocarbons                      | Water & Corrosion Water   |
| Hydrochloric Acid                 | Winhibitors               |
| Industrial Water                  | Xylene                    |