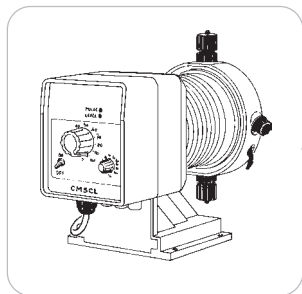




This operating instructions contains safety information that if ignored can endanger life or result in serious injury. They are indicated by this icon.



Use of this pump with radioactive chemicals is forbidden!



OPERATING INSTRUCTIONS MANUAL FOR “CMS ANALOG” SERIES DOSING PUMP



Keep the pump protected from sun and water.
Avoid water splashes.



Please read it carefully!

English language

R1-01-03

« CE » referring norms



“CMS Analog” series dosing pumps comply with the following European regulations:

EN60335-1 : 1995, EN55014, EN50081-1/2, EN50082-1/2, EN6055-2, EN60555,3

Based on directive CEE 73/23 c 93/68 (DBT Low voltage directive) and directive 89/336/CEE (EMC Electromagnetic Compatibility)



All metering pumps supplied with 115 VAC are available with certification CSA, except for 25 05 and 15 10 pump models.



GENERAL SAFETY GUIDELINES

Danger!

In emergencies the pump should be switched off immediately! Disconnect the power cable from the power supply!

When using pumps with aggressive chemicals observe the regulations concerning the transport and storage of aggressive fluids!

When installing outside European Community, always observe national regulations!

Manufacturer is not liable for any unauthorized use or misuse of this product that can cause injury or damage to persons or materials!

Caution!

Pumps must be accessible at all times for both operating and servicing. Access must not be obstructed in any way!

Feeder should be interlocked with a no-flow protection device to automatically shut-off the pump when there is no flow!

Pumps and accessories must be serviced and repaired by qualified and authorized personnel only!

Always discharge the liquid end before servicing the pump!

Empty and rinse the liquid end before work on a pump which has been used with hazardous or unknown chemicals!

Always read chemical safety datasheet!

Always wear protective clothing when handling hazardous or unknown chemicals!

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**Technical features and drawings are subject to changes and modifications
without any advice.**

GENERAL INFORMATION

“CMS Analog” series foot mounted solenoid driven metering pump fits small and medium dosing amounts of liquid products. They are constituted of the following main assemblies:

Box
Electronic Circuitry
Electrical Driven Magnet
Diaphragm
Pump Head

The pump working mode is intermittent: a magnetic field is created each time a pulse reaches the magnet. The magnetic field pushes the piston. A diaphragm (fixed on the piston head) compresses the liquid into the pump head. The liquid gets out through the delivery valves while the suction valves close. When the pulse ends, a spring takes back the piston and the diaphragm. The vacuum created by the diaphragm movement takes the liquid inside the pump head from the suction valve, while the delivery valve is closed. The pump capacity is proportional to the number of strokes and to the pump head internal volume (Single Stroke Injection Quantity). Solenoid driven dosing pumps can operate without liquid without problems to its assemblies.

Box

“CMS Analog” series dosing pumps are assembled in IP65 (PP + glass fiber) plastic material boxes. Installation is wall mounted by means of two screws at a distance of 152 mm. “CMS Analog” series is suitable for foot mounting installation.

Electronic Circuit

The electronic circuit is made of proved quality components. It provides the necessary electrical pulses to the magnet.

Electro-Magnet

The electro-magnet with class H (180°C) copper winding, driven by the electronic circuit, gives the necessary push to the piston and the diaphragm. Piston stroke length varies from 0 to 1,6 mm, according to the pump dimension type (pressure/output).

Diaphragm

PTFE diaphragms used in the “CMS Analog” series pumps assure good chemical compatibility and mechanical resistance.

Pump Head

The pump head diameters used in the “CMS Analog” series pump are: ø22, ø32, ø44, ø58, ø64. The pump head works as a dosing chamber, the suction valve, delivery and manual outgassing valves are inside it. The purpose of the manual outgassing valve is to help the priming of the pump during installation. Pump head is made in PP and upon request PVDF.

INSTALLATION

The pump is supplied with all the materials needed for the installation. To set up the “CMS Analog” series pump, first mount it in horizontal position in a well aerated and easily accessible environment. The distance between the pump head and the suction filter should not be more than 1.5m. Connect the suction pipe (transparent one) to the suction fittings (bottom pump head valve). Be sure the o-ring in the suction valve is in place. Use the hands to tight the fitting nut. Place the suction filter on the bottom of the product tank. The suction pipe should be as short as possible in vertical position without any bends to avoid air bubbles. Install the injection valve. Connect one end of the

delivery pipe (opaque one) to the delivery fitting on the top of the pump head and the other end to the injection valve previously installed.



To avoid delivery pipe breaking be sure it does not touch any other object.

Always install the injection valve at the end of the rigid delivery hose. The injection valve should never be installed lower than the product tank to avoid that injection valve breaking lets the product flow freely into the system. If the only way to install the injection valve is lower than the tank, then it is recommended to use an anti-siphon valve on the delivery side. This valve prevents vacuum on the pump. Feeder should be interlocked with a no-flow protection device to automatically shut-off the pump when there is no flow. Check regularly the delivery valve and immediately change it if inoperable or broken. Do not install tanks with chemical beneath: vapours may damage the pump.



FREE END OF SUCTION HOSE SHOULD BE INSERTED JUST ABOVE THE BASE OF NOOZLE!

USE ONLY HOSES COMPATIBLES WITH PRODUCT TO DOSE. PLEASE REFERS TO OUR “CHEMICAL COMPATIBILITY TABLE” !

PRIMING

To prime the pump without touching chemicals please do as follow:

- connect all hoses into proper places (delivery hose, suction hose, outgassing hose).
- open outgassing valve and turn on the pump.
- set pump's single injection at 100% and pulses at 50%.

All air inside the pump head will exit through the outgassing outlet. When product will leak from it, close immediately the outgassing valve. If dosing product is particularly dense, to facilitate the priming, insert on vent pipe a syringe of 20 cc and suck inside.

METERING

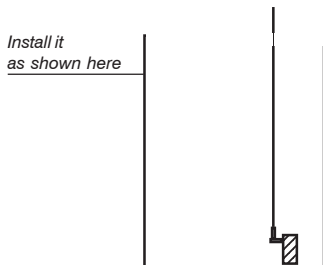
The “CMS Analog” series pump technical features are printed on a label located at the left side of pump box. They include: power supply, working counterpressure (Kpa/bar) and pump capacity in liter per hour (l/h). All these dosing information are calculated by dosing water at 20 °C temperature, at the maximum counterpressure reported on the label, using the injection valve and the % knob set to maximum. Dosing accuracy is $\pm 5\%$ l/h at constant maximum counterpressure and 1 cps flow (**max viscosity: 60 cps**).



Caution: injection capacity is a constant value but a variation in counterpressure or product's viscosity may cause some changes. For further details see “delivery curves” paragraph.

LEVEL PROBE AND FOOT FILTER INSTALLATION

Level probe must be assembled using the foot valve included into pump's kit. Foot valve is designed to be installed in contact with tank base. It's not necessary a space to avoid sediment accumulation. Connect the BNC to dosing pump using “LEVEL” input.



to BNC Connector
(to pump's level input)

Pump's suction hose

Level's probe

Foot filter



SINGLE STROKE INJECTION ADJUSTMENT

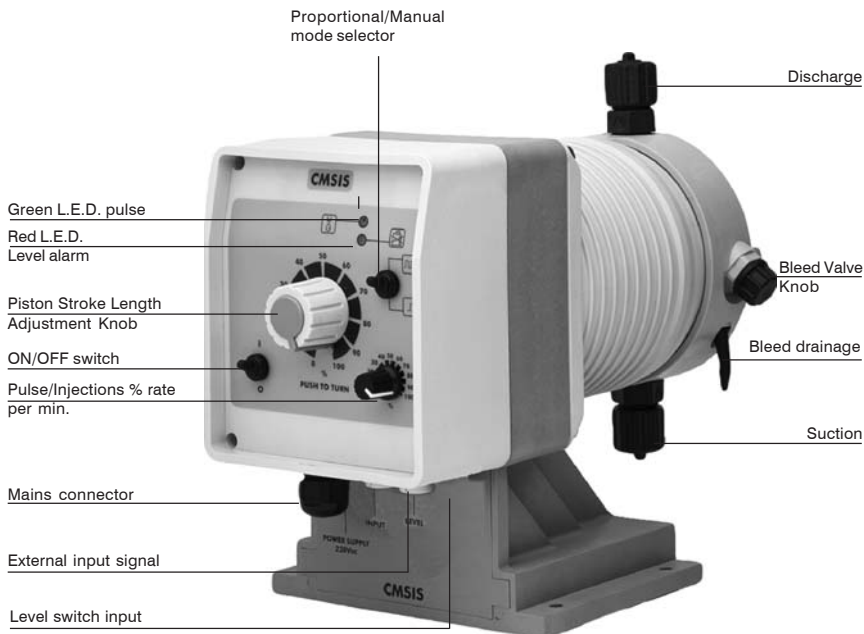
The “CMS Analog” series pumps have a double flow setting that can be operated at same time: the number of strokes per minute and the single stroke capacity. This feature results in a more accuracy of the metering. The single stroke capacity adjustment is a mechanical control on the piston that pushes the diaphragm and it's operated through the central panel knob. This knob is locked to avoid undesired metering by accidental movement. To unlock it push the knob and rotate it on the needed value.



Warning: to avoid mechanical damages the piston displacement adjustment must be done when the pump is working.



STROKE ADJUSTMENT RECOMMENDED RANGE: from 30% to 100%.



ELECTRICAL CONNECTIONS

Pump has to be connected to power supply using the standard "SCHUKO" plug supplied or the special power supply cable.



Before starting any electrical connection perform the following operations:

- ensure a correct ground installation!
- if there is a bad ground, install a differential switch with high sensibility (0,03 A) as additional protection from electric shocks!
- check that pump voltage corresponds to supply voltage!
- make ground connection before any other connection!

REPAIR MUST BE PERFORMED BY AUTHORIZED PERSONNEL ONLY.

Electrical features:

Power supply range for 230 VAC models	184 ÷ 268 VAC
Power supply range for 115 VAC models	92 ÷ 134 VAC
Frequency	50 ÷ 60 Hz

Average Power Consumption:

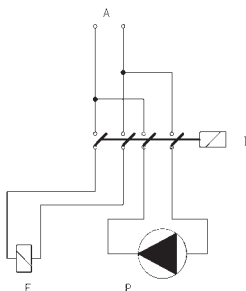
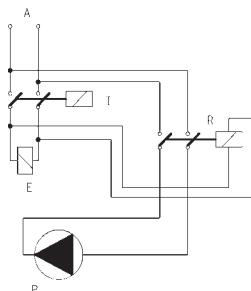
Pump model	Consumption 115 Vac	Consumption 230 Vac
CMSxx 2505	24 W	42 W
CMSxx 1510	24 W	42 W
CMSxx 1804	24 W	42 W
CMSxx 1408	24 W	42 W
CMSxx 0720	24 W	42 W
CMSxx 0340	24 W	42 W
CMSxx 0260	24 W	42 W

Pump power "on" is confirmed with a green led on the frontal panel that turns off each stroke.



Do not connect the pump in parallel to an inductance load, e.g. motors, to prevent electronic circuitry damages. Always use a connector to cut off spikes due to other devices switching.

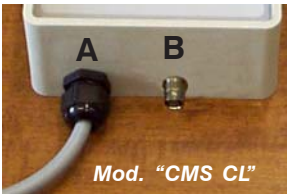
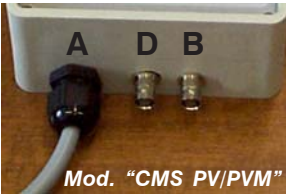
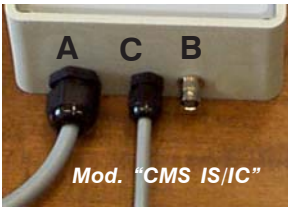
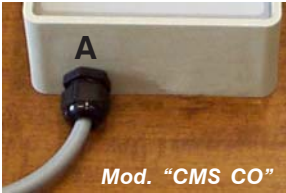
Dosing pump in parallel connection with inductive loads



P- Metering Pump
R- Relay
I- Connector or Multi-pole safety device
E- Inductive Load
A- Power supply

INPUT/OUTPUT CONNECTIONS

“CMS Analog” pumps have different Input/Output connections. Follow the pictures:



Legend

A Power supply
B Level
C Input
D Pulse emitter water meter

ELECTRICAL PROTECTION

Internal circuitry is protected against noises using the EMC system and with a fuse located under the front cover of pump. To replace the fuse (**trained personnel only**) do as follow:

- **unplug power supply**
- **fully rotate counterclockwise piston displacement knob**
- **remove the 6 screws on the front cover of the pump**
- **remove pulling horizontally the frontal cover**
- **replace fuse, use only approved fuses reported in table below**
- **put back cover in place, take care of seal and piston displacement knob position**

Each pump type fuse (**5x20**) **T(delayed)** can be found in table below:

Pump model	Fuse for mains	
	230 Vac	115 Vac
CMSxx 2505	800mA	1,6A
CMSxx 1510	800mA	1,6A
CMSxx 1804	800mA	1,6A
CMSxx 1408	800mA	1,6A
CMSxx 0720	800mA	1,6A
CMSxx 0340	800mA	1,6A
CMSxx 0260	800mA	1,6A

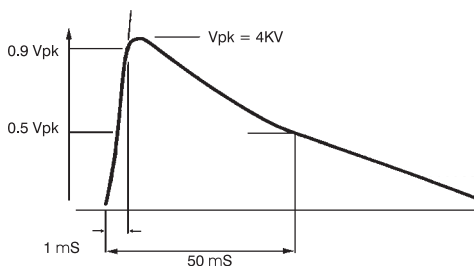


fig. 1

“CMS Analog” pump is equipped with an overvoltage protection (working voltages: 275 V, 150V, 39V) and a voltage peak protection up to 4 KV, 50 μ sec against pulses as shown in fig. 1.

LEVEL ALARM

CL, IS, IC, PV and TE type pump are provided with a liquid level alarm to indicate if product tank is empty. The level probe is connected to the right BNC plug on pump’s bottom panel. The level probe is made of a N.O. reed contact (10VA, 1A max, 230Vac max) closed by a floating magnet housed in a (PP) plastic box. When the product level goes below the minimum the magnet closes the reed contact. The pump stops and the red LED on pump’s front panel indicates the alarm status.

PUMP TYPES

“CMS Analog” series pump capacity can be reduced 10 or 100 times operating the 1/10/100 switch in the frontal panel, the % marked knob will act on this set capacity.



CMS CO

Constant dosing pump with stroke speed adjustment between 0 and 100% of indicated capacity (see label on pump type). The % marked knob sets the pump capacity, changing linearly the magnet stroke number per minute. It is strongly suggested to not operate the pump in the range from 0 to 10%, since there is not a linear correlation with the pump stroke speed in that range. This pump is specially designed for constant dosing rates. CMS CO pump can be ON/OFF driven by a LPH or a LCD instrument. To set 2 l/h against 10 bar on a CMS CO 1004 the % marked knob should be set to 50%.



CMS CL

Constant dosing pump with level alarm, provided with a floating magnetic sensor probe. A red led indicates that the pump stops dosing because the product tank is empty. This pump has the same features and adjustments of the CO type pump.



CMS IC

Proportional/constant pump driven by current signal. Setting the switch on the *constant*  position, the pump has the same features and adjustments of the CL pump. Setting the switch on the *proportional*  position, the pump capacity is set proportionally to a given analog current signal; a given linear change of the signal will be followed by a linear change of capacity. The current signal accepted range is 0÷20 mA (it can be changed upon demand). The maximum pump capacity requested by the maximum input signal is set by the % marked knob. The IC pump can be driven by any electronic device (such as pH-meter, RH-meter, etc) that gives an analog current signal output. This signal must be applied to the bipolar cable provided with the pump, already internal connected, being care to connections: red wire: *positive* (+); black wire: *negative* (-).

CMS IS

Proportional/constant pump driven by a digital signal. Setting the switch on the *constant*  position, the pump has the same features and adjustments of the CL pump. Setting the switch on the *proportional*  position, to each external voltage free pulse correspond a magnet stroke. When proportional position is set, the % marked knob does NOT affect the pump capacity. The IS proportional dosing pump can be driven by any external device (PCs, PLCs, etc.) that produce a digital signal. The digital signal (N.O. contact) must be applied to the cable provided with the pump, already internal connected. If it is requested a 0÷5; 0÷12 Vdc input signal option, be care to connections: red wire: *positive* (+); black wire: *negative* (-).

CMS PV

Proportional/constant pump driven by a water meter digital signal. Setting the switch on the *constant*  position, the pump has the same features and adjustments of the CL pump. It is furthermore possible to divide the maximum magnet strokes per minute by 1, 10 and 100 using the switch on the front panel. Setting the switch on the *proportional*  position, to each external pulse correspond one pump stroke. This pump can be driven by a CTFI or CWFI series water meters. This pump can also be driven by a digital signal coming from a voltage free contact. Driving signal is applied on the BNC plug on the left bottom of the front cover. Dividing factor (N) value is obtained multiplying the value indicated on the adjustment knob by the multiplying switch (x1, x10, x100) value.

Capacity definition for "CMS PV" pump

Given the water m³ to be treated and the product amount to dose in p.p.m., the minimum pump capacity to be used can be obtained with the following formula:

$$\frac{\text{ppm} \times K \times \text{m}^3}{1000} = \text{l/h}$$

l/h - minimum pump capacity required

ppm - product amount to dose in p.p.m. (gr/m³)

k - dosed product dilution factor (pure chemical k=1)

m³ - maximum capacity of the system to be treated in m³/h.

Dividing factor (N) to be set on the adjustment knob is given by the following formula:

$$\left(\frac{\text{imp/l} \times \text{cc}}{\text{ppm} \times K} \right) \times 1000 = N$$

N - is the number the external pulses are divided by to be set on the adjustment knob

imp/l - pulse per liter given by the water meter

cc - pump's single stroke dosing quantity (in cc). Refer to following table

k - dosed product dilution factor (pure chemical k=1)



*ppm** - product amount to dose in p.p.m. (gr/m³)

* 10.000 ppm equals to 1%

Pump model	cc max	Piston displacement
CMSPV 0260	8,4	100%
CMSPV 0340	5,6	100%
CMSPV 0720	2,8	100%
CMSPV 1408	0,89	100%
CMSPV 1804	0,45	100%
CMSPV 1510	1,4	100%
CMSPV 2505	0,70	100%

If the dividing factor (N), obtained with the above formula, is <1 , a pump with higher single stroke dosing quantity is required or the water meter needs to be changed with one that gives higher number of pulses per liter. In some application this issue can be solved reducing the dosed product dilution factor. If dosed amount is higher than the needed one, the set dividing factor (N) can be increased.

CMS PVM

Proportional/constant pump driven by a water meter digital signal. Setting the switch on the *constant*  position, the pump has the same features and adjustments of the CL pump. It is furthermore possible to divide the maximum magnet strokes per minute by 1 ($\div 1$), 10 ($\div 10$) and 100 ($\div 100$) using the selector on the front panel. The electronic capacity adjustment sets the injection per minute. Setting the switch on the *proportional*  position and the selector on “multiplier” (X1), the pump gives a stroke each 10 external pulses sent. Setting the selector on “divider” ($\div 1$ or $\div 10$), the pump gives at maximum a stroke each external pulse sent and at minimum a stroke each 100 pulses sent. This pump can be driven by a CTFI or CWFI series water meters. This pump can also be driven by a digital signal coming from a voltage free contact. Driving signal is applied on the BNC plug on the left of the bottom pump cover.

MAINTENANCE

Every month (when in normal use) pump and accessories should be checked for proper operation. For a correct maintenance, please perform following tasks:

- check electrical connections
- check liquid end screws
- check discharge line connections
- check discharge and suction valve connections
- check the entire liquid end for leakage
- check feed rate: run the pump for a short period in priming mode

REPAIR



All repair measures must be performed by authorized and qualified personnel. If pump needs to be repaired in manufacturer's factory send it only if it has been cleaned and after the liquid end has been rinsed!

If, despite pump's emptying and cleaning, there are still possible safety hazards the information must be declared on return's form!



If pump needs a replacement use only ORIGINAL spare parts !

Replacing discharge valve:

- remove discharge line
- unscrew discharge valve from the liquid end
- remove oring from the liquid end
- screw in the new discharge valve with oring up to the stop
- refit discharge line

QUICK TROUBLESHOOTING GUIDE

If...pump does not work and the green led is off:

- check and verify power supply;
- verify provided power supply is the same reported in the pump tag;
- check fuse integrity and eventually replace it;
- replace electronic PCB.

If...pump does not work and the red led is on:

- check and ensure product tank is not empty;
- check level probe floater, replace it if blocked down;
- remove crystallized product that can block the level probe floater.

If...pump does not work and the green led flashes

- check and verify foot filter is not obstructed with impurities and chemical crystals;
- some air can be in the pump head. Remove it as described in the PRIMING section;
- check and ensure suction and delivery valves are not obstructed with product crystals;
- check and verify valves o-ring are not swell or damaged, it is a clear evidence of chemical incompatibility with used products (see "o-rings" section).

If...pump blows fuse after working a while:

- check and ensure supplied power is the same reported in pump tag;
- check electronic circuitry connecting it to a lamp(of the right voltages) instead of the magnet. All connections are "quick lock" made so: it is a quick test to perform, if the lamp does not light intermittently the electronic PCB needs to be replaced;
- check and ensure magnet impedance is ($\pm 5\%$) the tag one. If not, replace it.

O-RINGS

The valve sealings are provided in 5 different types to satisfy different chemical compatibility issues. The elastomer that will best fit the requested needings can be found on the manufacturer compatibility table. Get in touch with customer support if needed. The elastomer used for the o-rings equipping the "CMS Analog" pumps are characterized by different suction/delivery valve colours.

<i>Elastomer</i>	<i>ISO Code</i>	<i>Manufacturer Code</i>	<i>Valve Colour</i>
Fluorocarbon	FPM	FP	black
Ethylenepropylene	EPDM	EP	grey
Polytetrafluoroethylene	PTFE	PTFE	blue
Nitrile	NBR	WAX	green
Silicone	MVQ	SI	yellow

TECHNICAL FEATURES

<i>Pump strokes per minute:</i>	0 ÷ 150
<i>Max suction pipe lenght:</i>	1,5 meters
<i>Environment temperature:</i>	0 ÷ 45°C (32 ÷ 113°F)
<i>Chemical Temperature:</i>	0 ÷ 50°C (32 ÷ 122°F)

CONSTRUCTION MATERIALS

Case:	PP
Pump Head:	PP (available in PVDF)
Diaphragm:	PTFE
Valve Balls:	Borosilicate Glass (available in SS316, Ceramic, PTFE)
Suction pipe:	PVC (available in PE)
Delivery pipe:	PE
Valve body:	PP (available in PVDF)
O-ring:	as requested (Viton®, EPDM, PTFE, Silicone, Nitril)
Injection connector:	PP/PVDF (glass ball, HASTELLOY C276 spring)
Level Probe:	PP (available in PVDF)
Level Probe cable:	PE
Foot Filter:	PP (available in PVDF)

PVDF / PTFE furniture can be optionally provided

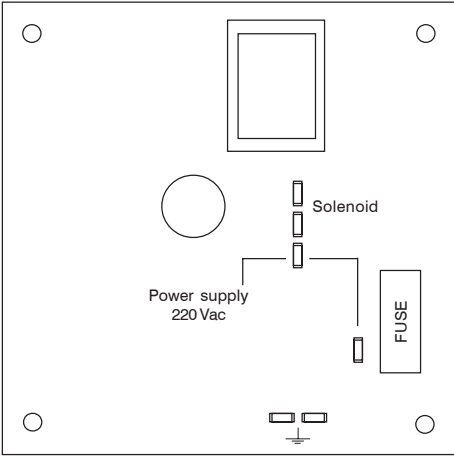
PROVIDED ACCESSORIES

n.4	Dibbles ø6
n.4	Screws 4,5 x 40
n.1	Fuse 5 X 20 (slow/delayed)
n.1	Foot valve/filter
n.1	Injection valve
n.1	Level probe (not included in model CO)
mt 2	Delivery hose in white opaque polyethylene
mt 2	PVC or PE suction hose
mt 2	Transparent PVC outgassing hose
n.1	Instruction manual

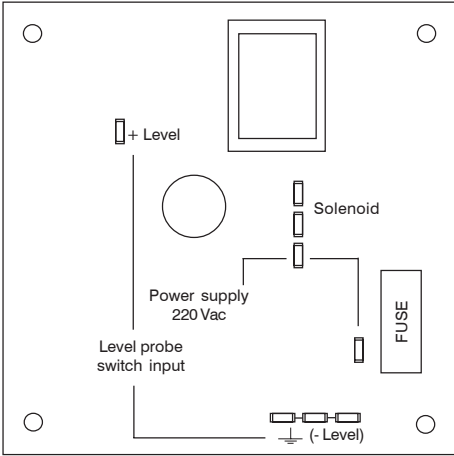
Warning: “CMS Analog” polymers metering pumps are supplied without bottom filter, level probe, injection valve and suction/delivery hose because these pumps must be connected with rigid tubing. Flexible hoses available upon request.



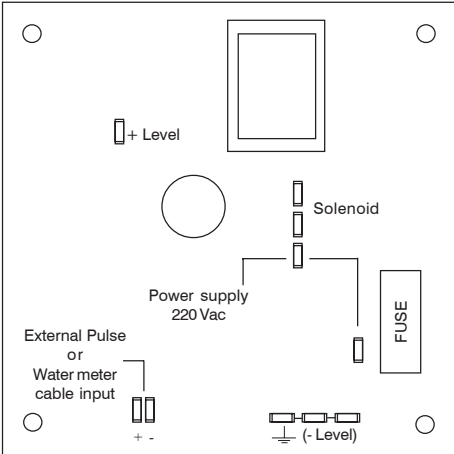
Circuit Boards Connections



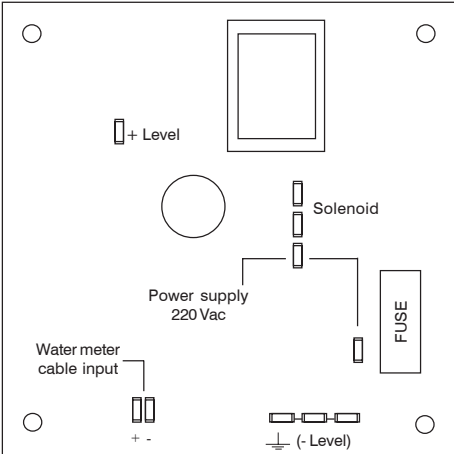
**“CO” Power
Circuit Board**



**“CL” Power
Circuit Board**



**“IS/IC” Power
Circuit Board**



**“PV” Power
Circuit Board**

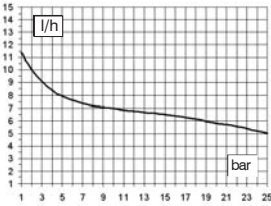
Delivery Curves

Solenoid ø 100 mm

25 - 05

l/h 05

bar 25

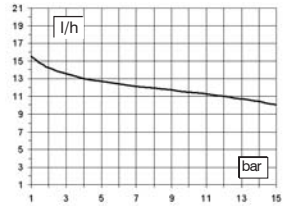


Solenoid ø 100 mm

15 - 10

l/h 10

bar 15

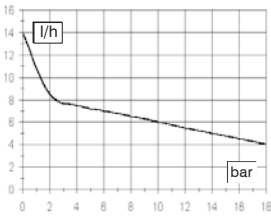


Solenoid ø 100 mm

18 - 04

l/h 04

bar 18

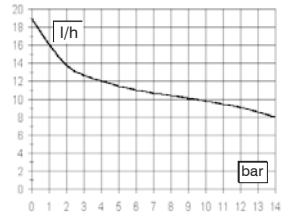


Solenoid ø 110 mm

14 - 08

l/h 08

bar 14

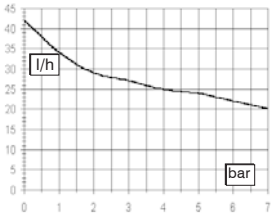


Solenoid ø 110 mm

07 - 20

l/h 20

bar 07

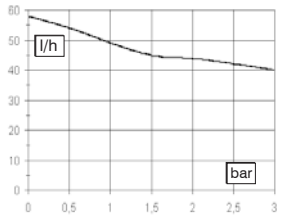


Solenoid ø 110 mm

03 - 40

l/h 40

bar 03

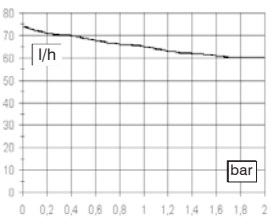


Solenoid ø 110 mm

02 - 60

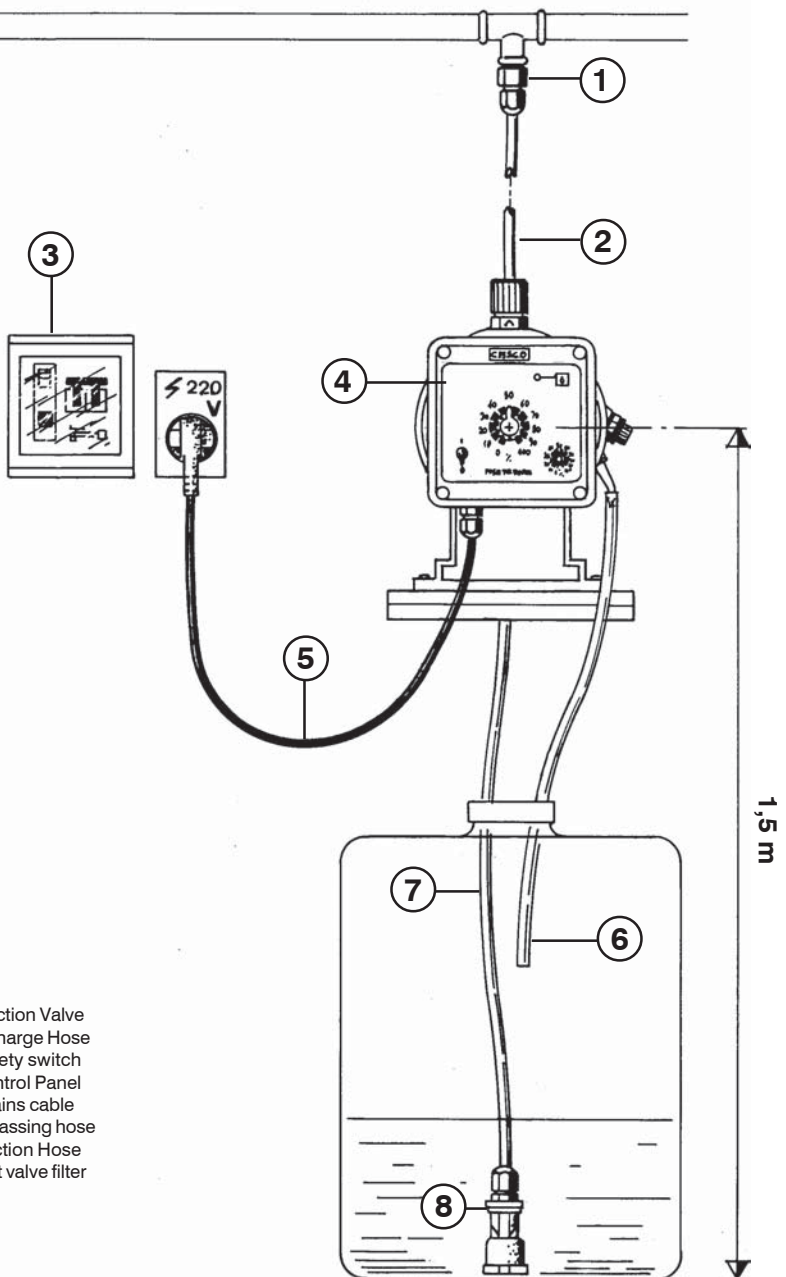
l/h 60

bar 02

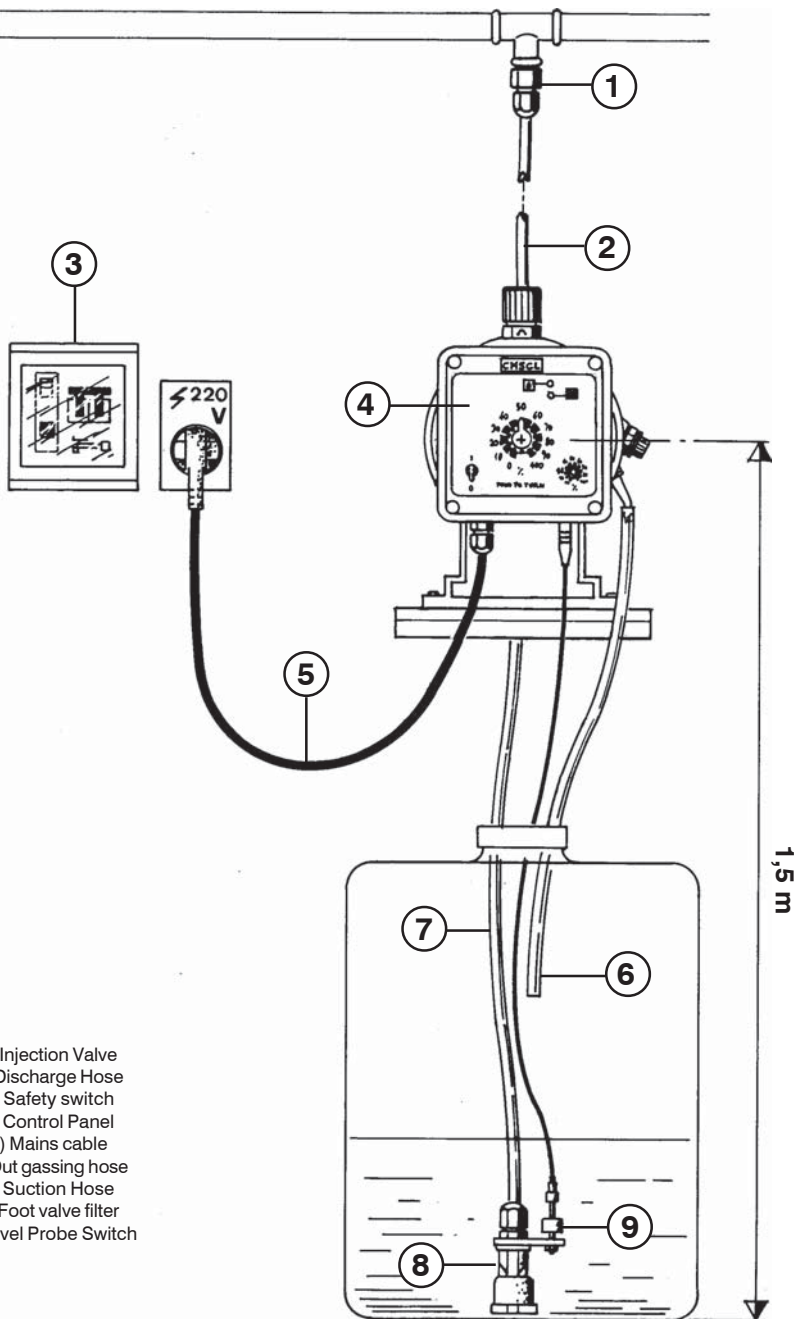


Flow rate indicated for H₂O at 20 °C at the rated pressure. Dosing accuracy ± 5% at constant pressure ± 0,5 bar.

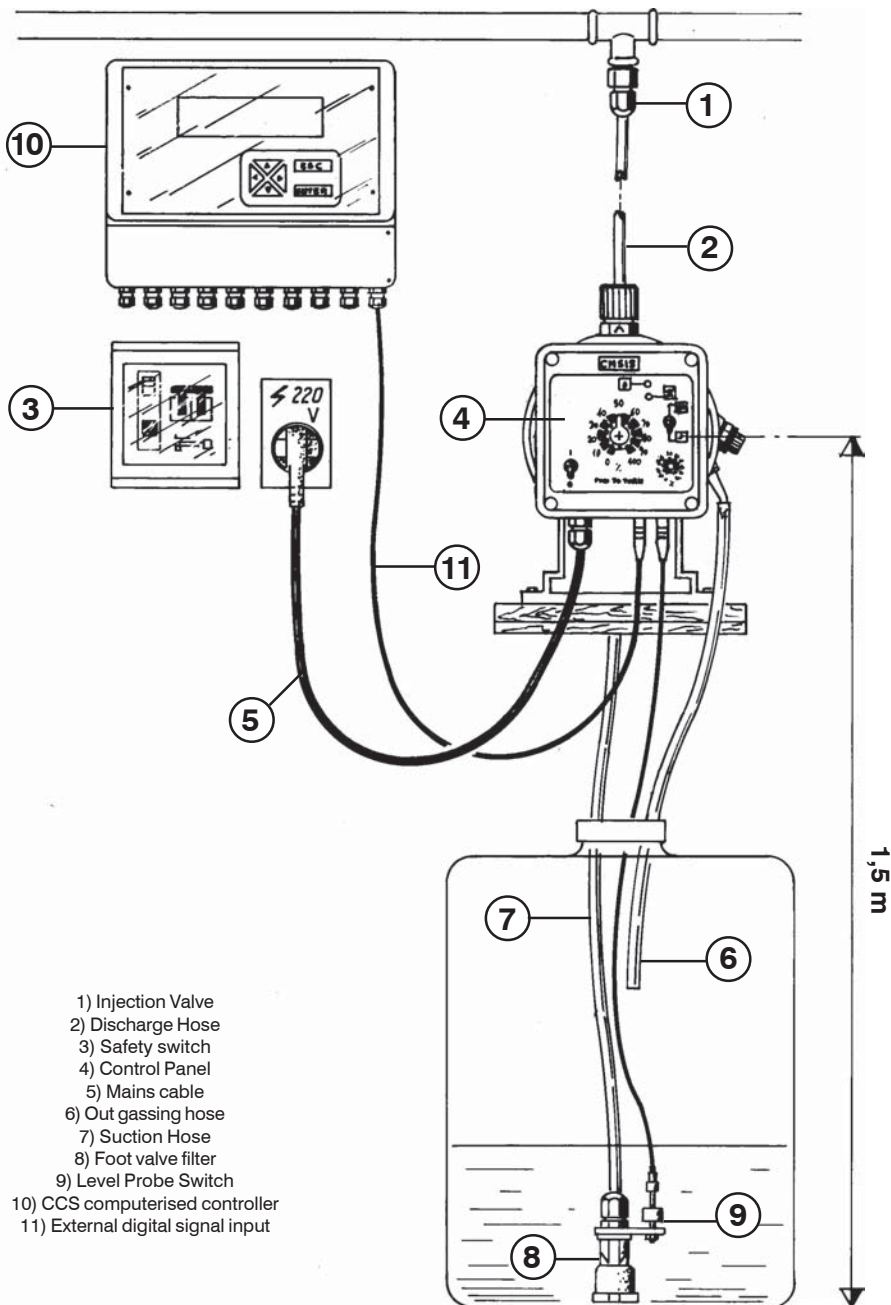
Installation draw for "CMS CO" metering pump



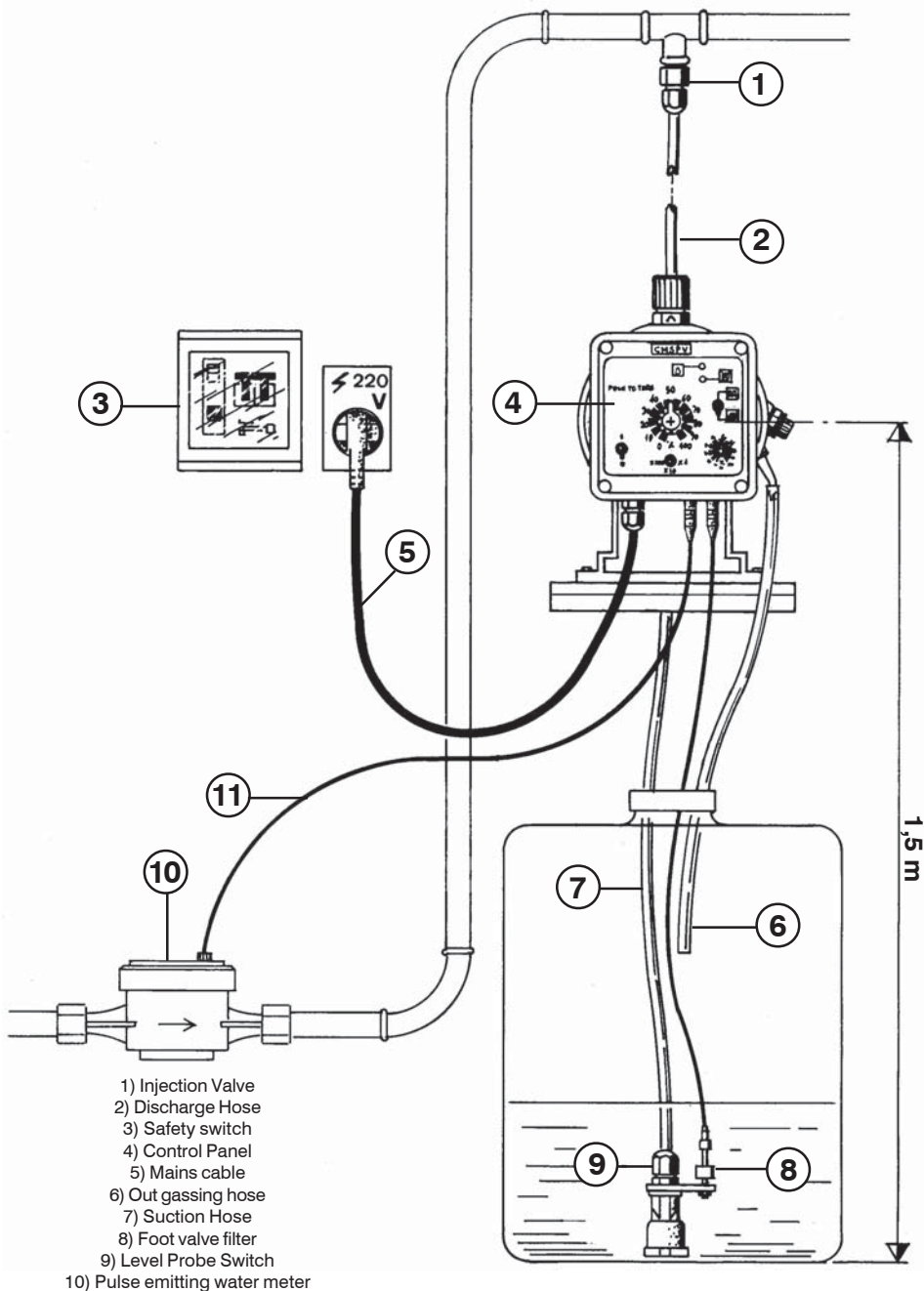
Installation draw for "CMS CL" metering pump



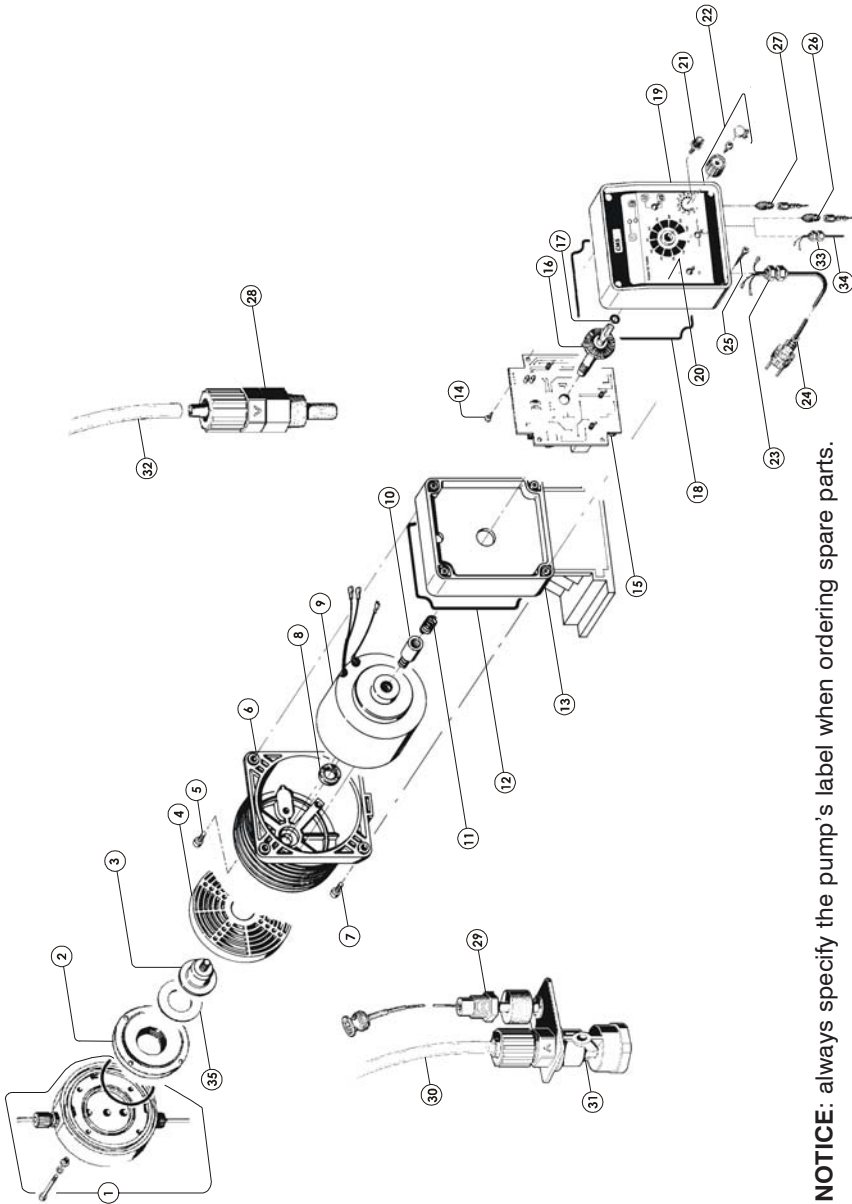
Installation draw for "CMS IS" metering pump



Installation draw for “CMS PV” metering pump

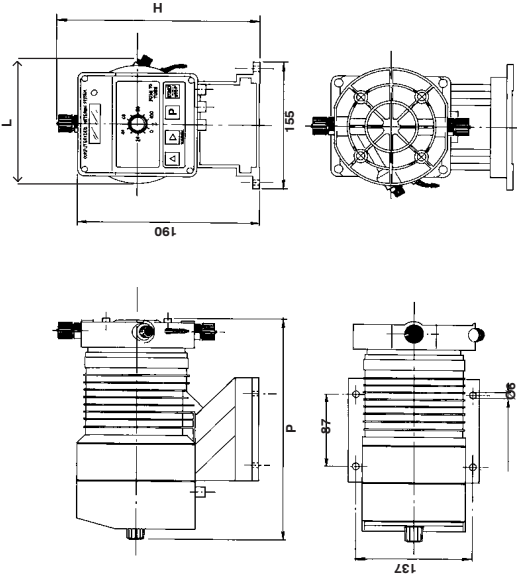


“CMS analog” Exploded View

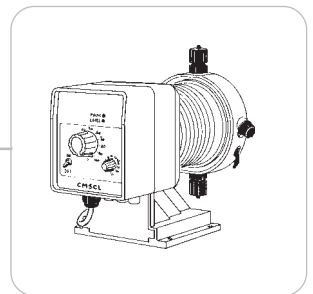


NOTICE: always specify the pump's label when ordering spare parts.

“CMS analog” Dimension



Pump Solenoid		Ø22	Ø32	Ø44	Ø58	Ø64
Net Weight	Kg.	6,0	7,5	7,5	8,0	8,0
Width (L)	mm	125	125	145	175	175
Height (H)	mm	210	210	240	250	250
Depth (P)	mm	300	300	300	300	300
Average Consumption	W	40	50	50	50	50



*When dismantling a pump please separate material types and send them according to local recycling disposal requirements.
We appreciate your efforts in supporting your local Recycle Environmental Program.
Working together we will form an active union to assure the world's invaluable resources are conserved.*