

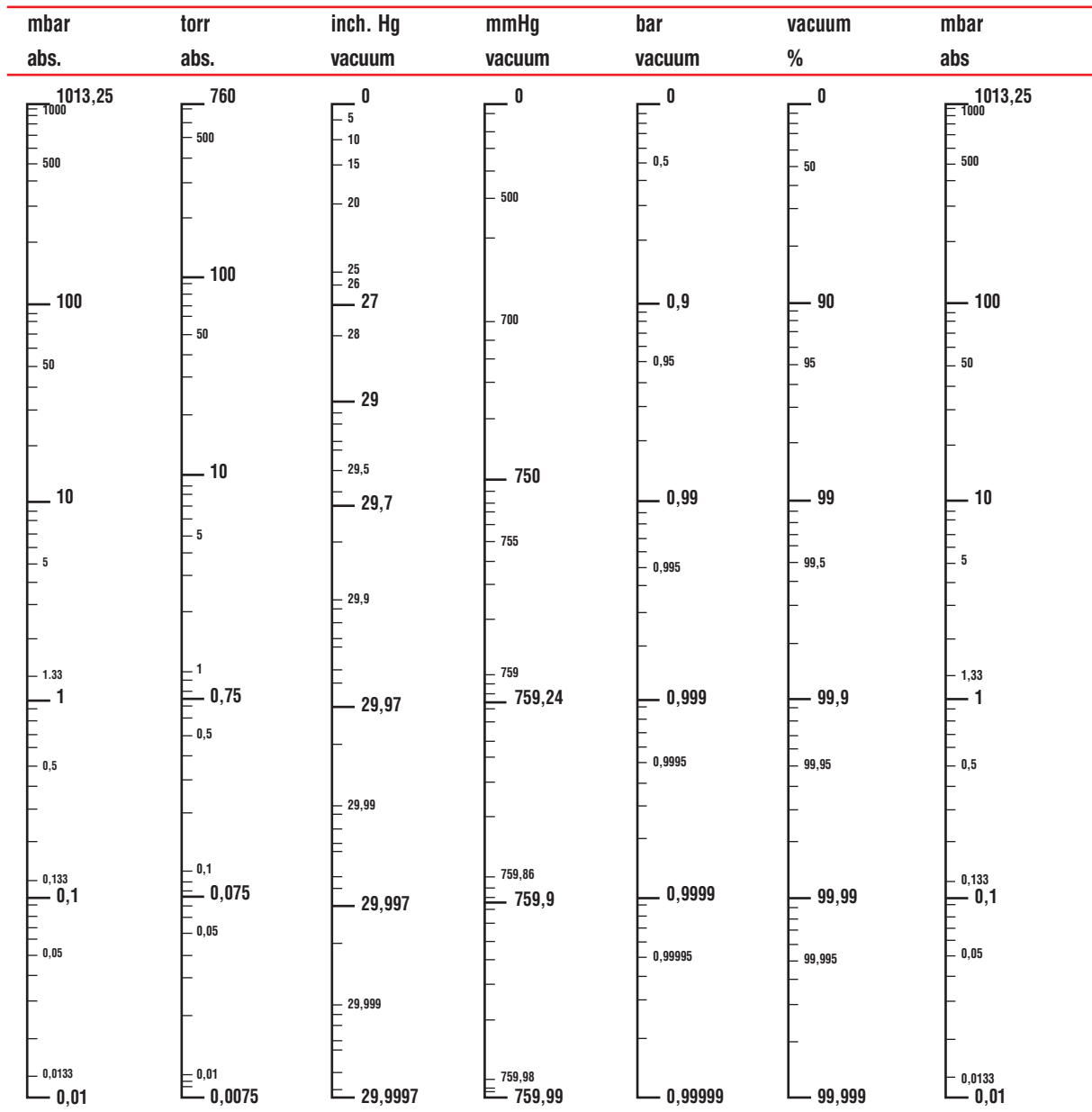
# [Instruments for vacuum measurement, checking and adjustment]

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# [Conversion tables]



Conversion table for vacuum units

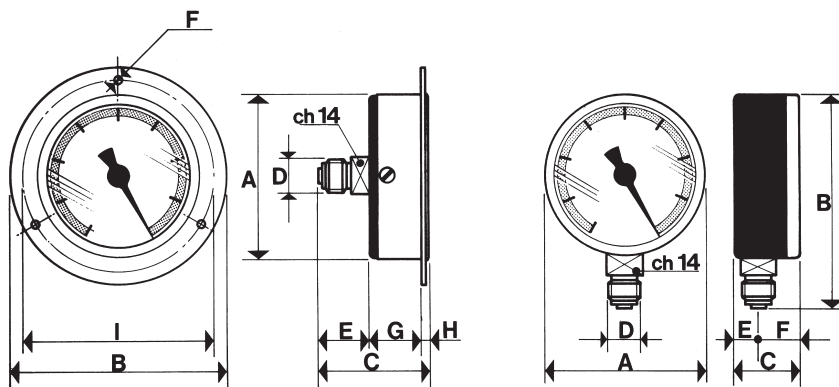
	= mbar	= bar	= torr	= inch. Hg	= psi (lbf/in <sup>2</sup> )	= atm	= Kg/cm <sup>2</sup> (at)	= mm H <sub>2</sub> O	= m H <sub>2</sub> O	= Pa (N/m <sup>2</sup> )	
<b>mbar</b>	x	1	10 <sup>-3</sup>	0,75	2,95x 10 <sup>-2</sup>	14,5 x 10 <sup>-3</sup>	9,87 x 10 <sup>-4</sup>	1,02 x 10 <sup>-3</sup>	10,2	1,02 x 10 <sup>-2</sup>	100,0
<b>bar</b>	x	1000,0	1	750,0	29,53	14,6	0,987	1,02	10197,0	10,19	100000
<b>torr</b>	x	1,33	1,33 x 10 <sup>-3</sup>	1	3,94 x 10 <sup>-2</sup>	1,93 x 10 <sup>-2</sup>	1,316 x 10 <sup>-3</sup>	1,359 x 10 <sup>-3</sup>	13,59	1,359 x 10 <sup>-3</sup>	133,32
<b>inch. Hg</b>	x	33,9	33,9 x 10 <sup>-3</sup>	25,4	1	0,491	3,34 x 10 <sup>-2</sup>	3,45 x 10 <sup>-2</sup>	345,0	0,345	3386,0
<b>psi (lbf/in<sup>2</sup>)</b>	x	68,9	6,89 x 10 <sup>-2</sup>	51,7	2,04	1	6,8 x 10 <sup>-2</sup>	7,03 x 10 <sup>-2</sup>	703	0,703	6897
<b>atm</b>	x	1013,25	1,013	760,0	30,0	14,696	1	1,033	10332	10,332	101325,0
<b>Kg/cm<sup>2</sup> (at)</b>	x	9,81	0,981	7356	28,96	14,2	0,968	1	10000	10	98067,0
<b>mm H<sub>2</sub>O</b>	x	9,81 x 10 <sup>-2</sup>	9,81 x 10 <sup>-5</sup>	7,35 x 10 <sup>-2</sup>	2,89 x 10 <sup>-3</sup>	1,42 x 10 <sup>-3</sup>	9,67 x 10 <sup>-5</sup>	10 <sup>-4</sup>	1	10 <sup>-3</sup>	9,8067
<b>m H<sub>2</sub>O</b>	x	98,067	9,81 x 10 <sup>-2</sup>	73,5	2,89	1,42	9,67 x 10 <sup>-2</sup>	10	10000	1	9806,7
<b>Pa (N/m<sup>2</sup>)</b>	x	0,01	10 <sup>-5</sup>	7,5 x 10 <sup>-3</sup>	2,95 x 10 <sup>-4</sup>	1,45 x 10 <sup>-4</sup>	9,87 x 10 <sup>-6</sup>	1,02 x 10 <sup>-5</sup>	0,102	1,02 x 10 <sup>-4</sup>	1

**Example:** to convert 10 mbar into Torr = 10 x 0,75 = 7,5 Torr

Conversion factors for pressure units (absolute values)



# Vacuum gauges



09 01 10  
09 01 16  
09 02 10  
09 03 10  
09 03 15

09 05 10  
09 05 16

The measurement method of our vacuum gauges is a Bourdon spring.

It is made using section tubes in special copper alloy, one extremity is welded to the threaded pin of the vacuum gauge, thus forming a single body with it, the other closed extremity is free.

By the increasing of the vacuum inside, it tends to warp from its original position (Bourdon effect). The movement of the free spring extremity gives the measure of the vacuum.

In order to allow an easier reading, this movement is amplified by means of a connection lever and transmitted to the pointer.

All these parts are enclosed in a strong metal case, containing the dial and the pointer that can be seen through a glass.

Double scale : from 0 to -1000 mbar  
from 0 to -100 KPa

Accuracy : 2,5% of scales  $\varnothing$  40 and  $\varnothing$  63;  
1,6% of scales  $\varnothing$  63 in glycerine filled types;  
1% of scale  $\varnothing$  100.

Connection : coaxial or radial

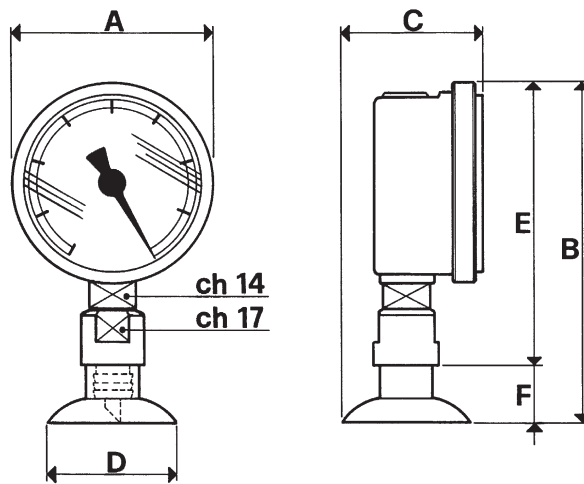
Temperature range : from -10°C to +50°C

Arts. 09 ..16 are glycerine filled vacuum gauges. The above described vacuum gauges are manufactured in compliance with all the safety rules and measurement units in force.

Art.	A $\varnothing$	B	B $\varnothing$	C	D $\varnothing$	E	F	F $\varnothing$	G	H	I $\varnothing$
09 01 10	63	--	85	49	1/4"	21	--	3.5	24	4	75
09 01 16	63	--	85	59	1/4"	22	--	3.5	33	4	75
09 02 10	100	--	132	52	1/4"	21	--	4.5	26	5	116
09 03 10	63	--	--	49	1/4"	21	--	--	25	3	--
09 03 15	40	--	--	41	1/8"	16	--	--	23	2	--
09 05 10	63	87	--	27	1/4"	9	18	--	--	--	--
09 05 16	68	87	--	37	1/4"	11	26	--	--	--	--



## [Vacuum gauge with steel punch]

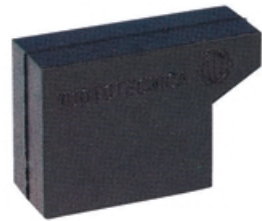


The vacuum gauge with punch has been manufactured in order to allow to immediately measure the vacuum degree inside tins and food containers in general.

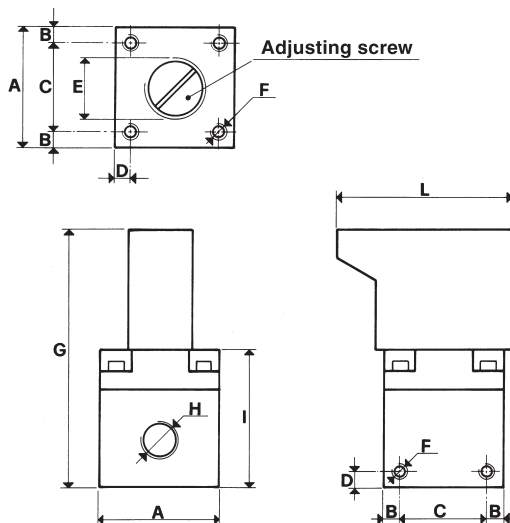
The glycerine filled vacuum gauge art. 09 05 16 used for this application (features are described on the previous page), is provided with a hardened steel punch in order to easily make holes into containers and a cup in silicone compound to guarantee a vacuum seal after punching.

It is available in a standard version, which is the one shown on this page, but it can also be supplied in other versions upon request.

Art.	A Ø	B	C	D Ø	E	F
09 05 99	68	110	42	40	92	18



## [Small vacuum switch]



This vacuum switch having very small dimensions, provides an electric signal when a given adjustable vacuum degree is reached.

The pressure differential existing between the set maximum value and the value of reset of the rest signal is  $50 \div 60$  mbar and it is not adjustable.

It is particularly suitable where an electrical signal is needed when a certain vacuum degree is reached, for safety, for starting a cycle, for checking the grip of the cups etc.

### Technical features :

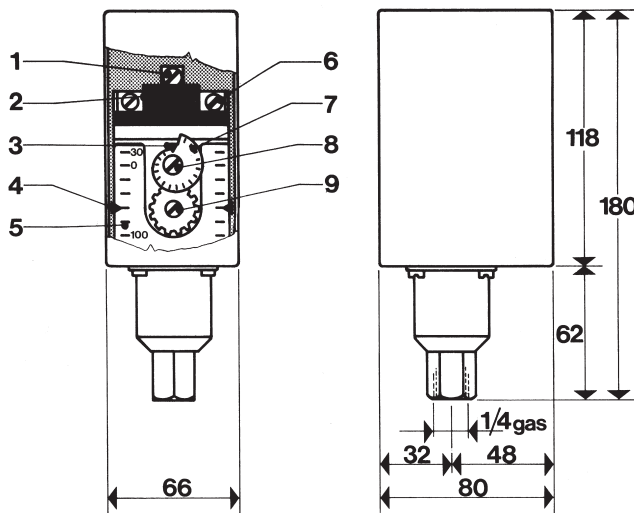
#### Art. 12 02 10

- Adjustment range:  
from 930 to 10 mbar abs.
- Repeatability:  $\pm 1,5$  mbar.
- Contacts: one in commutation
- Contacts capacity: 3A at 250V A. C.
- Electrical connections:  
fast-on terminals mod. 110.
- Room temperature:  
from  $-25^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .
- Protection: IP 55.

Art.	A	B	C	D	E	F	G	H	I	L
12 02 10	30	4	22	4	14	M4	64.5	1/8"	35	44



## [ Pressure switches Vacuum switches ]



The pressure switches-vacuum switches of the series 836 are compact units, strong and accurate and they can be used in a variety of applications.

The feature of the control is a quick tripping precision microswitch, equipped with silver contacts.

Normal industrial vibrations have no effect on the efficient opening and closing of the contacts.

The particular linear construction, relatively friction free, assures a precise and reliable operation independent of the pressure switch mounting angle.

The "Long Life" bellows with which they are equipped, are made of copper alloy and can be used for air, water, oil, liquids, vapours, gas circuits, provided that all these agents are not corrosive.

Pos.	Description
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1	Common contact
2	Microswitch
3	Differential index
4	Basic pressure index
5	Basic pressure scale
6	Exchange contacts
7	Differential scale
8	Pressure adjustment
9	Differential adjustment

### Model 836-C6A

Adjustment range: from 0 to 8 bar (a).

Differential: from 133 to 1200 mbar.

Maximum line pressure: 21 bar (a).

### Model 836-C2A

Adjustment range: from 0 to 1,7 bar (a).

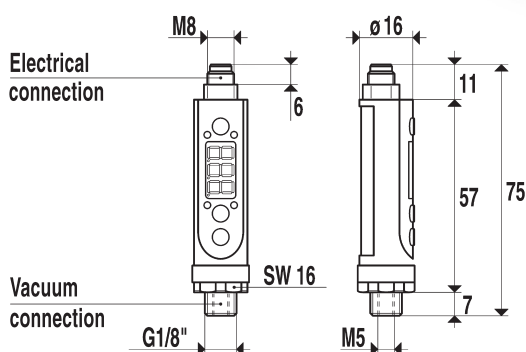
Differential: from 26 to 280 mbar.

Maximum line pressure: 4,5 bar (a).

Contact features: 125 VA with A.C. from 24 to 600 Volt. 57,5 VA with D.C. from 115 to 230 volt. Rated current for non inductive loads.

A.C.: 5 Ampere at 240 Volt/3 Ampere at 600 Volts. Contacts are unipolar with double interruption.

THIS INSTRUMENT APPEARS IN THE U.L. LISTS AND IS APPROVED BY C.S.A.



## [Digital vacuum switch]

This vacuum switch is a real innovation in the field of vacuum checking and measurement. Contained in a sturdy ABS-capsule, the vacuum switch is compact and extremely light; these features allow installation on the machine and close to the application.

The digital vacuum switch, accurately calibrated and compensated for temperatures, is able to give very precise measurements values.

The measured values are shown on the display, making vacuum gauges redundant.

Two LED, one red and one green, built into the small control panel, show the switch state of the two output digital signals. The two switch outputs are completely independent.

The switch point between 0 and -1 bar as well as the hysteresis from 0 to 100% of the set up value can be easily programmed by the means of the small push buttons incorporated in the small control panel. Also, other functions can be programmed, such as the comparison between two values, contacts N.O. and N.C., choice of the vacuum unit, lock of the values and the programmed functions, reversible display, etc.

This switch can be rotated freely, without unscrewing it from the vacuum connection, to orientate the display in the required position.

The vacuum connection is dual threaded: G 1/8" external and M5 internal.

The electrical connection is an M8 4-pin threaded plug and upon request the connection cable is available in PUR, with an axial or radial connector.

Digital vacuum switch are suitable for the measurement and the control of dry air and non-corrosive gases.

It is recommended for use in a vacuum circuit where determination of a safe vacuum level is required prior to the start of a production cycle, for the grip control of a vacuum cup(s), etc.

Also with the adjustable hysteresis, it is possible to control the compressed air for vacuum generators, allowing a considerable energy saving.

### ELECTRICAL FEATURES AND DATA

#### ART. 12 10 10

Adjustment range	from 0 to -1 bar(g)
Supply voltage	10.8 ÷ 30 VDC (protection against polarity reversal)
Current input	≤ 55 mA to programme; ≤ 35 mA during operation
Switch outputs	2 digital PNP, NO or NC, max switch power 250 mA
Display tolerance	± 1%
Response time	≤ 2,5 ms
Switch frequency	400 Hz
Hysteresis	Adjustable from 0 to 100% of the max set up value
Repeatability	± 0,2% of measuring range
Display	LED 3 digit 7segment display
Insulation resistance	< 100 MΩ at 500 VDC
Proof voltage	1000 VDC -1 min
Class of protection	IP 65

### ENVIRONMENTAL CONDITIONS

Position of installation	anywhere
Measuring fluids	non-corrosive gases and dry air
Working temperature	0 ÷ +50°C
Storage temperature	-20 ÷ +80 °C
Emitted interference	according to EN 50081-1
Interference immunity	according to EN 50082-2

### MECHANICAL FEATURES AND DATA

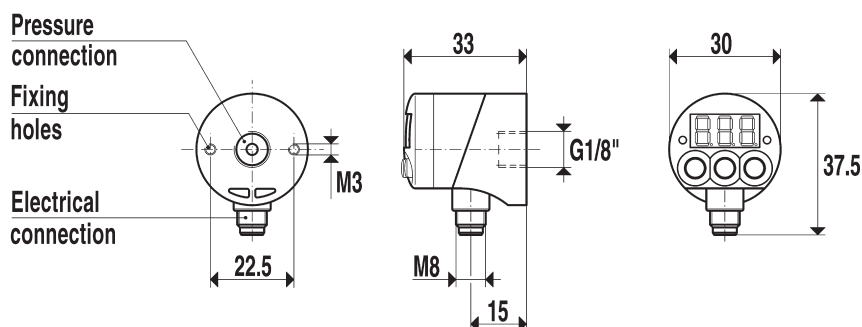
Container	plastics ABS-PC
Connections	nickel-plated brass
Weight	~ 25 g.
Electrical connector	M8-4 pin plug
Connection to fluid	thread G 1/8" external, M5 internal

### ACCESSORIES

Electrical connection cable	with axial connector, mt 5 - PUR M8 x 1 x 0,25 mm - Item No. 00 12 20
Electric connection cable	with radial connector, mt 5 - PUR M8 x 1 x 0,25 mm - Item No. 00 12 21
Kit for fixing to wall	adaptor flange with bracket, OR and screws. - Item No. 00 12 22



## [Digital pressure switch]



Contained in a sturdy ABS-capsule, the pressure switch is compact and extremely light; these features allowing installation directly on the machine and close to the application.

The digital pressure switch, accurately calibrated and compensated for temperatures, offers a very precise measurement.

The measured values are shown on the display, making external pressure gauges redundant.

Two LED, one red and one green, installed in the small control panel, show the switch state of the two output digital signals. The two switch outputs are completely independent.

The switch point between 0 and 10 bar(g) as well as the hysteresis from 0 to 100% of the set value can be easily programmed by the means of the small push buttons incorporated in the small control panel. Also, other functions can be programmed, such as the comparison between two values, N.O. and N.C. contacts, unit of measurement choice, locking of the values and of the programmed functions, etc.

The pneumatic connection is a G 1/8 female thread.

The electrical connection is an M8 –4 pin threaded plug; upon request a connection cable is available in PUR, with an axial or radial connector.

This digital pressure switch is suitable for the measurement and the control of dry air and non-corrosive gases.

It is recommended when a signal is required to indicate that a certain pressure level has been achieved, a safety circuit, to start a work cycle or to keep the working pressure inside pre-selected values, etc.

### ELECTRICAL FEATURES AND DATA

#### ART. 12 25 10

Adjustment range	from 0 to 10 bar (g)
Supply voltage	10.8 ÷ 30 VDC (protection against polarity reversal)
Current input	≤ 55 mA to programme; ≤ 35 mA during operation
Switch outputs	2 digital PNP, NO or NC, max switch power 250 mA
Display tolerance	± 1%
Response time	≤ 2,5 ms
Switch frequency	400 Hz
Hysteresis	Adjustable from 0 to 100% of the max set up value
Repeatability	± 0,2% of measuring range
Display	LED 3 digit, 7 segment display
Insulation resistance	<100 M Ω at 500 VDC
Proof voltage	1000 VDC -1 min
Class of protection	IP 65

### ENVIRONMENTAL CONDITIONS

Position of installation	anywhere
Measuring fluids	non-corrosive gases and dry air
Working temperature	0 ÷ +50 °C
Storage temperature	-20 ÷ +80 °C
Emitted interference	conforme alla norma EN 50081-1
Interference immunity	conforme alla norma EN 50082-2

### MECHANICAL FEATURES AND DATA

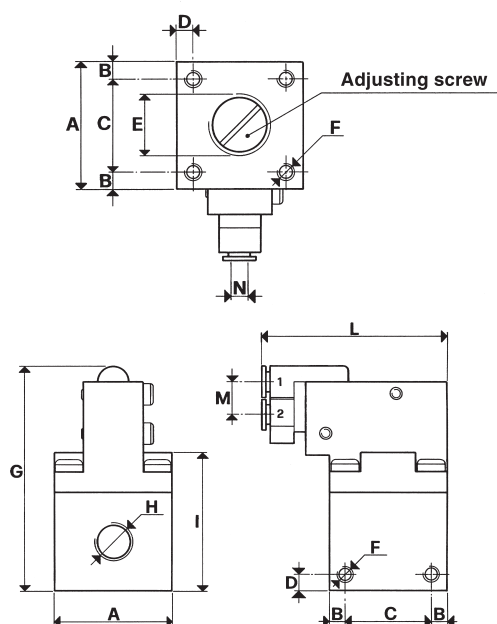
Container	plastic ABS-PC
Connections	nickel-plated brass
Weight	~45 g.
Electrical connector	M8-4 pin plug
Connection to fluid	G 1/8" female thread

### ACCESSORIES

Electrical connection cable	with an axial connector, mt 5 - PUR M8 x 1 x 0,25 mm - Item No. 00 12 20
Electrical connection cable	with a radial connector, mt 5 - PUR M8 x 1 x 0,25 mm - Item No. 00 12 21
Kit for fixing to wall	adaptator flange with bracket, spacers and screws. - Item No. 00 12 23



## [Pneumatic vacuum switches]



These vacuum switches having very small dimensions, either give or remove a pneumatic signal, according to the model, when a given adjustable vacuum degree is reached. The pressure differential existing between the set maximum value and the value of reset of the rest signal is not adjustable.

They are particularly suitable to control vacuum generators and to operate pneumatic control valves.

### Technical features:

#### Art. 12 01 30

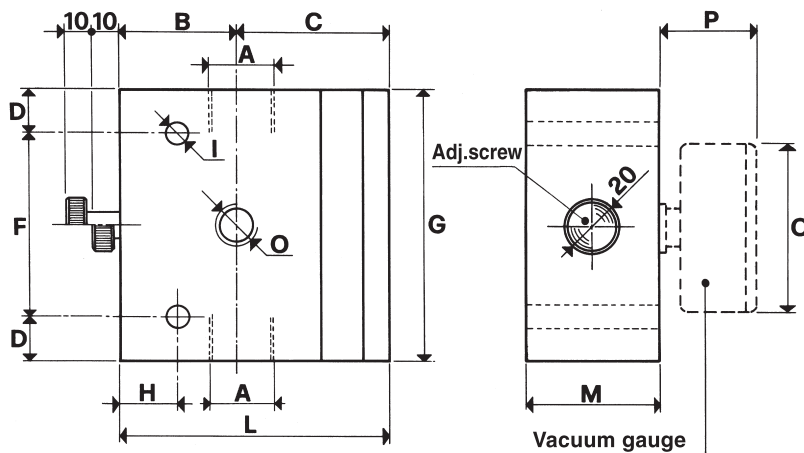
- Adjustment range: from 930 mbar to 50 mbar (a).
- Fixed differential: 70 mbar.
- Repeatability:  $\pm 5$  mbar.
- Signal: normally closed, on commutation.
- Supply pressure: 2 ÷ 8 bar (g).
- Microvalve maximum capacity: 50 l/min.
- Room temperature: from  $-10^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ .

#### Art. 12 02 30

- Adjustment range: from 900 mbar to 40 mbar (a).
- Fixed differential: 100 mbar.
- Repeatability:  $\pm 5$  mbar.
- Signal: normally open, on commutation.
- Supply pressure: 2 ÷ 8 bar (g).
- Microvalve maximum capacity: 50 l/min.
- Room temperature: from  $-10^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ .

Art.	A	B	C	D	E	F	G	H	I	L	M	N
					$\emptyset$	$\emptyset$		$\emptyset$				$\emptyset$
12 01 30	30	4	22	4	14	M4	57	1/8"	35	47	8	4
12 02 30	30	4	22	4	14	M4	57	1/8"	35	47	8	4

# [Vacuum regulators]



Art. 09 03 10  
Art. 09 03 15 per 11 01 10  
11 02 10

## Distinctive features

Vacuum regulators are used to adjust the preset vacuum degree, they keep it constant (secondary depression) regardless of the oscillations of the vacuum degree of the net (primary depression) and of the capacity.

Their operation is with a membrane-piston and they take advantage of the pressure differential existing between the secondary depression and the atmospheric pressure.

Unlike vacuum adjusting valves, regulators do not introduce air into the circuit, thus permitting to produce more grip points with different vacuum values, from only one depression source.

## Technical features:

- Operation: membrane-piston regulator.
- Adjustable operating pressure: from 800 to 1 mbar abs.
- Capacities: from 2 to 160 cum/h.
- Room temperature: from -10°C to +80°C.
- Mounting: any position.

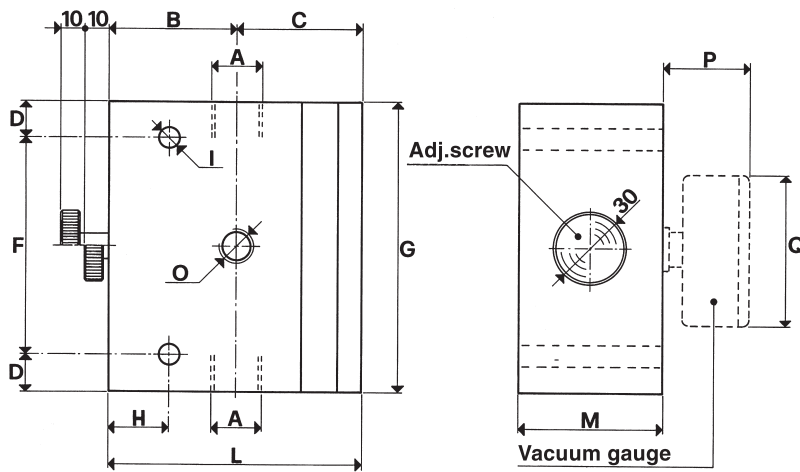
## Applications

The main use of the vacuum regulators is on the centralized plants where, independently of the vacuum degree of the plant, every grip can be adjusted within that value.

It is also necessary every time that the working depression has to be lower than the primary depression.

Art.	A Ø	Max cap. cum/h.	B	C	D	F	G	H	I Ø	L	M	O Ø	P	Q Ø
11 01 10	1/4"	006	47	42.0	10	040	060	20	6.5	089.0	40	1/8"	30	40
11 02 10	3/8"	010	47	42.0	10	040	060	20	6.5	089.0	40	1/8"	30	40
11 03 10	1/2"	020	53	52.0	15	055	085	25	8.5	105.0	50	1/4"	36	63
11 04 10	3/4"	040	55	55.5	15	070	100	30	8.5	110.5	50	1/4"	36	63
11 05 10	1"	080	60	58.0	15	090	120	30	8.5	118.0	60	1/4"	36	63
11 06 10	1 1/2"	160	54	77.5	15	130	160	20	8.5	131.5	99	1/4"	36	63

# [Regulators for low vacuum]



Art. 09 03 10

## Distinctive features

Vacuum regulators are used to adjust the preset vacuum degree, they keep it constant (secondary depression) regardless of the oscillations of the vacuum degree of the net (primary depression) and of the capacity.

Their operation is with a membrane-piston and they take advantage of the pressure differential existing between the secondary depression and the atmospheric pressure.

Unlike vacuum adjusting valves, regulators do not introduce air into the circuit, thus permitting to produce more grip points with different vacuum values, from only one depression source.

## Technical features:

- Operation: membrane-piston regulator.
- Adjustable operating pressure: from 980 to 1 mbar abs.
- Capacities: from 20 to 160 cum/h.
- Room temperature: from -10°C to +80°C.
- Mounting: any position.

## Applications

The main use of the vacuum regulators is on the centralized plants where, independently of the vacuum degree of the plant, every grip can be adjusted within that value.

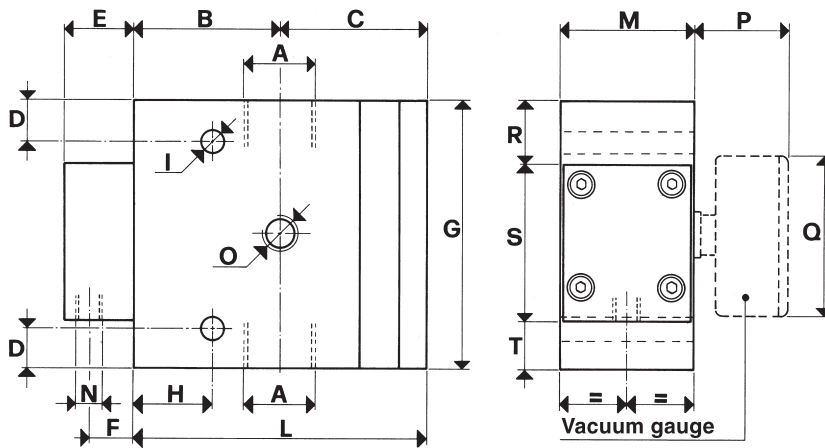
It is also necessary every time that the working depression has to be lower than the primary depression.

Art.	A Ø	Max cap. cum/h.	B	C	D	F	G	H	I Ø	L	M	O Ø	P	Q Ø
11 03 50	1/2"	20	53	52	15	90	120	25	8.5	105	60	1/4"	36	63
11 05 50	1"	80	60	58	15	90	120	30	8.5	118	100	1/4"	36	63
11 06 50	1 1/2"	160	54	77.5	15	130	160	20	8.5	131.5	99	1/4"	36	63

N.B. - The vacuum gauge is supplied only upon request.



## [Vacuum regulators with pneumatic adjustment]



Art. 09 03 10

Art. 09 03 15 per 11 01 30

11 02 30

Art.	A Ø	Max cap. cum/h.	B	C	D	E	F	G	H	I	L	M	N Ø	O Ø	P Ø	Q	R	S	T
11 01 30	1/4"	6	47	42	10	20	10.5	60	20	6.5	89	40	1/8"	1/8"	30	40	9	45	6
11 02 30	3/8"	10	47	42	10	20	10.5	60	20	6.5	89	40	1/8"	1/8"	30	40	9	45	6
11 03 30	1/2"	20	53	52	15	26	16.5	85	25	8.5	105	50	1/8"	1/4"	36	63	16.5	58	10.5
11 04 30	3/4"	40	55	55.5	15	26	16.5	100	30	8.5	110.5	50	1/8"	1/4"	36	63	24	58	18
11 05 30	1"	80	60	58	15	26	16.5	120	30	8.5	118	60	1/8"	1/4"	36	63	34	58	28
11 06 30	1 1/2"	160	54	77.5	15	30	19.5	160	20	8.5	131.5	99	1/4"	1/4"	36	63	37.5	80	42.5
11 03 80	1/2"	20	53	52	15	26	16.5	120	25	8.5	105	60	1/8"	1/4"	36	63	34	58	28
11 05 80	1"	80	60	58	15	26	16.5	120	30	8.5	118	100	1/8"	1/4"	36	63	34	58	28
11 06 80	1 1/2"	160	54	77.5	15	30	19.5	160	20	8.5	131.5	99	1/4"	1/4"	36	63	37.5	80	42.5

### Distinctive features

Vacuum regulators are used to adjust the vacuum degree and to keep it constant at the preset value (secondary depression) independently of the capacity and of the oscillations of the vacuum degree of the pump or of the pumpset (primary depression).

Unlike vacuum adjusting valves, regulators do not introduce air into the circuit, this permits to produce more grip points at different vacuum values, from one only depression source.

Their operating principle is based on the contrasting action between a pneumatic cylinder with short stroke and a fluctuating piston driven by the pressure differential existing between the secondary depression and the atmospheric pressure.

In order to adjust the vacuum degree of the regulator it is necessary to operate on the pressure of the compressed air for feeding the pneumatic cylinder: higher is the pressure, higher is the vacuum degree, and vice versa.

### Technical features:

- Supply pressure:
  - from 0 to 3 bar(g) for the regulators Art. 11 .. 30;
  - from 0 to 7 bar(g) for the regulators Art. 11 .. 80.
- Adjustable working pressure:
  - from 800 to 1 mbar abs. for the regulators Art. 11 .. 30;
  - from 980 to 1 mbar abs. for the regulators Art. 11 .. 80.
- Capacities: from 2 to 160 cum/h;
- Room temperature: from -10°C to +80°C.
- Mounting: any position.

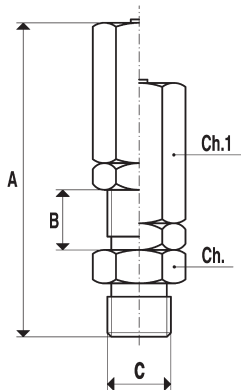
### Applications

Vacuum regulators are generally used on the centralized plants, where, independently of the vacuum degree of the plant, every vacuum point can be adjusted to its own value.

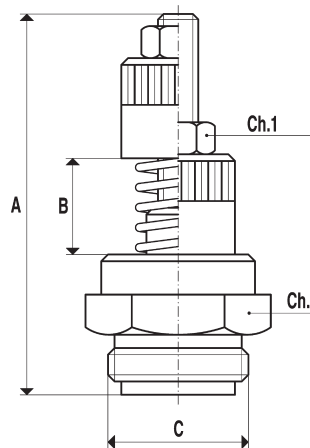
It is also necessary every time that the working depression has to be lower than the primary depression and to be kept constant.



## [Vacuum relief valves]



Art. 04 01 10



Art. 04 02 10  
04 03 10  
04 04 10

When these valves reach a certain precalibrated vacuum degree, they introduce atmospheric air into the circuit to avoid the increase of the set value and to keep it constant.

They can be used as regulators only on circuits having only one vacuum generator and only one use (or more uses but all working at the same vacuum degree).

In most cases they are used as safety valves on tanks or containers not tested at the high depressions and on lifting systems with cups.

The vacuum degree adjustment is obtained turning the knurled bush in the two directions; thanks to its fine thread, a very accurate calibration is assured.

Art.	Vac. adj. mbar (a)	A	B	C Ø	Ch	Ch1	Max cap. cum/h
04 01 10	670±1	45	6.5	1/8"	12	12	4
04 02 10	670±1	57	15.0	1/2"	24	10	20
04 03 10	670±1	60	12.0	3/4"	30	17	40
04 04 10	670±1	65	12.0	1"	35	17	70