Function

Filling units are devices that have the function of filling and re-integrating fluid fluid into heating or air conditioning systems.
They are generally installed on the water intake pipes and after a first loading phase of the plant they have the function of maintaining the pressure value stable within the plant, automatically providing for the reintegration of the missing water from the water tank The factory-set pressure value is about 1.5 bar, generally indicated for this type of system, but it can be modified according to your needs with a few simple steps.
Loads of the plants, both to compensate for the pressure drops due to the expulsion of air by air vent valves or the temperature fluctuations of the fluid contained in the closed loop systems.

Product

Code	Size	Description	Max. preassure upstream	Adjustable preassu-re downstram
91249AD05	G1/2"	Filling Unit PN20 series	20 bar	1-6 bar
91249AD05 244	G1/2"	Filling Unit PN20 series with pressure gauge	20 bar	1-6 bar

Technical features

MATERIALS	
Body and spring presser:	Brass CW 617 N - UNI EN 12165
Ferrule and Nipples:	Brass CW 617 N - UNI EN 12165
Diaphragm and internal parts:	Brass CW 617 N - UNI EN 12165
Spring:	Stainless steel
Tightening:	EPDM

PERFORMANCE	
Working fluid	water
Working Temperature	5÷80°C
Max Pressure Upsream	20 bar
Adjustable Pressure Downstream	1÷6 bar
Pre-setted pressure downstream	1,5 bar

CONNECTIONS	
Main ports	G 1/2”
Pressure gauge port	G 1/4”

Physical characteristics

The ICMA Series 249 filling unit includes in one device the features and benefits of five control tools listed below:
1) Pressure reducer
The pressure reducer at the time of filling the plant allows continuous water intake from the water tank until the set pressure is reached, after which it automatically closes the access.
In normal operating condition, however, it keeps the value of downstream pressure of the instrument constant, automatically compensating for the smallest variations due to possible outbreaks of air or changes in the fluid temperature in the plant.
You can also change the factory preset pressure value easily and accurately with few steps described in the "Operating Pressure Calibration" section below.
2) Filter
The installation of the filling groups is always recommended on the water supply pipes and therefore the presence of a filter at their input is very important. This filter has the task of retaining untreated foreign bodies in the water from the aqueduct, improving the operation and prolonging the life of the devices installed in the implant and the filling group itself, preventing damages or malfunctions of membranes and gaskets Due to the interposition of any dirt or sand grains in the sealing and sliding seats.
3) Check Valve
The retention or non-return valve is intended to avoid the reflux of fluid present in the plant to the aqueduct. This could occur in the event of a sudden drop in water pressure or a rise in pressure in the plant due to, for example, an increase in the fluid temperature contained therein.
4) Stop Valve
Once the system is filled, closing the shut-off faucet has the potential to exclude the aqueduct from the plant, thus avoiding, in the case of uncontrolled breaks or losses, that water continues to be loaded into the plant And consequently discharged at the point of failure.
This operation must be carried out by qualified personnel as it will be necessary to periodically check the value of the system pressure and its possible restoration by temporarily opening the tap.
5) Pressure Gauge
It is used for direct and immediate control of downstream pressure of the instrument, ie within the implant. The supplied pressure gauge has a measuring range of 0-6 bar.

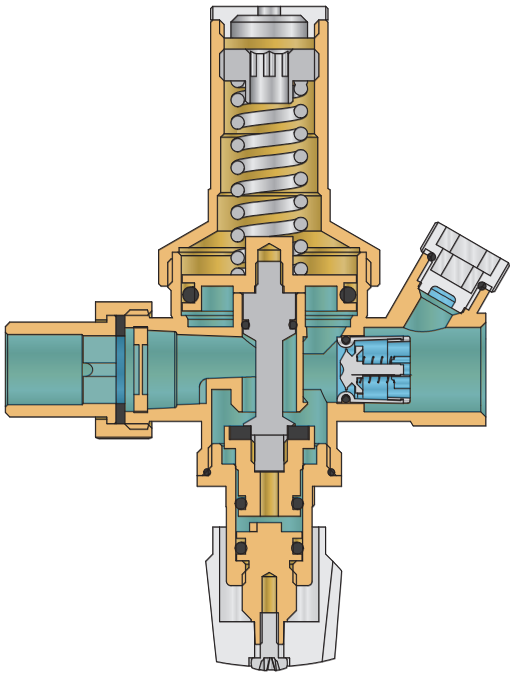
Operation principle

The pressure reducer function is realized by means of a brass diaphragm with O-Ring seal on the slider inside the cover, directly connected with a shutter and opposed by the thrust of a spring.

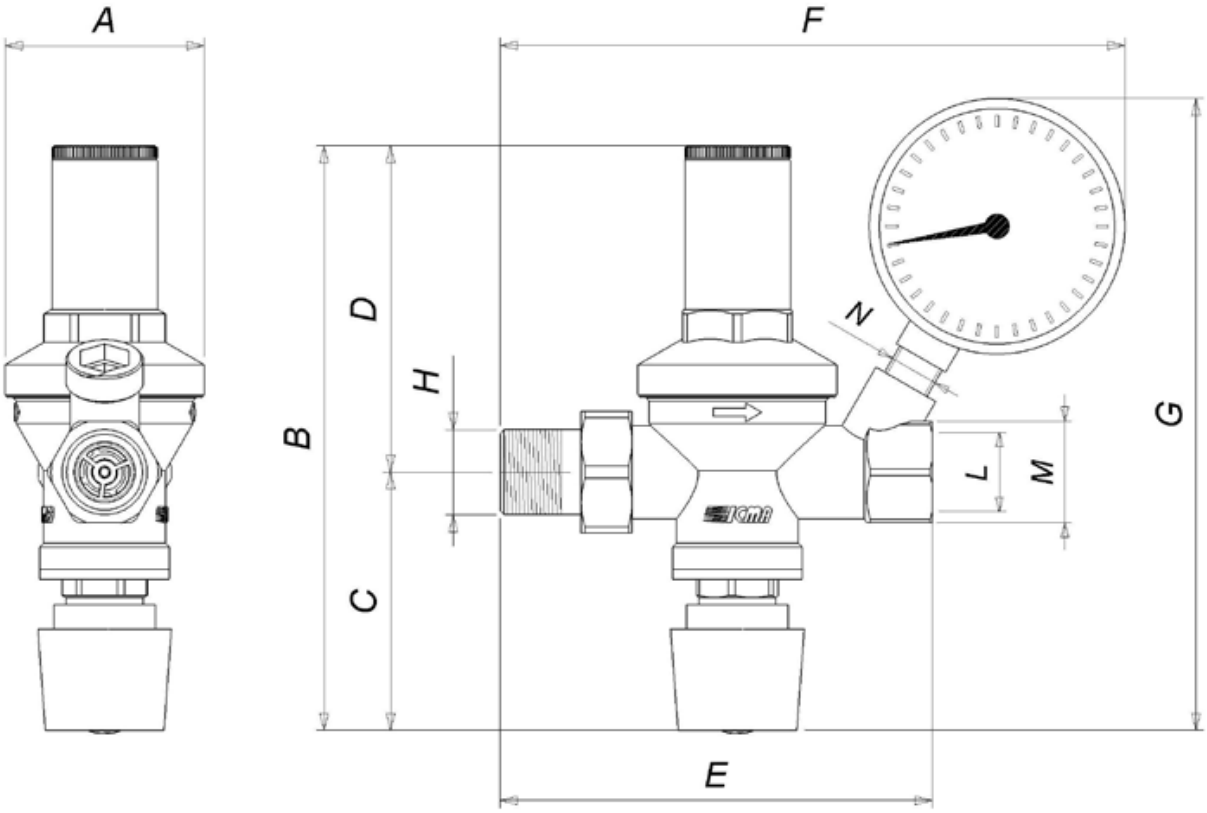
Water pressure inside the circuit exerts a push directly on the diaphragm, this thrust is in turn countered by the spring thrust that in the stability condition keeps the shutter closed. When the water pressure in the circuit decreases, the spring overwhelms this contrast and pushing the diaphragm downwards determines the opening of the shutter, this entails water inlet from the aqueduct to the plant that will continue until the water pressure in the implant on the diaphragm will not return to equal to that of the spring thrust, bringing the shutter back to its closing position.

The flow rate of fluid crossing the group in the open condition is proportional to the pressure difference between the mountain and the valley of the same group.

The spring thrust is adjustable by means of the upper screw and this allows to adjust the desired pressure value downstream of the group and consequently in the entire plant.



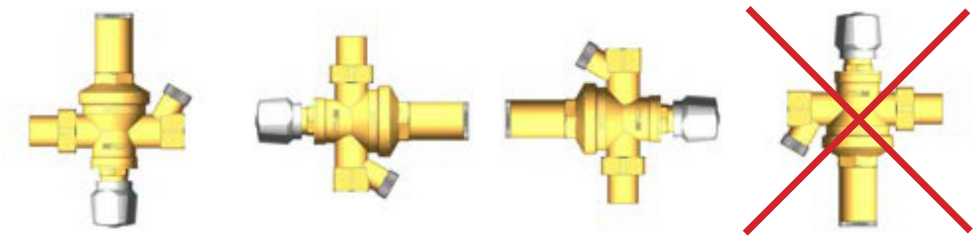
Dimensions



Art.	A	B	C	D	E	F	G	H	L	M	N
91249AD05	50	150	68	82	107	155	160	G1/2" M	G1/2"F	CH.25	G1/4"
91249AD05 244	50	150	68	82	107	155	160	G1/2" M	G1/2"F	CH.25	G1/4"

Installation

ICMA filling units can be installed in any position other than overturned, as they may cause dirt on the sliding areas of the gaskets, damaging or compromising their operation.
It is very important to observe the direction of the flow indicated by the arrow highlighted on the cover.

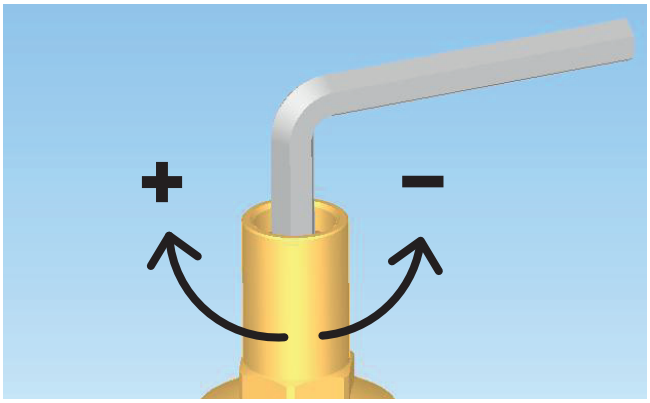


It is recommended to install filling groups inside wells or technical premises to avoid problems due to frost.
Thanks to their small footprint, they can also be installed in limited spaces, however, it is advisable to install easy access areas to facilitate normal maintenance and cleaning operations and to facilitate reading of the pressure gauge.
It is advisable to install shut-off valves upstream and downstream of the filling unit to be able to be excluded from the line and easily removed, thus performing normal maintenance and cleaning of the filter without necessarily emptying the system. For this purpose, it is also recommended to install a three-piece fitting downstream of the assembly so that it can be pulled out by simply unscrewing two nuts.

After the first filling of the system, it is always advisable to perform a thorough cleaning of the filter.
To reduce the filling times of the plant, you can install the group with a by-pass. In this way, it will be possible to fill the plant by two-thirds with the by-pass and the remaining with the group allowing the gradual expulsion of any air bubbles and automatically reintegrating the pressure value.
ARIET HOLES: To prevent breakage of filling units installed in hazardous plants, it is advisable to foresee the use of specific components for the purpose of absorbing so-called "blows of ramps", thus avoiding possible damages

Adjusting working pressure

To perform the calibration of the pressure of the filling groups, or the pressure that will be in the downstream system of the group, do the following:

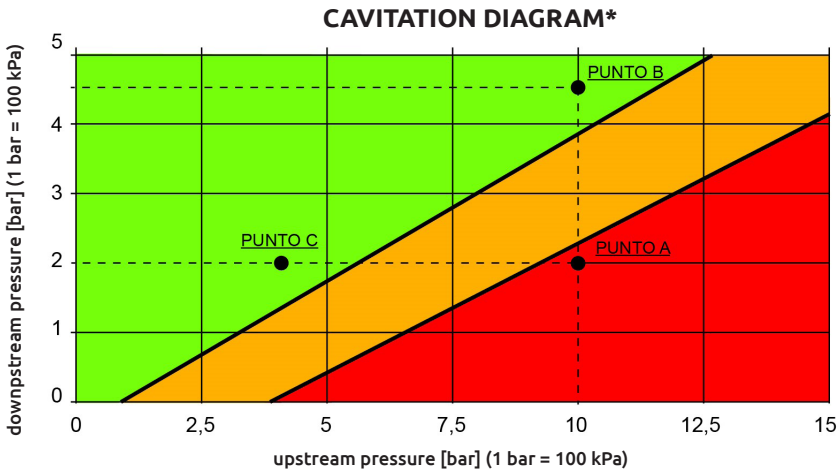


1) Close the shut-off valve downstream of the filling unit.
2) Unscrew the gray plastic cap at the top of the unit.
3) Turn on the screw inside the brass body using an 8 mm Allen key.
4) To increase the calibration pressure downstream of the group, screw the Allen screw (turn clockwise), while lowering it it is necessary to unscrew it (rotate it anticlockwise).
5) Check the pressure value set by reading it on the pressure gauge.
6) Once the desired pressure has been set, reposition the gray cap to avoid unnecessary tampering and to preserve the mechanism from any dirt.
7) Then re-open the shut-off valve and check that the downstream pressure of the group and consequently in the entire plant is brought to the desired calibration value.
Model 249 has a factory set calibration value of about 1.5 bar.
The ICMA filling range adjustment field instead is the following:
Article 249: 1 to 6 bars

Pressure reducer sizing

To avoid cavitation phenomena and thus component noise, it is recommended to dimension the number of pressure reducers required for a certain pressure drop.
The cavitation diagram shows three zones of pressure reducer operation as a function of upstream and downstream pressures:

- **ZONE 1:** Malfunction zone
- **ZONE 2:** Critical zone.
- **ZONE 3:** Optimum operating zone.



To avoid cavitation phenomena, it is recommended that the pressure reducer work inside ZONE 3 and, furthermore, to avoid that the ratio between the maximum pressure upstream and the regulation pressure downstream of the reducer exceeds the value of 2.5

SIZING
In the event that a pressure reducer is to be operated between the following pressure values [POINT A]:
• P upstream: PM = 10 bar
• P downstream: PV = 2 bar

As can be seen from the diagram, there is a risk of cavitation at these working pressure values. To avoid such phenomena, and bearing in mind that the ratio between the maximum upstream pressure and the downstream control pressure must not exceed the value of 2.5, a second pressure reducer can be used in series, so that the same pressure jump is obtained through two separate pressure jumps

The conceivable solution, therefore, is to use two pressure reducers in series, both of which must work in ZONE 3 of the diagram, distribute the pressure difference over two reduction jumps and whose pressure ratio is no greater than 2.5.

Possible solution:
Pressure reducer A [POINT B]:
• P upstream: PMA = 10 bar
• P downstream: PVA = 4,5 bar
Pressure ratio: 10/4.5 = 2.2 < 2.5

Pressure reducer B [POINT C]:
• P upstream: PMB = 4,5 bar
• P downstream: PVB = 2 bar
Pressure ratio: 4,5/2 = 2,2 < 2,5

Cavitation phenomena in the pressure reducer can be controlled, in addition to acting on the pressure drop, also by choosing an optimal value for the velocity of the fluid flowing through it.
It is therefore advisable to choose the diameter of the pressure reducer so that the fluid velocities passing through it are within the following values:

• For water:
V = 0,7 ÷ 1,5 m/s (residential use)
V = 1 ÷ 3,5 m/s (industrial use)

***The cavitation diagram is only intended to provide the technician with a quick rough reference for associating the chosen component with a given system size. The values given in the table are not binding and therefore do not represent the performance limits of the components.**

Maintenance

To keep the filling unit in optimum operating condition, it is advisable to periodically clean the filter.
The frequency of this operation will be dictated by the hardness and degree of impurity of the aqueduct water.
Maintenance operations must be carried out by qualified, authorized personnel, in accordance with the instructions given here. Before any work on the equipment, make sure that you are in rest.

Safety

Read the installation and commissioning instructions carefully before operating the unit to avoid accidents and system failures caused by improper use of the product. Please note that warranty claims will be void if unauthorized modifications or tampering are made during the assembly and construction phase.

Working conditions

The indicated limit values must in no way be exceeded. The operating safety is therefore ensured in compliance with the general conditions and operating limits described in this sheet.

Safety rules for mounting and inspection

Installation and inspection must be carried out by qualified, authorized personnel, knowing the instructions given here.
Before any work on the equipment, make sure that you are in rest.