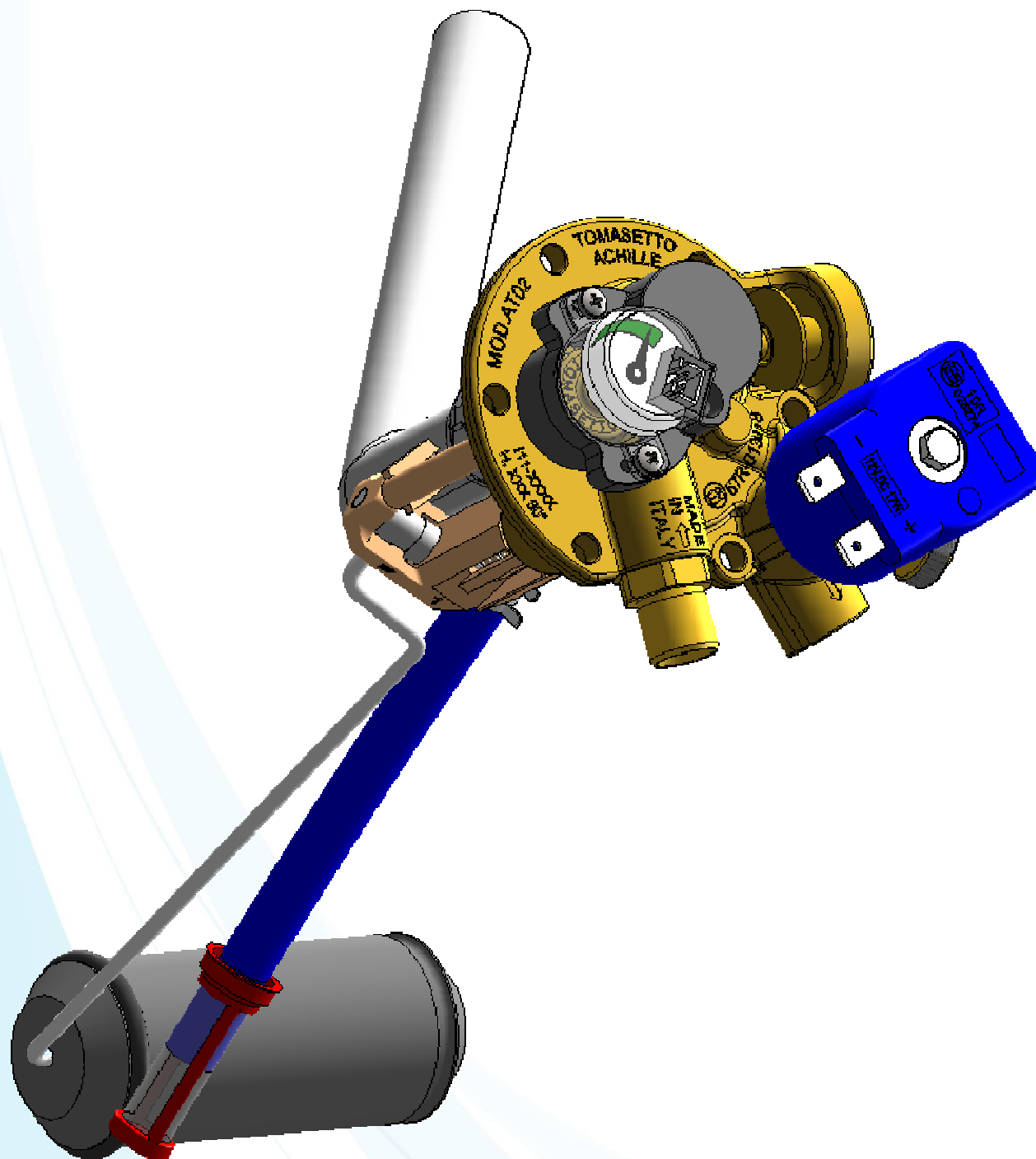


Tomasetto Multivalve Model AT 02



Indice	pag.
Multivalve description	4
Multivalve function description.....	5
a) 80% fill limiter system	5
b) Electronic level indicator	5
c) Pressure relief valve (PRV)	5
d) Pressure relief device (PRD)	6
e) Shut-off solenoid valve	6
f) Excess flow valve	7
g) Non-return valve	8
h) Manual tap	8
Installation Instructions	9
a) Multivalve model and size check	10
b) Tank integrity check and overall dimensions check	11
c) Multivalve integrity check and 80% system check.....	13
d) Installation of multi-valve in a cylindrical tank.....	14
e) Installation of multi-valve in 0°, 30° and 90° cylindrical tanks.....	16
f) Installation of multi-valve in a toroidal tank	18
g) Installation of multi-valve in 30° and 37°toroidal tanks	19
h) Installation of multi-valve in 0 °toroidal tank	22
i) Setup of the inlet and outlet fittings.....	25
j) Checks to be performed on the tank after installation on the vehicle	28
l) Fittings tightening and electrical wire connection	30
m) Calibration of the level sensor	34
n) Final checks	35
o) Remote filling point	36
Troubleshooting	39

Multivalve description

The Tomasetto multivalve model AT02 is a component for LPG gas systems designed according to the UN ECE R01 67 Regulation and approved by the Ministry of Transport of the Czech Republic with approval number E8-67R013018.

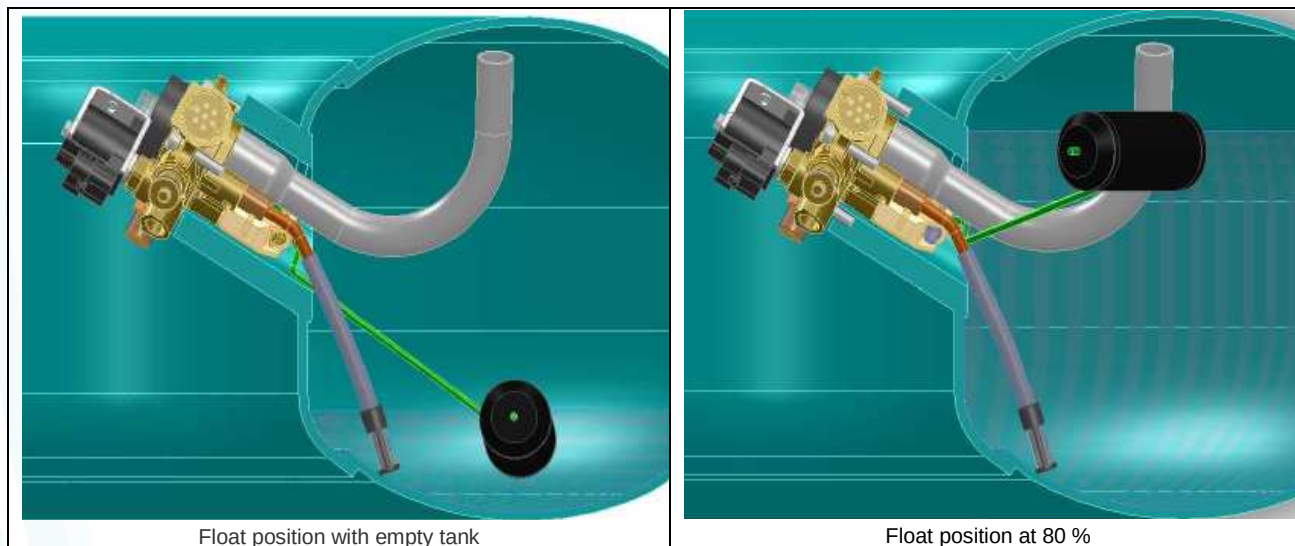
The Tomasetto multivalve model AT02 is a multifunction device to be installed on automotive LPG tanks and equipped with the following accessories:

- a) 80% fill limiter valve;
- b) level indicator;
- c) Pressure Relief Valve (PRV);
- d) Pressure Relief Device (PRD);
- e) Shut-off solenoid valve;
- f) Excess flow valve;
- g) Non-return valve;
- h) Manual tap

DESCRIPTION OF THE DEVICES

a) 80% fill limiter system

The 80% fill limiter is a safety device aimed to close the filling valve when the 80% of the tank capacity is reached, by using a float, a rod and a special mechanism with a rotating cam.



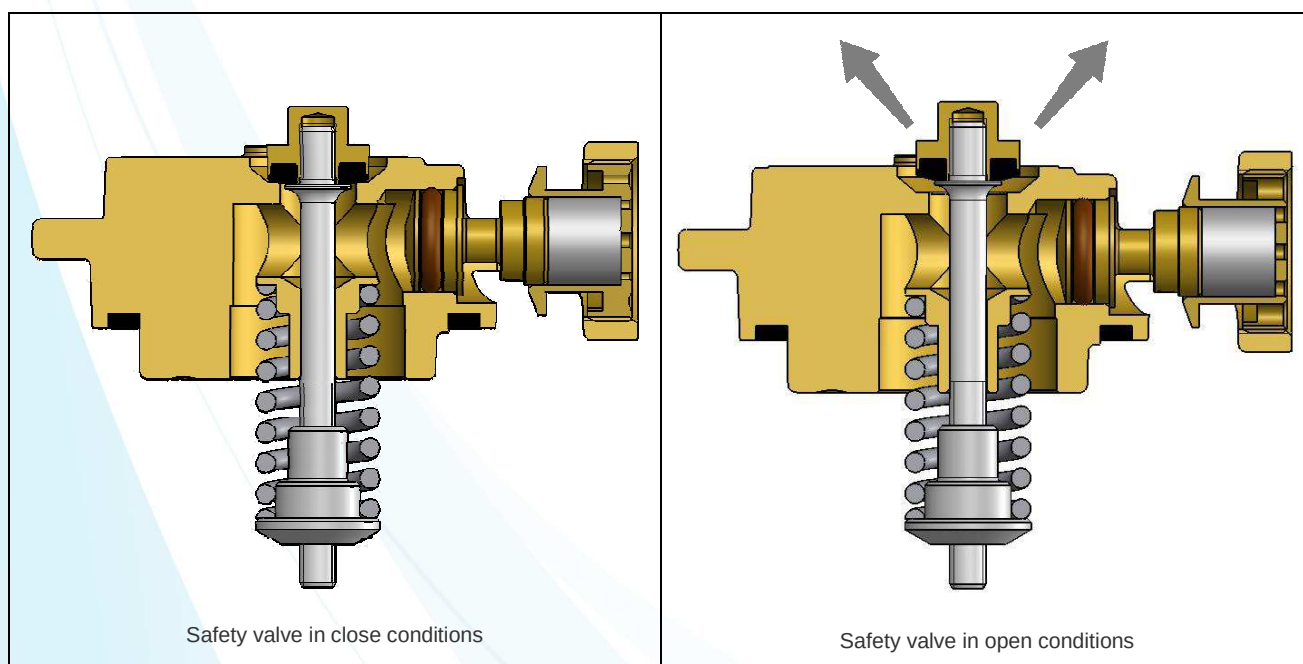
b) Electronic level indicator

The level indicator should be chosen according to the adopted ECU system.

c) Pressure relief valve (PRV)

The PRV is a safety device aimed to limit the maximum pressure inside the tank to 2.7 ± 0.1 MPa.

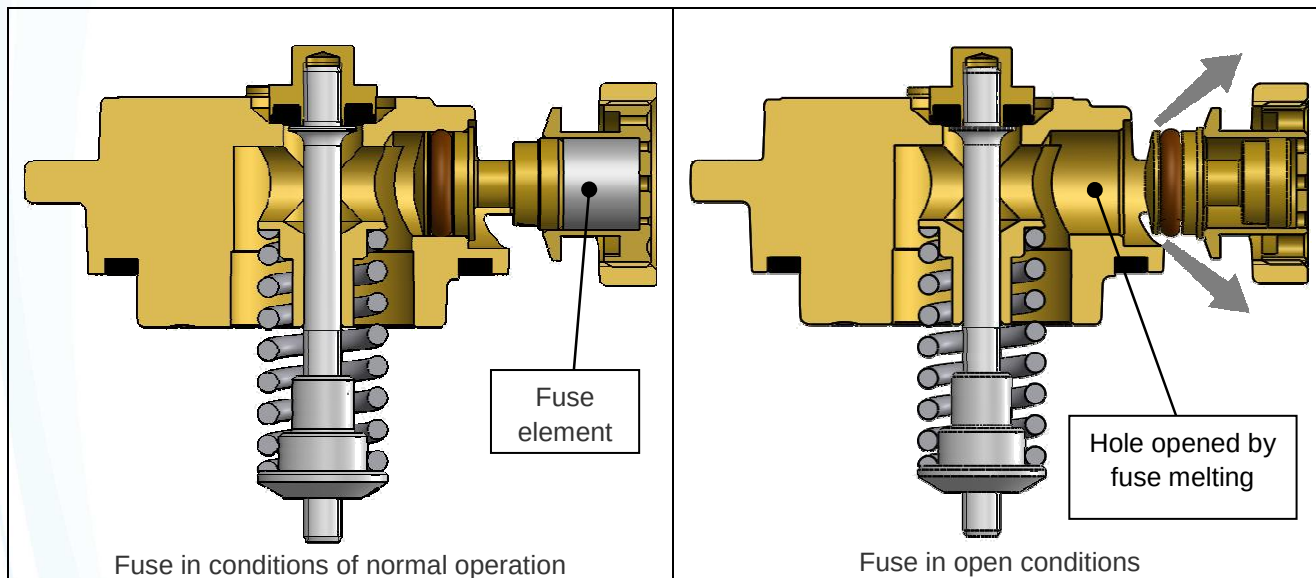
The PRV is a valve with a retaining spring allowing, in case of overpressure, the discharge of the LPG from the tank in vapor phase.



d) Pressure relief device (PRD)

The PRD is a safety device equipped with a thermo fuse element which melts at a pre-set temperature of $120^{\circ}\text{C} \pm 10^{\circ}\text{C}$.

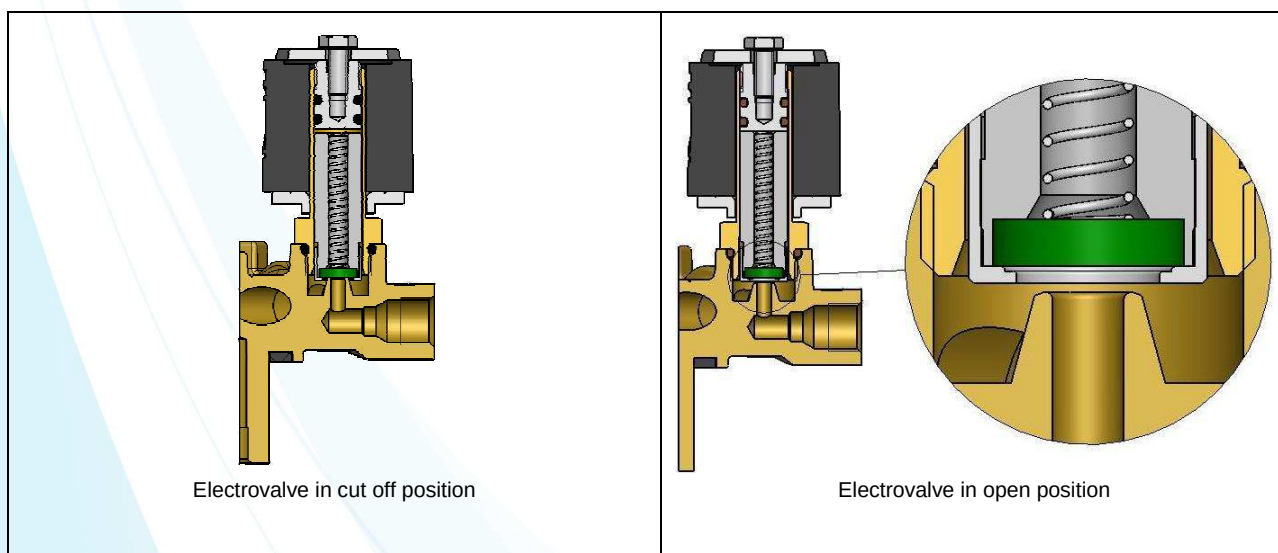
In case of fire, the fuse melts and opens a hole for the fast release of the LPG from the tank, preventing the risk of an explosion.



e) Shut-off solenoid valve

This device is aimed stop the gas flow when one of the following conditions occurs:

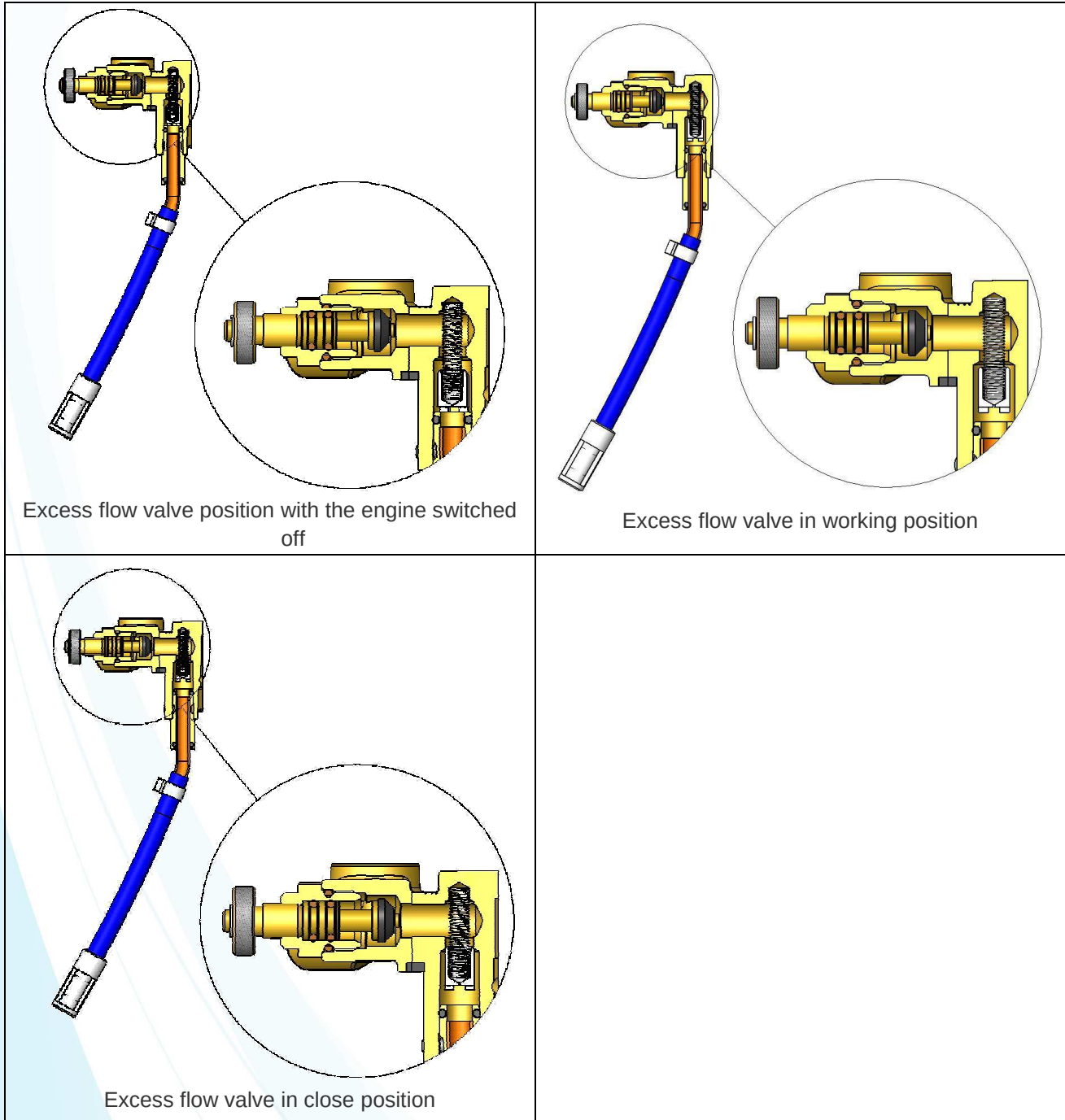
the engine is switched off or is working in petrol and the electric supply to the solenoid is switched off; in this condition, a spring inside the solenoid valve maintains the moving core in the closing position; while switching to LPG, the electric supply to the solenoid is switched on and the solenoid generates a magnetic field that attracts the plunger, allowing the opening of the multivalve hole and, consequently, the LPG flow.



f) Excess flow valve

The excess flow valve is located in the withdrawal circuit , upstream the solenoid valve and is aimed to block the flow of LPG in the event of an accidental breakage of the LPG piping .

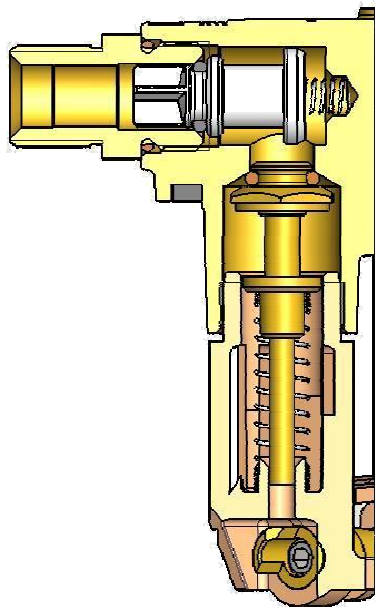
After its intervention, for the automatic resetting of the valve, a residual flow is allowed.



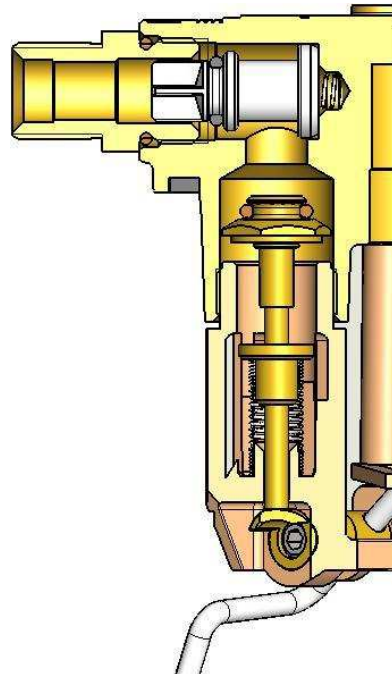
g) Non-return valve at the inlet

The non-return device is equipped with a double safety system: the first non-return valve is integrated in the 80% filling limiter,, the second device is located in the inlet fitting.

These devices are aimed to avoid the back flow of gas from the tank toward the outlet of the filling device



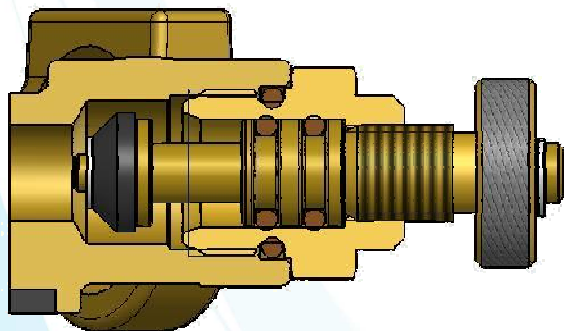
non-return valves in close position



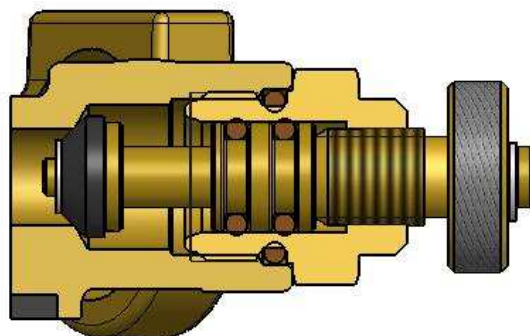
non-return valves during filling operation

h) Manual valve

The manual valve intercepts the outlet gas circuit upstream of the solenoid valve and is aimed to the maintenance of the solenoid valve.



Manual valve in open position



Manual valve in close position

Installation instructions

For a correct installation, all the operations must be performed according to the requirements of the ECE R01 ONU67 Regulation, Part I and Part II

The use of the multivalve is limited to that specified in the UN ECE 67R01 Regulation

a) Multivalve model and size checks

The correspondence between the type and the size of the tank marked on the multi-valve has to be verified with the information indicated on the marking plate of the tank.

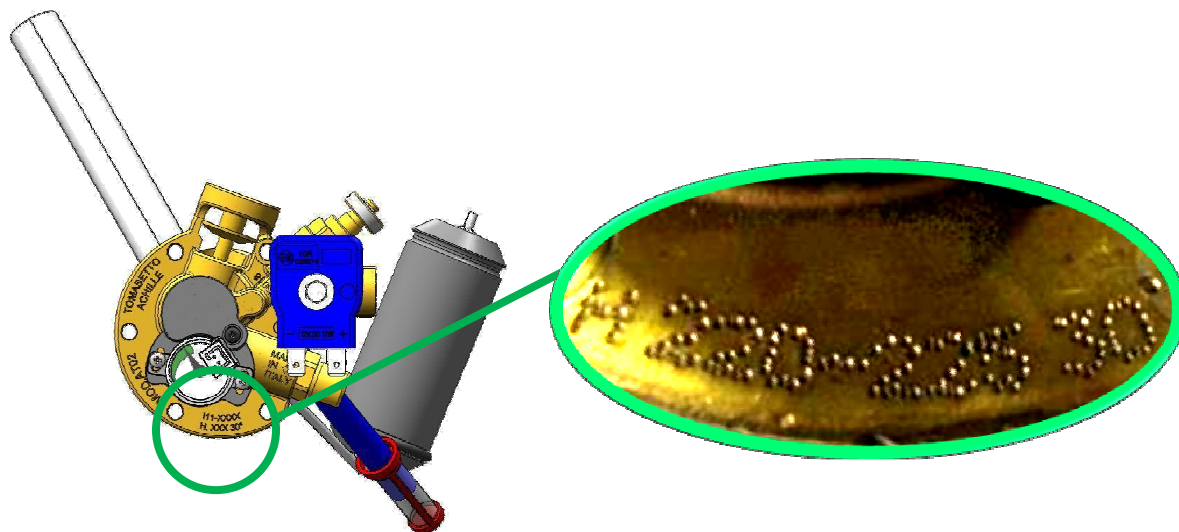


Figure 1: Multivalve size



Figure 2: LPG tank size

b) Tank integrity and overall dimension checks

The angular error of the screws threaded holes of the flange must not exceed $\pm 2^\circ$.

The tank must be placed in a horizontal position.

For a correct installation, it is warmly suggested to tighten two screws on the two opposite holes as shown in figure 3.

The inclination of the ring with respect to the horizontal plane has to be measured as shown in Figure 3.

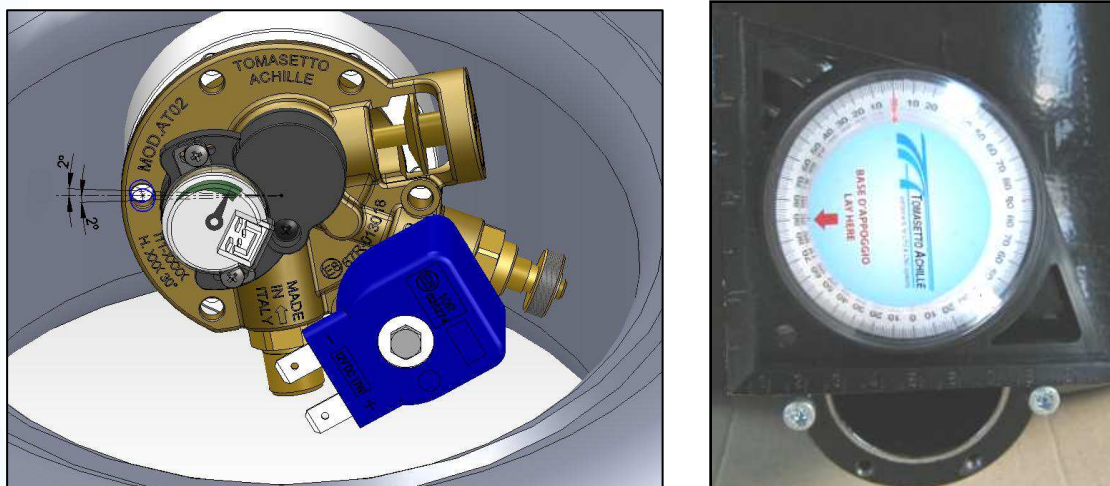
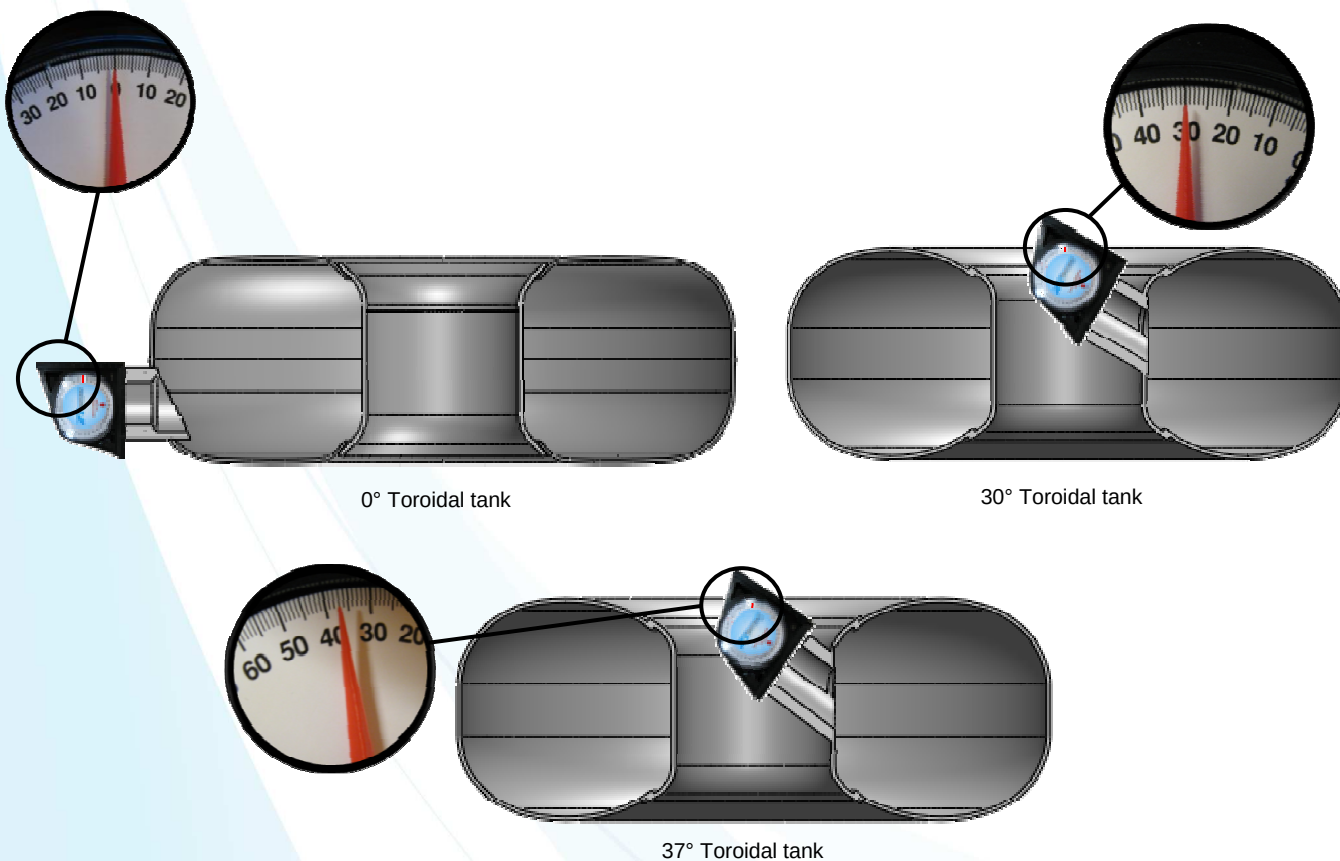


Figure 3: measuring method of the angular error of the flange

In the toroidal tanks, the inclination of the flange has to be checked with a goniometer in order to verify whether it is one as per the requirements: 0° , 30° or 37° .



0° Toroidal tank

30° Toroidal tank

37° Toroidal tank

The seat ring has to be clean and any remaining paint has to be removed, taking care to not create planarity error, dents or scratches that might affect the sealing. The inside part of the tank has to be cleaned from any welding or sanding residue and empty from any trace of water (see figure 4).



Figure 4: Removing of the paint from the seat ring of the tank

If necessary, residual paint from the screw threaded holes M5 has to be removed, as well as any burr or debris created by this operation (see figure 5).



Figure 5: Removing of the paint from the screw threaded holes

c) Integrity checks of the multivalve

The multivalve has to be without damages due to improper handling.

Warning! Handle the multivalve grabbing it from the multivalve body.
Do not grab the multivalve in different ways.

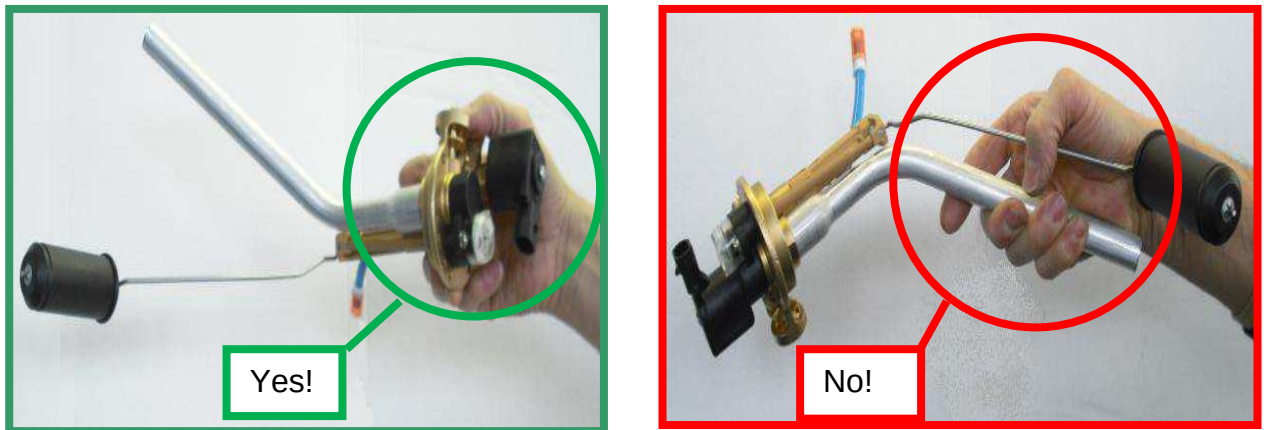


Figure 6: Handling methods

The correct movement of the float rod has to be checked by rotating it as shown in Figure 7.

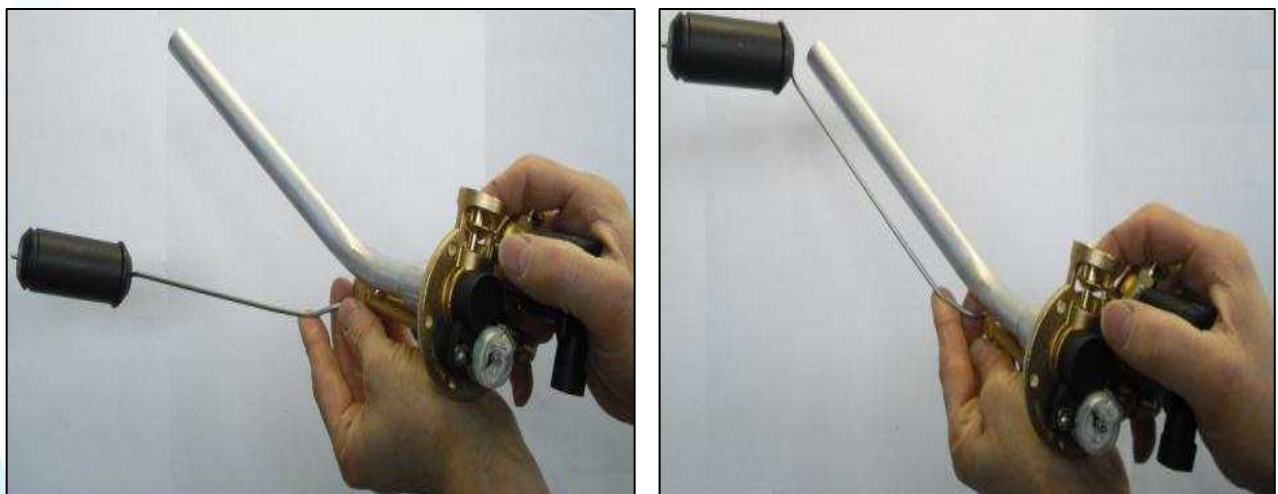


Figure 7: float rod test

d) Installation of a multivalve in a cylindrical tank

For cylindrical tanks located inside the vehicle, the multi-valve must be installed together with the gas tight housing.

Lay out for 0° and 30° cylindrical tanks

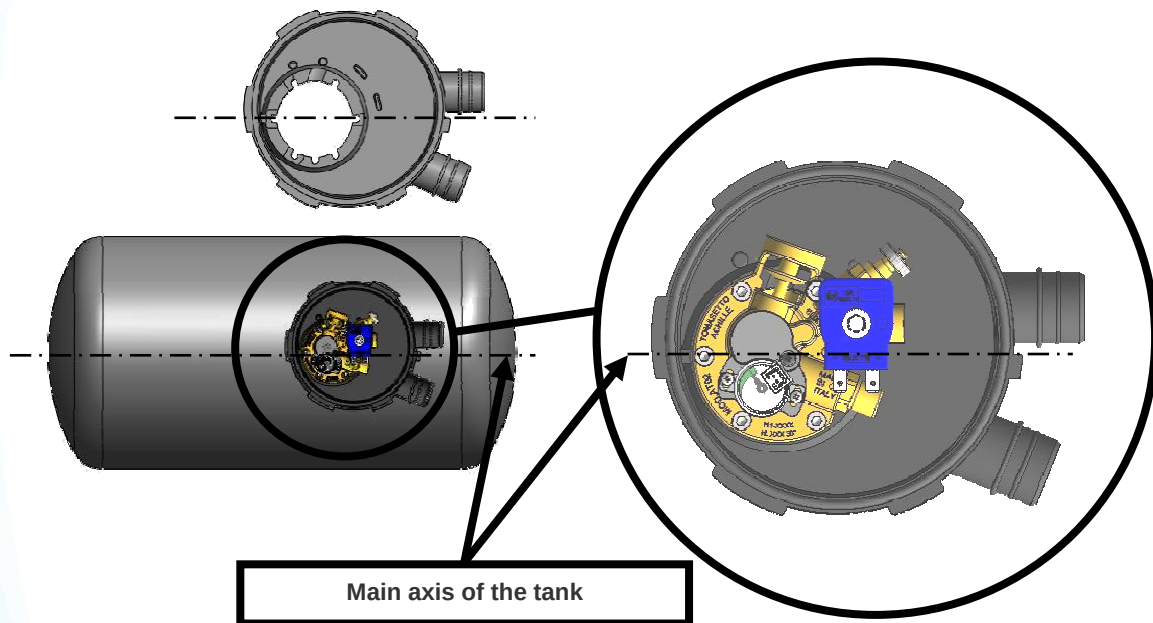


Figure 8: Assembly lay out for 0° and 30° cylindrical tanks

Lay out for 90° cylindrical tanks:

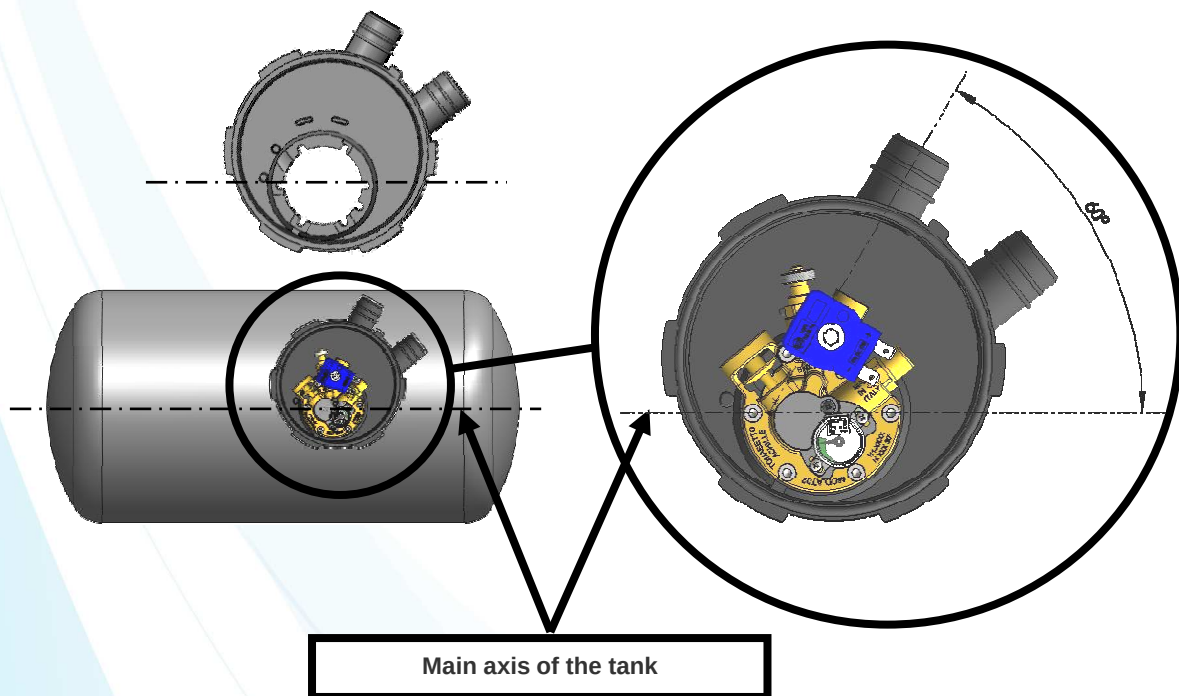


Figure 9: Assembly lay out for 90° cylindrical tanks

For 90° cylindrical tanks with diameter smaller than 270 mm, a special gas tight housing has to be used as shown in figure 1:

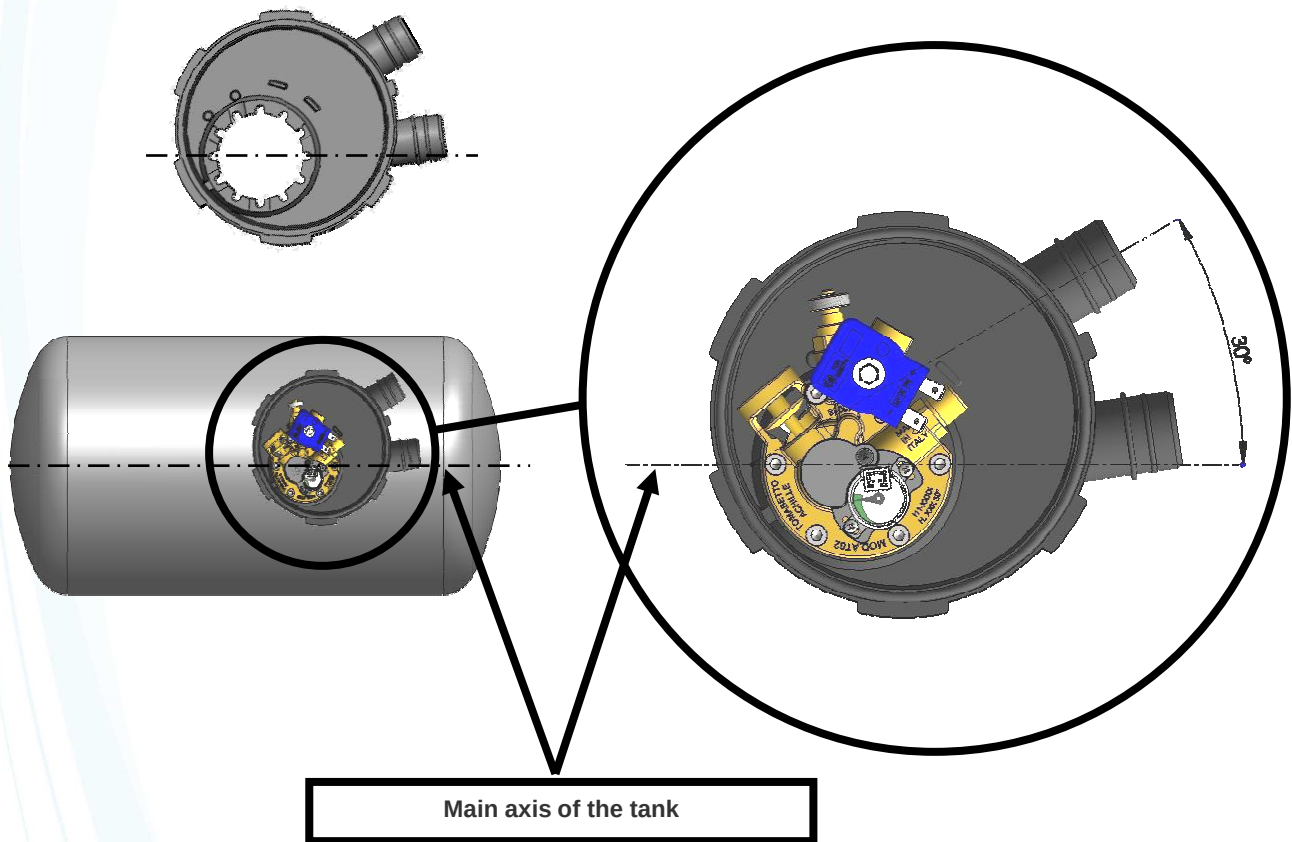


Figure 10: Assembly lay out for 90° cylindrical tanks with diameter up to 270 mm

e) Assembly instructions for 0°, 30° and 90° cylindrical tanks:

Placement of the O-ring gasket in the ring of the tank;



Figure 11: Placement of the O-ring gasket

Placement of the gas-tight housing (Figure 12);



Figure 12: Positioning of the gas tight housing

Inserting of the float rod and of the withdrawal pipe in the tank (Figure 13);

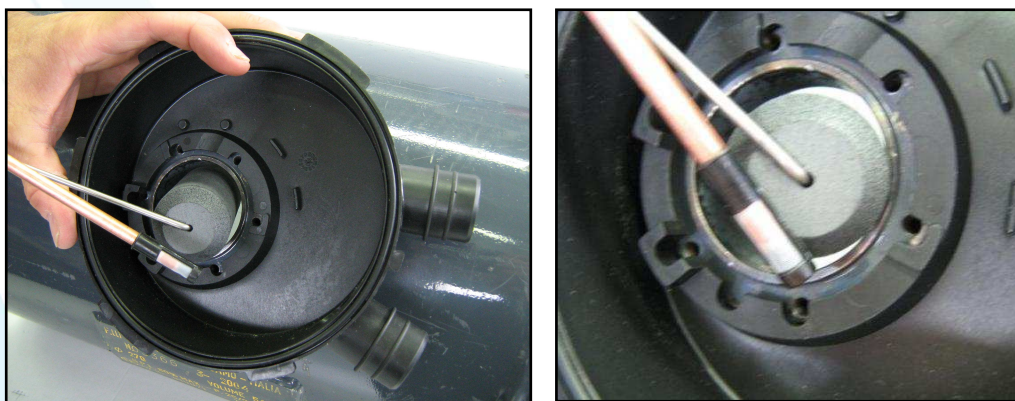


Figure 13: Insert the float and the withdrawal pipe in the tank

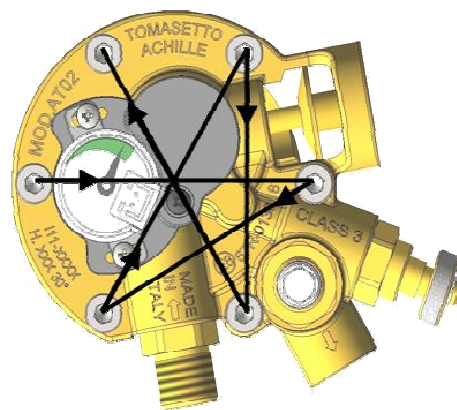
Removal of the coil with a 7mm wrench and fixing of the 6 flange screws (sequence explained in figure 14)
Fixing torque to be 3.5 +/- 0.5 Nm



Warning: avoid to damage the solenoid components during installation



Do not remove during installation



Screws fixing lay out sequence

Figure 14: operation sequence for screws fixing

80% system correct functioning verification: this check has to be performed by rotating the tank along its axis and by checking the correct indication of the level sensor (Figure 15).

Warning: According to the ECE 67 R01 Regulation, Part II paragraph 17.6.3.1 "The automatic filling level limiter shall be suitable for the fuel container it is fitted to and shall be installed in the appropriate position to ensure that the container cannot be filled to more than 80%"



Level gauge: empty position



Level gauge: full position



Figure 15: 80% system check

f) Installation of multivalve in a toroidal tank

In 0°, 30° and 37° toroidal tank the assembly position of multivalve changes as shown in the following pictures.

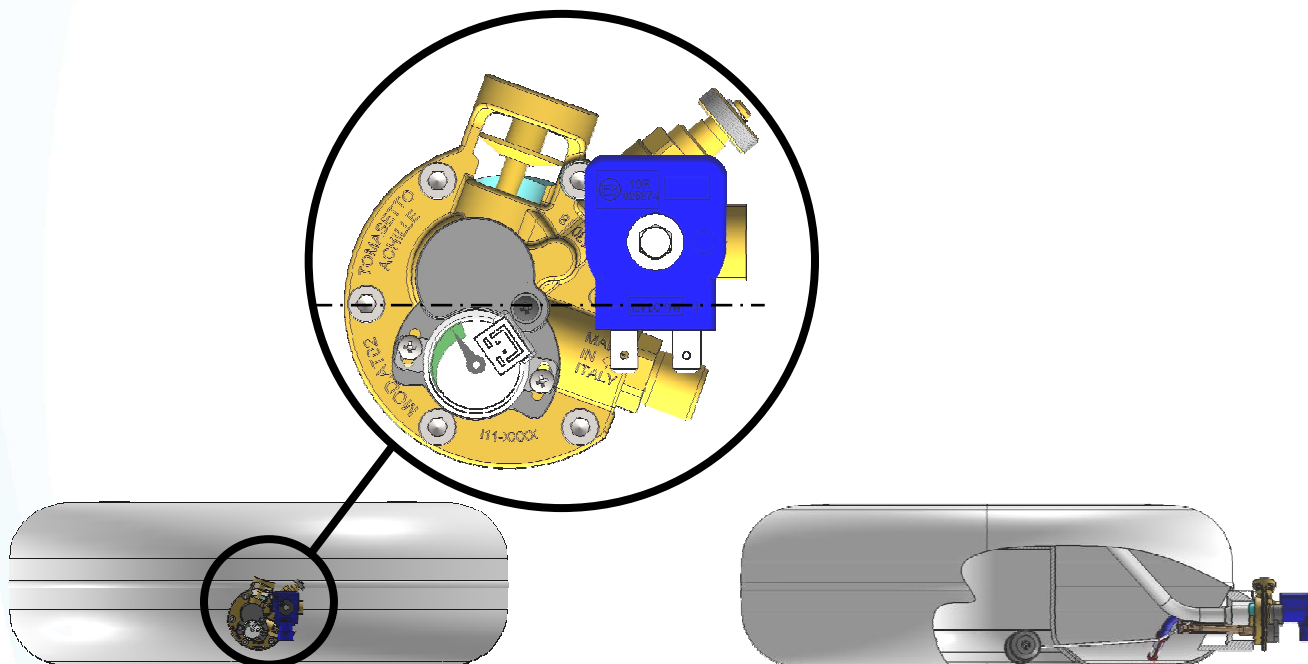


Figure 16: Multivalve lay out assembly for 0° toroidal tank version

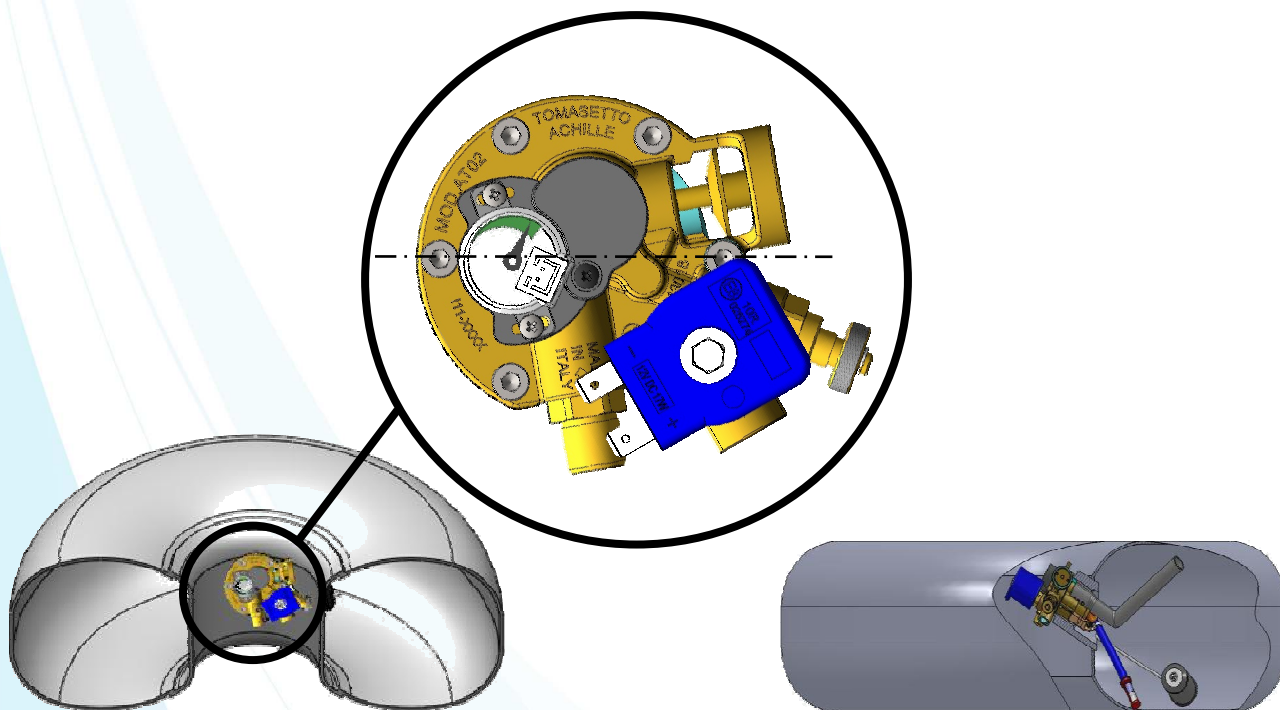


Figure 17: Multivalve lay out assembly for 30° and 37° toroidal tank version

g) Installation of the multivalve in 30° and 37° toroidal tanks:

Inserting of the float rod and of the withdrawal pipe in the tank (Figure 18).

Do not force the components of multivalve during the assembly operation.

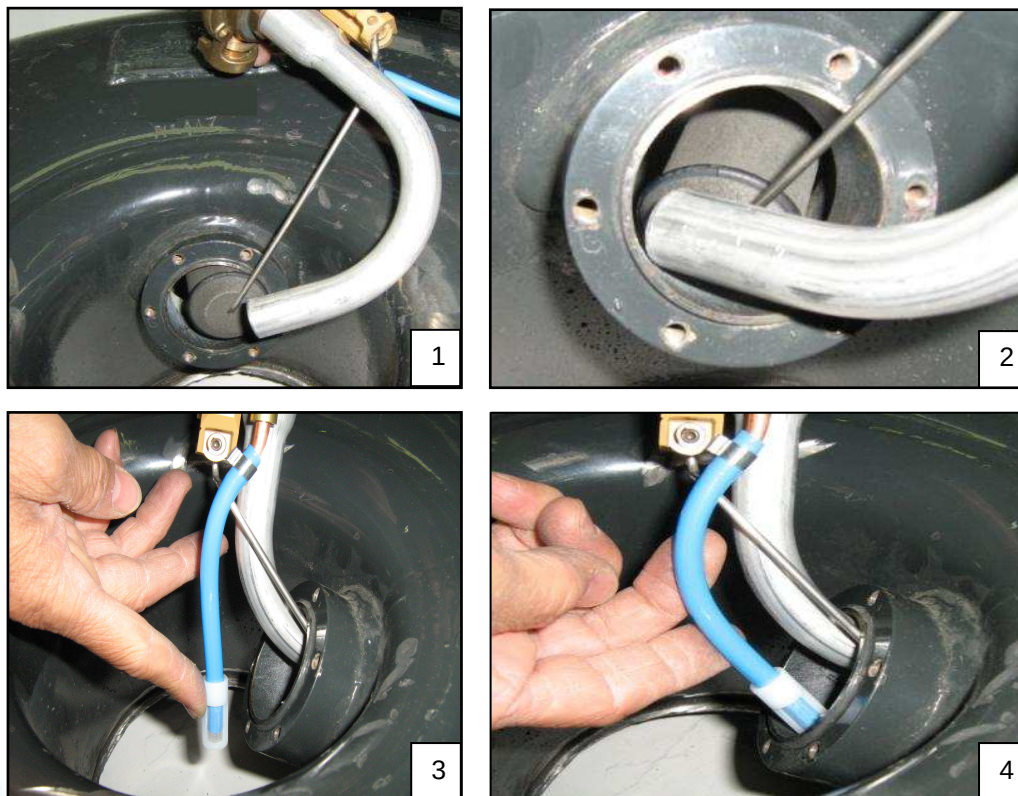
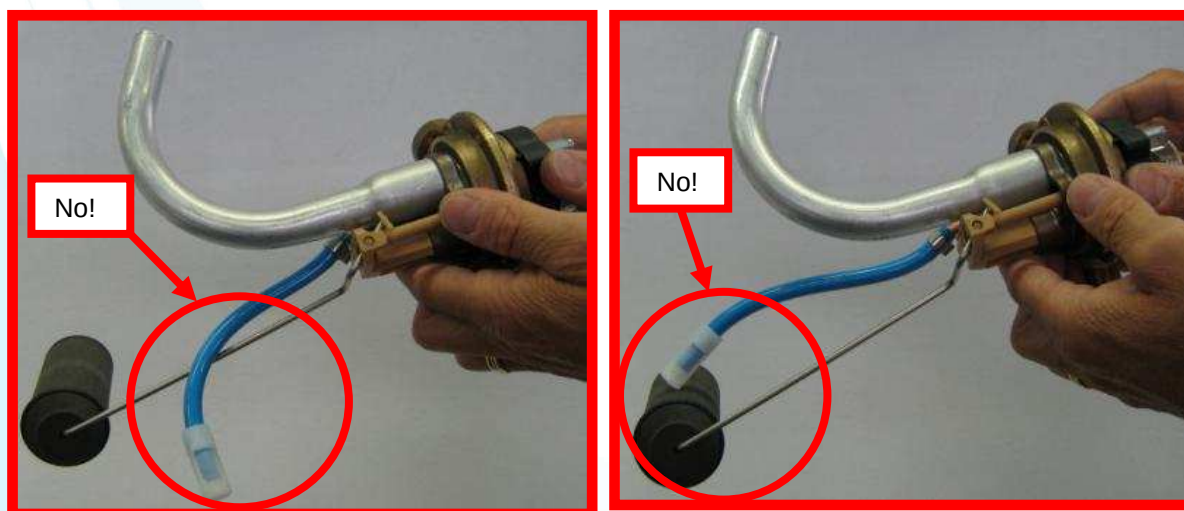
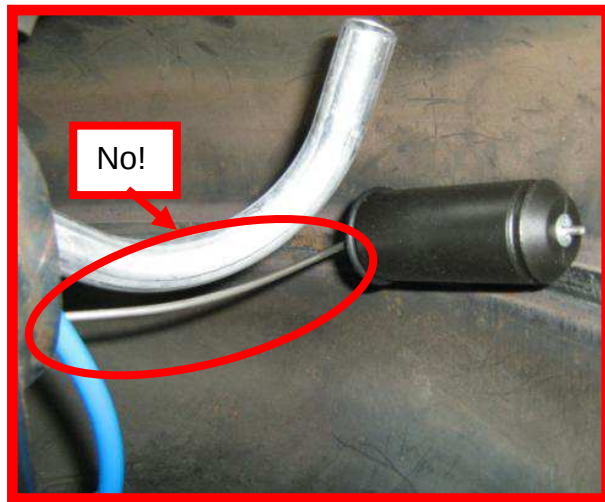
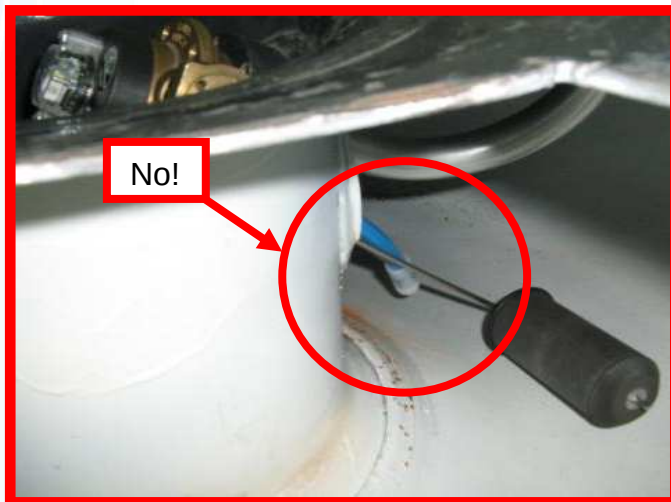


Figure 18: Inserting of the float rod, of the withdrawal pipe and of the plastic pipe in the 30° and 37° toroidal tank

Warning. To avoid damages to the plastic pipe and guarantee the correct working of the 80% system, the plastic pipe must not be assembled in the tank as shown in figures





Removal of the coil with a 7mm wrench and fixing of the 6 flange screws (sequence explained in figure 19)
Fixing torque to be 3.5 +/- 0.5 Nm.

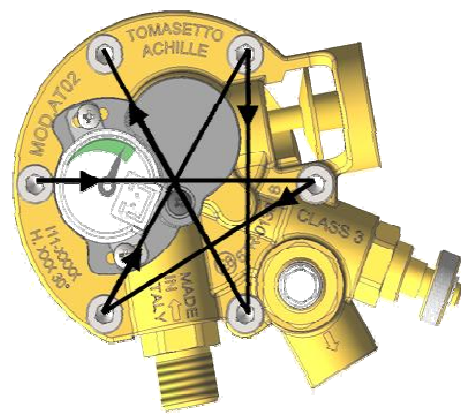
Fixing screw of coil



Warning: avoid to damage the solenoid components during installation



Do not remove during installation



Screws fixing lay out sequence

Figure 19: operation sequence for screws fixing

80% system correct functioning verification: this check has to be performed by rotating the tank and by checking the correct indication of the level sensor (Figure 20).

Warning: According to the ECE 67 R01 Regulation, Part II paragraph 17.6.3.1 "The automatic filling level limiter shall be suitable for the fuel container it is fitted to and shall be installed in the appropriate position to ensure that the container cannot be filled to more than 80%"



Level gauge: empty position



Level gauge: full tank



Figure 20: 80% system check

h) Installation of the multivalve in 0° toroidal tanks

In the 0° toroidal tanks, the multivalve is protected by a plastic protection to prevent damage during use. Inserting of the float rod and of the PRV withdrawal pipe in the plastic ring and clamping (figure 21).



Figura 21:

Inserting of the float rod and of the withdrawal pipe in the tank (figure 22).

Do not force the components of multivalve during the assembly operation.

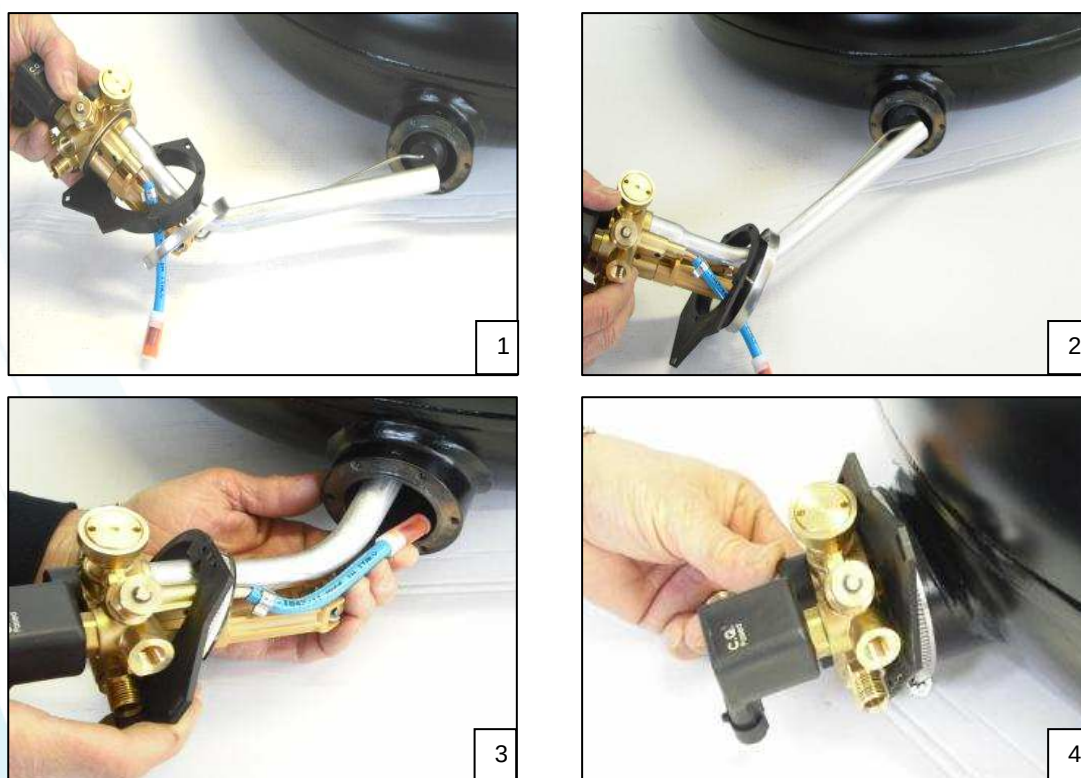


Figure 22: Inserting of the float rod, of the withdrawal pipe and of the plastic pipe in the 0° toroidal tank

Warning. To avoid damages to the plastic pipe and guarantee the correct working of the 80% system, the plastic pipe must not be assembled in the tank as shown in figures below



Removal of the coil with a 7mm wrench and fixing of the 6 flange screws (sequence explained in figure 23)
Fixing torque to be 3.5 +/- 0.5 Nm.

Warning: during the coil assembly operation, insert the gasket and plastic cap to increase the coil protection, to prevent damages caused by water and debris.

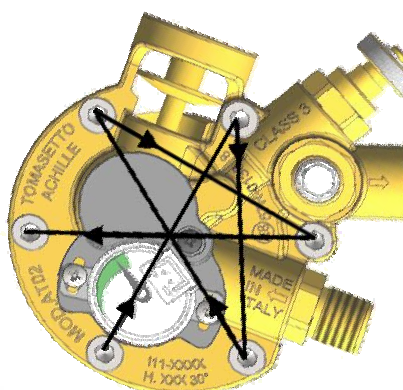
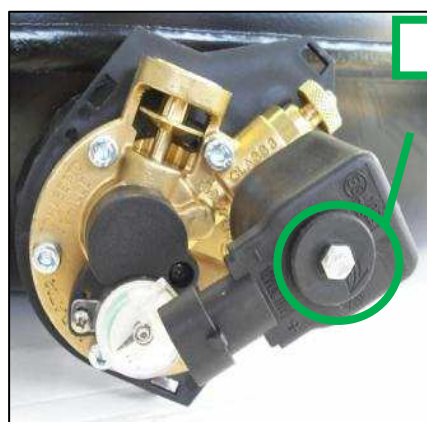


Figure 23 operation sequence for screws fixing

80% system correct functioning verification: this check has to be performed by rotating the tank and by checking the correct indication of the level sensor (Figure 24)

Warning: According to the ECE 67 R01 Regulation, Part II paragraph 17.6.3.1 "The automatic filling level limiter shall be suitable for the fuel container it is fitted to and shall be installed in the appropriate position to ensure that the container cannot be filled to more than 80%"

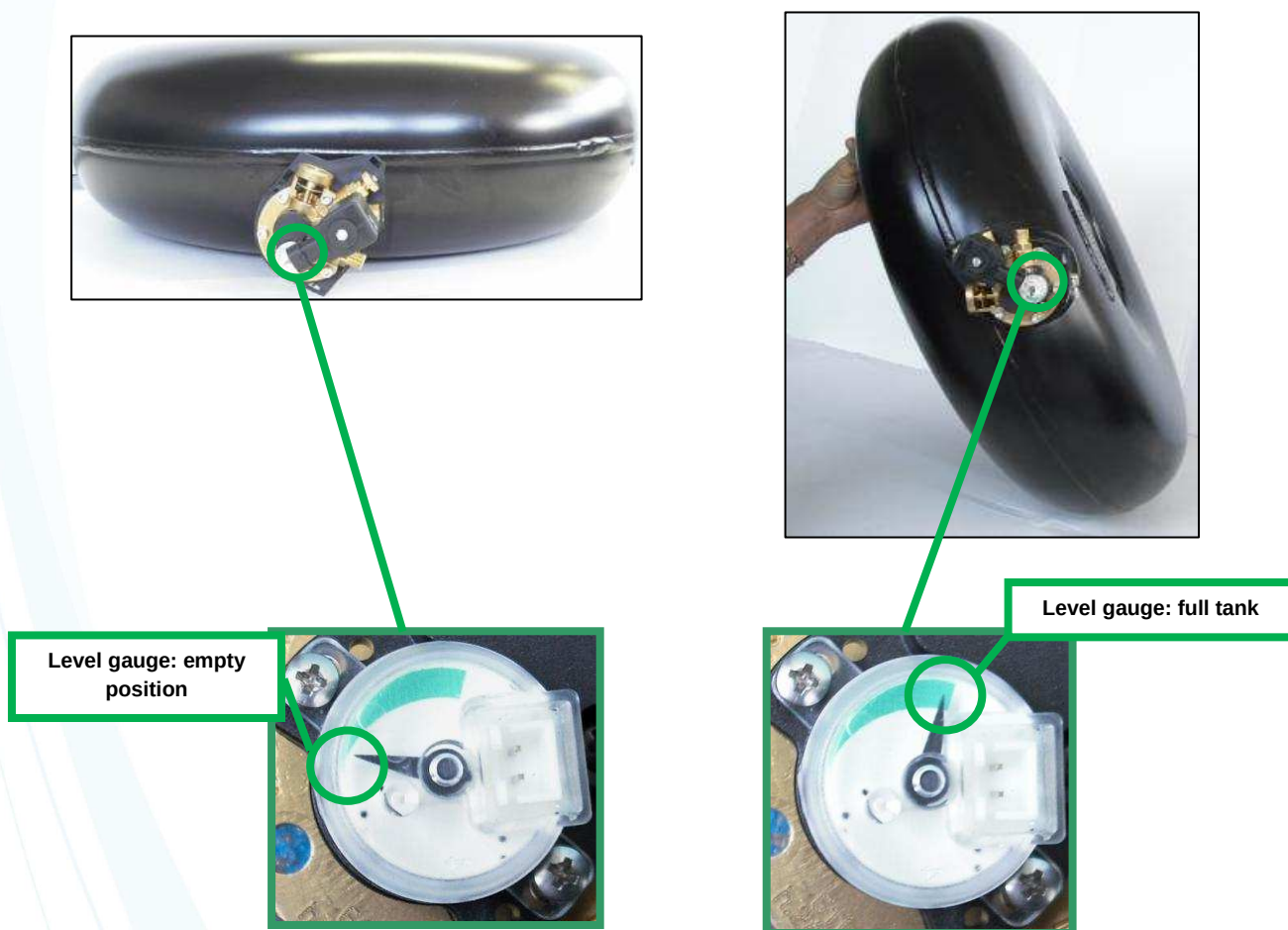


Figure 24: 80% system check

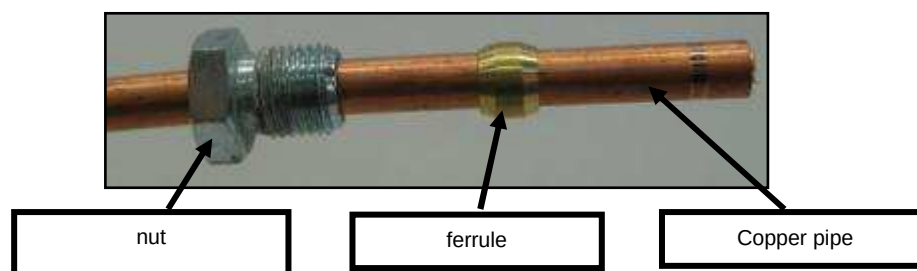
i) Inlet and outlet fittings setup

NOTE: the inlet and outlet fittings preparing is warmly recommended before proceeding with the installation of the tank on the vehicle

WARNING! DO NOT FIX THE INLET AND OUTLET CONNECTIONS IF THE MULTIVALVE IS NOT FIXED ON THE TANK BUNG

- OUTLET FITTING

Inserting of the nut and of the ferrule on the copper pipe.



Manual connection of the nut, ferrule and copper pipe to the multivalve outlet fitting;



Figure 25: outlet fitting manual connection

During the fixing operation, it is warmly recommended to push the copper tube in mechanical beat on the body.

Fixing torque of the nut to be 2.5 +/- 0.5 Nm (Figure 26).

After fixing operation, remove the nut and check the ferrule deformation (green photo in figure 26).

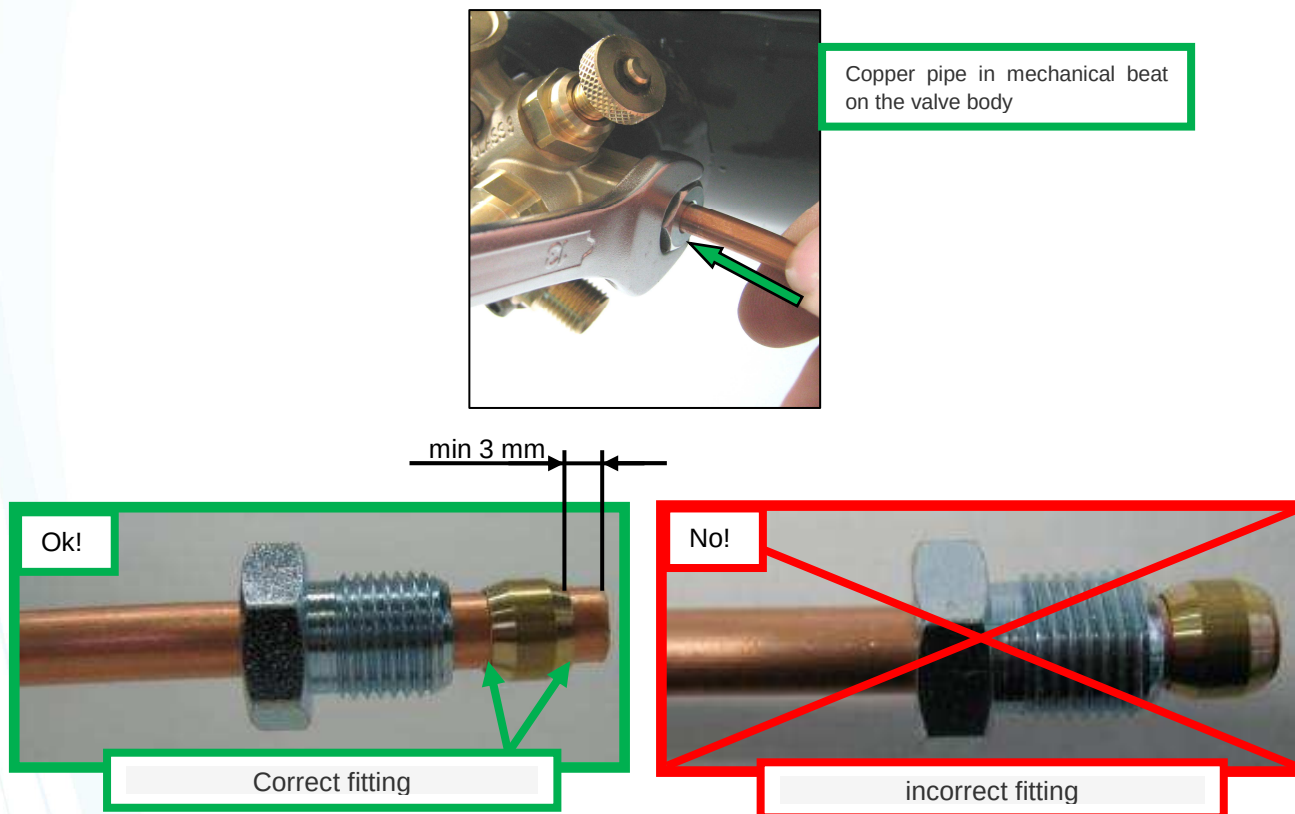


Figure 26: outlet fitting fixing operation

- INLET FITTING

Inserting of the 1/4 gas nut and of the ferrule on the copper pipe.

Manual connection of the nut, of the ferrule and of the copper pipe to the multivalve outlet fitting.

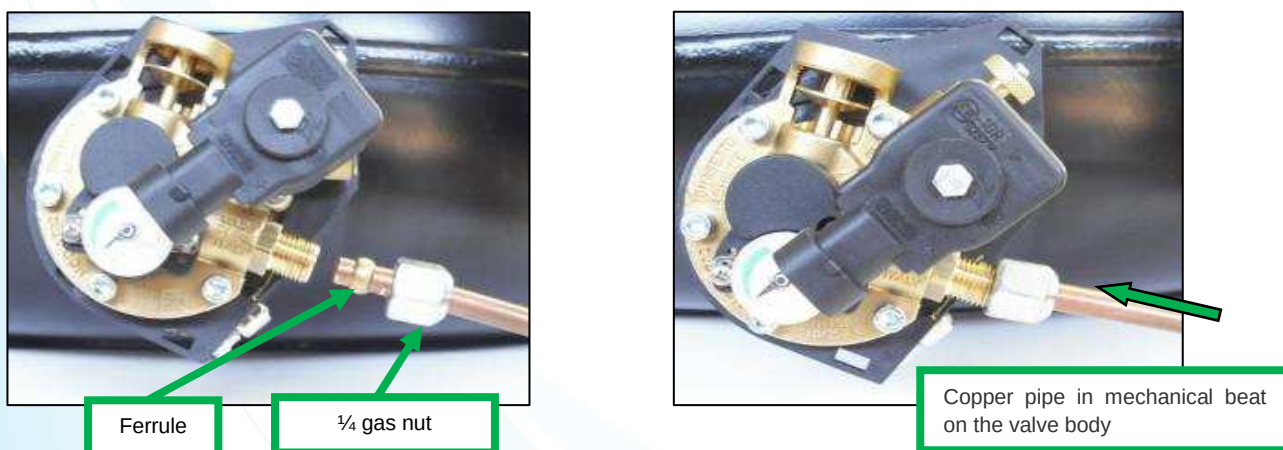


Figure 27: inlet fitting fixing operation

During the fixing operation, it is warmly recommended to push the copper tube in mechanical beat on the body.

Fixing torque of the nut to be 2.5 +/- 0.5 Nm (Figures 27 and 28).

After fixing operation, remove the nut and check the ferrule deformation (green photo in figure 28).

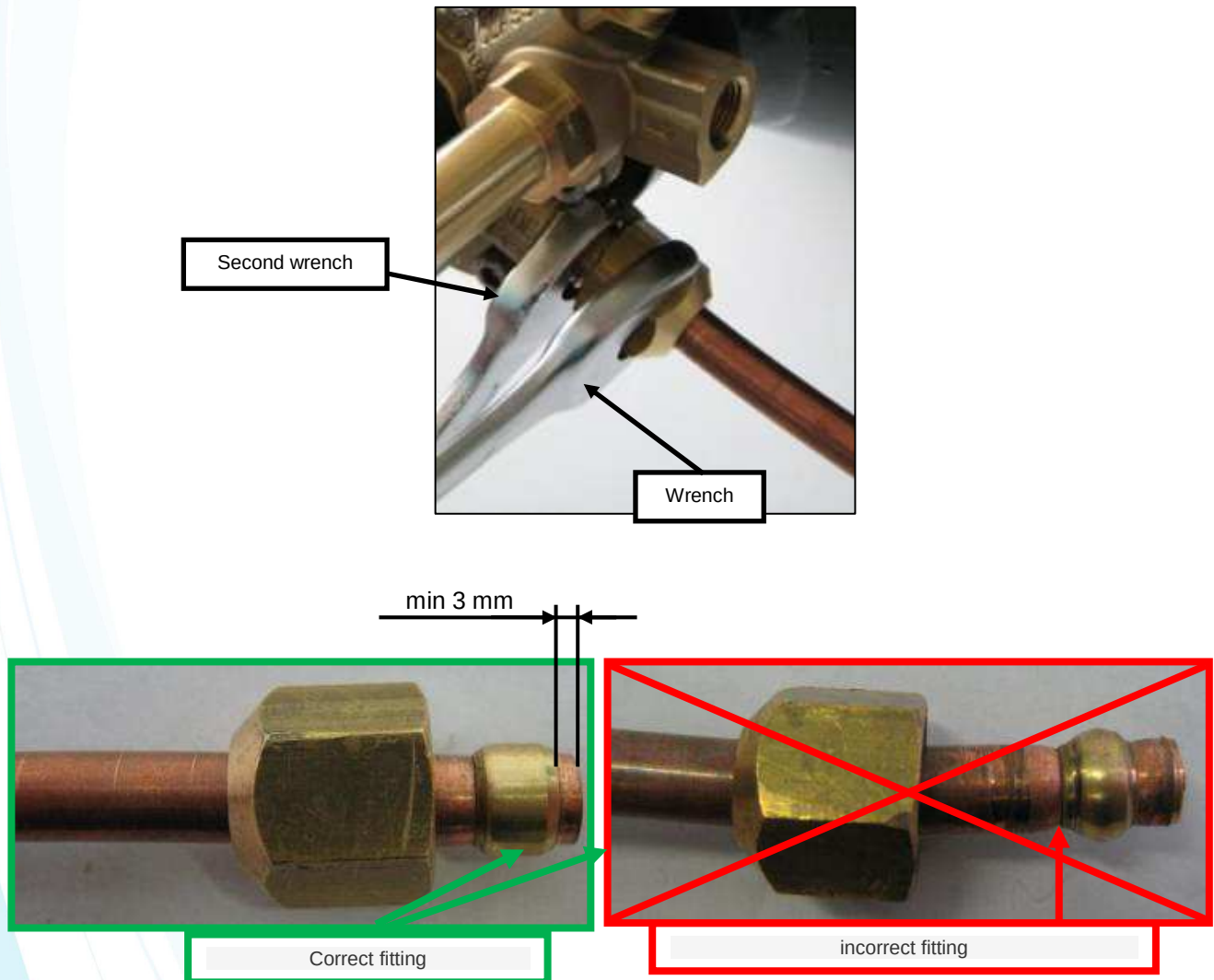


Figure 28: inlet fitting preparation

j) Checks to be performed after the installation on the vehicle

According to the ECE 67 R01 Regulation, Part II paragraph 17.6.3.1 "The automatic filling level limiter shall be suitable for the fuel container it is fitted to and shall be installed in the appropriate position to ensure that the container cannot be filled to more than 80%".

Correct installation of the tank in the vehicle and 80% system checking verification to be performed with a full filling of the tank.

Installation instruction for cylindrical tanks

The error in the tank axis respect to the horizontal plane must not exceed $\pm 2^\circ$. Errors higher than $\pm 2^\circ$ can compromise the correct functioning of the 80% system.

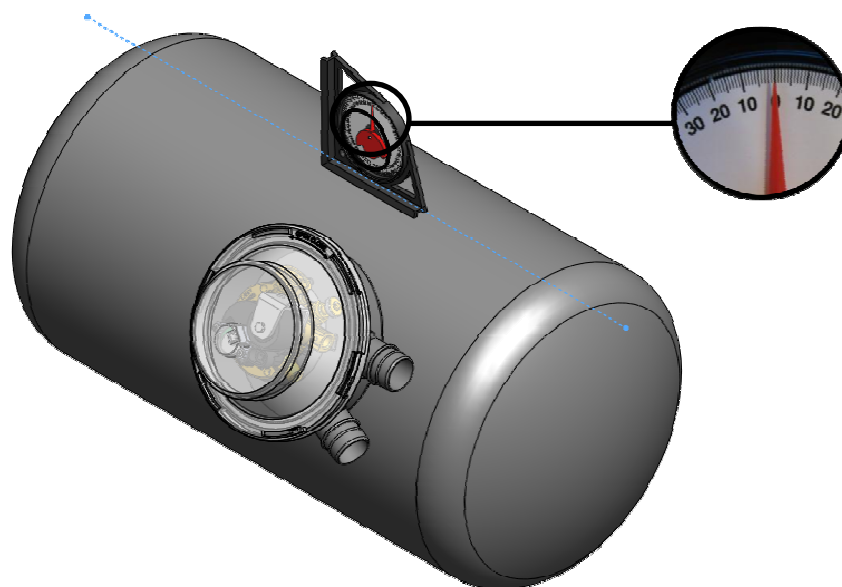
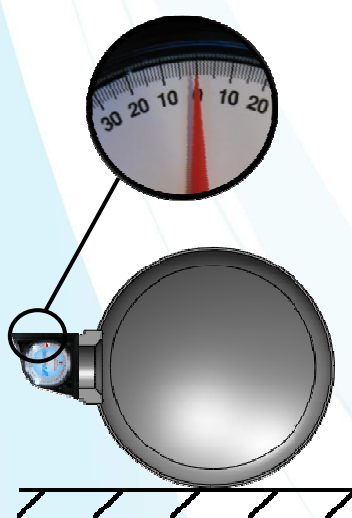
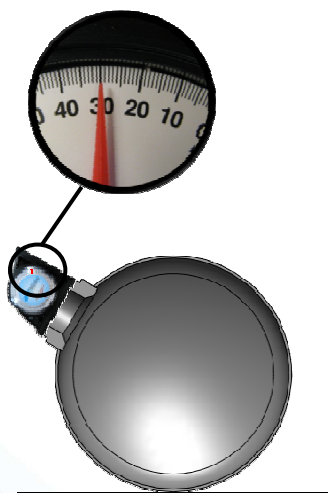


Figure 29: tank inclination axis check for cylindrical version



0° cylindrical tank



30° cylindrical tank



90° cylindrical tank

Installation instruction for toroidal tanks:

The error in the tank planarity respect to the horizontal plane must not exceed $\pm 2^\circ$. Errors higher than $\pm 2^\circ$ can compromise the correct functioning of 80% system.

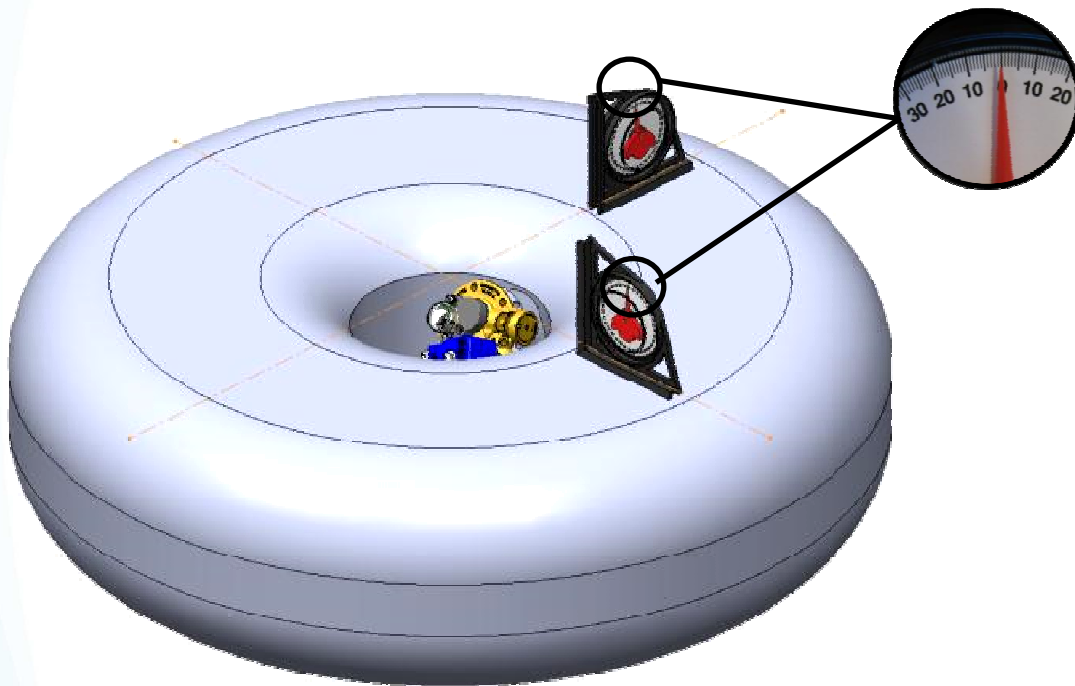


Figure 30: tank planarity check for 30° and 37° versions

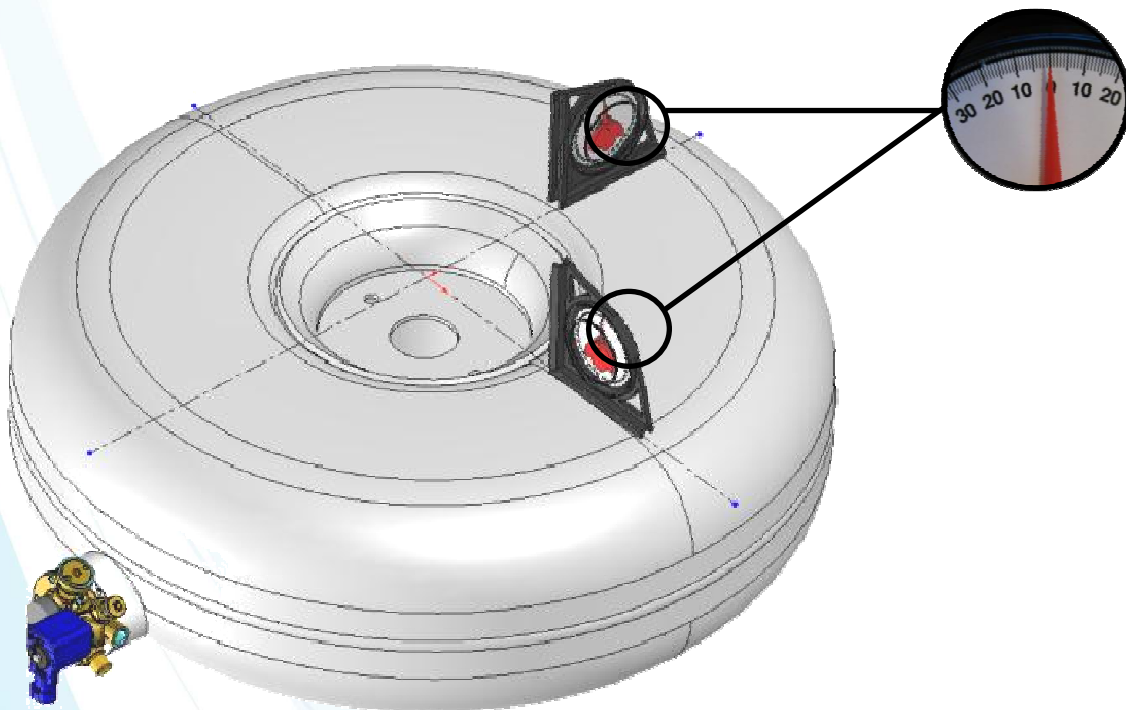


Figure 31: tank planarity check for 0° version

I) Fittings tightening and electrical wire connection

Inlet and outlet fittings tightening operation

0°, 30° and 90° cylindrical tanks with external diameter greater than 270 mm

Copper pipes inserting (to be performed with appropriate fittings) in the gas tight housing and manual screwing in the multivalve seat.

Inlet fitting (17 mm and 16 mm wrenches) and outlet fitting pipes fixing (13 mm wrench) (Figure 32).

Maximum screwing torque to be 5 Nm

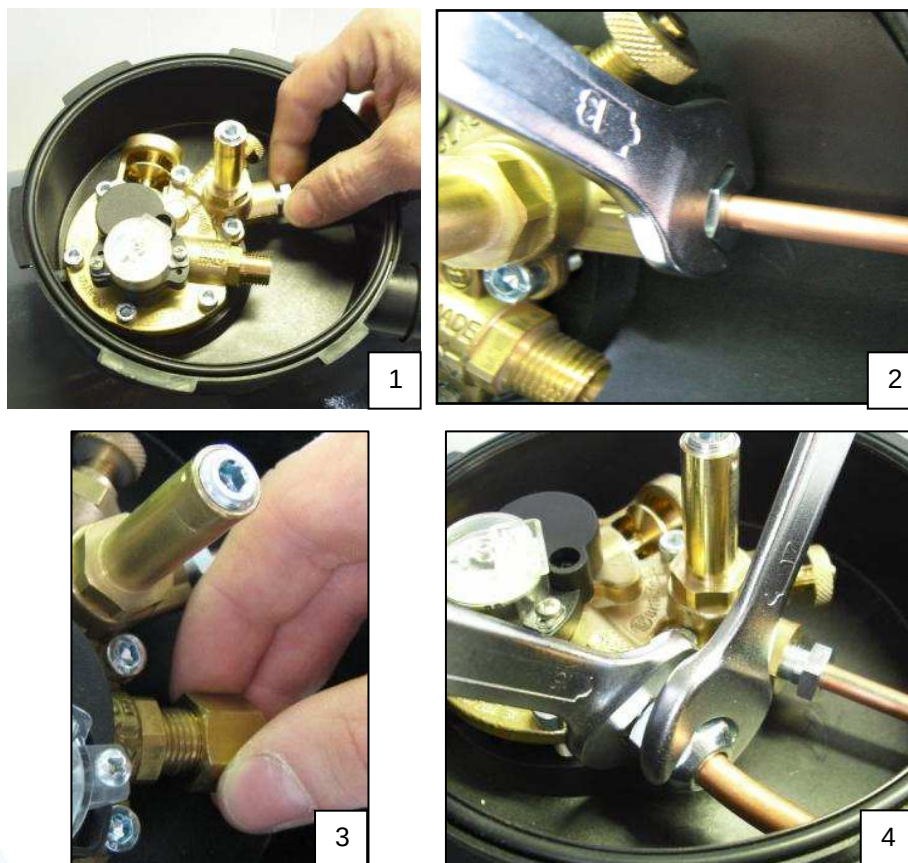


Figure 32: inlet and outlet fittings screwing

For the installation of 90° cylindrical tank multivalves with external diameter smaller than 270 mm, the following scheme has to be follow:

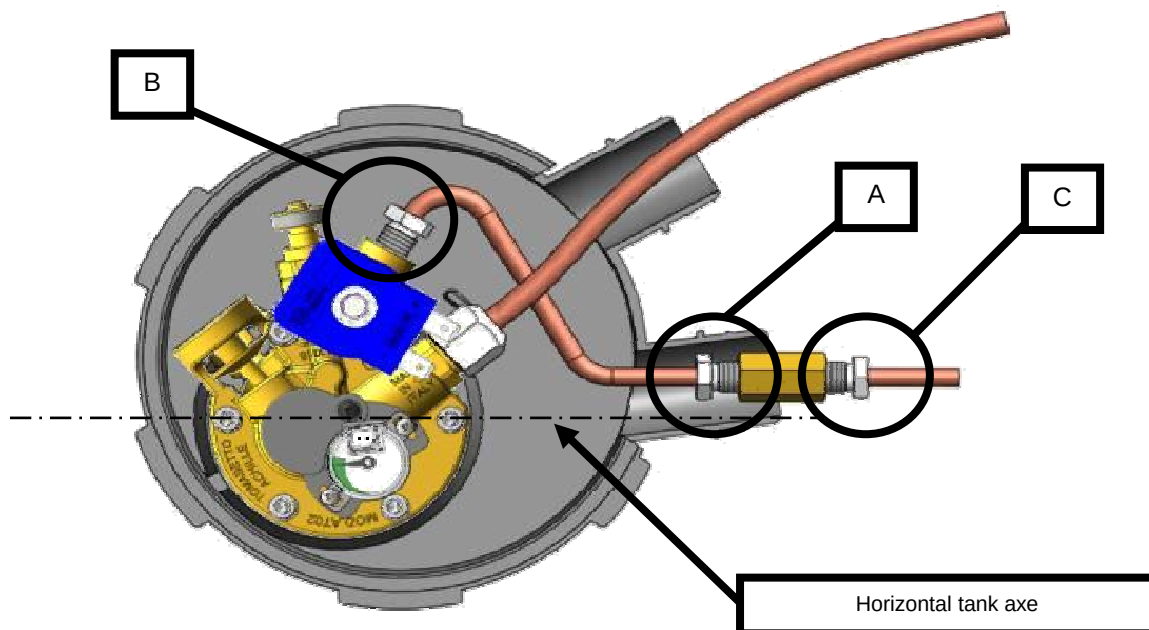


Figure 33: installation scheme for 90° cylindrical tanks with external diameter smaller than of 270 mm

Coil inserting and fixing (appropriate hex screw to be used).
Electrical level sensor wire connection (if present).
Electrical coil wire connection (figure 34).
Gas tight housing closing.

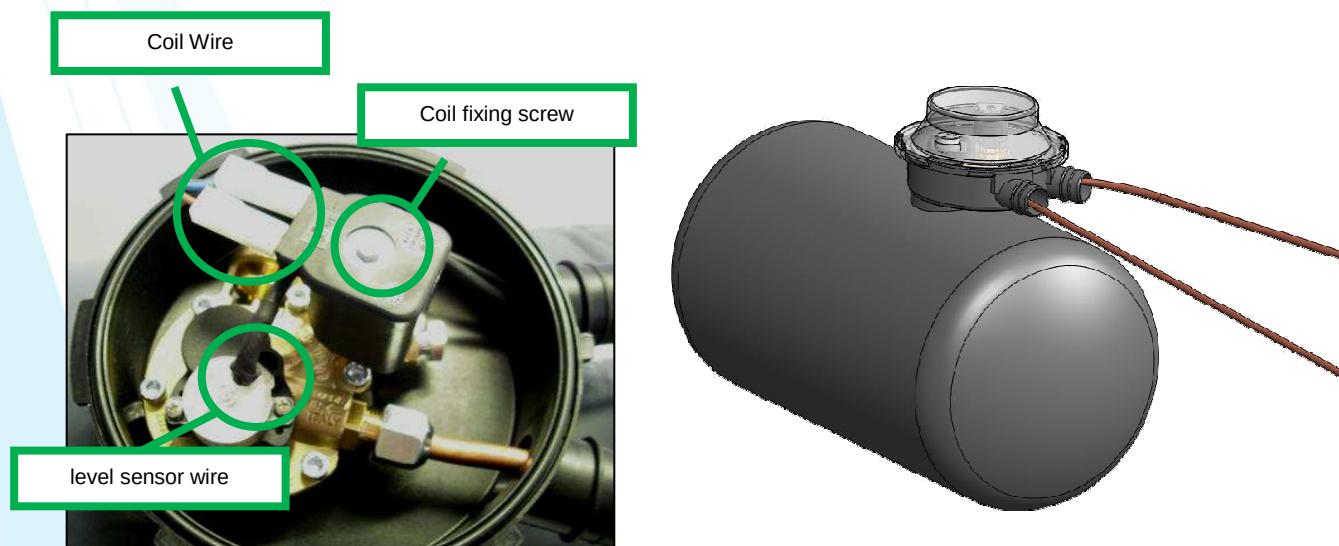


Figure 34: cylindrical tank electrical connection

30° and 37° toroidal tanks

Copper pipes inserting (to be performed with appropriate fittings) in the gas tight housing and manual screwing in the multivalve seat.

Inlet fitting (17 mm and 16 mm wrenches) and outlet fitting pipes fixing (13 mm wrench) (Figure 35).

Maximum screwing torque to be 5 Nm

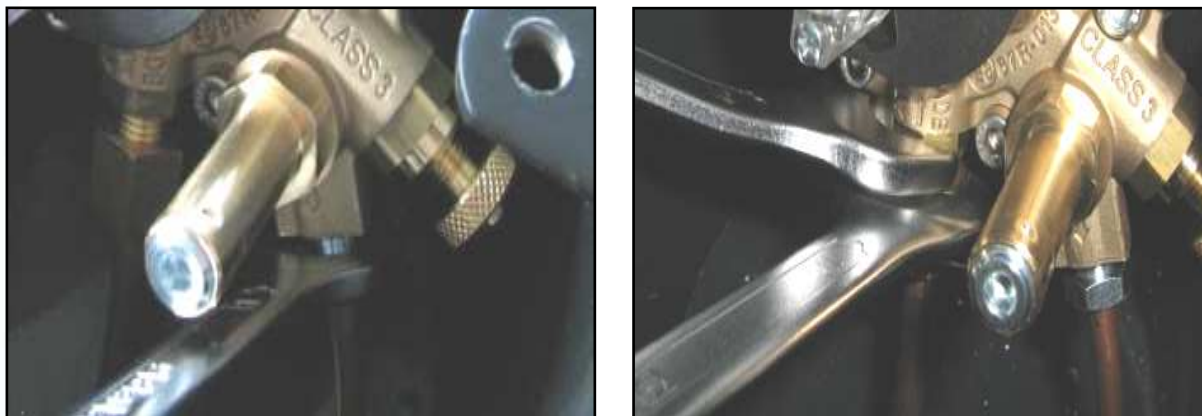


Figure 35: inlet and outlet fittings screwing 30° and 37° toroidal tank

Coil inserting and fixing (appropriate hex screw to be used).

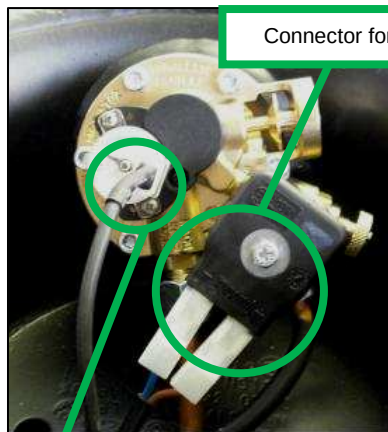
Electrical level sensor wire connection (if present).

Electrical coil wire connection (figure 36).

Fixing screw of coil



Connector for the coil



Connector for level
sensor

Figure 36: 30° and 37° toroidal tank electrical connection

0° toroidal tanks

Copper pipes inserting (to be performed with appropriate fittings) in the gas tight housing and manual screwing in the multivalve seat.

Inlet fitting (17 mm and 16 mm wrenches) outlet fitting pipes fixing (13 mm wrench) (Figure 37).

Maximum screwing torque to be 5 Nm



Figure 37: inlet and outlet fittings screwing 0° toroidal tank

Coil inserting and fixing (appropriate hex screw to be used).

Electrical level sensor wire connection (if present).

Electrical coil wire connection (figure 38).

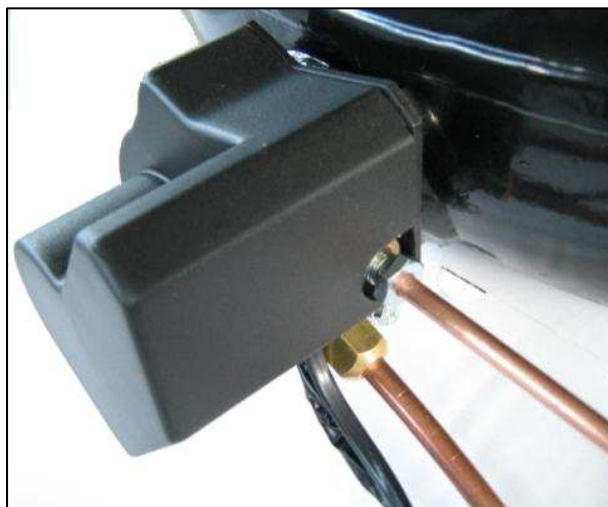
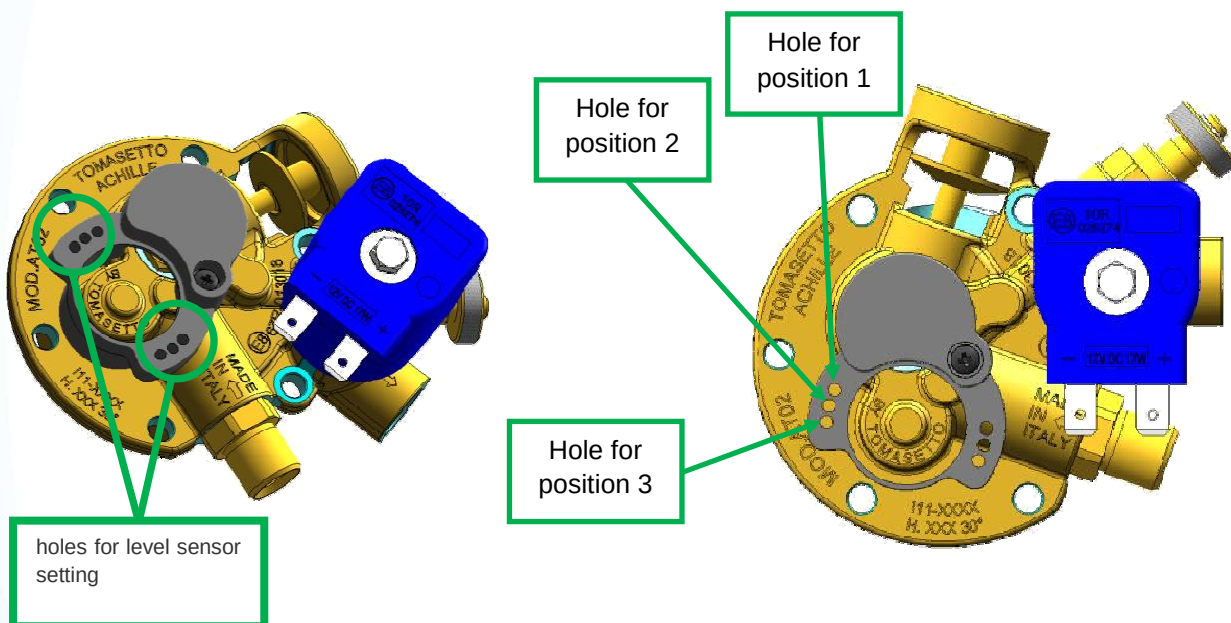


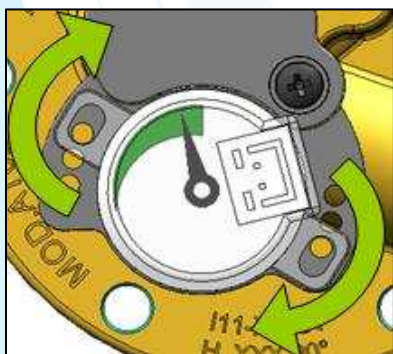
Figure 38: 0° toroidal tank electrical connection and external plastic protection assembly

m) Calibration of the Level sensor

LPG level sensor indication setting (if required): to modify the level sensor setting, the holes on the plastic sensor holder has to be used.



Level sensor to be rotated anticlockwise in case the LPG/petrol switch doesn't switch on the full LED.



Level sensor to be rotated clockwise in case the LPG/petrol switch doesn't switch on the empty LED.

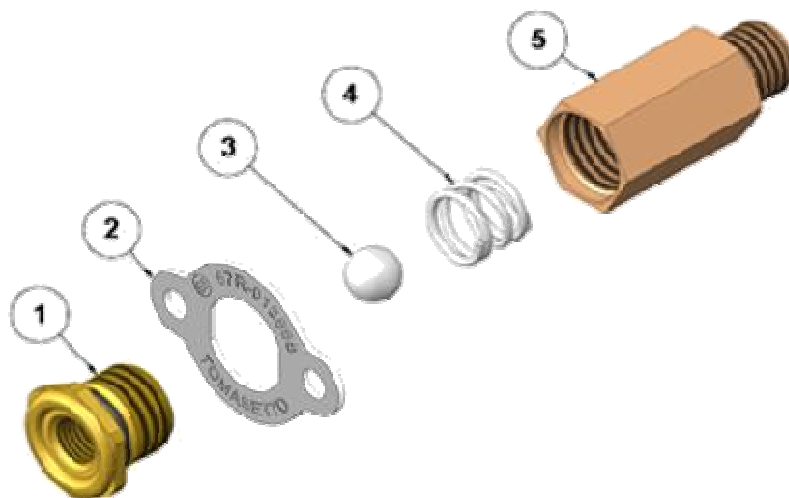
n) Final checks

After the multivalve installation, a filling of the tank is warmly recommended in order to verify:

- absence of leakage from multivalve gasket and fittings, with a leak detector or equivalent methods;
- correct filling of the tank according to the ECE 67 R01 Regulation, Part II paragraph 17.6.3.1 ***“The automatic filling level limiter shall be suitable for the fuel container it is fitted to and shall be installed in the appropriate position to ensure that the container cannot be filled to more than 80%”***;
- proper working of the shut-off solenoid valve.

o) Remote filling point

The remote filling point is a device aimed to supply the LPG in the system. The filling valve is equipped with a non return valve to avoid the back flow from the tank.



It is recommended to install the filling point in an appropriate area in order to facilitate the operations during the filling.

It is recommended to install the filling valve in an appropriate area free from water and debris.

It is recommended to install the remote filling point in an appropriate position suitable to hold different filling adapters..

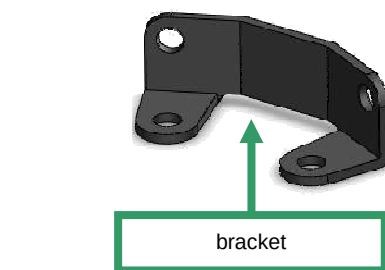
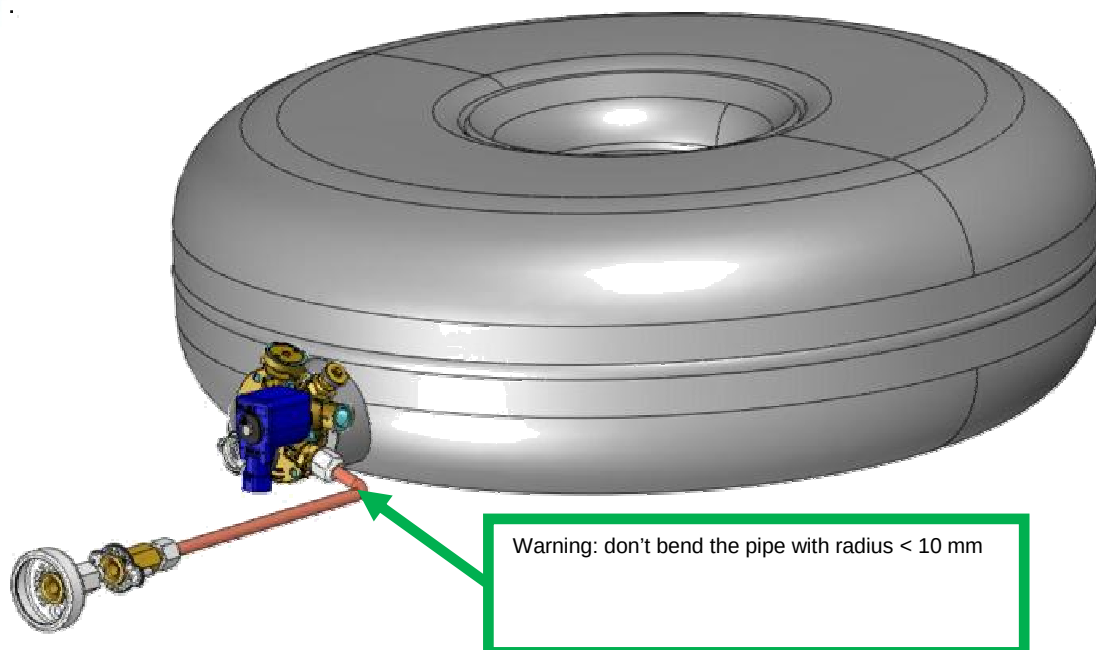


Figure 39: filling point installation

Warning: during the installation, avoid to bend the inlet with a radius which can reduce the cross section of the pipe and reduce the performance of LPG system.



It is warmly recommended to properly fix the device in order to avoid the rotation of the components.
It is warmly recommended to properly install the device in order to prevent bending of pipes or damages of the components during the filling operations.
It is warmly recommended to screw the plastic plug of the filling valve in order to avoid damage from dust.

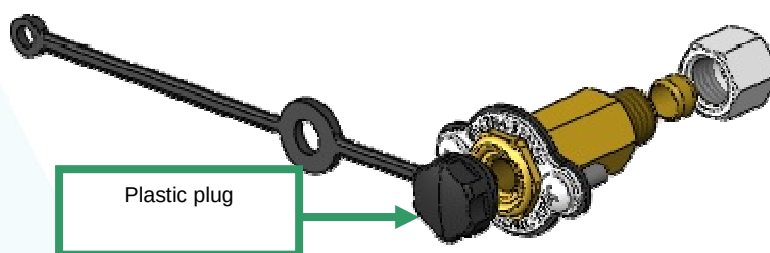
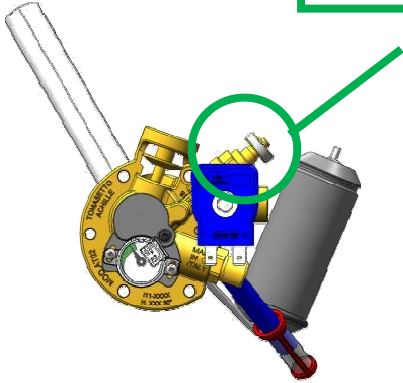
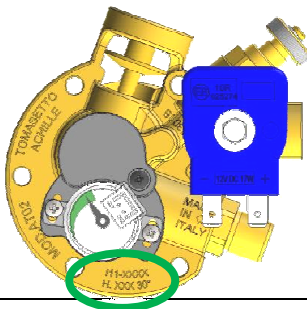


Figura 40: filling valve device with plastic plug

Troubleshooting

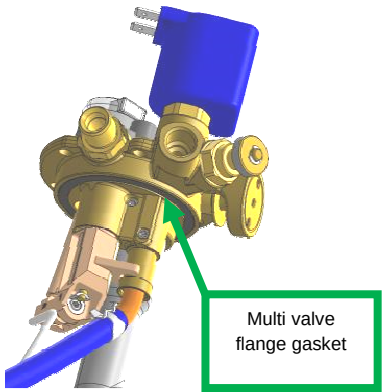
Each maintenance operation must be performed without LGP in the tank and in safety conditions

It's strictly forbidden to modify or tamper the multivalve and its accessories

FAILURE	CAUSE	CORRECTIVE ACTION
The engine does not work with LPG	- Manual valve closed.	- Open the manual valve. 
	- Excess flow valve locked in the close position	- close the manual valve and re-open it after a few seconds.
	- Bottleneck or damaged pipes.	- Replace the hoses.
	- Electrical connections are disconnected.	- Connect correctly the electric wires and/or verify that there aren't interruptions
	- Presence of impurities inside the solenoid which blocks the passage of the gas	- Replace the multi-valve
	- multi-valve model installed incorrectly.	- Install the multivalve according to the tank size. 
	- Shut off valve damage	- Replace the coil or, in case the multivalve doesn't work, replace the multi-valve
	- Insufficient flow rate to the reducer due to a small quantity of LPG inside the tank.	- Re-filling.

FAILURE	CAUSE	CORRECTIVE ACTION
LPG does not flow during the filling	- Non-return valve blocked .	- Replace the multi-valve.
	- Filling valve blocked by dust or debris	- Replace the filling valve.
	- Pipe bottleneck due to excessive bending	- Replace the pipe.
Noise and vibration of the multivalve during refilling operation	- Filling station pump pressure insufficient.	- Try to fill in another filling station
Wrong level indication	- Float rod blocked inside the tank.	- Check the correspondence between the tank size and the multivalve size, if not, remove the multivalve and install a right one
	- Plastic pipe overlapped on the float rod	- Remove the multivalve from the tank, replace the plastic pipe and assemble the multivalve according to the instructions on page 21 or 24
	- Damaged Level sensor	- Replace the level indicator and set it according to the instructions on page 36.
Wrong filling of the tank	- Wrong installation of the tank	- Check if, in the installation of the tank, the procedures as per the instruction on page 30 or 31, were followed.
	- Float rod damaged or bent	- Check the correct 80% setting in an authorized service center. - If the float rod is damaged, replace the multivalve.

FAILURE	CAUSE	CORRECTIVE ACTION
100% tank filling	- Float rod damaged or bent during the installation	- Check the correct 80% setting in an authorized service center. - If the float rod is damaged, replace the multivalve.
	- Wrong assembly of the multivalve in the tank	- Assembly the multivalve according to the instructions on page 16, 17 or 20
	- Wrong installation of the tank	- Place the vehicle on a perfectly horizontal plane during refilling - Check the installation of the tank following the instruction on page 30 or 31
	- Filling station pump pressure insufficient.	- Change the filling station
	- The 80% valve is blocked.	- Verify if the tank is empty - Remove the multivalve and clean it with compressed air - If it isn't possible to clean the multivalve, replace it.
	- Plastic pipe overlapped on the float rod	- Remove the multivalve from the tank, replace the plastic pipe and assemble the multivalve according to the instructions on page 21 or 24
	- Float rod blocked inside the tank.	- Check the compatibility of the tank and the multivalve - Check if the float rod is conformed to the original version and install the multivalve according the instructions on page 18, 21 or 24.

FAILURE	CAUSE	CORRECTIVE ACTION
LPG leak from the tank	- Wrong flange fixing screws torque	- Fix the 6 screws of the multivalve to the tank. - The fixing torque to be in a range of 3 to 4 Nm
	- Damaged Tank Ring	- Remove the multivalve and follow the operation explained on page 14
	- Multivalve flange gasket damaged 	- Replace the multivalve.
Inlet and outlet fitting threads damaged	- Excess fixing Torque	- Replace the multi-valve.
	- Wrong Screwing of the inlet and outlet fittings	- Replace the multi-valve.

FAILURE	CAUSE	CORRECTIVE ACTION
Level indicator failure	- Electrical wire disconnected	- Connect the electrical wire according to the instruction on page 33
	- Damage in the magnet holder during the installation of the multi-valve	- Replace the multivalve.
	- Damaged Level sensor	- Replace the level sensor according to the instruction on page 36
	- Float rod blocked inside the tank.	- Check the compatibility of the tank and of the multivalve
	- Float rod damaged or bent during installation	- Check the correct 80% setting in an authorized service center. - If the float rod is damaged, replace the multivalve.
	- Plastic pipe overlapped on the float rod	- Remove the multivalve from the tank, replace the plastic pipe and assemble the multivalve according to the instructions on page 21 or 24
LPG leak from the tank during refilling	- Insufficient inlet fitting fixing torque	- Fix correctly the inlet fitting. - Fixing torque to be in a range of 4 to 5 Nm
LPG leak from the tank in normal working condition	- Leak from pipe connection	- Fix correctly the outlet fitting. - Fixing torque to be in a range of 4 to 5 Nm
	- Wrong nut and ferrule fixing torque	- Fix correctly the outlet fitting. - Fixing torque to be in a range of 4 to 5 Nm